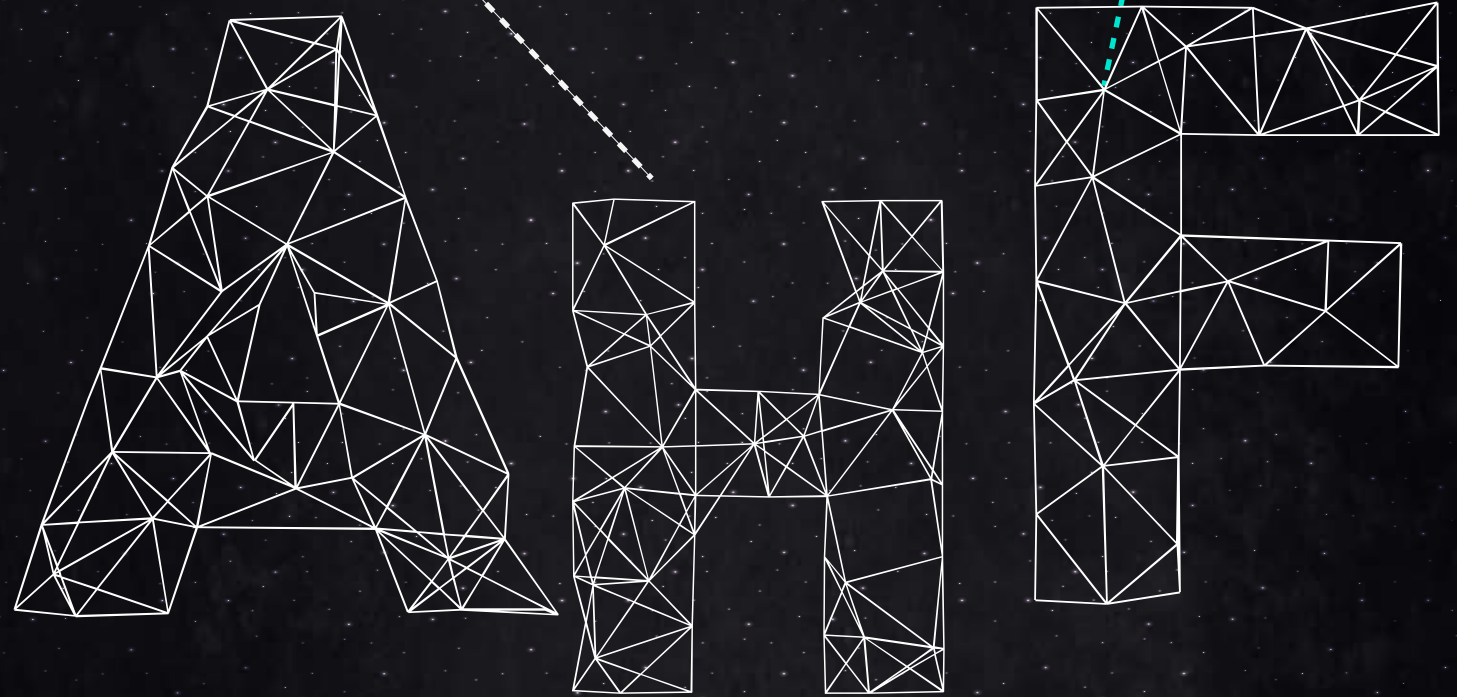**Sinexcel**
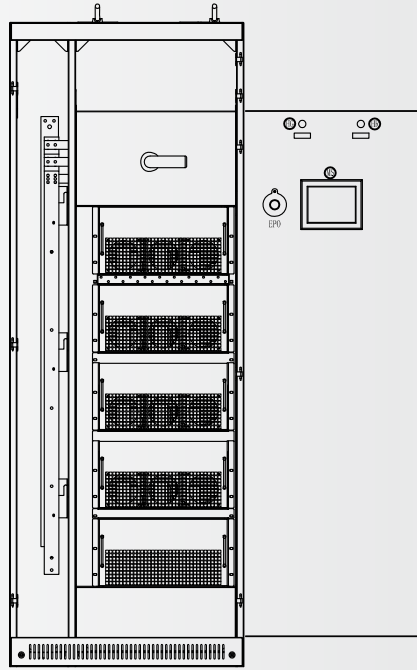
Energy Efficiency

