

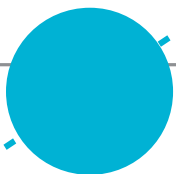
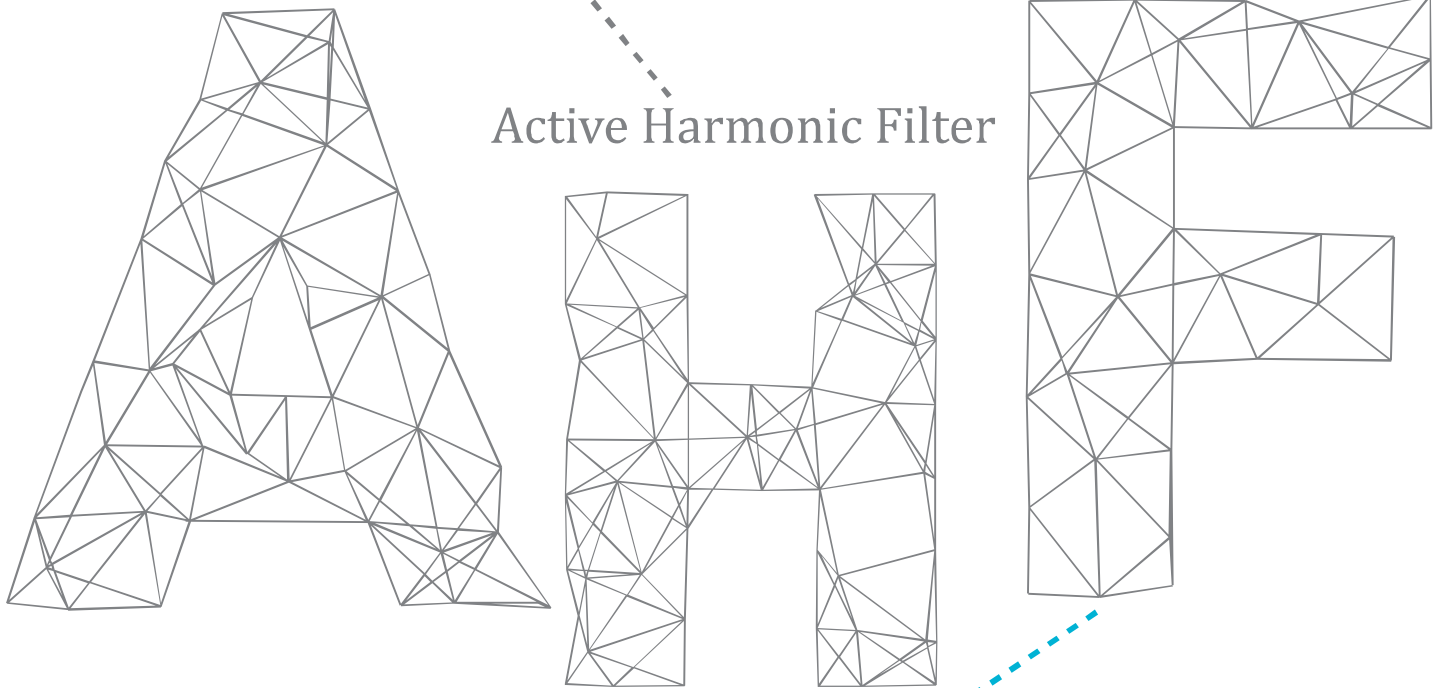
***Sinexcel***

***MH***

Power Quality

Intelligent FFT

Active Harmonic Filter



Harmonic Mitigation

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Modular  
Solution

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# Active Harmonics Filter

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# CAUSES & EFFECTS OF HARMONICS

