



Marstech Systems Pte Ltd

Active Power Filter



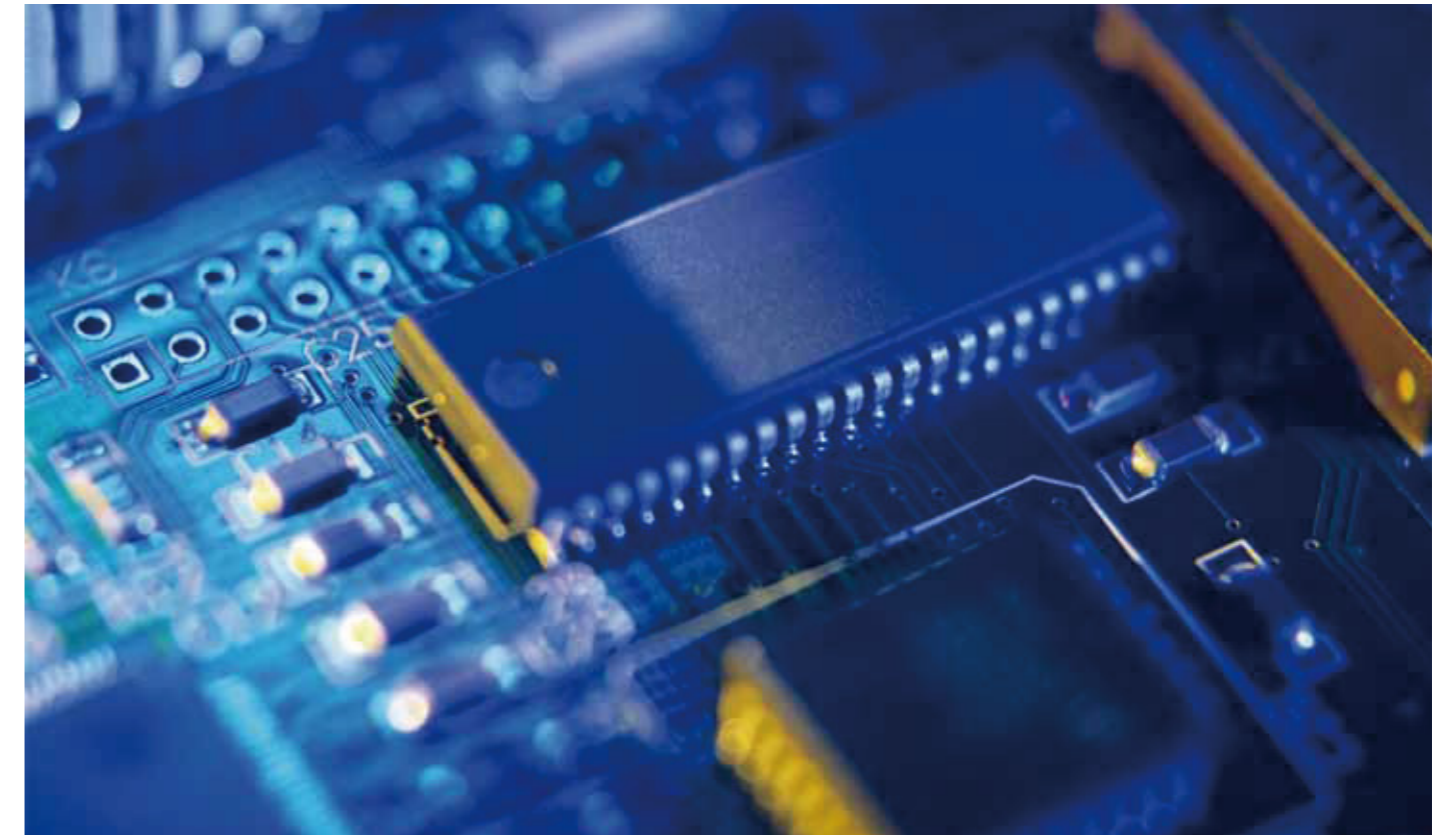
We bring the green power

The best harmonic solution

Recently, power electronic devices are widely applied in electric power equipment, such as uninterruptible power supply, motor driver, arc furnace, trolley car, battery charger, and lighting appliance. The electric power equipment may generate a large amount of harmonic currents due to the nonlinear input characteristic of such loads. The harmonic current will pollute the power distribution system and result in transformer over-heat, rotary machine vibration, degrading voltage

quality, and destruction of electric power components and equipment. It is extremely urgent to bring the harmonic pollution under control.

