

LW36A-126/145/T3150-40

High Voltage SF6 AC Circuit Breaker

Operation Instruction

0HK.412.530SM

Huayi Electric Apparatus Group Co., Ltd.

	Operation Instruction	Huayi Electric Apparatus Group
Name & Model	LW36A-126/145	0HK.412.530SM
	High Voltage SF6 AC Circuit Breaker	1/30

List

1 . Summarize.....	2
2 . Structure and feature.....	3
3 . Packing, transport and store.....	13
4 . Installation.....	14
5 . On site testing after installed.....	21
6 . Use and maintenance.....	23
7 . Technical documents enclosed with products.....	25
8 . Ordering instruction.....	25

Accessories 1 The characteristic of gas SF6

Accessories 2 Installation tools and spare parts list

Accessories 3 Test report of installation and test

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1 Summarize

1. 1 The operation instruction is apply for LW36A-126/145 High voltage SF6 AC circuit breaker. It detail described the installation and use, maintenance, the safe criterion should be took note of, the danger maybe happen. People shall read this operation instruction carefully before install and use the products, be ensure that people were known well to operate the circuit breaker. If you still have any question or need more detailed information, please contact the manufacturer.

1. 2 LW36A-126/145 high voltage SF6 AC circuit breaker is suit for 50Hz、 110kV power system, it is a control and protection equipment for power system, it also can be used as network interconnecting circuit breaker.

1. 3 The circuit breaker accord with the requirements of GB1984-2003 《high voltage AC circuit breaker》and IEC62271-100《high voltage AC circuit breaker》. The circuit breaker insulated by gas SF6 and arc suppression medium by gas SF6, use self-energy arc suppression principle, with CT30 spring operating mechanism, the characteristics are high breaking capacity , small operating power, high reliability.

1. 4 Use ambient environment condition

Normal use ambient environment condition accord with the regulate of GB11022-99 《the common technical requirements of high voltage switch equipments and control equipments standard》 , as follow:

a. ambient environment temperature	-25 ~ +40
b. altitude	≤2500m (126kV); ≤1000m(145kV)
c. wind speed	34m/s
d. one day difference in temperature	25
e. sunlight	0.1w/cm ²
f. month average relative humidity	90%
g. earthquake acceleration	level 0.2g , uprightness 0.1g
h. ice coating thickness	10mm
i. atmosphere dirtiness grade	not exceed GB5582 standard's grade
j. installation situation	outdoor

If user request special use ambient environment , please contact with manufacturer.

1. 5 The operation instruction specify “**attention**” and “**warning**” , when the content specified “**attention**”, if you breach it, it will be inconvenience or little damaged; When the content specified “**warning**”, if you breach it, it will be bodily injury or equipment damaged. The attention and warning will be specified by boldface.

2. Configuration feature

The circuit breaker is 3 phases porcelain vase stanchion type configuration, outdoor design. 3 phases with a spring operating mechanism, lay at center , 3 phase interlock. The circuit breaker insulated by gas SF6 and arc suppression medium by gas SF6, when operating the gas SF6 in the 3 phase porcelain vase is interflow, use pointer type density controller to monitoring the pressure and density. Due to use self-energy arc suppression principle , and optimize designed in the circuit breaker kinetic system, so enhanced mechanical efficiency availably, reduced operating power in farthest.

2 . 1 Main technical parameter

sheet 1

No.	Item	Unit	Parameter
1	Rated voltage		126/145
2	Rated power frequency withstand voltage (1min)	to ground	230/275
		between fracture	265/275
3	Rated lightning impulse withstand voltage	to ground	550/650
		between fracture	630/650
4	The power frequency withstand voltage when gas SF6 is zero pressure (5min)		95
5	Rated frequency	Hz	50
6	Rated current	A	3150
7	Phase coefficient		1.5
8	Rated short circuit breaking current	kA	40/31.5
9	Rated short circuit making current		100/80
10	Rated short time withstand current		40/31.5
11	Rated peak withstand current		100/80
12	Rated short circuit continuous time	s	4
13	Rated out of synchronism breaking current	kA	10
14	Short line fault breaking current		36 , 30
15	Rated line charge breaking current	A	31.5
16	Rated operating sequence		O-0.3s-CO-180s-CO
17	Switch off time	ms	30±3
18	Switch on time		75±8

Continuous sheet 1

No.	Item	Unit	Parameter
19	On-off time	ms	≤60
20	Main loop resistance	μΩ	≤ 40
21	Rated gas SF6 pressure (20 meter's pressure)	MPa	0.6
22	Alarm/closedown pressure (20 meter pressure)		0.55 / 0.50
23	Gas SF6 leak annual	%	≤ 1
24	Moisture content of gas	ppm(v)	≤150
25	Mechanical life	次	6000
26	Wireless interfere level	μV	≤500
27	Creepage distance	Between fracture	3150/3625
		To ground	3150/3625
28	Gas SF6 weight of each circuit breaker	kg	10
29	Circuit breaker weight		1300

