CN Aiso

COMPLETE SET DEVICE SERIES PRODUCT CATALOGUE

Reactive power compensation
complete set device
High and low voltage
complete set device

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CN Aiso

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COMPANY PROFILE

WHO WE ARE?

Yueqing AISO Electric Co., Ltd. located in Liushi Town, Yueqing City, Wenzhou City, Zhejiang Province. We are professional electric manufacturer.

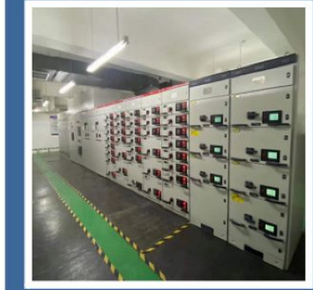
1. Quality is the first, our culture.
2. "With us your money in safe" full refund in case of bad not in accordance with technical requirements or delay delivery time.
3. "Time is gold" for you and for us, we have professional team work whom can making better quality in short time.

Please feel free to contact us for more details.
And fully utilize our 8 years experience and wide contacts.



WORKSHOP



With excellent team work, professional engineers and advanced equipments, we're able to provide quality products and offer you the best customized solutions.

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Committed to creating a better, safer and more efficient electrical world for global customers

REACTIVE POWER COMPENSATION COMPLETE SET DEVICE

YUEQING AISO ELECTRIC CO.,LTD.

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ZRTBBX

Type high voltage fixed reactive power compensation complete set device

General

ZRTBBX type high voltage fixed reactive power compensation complete set device (hereinafter referred to as the device) is suitable for 6~35kV AC power system with frequency of 50Hz. It is mainly used in power system to adjust bus voltage and reactive power, improve power factor, improve voltage quality and reduce network loss.

Executive Standards

- GB 50227-2008 "Code for design of shunt capacitor device"
- JB/T7111-1993 "High voltage shunt capacitor device"
- JB/T10557-2006 "High voltage reactive power local compensation device"
- DL/T 604-1996 "Ordering technical conditions for high voltage shunt capacitors"

Model and meaning

ZR TBBX □ - □ / □ □ □ □ □

- W: Outdoor (indoor by default)
- Reactance rate%, L is filtering
- Relay protection mode:
  K: Open triangle protection
  C: Voltage differential protection
  L: Unbalanced current protection
  Q: Bridge differential current protection
  Y: Unbalanced voltage protection
- Main connection mode:
  A: single star B: Double star
- Unit capacity (kvar)
- Rated capacity (kvar)
- System voltage (kV)
- Complete set of high voltage fixed reactive power compensation device
- Enterprise code

Working conditions

4.1 Cabinet type indoor installation, frame type general outdoor installation.
4.2 The altitude of the installation operation site shall not exceed 1000m, and the place exceeding 1000m shall be ordered through negotiation.
4.3 The ambient air temperature of the installation operation site is −25℃ to +45℃ for indoor devices and −40℃ to + 45℃ for outdoor devices.
4.4 There is no severe mechanical vibration, corrosive gas and steam, and conductive explosive dust in the installation operation site.
4.5 The network or the busbar voltage connected to the installation site shall be free from the influence of higher harmonic, and waveform deviation factor and harmonic content of voltage shall not exceed the provisions of GB/T14549-93 "Voltage Quality, Harmonics in Public Supply Network".

Main technical performance index

5.1 Capacitance deviation

5.1.1 The difference between the actual capacitance and the rated capacitance of the device is within the range of 0～+5% of the rated capacitance.

5.1.2 The ratio of the maximum to the minimum capacitance between any two line terminals of the device shall not exceed 1.02.

5.2 Inductance deviation

5.2.1 Under rated current, the allowable deviation of reactance value is 0～+5%.

5.2.2 The reactance value of each phase shall not exceed ± 2% of the average value of three phases.

5.3 Insulation level

Unit: kV Table 1

Rated voltage of device	1min power frequency withstand voltage of primary circuit (root-mean-square value)	Impulse withstand voltage of primary circuit [(1.2-5)/ 50 μ s peak value]	1min power frequency withstand voltage of secondary circuit (root-mean-square value)
6	32	60	2
10	42	75	2
35	95	200	2

5.4 Overload capacity

5.4.1 Steady state overvoltage

Unit: kV Table 2

Power frequency overvoltage Un	Maximum duration	Explanation
1.10	Long-term	It refers to the maximum value of long-term overvoltage not exceeding 1.10un
1.15	30 minutes in every 24 hours	Adjustment and fluctuation of system voltage
1.20	5min	The voltage increases under light load
1.30	1min	The voltage increases under light load

5.4.2 Steady-state over-current: can run for a long time when the root-mean-square value is not more than 1.1x1.3IN.

5.4.3 When switching a capacitor with a non-rebreakdown switch, a transition overvoltage with a first peak value of not more than 2√2 times the applied voltage (root-mean-square value) and a duration of not more than 1/2 cycle wave may occur. The corresponding transition over-current peak may reach 100IN, in which 1000 operations are allowed per year.

5.4.4 Maximum tolerant capacity: the total capacity does not exceed the 1.35QN within the limit of 5.4.1 and 5.4.2.

5.5 Discharge performance: 5s after power off, the voltage on each group of capacitors is less than 50V.

5.6 Apart from the protection of a single fuse (or internal fuse) for the internal fault of the capacitor, the device is equipped with different relay protection according to the main wiring mode.

5.7 The device is equipped with over-current, over-voltage and under voltage protection for system fault.

5.8 Rated capacity and overall dimension: all according to user's requirements.

Structure and working principle

6.1 The device is a cabinet structure or a frame structure, which can switch the capacitor bank manually, and can be equipped with voltage and reactive power automatic controller to auto-matically switch the capacitor bank.

6.2 The cabinet structure device consists of an incoming isolating switchgear, a series reactor cabinet, a shunt capacitor cabinet and a connected bus. The capacitor cabinet can determine the number of cabinets according to the compensation capacity and the setting scheme, which is generally composed of multiple cabinets. The cabinet body is made of high-quality cold-rolled steel plate bending welding or aluminum-zinc plate bending assembly.

6.3 Structure layout: when the rated capacity of a single capacitor is 30 kilowatts, the capacitor bank is composed of three-layer (single) double-row structure, when the rated capacity is more than 100 kilowatts, two-layer (single) double-row structure, and when the rated capacity is more than 200 kilowatts, single-layer (single) double-row structure.

6.4 Frame structure device is composed of disconnector frame, dry air core reactor, shunt capacitor frame and fence. It includes zinc oxide arrester, shunt capacitor, single protective fuse, fully sealed discharge coil, post insulator, copper (aluminum) bus bar and metal frame.

- The capacitor set is shelved on the metal frame, and the connection bus and pillar insulators are combined to form a primary circuit according to the set connection mode.
- The structure of capacitor bank is usually assembled type, with firm and stable structure, saving steel and convenient installation and transportation.
- The installation forms of capacitor can be divided into single row three layer type, double row single layer type and double layer double row structure.
- Each phase capacitor is usually connected in parallel and then in series. The surface of metal frame is hot-dip galvanized or sprayed with plastic.
- Fence (1.8m high) can be set around the whole device as required. The fence surface is sprayed with plastic. The frame material is made of high quality profiles. See Fig.11-Fig.17 for the outline and structural view.

6.5 Selection of series reactor

The series reactors installed on the neutral side generally choose the dry core reactor; the series reactors installed on the power side generally choose the air-core reactor, which can be stacked in three phases or installed in font.

6.6 Secondary protection and control

The capacitor bank adopts microcomputer capacitor protection monitoring device, which is installed on the fore high-voltage switchgear. It has two control modes: manual and remote automatic control, and the two block each other.

For the capacitor bank which needs automatic switching control, the voltage and reactive power automatic control device or power factor controller is used to automatically switch the capacitor bank through sampling, logic analysis and instruction switching switch. The controller carries RS232 or RS485 communication interface, which can be connected with other monitoring equipment in the substation to form an integrated substation automation system to meet the requirements of various operation and management modes such as unattended or undermanned substation and centralized control.

6.7 Interlock requirement

The incoming cabinet is equipped with grounding switch and circuit breaker mechanical inter-locking and electrical interlocking, and each capacitor is provided with electromagnetic lock and door lock, playing the role of safety protection. When all the cabinet doors are not allowed to close or open at will during operation, the main switch will trip immediately; for the frame structure, the user must install a mechanical coding lock on the operating mechanism of the isolating switch in the capacitor device and the fence door to form an miss operation blocking with the fore circuit breaker. The fence door must be locked before operation and must not be opened during operation, to strictly prevent the occurrence of all kinds of misoperation.

Primary wiring of compensation device

7.1 Connection mode of compensation device: there are "Y" and "Y-Y" connection modes as well as neutral non-grounding for the compensation device. The specific connection method is shown in the primary wiring diagram of each product and the primary system wiring schematic diagram of the compensation device (see Fig. 1 and Fig. 2).

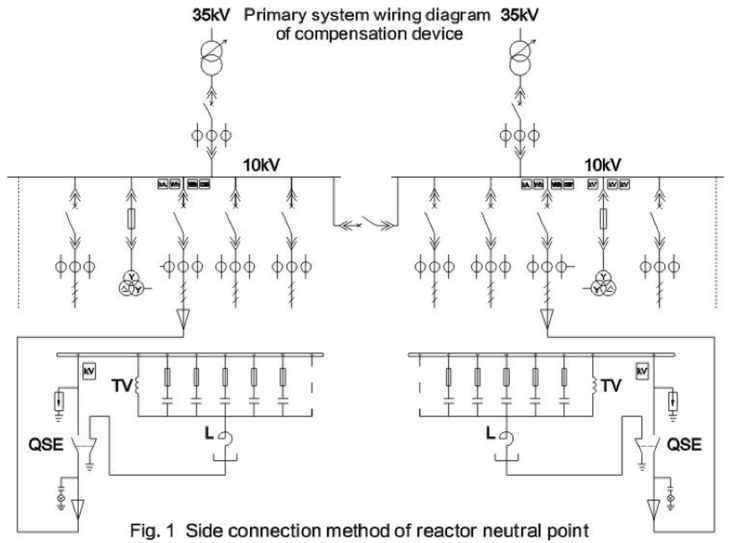


Fig. 1 Side connection method of reactor neutral point

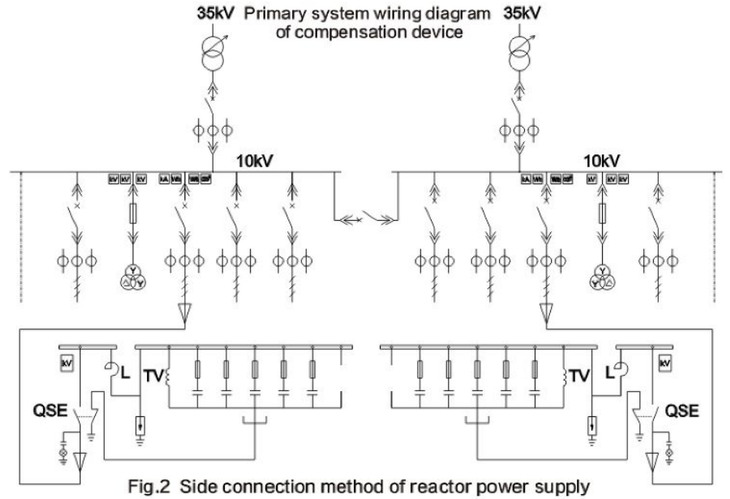


Fig.2 Side connection method of reactor power supply

7.2 Overall dimensions and installation of shunt capacitor compensation device

7.2.1 Cabinet structure

Technical parameters of shunt capacitor compensation device

Table 1

No.	Model	Rated parameter			Shunt capacitor	Overall dimension (L×D×H)	Figure number
		Ue(kV)	Ie(A)	Qe(kvar)			
1	ZRTBBX-10-800/134-AK	11/√3	42	800	BAM11/√3-134-1	2200 × 1350 × 600	3
2	ZRTBBX-10-900/150-AK	11/√3	47.2	900	BAM11/√3-150-1		
3	ZRTBBX-10-1000/167-AK	11/√3	52	1000	BAM11/√3-167-1		
4	ZRTBBX-10-1200/200-AK	11/√3	63	1200	BAM11/√3-200-1		4
5	ZRTBBX-10-1500/250-AK	11/√3	78.7	1500	BAM11/√3-250-1		
6	ZRTBBX-10-1600/267-AK	11/√3	84	1600	BAM11/√3-267-1		

7.2.1.1 Outline drawing of reactor neutral point side

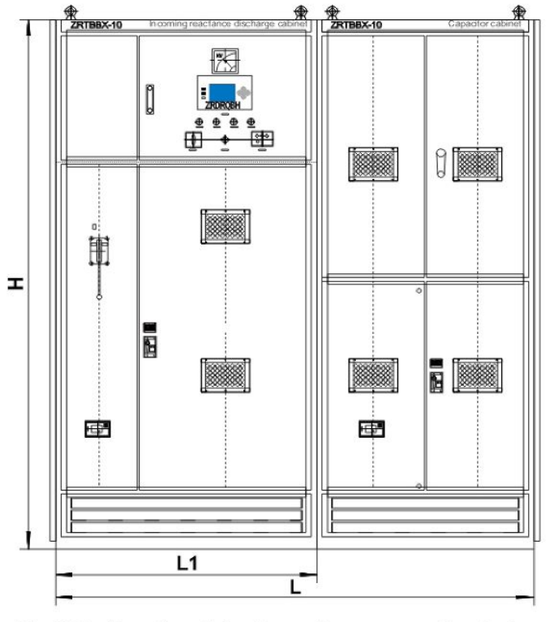


Fig. 3 Configuration of shunt capacitor compensation device

7.2.1.2 Internal structure diagram of reactor neutral point side

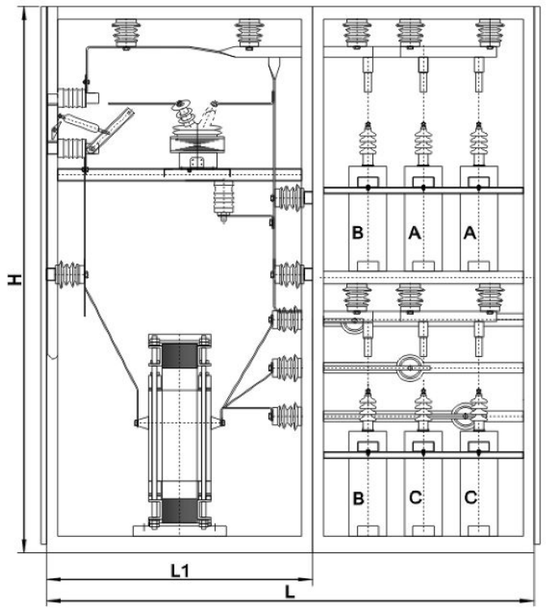


Fig. 4 Internal structure diagram of shunt capacitor compensation device

7.2.2 Another form of series reactor at neutral point
Technical parameters of shunt capacitor compensation device

Table 2

No.	Model	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Overall dimension (L×D×H)	Figure number
1	2×ZRTBBX-10-1200/200-AK	11/√3	63	1200	BAM11/√3-200-1	7600×1400×2600	5
2	2×ZRTBBX-10-1404/234-AK	11/√3	73.6	1404	BAM11/√3-234-1		
3	2×ZRTBBX-10-1500/250-AK	11/√3	78.4	1500	BAM11/√3-250-1		
4	2×ZRTBBX-10-1602/267-AK	11/√3	84	1602	BAM11/√3-267-1		6
5	2×ZRTBBX-10-1800/300-AK	11/√3	94.4	1800	BAM11/√3-300-1		
6	2×ZRTBBX-10-2004/334-AK	11/√3	105	2004	BAM11/√3-334-1		
7	2×ZRTBBX-10-2400/400-AK	11/√3	126	2400	BAM11/√3-400-1		

7.2.2.1 Outline drawing of series reactor neutral point side

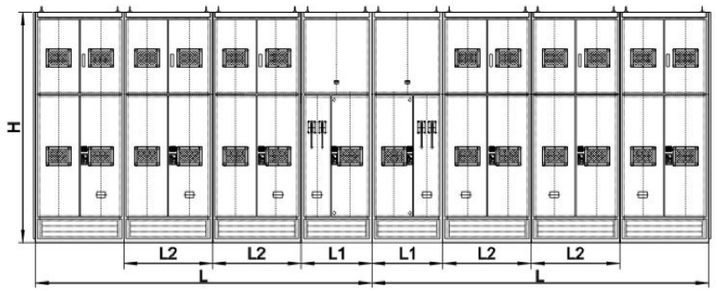


Fig. 5 Overall and installation dimension of shunt capacitor compensation device

7.2.2.2 Internal structure diagram of series reactor neutral point side

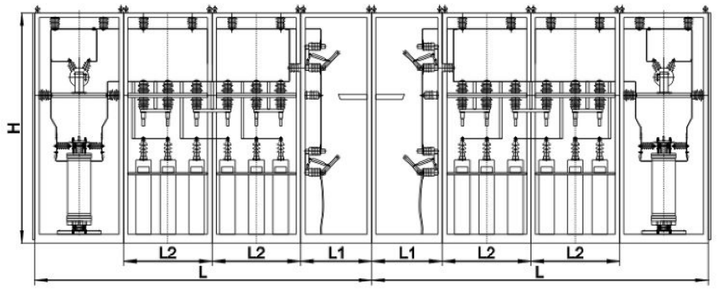


Fig. 6 Internal structure diagram of shunt capacitor compensation device

7.3 Air core reactor is set at power supply side
Technical parameters of compensation device

Table 3

No.	Model	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Overall dimension (L×D×H)	Figure number
1	ZRTBBX-10-4008/167-AK	11/√3	210	4008	BAM11/√3-167-1	5800×1600×2600	7
2	ZRTBBX-10-4800/200-AK	11/√3	252	4800	BAM11/√3-200-1		
3	ZRTBBX-10-5616/234-AK	11/√3	295	5616	BAM11/√3-234-1		
4	ZRTBBX-10-6000/250-AK	11/√3	315	6000	BAM11/√3-250-1		
5	ZRTBBX-10-6408/267-AK	11/√3	336	6408	BAM11/√3-267-1		8
6	ZRTBBX-10-7200/300-AK	11/√3	378	7200	BAM11/√3-300-1		
7	ZRTBBX-10-8016/334-AK	11/√3	420	8016	BAM11/√3-334-1		
8	ZRTBBX-10-9600/400-AK	11/√3	504	9600	BAM11/√3-400-1		

7.3.1 Configuration and installation of shunt capacitor compensation device
(using dry type air core reactor)

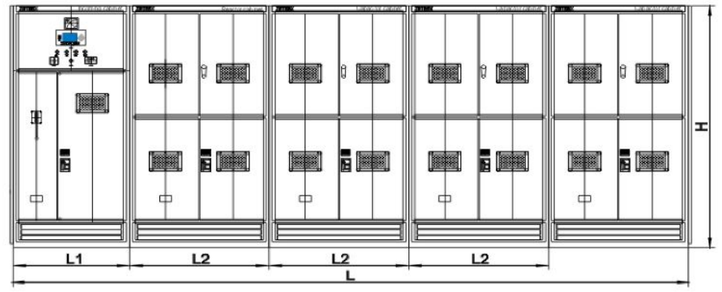


Fig. 7 Configuration of shunt capacitor compensation device
(reactor set at power supply side)

7.3.2 Internal structure diagram of shunt capacitor compensation device
(using dry type air core reactor)

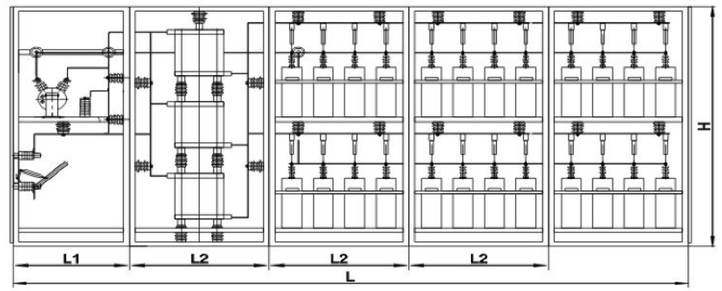


Fig. 8 Internal structure diagram of shunt capacitor compensation device
(reactor set at power supply side)

7.4 Another form of installing series reactor on power supply side
Technical parameters of compensation device

Table 4

No.	Model	Rated parameter			Shunt capacitor	Overall dimension (L×D×H)	Figure number
		Ue(kV)	Ie(A)	Qe(kvar)			
1	ZRTBBX-10-2400/100-AK	11/√3	126	2400	BAM11/√3-100-1	5200×1200×2600	9
2	ZRTBBX-10-3000/125-AK	11/√3	157.4	3000	BAM11/√3-125-1		
3	ZRTBBX-10-3216/134-AK	11/√3	168.8	3216	BAM11/√3-134-1		
4	ZRTBBX-10-3600/150-AK	11/√3	188.9	3600	BAM11/√3-150-1		10
5	ZRTBBX-10-4008/167-AK	11/√3	210.3	4008	BAM11/√3-167-1		
6	ZRTBBX-10-4800/200-AK	11/√3	252	4800	BAM11/√3-200-1		

7.4.1 Another form in front of series reactor

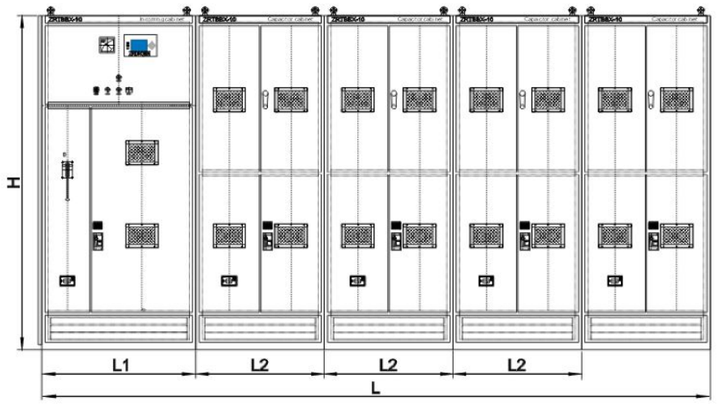


Fig. 9 Overall and installation dimension of shunt capacitor compensation device
(reactor set at power supply side)

7.4.2 Another internal structure in front of series reactor

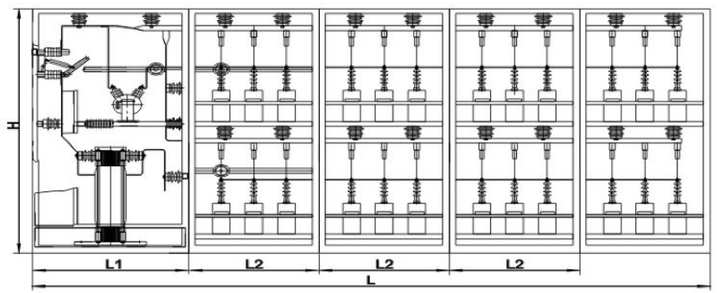


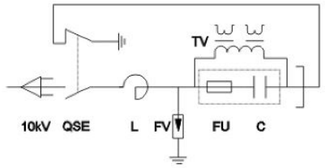
Fig. 10 Internal structure diagram of shunt capacitor compensation device
(reactor set at power supply side)

7.5 Frame type shunt capacitor compensation device
7.5.1 Technical parameters of device

Table 5

No.	Model	Rated parameter			Shunt capacitor	Overall dimension (L×D×H)	Figure number
		Ue(kV)	Ie(A)	Qe(kvar)			
1	ZRTBBX-10-2400/200-AKW	11/√3	126	2400	BAM11/√3-200-1W	5400×3000×3920	
2	ZRTBBX-10-3000/200-AKW	11/√3	157	3000	BAM11/√3-200-1W	6200×3000×3920	
3	ZRTBBX-10-4500/300-AKW	11/√3	236	4500	BAM11/√3-300-1W	6200×3000×3920	
4	ZRTBBX-10-4800/400-AKW	11/√3	252	4800	BAM11/√3-400-1W	5400×3000×3920	11
5	ZRTBBX-10-6000/400-AKW	11/√3	315	6000	BAM11/√3-400-1W	6200×3000×3920	
6	ZRTBBX-10-7500/500-AKW	11/√3	393	7500	BAM11/√3-500-1W	6800×3600×3920	
7	ZRTBBX-10-9000/334-AKW	11/√3	472	9000	BAM11/√3-334-1W	7000×3600×3920	
8	ZRTBBX-10-21600/450-BLW	11/√3	1134	21600	BAM11/√3-450-1W	7600×7000×3300	12
9	ZRTBBX-10-2000+2000-AKW	11/√3	105+105	4000	BAM11/√3-334-1W	6600×4800×4300	
10	ZRTBBX-10-3000+3000-AKW	11/√3	157+157	6000	BAM11/√3-334-1W	7600×4800×4300	
11	ZRTBBX-10-3600+3600-AKW	11/√3	189+189	7200	BAM11/√3-300-1W	7800×4800×4300	13
12	ZRTBBX-10-4800+4800-AKW	11/√3	252+252	9600	BAM11/√3-400-1W	7800×4800×4300	
13	ZRTBBX-10-2100+4200-AKW	11/√3	110+220	6300	BAM11/√3-350-1W	7800×4800×4300	
14	ZRTBBX-10-2400+4800-AKW	11/√3	126+252	7200	BAM11/√3-400-1W	8000×5000×4300	14
15	ZRTBBX-10-4800+9600-AKW	11/√3	252+504	14400	BAM11/√3-400-1W	9000×6000×4300	
16	ZRTBBX-35-4000/334-ACW	11×2	60	4000	BAM11-334-1W	6000×7000×3700	
17	ZRTBBX-35-6000/500-ACW	11×2	91	6000	BAM11-500-1W	6600×7200×3700	
18	ZRTBBX-35-8000/334-ACW	11×2	120	8000	BAM11-334-1W	6000×7000×3700	15
19	ZRTBBX-35-9000/500-ACW	11×2	136	9000	BAM11-500-1W	6600×7200×3700	
20	ZRTBBX-35-9600/400-ACW	11×2	145	9600	BAM11-400-1W	9000×7300×3700	
21	ZRTBBX-35-12000/500-ACW	11×2	181	12000	BAM11-500-1W	6000×7200×3700	
22	ZRTBBX-66-10020/167AQW	20×2	83.5	10020	BAM20-167-1W	8000×8000×4000	
23	ZRTBBX-66-15000/250-AQW	20×2	125	15000	BAM20-250-1W	8000×8000×4000	
24	ZRTBBX-66-18000/300-AQW	20×2	150	18000	BAM20-300-1W	8000×8000×4000	16
25	ZRTBBX-66-20040/334-AQW	20×2	167	20040	BAM20-334-1W	8000×8000×4000	
26	ZRTBBX-66-36000/500-AQW	20×2	300	36000	BAM20-500-1W	10000×10000×4000	
27	ZRTBBX-110-12000/167-AQW	5.9×12	56	12000	BAM5.9-167-1W	21000×13000×6000	17
28	ZRTBBX-110-28000/195-AQW	5.9×12	132	28000	BAM5.9-195-1W	21000×18000×6000	

7.5.2 Configuration of the device



Primary schematic diagram of the device

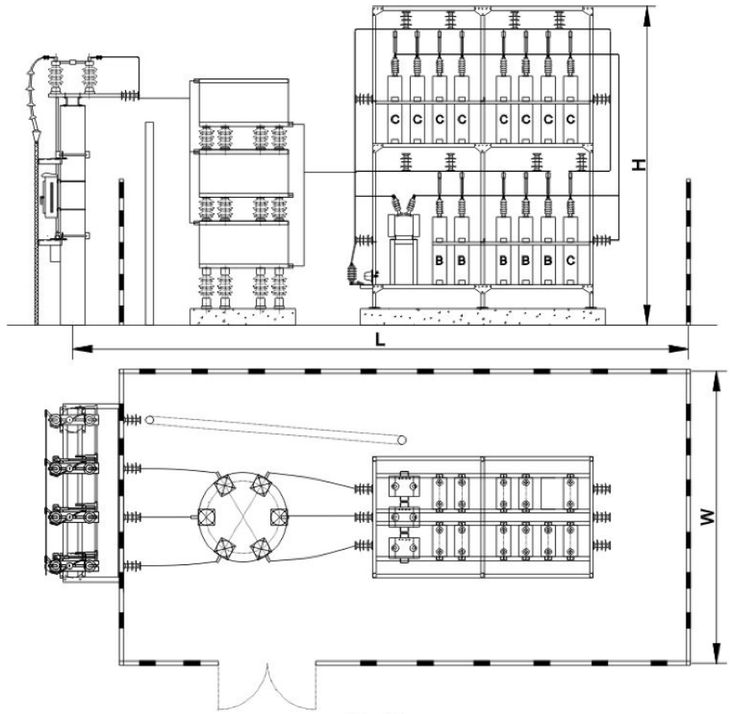
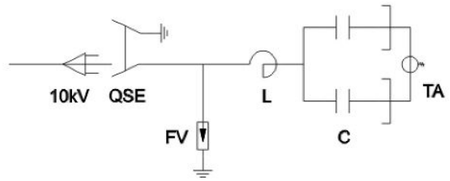
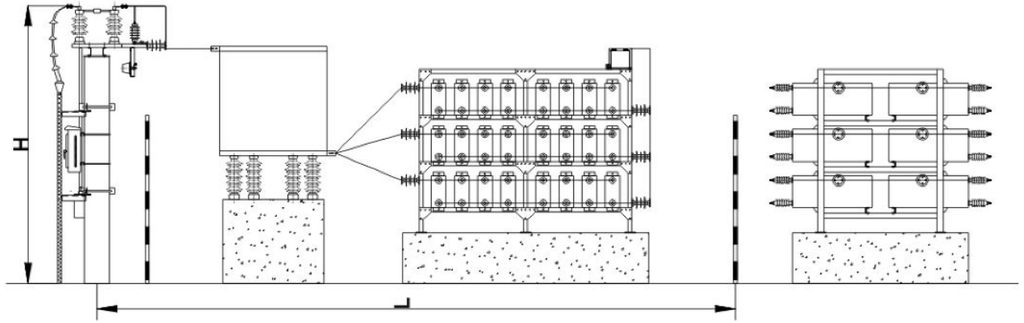