## NONLINEAR LOADS

### INDUSTRIAL EQUIPMENT

Induction furnaces,  
static converters,VFD,  
welding machines

### OFFICE EQUIPMENT

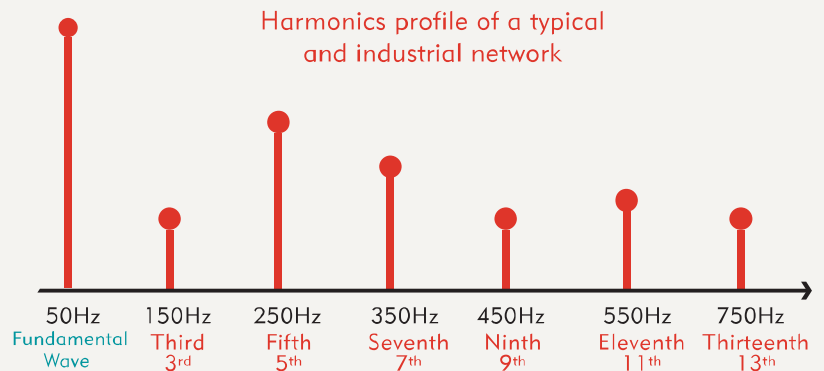
Computers, servers, printers,  
LED lights

### HOUSEHOLD APPLIANCES

Fluorescent lightings, TV LED display  
dimmers, microwave ovens,  
inverter airconditioners

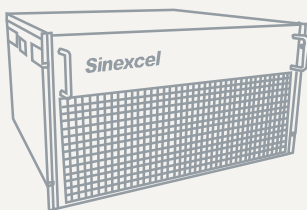
### UNINTERRUPTIBLE POWER SUPPLIES (UPS)

Non-Linear loads draw harmonic current on the supply network which introduce a voltage distortion back to the supply line. Loads sharing the same supply network will experience an increased electrical stress due to this voltage distortion. Their working life span, stability and efficiency will be greatly impacted.



## SOME OF THE COMMON EFFECT FROM HARMONICS DISTORTION ARE:

- Power factor capacitor failure
- Nuisance tripping of circuit breaker
- Power supply unit failure of computer, power electronics, PLC controller
- Overheating of neutral conductor
- Hot spot formation on switchboard busbar joints
- Cable Installation

