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Inverter Base Harmonic Compensation-AHF

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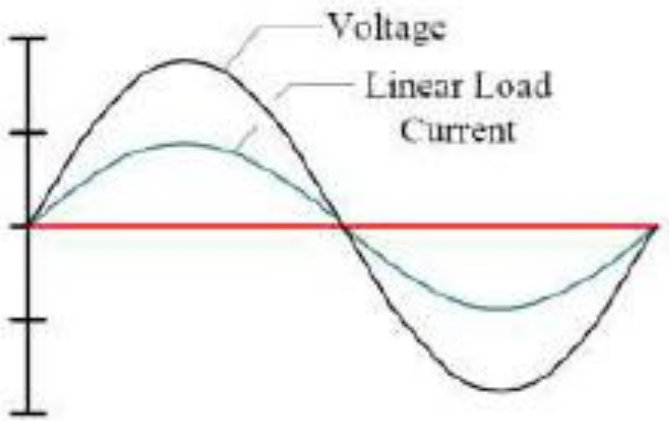
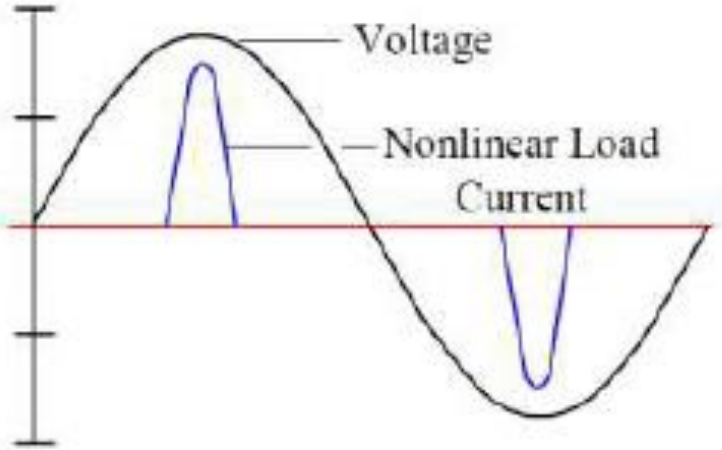
15814420260

Non-Linear Loads

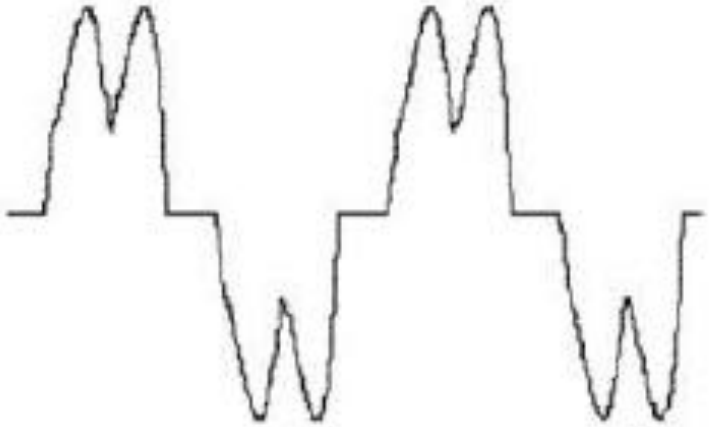
Linear Load Current flow

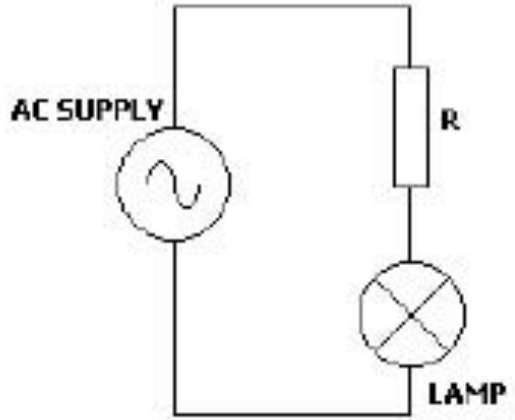


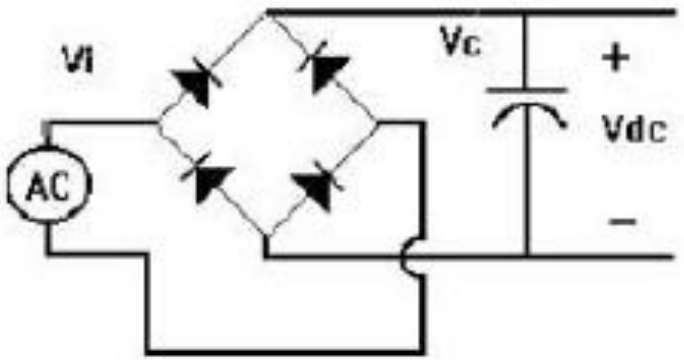
Single Peak Current Pulse from Single Phase Rectifier

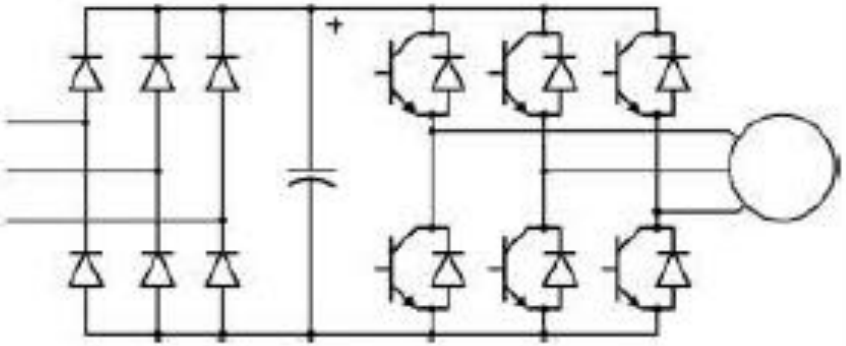


Double Peak Current Pulse from 6-Pulse VSD









Harmonics-*Sinexcel* Business

Harmonics are sinusoidal voltages or currents having frequencies that are integer multiples of the supply frequency (fundamental frequency).

