TBBF(X) type High-voltage Shunt Capacitor Installation

TBBF

TBBFX

1. General Description

TBBF type high-voltage shunt capacitor installations are usually produced in forms of cabinet or frame. The equipments use vacuum contactor or vacuum breaker & reactive voltage auto-control equipment to control the capacitor bank, in this way, the capacitor bank will be auto-switched. The equipments are produced in purpose of increasing the power factor, reducing circuit losses and improving voltage quality.

According to the reactive gross which should be compensated, the equipment could be used as one whole group or some certain number of groups, with reasonable control & protect way, can easily realize auto-switched of the capacitor bank.

2. Executing Standards

☐ GB50227-2008
☐ JB/T7111-1993
☐ JB/T10577-2006
☐ DL/T604-2009

3. Application Ambient Conditions

3.1 Indoor: Cabinet type, outdoor: frame type.
3.2 Altitude≤1000m,consult us if the altitude＞1000m.
3.3 Operating temperature: -25℃～+45℃.
3.4 Relative humidity: daily mean≤95%, monthly mean≤90%.
3.5 No causticity gas、vapor, no inflammable gas, no blaze, no explosion risk, no frequent violent shake.

4. Type Meaning and Specification

T BB F □ — □ — □ — □ — □

- K: open delta protection
- L: unbalance current protection
- Connection: A-single star B-double star
- Capacitance of per capacitor (kvar)
- Rated capacitance (kvar)
- Rated voltage (kV)
- Auto-switched in groups
- Parallel compensate
- Installation

Based on TBBF, we could make it in a preassemble chamber, which is similar to TBBF, and will excellently be suitable for outdoor use. We call the product TBBFX type.

5. Main Technology Parameter

5.1 TBBF

Device type		TBBF6-□ /□ -AK(W)	TBBF10-□ /□ -AK(W)	TBBF35-□ /□ -AKW
Rated voltage		6 kV	10kV	35 kV
Rated current		A	A	A
Rated capability		kvar	kvar	kvar
Rated frequency		50Hz	50Hz	50Hz
4s hot stabilization current(availability value)KA.			20、25、31.5	
Act stabilization current(peak value)KA.			50、63、80	
Type of capacitor unit		BFM6.6/ √3-□ -1(W)	BFM11/ √3-□ -1(W)	BFM11/ √3-□ -1(W)
Medium of capacitor unit			All film medium of M/DBT	
Reactance ratio of series reactor percent for collocate whole set.		XK=□ %	XK=□ %	XK=□ %
Performance parameter	Tolerance of capacitor		0～+5%	
	Most ratio of 3 phases		≯1.02	
	Allow tolerance of inductance		0～+5%	
	Average tolerance of 3 phase inductance		≯±2%	
	Discharge capability of fuse		12kJ	
Protect fashion		Open delta voltage protect,Neutral imbalance current protect or owe-voltage, owe-current, and over-current protecting		
Device type		Cabinet type	Cabinet type	Frame type
Connect line fashion		Single or double star type		
Insulate level of capacitor	1 min patience voltage in power frequency (RMS value)	between phases≥32kV,phase to earth≥32kV (Test value on altitude 1000m)	between phases≥42kV,phase to earth≥42kV (Test value on altitude 1000m)	between phases≥95kV,phase to earth≥95kV (Test value on altitude 1000m)
	Impact patience voltage to earth	≥60kV (Test value on altitude 1000m)	≥75kV (Test value on altitude 1000m)	≥200kV (Test value on altitude 1000m)
Insulate level of the installation	1 min patience voltage in power frequency (RMS value)	≥51kV (Test value on altitude 1000m)		
	Impact patience voltage to earth	≥75kV (Test value on altitude 1000m)		
Insulate level in secondary		≥2.0kV	≥2.0kV	≥2.0kV
Surface deal, color		Spray lacquer, Chint B or other	Spray lacquer, Chint B or other	Hot plating or spray lacquer, Chint B
protect grand(cabinet type)		IP20	IP20	

Remark: rated insulate level should be corrected according to altitude high.