Power Quality

ACTIVE
HARMONIC
FILTER

AHF

Flexible Alternative Current
Harmonic Mitigation

Inverter Based PQ
Active Harmonic Filter

Modular
Solution

Front View

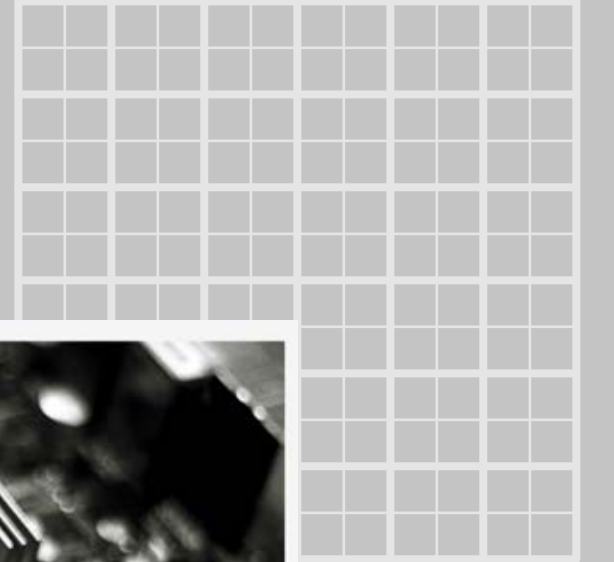**Left Side View**
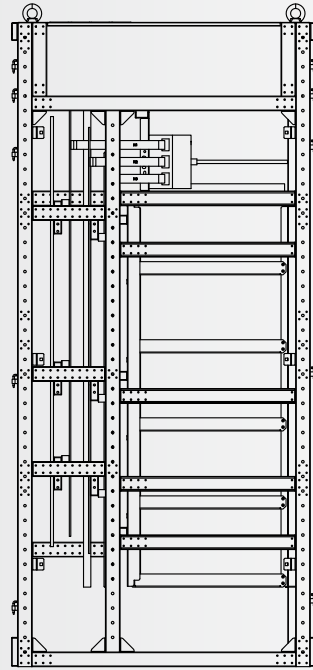
Different compensation models for different loads

NONLINEAR LOADS

INDUSTRIAL EQUIPMENT

Induction furnaces,
static converters, VFD,
welding machines

OFFICE EQUIPMENT

Computers, servers, printers

HOUSEHOLD APPLIANCES

Fluorescent lightings, TV light,
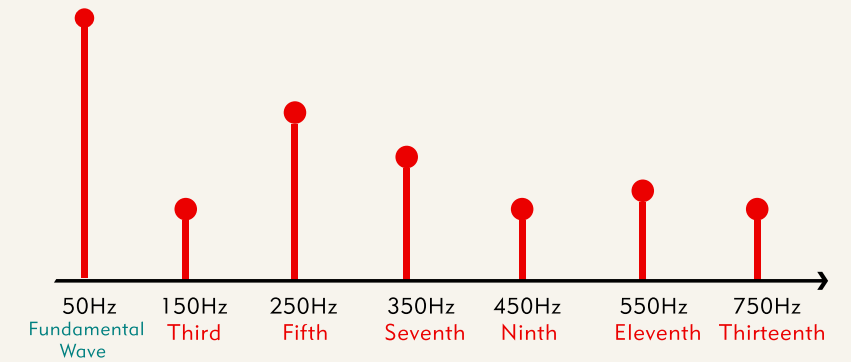dimmers, microwave ovens.

### UNINTERRUPTIBLE POWER SUPPLIES (UPS)

WHY HARMONIC HURT YOUR SYSTEM?

Higher harmonic current would lead to capacitors' inner swelling,
oil spilling and fire risk, severe discharge, flashover and overheat,
resulting in over-current and over-voltage, accelerating the aging
of the capacitor dielectric, lower safety levels of installations,
which cause the unnecessary financial losses .

Higher orders harmonic cause more serious distortion on the grid
voltage and current waveform, which will increase the transformer
copper and iron losses or load imbalance.

Affect the equipment efficiency and occupy unnecessary grid
capacity cause overheating of equipment and shortening the
lifetime.

50Hz	150Hz	250Hz	350Hz	450Hz	550Hz	750Hz
Fundamental Wave	Third	Fifth	Seventh	Ninth	Eleventh	Thirteenth