Source

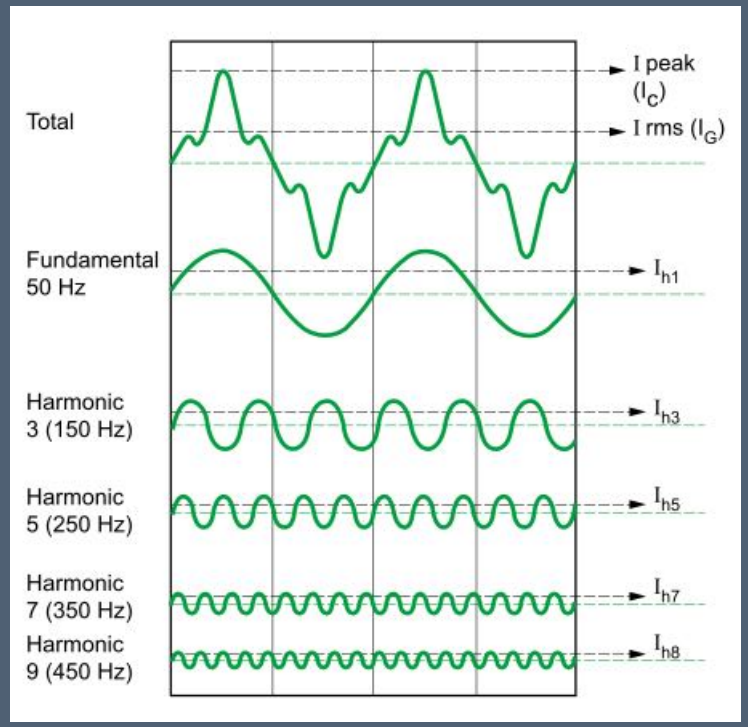
- Rectifiers
- VFD
- LED lighting

Features

- Integer multiple of the fundamental frequency

Solutions

- Harmonic filters

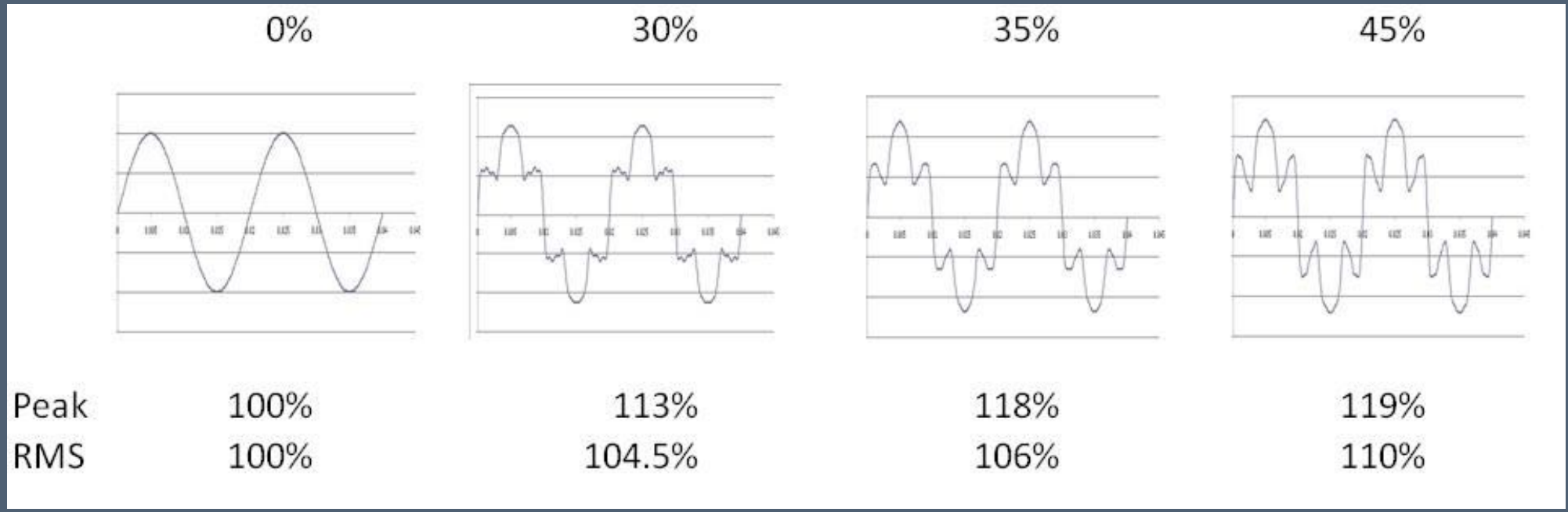


Harmonics-*Sinexcel* Business

Why should we eliminate harmonics?

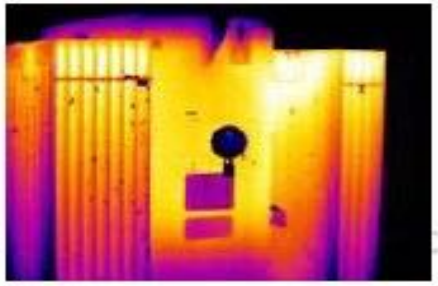
- Protection devices false tripping
- Equipment damaging
- Cable overheat
- Insulation damage
- Occuping transformer/generator capacity
- Capacitor banks swell
- Electromagnetic interference

Total harmonic distortion

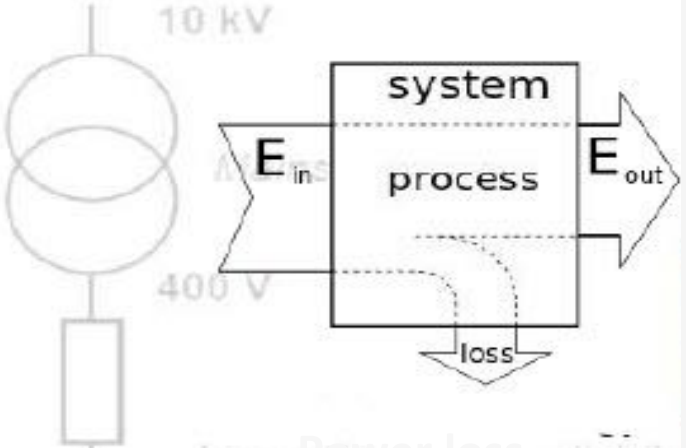


- Modification of the peak value of the waveform
- Increase of the RMS value of the waveform

Busbar Joint Fire risk



Transformer De-Rate



VFD Premature Failure

Capbank Overheat Fire risk

Maintenance Manpower Overhead

IEEE 519-2014

Voltage distortion limits

Bus voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
V ≤ 1.0 kV	5.0	8.0
1 kV < V ≤ 69 kV	3.0	5.0
69kV < V ≤ 161 kV	1.5	2.5
V ≤ 161 kV	1.0	1.5

*For service to industrial users (i.e., manufacturing plants) via a dedicated service transformer, the PCC is at the HV side of the transformer.
**For commercial users (office parks, shopping malls, etc.) supplied through a common service transformer, the PCC is commonly at the LV side of the service transformer.

