



**Technical catalogue**  
**ACTIVE HARMONIC FILTER**



# Technical catalogue

## ACTIVE HARMONIC FILTER



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## Introduction

BTB ELECTRIC Company is a leading European manufacturer of electrical equipment, specializing in solutions to enhance power quality. Our product range includes Capacitors, Harmonic Filter Reactors, Power Factor Controllers, Active Harmonic Filters, and Intelligent Combined Low Voltage Power Capacitors.

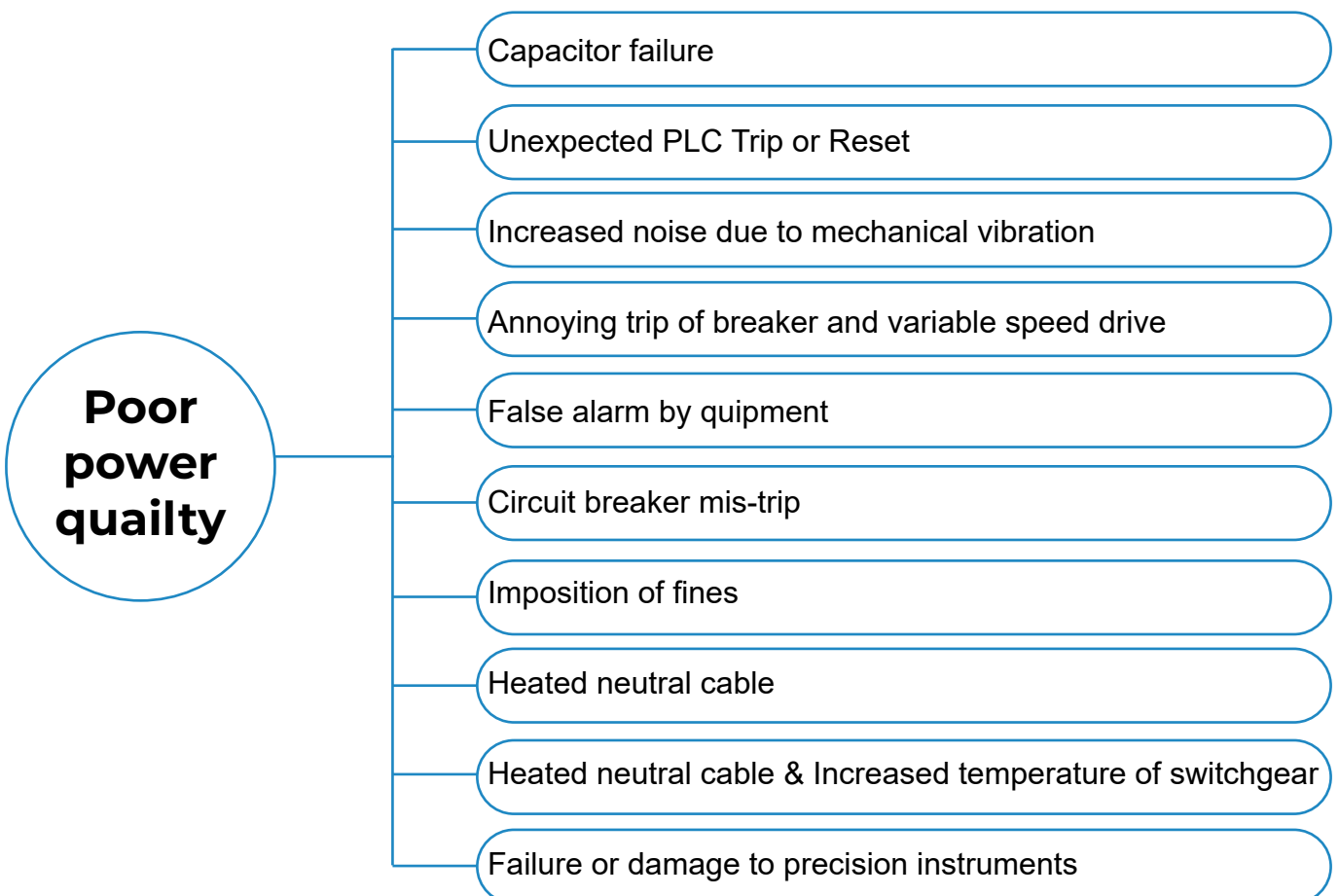
At BTB Electric, we prioritize reliability and efficiency. Our AHF harmonic filter is engineered to optimize power supply quality, ensuring reliable equipment operation while minimizing economic losses associated with equipment issues. With production adhering to the stringent ISO9001 quality management system, we guarantee the highest standards in manufacturing.