Fig. 11



Primary schematic diagram of the device



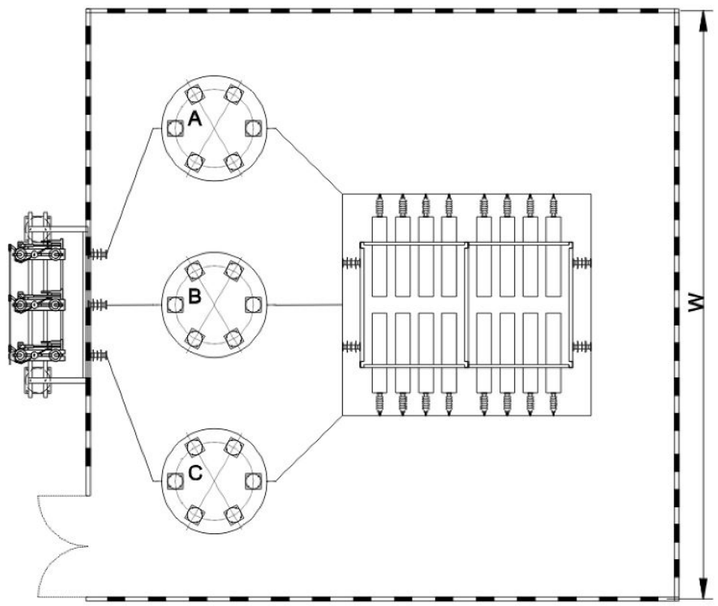
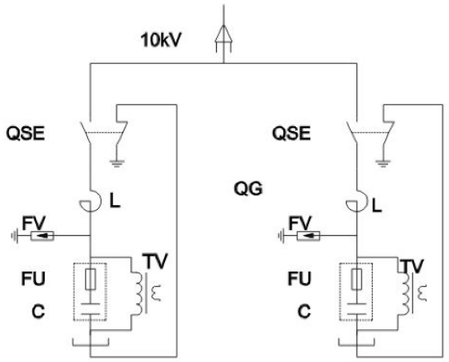
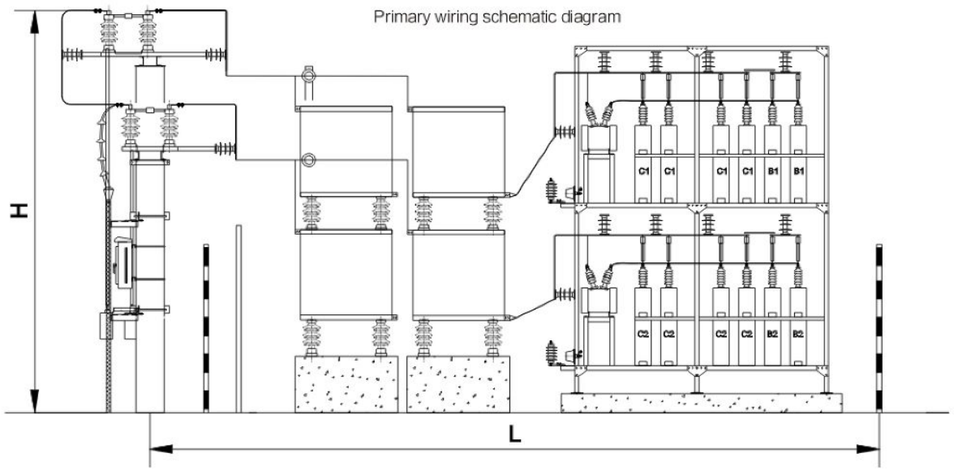


Fig. 12



Primary wiring schematic diagram



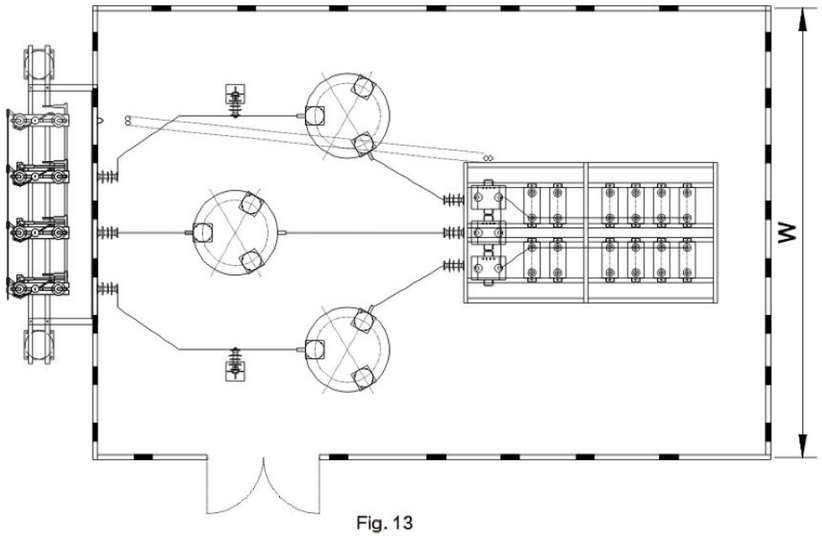
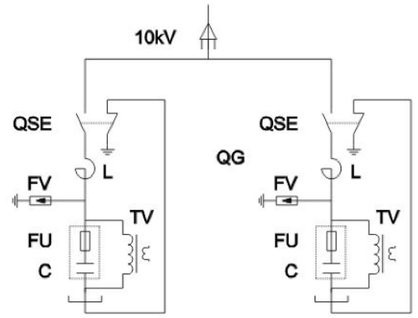
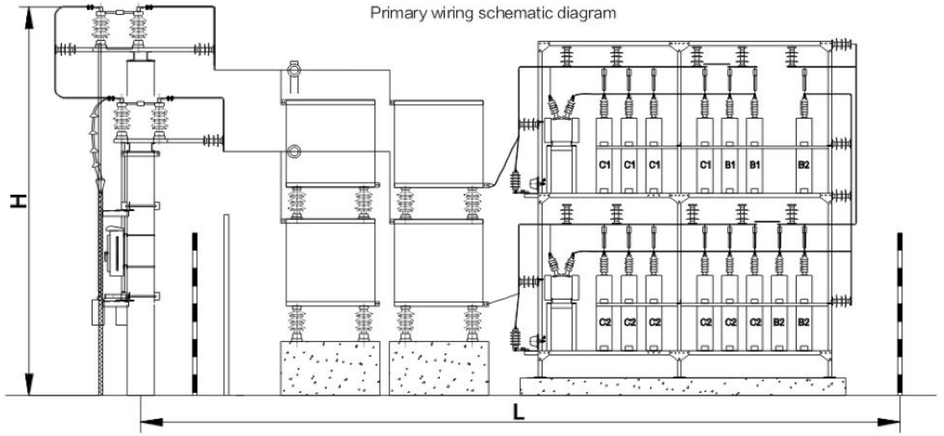


Fig. 13



Primary wiring schematic diagram



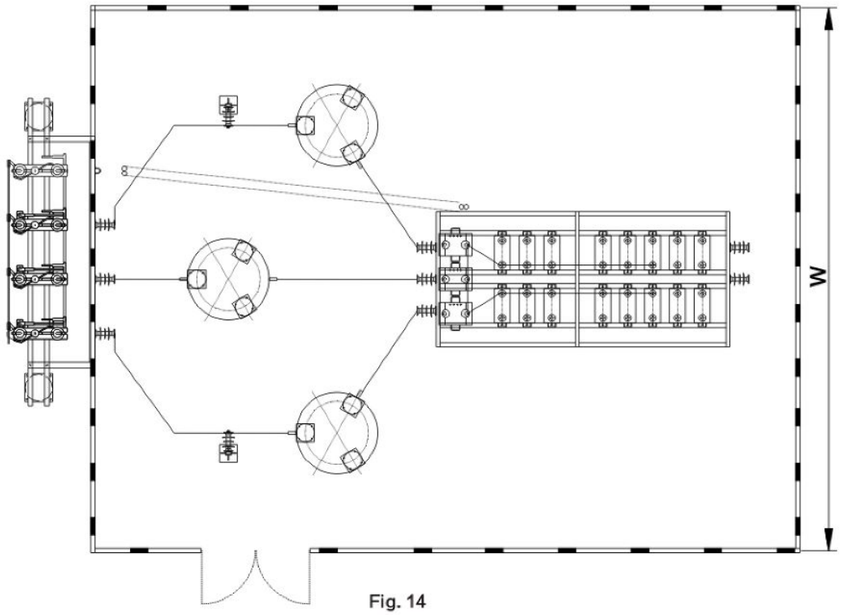
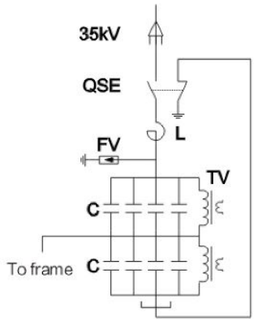


Fig. 14



Primary schematic diagram of the device

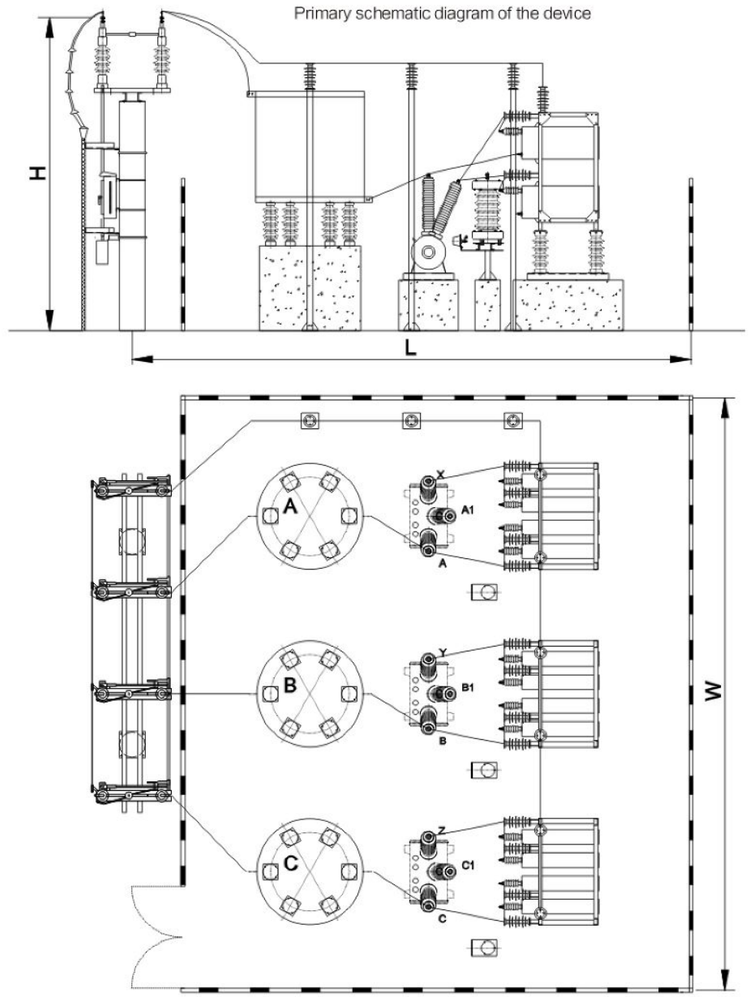
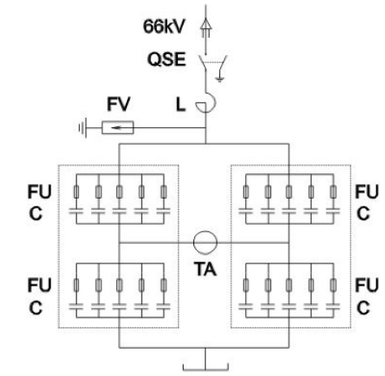


Fig. 15



Primary schematic diagram of the device

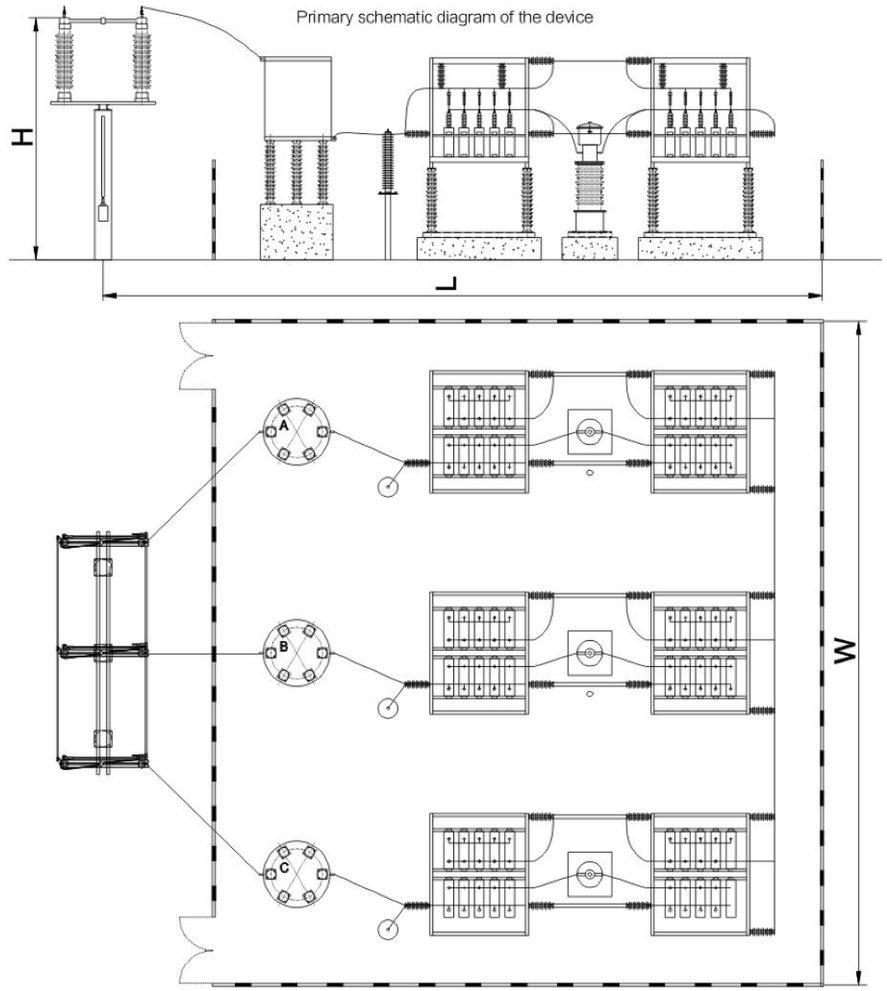


Fig. 16

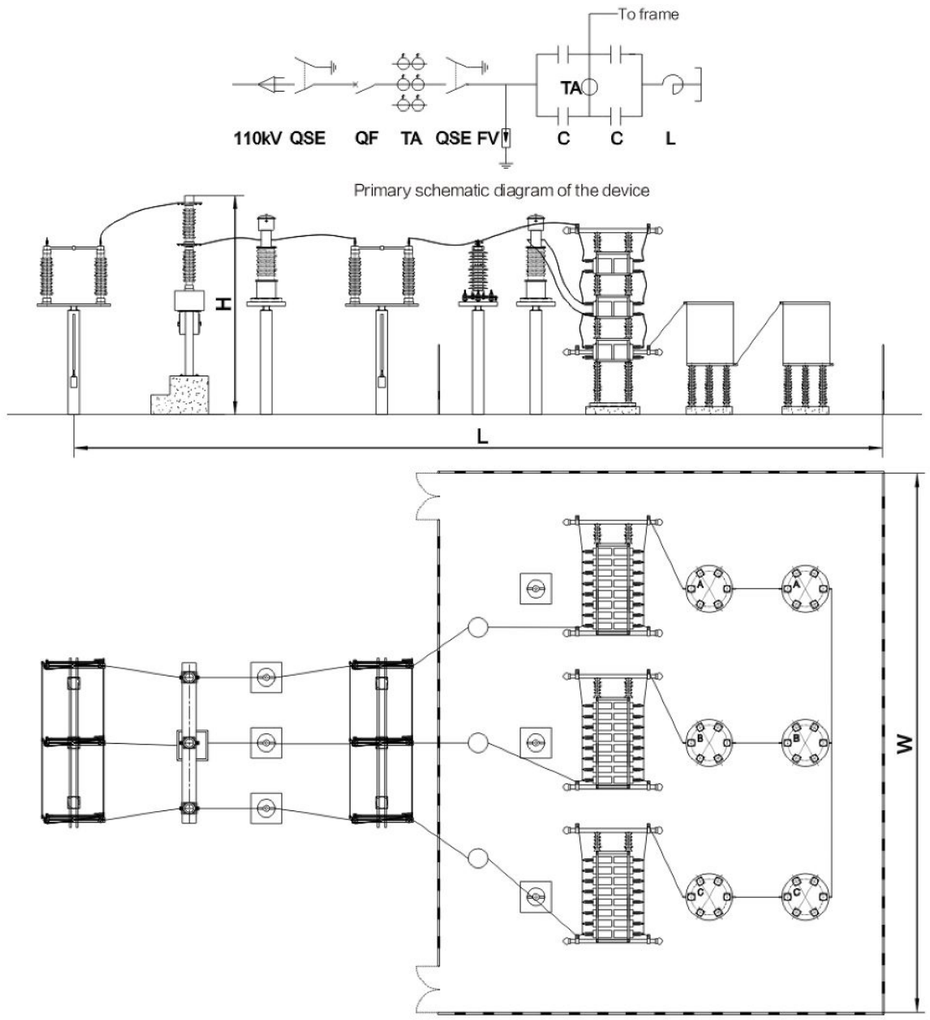


Fig. 17

◆ Ordering instructions

8.1 The user shall specify the model, specification and quantity of the order, as well as the configuration requirements of network high-order harmonic, current and voltage discharge coil, series reactor and shunt capacitor.
8.2 The user shall provide primary wiring mode and secondary protection mode, indoor layout and sectional drawing of capacitor and incoming line mode (upper incoming line, lower incoming line, left and right incoming line or cable incoming line or busbar type incoming line).
8.3 Short circuit capacity Sd at the installation place of compensation device.
8.4 Altitude, temperature and air environment conditions of installation site.
8.5 Delivery time and mode of transportation.
8.6 If you have special requirements, you can come or write to discuss.

ZRTBBZ(6 ~ 35)

Type high voltage automatic reactive power compensation complete set device

◆ General

ZRTBBZ high voltage automatic grouping reactive power compensation complete set devices (hereinafter referred to as the devices) and ZRTBBZ high voltage shunt capacitor devices are mostly cabinet structure or frame structure.

As for the cabinet structure, multi-cabinet assembly in turn. The whole cabinet is made of high-quality cold-rolled steel plate bending welding or aluminum-zinc plate bending assembly. Front and rear single or double doors, top, bottom and side sealing plate, equipped with ventilation and heat dissipation windows. The upper part of the cabinet body is provided with an instrument room, which is used for arranging the relay protection device of the unit cabinet.

As for the frame structure, it is composed of incoming isolating switch gantry, lightning arrester bracket, capacitor bank frame and series reactor, and the whole device is surrounded by steel mesh fence.

The device adopts vacuum contactor or vacuum circuit breaker and voltage and reactive power automatic control device to realize automatic switching and control of capacitor bank, which can automatically adjust busbar voltage, compensate reactive power, improve voltage qualified rate and power factor, and has the characteristics of safety, reliability, convenience and flexibility, making full use of capacitor capacity and improving use efficiency, etc..

According to the total amount of reactive power to be compensated, the device can not only automatically switch on and off the whole group of reactive power, but also is designed into several equal or unequal capacity group units according to the requirements and needs. The voltage and reactive power of the power grid are detected by the automatic switching device. The purpose of automatic capacitor switching is achieved by reasonable control and protection.

The device is suitable for power plants and electric power bureaus as well as substations with 220kV and below in large-scale factories and mining enterprises. The power supply system and frame structure of 6~10kV are widely suitable in 6~66kV power supply system. As an automatic compensation and control of reactive power, the switching function of capacitors is used to achieve the target COS ϕ or QC value set by users, so that the voltage and reactive power of the system are in the best state automatically.

The degree of automation of the device can cooperate with the integrated automatic monitoring device of the substation to realize the reactive power compensation of the unattended substation with high reliability. The device is mainly composed of a single shunt capacitor, and is equipped with a single capacitor protection fuse, a discharge coil, a zinc oxide arrester and a CKS- dry series reactor (the reactor can also be installed outside the wall), as well as a reliable vacuum contactor without reignition and no bounce, vacuum circuit breaker or sulfur hexafluoride circuit breaker as the grouping automatic switching equipment of the shunt capacitor bank, and the connecting busbar is tin plated with copper bar. Its shape and structure are shown in Fig.2 ~ Fig.7.

◆ Executive standards

- GB 50227-2008 "Code for design of shunt capacitor device"
- JB/T7111-1993 "High voltage shunt capacitor device"
- DL/T 604-1996 "Ordering technical conditions for high voltage shunt capacitors"

Model and meaning

ZRTBBZ □ – □ – □ – □ – □ – □ □

- Reactance rate%
- K: Open triangle protection
- L: Unbalanced current protection
- Connection mode: A: single star B: Double star
- Capacity of single capacitor (kvar)
- Total nominal capacity of unit (kvar)
- Rated voltage of device (kV)
- The device switches automatically in groups
- Shunt compensation
- Complete set device
- Enterprise code

Working conditions

4.1 Cabinet type indoor use, frame type outdoor use.
4.2 The altitude shall not exceed 1000m; (otherwise required for more than 1000m).
4.3 The ambient air temperature is −25～40℃; the indoor ventilation and heat dissipation are good.
4.4 Relative humidity: daily average no more than 95%, monthly average no more than 90%.
4.5 There is no corrosive gas, water vapor and other serious pollution in the surrounding air, and no flammable gas, fire, and explosion danger.
4.6 Places without frequent violent vibration.
4.7 There shall be no large waveform distortion at the network and bus voltage power supply side of the installation site, and there shall be no influence of high-order harmonic source. The waveform deviation factor and harmonic content of voltage shall not exceed the provisions of GB/T14549-93 "Voltage Quality, Harmonics in Public Supply Network".

Product features

5.1 Combined into shunt capacitor banks with equal or unequal capacity, the automatic control of reactive power can be realized flexibly and the compensation is reasonable.
5.2 Simple structure, product miniaturization, a group of one control unit, up to 12 units, building block combined structure, compensation capacitance can be large or small, beautiful shape, convenient and flexible selection, low investment.
5.3 Due to the group automatic switching, the utilization rate of capacitor is high.
5.4 The frame structure is widely used outdoors, with large installation capacity and no need of buildings.
5.5 The automatic reactive power switching device can be placed in the central control room, and the automatic reactive power switching device of the cabinet-type device can also be placed in the main power supply incoming cabinet of the device, which cooperates with the fore switchgear with full protection and control function and high level of automation.
5.6 Automatic and manual operation, flexible operation, simple control, safe and reliable.
5.7 With RS232 or RS485 serial communication interface, the integrated substation automation system can be formed through the communication interface and other monitoring equipment in the substation, which can meet the requirements of many operation and management modes, such as unattended or undermanned substation, centralized control and so on.
5.8 It has over temperature and over-voltage protection alarm, internal and external fault locking function.
5.9 It has protective performance, incoming isolating and grounding interlock, when the device is out of operation, the neutral point and facies line can be grounded at the same time; it has good five-protection blocking performance.

Selection of capacity matching equipment for main basic parameters compensation device

6.1 Main technical parameter

	Equipment model	ZRTBBZ-6-□/-AK(W)	ZRTBBZ-10-□/-AK(W)	ZRTBBZ-35-□/-AKW
	Rated voltage	6 kV	10kV	35 kV
	Rated current	A	A	A
	Rated capacity	kvar	kvar	kvar
	Rated frequency	50Hz	50Hz	50Hz
	4s thermal stable current(effective)kA		20、25、31.5	
	Dynamic stable current(peak)kA		50、63、80	
	Unit capacitor model	BAM6.6/√3-□-1(W)	BAM11/√3-□-1(W)	BAM11/√3-□-1(W)
	Unit capacitor dielectric		Benzyl toluene impregnation whole membrane medium	
	Reactance rate of matching series reactor%		X K=□ %	
Performance parameter	Capacitance Deviation%		0 ~ +5%	
	Maximum ratio of three phases		≯ 1.02	
	Inductance allowable deviation%		0 ~ +5%	
	Average deviation of three phase inductance		≯ ±2%	
	Discharge energy of fuse		12kJ	
	Protection mode		Open delta voltage protection; neutral unbalanced current protection or differential current, differential current and over-current protection	
	Equipment type	Cabinet type	Cabinet type	Frame type
	Wiring mode		Single or double star	
Insulation level of capacitor	1min power frequency withstand	Alternate≥32kV To the ground≥32kV	Alternate≥42kV To the ground≥42kV	Alternate≥95kV To the ground≥95kV
	Voltage (RMS)		Test value at 1000m altitude	
	Impulse withstand voltage	≥ 60kV	≥ 75kV	≥ 200kV
	To ground (peak value)		Test value at 1000m altitude	
	1min power frequency withstand	≥ 51kV		
Insulation level of device	Voltage (RMS)	Test value at 1000m altitude		
	Impulse withstand voltage	≥ 75kV		
	To ground (peak value)	Test value at 1000m altitude		
	Secondary insulation level		≥ 2.0kV	
	Surface treatment, color		According to requirements	
	Protection level (cabinet type)	IP20	IP20	

Note: the rated insulation level should be corrected according to the altitude

6.2 The primary connection mode of the compensation device: the connection mode of the compensation device is "Y" connection mode, and neutral non-grounding. For details, please refer to the primary principle wiring Fig. 1 of the compensation device.