IEEE 519-2014

Current distortion limits for systems rated 120V through 69 kV

Maximum harmonic current distortion in percent of I_L						
Individual harmonic order (odd harmonics)						
I_{SC}/I_L	3≤h<11	11≤h<17	17≤h<23	23≤h<35	35≤h<50	TDD
<20	4.0	2.0	1.5	0.6	0.3	5.0
20<50	7.0	3.5	2.5	1.0	0.5	8.0
50<100	10.0	4.5	4.0	1.5	0.7	12.0
100<1000	12.0	5.5	5.0	2.0	1.0	15.0
>1000	15.0	7.0	6.0	2.5	1.4	20.0

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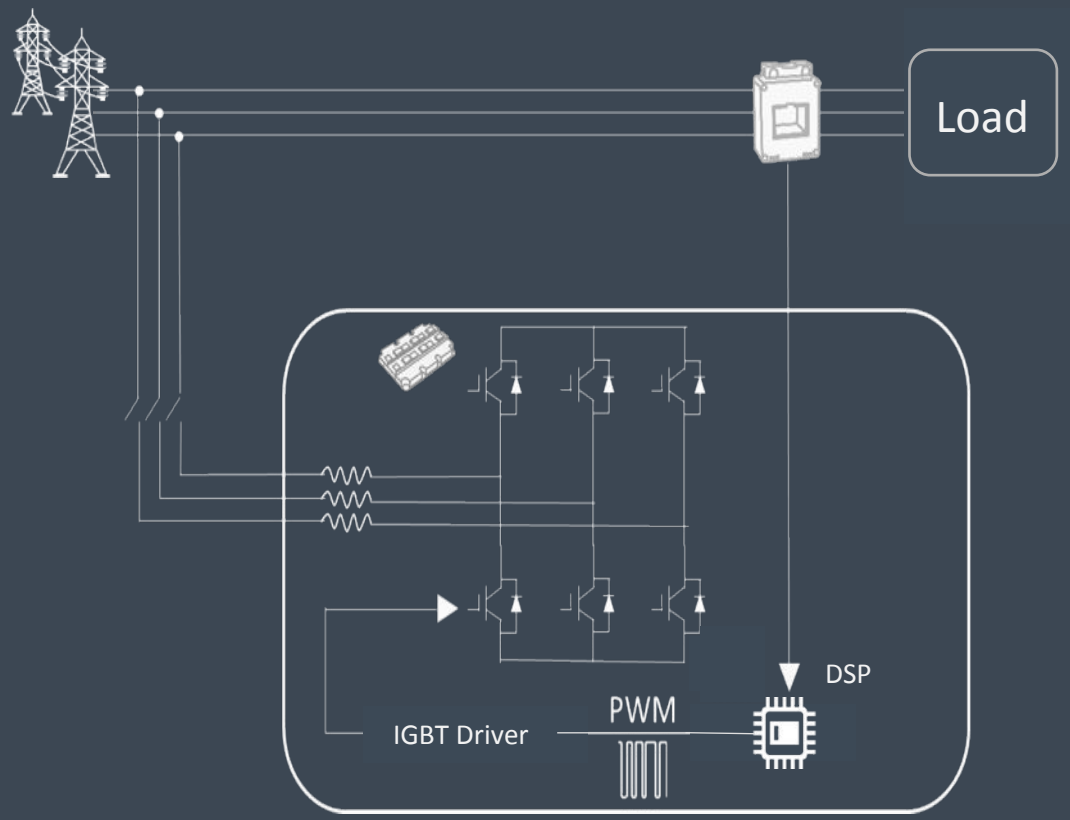
Full Controlled Technology



Tech Combination

Flexible Alternative Current Transmission

- Power Electronic
- Micro-Programming
- Micro-Electronics
- Communication
- Control