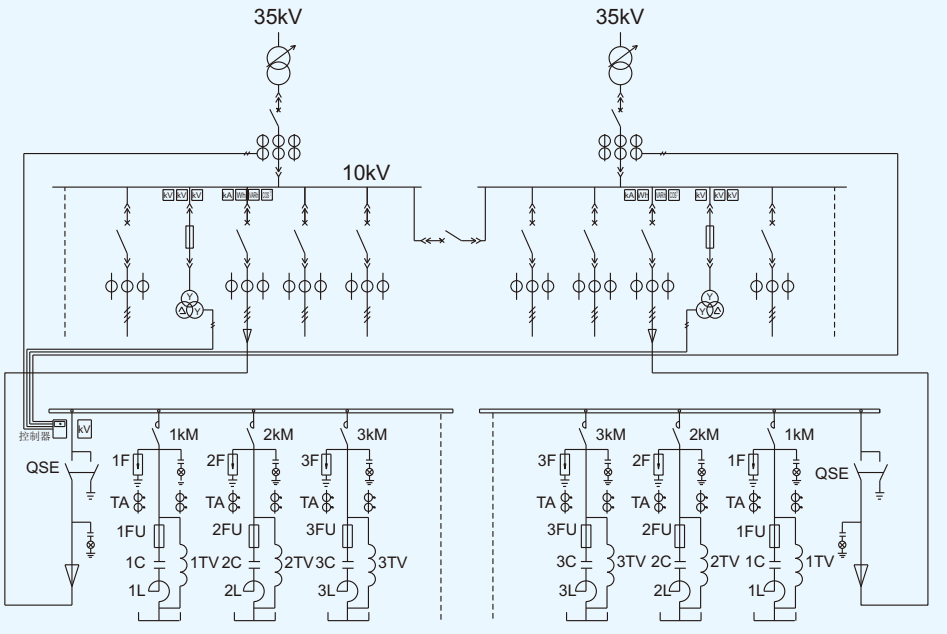
5.2 TBBFX

Device type		TBBFX10□ /□ AK(W)	TBBFX6□ /□ AK(W)
Rated voltage		10 kV	6 kV
Rated current		A	A
Rated capability		50Hz	50Hz
Rated frequency		kvar	kvar
4s hot stabilization current(availability value)KA.		20、25、31.5	20、25、31.5
Act stabilization current(peak value)KA.		50、63、80	50、63、80
Type of capacitor unit		BFM□ / √3-□ -1(W)	BFM□ / √3-□ -1(W)
Medium of capacitor unit		All film medium of M/DBT	All film medium of M/DBT
Reactive ratio of series reactor percent for collocate whole set.		XK=□ %	XK=□ %
Performance parameter	Tolerance of capacitor	0～+5%	0～+5%
	Most ratio of 3 phases	≯1.02	≯1.02
	Allow tolerance of inductance	0～+5%	0～+5%
	Average tolerance of 3 phase inductance	≯±2%	≯±2%
	Discharge capability of fuse	12kJ	12kJ
Protect fashion		Open delta voltage protect,Neutral imbalance current protect or low-voltage, low-current, and over-current protect	
Device type		chamber type	chamber type
Connect line fashion		Single or double star type	Single or double star type
Insulate level of capacitor	1 min patience voltage in power frequency (RMS value)	between phases ≥42kV ,phase to earth≥42kV (Test value on altitude 1000m)	between phases≥32kV ,phase to earth≥32kV (Test value on altitude 1000m)
	Impact patience voltage to earth	≥75kV (Test value on altitude 1000m)	≥60kV (Test value on altitude 1000m)
Insulate level of the installation	1 min patience voltage in power frequency (RMS value)	≥51kV (Test value on altitude 1000m)	≥51kV (Test value on altitude 1000m)
	Impact patience voltage to earth	≥75kV (Test value on altitude 1000m)	≥75kV (Test value on altitude 1000m)
Insulate level of secondary circuit		≥2.0kV	≥2.0kV
Surface deal, color		Spray lacquer, Chint B or other	Spray lacquer, Chint B or other
protect grand(chamber type)		IP36	IP36

6. Connect line fashion of compensate installation

Primary connect line fashion of compensate installation: It is as "Y" fashion and neutral point isn't to earth. To see primary connect drawing 1.