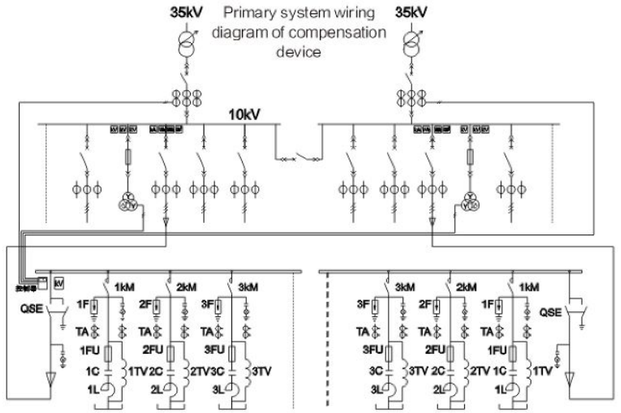


Fig. 1 Primary system wiring diagram of ZRTBBZ shunt capacitor compensation device

6.3 Selection of matching equipment for device capacity

6.3.1 Cabinet type compensation device

6.3.1.1 Technical parameters of compensation device

Table 1

No.	Model	Rated parameter			Shunt capacitor	Overall dimension (L×D×H)
		Ue(kV)	Ie(A)	Qe(kvar)		
1	ZRTBBZ-10-2400/200-AK	11/√3	126	2400	BAM11/√3-200-1	4800×1600×2600
2	ZRTBBZ-10-2800/234-AK	11/√3	147	2800	BAM11/√3-234-1	4800×1600×2600
3	ZRTBBZ-10-3000/250-AK	11/√3	157.5	3000	BAM11/√3-250-1	4800×1600×2600
4	ZRTBBZ-10-3200/267-AK	11/√3	168	3200	BAM11/√3-267-1	4800×1600×2600
5	ZRTBBZ-10-3600/300-AK	11/√3	189	3600	BAM11/√3-300-1	4800×1600×2600
6	ZRTBBZ-10-4000/334-AK	11/√3	210	4000	BAM11/√3-334-1	4800×1600×2600
7	ZRTBBZ-10-4800/400-AK	11/√3	252	4800	BAM11/√3-400-1	4800×1600×2600
8	ZRTBBZ-10-6000/400-AK	11/√3	315	6000	BAM11/√3-400-1	5800×1600×2600
9	ZRTBBZ-10-7200/400-AK	11/√3	378	7200	BAM11/√3-400-1	6800×1600×2600

6.3.1.2 Shape of ZRWKG power factor control mode

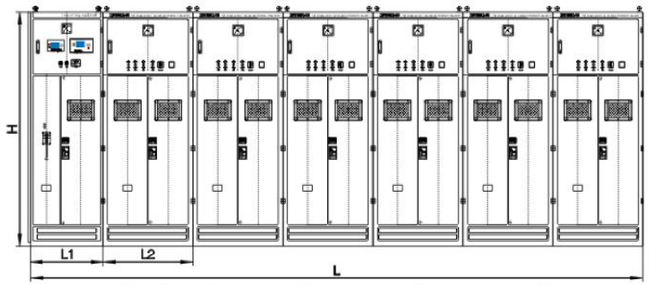


Fig. 2 Configuration of shunt capacitor compensation device (ZRWKG control mode)

6.3.1.3 Internal structure diagram of ZRWKG power factor control mode

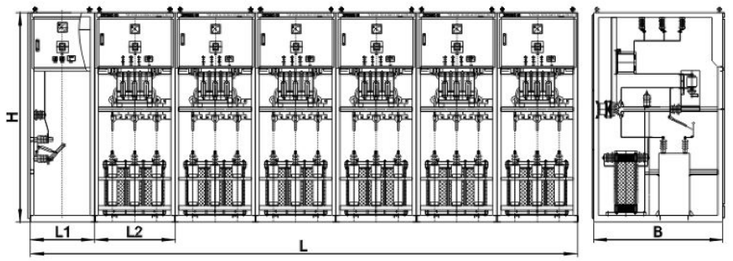


Fig. 3 Internal structure of shunt capacitor compensation device (ZRWKG control mode)

6.3.2 Voltage and reactive power automatic control mode 1 of ZRWKG

6.3.2.1 Technical parameters of compensation device

Table 2

No.	Model	Rated parameter			Shunt capacitor	Overall dimension (L×D×H)
		Ue(kV)	Ie(A)	Qe(kvar)		
1	ZRTBBZ-10-2505/167-AK	11/√3	131.5	2505	BAM11/√3-167-1	5800×1600×2600
2	ZRTBBZ-10-3000/200-AK	11/√3	157.5	3000	BAM11/√3-200-1	
3	ZRTBBZ-10-3510/234-AK	11/√3	184.2	3510	BAM11/√3-234-1	
4	ZRTBBZ-10-3750/250-AK	11/√3	196.8	3750	BAM11/√3-250-1	
5	ZRTBBZ-10-4005/267-AK	11/√3	210.2	4005	BAM11/√3-267-1	
6	ZRTBBZ-10-4500/300-AK	11/√3	236.2	4500	BAM11/√3-300-1	
7	ZRTBBZ-10-5000/334-AK	11/√3	262.4	5000	BAM11/√3-334-1	
8	ZRTBBZ-10-6000/400-AK	11/√3	317.1	6000	BAM11/√3-400-1	

The specification in Table 2 adopts ZRWKG voltage and reactive power automatic control and protection device combination, which is located in the incoming cabinet and has the function of harmonic detection and alarm; GN19-12 isolating switch is adopted in the incoming cabinet, the capacitor bank adopts JCZ5-12 or VSC-12 vacuum contactor, which can be switched auto-matically or manually, and the series reactor is CKSC dry core reactor, realizing Open Triangle Voltage Protection with FDGR, and the structure is detailed in Fig.4 and Fig.5.

The device can also be equipped with ZRWKG-T voltage and reactive power automatic control, placed in the central control room, equipped with RS-232 or RS-485 communication interface to achieve remote automatic.

6.3.2.2 Outline drawing of ZRWKG control mode

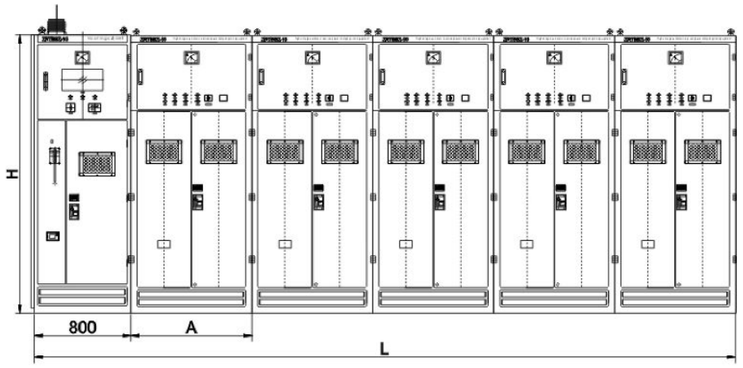


Fig. 4 Overall and installation dimension of compensation device for shunt capacitor with grouping cabinet

6.3.2.3 Internal structure diagram of ZRWKG or ZRWKG-T control mode

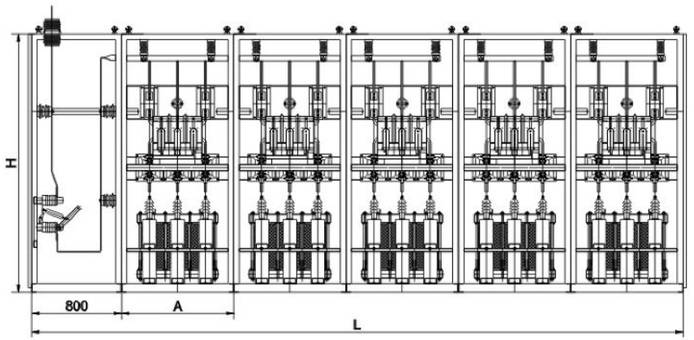


Fig. 5 Internal structure diagram of compensation device for shunt capacitor with grouping cabinet

6.3 Voltage and reactive power automatic control mode 2 of ZRWKG or ZRWKG-T

6.3.1 Outline drawing

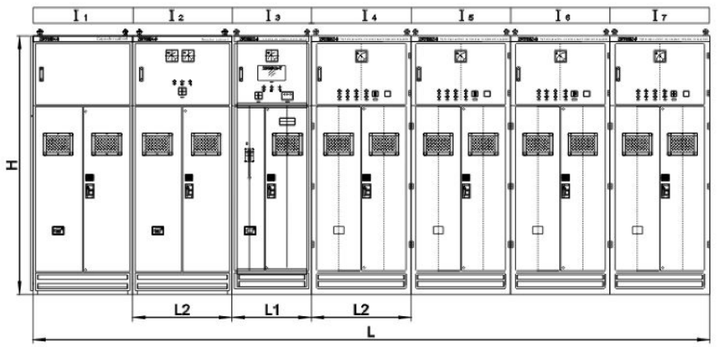


Fig. 6 The fixed group and the adjustment group were cooperated

6.3.2 Internal structure diagram

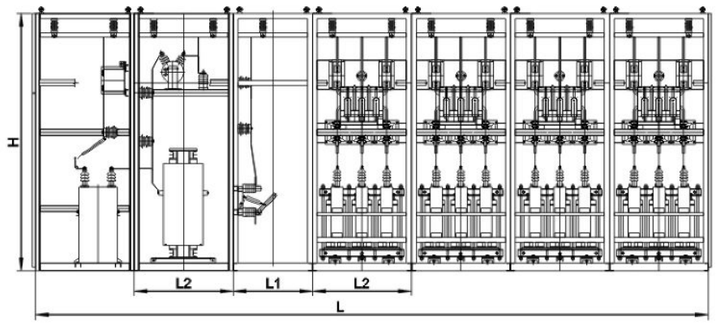


Fig. 7 Structure of fixed group and regulation group

As can be seen from Fig. 6 and Fig. 7, the device consists of a fixed switching group and four capacitor groups. The RCBK voltage and reactive power automatic controller on the incoming cabinet is responsible for the control and protection of the four capacitor banks. The controller device controls the manual and automatic switching of eight groups of capacitor banks in two busbars to realize automatic compensation under parallel operation or separate operation.

6.4 Frame type group compensation device

6.4.1 Technical parameters of device

Table 3

No.	Model	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Overall dimension (L×D×H)
1	ZRTBBZ-35-2400+4800-AKW	11×2	109	7200	BAM11-400-1W	10000×6000×3700
2	ZRTBBZ-35-3600+7200-AKW	11×2	162	10800	BAM11-300-1W	14000×6000×3700
3	ZRTBBZ-35-4000+8000-AKW	11×2	182	12000	BAM11-334-1W	14000×6000×3700
4	ZRTBBZ-35-4800+9600-AKW	11×2	218	14400	BAM11-400-1W	16000×8000×3700
5	ZRTBBZ-35-6000+12000-AKW	11×2	273	18000	BAM11-334-1W	21000×7000×3700
6	ZRTBBZ-35-12000+12000-AK	11×2	364	24000	BAM11-500-1W	11000×9000×3700

The specification in Table 3 adopts ZRWKG voltage and reactive power automatic compen-sation control cabinet and central control room with RS-232 or RS485 communication interface to realize remote automation. The incoming switch is GW4-35 or GW5-35 isolating switch, the capacitor bank is switched by SF6 sulfur hexafluoride circuit breaker or high voltage vacuum circuit breaker, the series reactor is composed of CKGKL dry air core reactor, and the FDR3C discharge coil is used to realize differential pressure protection. Outline structure see Fig.8.

6.4.2 Configuration of the device

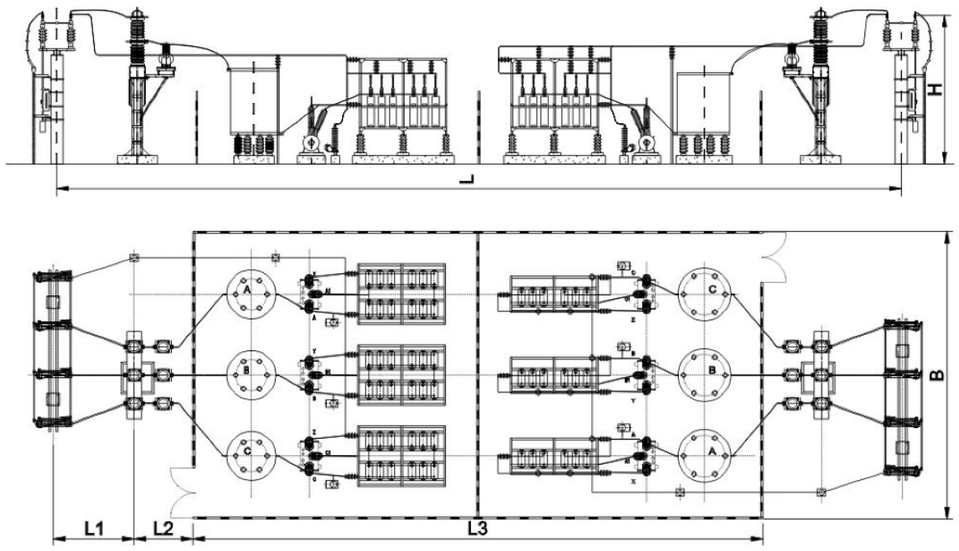


Fig. 8 Vertical and plane view of group frame shunt capacitor compensation device

◆ Ordering instructions

7.1 Device specification, model and order quantity
7.2 Harmonic condition of network voltage
7.3 Installation of compensation device primary system diagram, short circuit capacity Sd
7.4 Incoming mode and direction of main power supply
7.5 Altitude, temperature and air environment conditions of installation site
7.6 Delivery time and mode of transportation

ZRTBBZ

Type outdoor box type automatic reactive power compensation complete set device

◆ General

ZRTBBZ outdoor box type automatic reactive power compensation device (hereinafter referred to as the device) is a new product which adopts preloaded box variable shell on the basis of ZRTBB to adapt to outdoor use. Vacuum contactor, load switch or vacuum circuit breaker and voltage and reactive power automatic control device are used to realize automatic switching and control of capacitor bank, which can automatically adjust bus voltage, compensate reactive power, improve voltage qualified rate and power factor, safe, reliable, convenient and flexible, making full use of capacitor capacity and improving use efficiency. According to the total amount of reactive power to be compensated, not only the whole group of reactive power can be switched on and off automatically, but also can be designed into several units with equal or unequal capacity according to the requirements and needs, and equipped with a multi-function automatic controller to control the capacitor bank according to voltage and reactive power, to achieve the purpose of reasonably adjusting voltage and compensating reactive power.

The device is suitable for power plants and electric power bureaus as well as substations with 220kV and below in large-scale factories and mining enterprises and power supply system of 6~10kV. As an automatic reactive power compensation control, capacitors are automatically switched on and off according to the measured voltage and reactive power or power factor.

The automation degree of the device can cooperate with the integrated automation monitoring device of the substation to realize the reactive power compensation of unattended substation with high reliability.

◆ Executive standards

- GB 50227-2008 "Code for design of shunt capacitor device"
- JB/T7111-1993 "High voltage shunt capacitor device"
- DL/T 604-1996 "Ordering technical conditions for high voltage shunt capacitors"

◆ Model and meaning

ZR T BB Z □ - □ - □ - □ - □ □ □

- Reactance rate%
- W: Outdoor box type
- K: Open triangle protection
- L: Unbalanced current protection
- Connection mode:
- A: single star B: Double star
- Capacity of single capacitor (kvar)
- Total nominal capacity of unit (kvar)
- Rated voltage of device (kV)
- The device switches automatically in groups
- Shunt compensation
- Complete set device
- Enterprise code

Working conditions

4.1 Outdoor use.
4.2 The altitude shall not exceed 1000m; (otherwise required for more than 1000m).
4.3 The ambient air temperature is −25 ~ 40℃.
4.4 Relative humidity: daily average no more than 95%, monthly average no more than 90%.
4.5 There is no corrosive gas, water vapor and other serious pollution in the surrounding air, and no flammable gas, fire, and explosion danger.
4.6 Places without frequent violent vibration.
4.7 There shall be no large waveform distortion at the network and bus voltage power supply side of the installation site, and there shall be no influence of high-order harmonic source. The waveform deviation factor and harmonic content of voltage shall not exceed the provisions of GB/T14549-93 "Voltage Quality, Harmonics in Public Supply Network".

Product features

ZRTBBZ high voltage shunt capacitor box type reactive power compensation device is outdoor box type. The front and rear doors of the box and the eave-type roof are suitable for wind and rain, cold and high temperature environment. There is front-operation in the box. The box body can adopt protective color light plate, aluminum-zinc coated plate, stainless steel plate or ordinary steel plate, and the front-and-rear-open double-door structure.

The device consists of more than two capacitor banks and a circuit breaker (switch) cabinet. The capacitor bank is of cabinet structure with vacuum contactor (or vacuum circuit breaker), capacitor unit, fuse, discharge coil, zinc oxide arrester and series reactor. The vacuum contactor (or vacuum circuit breaker) is used as the switching equipment of shunt capacitor bank, and the connecting bus adopts tinned copper bar.

5.1 The capacitor bank can be composed of equal or unequal capacity, which is easy to realize reasonable compensation.
5.2 The structure is simple, the product is miniaturized, the building block type combination type, and the investment is saved.
5.3 Due to the use of grouping automatic switching, the utilization rate of capacitor is high.
5.4 Due to the use of microcomputer protection and automatic switching device, the protection and control functions are complete and the degree of automation is high.
5.5 It has RS232 or RS485 serial communication interface, which can be connected with other monitoring equipment in the substation to form a substation integrated automation system, which can meet the requirements of many operation and management modes, such as unattended or undermanned substation, centralized control and so on.
5.6 Interlock requirement: the incoming cabinet is equipped with grounding switch and circuit breaker mechanical interlocking and electrical interlocking, and each capacitor is provided with electromagnetic lock and door lock, playing the role of safety protection. When the rear door and the front door of the box are closed, the main switch will trip immediately if switch on normally or if it is opened at will; the front and rear door of the box body is also equipped with a padlock to strengthen the management.

Technical parameter

6.1 The device can operate continuously at 1.1 times of rated voltage and 1.43 times of rated current.
6.2 The rated voltage of the device is 6kV or 10kV, and the rated total capacity is 1000-10000kvar.
6.3 The open-delta voltage protection is generally used in the single star connection, and the neutral unbalanced current protection is used in the double star connection.
6.4 The device adopts CKSC three-phase iron core series reactor or CKGKL three-phase air-core series reactor, which is used to reduce the inrush current and operating overvoltage when the complete set is put into operation and to restrain the influence of higher harmonics. The insulation grade of the reactor is bus rated voltage, and the rated current is the same as that of the complete set of device. The rated capacity is generally considered according to the total nominal capacity of the complete set of device.

6.5 The deviation of the measured capacitance of the capacitor bank shall not exceed 0 ~ +5% of the rated value: the maximum and minimum capacitance between any two line terminals of the three-phase capacitor bank shall not exceed 1.02, and the maximum and minimum capacitance between each series section shall not exceed 1.02.
6.6 For a capacitor bank with a series of three-phase reactors, the reactance value of each phase does not exceed ±2% of the three-phase average.

6.7 Technical parameter

	Equipment model	ZRTBBZ-10 □ / □ AK(W)	ZRTBBZ-6 □ / □ AK(W)
	Rated voltage	10 kV	6 kV
	Rated current	A	A
	Rated frequency	50Hz	
	Rated capacity	kvar	
	4s thermal stable current(effective)kA	20、25、31.5	
	Dynamic stable current(peak)kA	50、63、80	
	Unit capacitor model	BAM10/√3-□-1(W)	BAM6/√3-□-1(W)
	Unit capacitor dielectric	Benzyl toluene impregnation whole membrane medium	
	Reactance rate of matching series reactor%	X K = □ %	
Performance parameter	Capacitance Deviation%	0 ~ +5%	
	Maximum ratio of three phases	≯ 1.02	
	Inductance allowable deviation%	0 ~ +5%	
	Average deviation of three phase inductance	≯ ±2%	
	Discharge energy of fuse	12kJ	
	Protection mode	Open delta voltage protection; neutral unbalanced current protection or differential current, differential current and over-current protection	
	Equipment type	Box type	
	Wiring mode	Single or double star	
Insulation level of capacitor	1min power frequency withstand	Alternate≥42kV To the ground≥42kV	Alternate≥32kV To the ground≥32kV
	Voltage (RMS)	Test value at 1000m altitude	
	Impulse withstand voltage	≥ 75kV	≥ 60kV
	To ground (peak value)	Test value at 1000m altitude	
	1min power frequency withstand	≥ 51kV	
Insulation level of device	Voltage (RMS)	Test value at 1000m altitude	
	Impulse withstand voltage	≥ 75kV	
	To ground (peak value)	Test value at 1000m altitude	
	Secondary insulation level	≥ 2.0kV	
	Surface treatment, color	Spray molding, according to color code	
	Protection level (cabinet type)	IP36	

◆ Connection mode of compensation device

The connection mode of the compensation device is "Y" connection mode, and neutral non-grounding. For details, please refer to the primary principle wiring diagram of the compensation device.

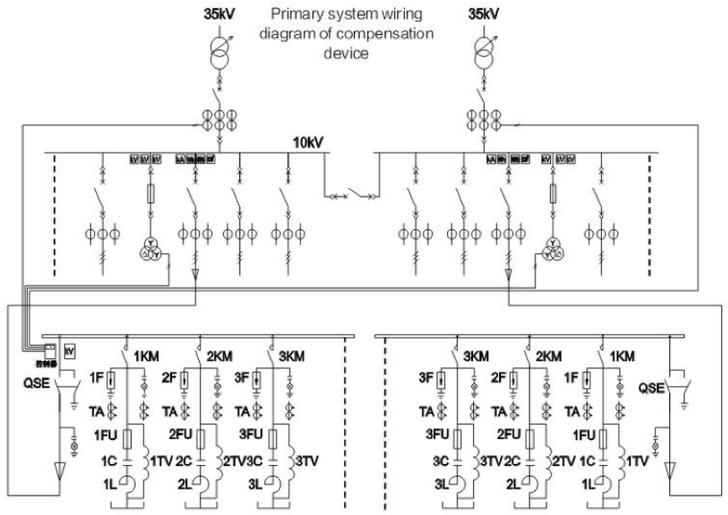


Fig. 1 Primary system wiring diagram of box type shunt capacitor compensation device

◆ Overall and installation dimension

8.1 Technical parameter of compensation device

Table 1

No.	Model	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Overall dimension (L×D×H)
1	ZRTBBZ-10-3000/167-AKW	11/√3	157.8	3006	BAM11/√3-167-1	6450×2300×3320
2	ZRTBBZ-10-3600/200-AKW	11/√3	189.0	3600	BAM11/√3-200-1	
3	ZRTBBZ-10-4200/234-AKW	11/√3	221.1	4212	BAM11/√3-234-1	
4	ZRTBBZ-10-4500/250-AKW	11/√3	236.2	4500	BAM11/√3-250-1	
5	ZRTBBZ-10-4800/267-AKW	11/√3	252.3	4806	BAM11/√3-267-1	
6	ZRTBBZ-10-5400/300-AKW	11/√3	283.4	5400	BAM11/√3-300-1	
7	ZRTBBZ-10-6000/334-AKW	11/√3	315.6	6012	BAM11/√3-334-1	
8	ZRTBBZ-10-7200/400-AKW	11/√3	377.9	7200	BAM11/√3-400-1	

According to the specification in Table 1, the incoming cabinet adopts KY28-12 central switchgear, the main switch is ZN63A-12/630-25 (VS1) circuit breaker, ZRWKG reactive power compensation automatic control device and ZRDRQBH capacitor special microcomputer protection unit are adopted, and are arranged in the incoming cabinet; and the capacitor bank is switched on and off by JCZ5-12 vacuum contactor, and each group is equipped with unit microcomputer protection, the structure is detailed in Fig.3 and Fig.4.

8.2 Outline drawing of box structure

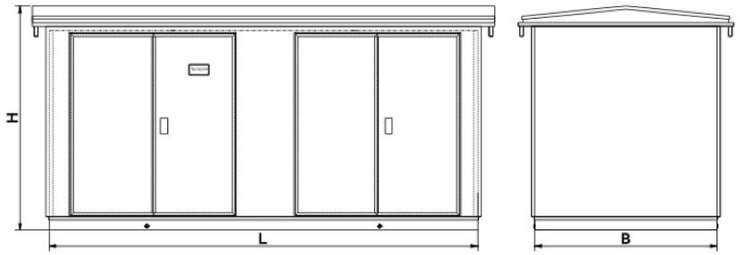


Fig. 2 Configuration of compensation device for box type shunt capacitor

8.3 Internal structure of box

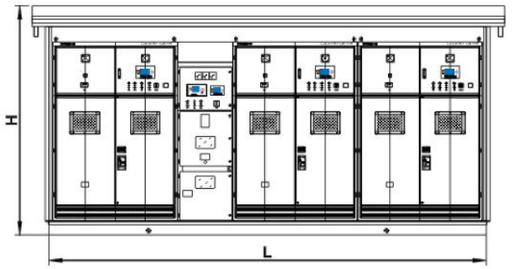
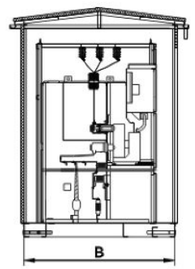


Fig. 3 Internal structure 1 of outdoor box type reactive power compensation device



KYN-12 high voltage switchgear

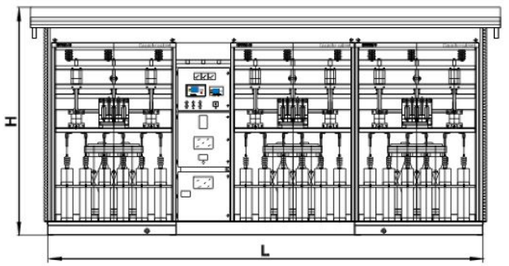
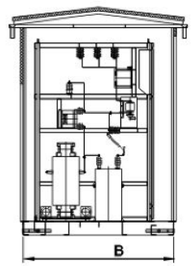


Fig. 4 Internal structure 2 of outdoor box type reactive power compensation device



ZRTBBZ high voltage reactive power compensation device

8.4 Cabinet layout (for another cabinet mode in box structure)

8.4.1 Technical parameters of compensation device

Table 2

No.	Model	Rated parameter			Shunt capacitor	Overall dimension (L×D×H)
		Ue(kV)	Ie(A)	Qe(kvar)		
1	ZRTBBZ-10-1500/167-AKW	11/√3	78.9	1503	BAM11/√3-167-1	4420 × 2300 × 3320
2	ZRTBBZ-10-1800/200-AKW	11/√3	94.5	1800	BAM11/√3-200-1	
3	ZRTBBZ-10-2100/234-AKW	11/√3	110.5	2106	BAM11/√3-234-1	
4	ZRTBBZ-10-2250/250-AKW	11/√3	118.1	2250	BAM11/√3-250-1	
5	ZRTBBZ-10-2400/267-AKW	11/√3	126.1	2403	BAM11/√3-267-1	
6	ZRTBBZ-10-2700/300-AKW	11/√3	141.7	2700	BAM11/√3-300-1	
7	ZRTBBZ-10-3000/334-AKW	11/√3	157.8	3006	BAM11/√3-334-1	
8	ZRTBBZ-10-3600/400-AKW	11/√3	189.0	3600	BAM11/√3-400-1	

In the specification in Table 2, GN19-12 isolating switch is used in the incoming cabinet, ZRWKG high voltage automatic reactive power compensation controller is located in the incoming cabinet, and the capacitor bank adopts JCZ5-12 switch, which can be switched on and off auto-matically or manually. Each group is equipped with a special microcomputer protection unit for capacitors, the structure is detailed in Fig.5 and Fig.6.

8.4.2 Internal structure of box

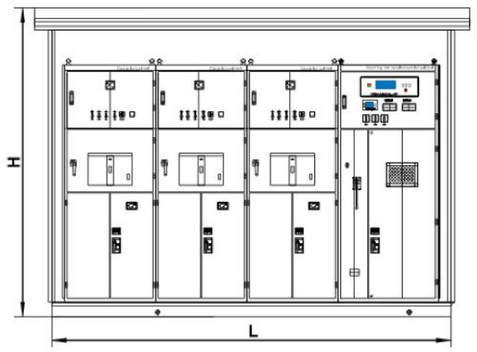
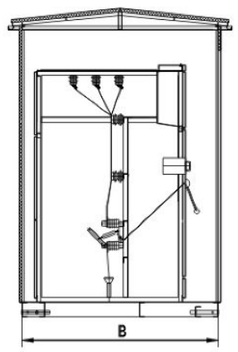


Fig. 5 Internal structure 3 of outdoor box type reactive power compensation device



ZRTBBZ incoming line isolation control cabinet

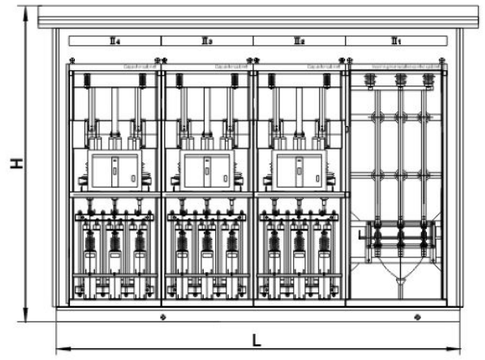
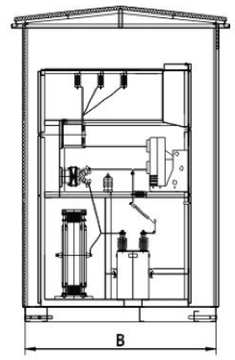


Fig. 6 Internal structure 4 of outdoor box type reactive power compensation device



ZRTBBZ high voltage capacitor bank

◆ Ordering instructions

7.1 Device specification, model and order quantity
7.2 Harmonic condition of network voltage
7.3 Installation of compensation device primary system diagram, short circuit capacity Sd
7.4 Incoming mode and direction of main power supply
7.5 Altitude, temperature and air environment conditions of installation site
7.6 Delivery time and mode of transportation

ZRTBBH

Type integrated reactive power compensation device

General

ZRTBBH type integrated high voltage shunt capacitor device is used in power frequency power system with rated voltage above 6-35kV. It is used to improve power factor, improve and improve power supply quality, adjust network voltage and reduce line loss.

