NO:2021.01

CHINT ELECTRICS

BZMJ Series
Self-healing Low Voltage Shunt Capacitors

User Instruction

Standard:IEC 60931-1-2014
IEC 60831-2-2014

⚠ Safety Warning

1. Only professional technicians are allowed for installation and maintenance.
2. Installation in any damp, condensed-phase environment with inflammable and explosive gas is forbidden.
3. When the product is being installed or maintained, the power must be switched off.
4. You are prohibited from touching the conductive part when the product is operating.

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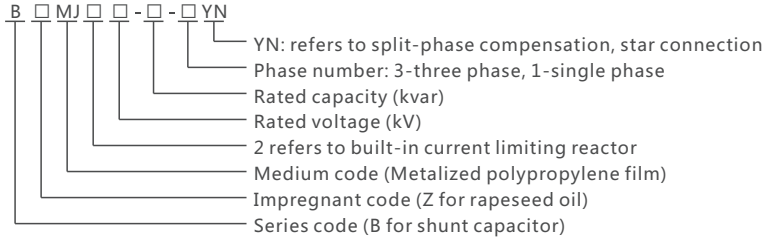
Catalog

1 Use Purpose and Range of Applications

BZMJ series self-healing low voltage shunt capacitors (hereinafter referred to as capacitors) are applicable to power frequency AC power systems with rated voltage up to 1,000V for power factor increase, reactive power loss reduction and voltage quality improvement.

2 Type Key and Definitions



3 Conditions for Normal Use, Installation and Transportation, and Storage

3.1 Environmental conditions: See Table 2 for ambient air temperature, relative temperature and altitude.
3.2 Installation conditions: On condition that the safety precautions are met, the installation site should be free from hazardous gases and vapors, conductive or explosive dusts, and strong mechanical vibration.
3.3 Application conditions
3.3.1 The rated voltage of the capacitor must be higher than the voltage of user's grid. When the environmental conditions exceed the limits in 3.1, user must derate the capacitor by raising its rated voltage, otherwise the service life of the capacitor can be significantly shortened after long-term overvoltage or overtemperature operation.
3.3.2 Harmonic current amplification is the primary cause for capacitor damage. Common harmonic sources include: power electronic equipment, frequency converter (energy saving transformation, such as motor speed regulation, variable frequency air conditioner, etc.), DC rectifier, inverter, electrolytic plating equipment, electric arc furnace and intermediate frequency furnace, etc. See the table below for capacitor selection and harmonic suppression measures under harmonic environment:

Table 1 Capacitor selection and harmonic suppression measures under harmonic environment

Model	Harmonic source power /transformer capacity	Harmonic source power /transformer capacity	Harmonic source power /transformer capacity
	N_{LL}≤10%	N_{LL}≤20%	20%≤N_{LL}≤40%
Voltage total harmonic distortion	THDu≤3%	3%＜THDu≤5%	THDu＞5%
Rated voltage of capacitor	0.4kV, 0.45kV	0.45kV, 0.48kV	0.48kV, 0.525 kV
Harmonic suppression measures	Not needed	Recommend to use series reactor 7%	Series reactor 7% or 14%

Note: If harmonic power ratio N_{LL}＞40%, user must install CKSG series reactor or take harmonic suppression measures.
3.3.3. If detuning low voltage series reactor is installed at the front end of the capacitor, the rated voltage of the capacitor should be selected as below: If the reactance rate of the reactor is 6% or 7%, the rated voltage of the capacitor should be 0.45kV or 0.48kV, if the reactance rate of the reactor is 12% or 14%, the rated voltage of the capacitor should be 0.525kV.

3.3.4 See 6.2 for product installation spacing. We suggest double the installation spacing if the product is installed above an altitude of 2000 meters. User should take effective measures to ensure good ventilation and heat dissipation of the capacitors under high temperature environment and keep the capacitors away from heat source.

3.4 Transportation conditions: The capacitors should be transported within original package (packed in foam box). The product should be handled carefully during transportation, to prevent the capacitor body from deformation due to collision. The product should be placed on upper level when loaded onto the truck. The capacitor assembly must be placed vertically during transportation, with an inclination less than 30 degrees.