## Product features

- **Enhanced Equipment Performance:** Our products reduce the heating of electrical equipment, slowing insulation aging, extending service life, and lowering maintenance costs.
- **Grid Stability:** By diminishing the resonance probability of compensation capacitors in the power grid, we enhance electricity consumption safety. Furthermore, our solutions mitigate the influence of harmonics on system signal transmission, bolstering system reliability. They also reduce equipment heating, minimizing data error rates in computer systems.
- **Electromagnetic Interference Reduction:** Our AHF effectively filters 2 to 50 times harmonics simultaneously. Additionally, it allows for customizable compensation times and rates for each harmonic, ensuring optimal performance tailored to specific requirements.

## Common symptoms due to poor power quality

Below are typical harmful effects attributed to poor electricity quality:

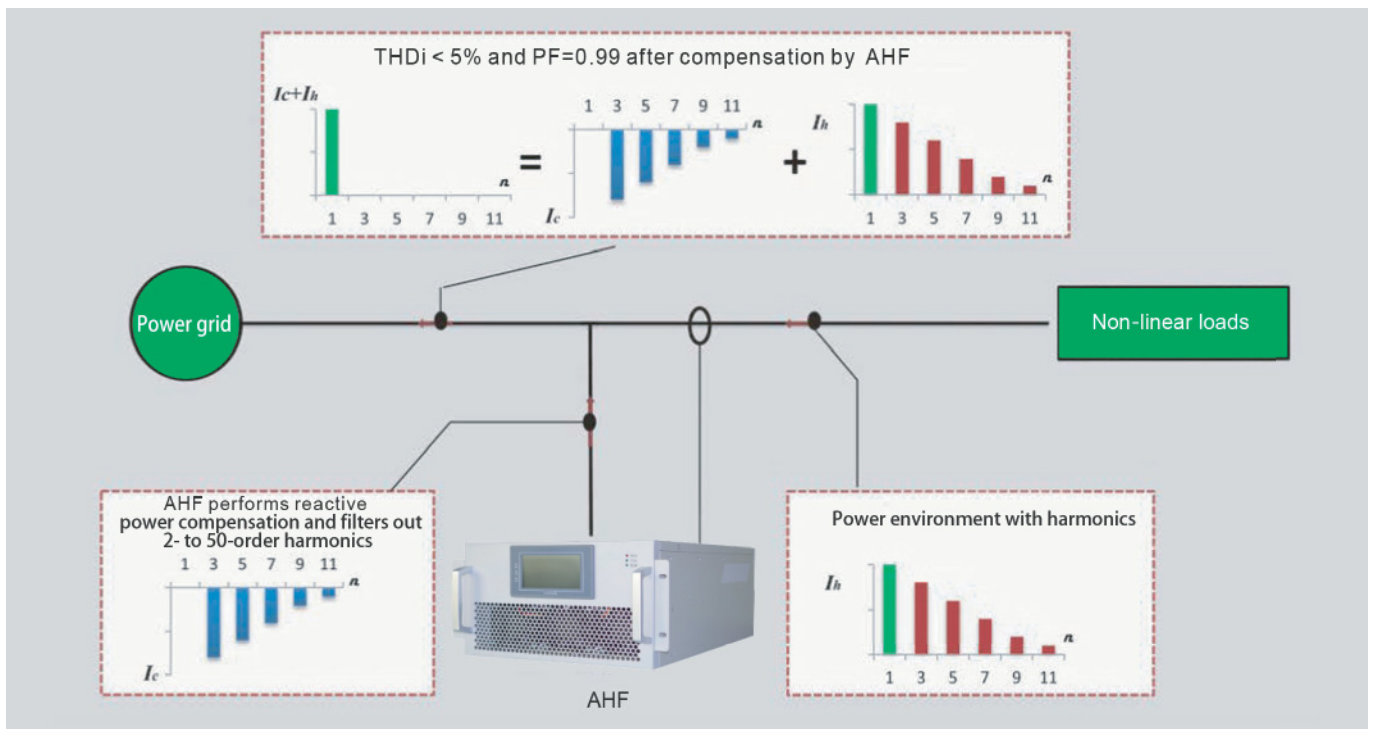


## Causes of electrical harmonics

In industrial environments, harmonic distortion is primarily caused by the electrical equipment used in operations. Modern industrial plants feature various equipment pieces that contribute to overall distortion. Examples include variable frequency drives and electrical motors powered by inverters. These drives convert regular AC voltage and current into DC and then generate a variable frequency output for precise motor control. However, the irregular current draw needed to charge the inverter's components distorts both the current and voltage waveforms. Such inverters are commonly employed to drive motors involved in industrial processes like pumping, cooling, heating water, moving conveyors, and operating cooling fans. Additionally, other electronic controls present in the process contribute to distortion. When interconnected on the same network, the cumulative effect of these devices increases overall distortion.

## Benefits of using an Active Harmonic Filter (AHF)

AHFs are connected in parallel to the low-voltage side of the power grid to enhance power quality. Equipped with smart control, high efficiency, rapid dynamic response, and stable operation, AHFs effectively mitigate complex power quality issues. They enable the achievement of perfect power quality by eliminating harmonic distortions and ensuring reliable system performance.