Executive standards

- GB 50227-2008 "Code for design of shunt capacitor device"
- JB/T7111-1993 "High voltage shunt capacitor device"
- JB/T10557-2006 "High voltage reactive power local compensation device"
- DL/T 604-1996 "Ordering technical conditions for high voltage shunt capacitors"

Model and meaning

ZR TBB H □ - □ - □ - □ - □ - □ □

- Reactance rate%
- B: Regulating capacitance
- W: Outdoor (indoor by default)
- Relay protection mode:
  K: Open triangle protection
  C: Voltage differential protection
  L: Unbalanced current protection
  Q: Bridge differential current protection
  Y: Unbalanced voltage protection
- Main connection mode:
  A: single star B: Double star
- Rated capacity (kvar)
- Rated voltage (kV)
- Integrated
- Shunt capacitor device
- Enterprise code

Working conditions

4.1 Installation environment: outdoor or indoor.
4.2 Altitude: no more than 1000 m.
4.3 Ambient temperature: -40℃ ~ +45℃.
4.4 Relative humidity: monthly average no more than 85%.
4.5 Anti-pollution ability: the leakage distance of external insulation is not less than 25mm/kV (relative to the maximum operating voltage of the system). The leakage distance should be increased appropriately for the heavily polluted area.
4.6 There is no corrosive gas and steam in the installation site, and there is no conductive and explosive dust.
4.7 Places without frequent violent vibration.
4.8 There shall be no large waveform distortion at the network and bus voltage power supply side of the installation site, and there shall be no influence of high-order harmonic source. The waveform deviation factor and harmonic content of voltage shall not exceed the provisions of GB3983.

Main technical performance index

5.1 Capacitance deviation
5.1.1 The difference between the actual capacitance and the rated capacitance of the device is within the range of 0 ~ +5% of the rated capacitance.
5.1.2 The ratio of the maximum to the minimum capacitance between any two line terminals of the device shall not exceed 1.02.
5.2 Inductance deviation
5.2.1 Under rated current, the allowable deviation of reactance value is 0 ~ +5%.
5.2.2 The reactance value of each phase shall not exceed ± 2% of the average value of three phases.

5.3 Insulation level

Unit: kV Table 1

Rated voltage of device	1min power frequency withstand voltage of primary circuit (root-mean-square value)	Impulse withstand voltage of primary circuit [(1.2-5)/ 50 μ s peak value]	1min power frequency withstand voltage of secondary circuit (root-mean-square value)
6	32	60	2
10	42	75	2
35	95	200	2

5.4 Overload capacity
5.4.1 Steady state overvoltage

Unit: kV Table 2

Power frequency overvoltage Un	Maximum duration	Explanation
1.10	Long-term	It refers to the maximum value of long-term overvoltage not exceeding 1.10un
1.15	30 minutes in every 24 hours	Adjustment and fluctuation of system voltage
1.20	5min	The voltage increases under light load
1.30	1min	The voltage increases under light load

5.4.2 Steady-state over-current: can run for a long time when the root-mean-square value is not more than 1.1x1.3IN.
5.4.3 When switching a capacitor with a non-rebreakdown switch, a transition overvoltage with a first peak value of not more than 2√2 times the applied voltage (root-mean-square value) and a duration of not more than 1/2 cycle wave may occur. The corresponding transition over-current peak may reach 100IN, in which 1000 operations are allowed per year.
5.4.4 Maximum tolerant capacity: the total capacity does not exceed the 1.35QN within the limit of 6.4.1 and 6.4.2.
5.5 Discharge performance: 5s after power off, the voltage on each group of capacitors is less than 50V.
5.6 All integrated capacitors used in complete sets have internal fuses as internal fault protection.
5.7 The complete set of device is provided with an external capacitor discharge circuit, and the discharge device forms an external voltage protection secondary circuit.

Table 3

No.	Model	Rated voltage (kV)	Rated voltage of capacitor group(kV)	Rated current of capacitor group(kA)	Rated capacity of capacitor group(kvar)	Connection mode	Protection mode	Model of shunt capacitor	Overall dimension (L×W×H)	Figure No.
1	ZRTBBH10-900	AKW10	11/√3	47	900	Y	Open delta voltage protection	BAMH11/√3-900-1×3W	4600×3000×3300	1
2	ZRTBBH10-1200	AKW10	11/√3	63	1200	Y	Open delta voltage protection	BAMH11/√3-1200-1×3W	4800×3000×3300	1
3	ZRTBBH10-1500	AKW10	11/√3	78	1500	Y	Open delta voltage protection	BAMH11/√3-1500-1×3W	4800×3000×3300	1
4	ZRTBBH10-1800	AKW10	11/√3	94	1800	Y	Open delta voltage protection	BAMH11/√3-1800-1×3W	4800×3000×3300	1
5	ZRTBBH10-2000	AKW10	11/√3	105	2000	Y	Open delta voltage protection	BAMH11/√3-2000-1×3W	4800×3000×3300	1
6	ZRTBBH10-2400	AKW10	11/√3	126	2400	Y	Open delta voltage protection	BAMH11/√3-2400-1×3W	4800×3000×3300	1
7	ZRTBBH10-3000	AKW10	11/√3	157	3000	Y	Open delta voltage protection	BAMH11/√3-3000-1×3W	4800×3000×3300	1
8	ZRTBBH10-3600	AKW10	11/√3	189	3600	Y	Open delta voltage protection	BAMH11/√3-3600-1×3W	4800×3000×3300	1
9	ZRTBBH10-4000	AKW10	11/√3	210	4000	Y	Open delta voltage protection	BAMH11/√3-4000-1×3W	4800×3000×3300	1
10	ZRTBBH10-4200	AKW10	11/√3	220	4200	Y	Open delta voltage protection	BAMH11/√3-4200-1×3W	4800×3000×3300	1
11	ZRTBBH10-5000	AKW10	11/√3	262	5000	Y	Open delta voltage protection	BAMH11/√3-5000-1×3W	5000×3600×3300	1
12	ZRTBBH10-5400	AKW10	11/√3	283	5400	Y	Open delta voltage protection	BAMH11/√3-5400-1×3W	5000×3600×3300	1
13	ZRTBBH10-6000	AKW10	11/√3	315	6000	Y	Open delta voltage protection	BAMH11/√3-6000-1×3W	6000×4500×3300	1
14	ZRTBBH10-7500	AKW10	11/√3	393	7500	Y	Open delta voltage protection	BAMH11/√3-7500-1×3W	6000×4500×3300	1
15	ZRTBBH10-10000	AKW10	11/√3	524	10000	Y	Open delta voltage protection	BAMH11/√3-10000-1×3W	6500×5000×3300	1
16	ZRTBBH10-12000	AKW10	11/√3	524	12000	Y	Open delta voltage protection	BAMH11/√3-12000-1×3W	7000×6000×3300	1
17	ZRTBBH35-5000	AKW35	42/√3	68	5000	Y	Voltage differential protection	BAMH42/√3-5000-1×3W	7000×8000×3700	1
18	ZRTBBH35-7500	AKW35	42/√3	103	7500	Y	Voltage differential protection	BAMH42/√3-7500-1×3W	7500×8000×3700	2
19	ZRTBBH35-9000	AKW35	42/√3	123	9000	Y	Voltage differential protection	BAMH42/√3-9000-1×3W	8000×8000×3700	2
20	ZRTBBH35-12000	AKW35	42/√3	165	12000	Y	Voltage differential protection	BAMH42/√3-12000-1×3W	9000×9000×3700	2
21	ZRTBBH10-300+300	AKW10	11/√3	15+15	600	Y	Open delta voltage protection	BAMH11/√3-300+300-1×3W	5100×3000×4100	3
22	ZRTBBH10-500+500	AKW10	11/√3	26+26	1000	Y	Open delta voltage protection	BAMH11/√3-500+500-1×3W	5100×3000×4100	3
23	ZRTBBH10-600+600	AKW10	11/√3	31+31	1200	Y	Open delta voltage protection	BAMH11/√3-600+600-1×3W	5100×3000×4100	3
24	ZRTBBH10-1000+1000	AKW10	11/√3	52+52	2000	Y	Open delta voltage protection	BAMH11/√3-1000+1000-1×3W	5100×3000×4100	3
25	ZRTBBH10-1200+1200	AKW10	11/√3	63+63	2400	Y	Open delta voltage protection	BAMH11/√3-1200+1200-1×3W	5100×3000×4100	3
26	ZRTBBH10-1500+1500	AKW10	11/√3	78+78	3000	Y	Open delta voltage protection	BAMH11/√3-1500+1500-1×3W	5400×3600×4100	3
27	ZRTBBH10-1800+1800	AKW10	11/√3	94+94	3600	Y	Open delta voltage protection	BAMH11/√3-1800+1800-1×3W	5400×3600×4100	3
28	ZRTBBH10-2400+2400	AKW10	11/√3	126+126	4800	Y	Open delta voltage protection	BAMH11/√3-2400+2400-1×3W	5400×3600×4100	3
29	ZRTBBH10-3000+3000	AKW10	11/√3	157+157	6000	Y	Open delta voltage protection	BAMH11/√3-3000+3000-1×3W	6000×3600×4100	3
30	ZRTBBH10-4000+4000	AKW10	11/√3	210+210	8000	Y	Open delta voltage protection	BAMH11/√3-4000+4000-1×3W	6000×3600×4100	3
31	ZRTBBH10-5000+5000	AKW10	11/√3	262+262	10000	Y	Open delta voltage protection	BAMH11/√3-5000+5000-1×3W	6000×3600×4100	3
32	ZRTBBH10-500+1000	AKW10	11/√3	26+52	1500	Y	Open delta voltage protection	BAMH11/√3-500+1000-1×3W	5800×4800×3300	4
33	ZRTBBH10-600+1200	AKW10	11/√3	31+62	1800	Y	Open delta voltage protection	BAMH11/√3-600+1200-1×3W	5800×4800×3300	4
34	ZRTBBH10-667+1333	AKW10	11/√3	35+70	2000	Y	Open delta voltage protection	BAMH11/√3-667+1333-1×3W	6000×5000×3300	4
35	ZRTBBH10-800+1600	AKW10	11/√3	42+84	2400	Y	Open delta voltage protection	BAMH11/√3-800+1600-1×3W	6000×5000×3300	4
36	ZRTBBH10-1000+2000	AKW10	11/√3	52+104	3000	Y	Open delta voltage protection	BAMH11/√3-1000+2000-1×3W	6000×5000×3300	4
37	ZRTBBH10-1200+2400	AKW35	42/√3	63+126	3600	Y	Open delta voltage protection	BAMH11/√3-1200+2400-1×3W	6000×6000×3300	4
38	ZRTBBH10-1500+3000	AKW35	42/√3	78+156	4500	Y	Open delta voltage protection	BAMH11/√3-1500+3000-1×3W	6000×6000×3300	4
39	ZRTBBH10-2000+4000	AKW35	42/√3	105+210	6000	Y	Open delta voltage protection	BAMH11/√3-2000+4000-1×3W	6500×6500×3300	4
40	ZRTBBH10-3000+6000	AKW35	42/√3	157+315	9000	Y	Open delta voltage protection	BAMH11/√3-3000+6000-1×3W	7000×7000×3300	4

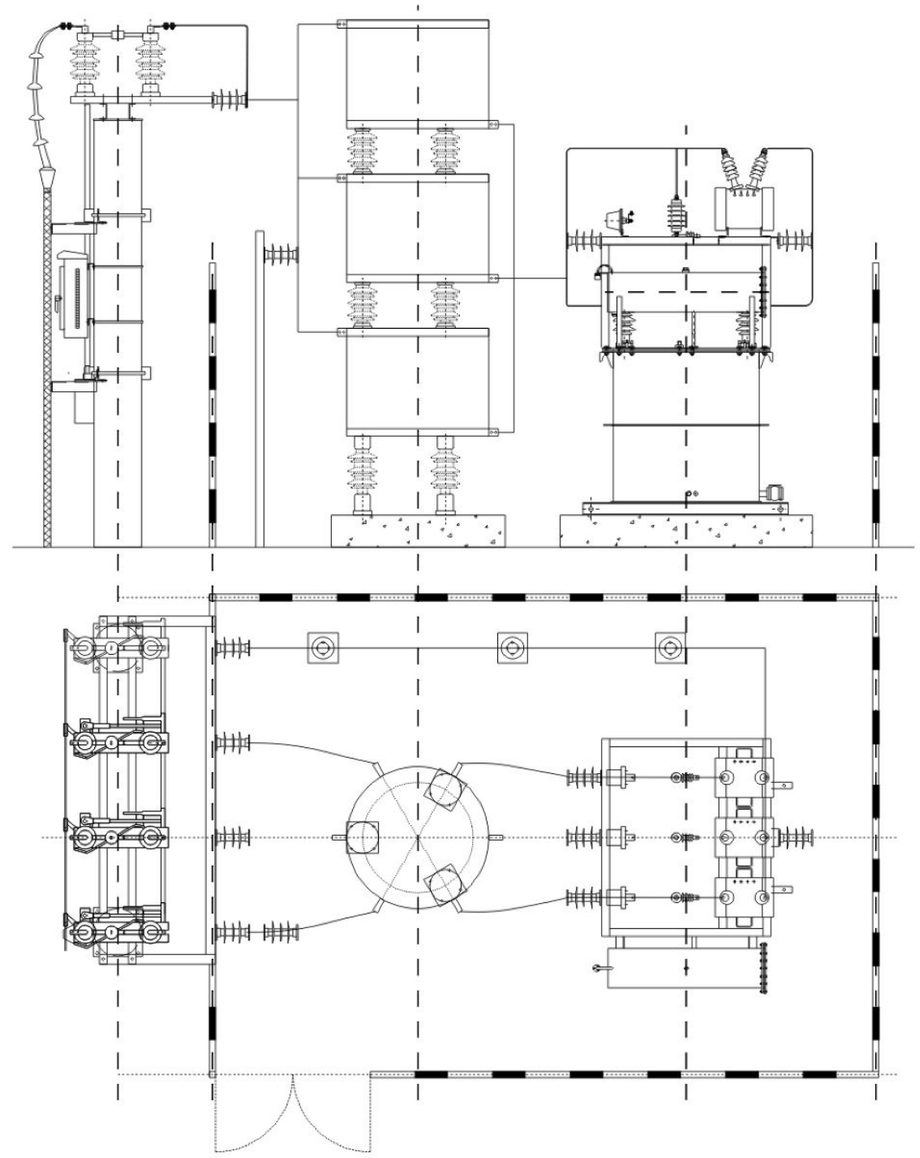


Fig. 1

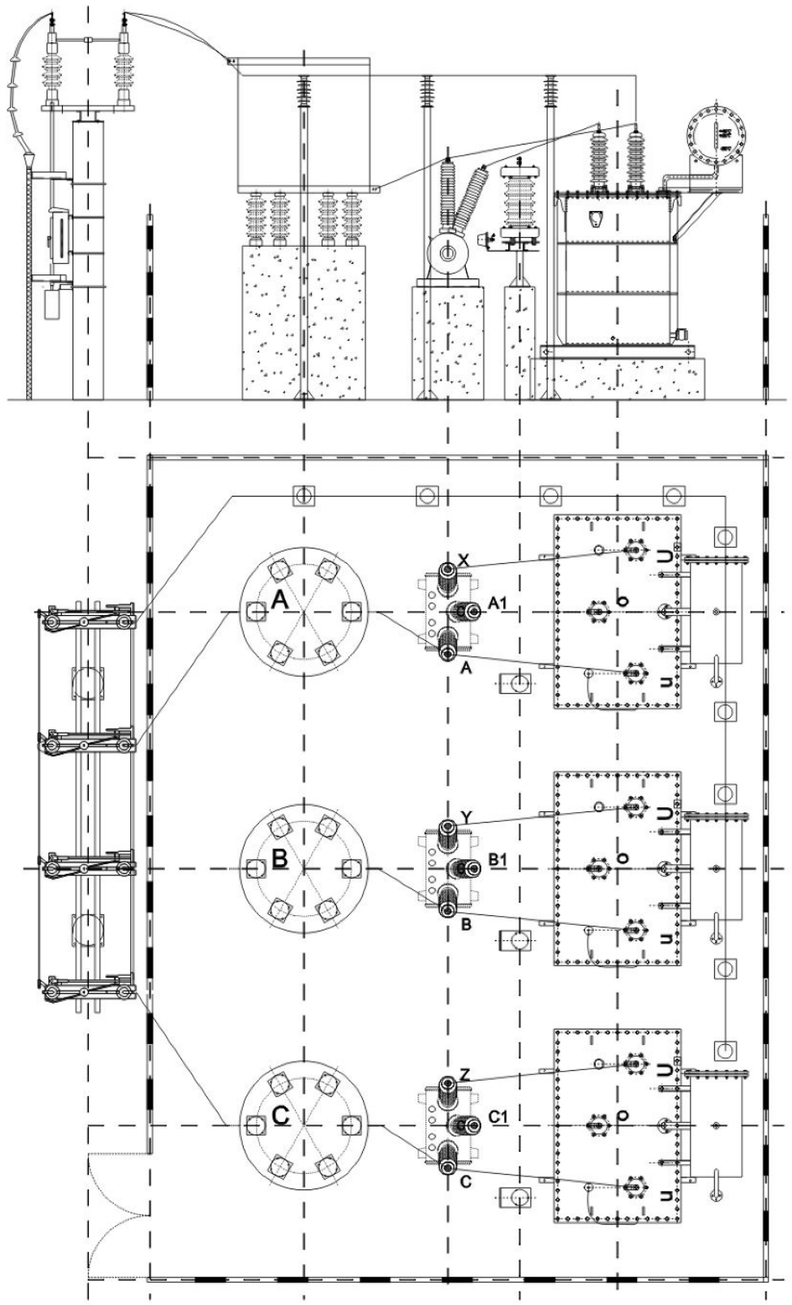


Fig. 2

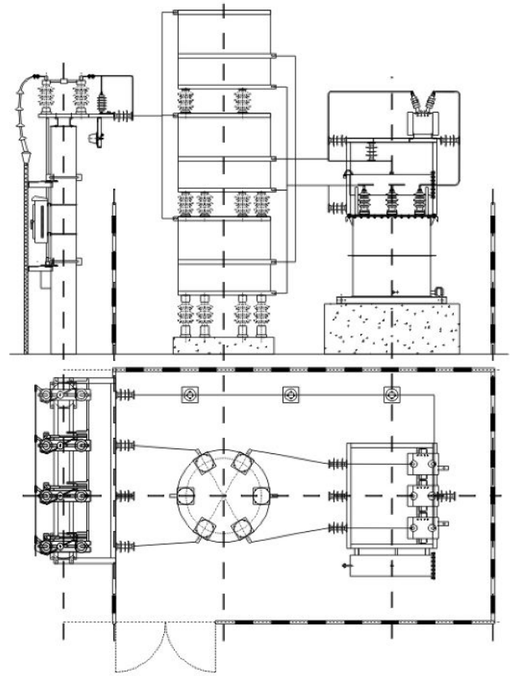


Fig. 3

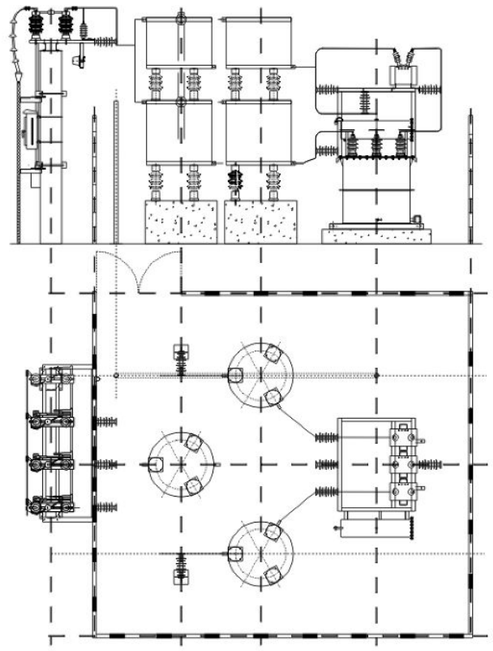


Fig. 4

Ordering instructions

7.1 The user shall specify the basic parameters and technical requirements (including the use requirements, structure and conductor requirements, equipment selection, protection and control mode selection and performance requirements, etc.) such as model, speci-fication, quantity and network high-order harmonic.

7.2 The user shall provide the primary wiring mode and secondary protection mode, provide the layout plan of capacitor device, and provide the incoming line mode (cable incoming line or bus incoming line).

7.3 The model selection of main equipment, such as disconnector, reactor, assembling capacitor, discharge coil and arrester, shall be selected by our company or specified by users.

7.4 Delivery date.

7.5 If you have special requirements, you can write to discuss.

ZRTBBZ

Type outdoor frame type automatic reactive power compensation device

General

ZRTBBZ outdoor frame type automatic reactive power compensation device is suitable for reactive power compensation on the 10kV or 6kV side of substations or industrial and mining enterprises, which can effectively increase power factor, reduce power loss, improve power supply quality and increase the output of main transformer.

The product is installed outdoors and consists of disconnector, vacuum contactor for switching shunt capacitor bank, lightning arrester, high voltage shunt capacitor, series reactor, discharge coil, spraying fuse, automatic control and protection device for reactive power compensation, installation framework, fittings, busbar, safety fence, etc.

The device is divided into several capacitor banks, which is controlled by a microcomputer controller and automatically switched by a vacuum contactor according to the system load to realize automatic reactive power compensation. The device is equipped with various complete protection functions, such as open-delta unbalanced voltage, single capacitor fault, short circuit, over-current, overvoltage, undervoltage, loss of voltage and so on.

The device conforms to GB 50227-2008 "Code for design of shunt capacitor device", JB/T 7111-1993 "High voltage shunt capacitor device", DL/T 604-1996 "Ordering technical conditions for high voltage shunt capacitors", etc. All electrical components of the device meet relevant standards.

Model and meaning

ZR TBB Z □ - □ / □ -AK W □

- Reactance rate%
- Outdoor installation
- Single star connection, open delta protection
- Capacity of group capacitor (kvar)
- Rated capacity of device (kvar)
- Rated voltage (kV)
- Switching of vacuum switch
- Shunt capacitor device
- Enterprise code

Working conditions

3.1 Ambient air temperature: −40℃ ~ +45℃.
3.2 Altitude: no higher than 2000m.
3.3 Sunshine: the amplitude (Max.) is 0.1w/cm^2.
3.4 Wind speed: no more than 35m/s.
3.5 Earthquake: intensity no more than 8.
3.6 Installation site conditions: no severe mechanical vibration; no harmful gases and steam; no conductive or explosive dust.

Note: Plateau products and products with special environmental requirements can be settled through negotiation.

Main technical performance index

4.1 Rated voltage: 6kV or 10kV.
4.2 Rated frequency: 50 Hz.
4.3 Maximum capacity of device: 20000kvar.
4.4 Maximum capacity of single group: 3000kvar.
4.5 Rated reactance rate: 0.1%~1%, 4.5% ~ 6%, 12%~13%.

Performance

5.1 Capacitance deviation
5.1.1 The difference between the actual capacitance and the rated capacitance of the device is within the range of 0~+5% of the rated capacitance.
5.1.2 The ratio of the maximum to the minimum capacitance between any two line terminals of the device shall not exceed 1.02.
5.2 Inductance deviation
5.2.1 Under rated current, the allowable deviation of reactance value is 0~+5%.
5.2.2 The reactance value of each phase shall not exceed ± 2% of the average value of three phases.

5.3 Insulation level

Unit: kV Table 1

Rated voltage of device	1min power frequency withstand voltage of primary circuit (root-mean-square value)	Impulse withstand voltage of primary circuit [(1.2-5)/ 50 μs peak value]	1min power frequency withstand voltage of secondary circuit (root-mean-square value)
6	32	60	2
10	42	75	2

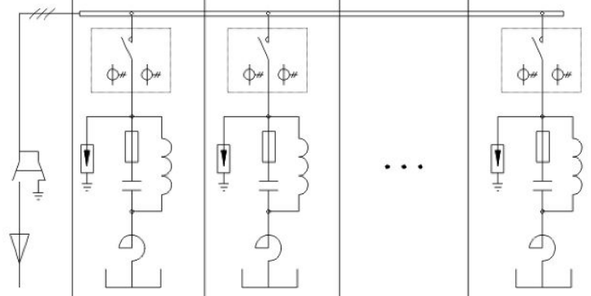
5.4 Overload capacity
5.4.1 Steady state overvoltage

Unit: kV Table 2

Power frequency overvoltage Un	Maximum duration	Explanation
1.10	Long-term	It refers to the maximum value of long-term overvoltage not exceeding 1.10un
1.15	30 minutes in every 24 hours	Adjustment and fluctuation of system voltage
1.20	5min	The voltage increases under light load
1.30	1min	The voltage increases under light load

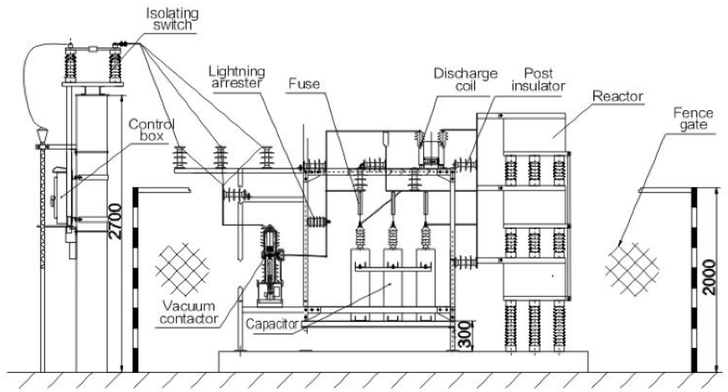
5.4.2 Steady-state over-current: can run for a long time when the root-mean-square value is not more than 1.1x1.3IN.
5.4.3 Limit inrush capacity: the inrush current generated at the moment of input of the capacitor bank is limited to less than 20 times the rated current of the capacitor bank.
5.4.4 Transition overvoltage: the device selects a special sulfur hexafluoride load switch for switching capacitors, and there is no heavy breakdown when switch on and off.
5.5 Discharge performance: five seconds after the power failure, the voltage on each group of capacitors is lower than 50V.
5.6 structure: the device is installed with hot-dip galvanized frame and protected by safety fence.
5.7 Protection: spray fuse is used as the main protection of capacitor, and open triangle unbalanced voltage is used as backup protection. The controller and switch can also realize the protection of over-current, over-voltage, under voltage, loss of voltage and fault locking, and other protection functions can be set according to the user's requirements.
5.8 Interlocking: "five prevention" can be achieved by installing electromagnetic lock, travel switch, auxiliary switch, program sequence lock, etc.

Primary schematic diagram

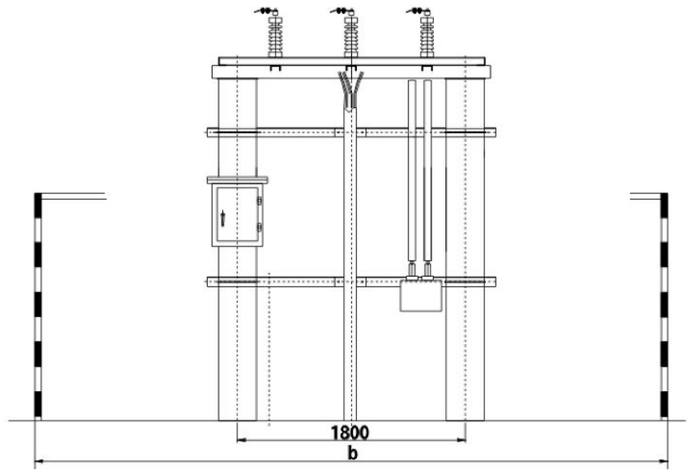
No.		0	1	2	• • •	N
Main circuit diagram						
Name		Incoming line	1# capacitor bank	2# capacitor bank	• • •	N# capacitor bank
Capacity			Kvar	Kvar	• • •	Kvar
Main components	Isolating switch	1				
	Current transformer		2(Switch external)	2(Switch external)	• • •	2(Switch external)
	Vacuum contactor		1	1	• • •	1
	Lightning arrester		3	3	• • •	3
	Fuse		According to the number of single capacitor configuration	According to the number of single capacitor configuration	• • •	According to the number of single capacitor configuration
	Discharge coil		3	3	• • •	3
	Shunt capacitor		Configuration according to grouping capacity or user requirements	Configuration according to grouping capacity or user requirements	• • •	Configuration according to grouping capacity or user requirements
	Series reactor		1	1	• • •	1

Note: this schematic diagram is a typical and commonly used scheme, and the manufacturer can make appropriate changes according to the needs of users.

Installation diagram



Device sectional drawing



Installation diagram of incoming line isolation

Ordering instructions

Please provide the following information when ordering:

8.1 The scheme of primary circuit, number of groups, capacity of each group, reactance rate, etc. shall be specified in detail.