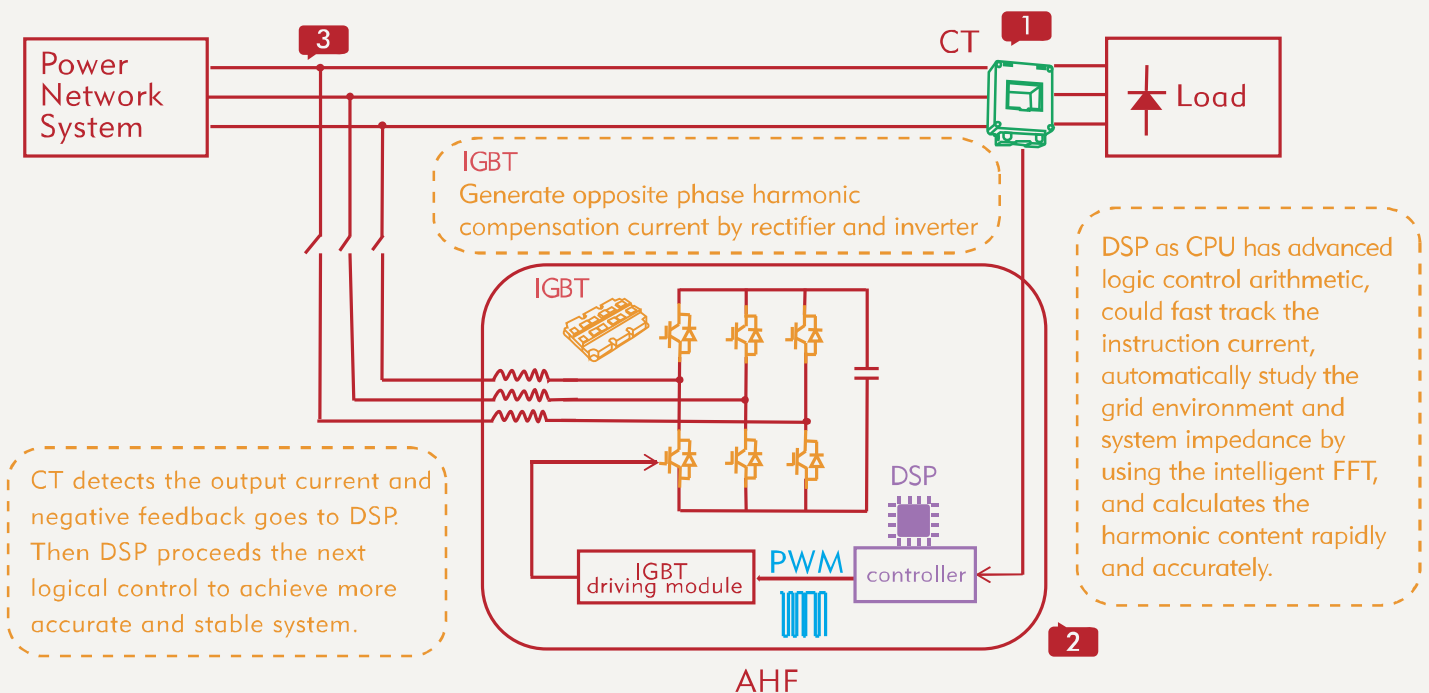


AHF

# AHF WORKING PRINCIPLE



External CT detect the load current, DSP as CPU has advanced logic control arithmetic, could fast track the instruction current, divides the load current into active power and reactive power by using the intelligent FFT, and calculates the harmonic content rapidly and accurately. Then sends PWM signal to internal IGBT's driver board to control IGBT on and off at 20KHZ frequency. Finally generates opposite phase compensation current on inverter induction, at the same time CT also detects the output current and negative feedback goes to DSP. Then DSP proceeds the next logical control to achieve more accurate and stable system.

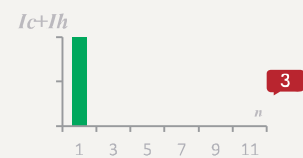
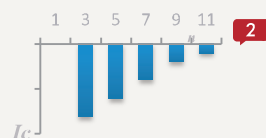
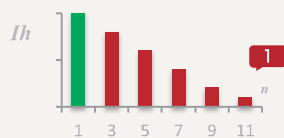


LOAD

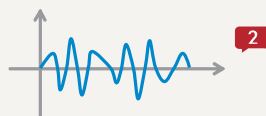
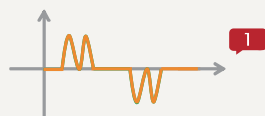
AHF