Active Power Filter (APF) is the most efficient equipment to dispose the power harmonic pollution, enhance the power quality, ensure the safety of the power and equipment, and bring about the green power finally.

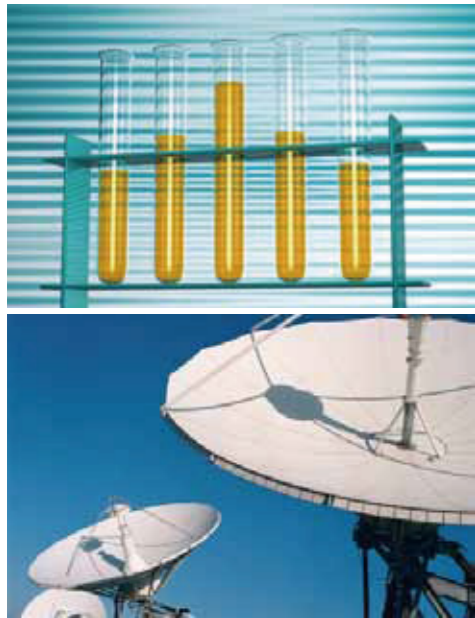


Harmonic harm

Harmonic pollution may disturb electrical equipment and systems' normal operation badly, and causes the following problems:

- Over voltage/current in the distribution network
- Overheat power cables, transformers, & generators
- Overheating in all types of electronics systems causing component failures
- Nuisance tripping in circuit breakers and protection relays
- Malfunction of automatic control system
- Damage to capacitors due to resonance
- Inaccuracy of instrument measurement
- Interference to telecommunication systems
- Voltage distortion and lagging in power factor



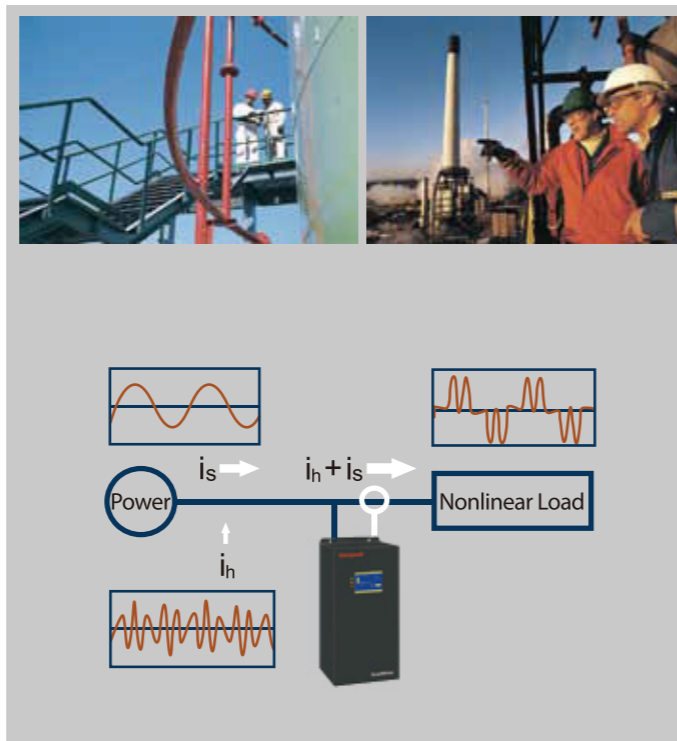


Main features

- Active power filter, fully improve the power quality.
- DSP full digital control, 20kHz switching frequency, immediately response for the load's little change.
- Truly closed-loop control, more than 97% of the harmonic filtered.
- Harmonic order compensation can be selected, up to 51st order.
- Reactive power compensation also can be selected.
- Capability of phase imbalance compensation.
- Automatically limit the current, over-current not happened.
- High efficiency , wastage less than 3% with full-load.
- Shunt connection, easy for maintenance.
- Reduce the net wastage and eliminate the overheating of transformer and motor to achieve the good saving-energy.
- Filter effect holding the line with impedance change, automatically eliminate the harmonic.
- According to the power configuration ,partial or full compensation, selectable CT install on source side or load side.
- Easy for extending and redundancy design, up to 10 units parallel connection with different capacity ,smart redundancy function.