4 Key Technical Parameters and Performance

4.1 See Table 2 for key technical parameters

Table 2 Key technical parameters

Rate voltage (kV)	0.23～1.2	See Table 3
Rate capacity (kvar)	1～60	See Table 3
Rate frequency (H_z)	50 or 60	Default 50
Capacitance deviation (%)	-5～+8	Short circuit discharge before test
Dissipation factor	≤ 30kvar product: tanδ≤0.0012	
	> 30kvar product: tanδ≤0.0015	
Withstand voltage (kV)	Inter-pole: power frequency 2.15U_N, 2s	
	Pole-to-case: 2.0 U_N+2 kV or 3 kV (take higher), 5s	
Maximum allowable overvoltage	1.1U_N, no more than 8h of continuous operation within 24h	
Maximum allowable overcurrent	1.3I_N, no more than 2h of continuous operation within 24h	Short time≤2.0I_N
Self-discharge characteristics	Residual voltage drops from √2U_N to 75V(DC) or below within 3min after power off.	
Ambient temperature (℃)	-25～+50 (-25/C)	Customizable -40～+50
Relative temperature	≤50% at 40℃, ≤90% at 20℃	
Altitude (m)	≤2000	
Tightening torque (N·m)	M6 screw ≤7, M8 screw ≤10	
Safety protection	Self-healing + overpressure protection+ discharge device	Short circuit discharge before test
Installation method	Vertical	

Note: The rated voltage (1.0~1.2)kV of the capacitor is special specification, the maximum customizable capacity is 40kvar.

4.2 See Table 3 for specifications and outline dimensions of main models

Table 3 Specifications and outline dimensions of main models

Rated voltage U_N(kV)	Optimal capacity Qc(kvar)	Rated current I_N(A)		Outline and installation dimensions		
		3-three phase	1-single phase	Capacity range	Height H	Figure number
0.23, 0.25	3, 5, 6, 7.5, 10, 12, 15, 20, 25, 30	$\frac{Qc}{\sqrt{3}U_N}$	$\frac{Qc}{U_N}$	1～4	120	Figure 1
				5	140	Figure 1
				6～8	190	Figure 1
				10	195	Figure 2
				12	220	Figure 2
				14～16	250	Figure 2
				18～20	295	Figure 2
				25	250	Figure 3
				30	315	Figure 3

Table 3 (continue)

Rated voltage U_N(kV)	Optimal capacity Qc(kvar)	Rated current I_N(A)		Outline and installation dimensions		
		3-three phase	1-single phase	Capacity range	Height H	Figure number
0.4, 0.45, 0.48	1, 3, 4, 5, 6, 7.5, 8, 10, 12, 14, 15, 16, 18, 20, 24, 25, 30, 35, 40, 45, 50, 60	$\frac{Qc}{\sqrt{3}U_N}$	$\frac{Qc}{U_N}$	1~5	95	Figure 1
				6~8	120	Figure 1
				10	140	Figure 1
				12~16	190	Figure 1
				18~20	220	Figure 1
				22~25	220	Figure 2
				28~32	250	Figure 2
				35~40	250	Figure 3
				45~60	315	Figure 3
Rated voltage U_N(kV)	**Optimal capacity Qc(kvar)**	**Rated current I_N(A)**		**Outline and installation dimensions**		
		3YN split-phase compensation capacitor		**Capacity range**	**Height H**	**Figure number**
0.4	5, 7.5, 10, 15, 20, 25, 30	$\frac{Qc}{\sqrt{3}U_N}$ Y refers to star connection,N refers to null line lead out.		5~7.5	140	Figure 2
				10	195	Figure 2
				14~16	250	Figure 2
				20	295	Figure 2
				25~30	315	Figure 3
0.45, 0.48, 0.525	5, 7.5, 10, 15, 20, 25, 30			5~7.5	140	Figure 2
				10	195	Figure 2
				14~16	220	Figure 2
				20	250	Figure 2
				25	250	Figure 3
				30	315	Figure 3

Note: The dimensions of 0.525 kV, 0.69kV, 0.75 kV, 0.86 kV, 1.2 kV single phase products may be different from those in the table, please refer to the real products. See the outline and installation dimensions in this manual for the figure number of outline and installation dimension drawings.