Drawing1 The primary system drawing of TBBF compensate installation.



7. Outline and fixing dimension

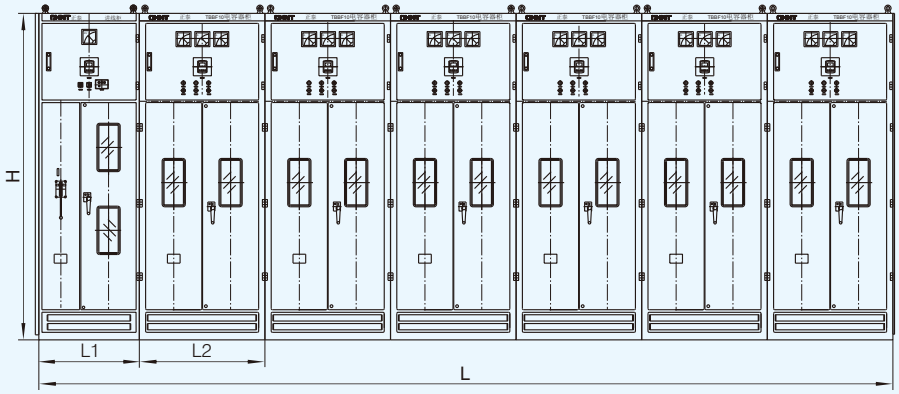
7.1 TBBF

7.1.1.1. Technology parameter table of compensate installation. Table 1

No.	Type spec	Rated parameter			Shunt capacitor	Outline dimension
		Ue(kV)	Ie(A)	Qe(kvar)		(L×W×H)
1	TBBF10-2400/200-AK	11/ √3	126	2400	BFM11/ √3-200-1	4800×1600×2600
2	TBBF10-2800/234-AK	11/ √3	147	2800	BFM11/ √3-234-1	4800×1600×2600
3	TBBF10-3000/250-AK	11/ √3	157.5	3000	BFM11/ √3-250-1	4800×1600×2600
4	TBBF10-3200/267-AK	11/ √3	168	3200	BFM11/ √3-267-1	4800×1600×2600
5	TBBF10-3600/300-AK	11/ √3	189	3600	BFM11/ √3-300-1	4800×1600×2600
6	TBBF10-4000/334-AK	11/ √3	210	4000	BFM11/ √3-334-1	4800×1600×2600
7	TBBF10-4800/400-AK	11/ √3	252	4800	BFM11/ √3-400-1	4800×1600×2600
8	TBBF10-6000/400-AK	11/ √3	315	6000	BFM11/ √3-400-1	5800×1600×2600
9	TBBF10-7200/400-AK	11/ √3	378	7200	BFM11/ √3-400-1	6800×1600×2600

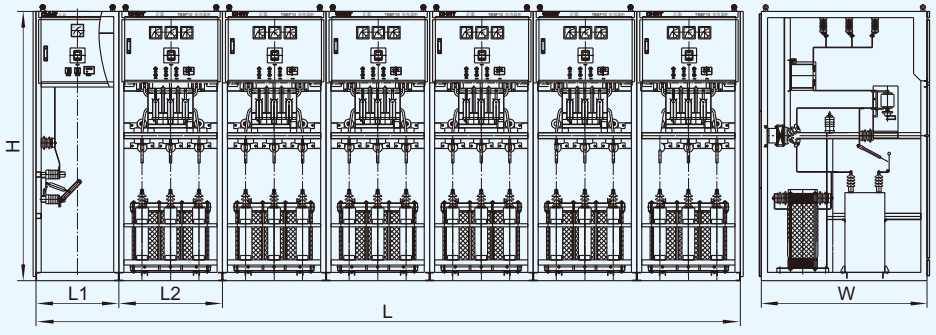
7.1.1.2 RVT outline of control fashion of power factor

Drawing2 Outline of compensate installation of shunt capacitor (RVT control fashion)



7.1.1.3 Inside configuration drawing of control fashion of RVT power factor.

Drawing3 Inside configuration drawing of compensate installation of shunt capacitor (RVT control fashion)