Working principle

Soft-start Resistor Module pre-charges the DC capacitor to avoid from any inrush current while connecting NCAH to grid initially. When the voltage of the DC capacitor reaches the setting value, the contactor of soft-start module switches on and bypass the pre-charge resistor. Then, the IGBT power converter module start to generate harmonic and reactive current to improve the power factor and eliminate load harmonic. Ripple current filter module filter the high-frequency ripple current from IGBT power converter to avoid high-frequency harmonic pollutions



Interface

NCAH APF has user-friendly control interface which can be easily operated.

With the LCD graphic multifunctional display, users can easily read the electrical date, current and voltage waveform and spectrum, manage the NCAH APF and monitor the power quality. Users can easily read the information below and operate it in these sections: NCAH APF, load side and source side:

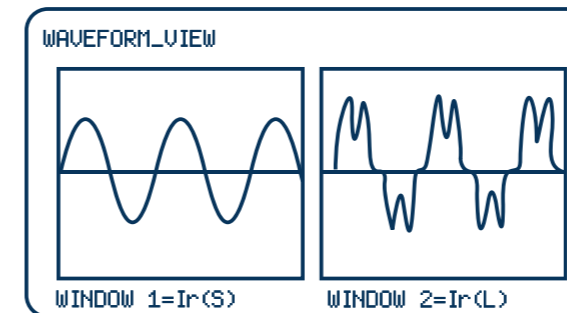
- Voltage, current, frequency, power factor and THD etc.
- Waveform and spectrum data (up to the 31st order)
- System management and parameter setting
- Status and alarm, fault
- Event Log

NCAH APF also provides 4 standard relay outputs for remote monitor: power, running, alarm and fault.

PC monitoring module (optional)

NCAH APF provides the communication interface below:

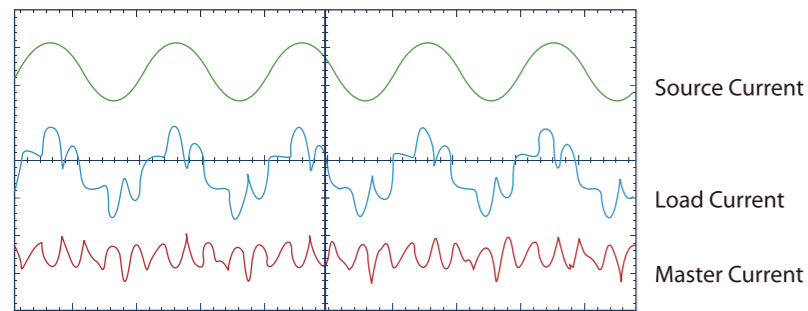
- COM port : RS232/RS485
- Ethernet, RJ45



Application case

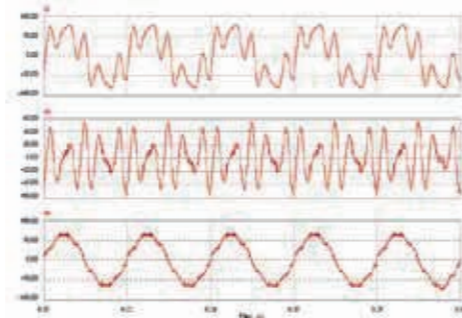
A semiconductor manufacturing factory, there are two chip assembly and test plants, and a data analysis center. A lot of low-voltage VFDs, UPS and other non-linear loads are installed in the factory. Equipment can not power off during normal operation, when power-down will result in tens of millions of dollars loss. There are transformers and various protective devices in the power distribution room. During the test run at the factory, transformer overheating and protective equipments malfunction phenomenon is happened. After measured, large 3,5,7,11,13 harmonics are existence and exceed the limits of IEEE519-1992 standard.

After concentrative compensation for the equipments in the workshop of choosing each NCAH-4L/200-400,, the current THD declined significantly and meet the IEEE519-1992 standard. It successfully solved the problems of transformer overheating and protection equipment malfunction to eliminate the huge losses caused by a sudden power outage.

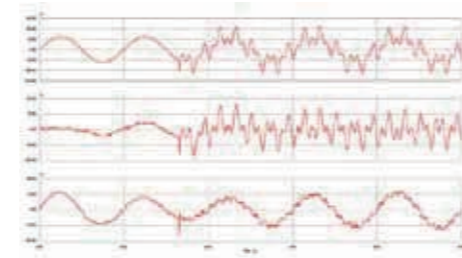


Application fields

Semiconductor, Metro, Telecommunication, Bank, Hospital, Smart Building, Oil and Gas, Chemical, Power, Mining, Papermaking, Printing, Automobile Manufacture, Oceanic Oil and so on.