4.3 The capacitors are placed in the capacitor compensation cabinet which should provide the following protection measures. See Table 4 for details.

Table 4 Capacitor protection measures in cabinet

Protective characteristics	Name and function of support devices	Typical models
Transient overvoltage protection	Zinc-oxide surge arrestor or surge protector	FYS-0.28 or NU6-2
Transient overcurrent protection	Capacitor dedicated contactor, current limiting reactor, or smart compound switch with zero-cross detection.	CJ19, XD1 or ZCK
Steady stage overvoltage protection	Generally, compensation controller can provide overvoltage protection.	NWK1-G, NWKL1
Steady stage overcurrent protection	Thermal relay or capacitor switch with overcurrent protection function.	JR36 or ZCK
Short circuit protection	Choose fast acting fuse for short circuit protection. For capacitors with capacity < 30kvar, user can use miniature circuit breaker for short circuit protection. For capacitors with capacity ≥30kvar, miniature circuit breaker is not recommended.	RT36 or NT00

5 Main Features, Outline and Installation Dimensions

The capacitors are made from metalized polypropylene film with excellent self-healing properties. They are compact, light-weighted and easy to install. The capacitor case is made from tinned steel sheet with sprayed surface.

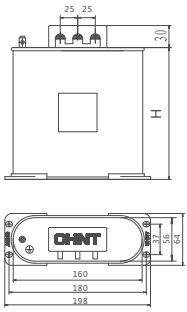


Figure 1 Outline and installation dimensions of waist-shaped products

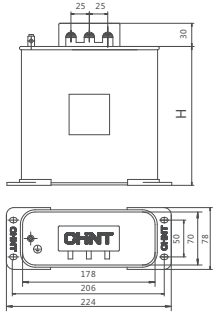


Figure 2 Outline and installation dimensions of small square products

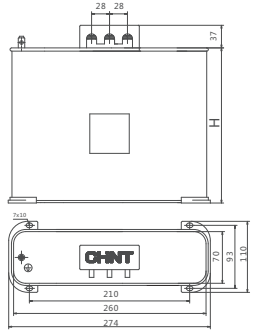


Figure 3 Outline and installation dimensions of large square products

Note: Refer to Table 3 based on capacitor model, then look for the outline and installation dimensions in Figure 1, Figure 2 and Figure 3.

Example: For model BZMJ0.45-20-3, user can refer to Table 3 and find that H=220mm, then check Table 1 for outline and installation dimensions and find that the outline dimension is 198mm×64mm×250mm and the installation dimension is 180mm×37mm.

6 Installation, Commissioning and Operation

6.1 Assembly and fixing of mounting feet

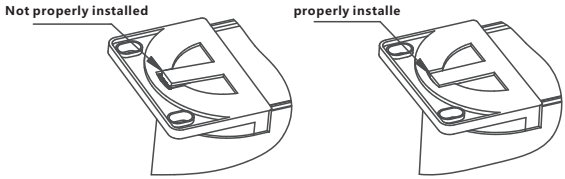


Figure 4 Installation drawings of mounting feet

Insert the plastic mounting feet from the bottom of the case and fixed it onto the mounting plate. If the locking bar at the bottom of the mounting feet is not flat (as shown in Figure 4), the capacitor is not properly installed. In this case, the capacitor body can easily fall out if there is any strong vibration during transportation.

6.2 See Figure 5 and Table 5 for installation spacing

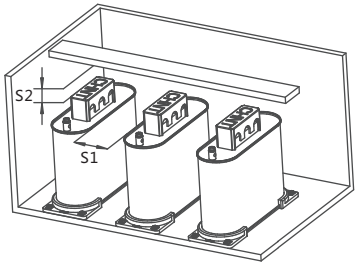


Figure 5 Capacitor installation drawing

Table 5 Safety distance

Capacity (kvar)	Minimum installation spacing S1(mm)	Safety distance at the top of capacitors S2(mm)
1~20	30	≥50
22~32	50	≥50
35~60	80	≥50

6.3 Wiring requirements

The capacitors should be connected by stranded soft conductors, with pressed dedicate copper connecting lug. See Table 6 for the selection of conductor sectional area.