8.2 Specify the scope of supply, the name and quantity of spare parts and spare parts in detail.

8.3 Electrical components and parameters with special requirements.

8.4 Delivery time and mode of transportation.

8.5 Other special requirements.

ZRTBBZW

Pole mounted outdoor line reactive power compensation complete set device

General

ZRTBBZW pole mounted outdoor line reactive power compensation complete set device (hereinafter referred to as the device) is suitable for 10kV or 6kV high-voltage distribution lines with rated voltage. It is used to improve power factor, reduce line loss and improve voltage quality.

The device is composed of full film high-voltage shunt capacitor, vacuum contactor for outdoor switching capacitor (with internal current transformer), control power transformer, zinc oxide arrester, drop out fuse, automatic controller for reactive power compensation, outdoor high-voltage current transformer and installation fittings. Complete configuration, compact structure and convenient installation.

According to the actual needs of the line, the device can be set in advance by the user and controlled by a microcomputer to realize the automatic switching of the shunt capacitor, so that the power factor of the line can reach the predetermined range. At the same time, it has the protection functions of short circuit, over-current, overvoltage, undervoltage, loss of voltage, prevention of capacitor charging closing, lack of phase, fault locking, self-diagnosis and so on. Moreover, various parameters can be changed at any time.

The outdoor high voltage vacuum AC contactor used in this device is a special switch for switching high voltage shunt capacitor banks developed by our company. It can absolutely guarantee " closing without bounce" and " opening without reignition" , and the service life of electrical machinery can reach more than 300000 times.

The device meets the industry standards of JB/T10558-2004 " Column type high voltage reactive power compensation device" , JB/T7111-1993 " High voltage shunt capacitor device" , DL/T604-2009 "Ordering technical conditions for high voltage shunt capacitors" and enterprise standard of Q/NR "TBBZ column type automatic switching high voltage shunt capacitor device".

Model and meaning

ZR TBB ZW□□ - □□□

- ZR — Enterprise code
- TBB — Complete set
- ZW — Shunt compensation
- □□ — The device is a group of automatic switching
- □ — Content to be determined
- □ — Rated voltage of device (kV)
- □ — Total nominal capacity of unit (kvar)
- □ — Capacity of single capacitor (kvar)
- Connection mode: A: single star B: Double star

2.2 Table of TBBZ device models and specifications

Table 1

No.	Model	Control physical quantity: time, voltage 1	Control physical quantity: time, voltage, power factor 2	Close range remote control, telemetry and remote regulation 3	Remote control, telemetry, remote regulation and remote signaling 4	Separate installation of automatic controller and switch 5
1	ZRTBBZW□-□-15	●				●
2	ZRTBBZW□-□-25		●			●
3	ZRTBBZW□-□-35			●		●
4	ZRTBBZW□-□-45				●	●

Working conditions

3.1 Ambient air temperature: upper limit +45℃, lower limit -40℃.
3.2 Altitude: not higher than 2000m.
3.3 Sunshine: the amplitude (maximum) is 0.1w/cm^2.
3.4 Phoenix speed: not more than 35m/s.
3.5 Earthquake: intensity is not more than 8 degrees.
3.6 Chemical conditions: there is no harmful gas and steam, no conductive or explosive dust in the installation site.
3.7 Anti pollution capacity: the leakage ratio distance of external insulation is ≥ 2.5cm/kV.
Note: Plateau and special environmental products are separately agreed.

System operating conditions

4.1 Rated voltage: 6kV, 10kV.
4.2 Maximum operating voltage: 6.6kV, 11kV.
4.3 Rated frequency: 50 Hz.
4.4 Neutral point grounding mode: non effective grounding or neutral point insulation.

Main technical parameters

Table 2

No.	Model	Rated voltage Un(kV)	Rated voltage of capacitor bank Un(kV)	Rated capacity QN(kvar)	Rated current IN(A)	Rated capacitance CN(f)	Rated frequency (Hz)	Capacitor (number of phases /units)
1	ZRTBBZW-10-80	10	11	80	4.4	2.11	50	3/1
2	ZRTBBZW-10-100	10	11	100	5.5	2.63	50	3/1
3	ZRTBBZW-10-150	10	11	150	8.26	3.95	50	3/1
4	ZRTBBZW-10-200	10	11	200	11	5.26	50	3/1
5	ZRTBBZW-10-300	10	11/√3	300	16.52	7.90	50	1/3
6	ZRTBBZW-10-360	10	11/√3	360	19.8	9.48	50	1/3
7	ZRTBBZW-10-400	10	11/√3	400	22	10.53	50	1/3
8	ZRTBBZW-10-450	10	11/√3	450	24.74	11.84	50	1/3
9	ZRTBBZW-10-500	10	11/√3	500	27.5	13.16	50	1/3
10	ZRTBBZW-10-600	10	11/√3	600	33	15.79	50	1/3
11	ZRTBBZW-10-720	10	11/√3	720	39.6	18.95	50	1/6
12	ZRTBBZW-10-900	10	11/√3	900	49.4	23.69	50	1/6
13	ZRTBBZW-10-1200	10	11/√3	1200	65.9	31.58	50	1/6
14	ZRTBBZW-6-80	6	6.6	80	7.34	5.85	50	3/1
15	ZRTBBZW-6-100	6	6.6	100	9.2	7.31	50	3/1
16	ZRTBBZW-6-150	6	6.6	150	13.75	10.97	50	3/1
17	ZRTBBZW-6-200	6	6.6	200	18.33	14.62	50	3/1
18	ZRTBBZW-6-300	6	6.6/√3	300	27.5	21.93	50	1/3
19	ZRTBBZW-6-350	6	6.6/√3	360	33	26.32	50	1/3
20	ZRTBBZW-6-400	6	6.6/√3	400	36.66	29.24	50	1/3
21	ZRTBBZW-6-450	6	6.6/√3	450	41.24	32.90	50	1/3
22	ZRTBBZW-6-500	6	6.6/√3	500	45.82	36.56	50	1/3
23	ZRTBBZW-6-600	6	6.6/√3	600	54.98	43.87	50	1/3
24	ZRTBBZW-6-720	6	6.6/√3	720	66	52.64	50	1/6

Note: products with other capacity can be provided according to user's requirements.

◆ Performance introduction

6.1 Capacitance deviation

6.1.1 The difference between the actual capacitance and the rated capacitance of the device is within the range of 0～+5% of the rated capacitance.

6.1.2 The ratio of the maximum to the minimum capacitance between any two line terminals of the device shall not exceed 1.02.

6.2 Insulation level

Table 3

Rated voltage of device	1min power frequency withstand voltage of primary circuit (root-mean-square value)	Impulse withstand voltage of primary circuit [(1.2-5)/ 50 μ s peak value]	1min power frequency withstand voltage of secondary circuit (root-mean-square value)
6	32	60	2
10	42	75	2

6.3 Withstand short circuit current capacity

Main circuit electrical equipment and the withstand short circuit current of conductor is 12.5kA, 2S.

6.4 Overload capacity

6.4.1 Steady state overvoltage

Table 4

Power frequency overvoltage Un	Maximum duration	Explanation
1.10	Long-term	It refers to the maximum value of long-term overvoltage not exceeding 1.10un
1.15	30 minutes in every 24 hours	Adjustment and fluctuation of system voltage
1.20	5min	The voltage increases under light load
1.30	1min	The voltage increases under light load

6.4.2 Steady-state over-current:

can operate for a long time under 1.3 IN.

6.4.3 Maximum allowable capacity:

within the limits of 6.4.1 and 6.4.2, the total capacity shall not exceed 1.35QN.

5.5 Discharge performance:

10min after power off, the voltage on each group of capacitors is less than 50V.

6.6 Structure

6.6.1 The metal exposed surface of all electrical equipment shall be sprayed with paint or electro -plating, and the installation fittings shall be hot-dip galvanized.

6.6.2 Minimum electrical clearance

Table 5

Relevant position	Minimum electrical clearance of main circuit	Minimum electrical clearance of auxiliary circuit
Between electrified bare conductors of different phases	200	4
Between electrified bare conductor and grounding body	200	15
Between electrified bare conductor and ground	3000	–

6.6.3 Protection grade of electrical equipment enclosure

The protection grade of the metal enclosure for the installation of electrical equipment is IP33.

6.7 Protection of the device includes short circuit, over-current, over-voltage, under voltage, loss of voltage, phase loss protection, which preventing capacitor closing with charge and switching oscillation. The specific settings are as follows:

6.7.1 Phase to phase short circuit of main circuit: drop fuse acts to cut off fault phase, switch slightly belt time limit (delay 0.2～0.5S) acts on tripping, exits operation and locks itself.

6.7.2 Short circuit of capacitor bank to neutral point: slightly time limit (delay 0.2～0.5S) acts on tripping and locks automatically. Setting value: 3In.

6.7.3 Over current of capacitor bank: act on tripping with time limit (delay 5S) and self locking. Setting value: 1.4～1.5In.

6.7.4 Overvoltage: act on tripping with time limit (delay 20～30S). Setting value: 1.1～1.3un.

6.7.5 Lightning overvoltage: it is protected by gapless zinc oxide arrester.

6.7.6 Under voltage: slightly time limit (delay 0.2～0.5S) acts on tripping. Setting value: 0.6Un.

6.7.7 Voltage loss: slightly time limit (delay 0.2～0.5S) acts on tripping.

6.7.8 Phase loss: any phase breaking is operated by tripping and locking automatically.

6.7.9 Prevent capacitor closing with charge: delay 10 min before putting capacitor bank into operation.

6.7.10 Anti-switching oscillation: when the switch is closed, the controller has calculated the reactive power gap of the line and set the reactive power backlash and voltage backlash. Only when the reactive power exceeds the capacitor capacity can the capacitor be put into operation. A certain delay is needed before putting into the capacitor to prevent switching oscillation caused by partial spikes or interference.

◆ Primary schematic diagram and main electrical equipment configuration

7.1 Primary schematic diagram

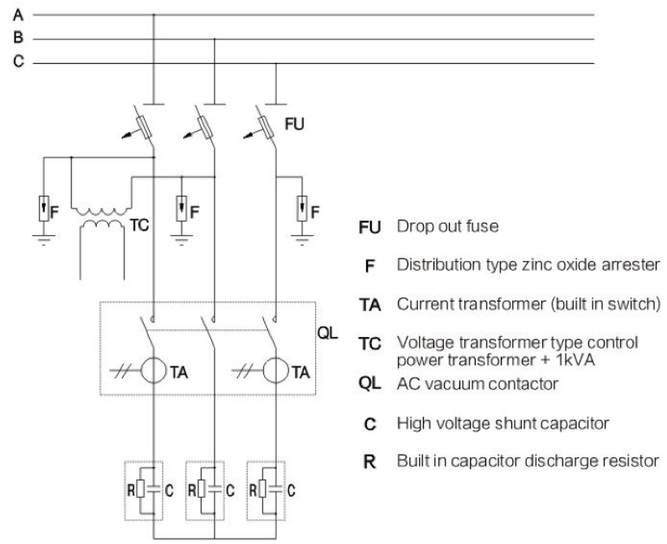


Fig.1 Primary schematic diagram controlled by time and voltage

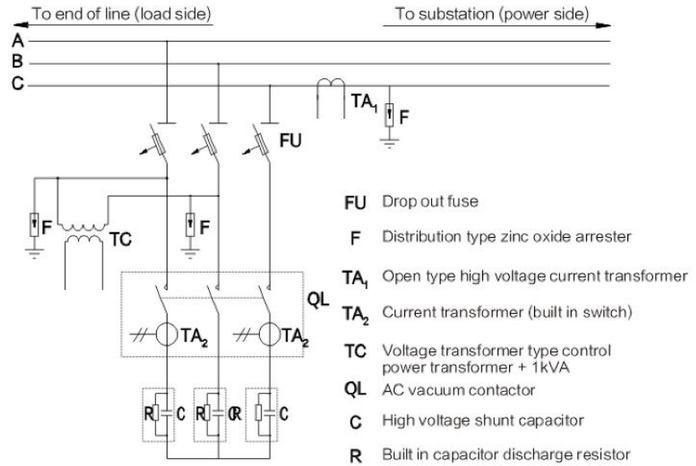


Fig.2 Primary schematic diagram of power factor and reactive power control type

7.2 Main electrical equipment configuration

Table 6

No.	Equipment model and name	Quantity (set)	Note
1	BFM(BAM) high voltage shunt capacitor	See Table 7	Built in discharge resistor
2	Outdoor AC vacuum contactor	1	Built-in 2 current transformers
3	RW10-10 drop out fuse	3	
4	HY5WR metal zinc oxide arrester	3	
5	LZKW outdoor high voltage current transformer	1	According to the time, voltage control type can not be used
6	Installation fittings	1 set	Selected by user

Quantity (set) Table 7

No.	Capacitor model	Capacity(kvar)												Explanation
		80	100	150	200	300	360	400	450	500	600	720	900	1200	
1	BAFM□-80-3W	1	–	–	–	–	–	–	–	–	–	–	–	–	
2	BAFM□-100-3W	–	1	–	–	–	–	–	–	–	–	–	–	–	UN=10kV □ is 11
3	BAFM□-150-3W	–	–	1	–	–	–	–	–	–	–	–	–	–	UN=6kV □ is 6.6
4	BAFM□-200-3W	–	–	–	1	–	–	–	–	–	–	–	–	–	
5	BAFM□-100-1W	–	–	–	–	3	–	–	–	–	–	–	–	–	
6	BAFM□-120-1W	–	–	–	–	–	3	–	–	–	–	6	–	–	UN=10kV □ is 11√/3
7	BAFM□-134-1W	–	–	–	–	–	–	3	–	–	–	–	–	–	
8	BAFM□-150-1W	–	–	–	–	–	–	–	3	–	–	–	(6)	–	UN=6kV □ is 6.6√/3
9	BAFM□-167-1W	–	–	–	–	–	–	–	–	3	–	–	–	–	
10	BAFM□-200-1W	–	–	–	–	–	–	–	–	–	3	–	–	(6)	

Note: the number in brackets is only used for UN = 10kV products

◆ Technical parameters, performance and structure of main electrical equipment

8.1 High voltage shunt capacitor

It meets the requirements of GB/T11024.1～4-2001 "shunt capacitors for AC power systems with nominal voltage above 1kV". Performance is shown in Table 8.

Table 8

Capacitance deviation: the difference between the measured value and the rated value is 0 ～5%, and the capacitance ratio between any two line terminals is ≤ 1.02	
Dielectric loss tangent: tg δ < 0.0005	
Low temperature partial discharge level: extinction voltage > 1.15UN	
Shell bursting capacity: not less than 15kJ	
Sealing performance: no leakage	
Liquid medium: M/DBT(C101) or PXE (soil)	
Solid medium: double coarsened polypropylene film	
Component structure: aluminum foil folding, convex foil lead	
Oil injection mode: pressure oiling	
Insulation level: 2.15UN, 10S between terminals	
Between terminal and shell: UN=6.6, 6.6√13	25kV 1min, lightning impulse 60kV
UN=11, 11√13	42kV(Dry)30kV(Wet)1min, lightning impulse75kV

8.2 ZW18 high voltage outdoor AC vacuum contactor

The capacitor bank specially designed and developed by our company is specially used for switching on and off high breaking speed, which completely eliminates the phenomenon of "closing bounce" and "switching off re ignition". With the automatic reactive power compensation controller, the automatic switching and relay protection can be realized. Performance is shown in Table 9.

Table 9

1	Rated voltage: 12kV
2	Rated current: 400A, 630A
3	Maximum breaking current: 200A, 300A
4	Insulation level: 42kV (dry and wet) for 1min
5	Lightning impulse: 75kV (peak value)
6	Electrical and mechanical life: > 100000 times
7	Release: shunt excitation, voltage loss (delay)
8	Operating mechanism voltage: 220 V+10% -20%, AC
9	Rated short time withstand current: 12.5kA, 4S
10	Rated peak withstand current: 31.5kA (peak value)
11	Rated short circuit making current: 31.5kA (peak value)
12	Average closing speed: 2.5～4m/S
13	Average opening speed: 3.5～5m/S
14	Closing bounce time: 0
15	Three phase different periodicity: ≤ 0.5ms
16	Others: internal CT

8.3 Automatic controller for high voltage reactive power compensation

ZRGKWN high voltage reactive power compensation automatic controller is a high-tech product specially designed and developed for pole top automatic switching high voltage shunt capacitor device, which has high reliability, strong anti-interference ability and other functions. The controller is installed in a special control box, which is installed separately from the capacitor bank. The controller has a variety of specifications and is configured according to the user's selection of the device (see 4.2). Performance is shown in Table10.

Table 10

Rated voltage: 220 ± 20%V, AC			
Rated frequency: 50 ± 2.5Hz			Anti high frequency interference: 1MHz, 1000Hz
Power consumption: ≤ 5W			Common mode 2kV, differential mode 1kV, 50 time/s
Output contact capacity: 10A, 220V AC			Electrical fast transient burst immunity: severity level 4
Analog input voltage: 220 (80% ~ 120%) VAC			Electrostatic discharge immunity: severity level 3
Analog input current: 5 (10% ~ 100%) a			Radiated electromagnetic field immunity: severity level 3
Loop resistance: voltage loop > 20KΩ, current loop < 0.1Ω		EMC perform-ance	Protection function: over voltage, over current, under voltage, to prevent capacitor closing with charge and phase loss.
Insulation level: 1 min power frequency withstand voltage 2500V			
Measurement error: voltage and current ± 0.5%, time < 1s/d, reactive power ±3%			Display function: voltage, line current, reactive power, power factor, device current, operation time accumulation, year, month, day, hour, minute, action times accumulation.
Action error: ± 1%			
Control mode	① According to voltage	Self check function	Self check recovery
	② By time		Operation status of capacitor
	③ According to time and voltage		Over current diagnosis
	④ According to power factor		Locking function: automatic controller fault, short circuit, over-current trip, phase loss
	⑤ According to voltage and reactive power		Other functions of advanced products: short distance or long distance remote control, tele-metry, remote adjustment, remote signaling.
	⑥ Remote control		
Setting function	1) Year, month, day, hour, minute	Record-ing function	Various setting parameters
	2) Rated voltage		Cumulative switching times
	3) Transformation ratio of voltage transformer		Accumulative operation time
	4) Transformation ratio of current transformer		SOE document records:
	5) Ratio correction		Daily maximum (low) voltage and time
	6) Input threshold (voltage, power factor)		Daily maximum (low) current and time
	7) Cut off threshold (voltage, power factor)		Daily maximum (low) power factor and time
	8) Investment time		Protection action before and after the data
	9) Resection time		Blackout time record
	10) Overvoltage and delay time		Power on time record
	11) Under voltage and delay time		Data storage for 60 days
	12) Over current and delay time		Current running data download
	13) Over current quick break and delay time	Communi-caton function	SOE file record download
	14) Voltage return difference		Setting value download and modification
	15) Reactive power return difference		Sending and receiving remote switching SMS
	16) Switching mode selection		
	17) Daily switching times		

Note: different specifications of automatic controller have different functions, some or all of them have the functions listed in the table.

8.4 Control power transformer

JDZC voltage mutual inductor type control power transformer is an outdoor product with both voltage mutual inductor and transformer functions. It is poured with epoxy resin and connected to the control box with aerial linker. Performance is shown in Table 11.

Table 11

Rated voltage (kV)	Rated capacity (VA)	1min power frequency withstand voltage(effective)kV	Lightning impulse (peak value)kV	Accuracy level
10/0.22	Long-term 1000VA	High voltage side 42, low voltage side 3	**75**	Grade 1.0
6/0.22	Long-term 1000VA	High voltage side 25, low voltage side 3	**60**	Grade 1.0

8.5 Outdoor high voltage current transformer

LZKW-10 outdoor high voltage current transformer is molded with special materials, which has the characteristics of anti-aging, anti-radiation, full insulation and so on. Small size, light weight, simple and convenient installation, no need to cut the current carrying wire, reliable operation. The performance is as follows:

Maximum working voltage: 12kV; accuracy level: 0.5
Rated primary current: 100 ~ 500A; rated secondary current: 5A
Rated output: 10VA

8.6 Metal zinc oxide arrester

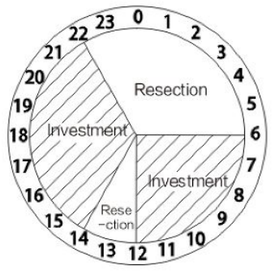
HY5WS organic composite sheath metal zinc oxide arrester is used for atmospheric overvoltage protection.

Table 12

Model of arrester	System rated voltage	Rated voltage of arrester kV(effective value)	Maximum residual pressure(peak value) Continuous operating voltage kV(effective value)	1/5 μ S under steep impulse current	8/20 μ S under lightning impulse current	DC reference voltage kV (peak value) 1mA	30/60 μ S under switching impulse current	Current impulse withstand Square-wave current A (peak value) 2ms	Impulse current kA 8/20 μ S	Impulse current kA(peak value) 4/10 μ S
	kV	kV	kV	≥	≤	≤	≤	A	kA	kA
HY5WS-10/30	6	10	8.0	15.0	34.6	30.0	25.6	75	5	25
HY5WS-17/50	10	17	13.6	25.0	57.5	50.0	42.5	75	5	25

8.7 Drop-out fuse

Selecting RW10-10 drop-out fuse, according to user's requirements, can provide breaking capacity 100 or 200MVA products. There are products specially designed for use in heavily polluted areas with a leakage distance per unit withstand voltage larger than 32mm/kV.



◆ Automatic switching mode

9.1 Switching mode by time

When the distribution line load changes with time, this switching mode can be selected.

You can pre-set 24 hours a day to 2 or 4 periods for cyclic switching, for example:

9.2 Switching mode according to voltage

This switching mode is suitable for distribution lines with various load changes. The input threshold and the cut-off threshold can be set in advance. When the line voltage is lower than the input threshold, the device will automatically put the capacitor into operation; and when the line voltage is higher than the cut-off threshold, the capacitor will be cut off automatically. The threshold voltage can be preliminarily determined with reference to the following methods.

a) Through calculation or field measurement, the minimum voltage (Umin) at the maximum load at the installation site and the maximum voltage (Umax) at the light load are determined;

b) A Umin is used as the input threshold voltage (Ud), which should be slightly higher than the average voltage (Uj) at the installation site but not higher than the rated voltage (Un) of the line.

A is the coefficient, when **Umin ≤ 0.93Un, A=1.03 ~ 1.08**
0.96Un > Umin > 0.93Un, A=1.01 ~ 1.05
Umin ≥ 0.96Un, Ud=Un

c) Umax+△U is used as the cut-off threshold voltage (Ug), which should be lower than the maximum voltage of the power station bus.

△U is the voltage rise value after the capacitor is put into operation

$$\triangle U = Un\frac{Q}{S}$$

Q —— Capacity of capacitor bank kvar

S —— Short circuit capacity at installation site kVA

Explain:

① The threshold set by the above method should also be tested and adjusted on the spot.

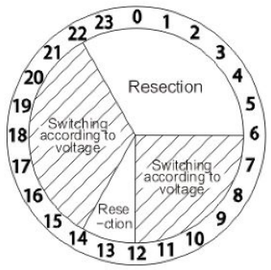
② When the average line voltage is higher than UN, the threshold voltage will be greater than UN.

For example: Un=10kV, Q= 600kvar, short-circuit capacity at installation site
S= 30MVA = 30 × 103kVA, Umin = 9.2kV, Umax = 10.3kV.

Input threshold: Ud=AUmin=(1.03 ~ 1.08) × 9.2=9.48 ~ 9.94kV, and Ud= 9.8kV can be set;

Resection threshold: Uq=Umax+Un=10.3+10 × =10.5kV, and Uq= 10.5kV can be set.

Note: in order to prevent switching oscillation, the difference between Ud and uq should be as large as possible without affecting normal switching.



9.3 Switching mode according to time and voltage

This switching method makes up for the shortcomings of the above two methods and expands the scope of switching threshold. The details are as follows:

a. Set 24 hours a day to 2 or 4 periods, the investment time can be artificially extended when setting up.

b. Set the input threshold voltage and the cut-off threshold voltage.

c. In the input period, the device switches the capacitor according to voltage, and in the cut -off period, the capacitor is cut off and not put into operation.

9.4 Switching mode according to power factor

Because this method limits the capacity of the device (less than 80% of the total reactive power from the installation to the end), it should not be used for the main purpose of loss reduction, but can be used when most of the load is concentrated at the end or only for the purpose of increasing the power factor. Multi-point compensation can be used at the compensatory point on the side of the power station.

In this way, the upper and lower limits of the power factor are set in advance. In order to prevent switching oscillation, the difference between the upper and lower limits should be as large as possible. In addition, the device also sets the reactive power return difference, which is normally set to 1.1 ~ 1.3 times the device capacity. Put the capacitor when the power factor at the installation is lower than the lower limit of the power factor and the total reactive power from the installation to the end of the line is greater than 1.1 ~ 1.3Q, and cut off the capacitor when the power factor is higher than the upper limit.

9.5 Switching mode according to voltage and reactive power

In this method, the upper and lower threshold of voltage and reactive power should be set in advance, in which the voltage is priority, that is, put the capacitor when the voltage is less than the lower limit of voltage, the capacitor is cut off when the voltage is greater than the upper limit of voltage, and control according to reactive power when the voltage is between the upper and lower threshold, at this time, the capacitor is put into if the reactive power is greater than the upper limit of reactive power, or cut off if the reactive power is less than the lower limit of reactive power.

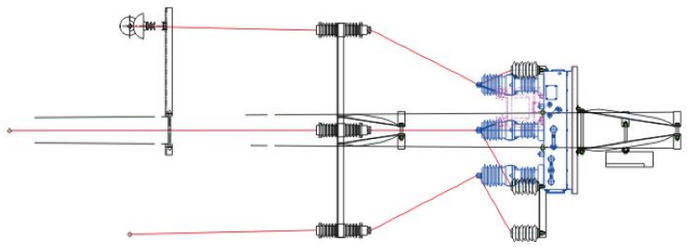
This control method needs to calculate the reactive power before the compensatory point in advance, so that the reactive power can be sent up to the compensatory point, but the reactive power along the compensatory point is not a fixed value, so this control method is more suitable for reactive power compensation at the outlet of the power station, because the reactive power loss of the main transformer is relatively stable.

9.6 Power station remote control switching mode

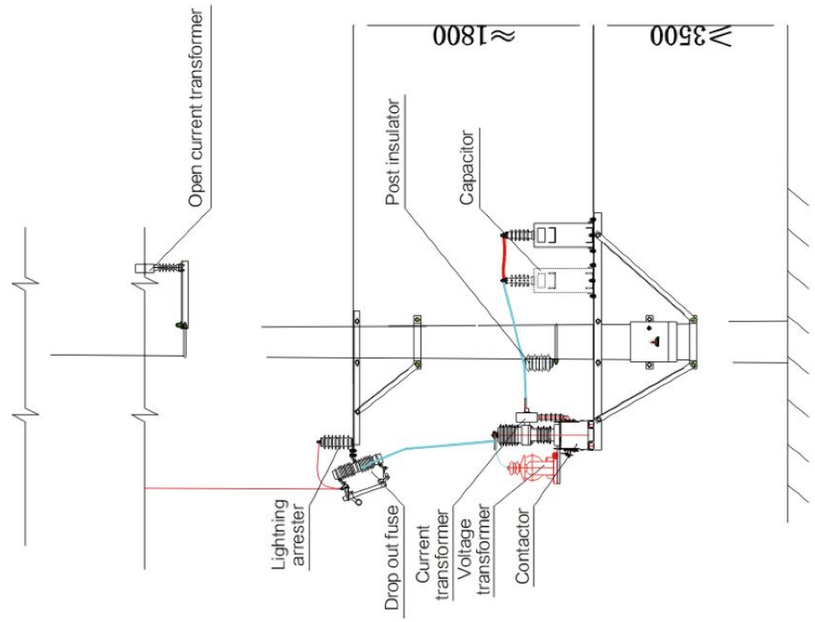
In this way, the monitoring system of the power station, after measuring the relevant data of the high voltage distribution line, such as voltage, current, active power, reactive power, power factor, etc., is processed by the computer and remotely controls the remote terminal (RTV)-pole top compensation device to realize automatic switching, and at the same time, using GSM commu -nication network, RTV automatically transmits the operation information (put, cut off, fault) and measured data (voltage, current, reactive power, power factor, harmonic voltage, harmonic current, daily voltage peak and time, daily voltage trough and time, daily peak load and time zone, daily low peak load and time zone, etc.) of the pole top device to the power station or other receiving devices by means of SMS, voice and data. It can also carry out remote monitoring, monitoring or parameter adjustment of the pole top device at any time, so as to realize the four remote (remote control, remote metering, remote signal, remote adjustment). This is a very ideal way, for it can not only switch capacitors according to the actual needs of line reactive power, but also monitor in time.