7.1.2 WZK-III or one of RCBK voltage – reactive control fashion

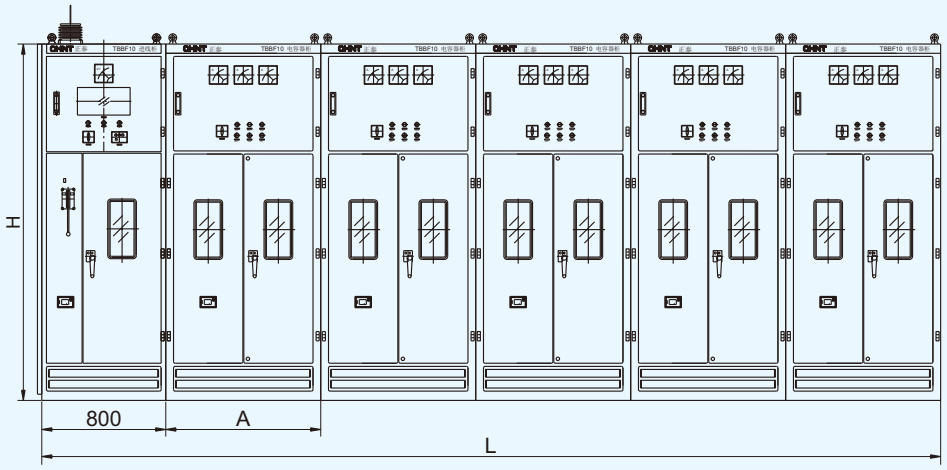
7.1.2.1 Technology parameter of compensate installation Table 2

No.	Type spec	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Outline dimension (L×W×H)
1	TBBF10-2505/167-AK	11/ √3	131.5	2505	BFM11/ √3-167-1	5800 × 1600 × 2600
2	TBBF10-3000/200-AK	11/ √3	157.5	3000	BFM11/ √3-200-1	
3	TBBF10-3510/234-AK	11/ √3	184.2	3510	BFM11/ √3-234-1	
4	TBBF10-3750/250-AK	11/ √3	196.8	3750	BFM11/ √3-250-1	
5	TBBF10-4005/267-AK	11/ √3	210.2	4005	BFM11/ √3-267-1	
6	TBBF10-4500/300-AK	11/ √3	236.2	4500	BFM11/ √3-300-1	
7	TBBF10-5000/334-AK	11/ √3	262.4	5000	BFM11/ √3-334-1	
8	TBBF10-6000/400-AK	11/ √3	317.1	6000	BFM11/ √3-400-1	

According to table 2, WZK or RCBK voltage controller is used as protect instrument in enter line cabinet and has alarm function. GN19-12 insulate switch is placed in the cabinet. Capacitor bank is switch-on-off with JCZ5-12 or V12 vacuum contactor which can be automatic or manual. The reactor is used CKSC dry iron core type ,and the protecting of open delta voltage is achieved by FDG2 or FDGQ2. The installation is also used DWZK controller in center control room which has RS232 or RS485 communication interface and realize distance automatic control.

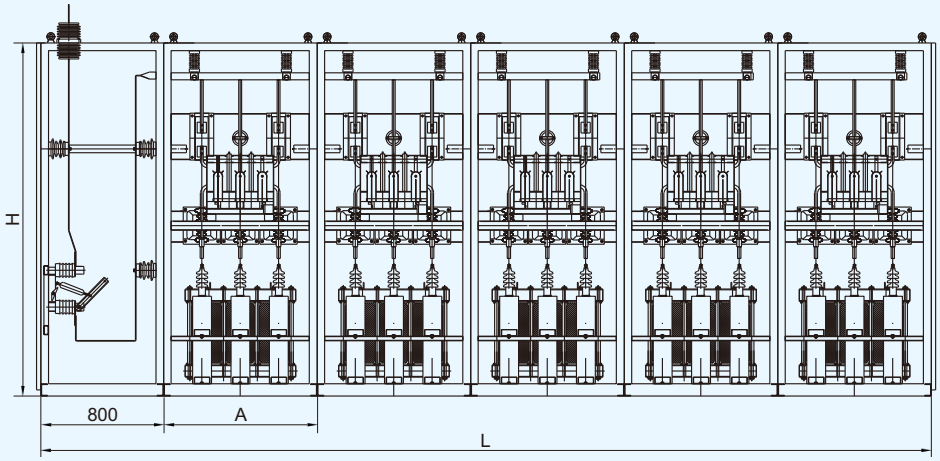
7.1.2.2 Outline drawing of RCBK control fashion