Table 6 Selection of conductor sectional area

Rated voltage (kV)	Rated capacity (kvar)	Conductor sectional area (mm^2)
0.4, 0.45, 0.525	≤10	4.0
0.4, 0.45, 0.525	12~20	6.0
0.4, 0.45, 0.525	24~32	10.0
0.4, 0.45, 0.525	35~60	16.0 or 25.0

6.4 Preparation and inspection before use

6.4.1 Before using the capacitor, user should check if the model on the nameplate is consistent with that of the product. User should also check if the included accessories are complete.

6.4.2 Capacitor testing: Use digital capacitance meter to test the capacitance value between any of the two phases of the 3-phase capacitor, the result should not be smaller than half of the rated value.

6.4.2 Before using the capacitor, user should check if all the connections are secure and if the dust guard is installed, make sure the capacitor is reliably grounded.

6.5 Monitoring and recording during operation

6.5.1 User should check the operating status of the capacitors on a regular basis, check if the 3-phase current is balanced by using the amperemeter in the cabinet.

6.5.2 If the 3-phase current is not balanced, use clamp on amperemeter to test the current and voltage of phase A, phase B and phase C of each group of capacitors.

6.5.3 If there is voltage but no current between phases, it means the overpressure protector is disconnected, user should maintain the product in time or replace it if necessary.

6.5.4 Check the surface temperature of capacitor case during operation, if the temperature of any individual capacitor case exceeds 65℃, maintain the product or replace it if necessary; if the temperature of all the capacitor cases is higher than 65℃, take effective ventilation and heat dissipation measures and check if any harmonic source device (such as frequency converter, rectifier and inverter, and medium and high frequency heating furnace) is used at user load end.

6.6 Operation procedure, method and precautions for shut down

6.6.1 If any deformation is found on the capacitor case, there is oil leakage or the reactive compensation

controller is not working normally, shut down the equipment for inspection and repair.
6.6.2 If the busbar in the cabinet is of bottom-in and top-out type, user must disconnect the bus before replacing the capacitors or other electric components. However, user only needs to disconnect the isolation switch in the cabinet when changing the secondary wiring or testing the capacitors.
6.6.3 Before testing and touching the capacitors, user must conduct short circuit discharge between each two terminals of the 3-phase capacitor.

7 Maintenance and Storage

7.1 Daily maintenance and calibration

Check if the operating current of the capacitor is normal by using the amperemeter and compensation controller in the cabinet. Check if there is any deformation, oil leakage and overheating.

Abnormalities such as overcurrent and overtemperature caused by harmonic will reduce the service life of the capacitor and can cause damage to other components and conductors in the cabinet due to overload.

7.2 Maintenance during operation

Tighten the terminal screws of the capacitor on a regular basis (once half a year) to prevent poor contact. Remove dust and greasy dirt.

User should pay close attention to the cabinet and replace any damaged capacitor in time if any under -compensation of power factor occurs due to significant capacitance drop (50% current decrease), otherwise it may lead to penalty. If all the capacitors are operating and in good condition but the power factor still cannot meet requirement, user must add capacity in time to ensure the automatic cycle operation of the capacitors.

7.3 Service cycle

User should determine the service cycle based on the application conditions, the recommended service cycle for cabinet is once half a year.

7.4 Maintenance for long-term idle

If the capacitor has been idled for one year or longer, please check if its capacitance value is within the allowable deviation range (-5%~+8%); conduct pole-to-case voltage withstand test again (apply AC 3kV for 5 seconds); or use megameter to test if the insulation resistance between the three phase terminals and the case is larger than 100MΩ before using the product.

7.5 Storage conditions, storage period and precautions

The smart capacitor should be stored in a dry and well-ventilated room and protected from rain, moist, chemicals and dust. The maximum storage period of the product is 36 months. Do not put the smart capacitor or its package directly on the floor.