SOURCE

SPECTRUM

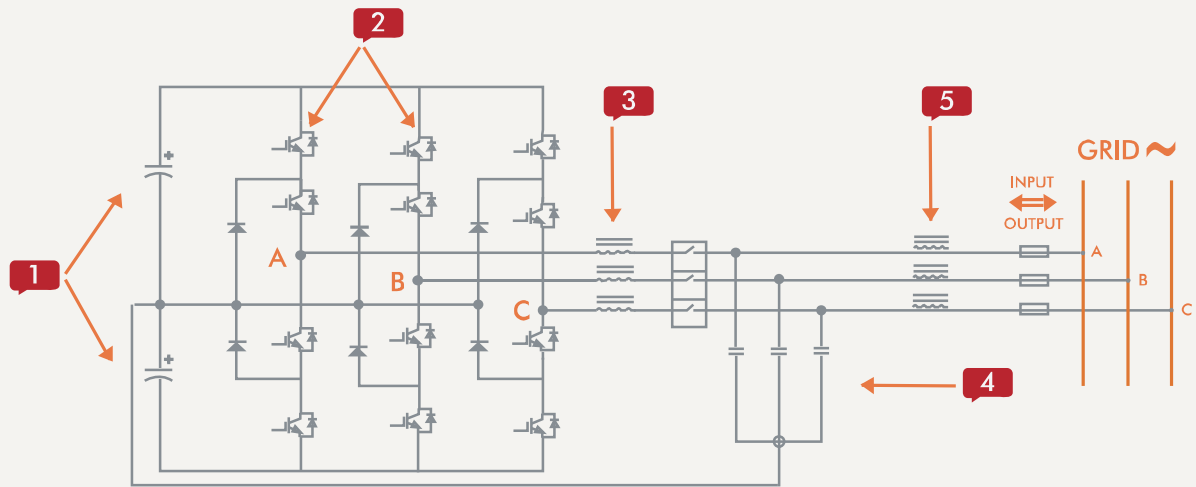


WAVEFORM





# ADVANCED DESIGN FEATURES



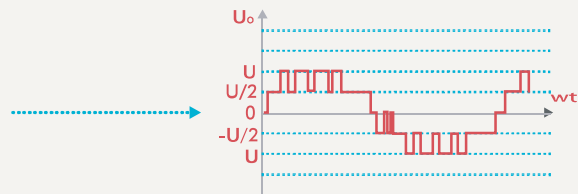
## DC BUS CAPACITOR

AC to DC rectifier storage

## IGBT

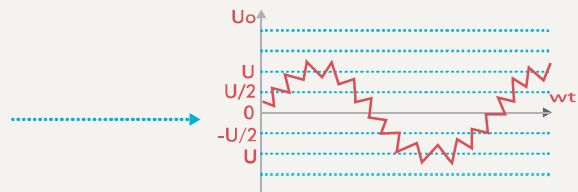
Controlled by DSP software algorithm, IGBT on-off timing selection and length could control inverter to generate a harmonic current.

IGBT generates square wave, it's outline is like sinusoid.



## INVERTER INDUCTION

The square wave will convert into triangular wave, which is more like sinusoid after inverter inductor.



## LC FILTER CIRCUIT

LC filter circuit filter out impurities of the harmonic.

## HIGH FREQUENCY INDUCTOR

Both for filtering. The combination of LC filter circuit and high frequency inductor are called LCL filter circuit



# KEY FEATURES AND BENEFITS

## MODULAR DESIGN

Ultra-compact design, wall and rack mount installation, easy to use in new or exiting switch room upgraded

Modular structure with highest reliability of system

3P4W and 3P3W adapted by same modules, same harmonic mitigation capability

## INTELLIGENT FFT

Unique intelligent FFT algorithm automatically study the electrical system impedance, to prevent system from resonance, high system reliability

Real time electrical system resonance monitor and management

## GRAPHICAL USER INTERFACE

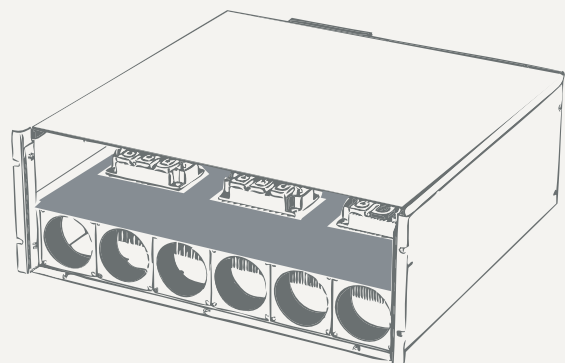
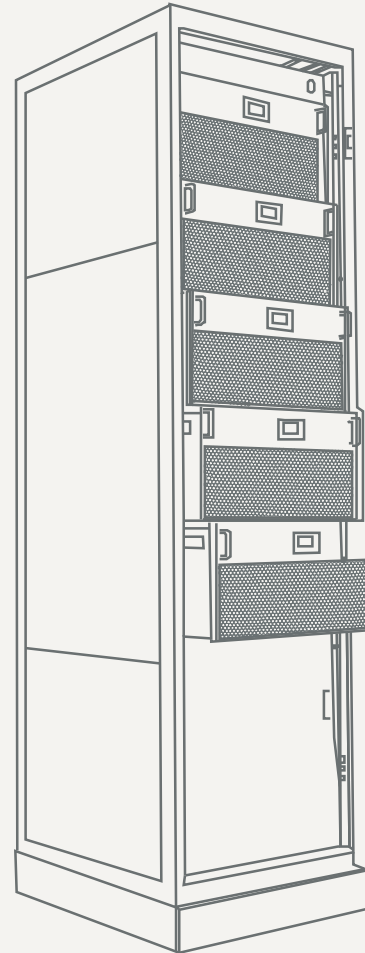
Module: 4.3 inch HMI, cabinet: 7 inch central HMI