Steady State Performance



Dynamic Response

Specification

Item	Unit	60A	120A	180A	240A	300A	360A	420A	250A	500A		
Input Voltage	V	400, (+20%~-40%)								690, (+15%~-30%)		
Phase/Wires		NCAH 3L:3 phase 3 wires NCAH 4L:3 phase 4 wires										
Frequency	HZ	50/60 ±5%										
Maximum Compensation Current/Phase	Arms	60	120	180	240	300	360	420	250	500		
Maximum Compensation Current for Natural(*)	Arms	180	360	540	720	900	1080	1260	750	1500		
Response Time	ms	<1ms										
Inrush Current		Less than rated current										
Current Limitation		Yes, at full correcting										
Noise	dB(A)	≤65										
Color		RAL7032(Optional)										
Protection Index		IP 31							IP 23			
Dimensions(W D H)	mm	510x694x215			600x800x2200				800x600x2200		1600x600x2200	
Weight	kg	35			250	290	330	370	410	450	420	840
Installation		Wall Mounting		Floor Standing								
Filter Performance		2rd to 51st Order(whole or Selectable)										
Controller		Full Digital DSP Design										
Switching Speed		20 KHz										
Communications		RS232 (standard),RS485,TCP/IP (optional)										
Equipment Storage Temperature		-40 C ~+70 C										
Operating Temperature		-25 C ~+50 C										
Relative Humidity		<95%Non-condensing										
Operating Altitude		≤ 2000m										
Reference Harmonic Standard		IEEE 519-1992										
Reference Design Standard		EN60146										
Reference Safety Standard		EN50178										
Reference EMC Standard		EN 61000-6-2:2005+AC: 2005, EN 61000-6-4:2007/A1:2011,EN 61000-3-2:2006+A2:2009, EN 61000-3-3: 2013										

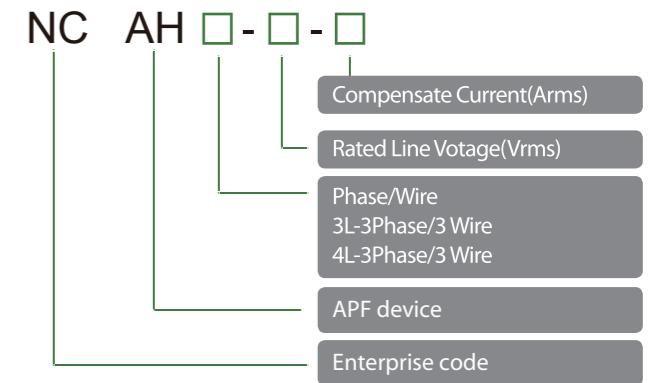
(*) Only for NCAH 4L

Capacity selection

There is no need to measure the impedance of the power system or analyze the load harmonic spectrum &their individual amplitude. The selection is based on the known estimated load harmonics current amplitude (ILh) to be compensated, and then select the NCAH model which has the output compensating current rating greater than that of the ILh .Generally, we recommend a 20% higher rating than the ILh to be compensated.

NCAH APF has 2 types: NCAH 3L and NCAH 4L. NCAH 3L is 3phases/3wires active power filter and adapt to 3phases/3wires power systems. NCAH 4L is 3phases/4wires active power filter and adapt to 3phases/4wires power systems, and it can compensate neutral line's harmonic current besides NCAH 3L's functions.

Example: NCAH 4L/100-400 represents the NCAH APF 3 phases /4 wires, its compensate current is 100A and rated line voltage is 400V.