Drawing 4 Outline and fixing dimension of compensate installation of shunt capacitor by grouping in cabinet type



7.1.2.3 Inside configuration drawing in RCBK control fashion.

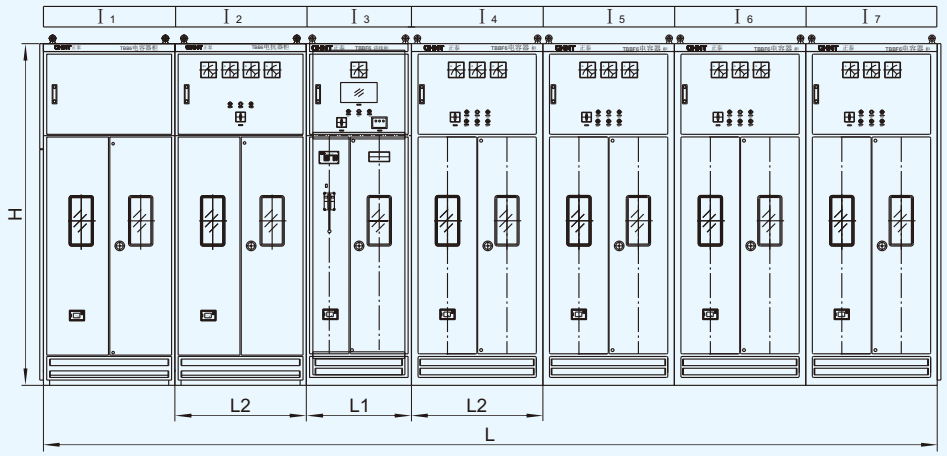
Drawing 5 Inside configuration drawing of compensate installation of shunt capacitor by grouping in cabinet type



7.1.3 The secondary fashion of WZK-III type or RCBK voltage-reactive control.

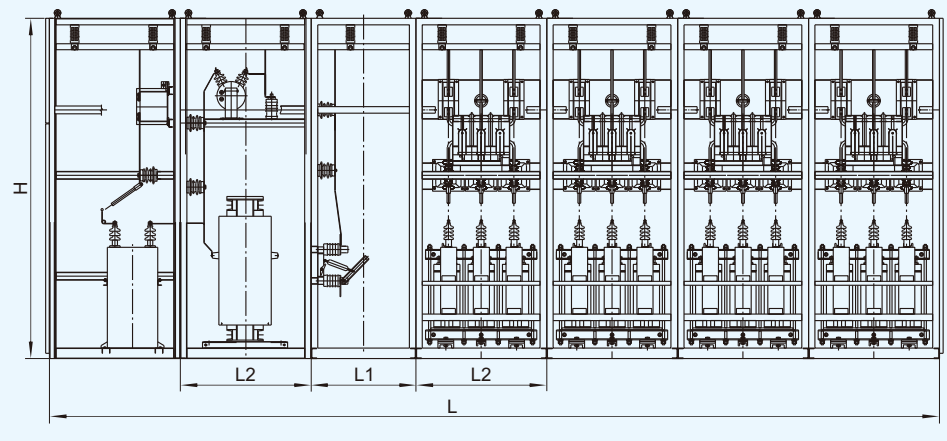
7.1.3.1 Outline drawing

Drawing 6 The combination between fixation group and adjust group



7.1.3.2 Inside configuration drawing.

Drawing 7 The configuration of fixation group and adjust group



From drawing 6 and 7 can be known, there are a fixation group and 4 capacitor bank which is switch-on-off. RCBK voltage controller can protect the 4 bank. the controller can run 2 segment busbar which there are 8 capacitor bank, and can automatic or manual.