Display electrical system voltage, current, frequency, before and after THDi, Apparent/Active/Reactive power, etc

Display before and after waveform, spectrum in same page with clear comparison

## MAINTENANCE FREE DESIGN

Independent air flue, separate electronic components from air flue. Free of dust cleaning maintenance requirement, improve product reliability



**AHF****SPECIFICATION 400V NETWORK TYPE**

Items	400V				
	Sinexcel AHF 005/010/015	Sinexcel AHF 025/035	Sinexcel AHF 050/060	Sinexcel AHF075/ 100	Sinexcel AHF 150
System parameters					
Rated input	380V/415V(228V~456V)				
Power grid frequency	50/60Hz(range : 45Hz~62.5Hz)	50/60Hz(range : 45Hz~62Hz)			
Parallel quantities	unlimited				
Efficiency	≥ 97%				
Power grid structure	3P3W, 3P4W				
CT	50/5 ~ 10,000/5A	150/5 ~ 10,000/5A			
Circuit topology	3-level				
Performance indicators					
Rated capacity	5A/10A/15A	25A/35A	50A/60A	75A/100A	150A
Harmonic compensation	Available				
Reactive power compensation	Available				
Unbalance compensation	Available				
Control algorithm	FFT, Intelligent FFT, and instantaneous reactive power				
Operation mode	12 combination, set up priority				
Filtering range	2 <sup>nd</sup> to 61 <sup>th</sup> orders	2 <sup>nd</sup> to 50 <sup>th</sup> orders			
Filtering order	Individual Programmable				
Filtering degree	2 <sup>nd</sup> to 61 <sup>th</sup> orders	2 <sup>nd</sup> to 50 <sup>th</sup> orders			
Filter performance	> 95%				
Reaction time	<15μs	<50μs			
Overall response time	5ms	< 5ms			
Target power factor	Adjustable from -1 to +1				
Switching frequency	90kHz	average 20kHz,maximum 35kHz			
Cooling air requirement	44 L/sec	75 L/sec	151 L/sec	300 L/sec	405 L/sec
Noise level	< 55dB	< 56dB			
Communications and monitoring capabilities					
Communications ports	RS485	RS485, and network port(RJ45)			
Communications protocols	Modbus	Modbus (RTU),TCP/IP(Ethernet)			
Module display interface	WIFI display	4.3-inch HMI (module), 7-inch HMI (Central monitor), LED			
Protection functions	over-voltage protection, under-voltage protection, short-circuit protection, inverter bridge inverse protection, over-compensation protection, and more				
Monitoring alarm	Available				
Fault alarm		Available, at most 500 alarm records			
Mechanical properties					
Mounting type	Wall-mounted/Rack-mounted	Wall-mounted/Rack-mounted/Cabinet			
Dimensions (W x D x H) mm <sup>2</sup>	400*325*44.5 (Rack-mounted) 400*44.5*325 (Wall-mounted)	440*490*150 (Rack-mounted)	440*590*190 (Rack-mounted)	440*600*230/500*600*190 Rack-mounted	500*560*267 (Rack-mounted)
		440*150*470 (Wall-mounted)	440*190*617 (Wall-mounted)	440*230*625/500*190*584 (Wall-mounted)	500*280*557 (Wall-mounted)
Net weight	4.98kg	18kg	35kg	36kg	48kg
Color	Black/gray/blue/orange/red (sand blast)	Black			
Environment requirements					
Altitude	≤ 1500 m; Between 1500 m to 4000 m, according to GB/T3859.2, the power decreases by 1% for every additional 100 m.				
Ambient temperature	-10℃~40℃ (may derate capacity if ambient temperature exceeds 45℃)				
Relative humidity	5% to 95%, non-condensing				
Protection class	IP20				
Related qualifications and standards					
Qualifications	CE, IEC 61000				
Standards compliance	IEEE519, ER G5/4				