Main technical parameter of mechanism

sheet 2

No.	Item	Unit	Parameter
1	Auxiliary loop voltage	V	DC220
2	Rated operating voltage of switch on coil and switch off coil	V	DC220
3	Rated operating current of switch on coil and switch off coil	A	2
4	Energy store motor	Rated voltage	AC220 /DC220
		Voltage range of normal operation	65%~110%
		Power	600
5	Energy store time of motor	s	≤15
6	Manual energy store moment	N·m	≤30
7	Loop voltage of heater and lighting	V	AC 220
8	Rated voltage of auxiliary switch	V	DC 220
9	Rated current of auxiliary switch	A	10
10	Connection point pairs of auxiliary switch		20

2 . 2 Whole configuration feature of circuit breaker

The configuration shown as drawing 1, 3 poles porcelain vase install on a common base. The control box lift on under the center of base, spring operating mechanism and control unit are installed in the control box, the output pole of mechanism is connect with middle phase's regulating lever.

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LW36A-126/145 High Voltage SF6 AC Circuit Breaker	0HK.412.530SM
	6/30

The point type SF6 density controller(with pressure meter) is use for monitoring the density of gas SF6 in equipment and send control signal , it have the function of temperature compensate. When the ambient temperature change to bring the pressure change of gas SF6, the controller will not act. Only when the gas SF6 leak to bring pressure change, the controller will alarm and closedown signal.

The control box connect under the base by 6 bolts M20, there are dampproof and dustproof seal equipment at the joint of mechanism output pole, the joint of B phase regulating lever and the exit of secondary wire.

Attention : 1 When not connect the pole, the pressure meter display data is the pressure of pipeline.

2 the pressure data displayed is at 20 .

1 . 4 Pole(porcelain vase)

Each pole is an airtight unit. The pole consist from top to bottom: above output wire plate, explosion chamber, bottom output plate, support porcelain tube, insulating tie bar, regulating lever box, operating mechanism etc. (see drawing 2) .

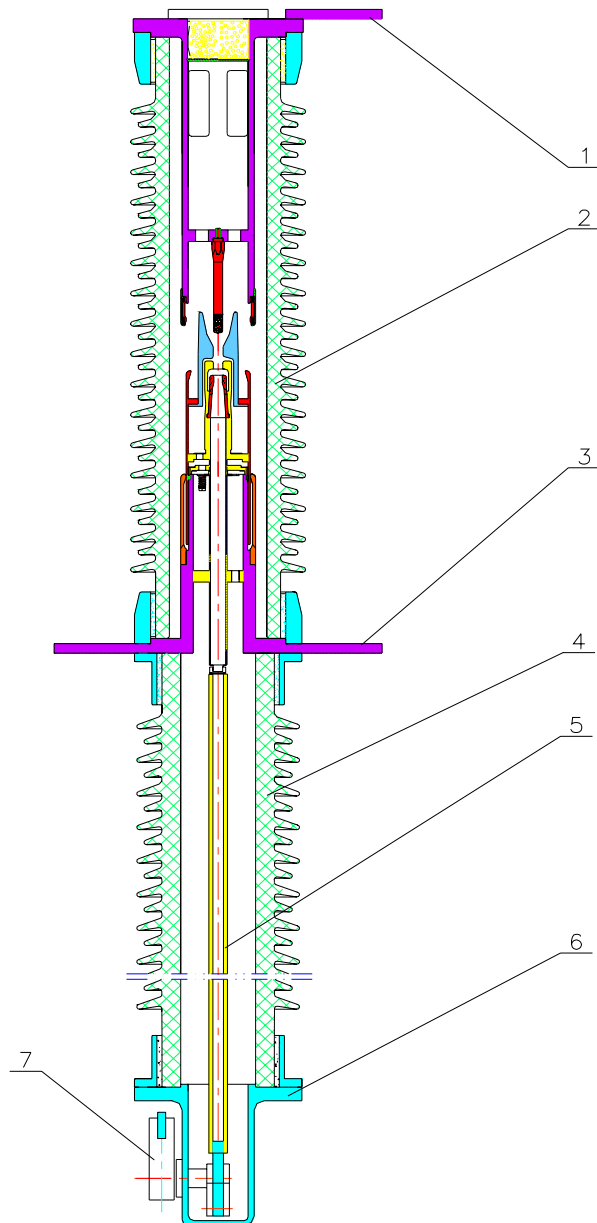
2 . 4 . 1 Above output wire plate and bottom output wire plate

Above output wire plate and bottom output wire plate are use for line primary connecting , the bottom output wire plate have output wires on face and inverse (the side of switch on indication and switch off indication on control box called face, or the side have a pressure meter called face), the output wire direction of above output wire plate can install according to user's request. If user haven't definitely request, the above output wire plate will be installed at face side. Wire connection hole dimensions of above output wire plate and bottom output wire plate have 3150A and 1250A two wire connection types, see drawing 3 ,the dimension criterion refer to GB5273《connection terminal of transformer, high voltage electric appliance, bushing》 .