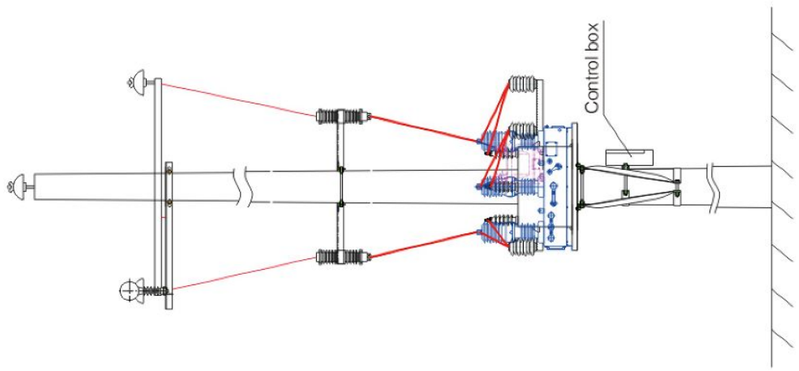
9.7 Selection of automatic switching mode

No.	Automatic switching mode	Application conditions	Remarks
1	Time	The change of reactive power load is very regular, heavy load and light load are concentrated in one or several time periods respectively within 24 hours of the whole day.	Optional
2	Voltage	The change of reactive power load is irregular, and there is no obvious light load period in 24 hours of the whole day.	Optional
3	Voltage and reactive power	The change of reactive power load is irregular, and there are obvious periods of light load in 24 hours of the whole day.	Preference
4	Power factor	The main purpose of compensation is to improve the power factor. Two or more points of compensation are installed near the power station.	Use as little as possible
5	Time, voltage	The main purpose of compensation is to improve the power factor. Two or more points of compensation are installed near the power station.	Optional
6	Remote control of power station	It is suitable for all kinds of reactive load changes. There is a monitoring automation system in the power station.	Preference for qualified candidates



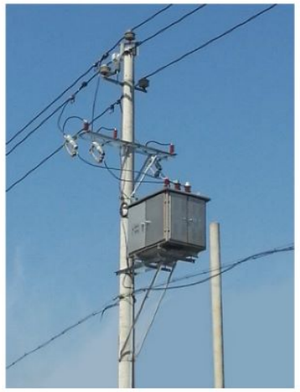
Single pole installation diagram





ZRTBBZW

Pole mounted outdoor line reactive power compensation device



General

ZRTBBZW pole mounted outdoor line reactive power compensation device is suitable for installation in 10kV and 6kV distribution lines. It can effectively improve power factor, reduce line loss and improve voltage quality.

The device is composed of full-film high-voltage parallel capacitor (built-in discharge resistance), special high-voltage vacuum contactor, control power transformer, high-voltage current mutual inductor, zinc oxide lightning arrester, drop-out fuse, automatic reactive power compensation controller, device box and hardware wire, etc. According to the needs of the line and pre-set by the user, the automatic switching of the shunt capacitor (according to time, voltage, power factor or reactive power) is realized, and the power factor reaches the predetermined range. At the same time, it has the protection functions of short circuit, over-current, over-voltage, under-voltage, lack of phase and preventing capacitor from closing with charge, etc.. The selected high voltage vacuum contactor is specially treated and has the characteristics of long life and frequent operation, so it is suitable for switching capacitors. The automatic controller has strong anti-interference ability, which can ensure the reliable operation of the device. In addition, the controller can have a serial interface, and close-range wireless remote control or remote GPRS remote control can be realized after accessing relevant modules according to the needs of different users.

The device has a variety of grouping compensation schemes to choose from, which can be compensated by single group or multi-group automatic compensation, or by automatic group reinforcement. Users can choose the corresponding grouping scheme according to the load characteristics of the line to make the reactive power compensation more accurate.

Standards: JB/T 10558-2006 "Column type high voltage reactive power compensation device", GB/T 50227-2008 "Code for design of complete set of shunt capacitor device", JB/T 7111-1993 "High voltage shunt capacitor device", DL/T604-1996 "Ordering technical conditions for high voltage shunt capacitors', etc. All electrical components meet the require-ments of relevant standards.

Model and meaning

ZR TBBZW □-□ □

- Fixed group capacity (G/minimum loss of compensation line)
  automatic group capacity (omitted)
- Rated capacity (kvar)
- Rated voltage (kV)
- Automatic switching of outdoor column vacuum contactor
- Enterprise code

Working conditions

3.1 Ambient air temperature: -40℃~+45℃.
3.2 Altitude: not higher than 2000m.
3.3 Sunshine: the amplitude (maximum) is 0.1w/cm^2.
3.4 Phoenix speed: not more than 35m/s.
3.5 Earthquake: intensity is not more than 8 degrees.
3.6 Installation site conditions: no severe mechanical vibration; no harmful gas and steam; no conductive or explosive dust。
3.7Pollution level: Ⅳ.
Note: Plateau and special environmental products are separately agreed.

◆ Main technical parameters

Model	Rated voltage (kV)	Rated voltage of capacitor bank(kV)	Rated capacity (kvar)	Rated current (A)	Capacitor deviation	Allowable steady state overvoltage	Allowable steady state overcurrent	Model of shunt capacitor
ZRTBBZW-10-100			100	5.25				
ZRTBBZW-10-200			200	10.50				
ZRTBBZW-10-300			300	15.75				
ZRTBBZW-10-360	10	11	360	18.90				B^{A}_{F} M11
ZRTBBZW-10-450			450	23.62				
ZRTBBZW-10-600			600	31.49				
ZRTBBZW-10-900			900	47.24	0~5%	1.1Un	1.3In	
ZRTBBZW-6-100			100	8.75				
ZRTBBZW-6-200			200	17.50				
ZRTBBZW-6-300	6	6.6	300	26.24				B^{A}_{F} M6.6
ZRTBBZW-6-360			360	18.90				
ZRTBBZW-6-450			450	39.37				
ZRTBBZW-6-600			600	52.49				

Note: the above table only lists the common compensation capacity. Our company can manufacture various products with special capacity according to different needs of users.

◆ Performance introduction

5.1 Capacitance deviation

5.1.1 The difference between the actual capacitance and the rated capacitance of the device is within the range of 0~+5% of the rated capacitance.

5.1.2 The ratio of the maximum to the minimum capacitance between any two line terminals of the device shall not exceed 1.02.

5.2 Insulation level

Rated voltage of device	1min power frequency withstand voltage of primary circuit (root-mean-square value)	Impulse withstand voltage of primary circuit [(1.2-5)/ 50 μ s peak value]	1min power frequency withstand voltage of secondary circuit (root-mean-square value)
6	32	60	2
10	43	75	2

5.3 Withstand short circuit current capacity

Main circuit electrical equipment and the withstand short circuit current of conductor is 12.5kA, 2S.

5.4 Overload capacity

5.4.1 Steady state overvoltage

Power frequency overvoltage Un	Maximum duration	Explanation
1.10	Long-term	It refers to the maximum value of long-term overvoltage not exceeding 1.10un
1.15	30 minutes in every 24 hours	Adjustment and fluctuation of system voltage
1.20	5min	The voltage increases under light load
1.30	1min	The voltage increases under light load

5.4.2 Steady-state over-current: can run for a long time when the root-mean-square value is not more than 1.1x1.3IN.

5.4.3 Maximum allowable capacity:

within the limits of 5.4.1 and 5.4.2, the total capacity shall not exceed 1.35QN.

5.5 Discharge performance:

10min after power off, the voltage on each group of capacitors is less than 50V.

5.6 Structure performance

5.6.1 The box body of the device is made of cold-rolled steel plate spray plastic or stainless steel plate shell, the structure of the device is beautiful in appearance, and there are distinct safety warning signs on the door. All kinds of electrical equipment are installed in the box, and the outdoor fittings, fasteners and cross poles are all treated by hot-dip galvanizing.

5.6.2 Minimum electrical clearance

Relevant position	Minimum electrical clearance of main circuit	Minimum electrical clearance of auxiliary circuit
Between electrified bare conductors of different phases(outdoor/indoor)	200 / 125	4
Between electrified bare conductor and grounding body(outdoor/indoor)	200 / 125	15
Between electrified bare conductor and ground	3000	–

5.6.3 Enclosure protection grade: IP33.

The box adopts good ventilation and heat dissipation design and has various protective functions, which is suitable for long-term outdoor operation.

5.7 Protection:

Protection of the device includes short circuit, over-current, over-voltage, under voltage, loss of voltage, phase loss protection, which preventing capacitor closing with charge. The pecific settings are as follows:

5.7.1 Short circuit between main circuit: drop fuse action to cut off fault phase. Switch acts on tripping, exits operation and locks itself.

5.7.2 Short circuit of capacitor bank to neutral point: slightly time limit acts on tripping and locks automatically. Setting value: 3In.

5.7.3 Over current of capacitor bank: act on tripping with time limit (delay 5S) and self locking. Setting value: 1.4~1.5In.

5.7.4 System overvoltage: act on tripping with time limit (delay 20~30S). Setting value: 1.1~1.3un.

5.7.5 Lightning strike and switching overvoltage: the protection is realized by zinc oxide arrester.

5.7.6 Under voltage: delay 0.2-0.5S to act on tripping. Setting value: 0.6Un.

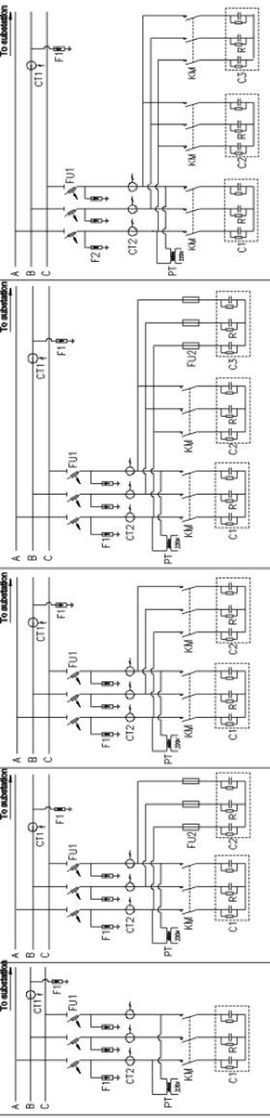
5.7.7 Voltage loss: acts on tripping.

5.7.8 Phase loss: any phase breaking is operated by tripping and locking automatically.

5.7.9 Prevent capacitor closing with charge (10 min discharge protection): delay 10 min before putting capacitor bank into operation.

Note: the device can also set other protection functions according to the special requirements of users.

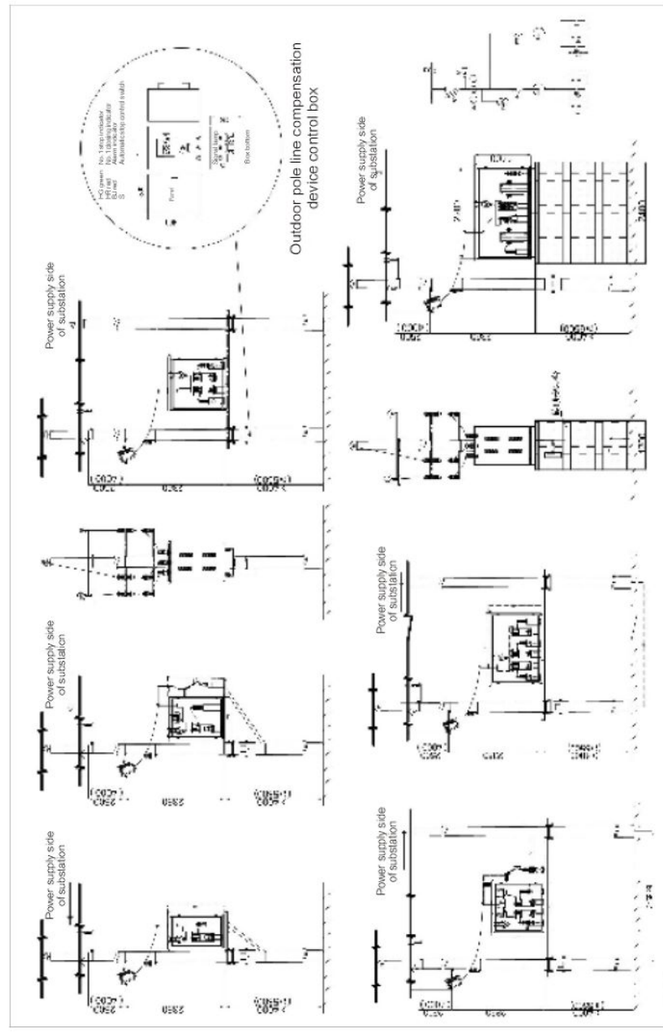
Primary circuit scheme

Scheme No.	01	02	03	04	05
Schematic diagram of main circuit					
Scheme description	A set of automatic	A set of automatic + a set of fixation	Two groups of automatic	Two groups of automatic + a set of fixation	Three groups of automatic
LZKW–10 Open current transformer	1	1	1	1	1
RW10–10 Drop out fuse	3	3	3	3	3
JCZ5 High voltage vacuum contactor switch	1	1	2	2	3
JDZC–1000VA Control power transformer	1	1	1	1	1
Core through current transformer	3	3	4 or 3	4 or 3	3
B‡M High voltage shunt capacitor	1 or 2 or 3	2 or 3 or 4	2 or 3 or 4	3 or 4 or 5	3 or 4 or 5 or 6
HY5WS Distribution type zinc oxide arrester	3	3	3	3	3
HY5WR Capacitive zinc oxide arrester	3	3	3	3	3
BRN Spray fuse	—	3	—	3	—
Overall dimension of box (L×W×H)mm	900×900×1350	900×900×1350	1350×900×1350	1350×900×1350	1800/2000×900×1350

Note: the box dimensions listed in this table are generally only applicable to devices with capacity of each capacitor bank not exceeding 300kvar. If the capacity of a single group exceeds 300kvar, the box size shall be designed according to the actual capacity.

Explain: the general installation method of scheme No. 01 and 02 is single pole installation, and scheme 03, 04 and 05 is double pole installation.

Installation diagram



Ordering instructions

Please provide the following information when ordering:

8.1 model and specification of the product, the number of groups and capacity of each group shall be indicated in detail according to the primary circuit scheme;
8.2 electrical components and parameters with special requirements;
8.3 transformation ratio of outdoor open current transformer;
8.4 material of device box shell (cold rolled steel plate, plastic spraying, stainless steel plate);
8.5 pole specifications (length and tip diameter);
8.6 name and quantity of spare parts and spare parts;
8.7 delivery time and mode of transportation;
8.8 other special requirements.

ZRTBKV

High voltage step voltage regulating reactive power compensation complete set device

General

The product is mainly suitable for 6kV–220kV voltage level substations at all levels, installed on the 6kV/10kV/35kV bus of the substation. Products are widely used in power system, metallurgy, coal, petrochemical and other industries to improve voltage quality, improve power factor and reduce line loss.

Model and meaning

ZR TB KV– □ – □ / □□ – □ / □

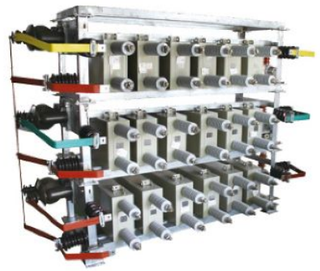
- Reactance rate of series reactor
- Single star connection/differential protection
- Double star connection/Neutral line unbalanced current protection
- Single star connection/open delta voltage protection
- Capacity of single capacitor (kvar)
- Installed capacity (kvar)
- Voltage regulation
- Complete set of shunt capacitor
- Enterprise code

Working conditions

3.1 Ambient temperature: −20℃~+45℃.
3.2 Relative humidity: ≤90%(25℃).
3.3 Altitude: ≤1000m.
3.4 Seismic intensity: ground horizontal acceleration 0.25g, vertical acceleration 0.125g.
3.5 Installation location: indoor or outdoor, the horizontal plane of the installation site shall be inclined to the vertical plane no more than 5 degrees, and the installation and operation site shall be free from severe mechanical vibration, harmful gas and steam, and conductive or explosive dust.

Device principle

The ZRTBKV substation voltage and reactive power automatic regulating device adopts the capacitor fixed access without grouping, and changes the compensation capacity of the capacitor by changing the voltage at both ends of the capacitor. According to the $Q=2\pi fCU$, the voltage and the C value of the capacitor remain unchanged, and the output of reactive power is changed by changing the voltage at both ends of the capacitor. Its output capacity can change the accuracy and depth of voltage regulation at (100%, 25%) × Q, that is, the regulation accuracy and depth of capacitors can be changed.



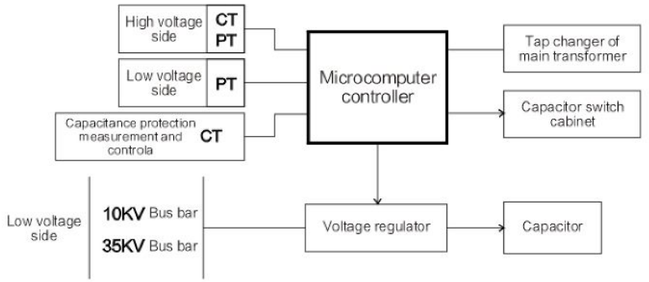
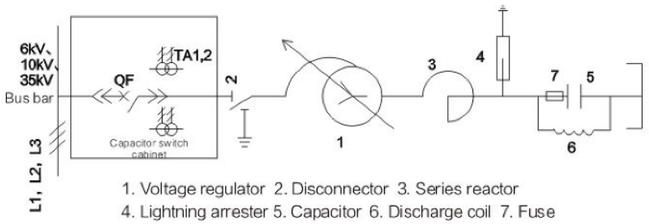


Fig.1 Working principle block diagram of the device

Device composition

The voltage regulating automatic compensation device is mainly composed of three parts, namely, the voltage regulator, the complete set of capacitors and the voltage and reactive power control screen. Figure 2 shows the primary schematic diagram of the device:



1. Voltage regulator 2. Disconnector 3. Series reactor
4. Lightning arrester 5. Capacitor 6. Discharge coil 7. Fuse

Fig.2 Installation wiring schematic diagram

Voltage regulator: the regulator connects the capacitor and the bus. On the premise of ensuring the stability of the bus voltage, the output voltage of the capacitor is changed to ensure that the output capacity of the capacitor meets the requirements of the system.

Voltage and reactive power control screen: make tap judgment and issue commands according to the input current and voltage signals. Adjust the main transformer tap-changer of the substation to adjust the voltage to ensure the qualified rate of bus voltage. Adjust the output voltage of the voltage regulator to change the reactive power output of the capacitor, with the corresponding display and signal function.

Capacitor complete set: capacitive reactive power source.

Advantages of the device

6.1 Compared with the switching type, with only one group of capacitor banks fixed access, nine-tap output can be realized, and the compensation accuracy is high, which can meet the requirements of reactive power variation of the system;
6.2 The voltage regulation mode of on-load autotransformer voltage regulator is adopted, the regulation speed is fast, the real-time automatic regulation can be realized, and the compen-sation effect is remarkable;
6.3 Can be closed at low voltage, which greatly reduces the closing inrush current and effectively reduces the impact on the system and capacitors;
6.4 Compared with switching, it can ensure that the capacitor can operate below the rated voltage for a long time, and there is no overvoltage and inrush current, which greatly prolongs the service life of the capacitor;

6.5 The device has a high degree of automation and has perfect protection functions, digital communication and remote maintenance functions, which can meet the needs of unattended and maintenance-free;
6.6.The additional loss is small, which is only about 2% of the capacitor capacity, which is equivalent to 1/10 of the SVC loss;
6.7 Capacitors do not need to be switched in groups, which reduces the equipment such as switching switches and area covered, and saves the cost of capital construction investment;
6.8 The device does not produce harmonics and will not cause harmonic pollution to the system;
6.9 When there is a series reactor, it can ensure that the reactance rate of each tap position is constant.

◆ Main function

7.1 Control function
7.1.1 Not only can the comprehensive regulation of voltage and reactive power be realized when the conditions are available, but also the voltage regulation of the main transformer can be controlled separately when there is no compensation capacitor, or the voltage regulator can be adjusted separately when the main transformer does not have on-load voltage regulation, and the reactive power compensation capacity can be controlled;
7.1.2 The reactive power of the capacitor can be automatically adjusted according to the needs of the power system;
7.1.3 According to the real-time data of the system and the control strategy of the nine-zone diagram, the voltage regulator and the main transformer tap-changer are controlled in real time to realize the optimal cooperation between the main transformer tap-changer and reactive power compensation equipment.
7.2 Protection function
7.2.1 Quick break and over-current protection;
7.2.2 Overvoltage protection;
7.2.3 Under voltage protection;
7.2.4 Unbalanced current protection, including neutral line unbalanced current protection and bridge differential unbalanced current protection, can meet the protection requirements of different connection modes of 66kV and below;
7.2.5 Unbalanced voltage protection, including unbalanced voltage protection and differential voltage protection between different sections in the same phase, is generally used for capacitor bank protection of 35kV voltage level;
7.2.6 The non-electric protection adopted for the voltage regulator body mainly includes light and heavy gas protection, temperature monitoring and pressure release protection;
7.2.7 Non-electric protection for on-load tap-changer, mainly includes on-load light and heavy gas protection;
7.3 Parameter setting and display function
7.3.1 It has on-site parameter setting function for personnel on duty, and all contents can be saved for more than ten years;
7.3.2 The voltage, current, power factor, reactive power, active power and voltage at low voltage side of main transformer can be displayed respectively;
7.3.3 Display microcomputer control mode, main transformer operation mode, tap changer gear of main transformer and voltage regulator;
7.3.4 Display various action information, and display the on-off status of corresponding high-voltage circuit breaker;
7.4 Locking function
7.4.1 The voltage on the low-voltage side of the main transformer can only be adjusted normally when the voltage is 80%～120% of the rated value; otherwise, the voltage of the main transformer will be automatically locked, and the lock will be automatically returned (that is, the locking state will be automatically released with the disappearance of the locking condition. Same as below);

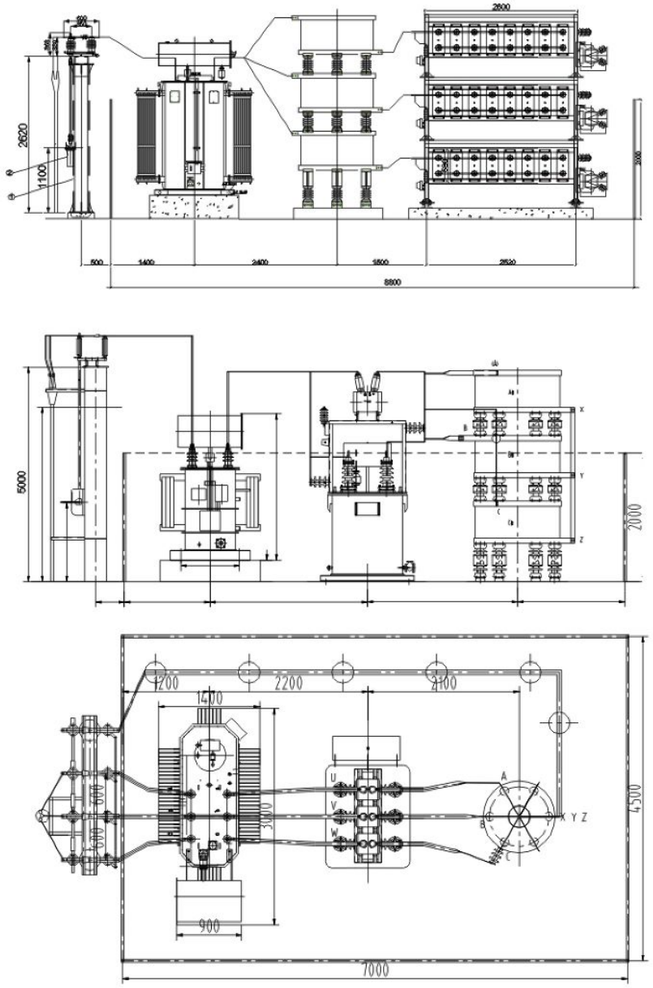
7.4.2 If the number of actions per day of the controlled device reaches or exceeds the set value, the control of the device will be automatically locked, and the lock will be automatically returned at 0:00;
7.4.3 The main transformer differential, backup, weight gas, on-load weight gas action, etc., will lock up the control of the main transformer, and the lock will be released automatically with the disappearance of the locking condition;
7.4.4 Locking control of TV secondary circuit disconnection;
7.4.5 When the capacitor protection acts, the capacitor will be locked, and the locking will be automatically released with the disappearance of the locking condition;
7.4.6 When the capacitor is not in the closing position, the automatic regulation is not put into operation, and the allowable switching pressing plate is not put into operation, it will be locked;
7.4.7 Other remote signals that need to be locked.
7.5 Communication function
The device has a double RS-485 communication interface, which can communicate directly with the microcomputer blue control or protection management machine. The protocol adopts DL/T667-1999 (IEC-60870-5-103)or Modbus. The two software are optional, and the functions of telemetry, remote signal, remote control and remote adjustment can be realized comprehensively and reliably.

◆ Main technical parameters

8.1 Main parameters of voltage regulator
8.1.1 Rated voltage: 6.3kV, 10.5kV, 38.5kV
8.1.2 Capacity: 6.3kV(300-4000kvar), 10.5kV(300-7500kvar), 38.5kV(2000-25000kvar)
8.1.3 Output voltage: Ue-Ue×(0-8)×6.25%
8.1.4 Reactive power output of adjustable capacitor: Qce * (100-25%)
8.1.5 Voltage regulation mode: on-load voltage regulation, according to the requirement of guaranteed voltage output, the principle of minimum load loss of transformer, and the manu-facturing level of domestic on-load tap-changer, select appropriate on-load tap-changer, and end voltage regulation can be adopted.
8.1.6 Group: y, a0
8.1.7 Loss: ≤1.2 ‰× capacitor capacity
8.1.8 Impedance: less than 2.0% (converted to electromagnetic capacity)
8.1.9 Pollution level: Ⅳ, the creepage distance of outgoing line bushing shall not be less than 31.5mm/kV.
8.1.10 Cooling mode: oil immersed self cooling
8.1.11 Transformer oil: 25#(or 45#) domestic oil
8.1.12 Temperature rise limit: according to the requirements of GB1094.2.
8.2 Main parameters of controller
8.2.1 Rated data
Rated power supply voltage: DC220V to DC110V(order indicated)
Rated AC data:
Phase voltage: 100/V
AC current: 5A
Rated frequency: 50 Hz
Thermal stability:
AC voltage circuit: long term operation 1.2un
AC current circuit: long term operation 2In
1s 40In
8.2.2 Device power consumption
AC voltage circuit: per phase no more than 1VA;
AC current circuit: per phase no more than 1VA;
Protection power supply circuit: no more than 12W in normal operation and 15W in protection action.

8.2.3 Measurement accuracy
The measurement error of each analog quantity shall not exceed ±0.2% of the rated value;
The power measurement error shall not exceed ±0.5% of the rated value;
Switch input voltage (DC220V/ 110V/24V), resolution no more than 2ms;
8.2.4 Node capacity
8.2.4.1 Outlet tripping and closing contact
In the DC inductive load circuit where the voltage is not more than 250V, the current is not more than 1A, and the time constant L/R is 5ms ±0.75ms, the contact opening capacity is 50W and the long-term allowable passing current is not more than 5A.
8.2.4.2 Exit signal and other contacts
In the DC inductive load circuit where the voltage is not more than 250V, the current is not more than 0.5A, and the time constant L/R is 5ms ±0.75ms, the contact opening capacity is 20W and the long-term allowable passing current is not more than 3A.