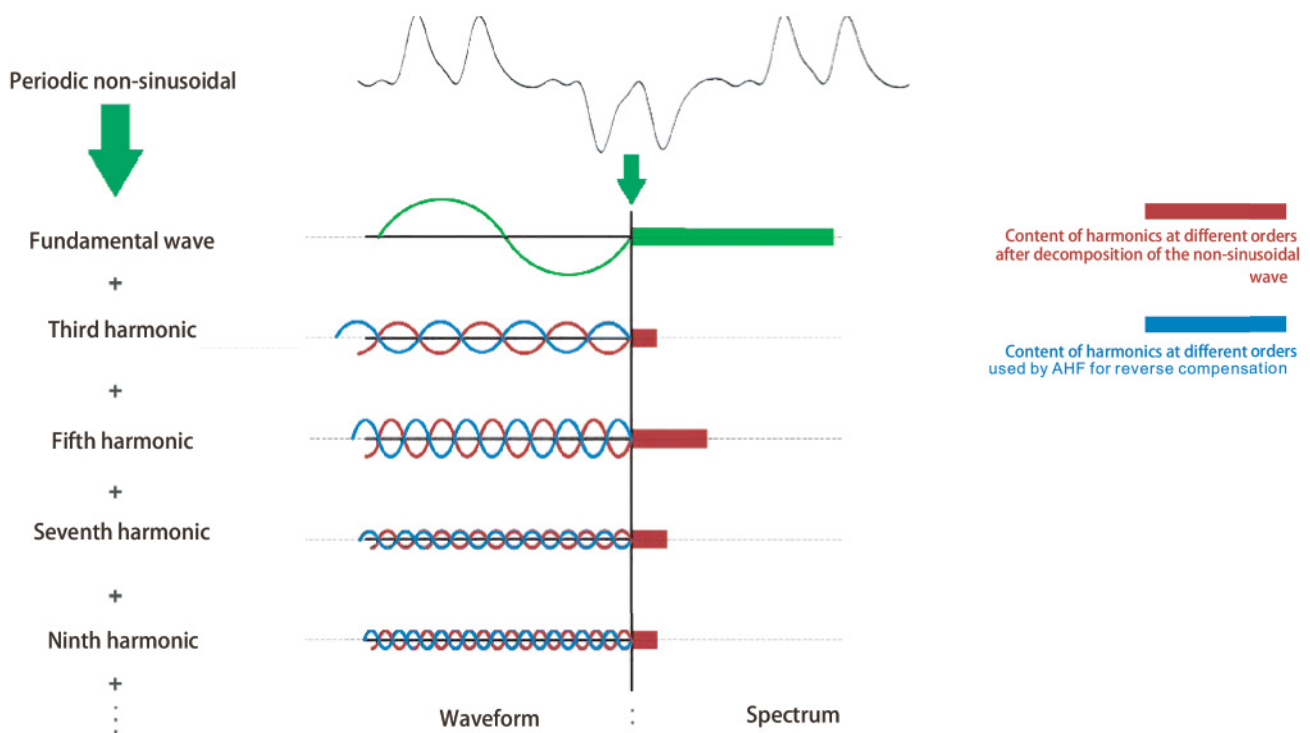
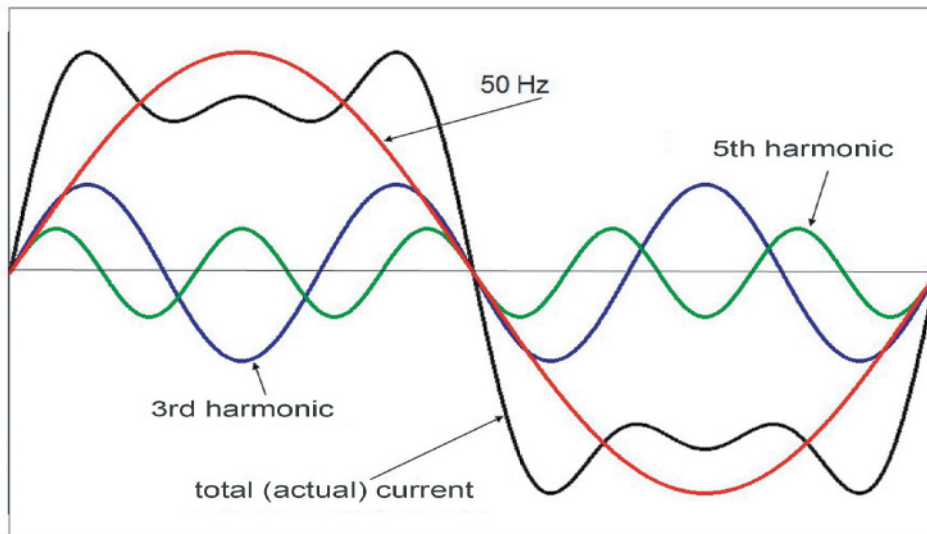


- Improve power supply quality and enhance the reliability of enterprise equipment, reducing economic losses due to equipment malfunctions.
- Decrease the heating of power equipment and aging of insulation, thereby extending equipment service life and reducing maintenance costs.
- Lower the probability of harmonic resonance in compensation capacitors, enhancing power consumption security. Additionally, mitigate the impact of harmonics on system signals, thereby improving system reliability.
- Reduce equipment heating, such as motors, and decrease data error rates in computer systems. Minimize electromagnetic interference generated by harmonics, ensuring the normal operation of weak-current systems.
- Meet international and local standards for electrical equipment and power quality.