Items	480V	600V	690V
	SinexcelAHF 35/50/75/90	SinexcelAHF 35/50/75/90	SinexcelAHF 35/50/75/90
System parameters			
Rated input	480V(384V~552V)	600V(420V~690V)	690V(483V~793V)
Power grid frequency	50/60Hz(range : 45Hz~62Hz)		
Parallel quantities	unlimited		
Efficiency	≥ 97%		
Power grid structure	3P3W, 3P4W		
CT	150/5 ~ 10,000/5		
Circuit topology	3-level		
Performance indicators			
Rated capacity	35/50/75/90A		
Harmonic compensation	Available		
Reactive power compensation	Available		
Unbalance compensation	Available		
Control algorithm	Intelligent FFT, FFT, and instantaneous reactive power algorithm		
Filtering range	2 <sup>nd</sup> to 50 <sup>th</sup> orders		
Filtering degree	Individually Programmable		
Filter performance	> 95%		
Reaction time	< 50μs		
Overall response time	< 5ms		
Target power factor	Adjustable from -1 to +1		
Switching frequency	20kHz		
Cooling air requirement	359 L/sec		
Noise level	< 65dB		
Communications and monitoring capabilities			
Communications ports	RS485, and Ethernet port (RJ45)		
Communications protocols	Modbus (RTU)		
Module display interface	7-inch LCD touch screen(rack-mounted) : 4.3-inch LCD touch screen(wall-mounted)		
	over-voltage protection, under-voltage protection, short-circuit protection, inverter bridge inverse protection, over-compensation protection, and so on		
Monitoring alarm	Available		
Fault alarm	Available, at most 500 alarm records		
Mechanical properties			
Mounting type	Wall-mounted/Rack-mounted		
Dimensions (W x D x H) mm <sup>2</sup>	544*640*250 (Rack-mounted) 504*253*640 (Wall-mounted)		
Net weight	66kg		
Color	Black		
Environment requirements			
Altitude	≤ 1500 m; Between 1500 m to 4000 m, according to GB/T3859.2, the power decreases by 1% for every additional 100 m.		
Ambient temperature	-20℃ ~ 40℃ (may derate capacity if ambient temperature exceeds 45℃)		
Relative humidity	5% to 95%, non-condensing		
Protection class	IP20		
Related qualifications and standards			
Qualifications	CE, ETL (UL508), IEC 61000		
Standards compliance	IEEE519 , ER G5/4		

# AHF 400V NETWORK TYPE



AHF 25 / 35A (wall mount)



AHF 25 / 35A (rack mount)

# AHF 400V NETWORK TYPE



AHF 50 / 60A (wall mount)



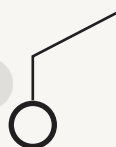
AHF 75 / 100A (rack mount)

# AHF 400V NETWORK TYPE



AHF 150A (rack mount)