2 . 4 . 2 Explosion chamber

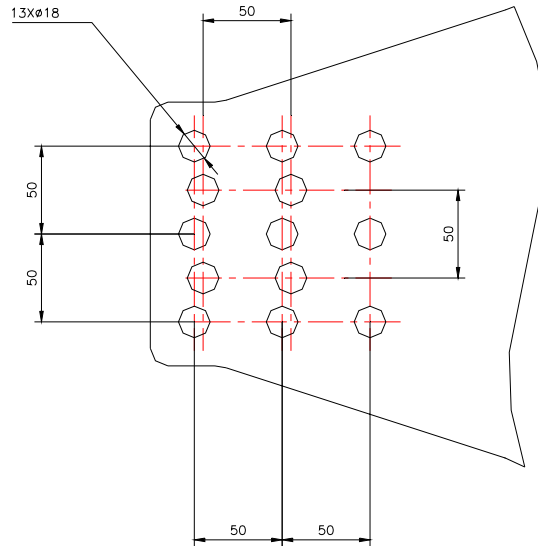
Explosion chamber installed in bushing, it is the core part of circuit breaker. It mainly consist by porcelain tube, fixed contact base, fixed main contact, fixed arc contact, spout, cylinder, moving arc contact, middle contact, bottom support base, tie bar, etc. (see drawing 4) . The sorbent is put on the top of fixed contact base, tie bar is connect with insulated tie bar of support porcelain tube, finally connect to outer regulating lever. The explosion chamber porcelain tube is made by high strength porcelain, it is high strength and good airtightness.

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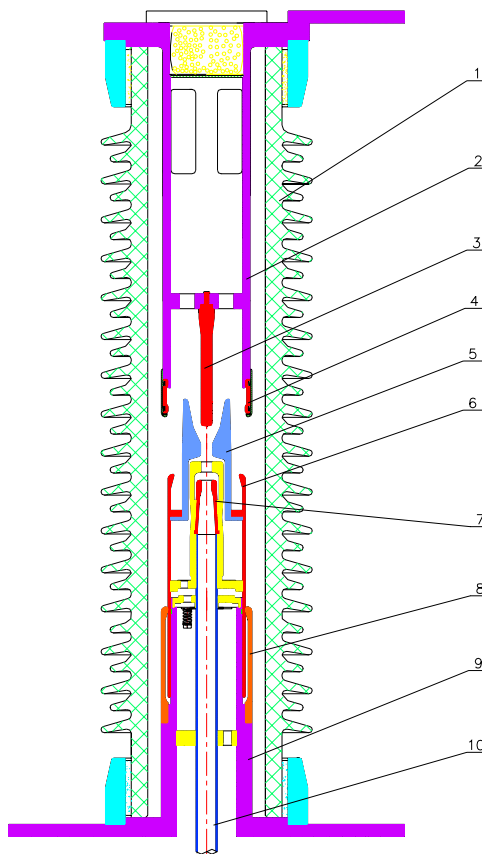


- 1.above output wire plate 2.explosion chamber 3.bottom output wire plate 4.support porcelain tube
5.insulated tie bar 6.regulating lever box 7.outer regulating lever

drawing 2 pole(porcelain vase)



drawing 3 connection terminal plate



1. porcelain tube
2. fixed contact base
3. fixed arc contact
4. fixed main contact
5. spout
6. Moving main contact
7. Moving arc contact
8. Middle contact
9. Bottom support base
10. tie bar

drawing 4 configuration drawing of explosion chamber

Long term current carrying loop consist by above wire connection plate, fixed contact base, fixed main contact, cylinder, middle contact, bottom support base, bottom wire connection plate. At the bottom of cylinder's thermal expansion chamber installed non-return valve, at the bottom of plenum chamber installed air return valve and pressure relief device.