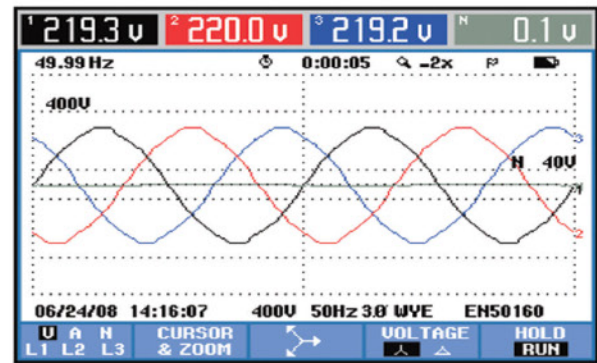
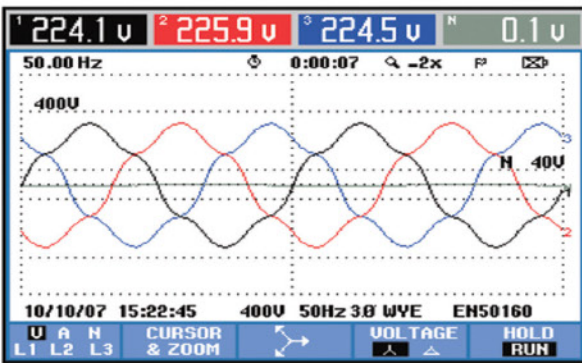
## AHF operating principle

The AHF monitors the load current in real time using external current transformers (CTs). It processes this data internally using a Digital Signal Processor (DSP) to extract harmonic components from the load current. Subsequently, it sends these harmonic components to internal Insulated Gate Bipolar Transistors (IGBTs) via Pulse Width Modulation (PWM) signals. The AHF controls the inverter to generate a current equal in power to the harmonic, but with reverse direction. This current is then injected into the system to counteract and filter the harmonic, thus improving power quality.

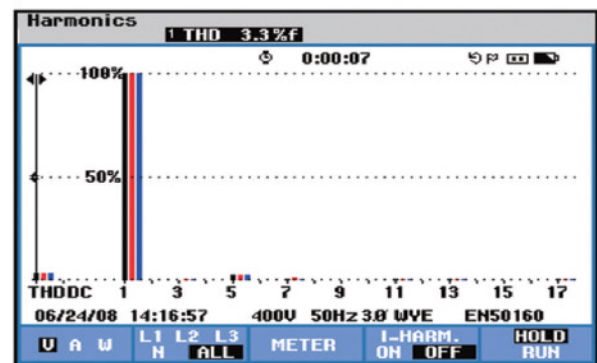
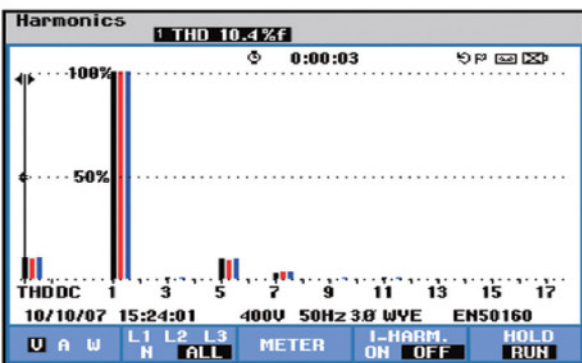
Moreover, individual harmonic orders superpose onto the fundamental current, resulting in a nonsinusoidal waveform.



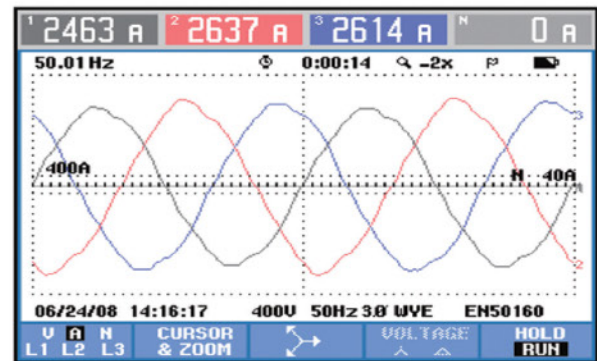
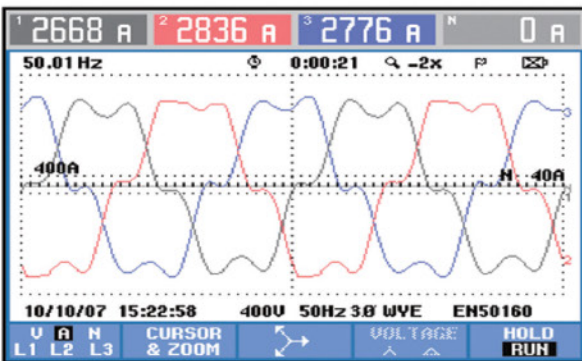
## Examples:



