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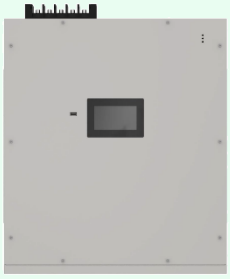
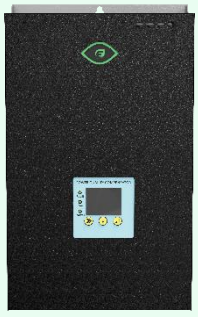
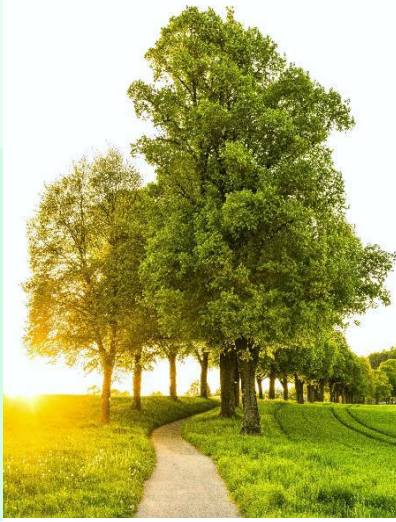
Enjoypowers' Power Quality Solutions

Active Harmonic Filter







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Catalogue

Power quality solutions———Active Harmonic Filter

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SinE-Series Active Harmonic Filter

General information

SinE-Series Active Harmonic Filter, operates on the base of a three-level topology circuit, provide power quality solutions such as eliminate harmonic, power factor correction, and load balance. The AHF module capacity of AHF modular from 30A to 200A, and allows 20 modules to connect parallel, and users can easily get the target filter current capacity.

Product value:

- Eliminate the harmonic current of nonlinear load
- Improve the operating efficiency of the power system and reduce the downtime of the power distribution system, especially for low-voltage systems with frequent load upgrades
- Meet the strict requirements of Utilities for electrical energy quality, avoid fines and power supply interruptions caused by electrical quality problems, and reduce carbon dioxide emissions

Features

- Harmonic compensation up to 50th harmonic
- fast reactive power compensation
- Load balancing between phases and unloaded neutral wire
- Compact design, 3 level topology
- Modular system extendable
- Grid resonance detection
- Hardware/software prevent resonance
- Dual DSP+FPGA Architecture
- Leading algorithm, fast response
- Accurate compensation
- User-friendly HMI
- High performance and reliability
- Insensitive to network conditions

Typical applications

Fast harmonic and reactive power compensation, eliminating 3rd and multiples of 3rd harmonics, reducing neutral current

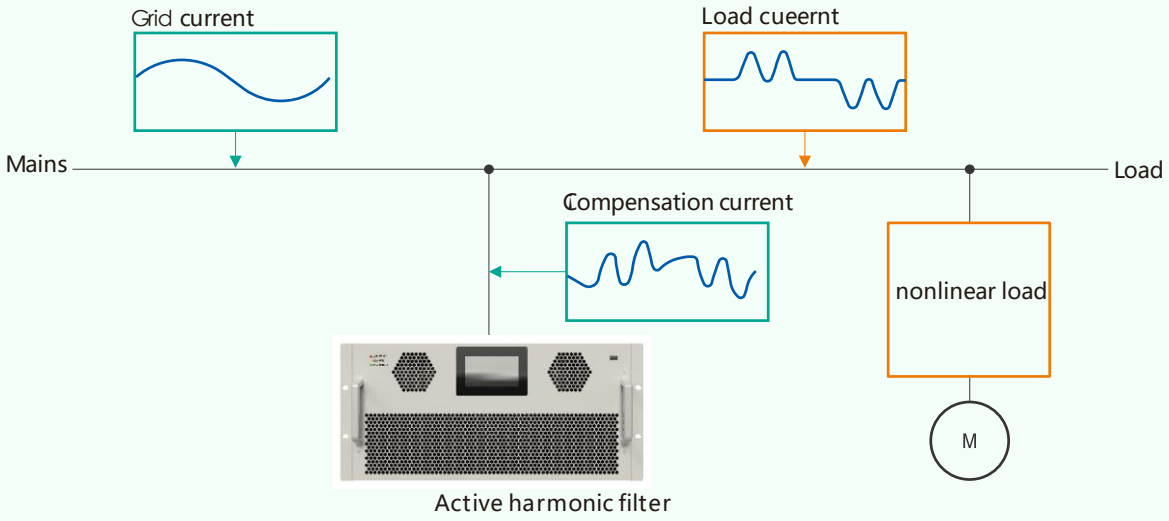
- Data Center and UPS system
- New energy power generation, e.g. PV and wind power
- Precision equipment manufacturing, e.g. single crystal silicon, semiconductor
- Industrial production machine
- Electrical welding system
- Plastic industrial machinery, e.g. extrusion machines, injection molding machines, molding machines
- Office building and shopping mall