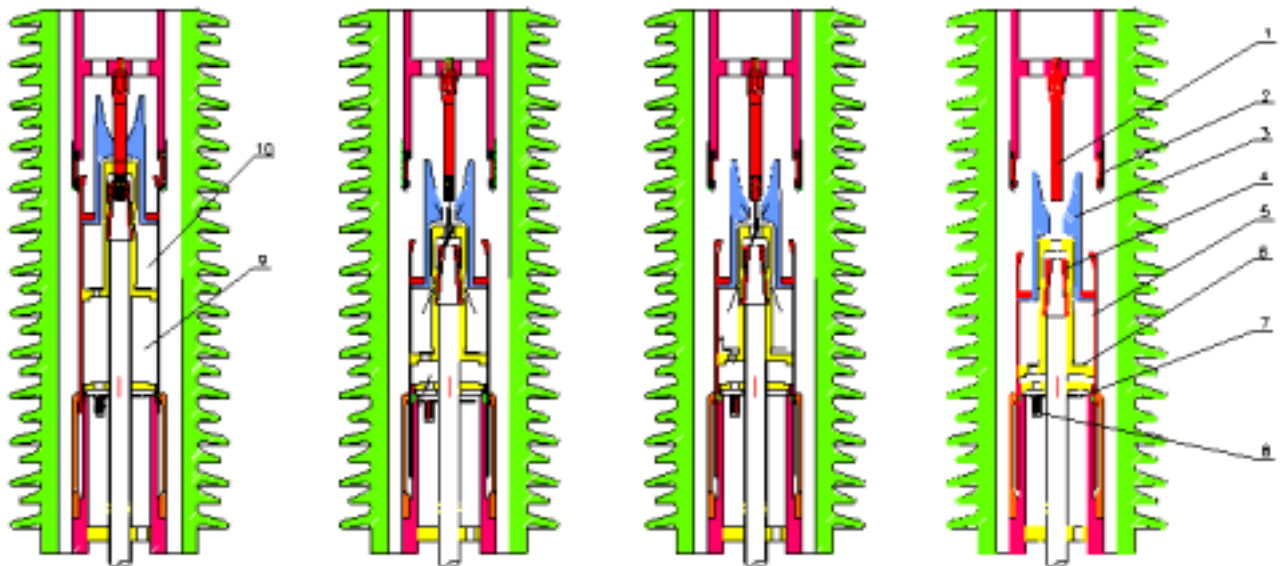
2 . 4 . 3 Support porcelain tube

Support porcelain tube work as support explosion chamber and insulated to ground. In the porcelain tube installed insulated tie bar, work as insulated to ground and mechanical drive. The support porcelain tube is made by high strength porcelain, it is high strength and good airtightness.

2 . 4 . 2 Regulating lever box

Regulating lever box work as transfer the operating mechanism's output action to insulated tie bar, and finally transfer to moving part of explosion chamber, to complete the circuit breaker's switch on and switch off. The regulating lever box installed valve for connecting the gas charge pipeline in base. When the gas charge pipeline was not connected, the whole pole is in seal state. The regulating lever shell made by high airtightness aluminium alloy, there are location holes can fixed the pole at the switch off position.

2 . 5 The principle of circuit breaker arc suppression (see drawing 5)



A switch on position **B breaking heavy current** **C breaking low current** **D switch off position**
 1. fixed arc contact 2. main contact 3. spout 4. moving arc contact 5. cylinder 6. non-return valve
 7. pressure relief valve 8. pressure reduce valve 9. plenum chamber 10. thermal expansion chamber

Drawing 5 the principle of arc suppression

There are manual switch on and switch off button, distance-on the spot changeover switch, energy store motor switch (see drawing 7) , circuit breaker's state indicator drop on faceplate of control box. The operator can see the circuit breaker state.

The sketch map and operating method of faceplate in control box, please refer to 《operation instruction of CT30 spring operating mechanism》 .

3 . Packing, transport and store

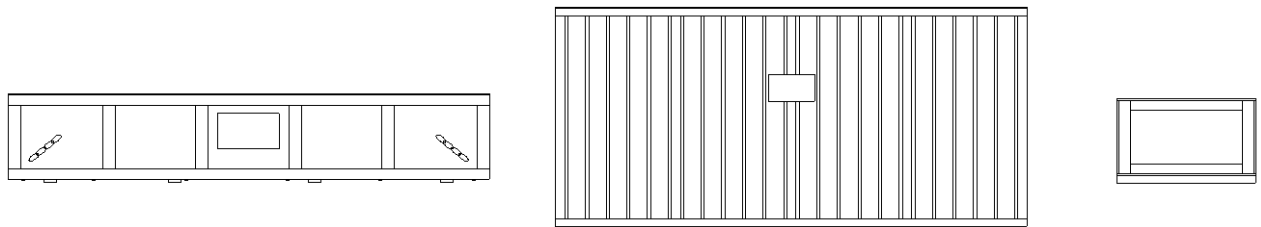
3 . 1 Packing

There are 5 subassembly of circuit breaker packing case, see drawing 8. Three poles(porcelain vase) packet by wood carton ; The random file and packing list are inside the control box. Besides, there is a accessory box for filling installation and debug tools, expendable and fastener etc accessories.

Attention : 1. Each pole(porcelain vase) has charged 0.03 ~ 0.05Mpa gas SF6.