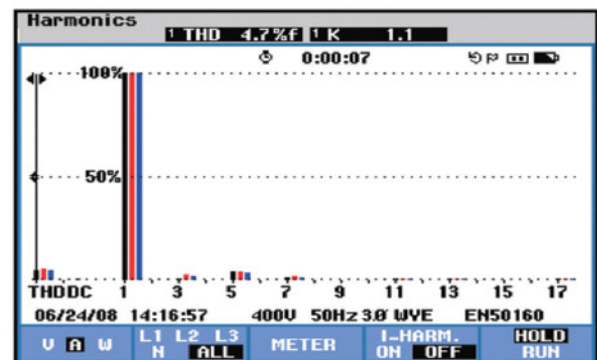
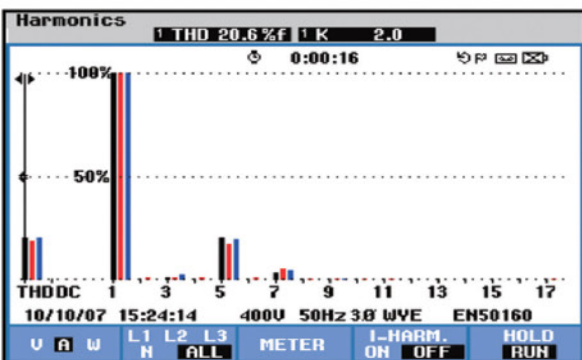
Waveforms and RMS values of phase currents before and after AHF were installed



Harmonic spectrum of phase currents before and after AHF were installed



Waveforms and RMS values of phase voltages before and after AHF were installed



Harmonic spectrum of phase voltages before and after AHF were installed

## Application



Automotive manufacturing



IDC industry



Hospital



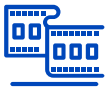
Modern architecture



Sewage treatment



Power generation



Theater



Photovoltaic



Oil exploitation



Semiconductor



Distribution network transformer



Car charging pile



Theme parks and hotels



Smelting steel



Papermaking



Subway



Rubber

## Description of the model

### BF3-07544LD

<b>B</b>	<b>F3</b>	<b>XXX</b>	<b>4</b>	<b>4L</b>	<b>D</b>
1	2	3	4	5	6

No.	Name	Meaning
1	Enterprise code	B: BTB Electric
2	Product type	F3: 3rd generation active harmonic filter
3	Capacity	50/75/100/150/200~600A
4	Voltage level	4: (400V), 6: (690V)
5	Wiring type	4L: (3P4W), 3L: (3P3W)
6	Mounting type	D: Drawer type, W: Wall-mounted type, C: Cabinet type

Product code	Product Description
BF3-05044LD / BF3-05044LW	AHF 50A, 3P4W, 400V, drawer/wall mounted
BF3-07544LD / BF3-07544LW	AHF 75A, 3P4W, 400V, drawer/wall mounted
BF3-10044LD / BF3-10044LW	AHF 100A, 3P4W, 400V, drawer/wall mounted
BF3-15044LD / BF3-15044LW	AHF 150A, 3P4W, 400V, drawer/wall mounted
BF3-20044LC	AHF 200A, 3P4W, 400V, cabinet type
BF3-25044LC	AHF 250A, 3P4W, 400V, cabinet type
BF3-30044LC	AHF 300A, 3P4W, 400V, cabinet type
BF3-35044LC	AHF 350A, 3P4W, 400V, cabinet type
BF3-40044LC	AHF 400A, 3P4W, 400V, cabinet type
BF3-45044LC	AHF 450A, 3P4W, 400V, cabinet type
BF3-50044LC	AHF 500A, 3P4W, 400V, cabinet type
BF3-60044LC	AHF 600A, 3P4W, 400V, cabinet type