Safety features

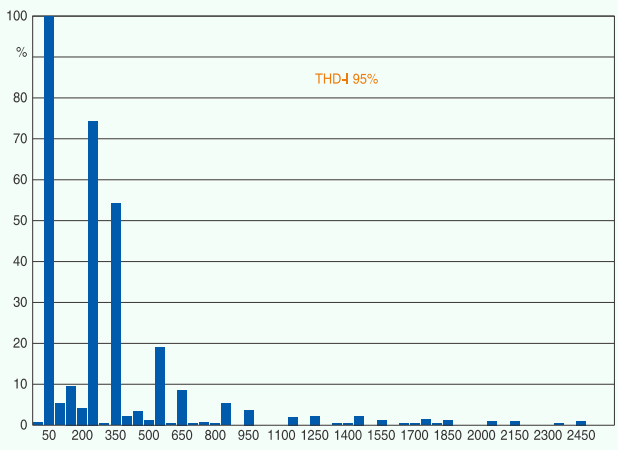
- Highest safety and reliability
- Overload protection
- Internal short-circuit protection
- Overheating protection
- Overvoltage and undervoltage protection
- Inverter bridge protection
- Resonance protection
- Fan fault alarm

SinE-Series Active Harmonic Filter

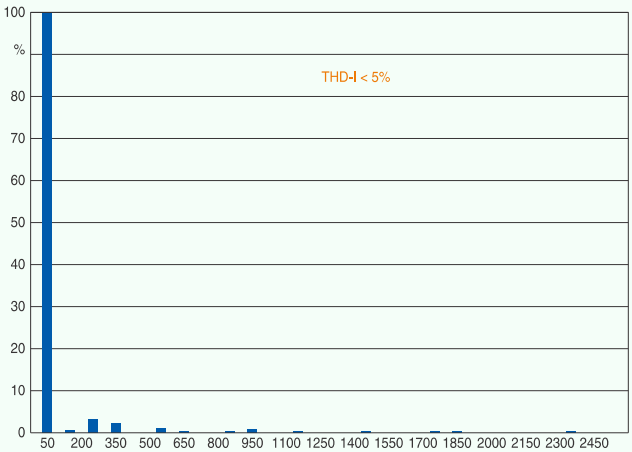
Active Harmonic Filter Working Principle



The THDi without AHF



The THDi with AHF



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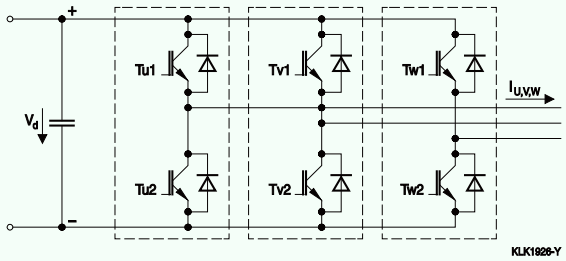
Advantages of 3-level topology

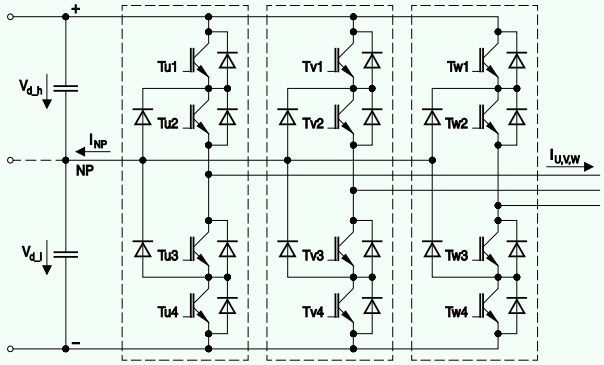
The active harmonic filter operates on a 3-level neutral point clamped (NPC) topology. As shown in the figure below, the traditional 2-level topology circuit structure consists of 6 IGBTs (2 IGBT power devices on each phase pin and current path), and in the 3-level topology, there are 12 IGBTs (in each phase 4 IGBT power devices on pins and current paths).