Sinexcel

ADF Inverter Base

Electrical network with poor power quality results in financial loss and safety concerns.
Good power quality not only improves the efficiency of the energy by decreasing the
loss of electrical equipment, but also guarantees that the power system could support
stable and healthy operation. It becomes more and more convenient for us both in daily
life and industry because of fast developing technology, which is also accompanied
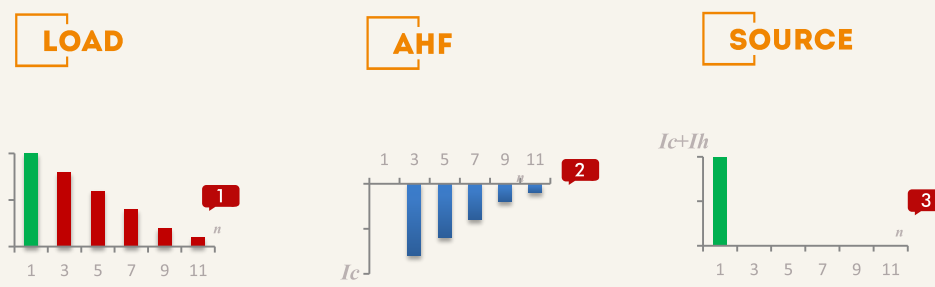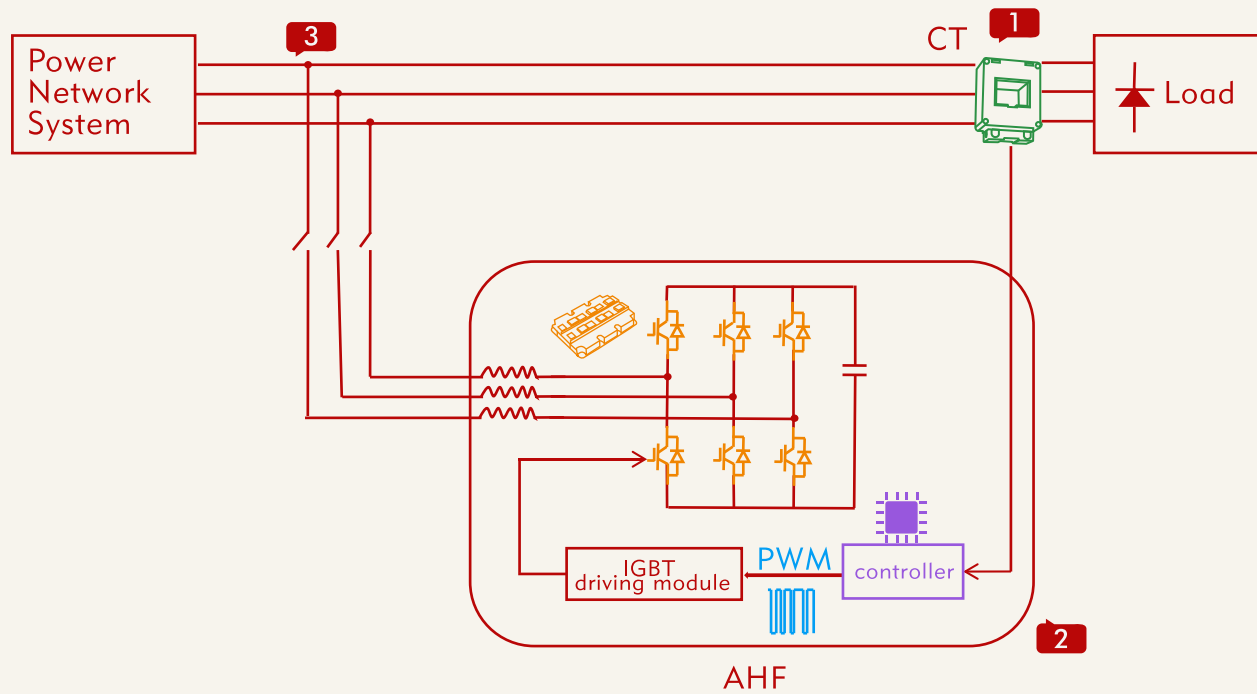with the development of non-linear loads .
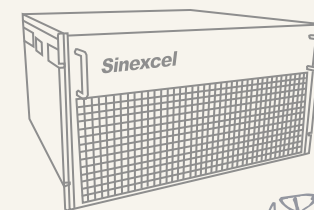
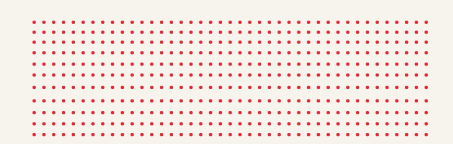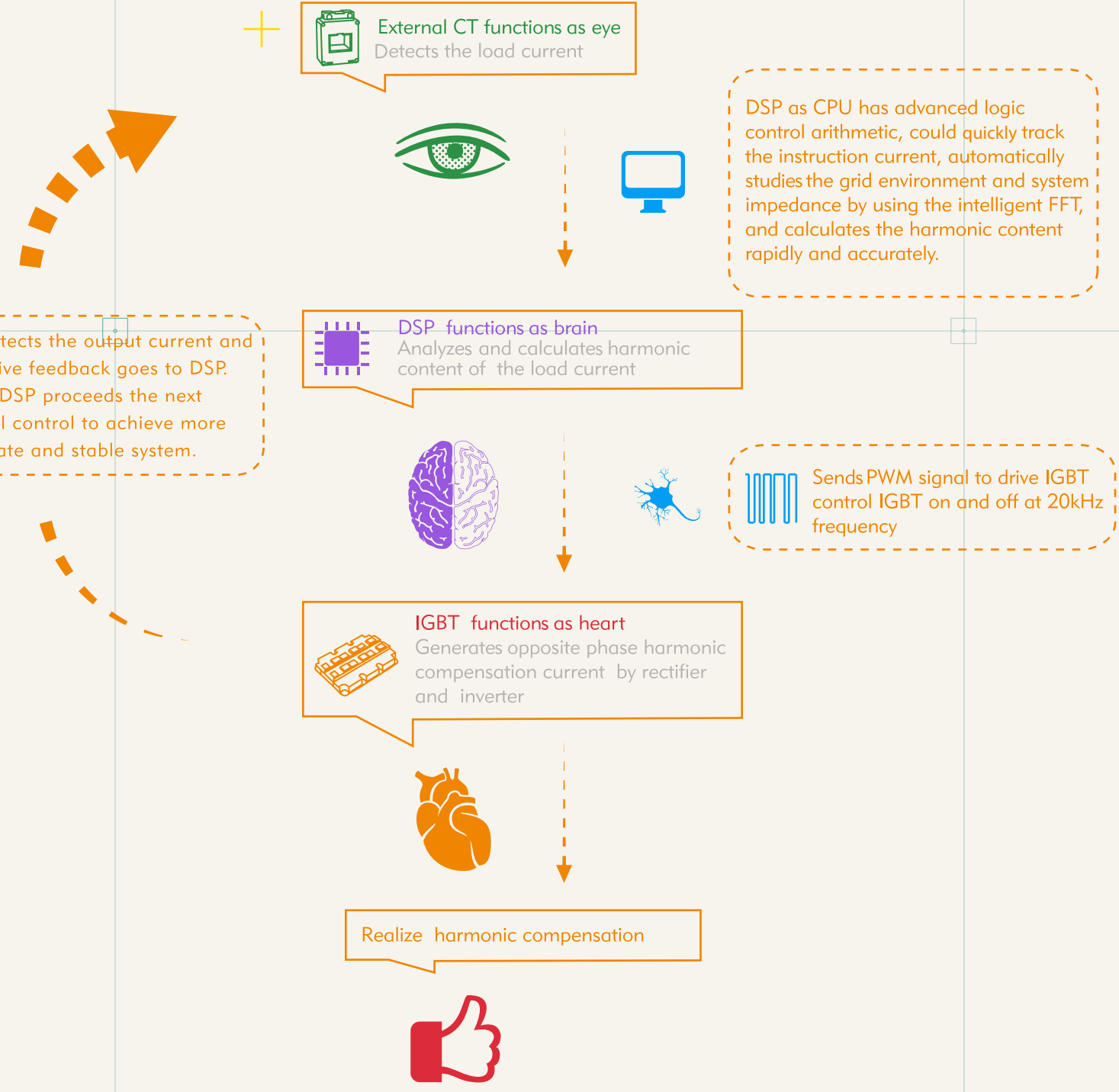# AHF WORKING PRINCIPLE