Benefit Of Inverter Based PQ

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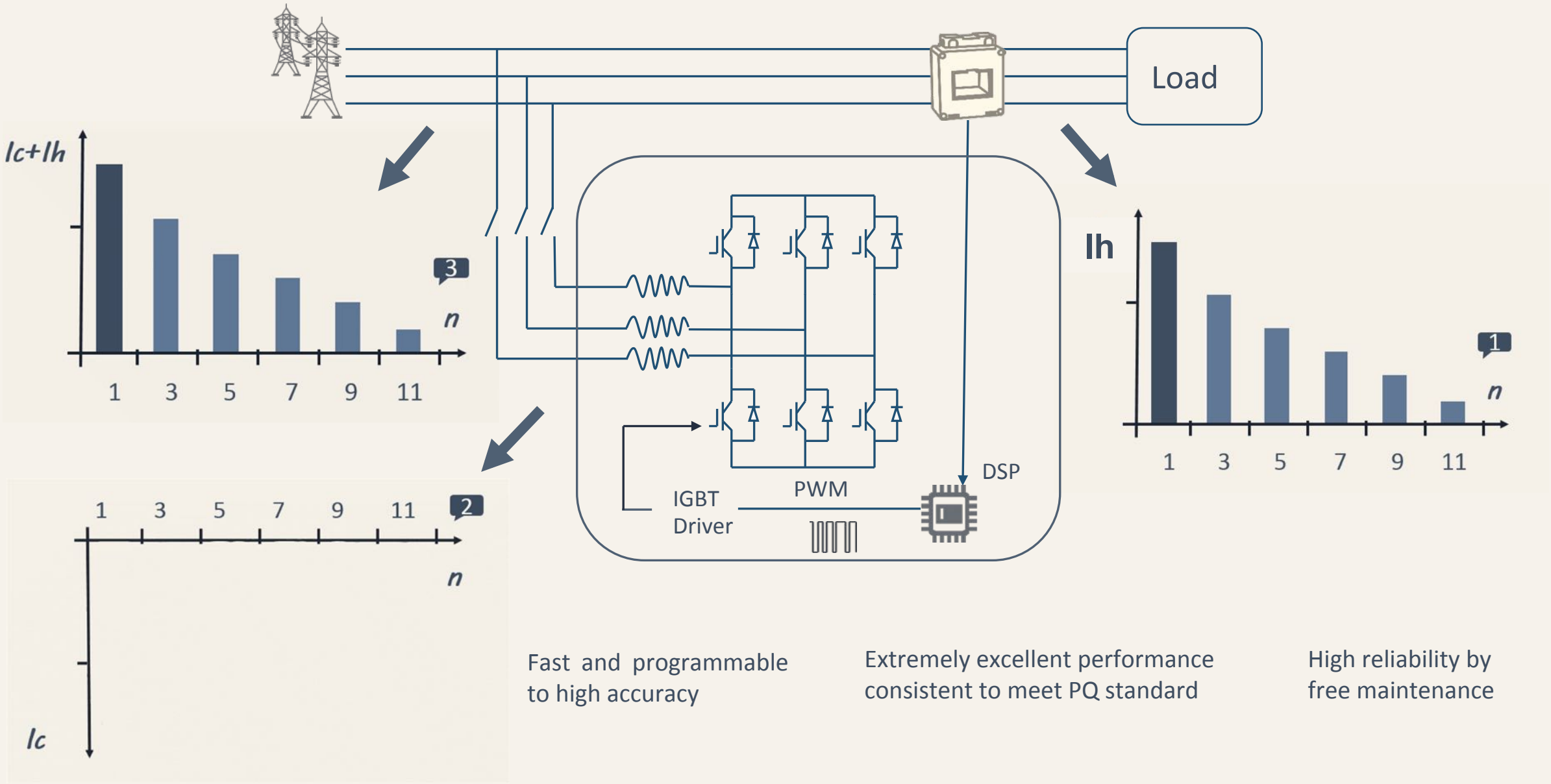
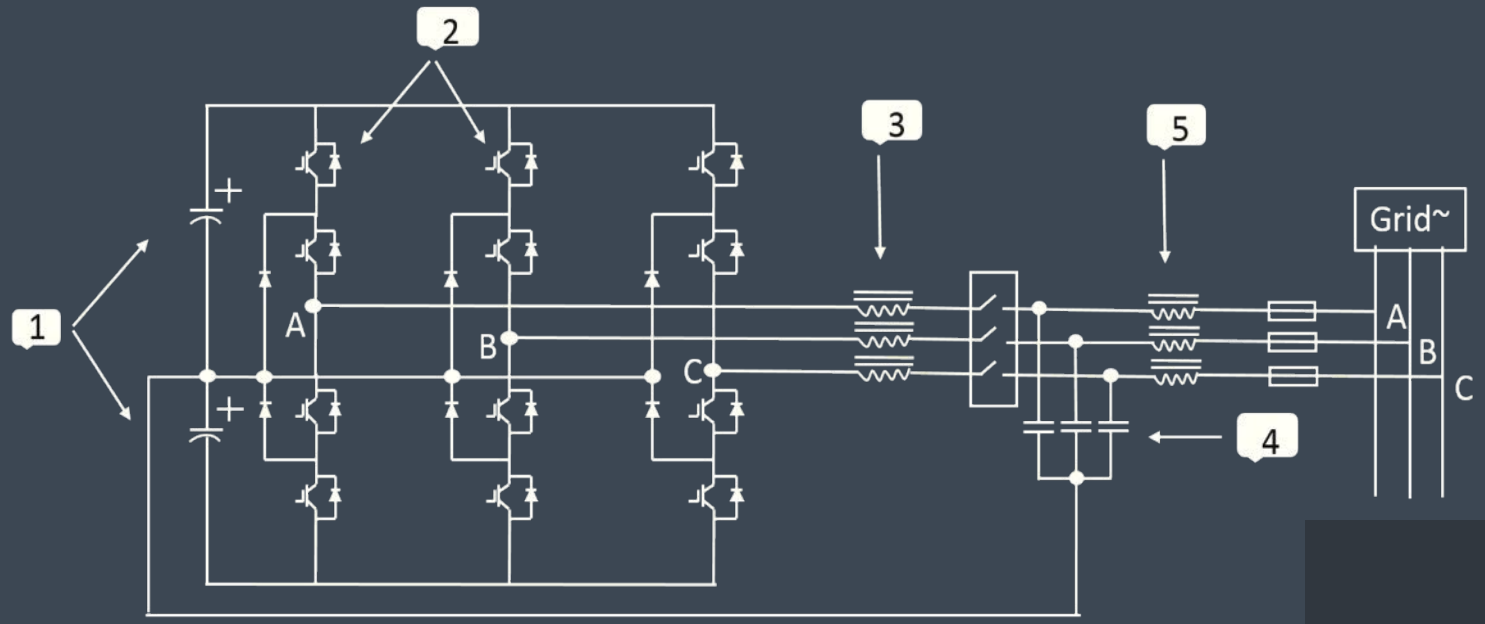


Fast and programmable to high accuracy

Extremely excellent performance consistent to meet PQ standard

High reliability by free maintenance

Sinexcel

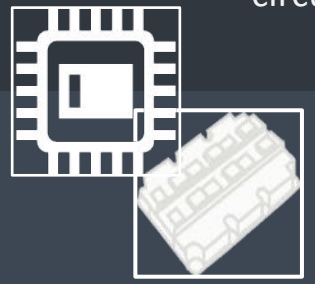


1. The grid side AC through the rectifier part and be changed into DC bus capacitance voltage, this voltage will be stabled in a small range by DC bus capacitor

2. DSP control the port and length of IGBT on and off time to generate a voltage at inverter part.

3. The different voltage between grid side and converter part add on the inverter inductor and generate a compensation current.

4. Ripple current be removed on the LCL filter circuit



AHF
Innovative Inverter Based PQ

Extremely Fast
calculation and reaction in ms

High Accuracy
Programmable and customized AC

2nd-50th harmonic compensation
Compensate dynamic change harmonic

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Sinexcel
Active Harmonic Filter
Sinexcel
Normal
Alarm
Active Harmonic Filter

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Active Harmonic Filter
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Active Harmonic Filter

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Sinexcel
Active Harmonic Filter