8 Analysis and Troubleshooting of Faults

Table 7 Analysis and Troubleshooting of Faults

No.	Faults	Cause analysis	Troubleshooting method
1	The measured current of a newly connected capacitor is much smaller than the rated current on its nameplate (same for multiple capacitors).	If a capacitor with higher rated voltage is connected to 380V grid, the actual output current will be much smaller, which is normal. There is nothing wrong with the capacitor, it is just derated.	User should determine the status of a capacitor based on its measured capacitance value (μF). The actual operating current $I_C = U_c/U_N \times I_N$
2	The current of the capacitor is closed to rated current when it is first put into operation, but the current drops after a period of time.	The current drops as the capacitance value of the capacitance decreases. There are several reasons for capacitance decrease such as improper use, large harmonic or quality defect.	Find out the reason and solve the problem. User must replace the capacitor if the capacitance value drops below 50%.

No.	Faults	Cause analysis	Troubleshooting method
3	The terminal screws of the capacitor generate heat or even turn into black during operation.	The wire nuts are loose or not tightened properly during installation. If the nuts are tightened properly, the reason might be long-term overcurrent due to harmonic current amplification in the grid.	Tighten the nuts, replace nuts, flat gaskets, elastic washer if necessary.
4	The fuse in branch circuit blows frequently (or miniature circuit breaker trips frequently); the CJ19 contactor fuses; the current-limiting resistance burns frequently; the surface of XD1 current-limiting reactor case cracks, etc.	These symptoms are typical when the grid harmonic is too big or there is intermittent resonance in the grid.	Conduct grid harmonic test or check if there are harmonic sources such as frequent converter, rectifier, intermediate frequency furnace or electric-arc furnace installed at load end. See 3.3.2 for harmonic suppression measures.
5	Sometimes there is buzzing sound in the cabinet during operation.	There is harmonic current passing through the capacitor.	User must take harmonic suppression measures if the harmonic current is too big (same as 4)
6	There is significant current increase when adding a capacitor into a group.	Either abnormal power frequency resonance (underloading), or harmonic current amplification or there is resonance.	Same as 4
7	Slight deformation occurs to the capacitor case after the capacitor has been used for a period of time, and no current can be detected.	Long-term overtemperature or overcurrent operation of the capacitor which cause self-healing breakdown of internal components that generates gases and increases internal pressure. When the overpressure protector breaks, slight deformation can occur to the capacitor case.	Use heat dissipation measures to lower the ambient operating temperature of the capacitor. Select products with higher rated voltage. Harmonic suppression measures are the same as described in 4.

9 Environmental Protection and Warranty Period

9.1 Environmental Protection

In order to protect the environment, the product or product parts should be disposed of according to the industrial waste treatment process, or be sent to the recycling station for assortment, dismantling and recycling according to local regulations.

9.2 Warranty period

The warranty period of the product is 30 months from production (delivery) date if the product is kept under normal storage conditions and the package or the product itself is in good condition. If the warranty period has expired, please inspect the product and make sure it meets all the requirements before installing and using the product. The following circumstances are not within the scope of warranty (excluding repair or replacement):

1) Damage due to improper use, storage or maintenance by user
2) Damage due to dismantle or repair by unauthorized agency or personnel or by user itself
3) The warranty period or service life of the product has expired.
4) Damage due to force majeure
5) Other man-made damages

10 Product Selection and Ordering Information

10.1 User should provide product parameters such as rated voltage, rated capacitance, number of phases, etc;
10.2 User should provide as many application conditions as possible, such as altitude, grid harmonic environment and application industry.

11 ⚠ Environmental Protection

In order to protect the environment, the product or product parts should be disposed of according to the industrial waste treatment process, or be sent to the recycling station for assortment, dismantling and recycling according to local regulations.

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QC PASS

BZMJ Series
Self-healing Low Voltage
Shunt Capacitors
IEC 60831-1-2014
IEC 60831-2-2014

DR/J03

Test date: Please see the packing

ZHEJIANG CHINT ELECTRICS CO., LTD.

CHINT ELECTRICS

BZMJ Series
Self-healing Low Voltage
Shunt Capacitors

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