Optimize your harmonic compensation efficiency

Flexible Alternative Current

Harmonic Mitigation
Inverter Based PQ
Active Harmonic Filter

External CT detect the load current, DSP as CPU has advanced logic control arithmetic, could quickly 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.

Power Network System

CT ❶

Load

IGBT driving module

PWM

controller ❷

AHF ❸

External CT functions as eye
Detects the load current

DSP as CPU has advanced logic control arithmetic, could quickly track the instruction current, automatically studies the grid environment and system impedance by using the intelligent FFT, and calculates the harmonic content rapidly and accurately.

CT detects the output current and negative feedback goes to DSP. Then DSP proceeds the next logical control to achieve more accurate and stable system.

DSP functions as brain
Analyzes and calculates harmonic content of the load current

Sends PWM signal to drive IGBT control IGBT on and off at 20kHz frequency

IGBT functions as heart
Generates opposite phase harmonic compensation current by rectifier and inverter

Realize harmonic compensation

LOAD **AHF** **SOURCE**

SPECTRUM

I_h

1 3 5 7 9 11 ❶

1 3 5 7 9 11

1 3 5 7 9 11 ❷

I_c

I_c+I_h

1 3 5 7 9 11 ❸

WAVEFORM

❶ ❷ ❸

UNDERSTAND   HOW AHF COMPENSATE HARMONIC

Optimize your harmonic compensation efficiency
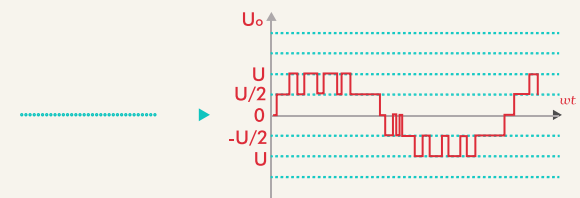
GRID ~

INPUT
OUTPUT

A
B
C
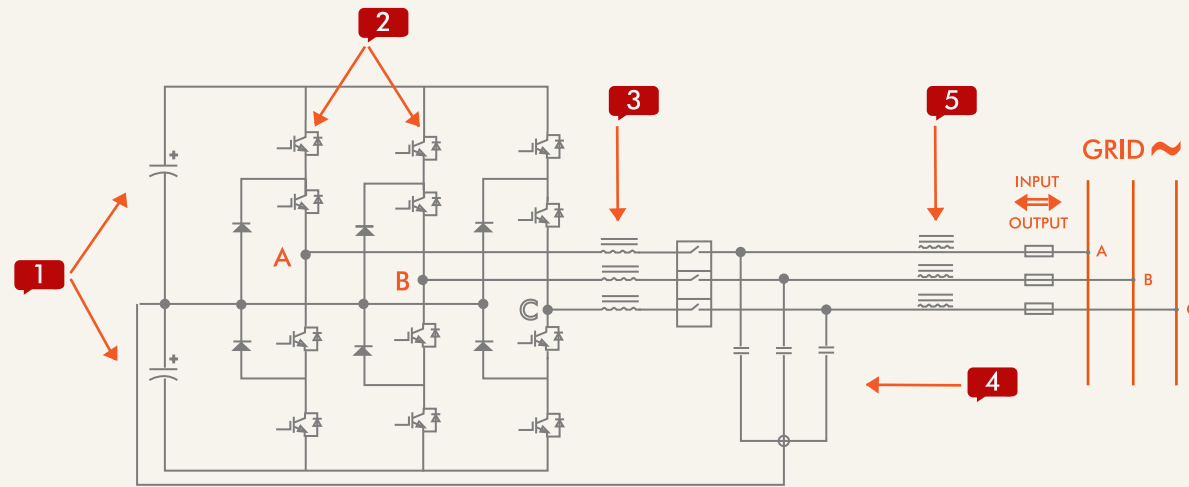
DC BUS CAPACITOR [1]

AC to DC rectifier storage

IGBT [2]

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.