Typical installation diagram



Ordering instructions

No.	Equipment name	Model	Unit	Quantity	Remarks (reference size)
1	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-300/100var-AKW/P6	Set	1	5600*2000*3500mm
2	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-400/134var-AKW/P6	Set	1	5600*2000*3500mm
3	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-450/150var-AKW/P6	Set	1	5600*2000*3500mm
4	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-500/167var-AKW/P6	Set	1	5600*2000*3500mm
5	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-600/200var-AKW/P6	Set	1	5600*2000*3500mm
6	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-700/234var-AKW/P6	Set	1	5600*2000*3500mm
7	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-750/250var-AKW/P6	Set	1	5600*2000*3500mm
8	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-800/267var-AKW/P6	Set	1	5600*2000*3500mm
9	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-900/300var-AKW/P6	Set	1	5600*2000*3500mm
10	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-1000/334var-AKW/P6	Set	1	5600*2000*3500mm
11	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-1200/400var-AKW/P6	Set	1	5600*2000*3500mm
12	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-1400/234var-AKW/P6	Set	1	5600*2000*3500mm
13	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-1500/250var-AKW/P6	Set	1	5600*2000*3500mm
14	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-1600/267var-AKW/P6	Set	1	5600*2000*3500mm
15	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-1800/300var-AKW/P6	Set	1	5600*2000*3500mm
16	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-2000/334var-AKW/P6	Set	1	5600*2000*3500mm
17	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-2100/350var-AKW/P6	Set	1	5600*2000*3500mm
18	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-2400/400var-AKW/P6	Set	1	5600*2000*3500mm
19	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-2500/417var-AKW/P6	Set	1	5600*2000*3500mm
20	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-2700/450var-AKW/P6	Set	1	5600*2000*3500mm
21	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-3000/500var-AKW/P6	Set	1	5600*2000*3500mm
22	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-3200/267var-AKW/P6	Set	1	6000*2000*4000mm
23	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-3600/300var-AKW/P6	Set	1	6000*2000*4000mm
24	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-4000/334var-AKW/P6	Set	1	6000*2000*4000mm
25	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-4200/350var-AKW/P6	Set	1	6000*2000*4000mm
26	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-4500/375var-AKW/P6	Set	1	6000*2000*4000mm
27	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-4800/400var-AKW/P6	Set	1	6000*2000*4000mm
28	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-5000/334var-AKW/P6	Set	1	6000*2000*4000mm
29	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-6000/334var-AKW/P6	Set	1	8800*2000*4500mm
30	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-6000/334var-BLW/P6	Set	1	8800*2000*4500mm
31	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-7200/300var-BLW/P6	Set	1	8800*2000*4500mm
32	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-8000/334var-BLW/P6	Set	1	8800*2000*4500mm
33	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-8400/400var-BLW/P6	Set	1	8800*2000*4500mm
34	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-9000/375var-BLW/P6	Set	1	8800*2000*4500mm
35	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-9600/400var-BLW/P6	Set	1	8800*2000*4500mm
36	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-10000/334var-BLW/P6	Set	1	8800*2000*4500mm
37	High voltage step voltage regulating reactive power compensation complete set device	ZRTBKV-10-12000/400var-BLW/P6	Set	1	8800*2000*4500mm

10.1 Users can order according to the model, capacity, specification and quantity provided by our company, and also can provide parameters and requirements to be designed and determined by our company.
10.2 If the user only orders the regulation part and does not attach the capacitor, the user must provide the installation drawing of the original capacitor bank in the substation. Our company will help the user to provide the installation mode according to the installation condition of the original capacitor.
10.3 Order quantity, delivery time, delivery method, transportation mode, etc.
10.4 Other technical requirements.

ZRTSC

High voltage dynamic reactive power compensation complete set device

General

The high voltage ZRTSC SVC dynamic reactive power compensation device adopts a full digital intelligent control system and uses high power thyristors in series to form a high voltage AC contactless switch, which can realize fast zero-crossing switching of multi-stage capacitor banks. The response time of the high voltage ZRTSC dynamic reactive power compensation device is less than 20ms. It can real-time monitor and dynamically compensate the impulse load and time-varying load, achieving the purpose of power factor compensation to more than 0.95; at the same time, the product absorbs foreign advanced technology, overcomes the shortcomings of the existing compensation methods, such as complex voltage regulation, easy impact of control switch, short service life and so on, and has the dual functions of dynamic compensation reactive power compensation and stabilizing system voltage, with the technical level is in the lead in China. Besides, the product has the remarkable characteristics of reducing network loss, saving electric energy and improving the quality of power supply, which can bring huge economic and social benefits to users.

Working principle

The high voltage ZRTSC dynamic reactive power compensation device is composed of optical fiber trigger control system, valve control system, reactor, capacitor, protection element and so on. The control system is real-time monitored and intelligently adjusted by a microcomputer. The capacitor bank is switched by the thyristor. When the reactive current detected by the controller exceeds the set value, it automatically judges the number of stages of the capacitor bank that needs to be put into operation. The controller outputs the trigger signal to the specified thyristor and makes it turn on and put the capacitor bank into operation.

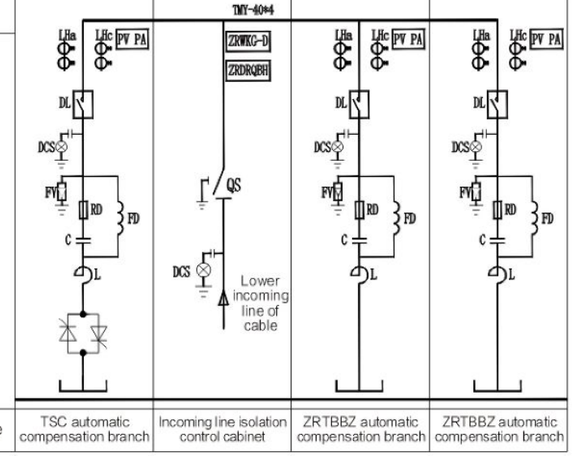
When the reactive current value of the load is lower than the set value, the controller gives the control signal, and the trigger stops sending the trigger signal and withdraws the capacitor bank from working. The above working is carried out completely automatically to ensure that there is no impact, no inrush current and no transition process in switching capacitors.

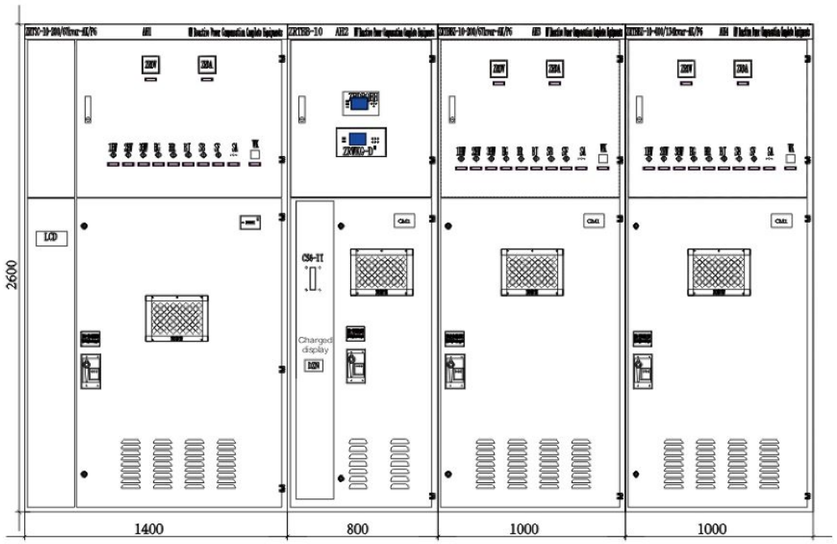
Technical features

3.1 Real-time tracking of load changes, dynamic compensation of reactive power, and improve-ment of system power factor;
3.2 The optical fiber trigger technology is adopted to realize the isolation of the primary system and the secondary system, solving the interference problem, and ensuring the synchronization and accuracy of the trigger pulse;
3.3 Imported thyristors are used to control the switching of capacitor banks to realize zero-crossing switching and improve the service life of the device;
3.4 During the switching process of the capacitor bank, there is no surge current, no operating overvoltage, and no arc reignition phenomenon;
3.5 Dynamically restrain system harmonics. In order to improve the voltage distortion factor, the amplification of harmonic current by the capacitor bank is fully considered in the main circuit design to ensure the safe operation and reliable operation of the device.

Technical parameters

4.1 System nominal voltage: 6kV, 10kV
4.2 Rated frequency: 50Hz
4.3 Dynamic response time: ≤20ms
4.4 Input voltage of control power supply: 380V±5%
4.5 Phase number: 3 phases
4.6 Recommended values of capacitor bank module: 300, 600, 750, 900, 1000, 1200, 1500, 1800, 3000kvar
4.7 Capacitor connection mode: Y type
4.8 Recommended reactor reactance rate: 6%, 12%
4.9 Power factor: above 0.9 after compensation
4.10 Cabinet protection grade: IP20

Equipment No.	AH1	AH2	AH3	AH4
Equipment model	ZRTSC-10-200/67kvar-AK/P6	ZRTSB-10	ZRTBBZ-10-200/67kvar-AK/P6	ZRTBBZ-10-400/134kvar-AK/P6
Primary bus		TMY-40*4		
Primary system diagram				
Rated voltage 10kV				
Equipment usage	TSC automatic compensation branch	Incoming line isolation control cabinet	ZRTBBZ automatic compensation branch	ZRTBBZ automatic compensation branch



ZRSVR

Series feeder automatic voltage regulator

General

ZRSVR feeder automatic voltage regulator is a device that ensures the stability of output voltage by tracking the change of line voltage and automatically adjusting the body transformation ratio of the device. It can automatically adjust the input voltage in the range of 30%, and is especially suitable for lines with large voltage fluctuation or large voltage drop. This kind of voltage regulator is connected in series at the middle and back end of 6kV, 10kV and 35kV lines, and the line voltage is adjusted within a certain range to ensure the stability of the user's power supply voltage and reduce the line loss of the line; in addition, the ZRSVR feeder automatic voltage regulator is also suitable for substations where the main transformer does not have the ability of voltage regulation. This kind of voltage regulator is connected in series in the transformer outlet side of the substation to ensure that the voltage on the outlet side is qualified.

At present, the main countermeasures are as follows:

(1) New substation;

(2) Adjust the main transformer tap-changer of the substation to change the system voltage;

(3) Rational distribution of reactive power compensation device in the system to improve the reactive power flow distribution of the power grid;

(4) Change the line parameters according to the purpose of voltage regulation, and select the conductor cross-sectional area according to the tolerant voltage loss;

(5) Increase the number of outbound lines of the substation to disperse the load of the original line.

The disadvantages of the above methods are as follows:

(1) New substation---long construction period, huge investment and slow efficiency;

The adjustment of the main transformer tap-changer of the substation is mainly based on the bus voltage of the substation, limiting the bus voltage within a certain range to meet the requirements of voltage deviation within the radius, but can not meet the voltage requirements at the end of the long-distance power supply line. The substation bus will have multiple outgoing lines, and the load curves of each outlet are different, and the voltage drop is also different, which can not guarantee that the voltages of all lines can meet the requirements. Therefore, the flexibility and pertinence of this voltage regulation method is poor, when facing complex line, the voltage near the substation is high and the voltage far away from the substation is low.

(2) Capacitor compensation is mainly to improve the power factor of the line, but with limited effect of voltage regulation. Capacitor compensation alone can not solve the problem of voltage reduction caused by long line, fine wire diameter and resistance.

(3) Increase wire cross-sections and new lines, etc.---Long investment cycle and slow effect.

Working principle

ZRSVR line automatic voltage regulator consists of three parts: autotransformer, on-load tap-changer and automatic controller.

The whole coil of autotransformer is divided into three parts: series excitation coil, shunt excitation coil and control coil. Among them, the series excitation coil is a winding with multiple taps, which are connected in series between the input and output through different contacts of the on-load tap-changer to change the tap position so as to change the transformation ratio of the autotransformer and achieve the purpose of adjusting the voltage; the shunt excitation coil is the common winding of the autotransformer, which produces a magnetic field that transmits energy; the control coil provides the controller with working power supply and sampling signals.

Technical features

3.1 The autotransformer structure is adopted to realize on load automatic voltage regulation within ± 30%;

3.2 It has excellent control performance and communication function, and realizes the "four remote" functions of telemetry, remote signaling, remote control and remote control;

3.3 Special anti-interference measures are adopted to ensure the normal operation of the controller;

3.4 The controller is equipped with high and low gear limit protection to prevent the tap changer from jamming;

3.5 The oil tank of on load tap changer is isolated from the tank of autotransformer body;

3.6 Small volume, large capacity, light weight, low loss, easy to install;

3.7 It has significant effect of reducing consumption and energy saving;

3.8 High cost performance and high reliability.

Technical parameters

4.1 Operating environment

4.1.1 The altitude is below 2000m;

4.1.2 Ambient temperature: maximum temperature +40℃, minimum temperature: -25℃;

4.1.3 Outdoor wind speed shall not exceed 35m/s;

4.1.4 Pollution level: Grade II;

4.1.5 The horizontal acceleration is not more than 3m/s^2, the vertical acceleration is not more than 1.5m/s^2, and the safety factor is greater than 1.67;

4.2 Autotransformer

4.2.1 Rated voltage: 10kV, 6kV, 35kV;

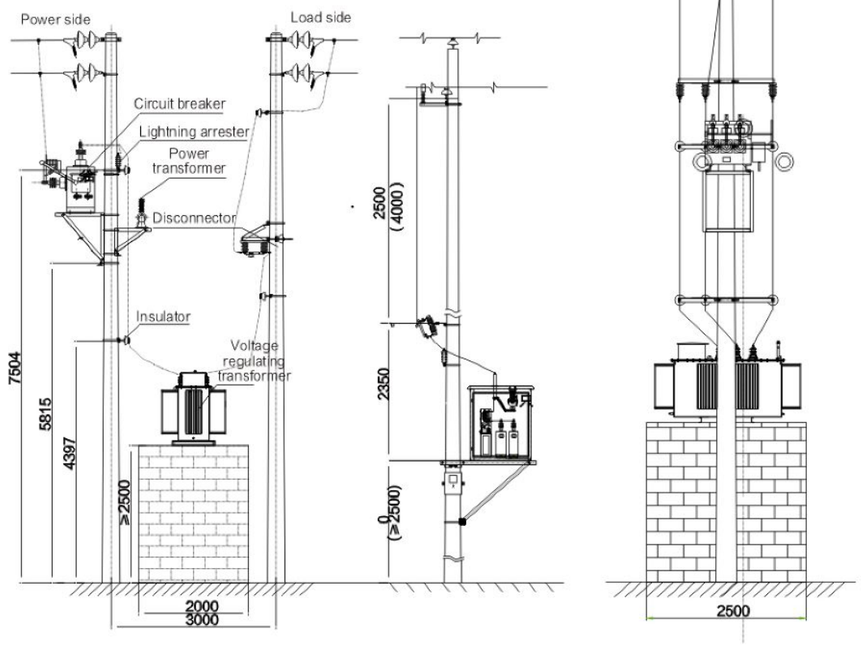
4.2.2 Rated capacity: 500～5000KVA (6kV), 315～12500KVA(10kV), 500～24000KVA(35kV)

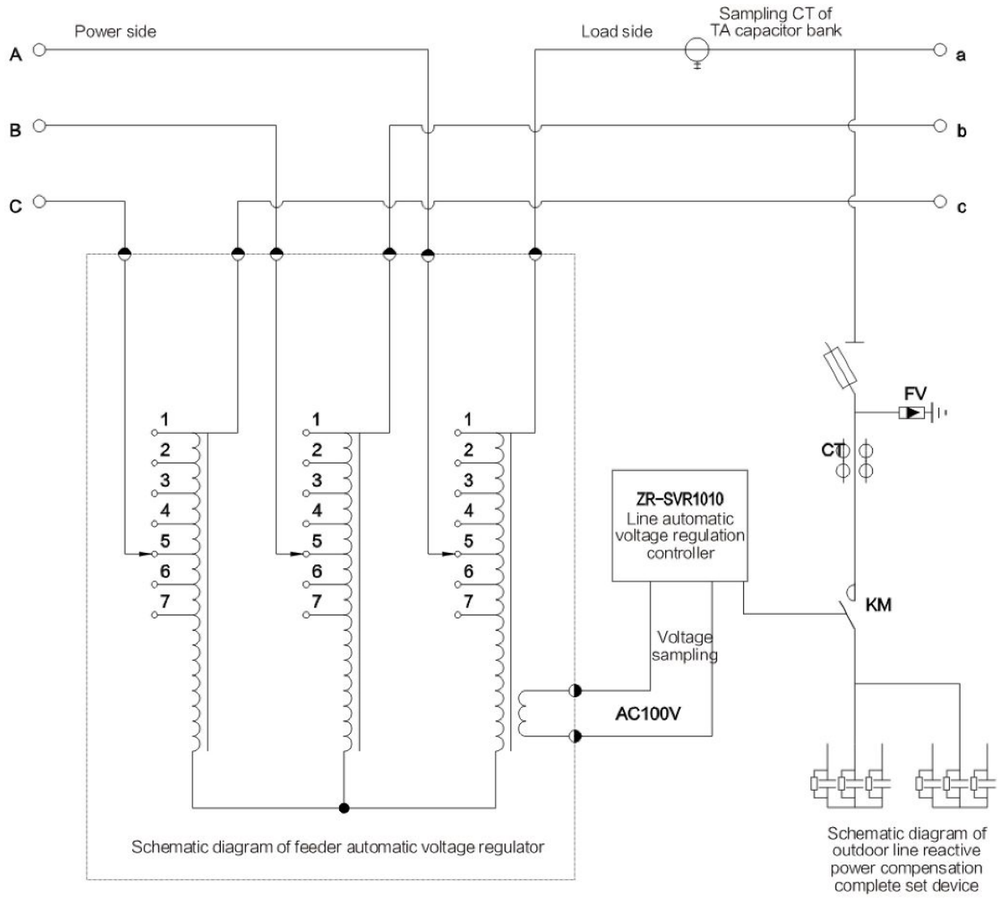
4.2.3 Rated frequency: 50Hz;

4.2.4 Wiring mode: three phase three wire single winding star connection;

4.2.5 Tapping stage: 7 or 9;

4.2.6 Cooling mode: oil immersed self cooling.



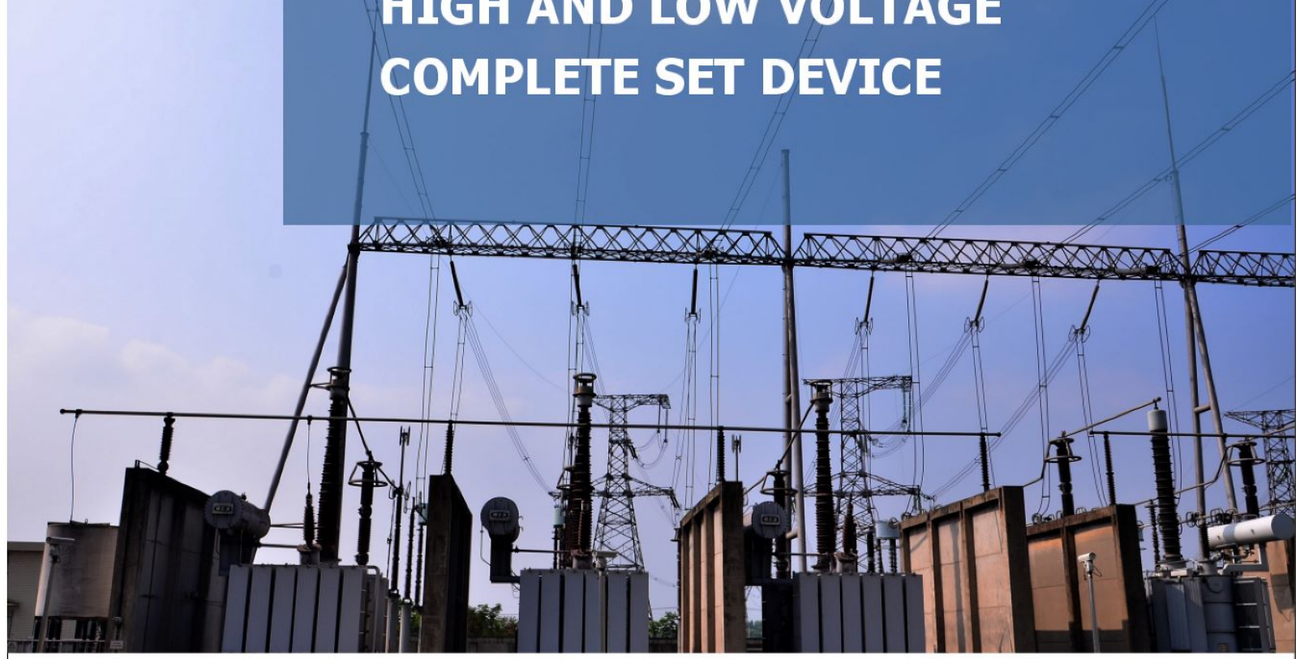


Schematic diagram of feeder automatic voltage regulator

Schematic diagram of outdoor line reactive power compensation complete set device

CN Aiso

HIGH AND LOW VOLTAGE COMPLETE SET DEVICE



YUEQING AISO ELECTRIC CO.,LTD.
www.aisoelectric.com

HXGN26-12(F)

Package type ac metal enclosed loop switchgear

General

1.1 Electric ratings: rated voltage 12kV, 50Hz, rated current up to 630A.
1.2 Application: applicable in the power distribution systems, especially suitable for application in prefabricated substation to control and protect the electric system.
1.3 Standards: IEC60298

Model and meaning

H X G N 26 - F

- F — Combination electric equipments of load switch and fuse
- 26 — Rated voltage
- N — Design No.
- G — Indoor
- X — Fixed type
- H — Packaged type

Working conditions

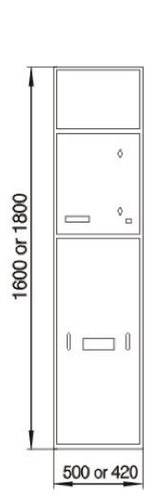
3.1 Ambient temperature: −15℃~+40℃;
3.2 Altitude: ≤1000m;
3.3 Humidity: daily average ≤95%, daily average of vapour pressure≤2.2kPa;
Monthly average≤90%, monthly average of vapour pressure ≤1.8kPa;
3.4 Earthquake intensity: ≤8;
3.5 Applicable in the places without corrosive and flammable gas.
Note: Customized products are available on your requirements.

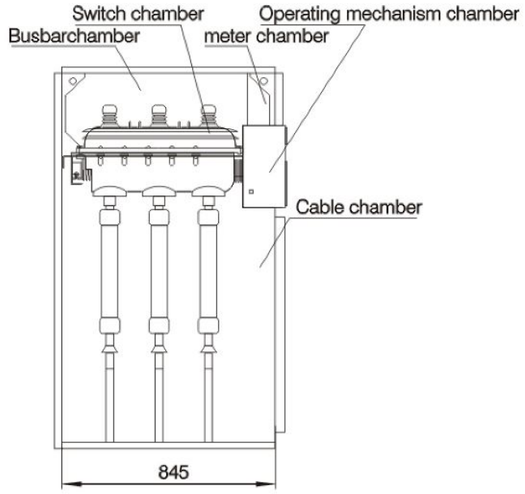
Features

4.1 SF6 load switch with insulated enclosure FLN36−12D and FLRN36−12D could be matched in the switchgear.
4.2 Compact design and easy operation.
4.3 There is a pressure reliefing duct at the rear of the switchgear to protect the operator when a failure occurs in the switchgear.
4.4 Allocation of the switchgear is changeable.
4.5 Reliable interlocking at the different making status of the loading switch, earthing switch, to ensure the reliable operation.

Overall dimensions

Switchgear overall dimensions





GCS

Low voltage drawer switchgear

◆ General

LV drawer switchgear is suitable for distribution system of power plant, high building and some lines, such as petroleum chemistry and industry, metallurgy, textile, etc. It is applicable for distri-bution, motor centralized control, reactive power compensation in power generation and power supply system of three phase AC 50/60Hz, rated voltage 380V(400V,600V), rated current 4000A and below, where require high automation and interfaces with computers.

◆ Model and meaning

G C S - □ □

- Auxiliary circuit scheme No.
- Main circuit scheme No.
- Senyuan electrical system
- Drawable
- Enclosed switch

◆ Working conditions

3.1 Ambient temperature: −5℃~+40℃, daily average ≤+35℃;
It should reduce capacity according to real condition when out of stipulation;
3.2 Indoor, Altitude ≤2000m;
3.3 The change of ambient relative temperature will cause a little moist by accident;
3.4 The slant between device installation position and vertical section≤5%;
3.5 Occasions without flammable and explosive matter, without corrosive chemical and frequent severe vibration.

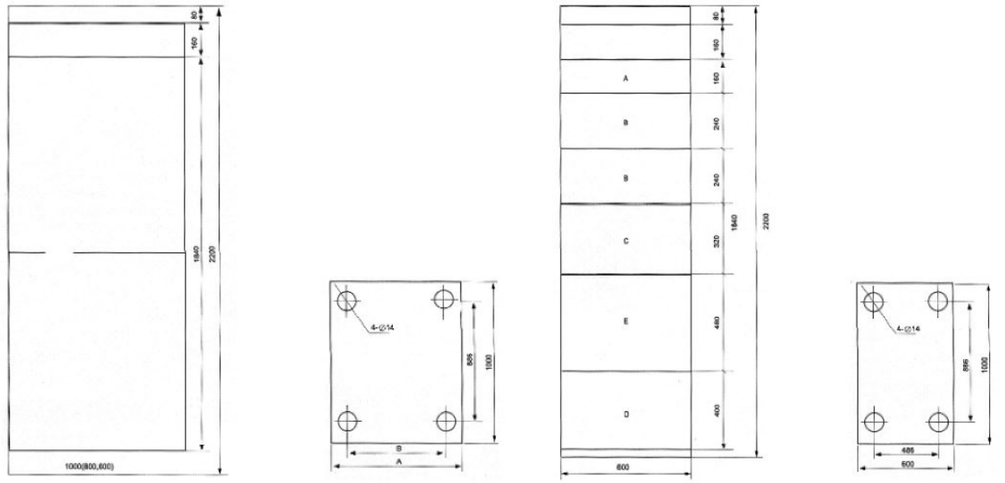
◆ Structure feature

4.1 Main frame adopts 8MF open type steel which bended by 2.5mm cold rolled steel sheet. There are modulus with 20mm, 100mm, 9.2mm installation hole located on three side, high strength for modelling installation conveniently.
4.2 The drawer divided into 1/2 unit, 1 unit, 3 unit, loop rated current is 400A and blow.
4.3 Flexible assembly, compact structure, strong versatility, perfect secure performance, convenient assembly.
4.4 Improve heat capacity of patchboard, reduce additional temperature rise of plug in, cable terminal, isolating board due to temperature rise of transition element.
4.5 It can not influence other unit when any unit appears to fault between function unit and isolating unit, limit the emergency in a small scope.
4.6 Busbar horizontal is good for dynamic and heat stable performance.
4.7 The max 22 loops for MCC single panel, take consideration of requirement of auto motor door group about large unit capacity power plant, petroleum chemistry system line.
4.8 It finishes connection of device and outer cable in cable compartment, upper and down inlet and outlet is available. The zero sequence current transformer is installed in the cable isolating compartment.
4.9 It can limit short circuit current depend on limited reactor in the same power distribution system, to stabilize busbar voltage, reduce short circuit intensity requirement.

◆ Technical parameters

Main circuit rated voltage (V)		AC 380(400),(600)
Auxiliary circuit rated voltage(V)		AC 220, 380,(400) DC 110, 220
Rated frequency (Hz)		50(60)
Rated insulation voltage (V)		660(1000)
Rated current (A)	Horizontal busbar	≤4000
	Vertical busbar (mcc)	1000
Busbar rated short time withstand current (kA/1s)		50, 80
Busbar rated peak withstand current (kA/0.1s)		105, 176
P.F test voltage (V/min)	Main circuit	2500
	Auxiliary circuit	2500
Busbar	Three phase four wire	A.B.C.PEN
	Three phase five wire	A.B.C.PEN
Protection degree		IP40

◆ Overall dimensions



General panel	A	B	C	D	E	F×G
GCS−TG 1010−2	1000	1000	850	956	60	400×400
GCS−TG 0810−2	800	1000	650	956	160	400×400
GCS−TG 1008−2	1000	800	850	756	60	400×400
GCS−TG 0808−2	800	800	650	756	160	400×400

MNS

Withdrawable type low voltage drawer switchgear

General

1.1 Electric ratings: rated voltage 690/1000V, rated current up to 5000A
1.2 Application:applicable in the low-voltage system of factories, etc, power distribution and motor control systems
1.3 Protection degree: IP30, IP40, IP54
1.4 Standards: IEC 60439

Working conditions

2.1 Ambient temperature: -5℃~+40℃;
2.2 Altitude:≤2000m;
2.3 Relative humidity:≤50%, when the temperature is +40℃. Higher relative humidity for lower temperature e.g. 90% at +20℃;
2.4 Applicable in the places without danger of fire and explosion, chemical pollution, corrosive and flammable gas;
2.5 Pollution grade: 3;
2.6 Indoor installtion.