NCAH Active Power Filter Passed CE Certification



Power Quality General Controller based on Active Power Filter

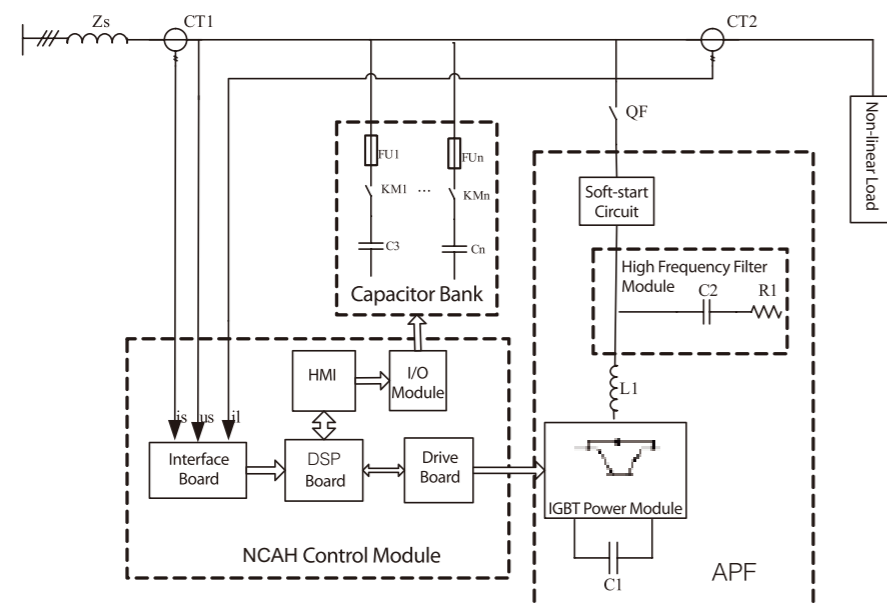
NCAH Plus

Technical background

Recently, the reactive power compensation usually chooses shunt capacitor bank which has many characteristics such as simple structure, easy control, big capacity, easy extending and so on. However the shunt capacitor bank can't eliminate harmonic efficiently and this may cause the series and parallel resonance with the system impedance. In the application field of need large amount of reactive power compensation and harmonic elimination, shunt capacitor bank and APF will be generally parallel installed and controlled respectively, which may change the load's equivalent harmonic impedance and cause the current coupling problem. So, it needs special design to keep system stable running.