U_o
U
$U/2$
0
$-U/2$
U
wt

INVERTER INDUCTION [3]

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

U_o
U
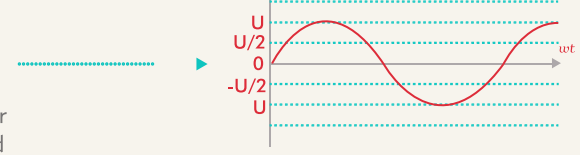$U/2$
0
$-U/2$
U
wt
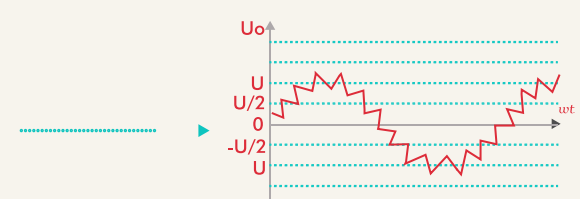
LCL FILTER CIRCUIT

LC FILTER CIRCUIT [4]

LC filter circuit filter out impurities of the harmonic. The rest of high frequency harmonic will be filtered by the high frequency inductor.

U_o
U
$U/2$
0
$-U/2$
U
wt

HIGH FREQUENCY INDUCTOR [5]

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

KEY FEATURES AND BENEFITS

Impressive compensation effect of AHF

MODULAR DESIGN

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

Module structure with highest reliability of system

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

INTELLIGENT FFT

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

Real time electrical system resonance monitor and management
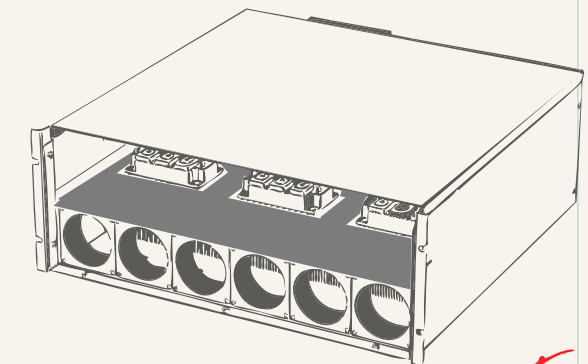
GRAPHICAL USER INTERFACE

Module 4.3 inch HMI, cabinet 7 inch HMI central
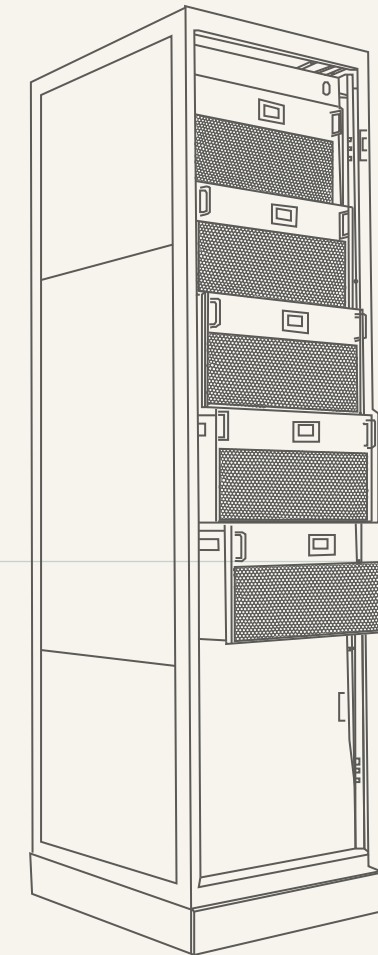
Display electrical system voltage, current, frequency, before and after THDi, Apparent/Active/Reactive power, etc
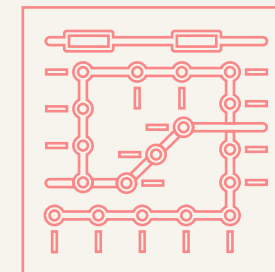
Display before and after waveform, spectrum in same page with clearly comparison
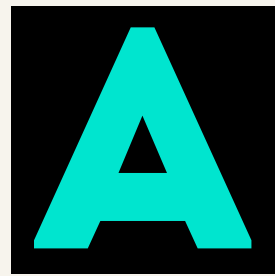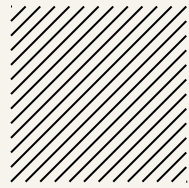
MAINTENANCE FREE DESIGN

Independent air flow, separates electronic components from air flow. Free of dust cleaning maintenance requirement improves product reliability
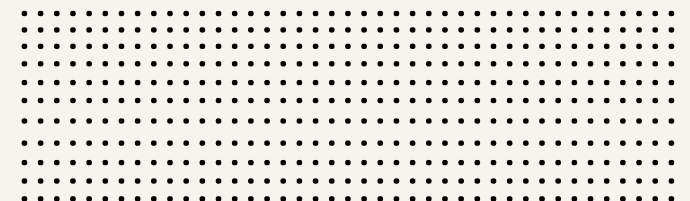
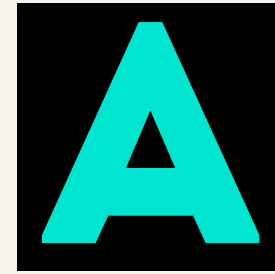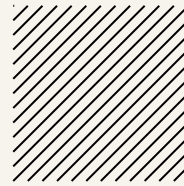AHF Cabinet