The 3-level topology circuit can generate three voltage levels at the output, including DC bus positive voltage, zero voltage and DC bus negative voltage. Two-level topology circuits can only output positive and negative voltages. At the same time, the three-level topology circuit also ensures higher quality and better harmonic output voltage, thereby reducing output filter requirements and associated costs.

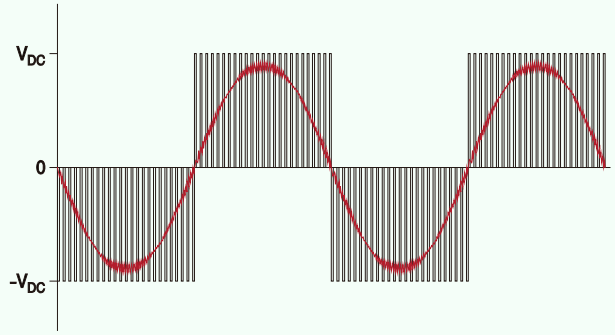
2-level topology circuit



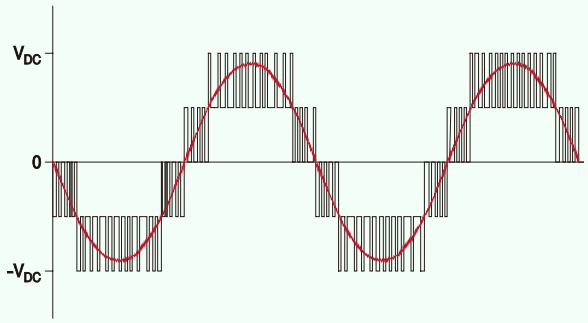
3-level topology circuit



Current and switched output voltage for a 2-level topology



Current and switched output voltage for a 3-level NPC topology



Main advantages of the 3-level NPC topology

- Lower losses: only half of the voltage has to be switched, thus reducing the switching losses in the transistor. Three-level solutions are characterized by reduced circuit losses and higher efficiency, thus supporting energy-saving concepts.
- Smaller output current ripple: the NPC three-level topology has a lower ripple in the output current and half of the output voltage transient thanks to a higher quality output voltage. This improves performance and reduces the internal filter requirement.

SinE-Series Active Harmonic Filter

Technical data and specifications			
Rated Voltage	200/400	480V	690V
Grid voltage range	-20%~+20%	Max Voltage 500v	-20%~+10%
Rated Current	50、75、100、150、200	50、75、100、150、200	75、100
Frequency	50/60Hz (-10%~+10%)		
Harmonic current compensation range	2nd to 50th harmonic order		
Rate of harmonic reduction	>97%		
CT configuration	Closed or open loop（Open loop is recommended in case of parallel operation）		
Overall response time	≤10ms		
Grid type	3P3W, 3P4W		
Overload capacity	110%-Continuous operation,120%-1min		
Circuit topology	3-level topology		
Switching frequency	20 kHz		
Modularity	Maximum 20 units can be combined		
Redundancy	Master/master or master/slave arrangement		
Typical power losses	< 2.5% (depending of the load)		
Target power factor	Adjustable from –1 to 1		
Harmonic compensation	Available		
Reactive power compensation	Available		
Unbalance compensation	Available		
Display	1.8/4.3/7-inch HMI（Optional）		
Communication ports	RS485		
	Modbus (RTU)		
Noise level	< 69 dB (depending on the load and model)		
Altitude	Derating usage >2000m		
Humidity	Operating Temperature：-35°C~55°C，Derating usage above 55℃		
	Storage temperature：-45°C~70°C		
Humidity	5%~95%RH，non-condensing		
Protection class	IP20		
Design/Approvals	EN 62477-1(2012)，EN 61439-1 (2011)		
EMC	EN/IEC 61000-6-4，Class A		
Certification	CE，CQC		

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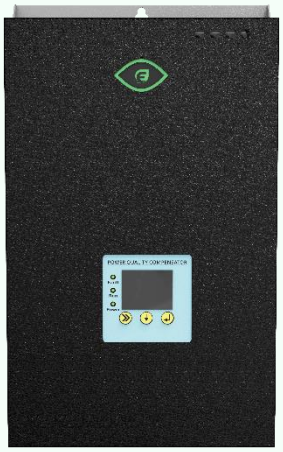
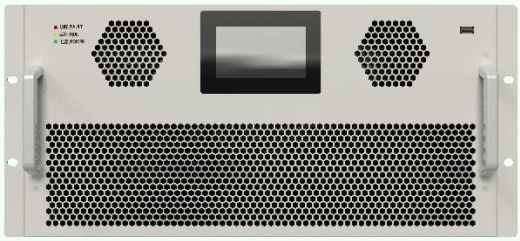
SinE-Series Active Harmonic Filter