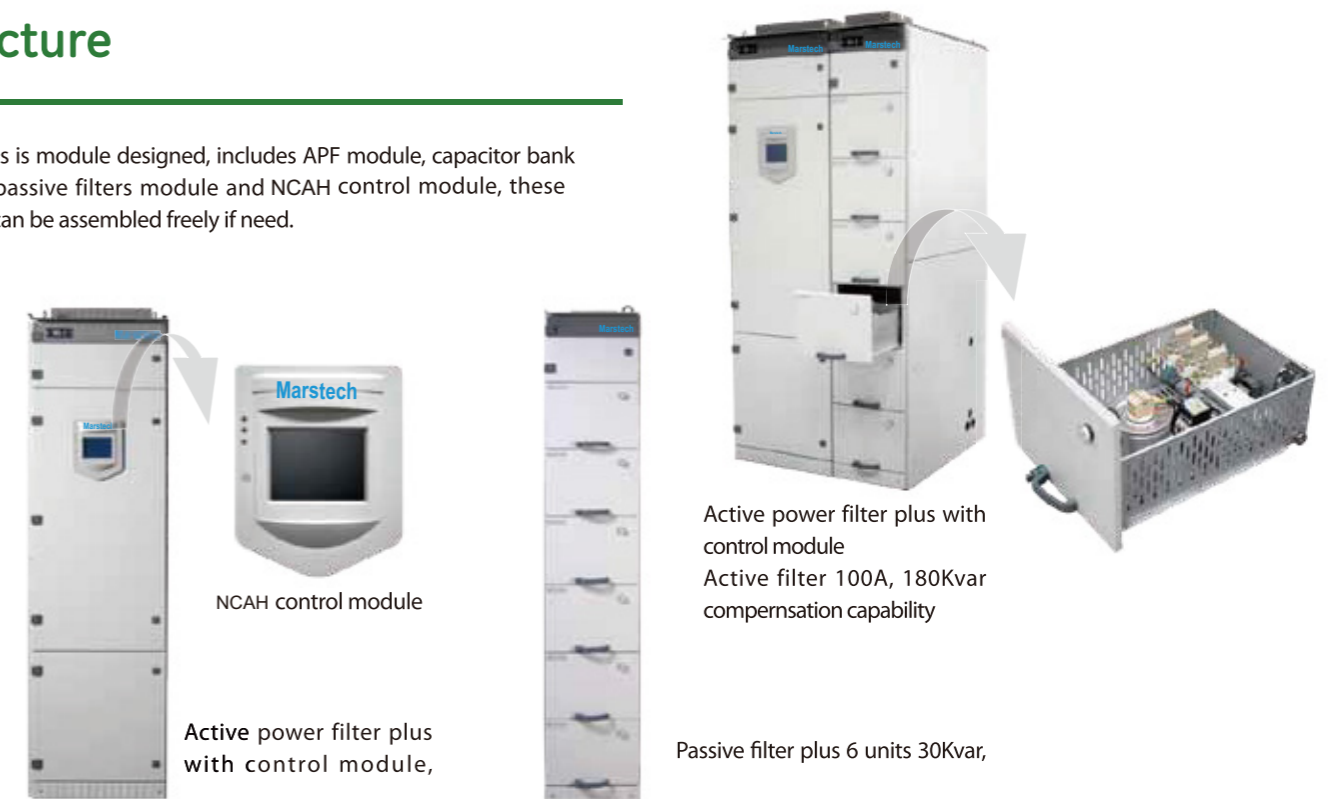
Product principle

NCAH Plus Power Quality General Controller combines capacitor bank, passive power filter and APF for parallel connection and control them as a complete system. NCAH Plus can compensate large reactive power, eliminate the power harmonic with avoiding the resonance between capacitor bank and system impedance. It can also enhance the equipment's stability and reduce the custom cost with only one control module.



Structure

NCAH Plus is module designed, includes APF module, capacitor bank module, passive filters module and NCAH control module, these modules can be assembled freely if need.



Features

- Integrate multi power quality solutions
- NCAH Control Module, easy configured
- Higher Cost-effective
- Module design, function module can be easily expanded.
- On line maintenance and long life
- Resonance protected automatically
- User-friendly interface, graphic show, operating easily
- Small cubage, aesthetic appearance and easily install.



NCAH Plus

Advantage

Item	Conventional power quality disposal solution	NCAH Plus
Effect	Effect not good, not fully improve power quality	Improve harmonic and power factor significantly
Security	Sometimes not protect itself	Safe, roundly meet all the safe problem of equipment caused by power pollution
Expansibility	Difficult to expand	Module design and easy to expand
General Cost	High	Low
Flexible ability with the power's pollution changing	Weak, need design and adjusting again	Strong, rapidly response with the control module

Specification

Dimension of APF module:

Module Type	Width(mm)	Height(mm)	Depth(mm)	Note
60A-420A	600	2200	800	

Specification

Dimension of Capacitor bank module:

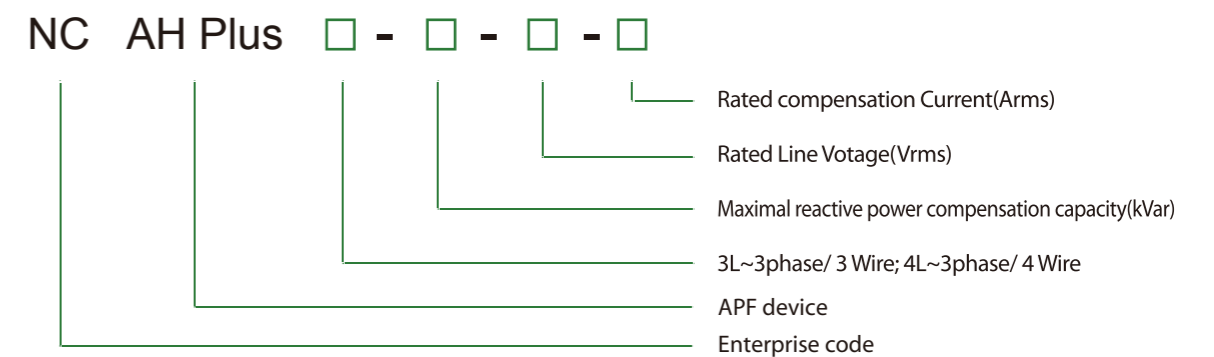
Capacitor bank module uses the drawer type combination structure, each cabinet's dimension is 400*800(1000)*2200, and the amount of included drawers is up to 6. Each drawer's capability is up to 30kVar.

One NCAH Plus power quality controller can be assembled with 2 capacitor compensation modules. Standard capacitor compensation module's dimension is as below:

Module Type	Width(mm)	Height(mm)	Depth(mm)	Note
30KVar-250KVar	600(1000)	2200	800(1000)	

Note: Following the customer requirements, capacitors with different capacity can be installed.

Capacity selection



Example:

NCAH Plus 3L/150-380-100 represents the NCAH Plus series Power Quality Controller: 3 phases /3 wires, maximum reactive power compensation capability is 150kVar, rated line voltage is 380V, rated harmonic compensation current is 100A. it's compensate current is 100A and rated line voltage is 400V.