2. Pole is in switch off state, insert locating pin.

3. Switch off spring and switch on spring are in release state, insert safety pin.



Dimension: 3100×780×690mm

4050×2290×880mm

650×300×200mm

Weight: 300kg/piece

500kg/piece

100kg/peice

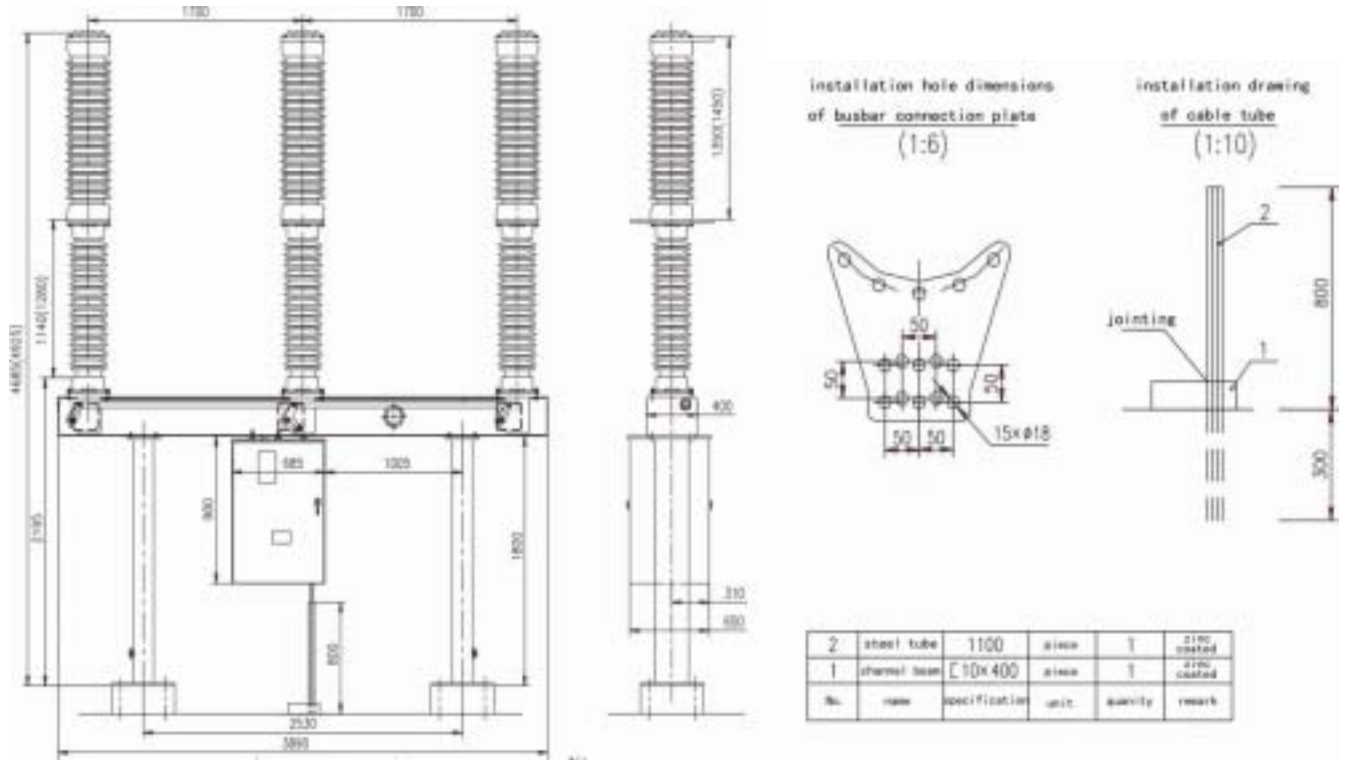
Drawing 8 Packing case

3 . 2 Transport

The packing case can move by forklift or swing by crane (hoisting bigger than 2 tons) ,move with translation and lightly put down. Line-haul transport by car, train, ship, if carried by car, the road surface should not lower than road standard 3 grade. The packet circuit breaker in transporting, loading and unloading are not allowed overturn, place upside down, should not be shake and hit consumingly.

Warning : 1. the pole(porcelain vase) is brittle, it will be broken if not transported according to criterion.

2. Transport or translation at charge gas pressure higher than 0.1MPa is strictly prohibited.



Outline drawing of circuit breaker

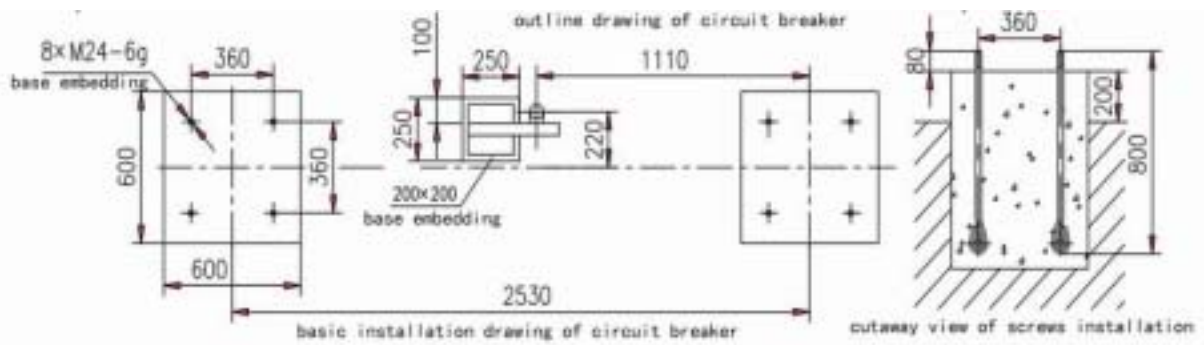
Note: 1. base embedding, the M24 screw exerted length is 80mm

with 2 nuts, the base dimensions error is ± 1 mm.