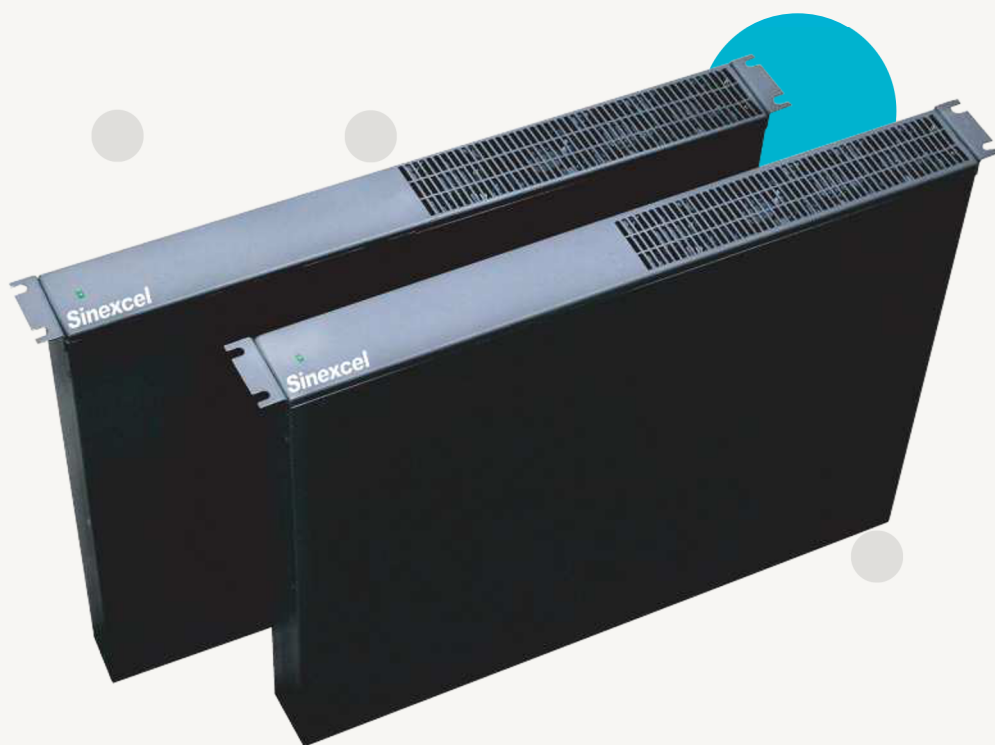
# AHF 480 / 600 / 690V NETWORK TYPE



AHF 90A (rack mount)



# AHF 400V NETWORK TYPE



AHF 5 / 10 / 15A (wall / rack mount)

# CABINET FOR RACK MOUNT

(Optional)



## Flexible Engineered Cabinet

- Dimension 600\*1000\*2200mm
- Flexible capacity
- Flexible incoming connection
  - Top / Bottom cable entrance
  - Top / Bottom MCCB position

# AHF Project Reference

## Critical Facilities

- Gleneagles HK Hospital, Hong Kong
- NTT Com Asia, Hong Kong
- Hang Seng Bank, Hong Kong
- China Unicom, Hong Kong
- Bank of East Asia, Hong Kong
- China Mobile, Hong Kong

## Commercial Buildings

- New Kowloon Private Condo development, Hong Kong
- City University, Hong Kong
- Queensway Government Administration Office, Hong Kong
- West Kowloon Police Headquarter, Hong Kong
- Dongfang View Hotel – LED Media Screen, Hong Kong
- Putrajaya Prime Minister Administration Office, Malaysia
- Marina Bay Financial Centre Tower 1 & 3, Singapore
- Asia Square Tower 1 & 2, Singapore
- Metropolis Tower 1 & 2, Singapore
- Ocean Financial Centre, Singapore
- South Beach Tower, Singapore
- Keppel Bay Tower, Singapore
- One Raffles Place North Tower, Singapore
- One Raffles Quay South Tower, Singapore
- Capita Green, Singapore
- SATS Building, Singapore
- UOB Plaza 2, Singapore

## Industrial Application

- Hanergy Photovoltaic network, Hong Kong
- BYE Electric Vehicle Charging Station, Hong Kong

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