Structure feature

3.1 Frame
a. C type material adopted for the main frame. There are mounting holes with E=25mm on the main frame.
b. The switchgear is made of 2mm cold-rolled steel plate or zinc-coated plate.
3.2 Enclosure
The following functional plates could be installed for protection, as per your requirements
a.Front side: transparent glass door, normal plate, drawer plate and ventilation door
b.Rear side: the rear door, the screw fixed sealing plate
c.Lateral side: screw fixed lateral plate
d.Top: top plate with ventilation holes, outgoing rings or flange plate for top outgoing
e.Bottom: bottom plate
f.Inter-switchgears: complete clapboard adopted for the separation

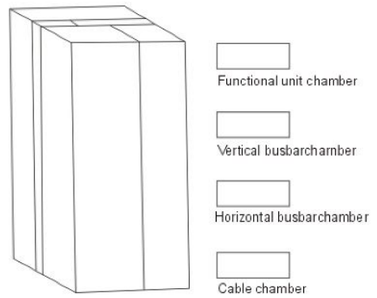
Main technical parameters

4.1 Electric data
a. Rated insulation voltage 690/1000V
b. Rated operational voltage 400V/690V
c. Rated frequency: 50/60Hz
d. Rated impulse withstands voltage: 8kV
e. Rated voltage of auxiliary circuit: AC380/220V, DC110/220V
f. Over-voltage grade: Ⅲ
g. Rated current: ≤5000A
h. Rated current of horizontal busbar: ≤5000A
i. Rated current of vertical busbar:1000A
4.2 Mechanical items
a. Incoming and outgoing mode
b. Cable incoming and outgoing
c. Connection mode
d. The functional units completely separated or partially separated
4.3 Switchgear dimensions
a. Height (mm): 2200
b. Width (mm): 600, 800, 1000
c. Depth (mm): 600, 800, 1000
d. Surface processing
e. Surface color: 5Y8/1
4.4 Horizontal busbar
a. Rated short-time withstand current: 50/80/100kA
b. Rated peak withstand current: 105/176/220kA
4.5 Vertical busbar
a. Rated short-time withstand current:50kA
b. Rated peak withstand current:105kA
4.6 Earthing system: TT, IT, TN-S, TN-C-S

Note:
1. For the switchgear of IP54, the min depth is 728mm
2. For easier bus bar installation depths of the switchgears should be unified. If the depths are not unified, a busbar exchange switchgear with depth of 400mm should be added.
3 .The depth of the switchgear should be ≥800mm, if there is incoming and outgoing of busbar bridge and channel .
4. Customized products are available.

The internal allocation

There are four independent chambers inside the switchgear
4.1 Horizontal busbar chamber: the horizontal busbar is at the rear side of the switchgear for front side outgoing. The horizontal busbar could also be installed at the top.
4.2 Vertical busbar chamber :
L type busbar adopted for the vertical bus bar.
When the drawer units is drawed out, the protection degree of the electrified part is IP20.
4.3 Functional unit chamber:
In front of the upper cabinet or cabinet front left side.
4.4 Cable chamber: the chamber is at the night and the front side for front outgoing, at the right and the rear side for rear outgoing.



HXGN15A-12(F-R)

Fixed type package type AC metal enclosed switchgear

General

1.1 Electric ratings: rated voltage 3-10kV, rated current up to 630A for load break switchgear and 125A for combined switchgear, 50Hz.
1.2 Application: applicable for power distribution, control, and protection on electric equipments as the loop power supply unit or terminal equipment
1.3 Standards: IEC60420

Model and meaning

H X G N 15A 12 (F·R)

- (F·R) — Combined load break switch and fuse
- 12 — Rated voltage
- 15A — Design No.
- N — Indoor
- G — Fixed type
- X — Packaged type
- H — Loop

Working conditions

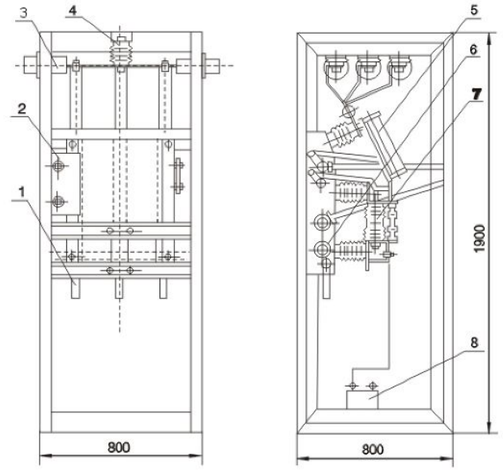
3.1 Ambient temperature: -25℃~+40℃
3.2 Altitude: ≤1000m
3.3 Humidity: daily average ≤95%, monthly average ≤90%
3.4 Earthquake intensity: ≤magnitude 8
3.5 Applicable in the places without corrosive and flammable gas
Note: Customized products are available on your requirements

Features

4.1 8MF material adopted for the switchgear, modular holes available with E=20mm.
4.2 Switch disconnector, vacuum load break switch, earthing switch and the switchgear door reliably interlocked, which could avoid miss operation.
4.3 Both manual and automatic operation are available.
4.4 There is lead sealed pin at the door of measurement chamber and meter chamber.
4.5 Prompt tripping could be realized to protect the equipments.
4.6 The design facilitate the operation at the front panel and the switchgear could be installed along side the wall.
4.7 The switchgear is featured for its complete interlocking functions: the load break switch could be operated to the making status when the switchgear door is closed and locked and the earthing switch to the making position. The earthing switch could make or break when the load break switch is at disconnect position. When the earthing switch is at making status, input the insulation clapboard to its position, the switchgear door then, could be opened. The vacuum arc-extinguishing chamber and fuse are reliably connected. So as the fuse & switchgear door and insulation clapboard & the switchgear door.

Main technical parameters

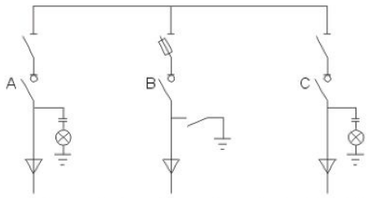
No.	Items		Unit	Data
1	Rated voltage		kV	12
2	Rated current	Load break switchgear	A	630
		Combined switchgear	A	125
3	Rated short-circuit breaking current		kA	31.5
4	Rated active on-load breaking current		A	630
5	Rated short-time withstands current		kA	20
6	Rated withstands current (peak)		kA	50
7	Rated industrial frequency voltage withstands inter-phase, to the earth and to the breaking point		kV	42/48
8	Thundering withstands voltage inter-phase, to the earth and to the breaking point		kV	75/85
9	Mechanical life		Time	10000
10	Rated take-over current		A	3150
11	Operating mode			Manual or automatic
12	Protection degree			IP2X



1. Earthing switch
2. Operating mechanism
3.Bushing
4.Insulator
5.Fuse
6.Spring operating mechanism
7.Load break switch
8.CT

The diagram for loop power supply

The loop power supply is composed of three basic units to separate any one of the failure line and ensure the continuous power supply through the other unit. The branch line for the user could separated and protect the transformer which could facilitate the maintenance. The loop power supply could be expanded as per the user's requirements to form various protection plans.



Cable income and outlet switchgear Switchgear at the user's transformer branch circuit Cable income and outlet switchgear

KYN28A-12(Z)(original GZS1)

Withdrawable type metalclad AC enclosed switchgear

General

1.1 Electric ratings: rated voltage 3.6~12kV, 50Hz
1.2 Application: applicable in the system of three phase AC single busbar, double busbar and single busbar stand-by pass to receive and distribute the power.
1.3 Standards: IEC60298

Model and meaning

K Y N 28A 12 (Z)

- (Z) — Vacuum circuit breaker
- 12 — Rated voltage (kV)
- 28A — Design No.
- N — Indoor type
- Y — Removable withdrawable type
- K — Metalclad type

Working conditions

3.1 Ambient temperature: −10℃~+40℃;
3.2 Altitude: ≤1000m;
3.3 Humidity: Daily average ≤95%, Monthly average ≤90%;
3.4 Earthquake intensity: ≤magnitude 8;
3.5 Applicable in the places without corrosive and flammable gas.
Note: Customized products are available on your requirements.

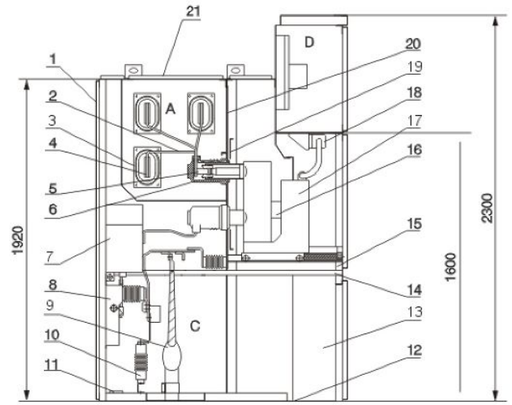
Features

4.1 The switchgear is composed of panel body and middle-mounted removable part.
4.2 The panel body is divided into four separate compartments.
4.3 The switchgear has aerial inlet and outlet, cable inlet and outlet, and combination schemes.
4.4 The panel body connected with nuts and bolts having high strength adopts package assembly so as to facilitate production, short production period, have interchangeability of parts and save occupied area.

Main technical parameters

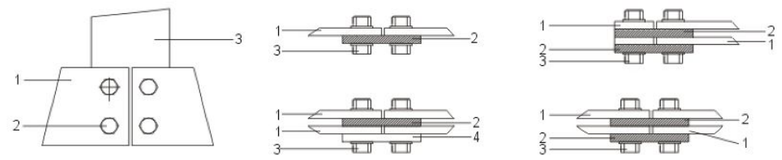
No.	Items	Unit	Data								
			Matched VCB/Contactor ZN63A-12(VS1)								VD4 12
1	Rated voltage	kV	12								42
2	1min power frequency voltage withstands	kV	42								75
3	Impulse lightening withstands voltage (peak)	kV	75								50
4	Rated frequency	Hz	50								
5	Rated current	A	630	1250	1600	2000	2500	3150	4000	5000	
6	Distribute busbar rated current	A	630	1250	1600	2000	2500	3150	4000	5000	16 20 25 31.5 40 50
7	Rated withstands current (peak)	kA	16 20 25 31.5 40 50								40 50 63 80 100 125
8	Rated peak withstands current (value)	kA	40 50 63 80 100 125								
9	Rated short-circuit continuous time	s	4								
10	Protection degree		The enclosure IP4X.When the chamber door and trolly door opened. The protection degree is IP2X								700~1200
11	Weight	kg	700~1200								

Structure diagram



A. Busbar compartment B. Circuit breaker compartment
C. Cable compartment 1. Enclosure 2.Small branch busbar
3.Busbar bushing 4.Main busbar 5. Static contactor assembly
6.Contactor box 7.CT 8.Earthing switch 9.Cable
10.Surge arrestor 11.Earthing main busbar 12.Base board
13.Control small busbar 14.Earthing switch operation
15.Withdraw level board 16.Heating derive
17.Cricuit break handcart 18. Board(valve)
19.Disassemble board 20.Pressure release channel

The connecting method of the busbar and branch busbar



1. Main busbar
2. Branch busbar
3. Bolt
4. Pad

Draw-out circuit breaker room

In the separate room of the circuit breaker, open the metal valve to check the static contact.

Branch main busbar is connected with static contact box 6 and main busbar and not need any other support. For special requirements, the main busbar can equipped with pyrocondensation bushing, insulation bushing of connect bolts and top cover, main busbar in side cabinet will be fixed with bushing 3, thus ,when inner trouble arc appears, air preserved in it can protect it from melt. Furthermore, bushing 3 can effectively limit the trouble within the cabinet.

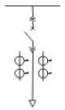
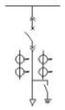
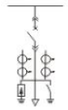
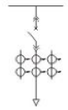
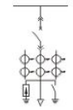
Cable separate room

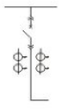
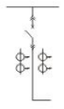
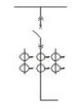
The space of switchgear separate room is enlarged thank to its withdrawable model CT7 and earthing switch are installed on back wall of the zone, while arrester 10 is installed on the bottom of rear side. Move the handcart15 and withdrawable horizontal baffle plate 17 away, then operators can enter form bottom for erecting and maintain. Each phase of the cable connection conductor can connect with 1-3 single core cables at the same time, and if necessary, can even connect with 6 single core cables. The disassemble non-metatenvelop plate or unmagnetoconductive metal plat equipped on bottom of the cabinet ensure the convenience of the construction.

Relay instrument room

The relay instrument room can be used for erection of relay protection components, instruments, indicators and secondary equipments fulfilled with special requirements. The control circuitry is laid in slots with enough space, and covered with metal cover board, to separate the secondary wires from high voltage parts. The left slot is pre-set for inlet and outlet of the controlling cable, while the inner control cable of itself is laid on the right side. Besides, a hole exits on the cover board of this room, for the inlet and outlet of small bus cables, and in cable connection, the cover board of the room can overturn. All these make the construction more convenient.

◆ Connection scheme

Scheme number		001	002	003	004	005	006
Primary connection scheme							
Switchgear dimensions(Width x Depth x Height)		800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370
Rated current		630-3150	630-3150	630-3150	630-3150	630-3150	630-3150
Primary Main Equipment Units	Vacuum circuit breaker (VS1 or VD4)	1	1	1	1	1	1
	Current transformer LZZBJ9-12/150b/2 ,LZZBJ9-12/150b/4	2	2	2	3	3	3
	Voltage transformer						
	High voltage fuse RN2-10						
	Earthing switch JN15		1	1		1	1
	Arrester HY5WS-17/50			3			3
Loop name		PD. feedback electricity	Feedback electricity	Feedback electricity	PD. feedback electricity	Feedback electricity	Feedback electricity
Note		If rated current ⩾ 1600A, the width is 1000mm					

Scheme number		007	008	009	010	011	012
Primary connection scheme							
Switchgear dimensions(Width x Depth x Height)		800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370
Rated current		630-3150	630-3150	630-3150	630-3150	630-3150	630-3150
Primary Main Equipment Units	Vacuum circuit breaker (VS1 or VD4)	1	1	1	1	1	1
	Current transformer LZZBJ9-12/150b/2 ,LZZBJ9-12/150b/4	2	2	2	2	3	3
	Voltage transformer						
	High voltage fuse RN2-10						
	Earthing switch JN15						
	Arrester HY5WS-17/50						
Loop name		Connection(Right)	Connection(Right)	Connection(Left)	Connection(Left)	Connection(Right)	Connection(Right)
Note		If rated current ⩾ 1600A, the width is 1000mm					

Scheme number		013	014	015	016	017	018
Primary connection scheme							
Switchgear dimensions(Width x Depth x Height)		800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370	800/1000 × 1500 × 2370
Rated current		630-3150	630-3150	630-3150	630-3150	630-3150	630-3150
Primary Main Equipment Units	Vacuum circuit breaker (VS1 or VD4)	1	1	1	1	1	1
	Current transformer LZZBJ9-12/150b/2 ,LZZBJ9-12/150b/4	3	3	2	2	2	2
	Voltage transformer						
	High voltage fuse RN2-10						
	Earthing switch JN15						
	Arrester HY5WS-17/50						
Loop name		Connection(Left)	Connection(Left)	Overhead coil in(Left connection)	Overhead coil in(Left connection)	Overhead coil in(Right connection)	Overhead coil in(Right connection)
Note		If rated current ⩾ 1600A, the width is 1000mm					

KYN61-40.5(Z)

Withdrawable type metalclad AC enclosed switchgear

General

1.1 Electric ratings: system voltage 40.5kV, rated current up to 2000A, AC50Hz.
1.2 Application: applicable for power receiving and distribution of power plant and substations for control, protection and measurement.
1.3 Standards: IEC 60298

Model and meaning

K Y N 61 40.5 □/□-□□ □ □

- Environmental features
- Operating mode
- Plan code
- Rated short-circuit Breaking current (kA)
- Rated current (A)
- Type of CB
- Rated voltage (kV)
- Design No.
- Indoor
- Withdrawable type
- Metalclad enclosed
- Switchgear

Working conditions

3.1 Ambient temperature: -15℃~+40℃;
3.2 Altitude: ≤1000m;
3.3 Humidity: daily average ≤95%, monthly average ≤90%;
3.4 Earthquake intensity: ≤magnitude 8;
3.5 Applicable in the places without corrosive and flammable gas.
Note: Customized products are available on your requirements.

Main technical parameters

4.1 Switchgear parameters

Items		Unit	Data
Rated voltage		kA	40.5
Rated current	Rated current of main busbar	A	1250, 1600, 2000
	Rated current of matched VCB	A	1250, 1600, 2000
	1min power frequency withstands voltage	kV	95
	Thundering withstands voltage	kV	185
	Power frequency withstands voltage of auxiliary circuit control circuit	V/1min	2000
Rated frequency		Hz	50
Rated short-circuit breaking current		kA	20, 25, 31.5
Rated short-time withstands current/Rated short-circuit continuous time		kA/4s	20, 25, 31.5
Rated withstands current (peak)		kA	50, 63, 80※
Rated short-circuit making current		kA	50, 63, 80※
Rated voltage of control circuit		V	DC: 110 220; AC: 110 220
Protection degree	Switchgear enclosure		IP3X
	Inter-chambers (door opened)		IP2X

4.2 VCB parameters

Items		Unit	Date
Rated voltage		kV	40.5
Rated current		A	1250, 1600, 6000
Rated frequency		Hz	50
Rated short- time breaking current		kA	20, 25, 31.5
Rated short-circuit making current		kA	50, 63, 80
Rated peak withstands current		kA	50, 63, 80
Rated short-time withstands current/Rated short-circuit continuous time		kA/4S	20, 25, 31.5
Rated insulation level	1min power frequency withstands voltage (rms)	kV	95
	Thundering withstands voltage (rms)	kV	185
	Power frequency withstands voltage of auxiliary circuit and control circuit	V/1min	2000
Mechanical life		Time	10000
Marking time	Electro-magnetic mechanism	s	≤0.2
	Spring mechanism	s	≤0.15
Breaking time		s	≤0.07
Rated operation sequence			Open-0.3s-close open-180s-close

Structure

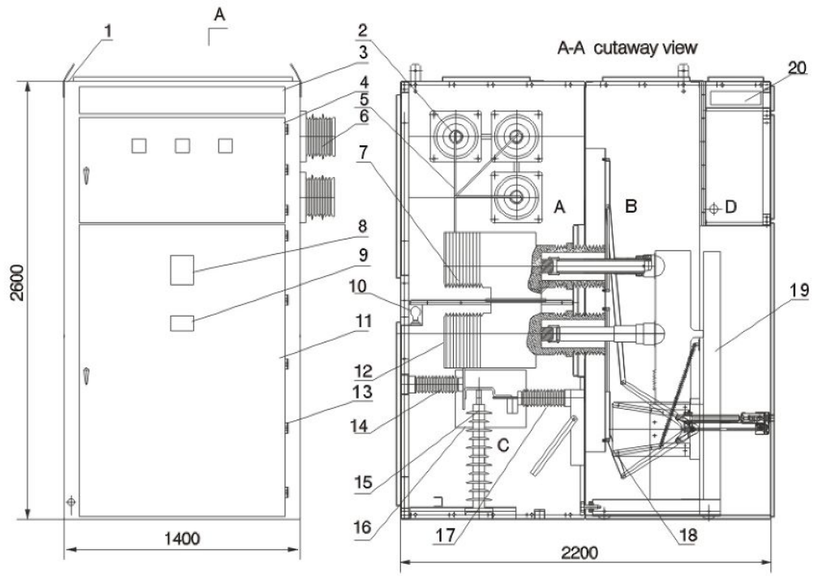


Fig 1 Switchgear structure

A.Busbarchamber B.Trolly C.Cable chamber D.Relay meters chamber
1.Ring 2.Main busbar 3.Small room covered central bus 4.Meters chambar door 5.Branched busbar 6.Busbarbushing
7.Contact box 8.Simulated busbarcoil 9.Nameplate 10.Lamp 11.Trolly door 12.CT 13.Gemel 14.Insulator
15.Surge arrester 16.Insulation clapboard 17.Earthing switch 18.Door installation 19.Trolly of VCB
20.Terminal chamber of mini busbar

YB□-12

European type substation

Composition

The covering material are: colored steel plate, cold rolled plate, stainless steel, glass-fabric special cement, aluminum alloy and copper aluminum zinc plate. The insulating medium of medium voltage switch device:SF6, atmosphere and vacuum. Transformer: oil and dry mode. Low voltage power device-main switch: universal breaker, intelligent breaker and outgoing switch. No flashover plastic switch, automatic reactive capacity, capacity with no touched point and connector can be throw in and throw out.

Model and meaning

YB □-12 0.4 □

- Transformer rated capacity (kVA)
- Low voltage side rated voltage (kV)
- High voltage side rated voltage (kV)
- Arrangement
- Pre-fabricated substation

Working conditions

3.1 Ambient temperature: −25℃~+40℃;
3.2 Altitude: ≤1000m;
3.3 Wind pressure: ≤700Pa;
3.4 Humidity: daily average ≤95%, monthly average ≤90%;
3.5 Pollution degree: Ⅳ;
3.6 Earthquake intensity:8 degree;
3.7 Occasions without fiercely shake and corrosiveness, as well as without flaming and explosive matter, the verticality is no more than 3 degree.

Product feature

4.1 There are automatic temperature controlling device, exhaust blower, heating and dew against device in the substation.
4.2 Characteristic: Fastness, heat insulation, ventilation, good performance, guards against the micro-organsm, moisture proof, nice looking ,convenient maintenance, occupies little ground and so on.
4.3 At the high voltage side, use breaking switch and current limited fuse as the protector for the transformer. When the current limited fuse was fused, the three-phase load breaking switch will cut off. The high voltage side also can adopt the vacuum breaker as the protector.
4.4 At the bottom of the transformer, the pony truck can be installed, which can pass in and out freely for the inspection.
4.5 The wiring and arrangement are various; In terms of different environment and condition. It can adopt different structures and covering material.

Technical specification

No.	Item	Unit	High voltage unit	Transformer	Low voltage unit
1	Rated voltage	kV	12	12/0.4	0.4
2	Rated capacity	kVA		30-1600	
3	Rated current	A	630		100-2500
4	Rated cutting current	kA	50		105-63
5	Rated short time withstand current	kA	20/3		
6	Rated peak value withstand current	kA(peak)	50		30/1
7	Rated closing current	kA	50		63
8	Power frequency withstand voltage	kV/min	Phase-earth and phase-phase: 42/1 Across open contacts: 48/1 10kV Cable AC withstand voltage phase-earth: 25/15	35/1	2.5/1
9	Lightning impulse withstand voltage	kV (peak)	Phase-earth and phase-phase: 75 Across open contacts: 85	75	
10	Protection degree		IP33		
11	Noise level	dB		≤55	

It adopt the S9(11)-M fully sealing transformer and SC9 solid-cast transformer, the capacity is: 30, 50, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600kV/A

Anti-corrosion wooden covering

Nonmetal covering

Aluminum alloy covering

Colored steel plate covering

YB□-12

American type substation

Composition

The YB□ prefabricated substation is an important unit of the power supply network. It has the feature of controlling, protecting, power transforming and power distributing for high voltage. The high voltage load break switch and fuse are put into the transformer oil. So it has two kind structures that are: single and sharing substation with transformer. There are the oil thermo-meter, pressure gauge, pressure release valve, oil drain valve monitors in the fully sealing oil box. The way of power supply is ring main unit mode, terminal mode and bi-power mode. For the fact of the domestic power supply network, our company produces the insert type dry fuse, if the fuse fused, it won't affect to the transformer oil. There are three kind of YB□ substation: stand-ard model, strengthen model, integrated model.

Model and meaning

YB □-□ 0.4-□

- Rated capacity of transformer (kVA)
- Rated voltage of low voltage (kV)
- Rated voltage of high voltage side (kV)
- Design No.
- Prefabricated substation

Working conditions

3.1 Ambient temperature: -10℃~+40℃
3.2 Altitude: ≤1000m;
3.3 Wind speed: 34m/s(Wind pressure: ≤700Pa);
3.4 Humidity: Daily average ≤95%, monthly average ≤90%;
3.5 Shake-proof: Level acceleration ≤0.4m/s, and the vertical acceldration ≤0.15m/s;
3.6 Gradient of installation place: ≤3 degree;
3.7 Occasions without fiercely shake and corrosiveness, as well as without flaming and explosive matter.
3.8 If you have other requirement not on the list, warmly welcome to contact us.

Product feature

4.1 Compact structure, the volume is the same as 1/3~1/5 of European substation;
4.2 Full sealing and fully insulated, needn't insulated gap;
4.3 The wiring management can be used in the ring main unit and terminal;
4.4 Low wastage, noise and temperature rise;
4.5 It has the strong capability of anti over load, short circuit and impulse;
4.6 Conforms to the various requirements of low voltage outgoing;
4.7 There are two kinds of cable, 200A elbow plug and 600A "T" the stationary electric cable, which can match to the fully sealing device;
4.8 Zinc oxides arresters, 200A electric with load insert which can be used as disconnecting switch.

Technical specification

5.1 Performance parameter of load break switch

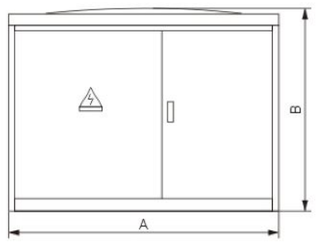
Rated current (A)	Rated voltage (kV)	Impulse withstand voltage (kV)	Power frequency withstand voltage (1 min.kV)	Rated short time withstand voltage (kA/s)	Short-circuit closing current (kA)	Rated peak withstand voltage (kV)	Load operation times	Mechanical operation times
315	12	75	42	12.5/2	31.5	31.5	100	2000
630	12	75	42	16/4	40	40	100	3000

5.2 12kV prefabricate substation S9, S10, S11 series oil transformer performance level

No.	Rated capacity (kV)	Rated voltage High voltage (kV)	Rated voltage Low voltage (kV)	Voltage adjustment scope (%)	Connecting group No.	No load current (%) S9	No load current (%) S10/S11	Consumption (W) No load S9	Consumption (W) No load S10	Consumption (W) No load S11	Consumption (W) Load S9	Consumption (W) Load S10/S11	Assis-tance voltage	Noise (dB)	Temp-erature rising
1	30					2.2	2.0		130			600			
2	50					2.0	1.8		170			870			
3	63					1.9	1.5		200			1040			
4	80					1.7	1.2		250			1250			
5	100					1.6	1.1		290			1500			
6	125					1.5	1.0	340	270			1800	4		
7	160					1.4	1.0	400	310			2200			Top oil temper-ature 60℃ winding 65°
8	200	6	0.4	±5	Yyn0	1.4	0.8	480	375			2600			
9	250	6.3				1.2	0.8	560	455	400	3050	3000		55	
10	315	10	0.69	(±2×25)	Dyn11	1.1	0.7	670	540	475	3650	3600			
11	400					1.0	0.7	800	650	570	4300	4200			
12	500					1.0	0.6	960	775	680	5100	5000			
13	630					0.9	0.6	1200	920	800	6200	6000			
14	800					0.8	0.6	1400	1120	980	7500	7400	4.5		
15	1000					0.7	0.5	1700	1320	1150	10300	9860			
16	1250					0.6	0.5	1950	1560	1360	12800	12000			
17	1600					0.6	0.5	2400	1880	1640	14500	14000			

Note: a. The high voltage tap scope of transformer is ±2×2.5% b. The low voltage of transformer is 0.69kV

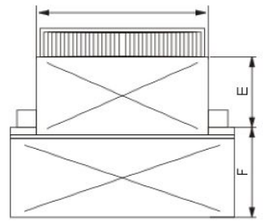
Overall dimension



Standard type/integrated type front view

YB□ Standard type outline dimension

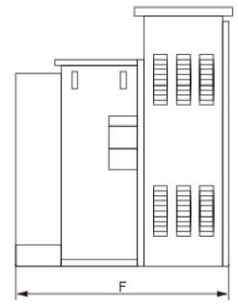
	Capacity (kVA)	A	B	C	D	E	F	G
Standard	100-250	1900	1650	1250	650/800	600	1410/1560	1450
	315	1900	1650	1350	650/800	650	1460/1610	1450
	400-500	1900	1750	1450	650/800	650	1490/1640	1550
	630	1900	1750	1550	650/800	700	1580/1730	1550
	800	1900	1850	1550	650/800	700	1640/1790	1650
	100	1900	1850	1650	650/800	700	1640/1790	1650



Standard type/strength type look down view

YB□ Strength type outline dimension

	Capacity (kVA)	A	B	C	D	E	F	G
Strength	100-250	2400	1650	1250	800	600	1560	1450
	315	2400	1650	1350	800	650	1610	1450
	400-500	2400	1750	1450	800	650	1640	1550
	630	2400	1750	1550	800	700	1730	1550
	800	2400	1850	1550	800	700	1790	1650
	100	2400	1850	1650	800	700	1790	1650



Standard type/strength type side view

YB□ integrated type outline dimension

	Capacity (kVA)	A	B	C	D	E	F	G	M	N
Integrated	100-250	2400	1750	1250	800	650	1750	1560	950	550
	315	2400	1750	1350	800	650	1750	1610	950	550
	400-500	2400	1850	1450	800	650	1750	1640	950	550
	630	2400	1850	1550	800	650	1750	1720	950	550
	800	2400	1950	1550	800	650	1750	1790	950	550
	100	2400	1950	1650	800	700	1750	1840	950	550