2. the operating applied force: pull up=1800Kg, horizontal force=2500Kg, total weight=1300Kg.

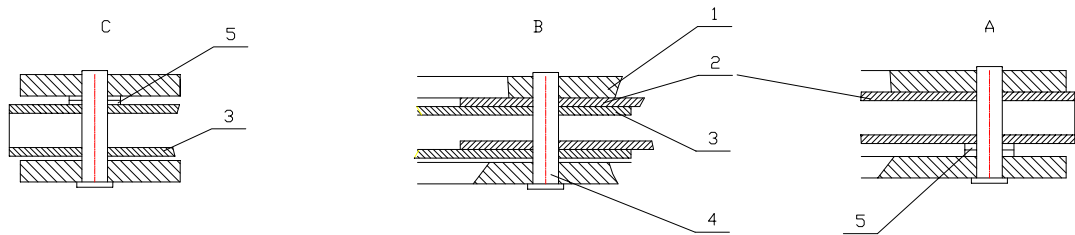
3. the circuit breaker earthed by 50x5 zinc coated, flat steel.

4. the dimension of 145KV circuit breaker marked in the ().



Drawing 9 groundwork installation

2. Put gasket between the regulating lever and operator link when connecting the operator link, to ensure the operator link's accept power direction and moving direction are same. (see drawing 13).

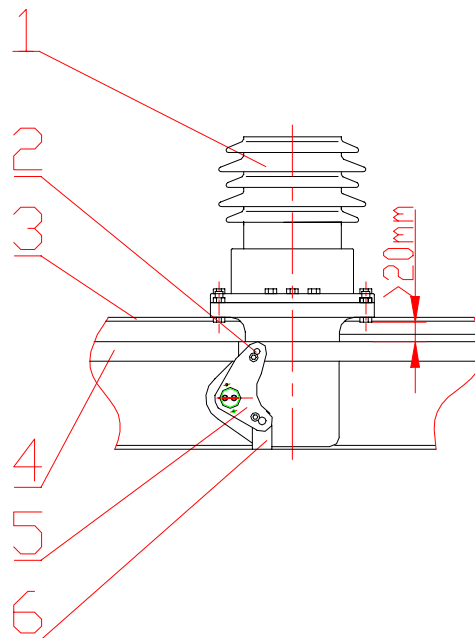


1 regulating lever 2 operator link 3 operator link 4 drive pin 5 adjusting gasket

Drawing 13 orientation of operator link

4 . 3 . 4 Connecting of operating mechanism

Connecting the operating mechanism's output lever with B phase regulating lever. In connecting, prize the large regulating lever in mechanism through installing hole, make the joint of output lever up and down jiggle, thereby connect B phase regulating lever by $\phi 20$ pin easily, see drawing 14. After finished the connection, fix the drive pin by M6 bolts and template.



1 pole 2 base 3 mechanism 4 operator link 5 B phase regulating lever 6 mechanism's output lever

Drawing 14 Connecting of operating mechanism

5 . Try operate had best use motor distance control, before operate, all operators shall outer of 30m or behind cover.

6 . Strictly prohibit the circuit breaker single operate or two phase operate through fair and foul. To finish 5 times switch on operation, 5 times switch off operation and 3 times cycle operation.

5 . 2 The inspecting and test after installed

5.2.1 measuring the mechanical operation characteristic

In switching on and switching off, register the energy store time, switch off time and switch on time of spring mechanism.

5 . 2 . 2 Measuring the resistance of main loop

In switch on state, measuring the resistance of three phases main loop and register it.

5 . 2 . 3 Measuring insulation resistance

In the state of switch on and switch off, measuring the insulation resistance of three phases fracture and to earth by megger, and register it.

5 . 2 . 4 Power frequency voltage withstand test

If the condition allowed, test the power frequency voltage withstand and register it.

5 . 2 . 5 Check the performance of density controller

Closing the valve of regulating lever box, connecting the deflate joint to the gas charge joint of in base, screw bolt slowly, to leak the gas inside the pipeline slowly. When the gas SF6 pressure fall down to alarm pressure, it shall be alarm; When the pressure fall down to closedown pressure, check the circuit breaker whether is in closedown state. Then remove the deflate joint, open the valve of regulating lever box(one phase) slowly, monitoring the finger of density controller whether restore.

After checked, opening the three phases regulating lever box, when the gas SF6 pressure is lower than 0.60Mpa, charging the circuit breaker's air chamber to rated pressure by charging device. After charged, screw out the charging device and save it, and fix the protection bolt of charging joint in base.

5 . 2 . 6 Leak hunting of circuit breaker

Checking airtightness of all sealing surface of circuit breaker, especially check the gas charge pipeline, whether the joint leak gas. If the joint is leaking gas, you can remove the joint, check whether the sealing surface have eyewinker or whether the O type gasket ring was broken, to leak huntung again after changed. If there are still leak hunting, please notify manufacturer to solve it in time.