INVERTER

A

400V Grid Voltage

Specification

Items	400V					
	Sinexcel AHF 005/010/015	Sinexcel AHF 025/035	Sinexcel AHF 050/060	Sinexcel AHF 075/100	Sinexcel AHF 150	Sinexcel AHF 300
	System Parameter					
Rate input	380 (228V~456V)					
Parallel grid fenquency	50/60Hz (range: 45Hz~62Hz)					
Parallel quantities	Unlimited					
Efficiency	≥97% (Full load)					
Power grid structure	3P3W/3P4W					
CT Ratio	50/5~10000/5	50/5-10000/5 (15A); 150/5~30,000/5 (25~150A) module; 600/5~10000/5 (300A)				
Circuit toplogy	3-Level					
	Peroformance Indicator					
Rated capacity	5A/10A/15A	25A/35A	50A/60A	75A/100A	150A	300A
Function	Harmonic compensation, Reactive power compensation, Unbalance compensation					
Control algorithm	Intelligent FFT/ Instantaneous Reactive Power/FFT					
Filtering range	2nd to 61th orders	2nd to 50th orders				
Filtering performance	≥95%					
Reaction time	20μs	<50μs				
Overall response time	5ms	<5ms				
Target power factor	Adjustable from -1 to +1					
Switch frequency	Average 50KHz	Average 20KHz				
Cooling air requirement	96CFM	321CFM	321CFM	543CFM	825CFM	1611CFM
Noise level	<68dB	<56dB			<65 dB	<75dB
	Communication & Monitoring Capability					
Communications ports	RS485	RS485, Ethernet port (RJ45)				
Commmunications protocols	MODBUS (RTU)	MODBUS (RTU, TCP/IP)				
Module display interface	WIFI display, 7-inch HMI(central monitor)	4.3-inch HMI(module), 7-inch HMI(central monitor), LED				
Protection functions	Abnormal voltage/frequency protection; Inverter short-circuit protection; Abnormal output current protection; Inverter over-loaded protection, Over-tempearture protection etc,.					
Monitoring alarm	Avaliable					
Fault alarm	Avaliable	Available, 500 alarm records				
	Mechanical Properties					
Mounting type	Wall-mounted/Rack-mounted	Wall-mounted/Rack-mounted/Cabinet				
Dimensions(W x D x H)mm	410*340*45(Rack-mounted) 410*45*340(Wall-mounted)	400*490*150 (Rack-mounted) 440*150*470 (Wall-mounted)	440*590*190 (Rack-mounted) 440*190*610 (Wall-mounted)	500*600*190(75A) 440*599*230(100A) (Rack-mounted) 500*190*585(75A) 440*232*625(100A) (Wall-mounted)	500*560*269 (Rack-mounted) 500*286*557 (Wall-mounted)	500*722*370 (Rack-mounted) 500*370*722 (Wall-mounted)
Net weight	4.98kg	18kg	35kg	40kg	48kg	110kg
Color	Silver	Black				
	Environment Requirement					
Attitude	≤1500m; Between 1500m to 4000m, derating 1% every additional 100m					
Ambient temperature	~10℃~40℃ (may derating if ambient temperature exceeds 45℃)					
Relative humidity	5%~95%, non-condensing					
Protection dass	IP20 (IP degrees can be customizd)					
	Related Qualifications & Standards					
Qualifications	CE, cETLus, CCS					
Standards compliance	IEEE519, ER G5/4, IEC 61000					

INVERTER

A

North America
& 690V Grid voltage

Specification

Items	208V	480V	600V	690V
	Sinexcel AHF 25/35/50/60/75/90	Sinexcel AHF 25/35/50/60/75/90/100	Sinexcel AHF 25/35/50/60/75/90/100	Sinexcel AHF 25/35/50/60/75/90/100
System Parameter				
Rated input	208V(176V~264V)	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	150/5~30,000/5			
Circuit topology	3-Level			
Performance Indicator				
Rated capacity	25/35/50/60/75/90A	25/35/50/60/75/90/100A		
Function	Harmonic compensation, Reactive power compensation, Unbalance compensation			
Control algorithm	FFT/ Intelligent FFT/ Instantaneous Reactive Power			
Filtering range	2nd to 50th orders			
Filtering performance	>95%			
Reaction time	<50μs			
Overall response time	<5ms			
Target power factor	Adjustable from -1 to +1			
Switching frequency	Average 20KHz			
Cooling air requirement	761CFM	For 25/35/50A 725CFM; For 60/75/90/100A 761CFM		
Noise level	<65dB			
Communication & Monitoring Capability				
Communication ports	RS485, Ethernet port (RJ45)			
Communications protocols	MODBUS (RTU, TCP/IP)			
Module display interface	7-inch LCD touched screen/LED(rack-mounted); 4.3-inch LCD touched screen(wall-mounted)			
Protection functions	Abnormal voltage/frequency protection; Inverter short-circuit protection; Abnormal output current protection; Inverter over-loaded protectio; Over-tempearture protection etc,.			
Monitoring alarm	Available			
Fault alarm	Available, 500 alarm records			
Machanical Properties				
Mounting type	Wall-mountedd/Rack-mounted/Cabinet			
Dimensions (WxDxH)mm	For 25/35/50A 500*540*180 (Rack-mounted) 500*184*627 (Wall-mouned) For 60/75/100A 500*675*25 (Rack-mounted) 500*250*675 (Wall-mouned) For 90A 544*670*25 (Rack-mounted) 500*250*665 (Wall-mouned)			
Net weight	70kg	40kg (25/35/50A); 70kg (60/75/100A); 62kg(90A)		
Color	Black			
Environment Requirement				
Altitude	≤1500m; Between 1500m to 4000m, derating 1% every additional 100m			
Ambient temperature	-20℃-40℃ (may derate capacity if ambiet temperature exceeds 45℃)			
Relative humidity	5% to 95%, non-condensing			
Protection class	IP20			
Related Qualifications & Standards				
Qualifications	CE, cETLus, cULus, DNV/BV/RINA			
Standards compliance	IEEE 519, ER G5/4, IEC 61000			