Wall mounted AHF

Mini Wall mounted AHF

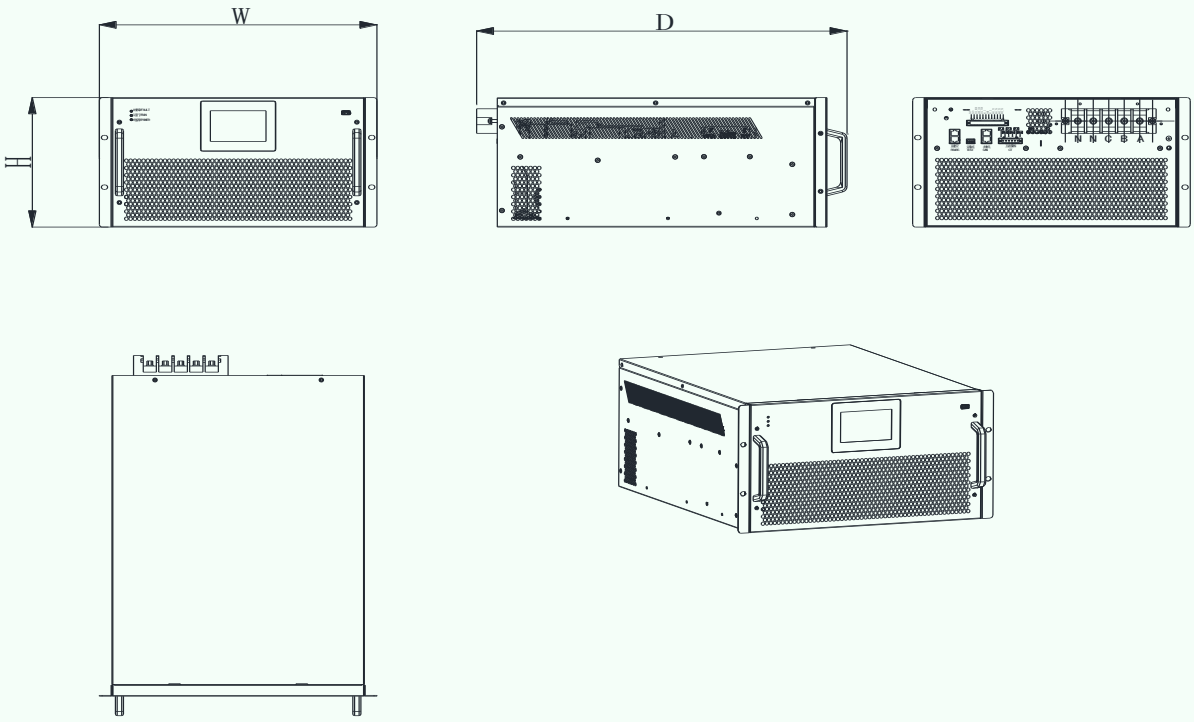


Rack mounted AHF



SinE-Series Active Harmonic Filter

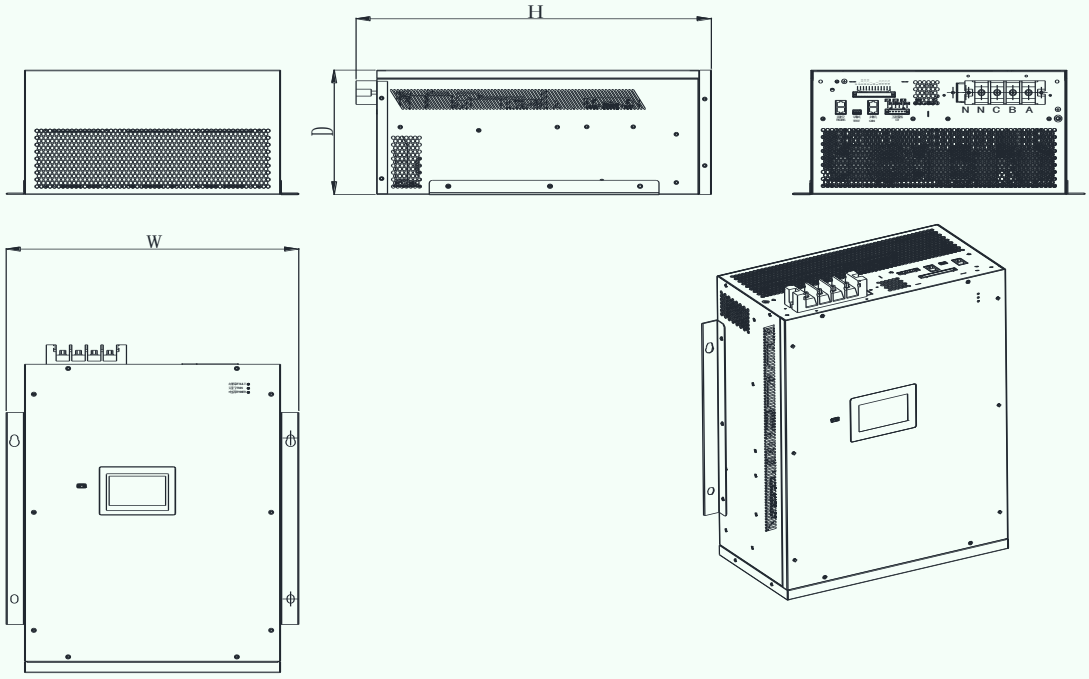
Rack-mounted AHF module



AHF modules		Approx. dimensions(W×D×H, mm)	Approx. weight (kg)
200V/400V/480v	50A	355×538×200	22
	75A	399×626×200	27
	100A	484×646×232	38
	150A	554×656×250	47