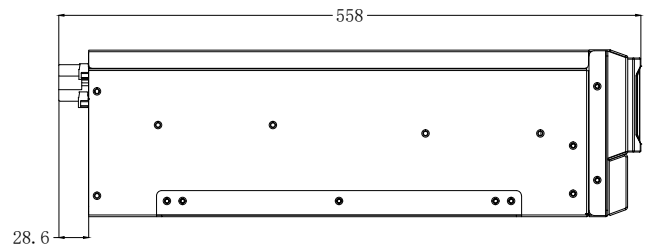
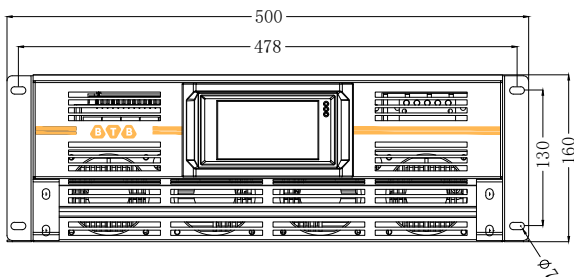
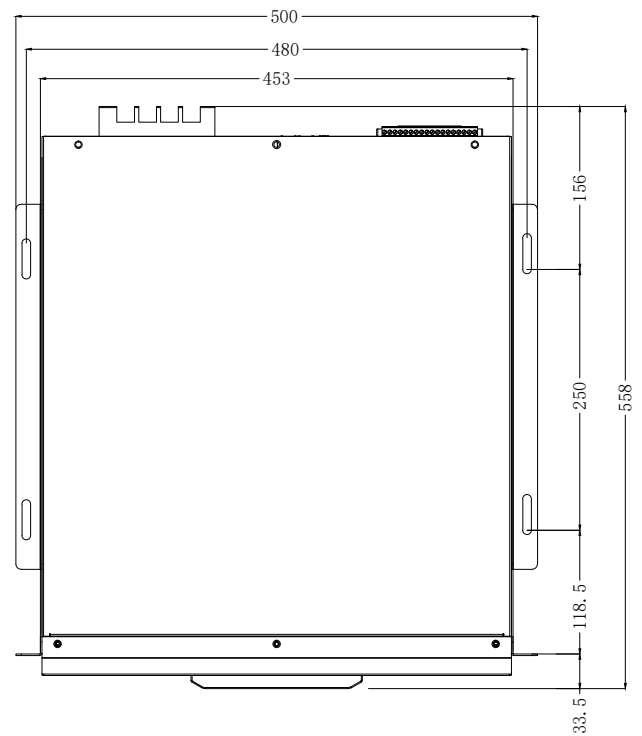
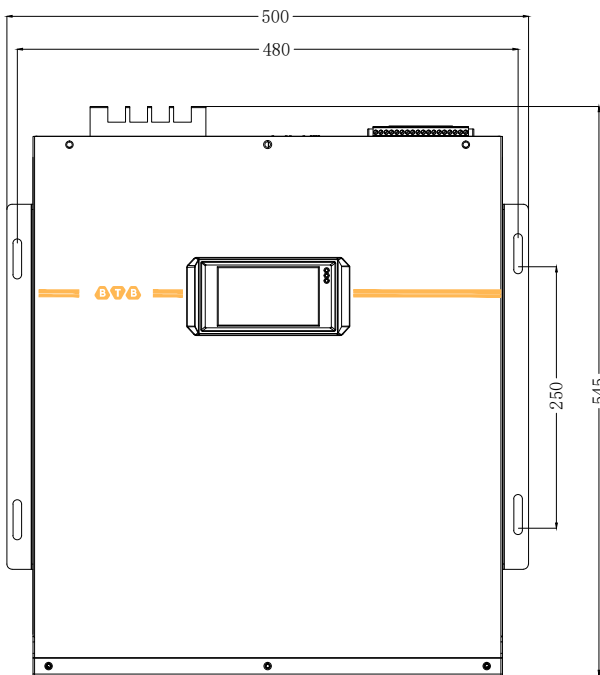
## Technical specifications

General characteristics	
Standards	JB/T 11067-2011, DL/T 1216-2013 IEC/EN 60439-1, 2014/30/EU, EN 61000-6
Rated input line voltage	380V $\pm$ 20%
Frequency (fn)	50Hz $\pm$ 10%
Compensation current	50A, 75A, 100A, 150A per module 200A, 300A, 400A, 450A, 500A, 600A per cabinet
Power grid structure	3P3W / 3P4W
Performance specifications	
Operating mode	Active harmonic filtering / Power factor correction / Load balancing
Compensation efficiency	$\geq$ 97%
Harmonic spectrum	2nd to 50th harmonics
Harmonic compensation selection	Individual selection from 2nd to 50th harmonics
Response time	Instantaneous response time < 0.1ms Full response time < 10ms
Power factor correction	Programmable from 1 (inductive) to -1 (capacitive)
Load balancing	Programmable load balancing between phases
Protections	Over-voltage protection, under-voltage protection, short-circuit protection, over-current protection, over-temperature protection, drive fault protection
Operation configuration	
Parallel operation	Up to 8 modules (with different rated currents capable)
CT requirements	3 CTs required (100/5A ~ 5000/5A, class 0.5)
Circuit topology	Three-level
Power loss	Less than 3% of rated power
Communication monitoring capability	
Communication interface	RS485, CAN interface
Communication protocol	Modbus protocol
Module display interface	LCD multi-function touch color screen (optional)
Error alarm	Support independent monitoring or centralized monitoring
Environmental conditions	
Operation temperature	-10 ~ 40°C (higher operation temperature allowed with derating)
Humidity	$\leq$ 95% non-condensation
Altitude	$\leq$ 1500m, 1500~3000m (derating 1% per 100m)
Environmental conditions	No harmful gas and steam, no conductive or explosive dust, no severe mechanical vibration
Intelligent air cooling	Excellent ventilation
Protection class	IP20 (higher protection class available on request)
Noise level	Below 65db