INVERTER

A
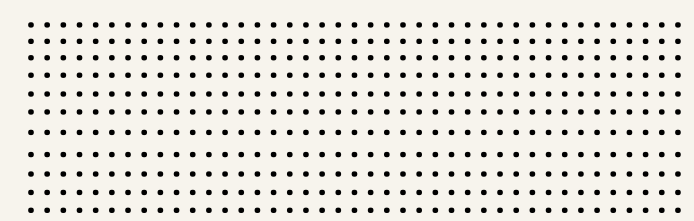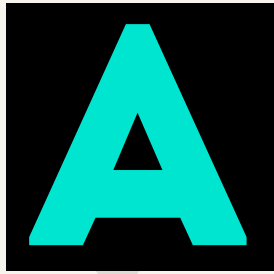
400V

400V

25A/35A wall 440*150*470mm^3
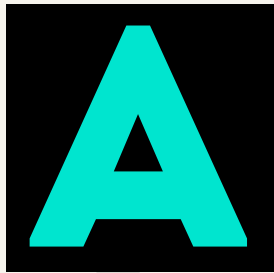rack 400*490*150mm^3 18kg

50A/60A wall 440*190*610mm^3 rack   440*590*190mm^3 35kg
75A   wall 500*190*585mm^3 rack   500*600*190mm^3 40kg
100A   wall 440*232*625mm^3 rack   440*599*230mm^3 40kg