	200A	674×715×250	56
690V	100A	569×697×250	50

SinE-Series Active Harmonic Filter

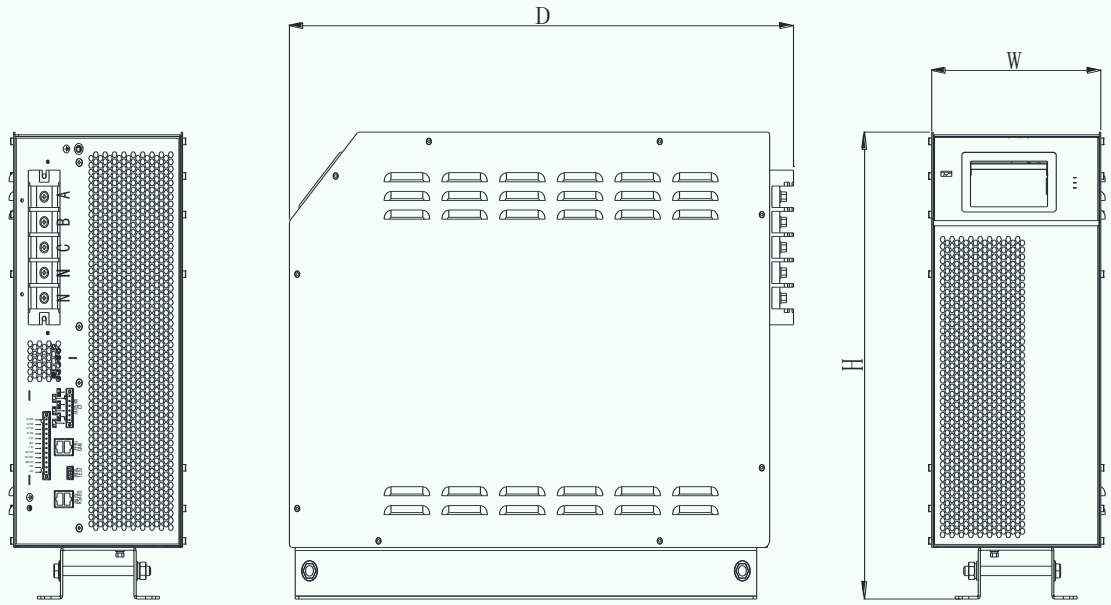
Wall-mounted AHF modules



AHF modules		Approx. dimensions(W×D×H, mm)	Approx. weight (kg)
200V/400V/480V	50A	378×200×525	22
	75A	418×200×556	27
	100A	503×232×611	38
	150A	573×250×621	47
	200A	694×250×680	56
690V	100A	588×250×662	50