# Dimension and structure

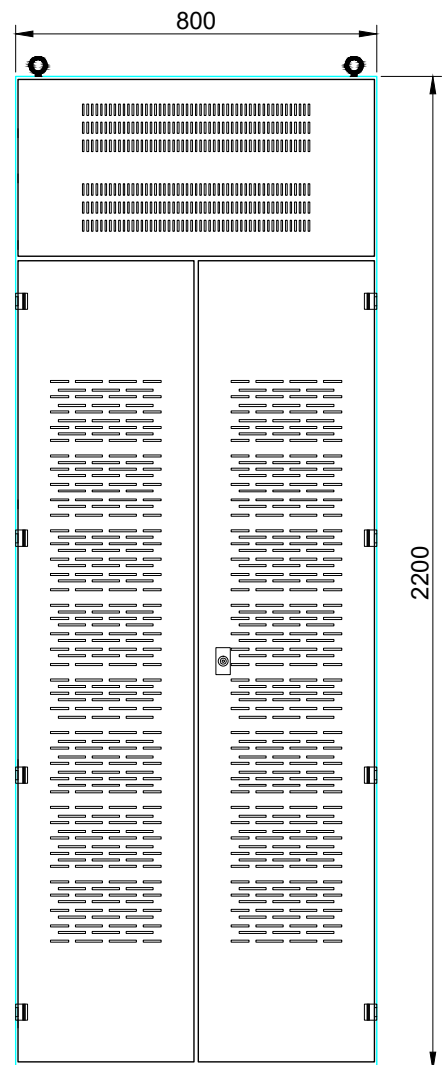
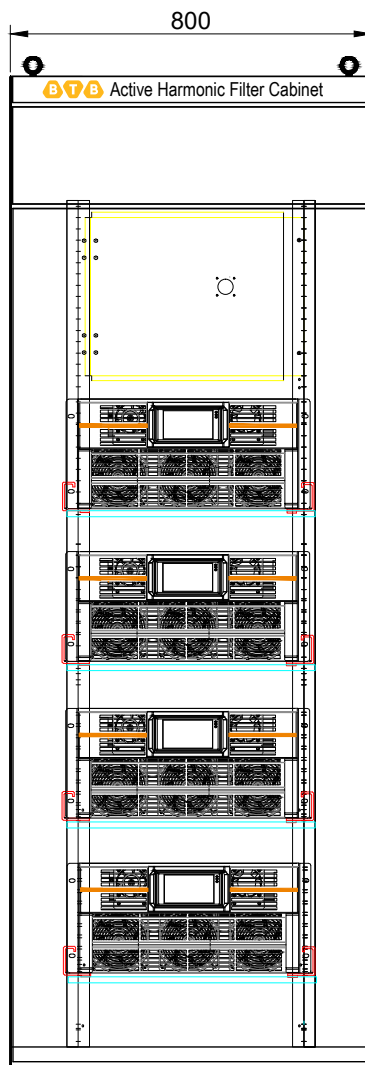
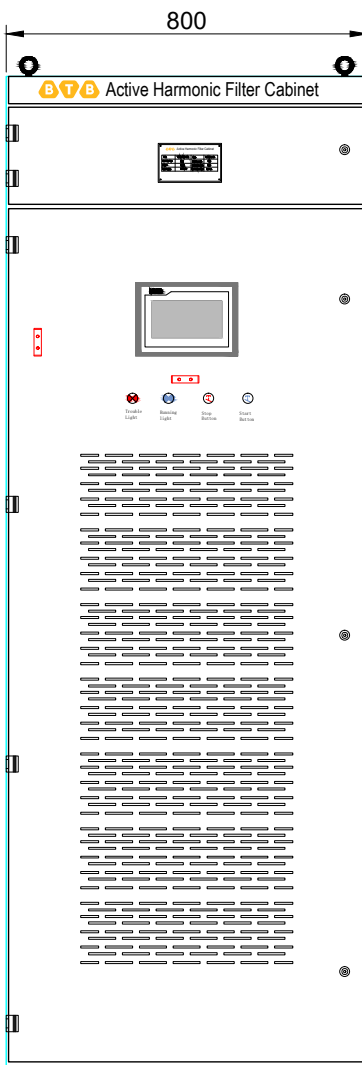
## 1. Drawer type and wall-mounted type