7.1.4 Grouping compensate installation for frame type.

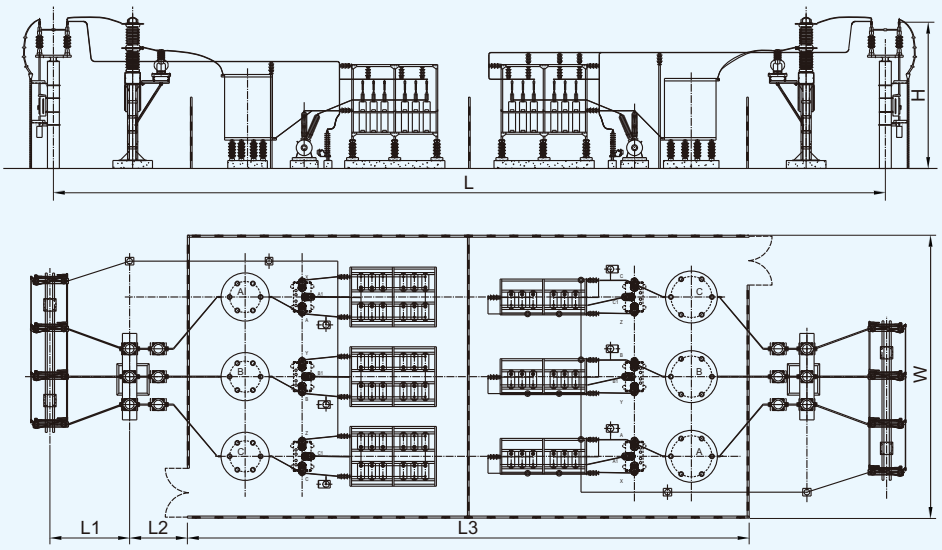
7.1.4.1 Technology parameter of the installation. Table 3

No.	Type spec	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Outline dimension (L×W×H)
1	TBBF35-2400+4800-AKW	11 × 2	109	7200	BAM11-400-1W	10000 × 6000 × 3700
2	TBBF35-3600+7200-AKW	11 × 2	162	10800	BAM11-300-1W	14000 × 6000 × 3700
3	TBBF35-4000+8000-AKW	11 × 2	182	12000	BAM11-334-1W	14000 × 6000 × 3700
4	TBBF35-4800+9600-AKW	11 × 2	218	14400	BAM11-400-1W	16000 × 8000 × 3700
5	TBBF35-6000+12000-AKW	11 × 2	273	18000	BAM11-334-1W	21000 × 7000 × 3700
6	TBBF35-12000+12000-AK	11 × 2	364	24000	BAM11-500-1W	11000 × 9000 × 3700

According to table 3,DWZK voltage control cabinet is placed in center control room, which is fixed RS-232 or RS-285 communication interface to realize distance control. enter line switch is GW4-35 or GW5-35,and capacitor bank is used SF6 breaker, and series reactor is used CKSKL dry hollow core, and discharge wingding is used FBGEC, to realize difference voltage protecting. The outline configuration is at drawing 8.

7.1.4.2 Outline configuration of installation.

Drawing 8 The drawing of 35kv cabinet type compensate installation by grouping



7.2 TBBFX

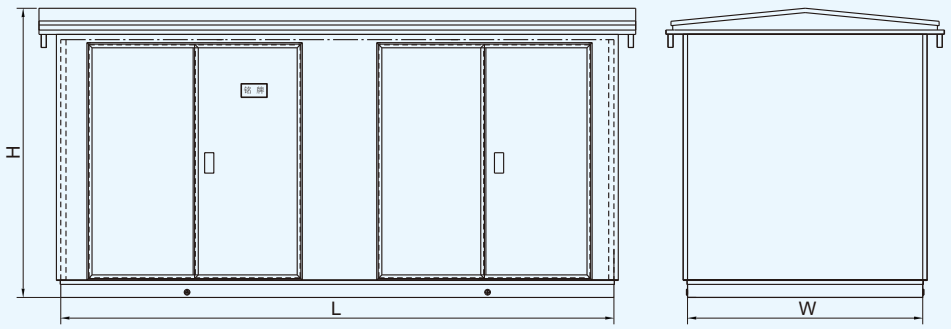
7.2.1 Technology parameter of compensate installation Table 1