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Unique

Flexible-Capacity

15/25/35/50/60/75/100/150A wall/rack
Free combination of capacity


Flexible Engineering-Sinexcel Flexible cabinet
AHF 400A
SVG 2500Kvar

Flexible Engineering-Wall Mount Compact Installation


Flexible Engineering-Integrated into Switchgear

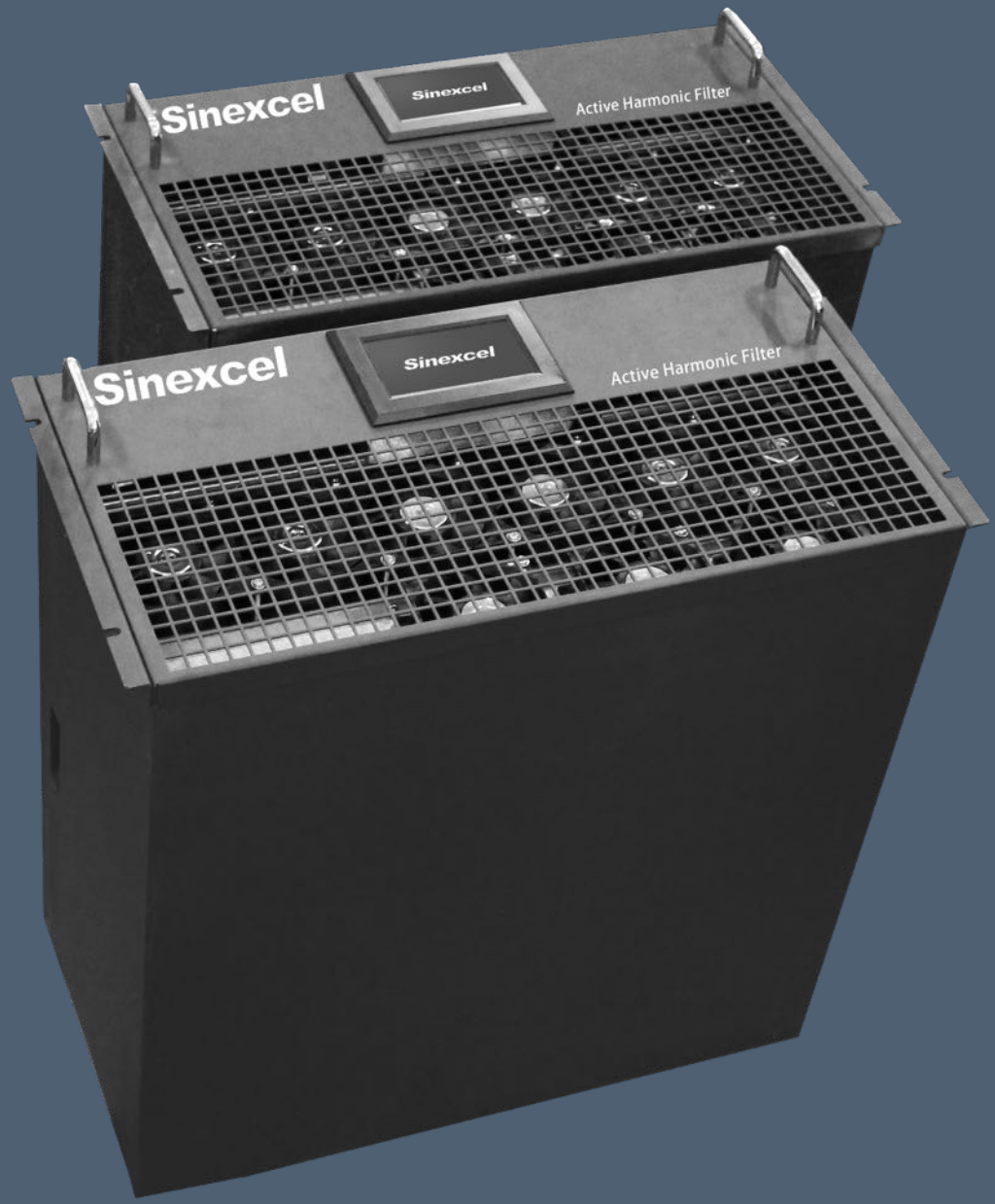
Sinexcel

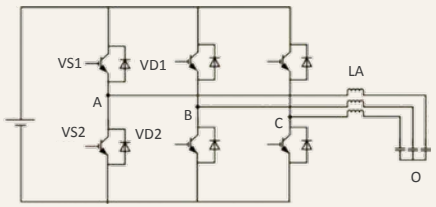
Unique
Modular Design

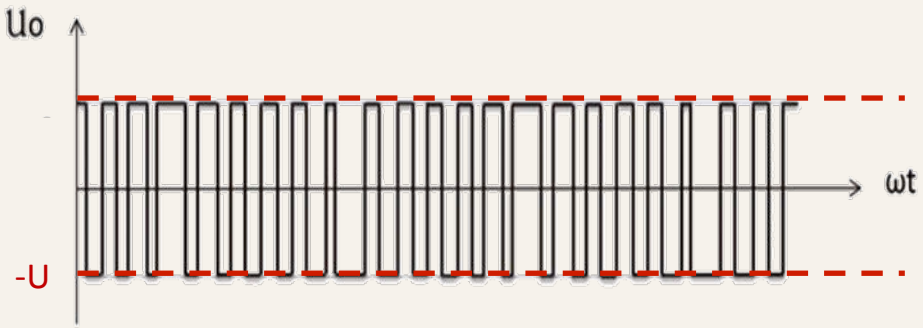
Modular redundancy

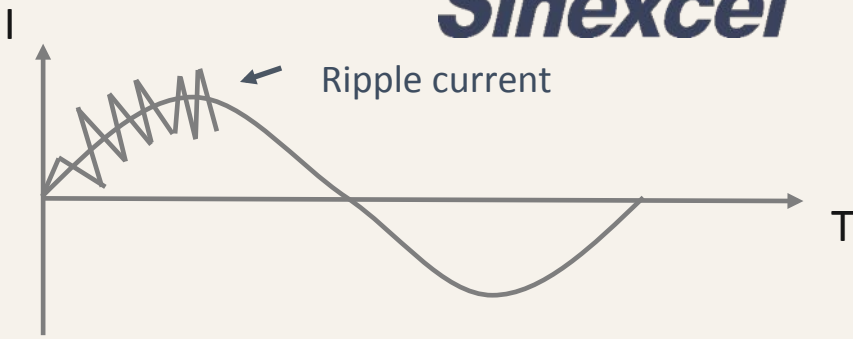
High reliability

Fastest and easiest engineering



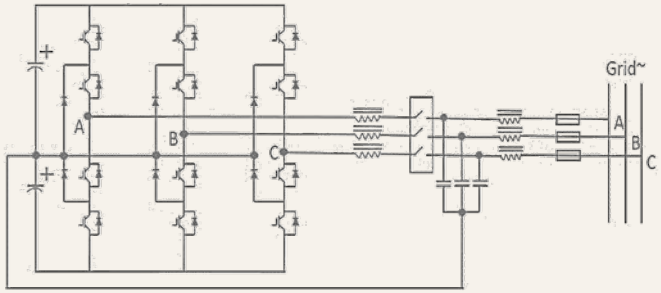




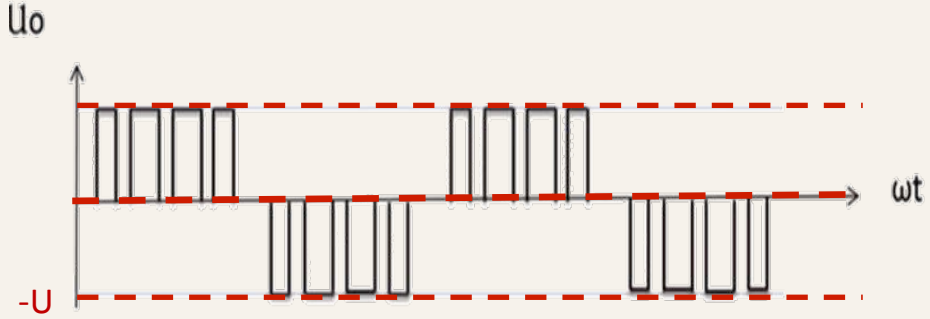


Technical Upgraded

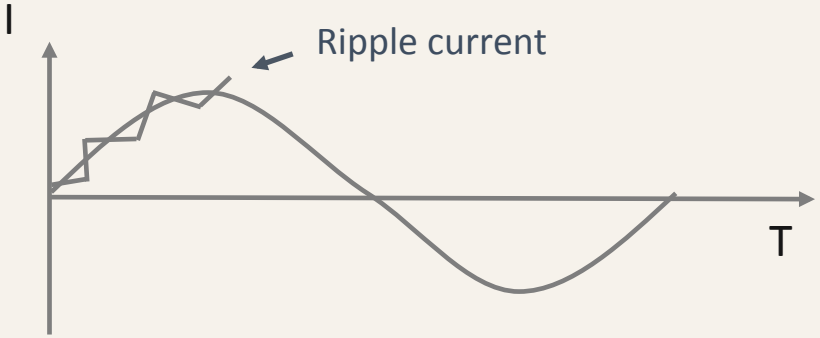