LW36A-126/145	0HK.412.530SM
High Voltage SF6 AC Circuit Breaker	22/30

5 . 2 . 7 Measuring moisture

Connecting the pressure reducing valve, pipeline and moisture tester to charging valve, test the moisture content of air chamber. In acceptance checking, the moisture content should not exceed 150ppm (V/V , 20) ; in operating, the moisture content should not exceed 300ppm (V/V , 20) .

5 . 2 . 8 Check the humidity controller and heater whether are normal.

5 . 2 . 9 Connecting primary busbar and primary connection terminal, user make connect direction according to field situation. Burnish the contact surface by emery cloth and clean by cloth dipt alcohol .

5 . 2 . 10 Scrub away all porcelain of circuit breaker by clean water.

5 . 2 . 11 Before go into operation, check the test items again, check the test data, fill in installation and test report bipartite, user and manufacturer hold on apiece one as source material for future reference.

5 . 3 Cleaning of site

After finished installed the circuit breaker, cover all cover boards, save all removed accessories.

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6. Use and maintenance

6 . 1 Routine maintenance and inspection in operating

6 . 1 . 1 Eyeballing inspect the porcelain whether have crack in operating.

6 . 1 . 2 Observe the gas charge pressure of circuit breaker and register it.

6 . 1 . 3 Observe the switch on indication and switch off indication of the control box and the regulating lever position of regulating lever box, to make sure whether the state of circuit breaker is normal.

6 . 1 . 4 Observe the corrosiveness of fastener and frame, register it.

6 . 1 . 5 Periodical inspect whether the heater is normal.

6 . 1 . 6 Observe whether have strike fire phenomenon of primary wire connection.

6 . 2 Circuit breaker maintenance

SF6 circuit breaker go by the name of non repair circuit breaker, but maintain per 3 years to ensure operate in good state. The maintaining should cut power several hours. The maintaining mainly include as follows:

6 . 2 . 1 Inspect the porcelain surface and clean it.

6 . 2 . 2 Inspect the erode status, repair lacquer if eroded; If the fastener rusted, replace it.

Warning: the fastener should be replaced one by one, because the pole is a airtight pressure container, it will cause injure person or broken equipment if replace in the same time.

6 . 2 . 3 Inspect the fastener whether become flexible, if yes, fix it.

6 . 2 . 4 Inspect the primary connection terminal plate whether changed color, if yes, shine the contact surface and fix it.

6 . 2 . 5 Lubricate to the moving parts of mechanism.

6 . 2 . 6 Measuring the moisture content and register it.

6 . 2 . 7 Measuring the resistance of main loop and register it.

6 . 2 . 8 Inspect the secondary wire connection whether locked in, whether can carry out the electric injunction reliably.

6 . 3 Heavy repair of circuit breaker

The heavy repair mainly is disassembly the arc chamber and repair it. When repairing it, user can invite manufacturer send professional person to guide.

The circuit breaker need heavy repair in follows' circumstances :

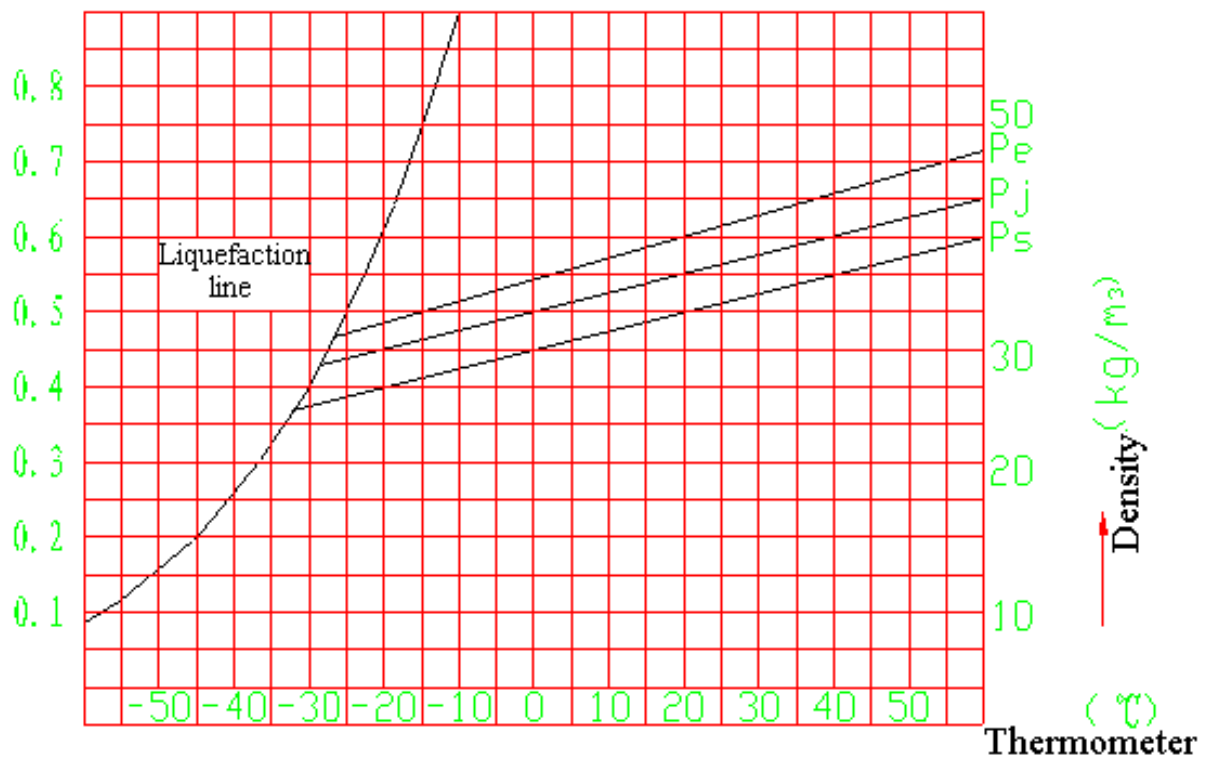
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Accessories 1 Gas SF6 characteristic