Code	Dimension (W×H×D) mm		Mounting dimension (W×H) mm	
	Drawer type	Wall-mounted type	Drawer type	Wall mounted type
BF3-05044LD BF3-05044LW	500×160×558	500×545×173	478×130 480×250	480×250
BF3-07544LD BF3-07544LW	500×160×558	500×545×173	478×130 480×250	480×250
BF3-10044LD BF3-10044LW	555×260×665	555×665×260	530×150 535×350	535×350
BF3-15044LD BF3-15044LW	555×260×665	555×665×260	530×150 535×350	535×350



## 2. Cabinet type

Code	Configuration	Dimension (W×H×D) mm
BF3-20044LC	2 modules	800x2200x800
BF3-25044LC	2 modules	
BF3-30044LC	2 modules or 3 modules	
BF3-35044LC	3 modules	
BF3-40044LC	3 modules or 4 modules	
BF3-45044LC	3 modules or 4 modules	
BF3-50044LC	4 modules	
BF3-60044LC	4 modules	



## Product Advantages

- **Harmonic Compensation:** The AHF can filter random harmonics ranging from the 2nd to the 50th order simultaneously, effectively improving power quality.
- **Reactive Power Compensation:** The AHF offers stepless compensation for both capacitive and inductive reactive power, with a programmable range from -1 to 1, allowing for precise adjustment according to system requirements.
- **Fast Response:** The AHF system features a fast response time, ensuring rapid correction of power quality issues to maintain system stability and efficiency.
- **Design Life:** With a design life exceeding 100,000 hours (equivalent to more than ten years), the AHF system provides long-term reliability and performance.



### **Extremely high reliability**

Three-level technology platform, excellent air duct design, flexible grid-connected technology, early warning monitoring function, maximum system reliability



### **Dynamic compensation mode**

Flexible setting for harmonic compensation, harmonic & reactive compensation, harmonic & three-phase unbalanced hybrid compensation modes according to application conditions



### **High efficiency, high power density**

Achieving 97% system efficiency and boasting the industry's highest power density, resulting in reduced system investment costs and operating costs



### **Easy to expand and maintain**

Featuring modular expansion and maintenance capabilities, with maintenance taking less than 15 minutes, ensuring maximum continuity of operation



### **Smart communication is easy to use**

Utilizing WIFI and GPRS communication methods, it's convenient for data collection and monitoring

## Select capacity according to transformer capacity and harmonic contamination level

Transformer capacity/KVA	THDI distortion rate					
	15%	20%	25%	30%	35%	40%
200	50A	50A	100A	100A	100A	100A
250	50A	100A	100A	100A	150A	150A
315	100A	100A	150A	150A	150A	200A
400	100A	150A	150A	200A	200A	250A
500	100A	150A	200A	200A	250A	300A
630	150A	200A	250A	300A	350A	400A
800	200A	250A	300A	350A	450A	500A
1000	200A	300A	400A	450A	550A	600A
1250	300A	350A	450A	550A	650A	750A
1600	350A	500A	600A	700A	850A	950A
2000	450A	600A	750A	900A	1050A	1200A
2500	550A	750A	900A	1150A	1300A	1500A

NOTE: This list just reference  
AHF capacity go from 80% load of transformet capacity

### Initial default settings

The parameter settings are described as follows:

Module parameter setting				
No.	Parameter item	Parameter setting		Remarks
1	Startup mode	Communication start <input type="checkbox"/>	Button start <input type="checkbox"/>	
		Auto start <input type="checkbox"/>	Load rate self starting <input type="checkbox"/>	
2	Local address setting	1		default
3	Compensation mode	Full compensation <input type="checkbox"/>		
		Compensation by harmonic order <input type="checkbox"/>		
4	Harmonic current compensation capacity	A		
5	Harmonic order	2 ~ 50		
6	Reactive power compensation function	On <input type="checkbox"/>	Off <input type="checkbox"/>	
7	Reactive current compensation capacity	A		
8	Unbalance compensation function	On <input type="checkbox"/>	Off <input type="checkbox"/>	
9	Unbalance compensation capacity	A		
10	Local mode	Single module <input type="checkbox"/>	Multi - module <input type="checkbox"/>	
		Single module+capacitor <input type="checkbox"/>		
11	External CT location	Load side <input type="checkbox"/>	Grid side <input type="checkbox"/>	
12	External CT ratio	/5		
13	Internal CT location	Single module <input type="checkbox"/>	Multi - module <input type="checkbox"/>	
		Single module+capacitor <input type="checkbox"/>		
14	Internal CT ratio	/5		
15	Phase sequence adaptation	On <input type="checkbox"/>	Off <input type="checkbox"/>	
16	Save	After the parameter setting is completed, enter the parameter saving interface and select to save the parameter		





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FOR LIFE**

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