No.	Type spec	Rated parameter Ue(kV)	Ie(A)	Qe(kvar)	Shunt capacitor	Outline dimension (L×W×H)
1	TBBFX10-3000/167-AK	11/ √3	157.8	3006	BFM11/ √3-167-1	
2	TBBFX10-3600/200-AK	11/ √3	189.0	3600	BFM11/ √3-200-1	
3	TBBFX10-4200/234-AK	11/ √3	221.1	4212	BFM11/ √3-234-1	
4	TBBFX10-4500/250-AK	11/ √3	236.2	4500	BFM11/ √3-250-1	6450×2800×3320
5	TBBFX10-4800/267-AK	11/ √3	252.3	4806	BFM11/ √3-2671	
6	TBBFX10-5400/300-AK	11/ √3	283.4	5400	BFM11/ √3-300-1	
7	TBBFX10-6000/334-AK	11/ √3	315.6	6012	BFM11/ √3-334-1	
8	TBBFX10-7200/400-AK	11/ √3	377.9	7200	BFM11/ √3-400-1	

According to table 1,enter line cabinet is used as KY28-12 the middle install type switch cabinet. Main switch is ZN63-12/630-25 (VS1) type breaker, and controller is RVT type which is placed in the cabinet. Capacitor bank is used for JCZ5-12 vacuum contactor to see drawing 3 and 4.

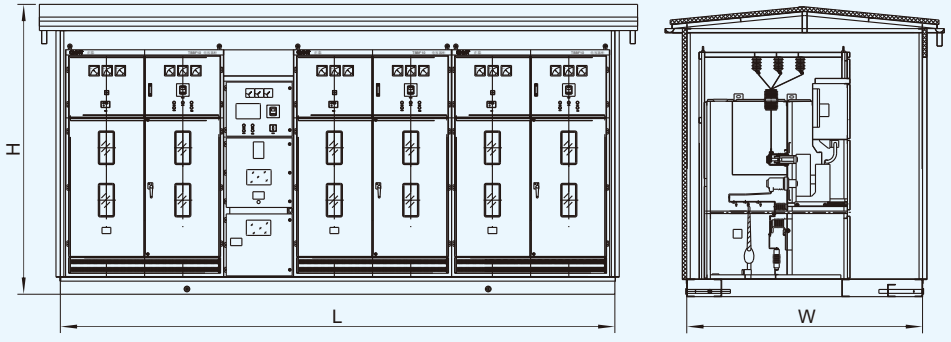
7.2.2 Outline drawing of chamber type configuration

Drawing 2 Outline of chamber type compensate installation of shunt capacitor



7.2.3 Inside configuration drawing of chamber type installation

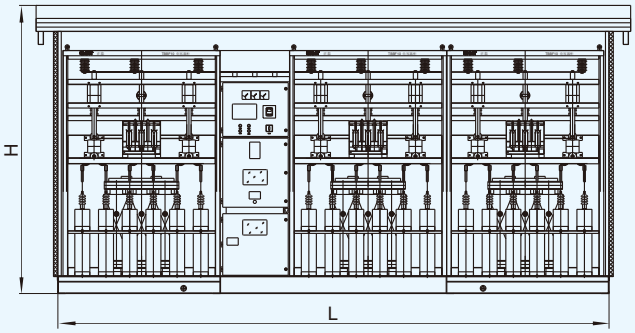
Drawing 3



One of inside configuration of compensate installation of chamber type shunt capacitor.

KYN-12 High voltage switch cabinet

Drawing 4



The secondary mode of chamber type compensate installation of shunt capacitor.