Higher switching frequency from up to 35kHz
100% more IGBT and more complicated program



One more level voltage, more PWM



Higher switching frequency of IGBT could filter more ripple current



Modular design compact and flexible
Higher accuracy on harmonic performance
Higher reliable by program control

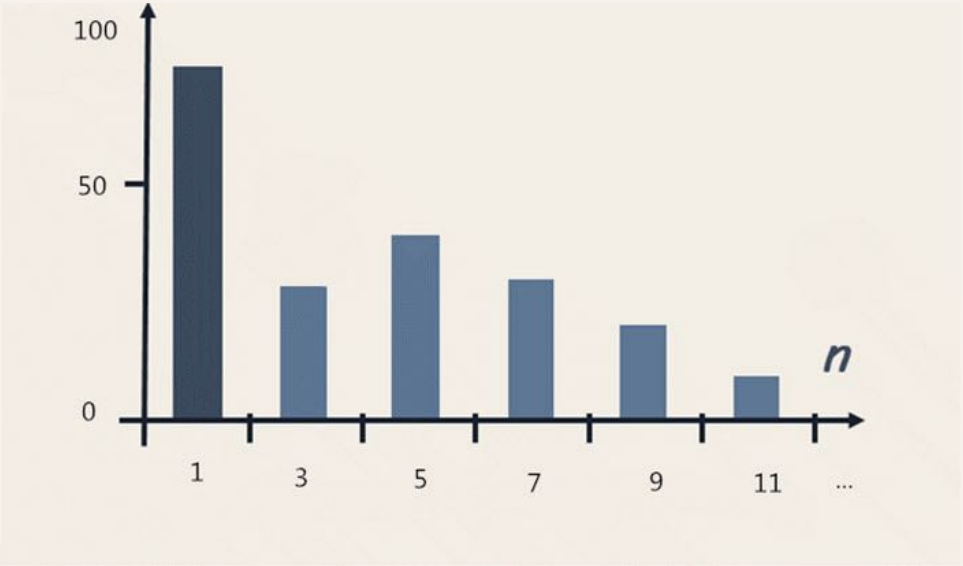
Close to sine wave

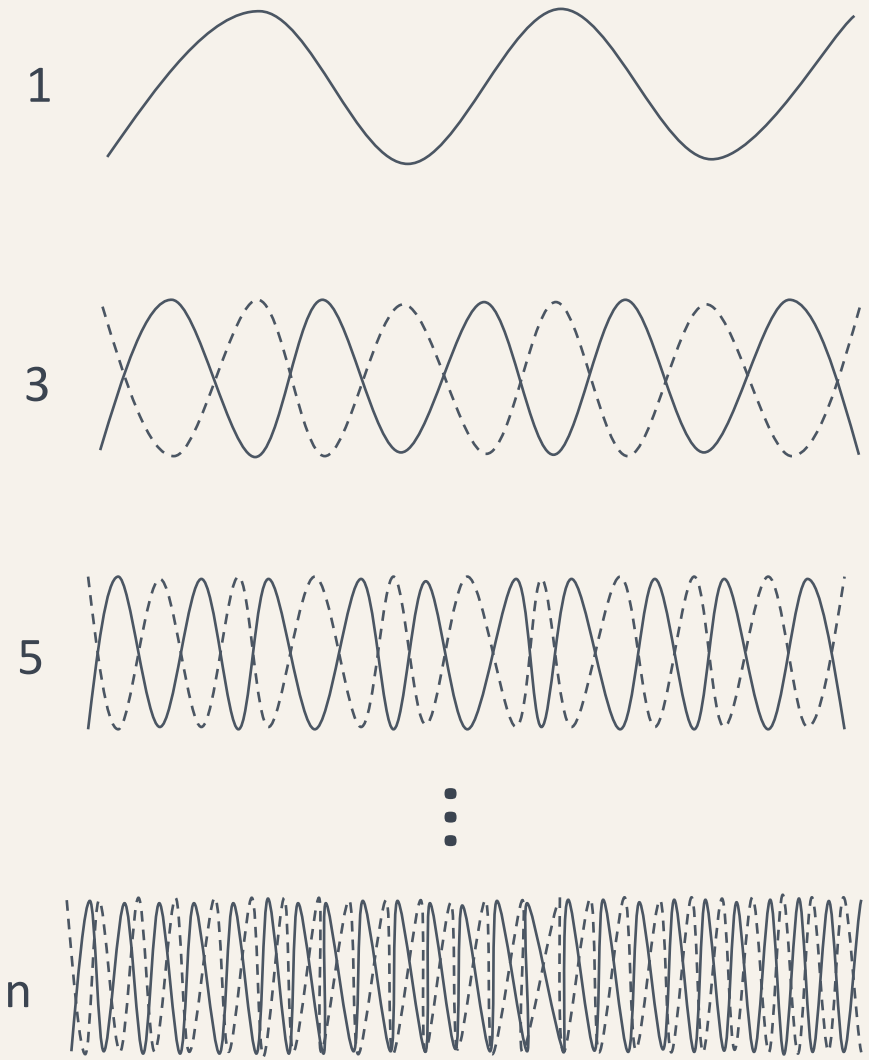
Customer Benefits

Unique
3 Level Topology

FFT-Fast Fourier Transform

It is the mode of program to identify RMS current to fundamental current, harmonic current of 150Hz/3rd , 250Hz/5th, 350Hz/7th,450Hz/9th...up to 2500Hz/50Hz
AHF output current as same frequency as individual harmonic order at the reverse direction.