SinE-Series Active Harmonic Filter

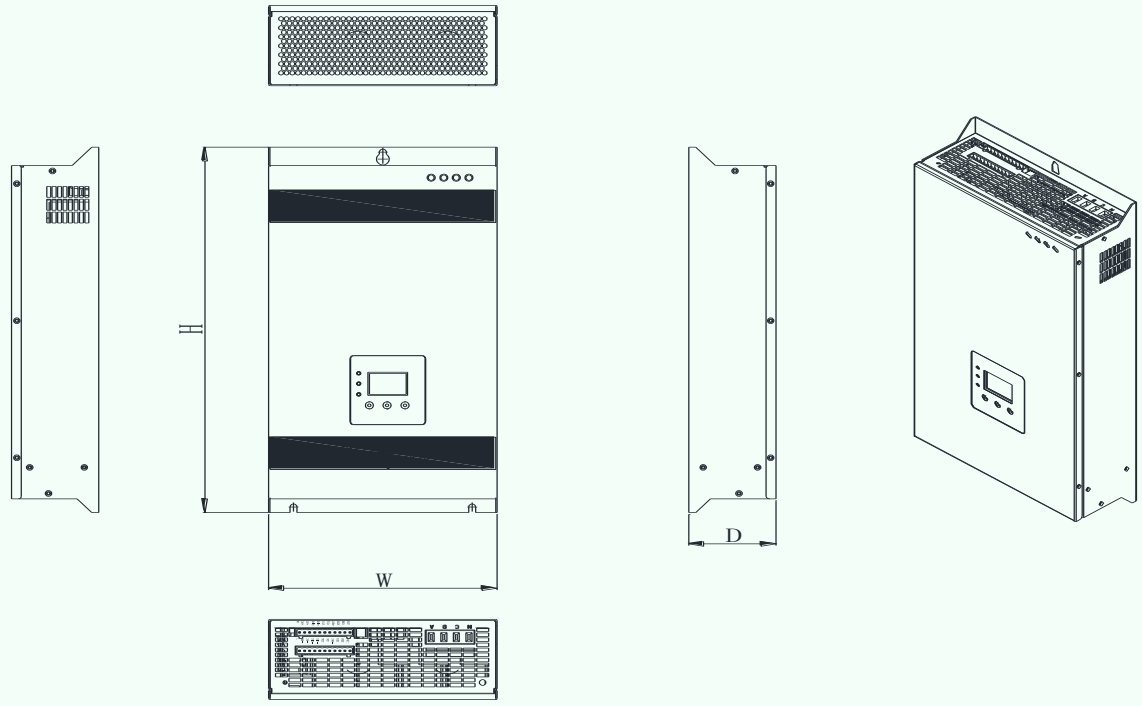
Vertical-mounted AHF modules



AHF modules		Approx. dimensions(W×D×H, mm)	Approx. weight (kg)
200V/400V/480v	50A	202.2×575×372.4	22
	75A	202.5×638×418	27
	100A	234.5×699×498	38
	150A	251.5×689×568	47
	200A	251.5×748×688	56
690V	100A	251.5×755×583	50

SinE-Series Active Harmonic Filter

Mini wall-mounted AHF modules



AHF modules		Approx. dimensions(W×D×H, mm)	Approx. weight (kg)
200V/400V	30A	230×88×400	8

Recommended reference value

Cable cross-section and fuses					
AHF Current	A/B/C（L1/L2/L3） mm²	N mm²	N mm²	PE mm²	Fuse A
50A	16	25	-	16	80
75A	25	35	-	16	125
100A	35	35	35	16	160
150A	50	50	50	25	250
200A	70	70	70	25	400

*The specifications given in the table above are recommended values under rated operating conditions, from ambient temperature to +35 °C.

*It is recommended to use copper core wire.

CT			
CT Radio	50/5~10000/5. Choose according to 1.2~1.5 times of grid current, or choose according to transformer capacity		
CT cable	CT rated power	Conductor cross-sectional area mm²	Wire length m
	5VA	2.5	≤10
		4.0	10~20
	10VA	2.5	≤20
		4.0	20~40
	15VA	2.5	≤30
		4.0	30~60

*CT rated secondary power is greater than 1VA;

*CT accuracy is required to be above 0.5;

*The secondary side of the CT must be reliably grounded (only one end needs to be grounded);

*CT cable is recommended to use shielded twisted pair cable (RVVP)

Cooling Requirements for Active Harmonic Filter Cabinets				
Module current		Demand of air volume （L/Sec）	Minimum air inlet area mm²	Minimum opening size of front and rear door panels mm²
400V	50A	150	26000	383×87
	75A	225	30000	383×100
	100A	300	35000	383×120
	150A	450	55000	430×140
690V	100A	500	60000	460×140

*Example: 400A AHF cabinet, the air volume requirement is 1200L/Sec, the minimum air inlet area is 140000 mm², and the minimum opening area is 383×120×4 mm²

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