TBBF high voltage capacitor bank

7.2.4 The disposal drawing of cabinet (another mode of chamber type configuration)

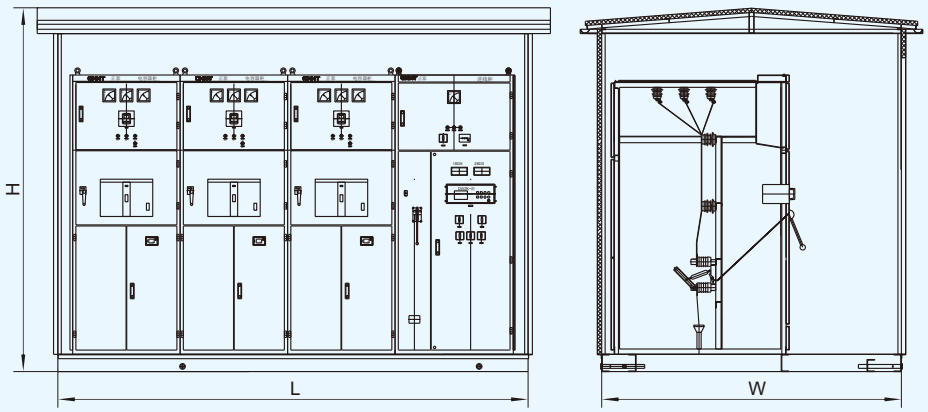
7.2.4.1 Technology parameter compensate installation Table 2

No.	Type spec	Rated parameter			Shunt capacitor	Outline dimension (L×W×H)
		Ue(kV)	Ie(A)	Qe(kvar)		
1	TBBFX10-1500/167-AK	11/ √3	78.9	1503	BFM11/ √3-167-1	
2	TBBFX10-1800/200-AK	11/ √3	94.5	1800	BFM11/ √3-200-1	
3	TBBFX10-2100/234-AK	11/ √3	110.5	2106	BFM11/ √3-234-1	
4	TBBFX10-2250/250-AK	11/ √3	118.1	2250	BFM11/ √3-250-1	4420×2800×3320
5	TBBFX10-2400/267-AK	11/ √3	126.1	2403	BFM11/ √3-2671	
6	TBBFX10-2700/300-AK	11/ √3	141.7	2700	BFM11/ √3-300-1	
7	TBBFX10-3000/334-AK	11/ √3	157.8	3006	BFM11/ √3-334-1	
8	TBBFX10-3600/400-AK	11/ √3	189.0	3600	BFM11/ √3-400-1	

According to table 2,GN19-12 switch is used in enter cabinet, and VQC controller is also placed in the cabinet. BSF02-12/630-25 magnetism-forever type vacuum breaker is used to switch on-off to capacitor bank which can automatic or manual. To see drawing 5 and 6.

7.2.4.2 Inside configuration drawing of chamber type

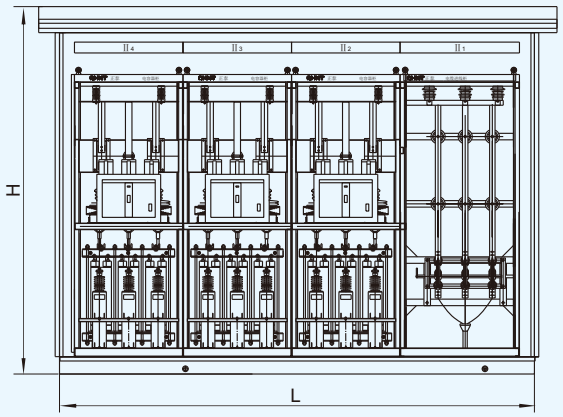
Drawing 5



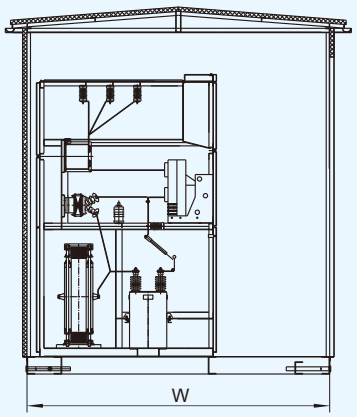
The third mode inside configuration drawing of chamber type compensate installation of shunt capacitor

TBBF enter line and switch cabinet

Drawing 6



The fourth mode inside configuration drawing of chamber type compensate installation of shunt capacitor.



TBBF high voltage capacitor bank