Resonance

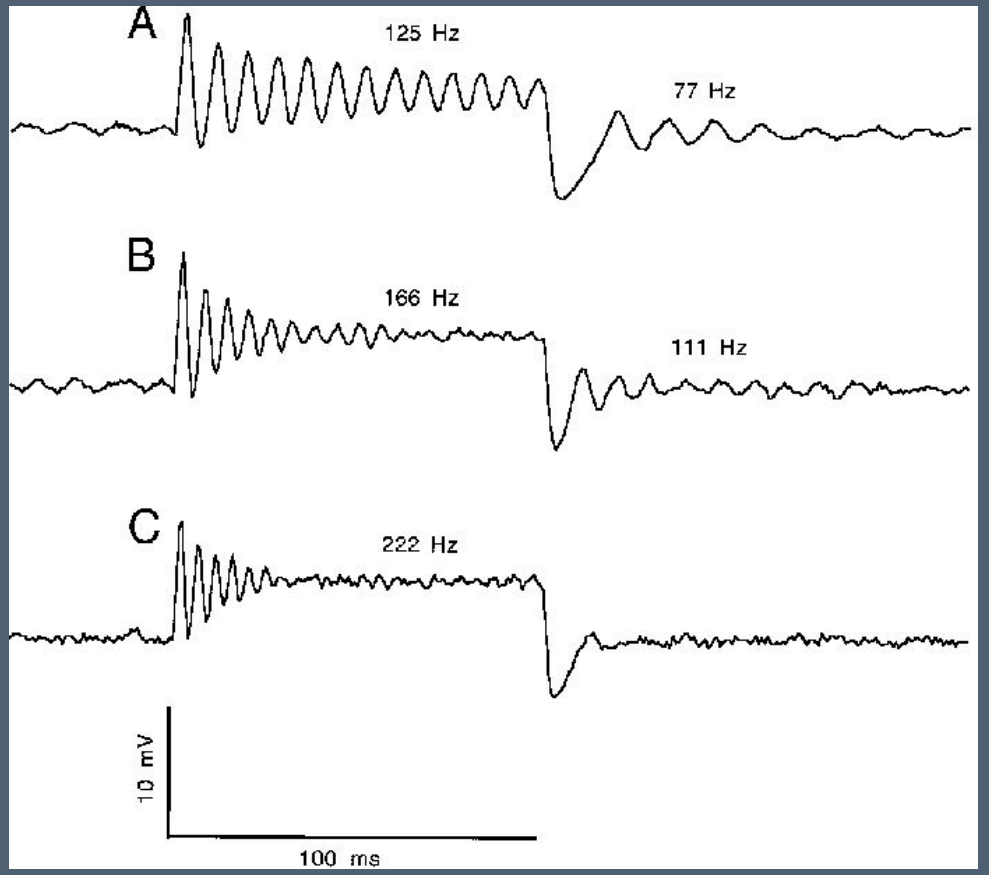
Electrical resonance occurs in an electric circuit at a particular resonant frequency when the impedances or admittances of circuit elements cancel each other.

Source

System impedance changing

Features

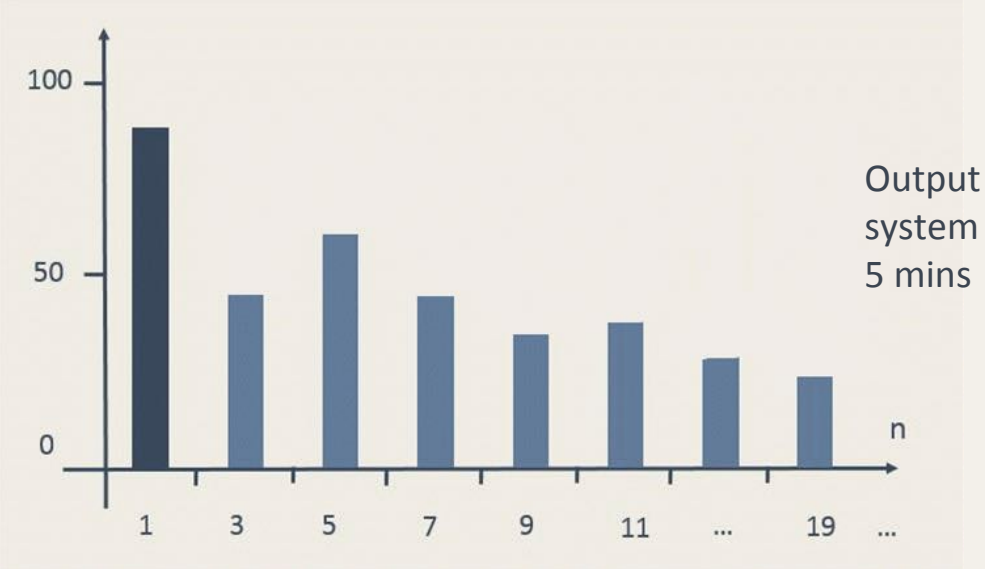
Varies with system frequency



Unique

Intelligent FFT

Base on FFT add intelligent program



Self learn system impedance, identify feature of individual harmonic order

Progress add compensation capacity

Resonance?

NO

YES

Output all capacity system needed within 5 mins

Program detects some harmonic order has resonance, stop output at the order but continuous compensates the others

Cancel most of the harmonic meet requirement

Resonance real time monitor

If resonance change to the other harmonic order, go back to the begin process and self learn impedance and adjust program


Unique
Friendly Interface
COMM.
HARMO.
PREFER.
I/O
SYSTEM
Load I L1
Load I L2
Grid I L1
Grid V L2
Sinexcel
AHF
Main
Data
Settings
Record
Grid Current
Grid L1
Grid L2
Grid L3
Neutral
Current(A)
Power Factor
THDI(%)
108. 6
109. 0
112. 1
17. 6
0. 98
0. 98
0. 99
3. 7
4. 4
3. 6
2016-10-09 11:24:47 Normal
Spectrum
Harmonics Comp. Setup
2016-10-09 11:35:15 Stop
Page Up
Page Down
Grid Voltage Spectrum
2016-10-09 11:37:11 Stop
L1
L2
L3