Gas SF6 was invented in this century, due to its outstanding insulated performance and arc suppression performance, used in high voltage and extra-high voltage switch equipments. In normal temperature, gas SF6 is colorless, inodorous and transparent inert gas, upstanding chemical stability. The atomic weight of SF6 is 146, it's about 5 times of atmosphere, so if leaked in atmosphere will deposit on the earth's surface.

Be the same as others gas, the pressure of gas SF6 will change along with temperature. The gas SF6 state curve of this LW36A-126/145 SF6 circuit breaker as follows :

Pressure (MPa)



Accessories 2 Installation tool and spare part schedule

1. Random accessories and auxiliary material

No.	Name and specification	Quantity	Purpose	Remark
1	Earth foot bolt M24×800	8pcs	Fix the circuit breaker on the base	
2	M24 nut, flat gasket, elastic gasket	apiece 8pcs		Stainless steel, M24 Bolt 16pcs
3	M20×65 stainless steel bolt, nut, flat gasket, elastic gasket	apiece 12pcs	Fix the phase pole on the beam	
4	M16×50(80) stainless steel bolt, flat gasket, elastic gasket	total 15pcs	Install the wire connection terminal plate	Thereinto stainless Steel M16×50 bolts 9pcs
5	Wire connection terminal plate (8HK280.511.019)	3pcs		
6	M6×15 bolt, template	apiece 4pcs	Install axis	
7	Pin (8HK280.933.034.1)	3pcs		
8	Pin (8HK280.933.034.2)	1pcs		
9	Sealant D05(transparent)	100 g×2pcs	Waterproof of mechanism box, and frame	
10	Sealant D05(white)	100g×1 piece	Airproof of SF6 gas pipe connection	
11	Conductive paste	1 piece		
12	Gasket ring 16×2.4	5pcs		HX807
13	Gas SF6	10kg		
14	tool	1 set/substation	Used for mechanism's slow motion	Include ratchet wheel spanner
15	Gas charging tool	1 set/substation	Used for charge gas SF6	Include pressure reducing valve, connection pipe, joint

2. Spare parts can provide

Name	Model no.	Quantity	Remark
Switch off coil		1 pc	
Switch on coil		1 pc	
Motor		1 pc	
Contactator		1 pc	

LW36A-126/145
High Voltage SF6 AC Circuit Breaker

0HK.412.530SM

28/30

1. The provided special purpose tool according to order contract

Name	Model No.	Quantity	Remark
Speed trial tool of circuit breaker		1 set	

2. The provided special purpose equipment according to order contract

Name	Model No.	Quantity	Remark
Gas SF6 leak detector		1 set	
Moisture measuring device		1 set	
Main loop resistance Measuring device		1 set	
Mechanical characteristic tester		1 set	
Vacuum pump		1 set	

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Accessories 3 Installation and test report

USER'S COMPANY		THE NAME OF SUBSTATION		
Model No.		Ex-work No.		
Installation company		Installation time		
No.	Installation content	Technical request	Test result	Remark
1	Disconnect the packing wood carton, check the subassembly a. pole b. base, control box	Intact packing		The accessory box is in the base box
2	Installation of base and control box Installation of groundwork Installation of pedestal	8pcs of M24 fang bolt		
3	Installation of pole B A C	apiece 4pcs of M20×65 bolts (stainless steel)		2pcs are special designed
4	Installation of three phases operator link	φ12 pin		
5	B phase connect with operating mechanism	φ20 pin		
6	Connect pipeline and gas charge	0.60MPa		
7	Connect secondary wire			
8	Try operation	Switch on 5 times		
		Switch off 5 times		
		Cycle operation 3 times		

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