Sinexcel

Items	400V	480V	600V	690V
Rated Voltage	228~456V	384~552v	420~690V	483v~793V
Rated Capacity	15/25/35/50/60/75/ 100/150A	25/35/50/60/75/90A		
Compensation	Harmonic Compensation, Reactive power compensation, unbalance Compensation			
Power Grid Structure	3P4W, 3P3W			
Filter Range	2~50th order			
Response Time	<5ms			
Efficiency	>97%			
Cooling air requirement	44/75/151/300/405L/Sec	359L/Sec		
Dimensions (W x D x H) (mm³)	440*470*150、440*590*190、440*600*230、500*510*270	544*640*250(Rack-mounted)/504*253*640(Wall-mounted)		
Module display interface	4.3-inch HMI(module), 7-inch HMI(central monitor),LED	4.3-inch HMI(wall-mounted), 7-inch HMI(rack mounted)		
Communications ports	RS485,and Ether net port(RJ45)			
Communications protocols	Modbus (RTU)			
Standards Compliance	IEEE519, ER G5/4			

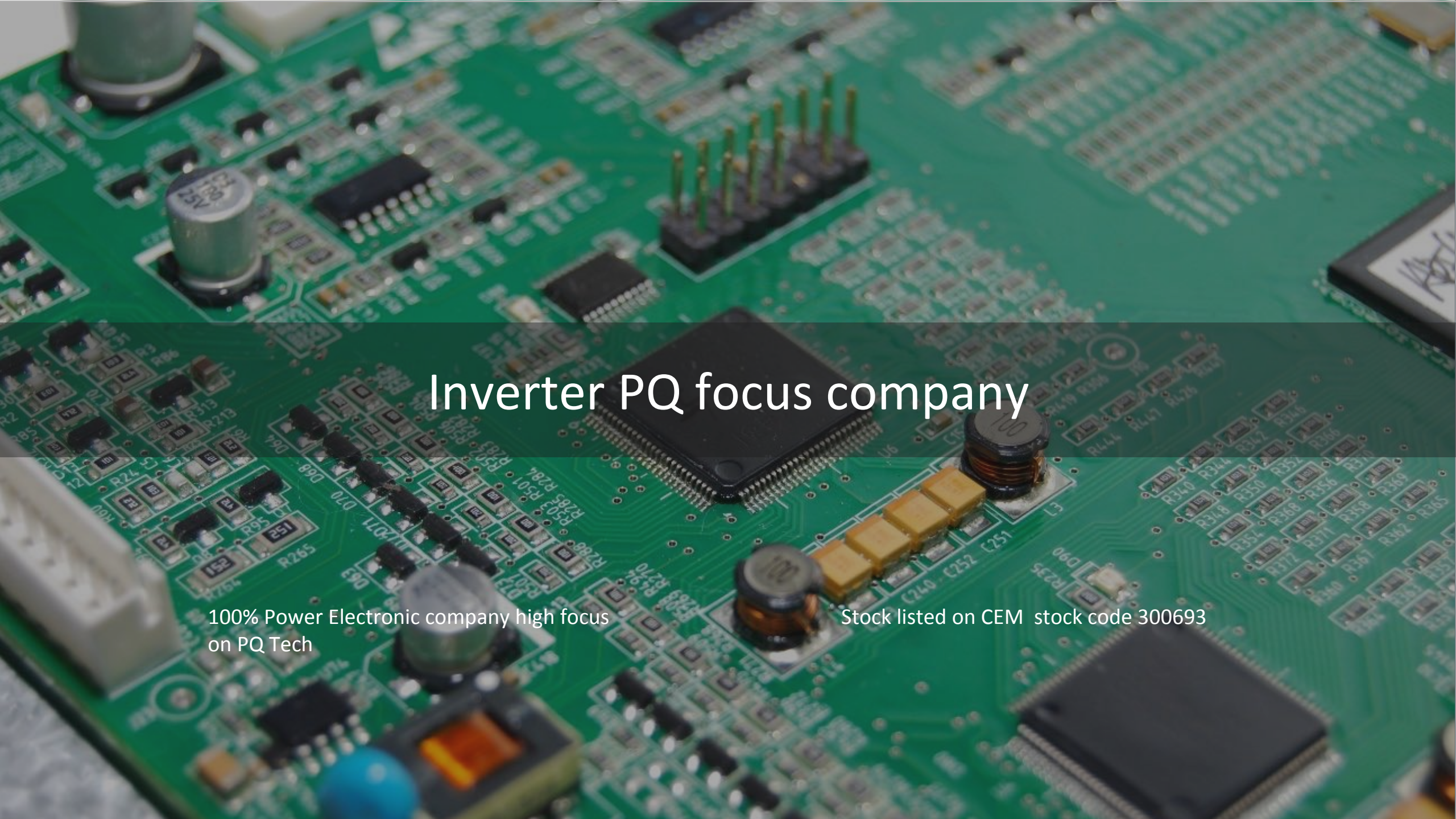
Sinexcel

LEADING
IN INDUSTRY

1 Million Installation Global
The biggest quantity installation reference

Widest Application
Reference in non-linear loads
Reference in industries
Reference in environment

Unique Engineering Innovation
Modular Design
3 Level topology



Inverter PQ focus company

100% Power Electronic company high focus on PQ Tech

Stock listed on CEM stock code 300693

Reference in Global, Industries, Non-linear Loads

Australia, Sydney Opera, 200A

New Zealand, Irrigation, Central Plains Water, VFD,1340A

Hong Kong International Airport, one of the busiest, most developed airport in the world, 4500A

Saudi Arabia, oil drilling, off grid diesel system, high impendence, high THDu, 450A

Changlong Ocean World, Theme Park, Hotel, Shopping mall , 12000A


Sinexcel
Active Harmonic Filter

Turkey, Ministry of Health of Turkey, UPS, sensitive medical equipment, 1015A

Korea, Hanwha Solar Factory. Furnace, 600A

图虫创意 stock.tuchong.com

Singapore, CBD Skyscraper Applications, Marina Bay Financial Center Tower, Asia Square Tower, Ocean Financial Center, Keepel Bay Tower, South Beach Tower, Metropolis Tower, Guoco Tower, Duo Tower for the top companies of the world PWC International, Hewlett Packard, Oracle, ABN AMRO Bank, Google, Boeing, lighting, UPS, VFD, harmonic of commercial building, 5000A+

Malaysia, Prime Minister's Department Complex,, 125A


Sinexcel
Active Power Filter

Chile, Food Product Factory, Cecinas Llanquihue, 200A

Germany, Transportation, AHF, Summit
Bulk Carrier, VFD, isolated grid, high THDu,
Ship Certification approval AHF, 300A

Tibet, industral, Tibet Julong copper industry and Tibet Zhongsheng mining industry 9900A AHF

The UK, Glabina cheese, VFD, 350A

Sinexcel

Thank You