INVERTER

A

400V

480V
600V
690V

300A wall/rack
500*690*370 110kg

150A   wall 500*286*557mm^3
       rack 500*560*269mm^3 48kg

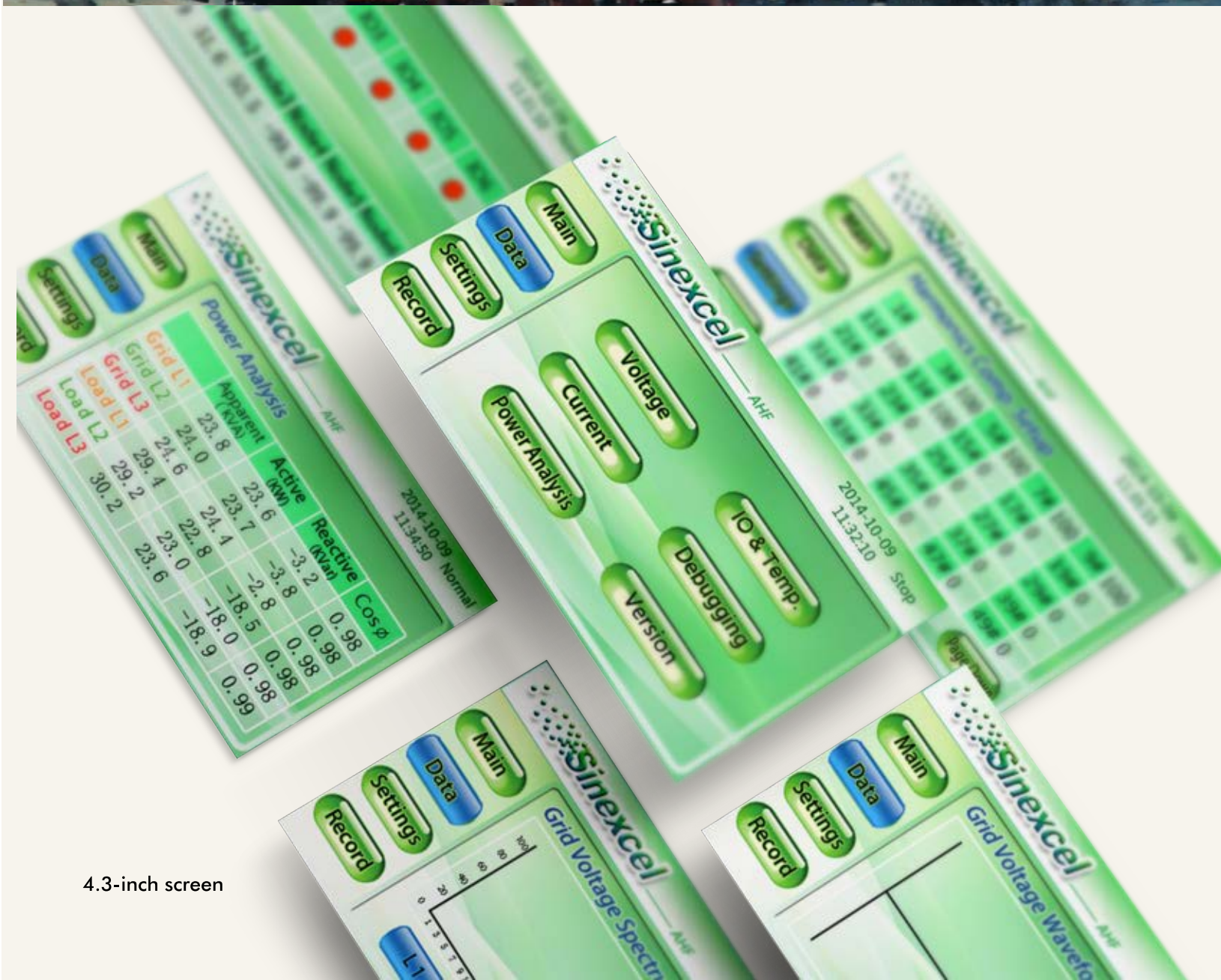Active Harmonic Filter

50A   wall   500*184*627mm^3 rack   500*540*180mm^3 40kg
90A   wall   500*253*590mm^3 rack   500*590*250mm^3 62kg
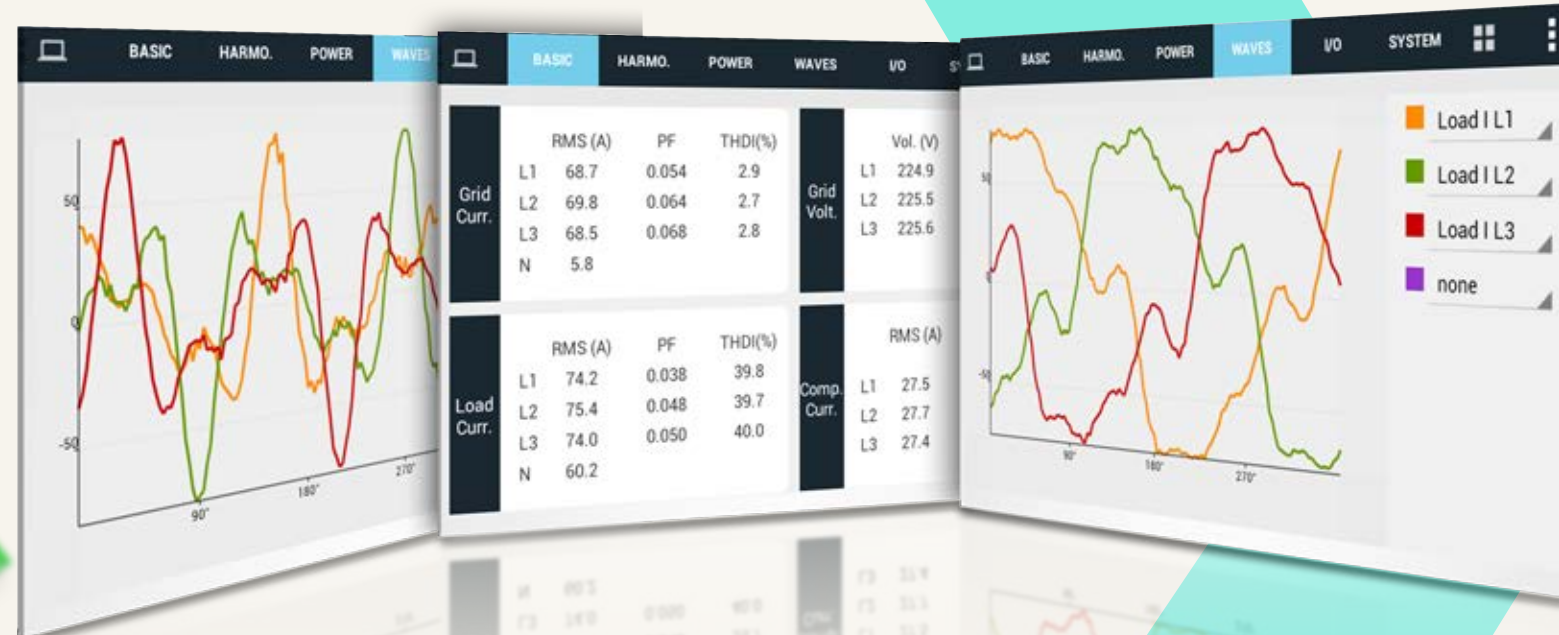100A   wall   500*250*723mm^3 rack   500*675*250mm^3 70kg

INVERTER A

400V

400V

5A/10A/15A   wall/rack   410*340*45mm³ 4.98kg

Flexible Engineering Cabinet

- Flexible dimension
  600*1000*2200mm³,800*1000*2200mm³,800*800*2200mm³,1000*1000*2200mm³, **800*600*2200mm³**
- Flexible Capacity
  AHF, 25A/35A/50A/60A/75A/100A/150A/**300A** adapt to cabinet
  SVG, 30kvar/50kvar/100kvar/**200kvar** adapt to cabinet
  AHF, SVG module adapt to cabinet
- Flexible incoming connection
  Top / Bottom cable entrance
  Top / Bottom MCCB position

4.3-inch screen

		RMS (A)	PF	THDI(%)			Vol. (V)
Grid Curr.	L1	68.7	0.054	2.9	Grid Volt.	L1	224.9
	L2	69.8	0.064	2.7		L2	225.5
	L3	68.5	0.068	2.8		L3	225.6
	N	5.8					

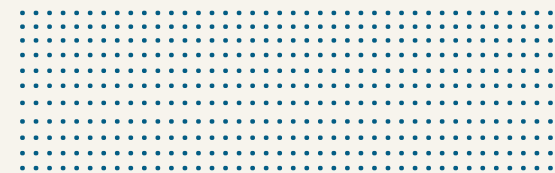|		RMS (A)	PF	THDI(%)			RMS (A)
Load Curr.	L1	74.2	0.038	39.8	Comp. Curr.	L1	27.5
	L2	75.4	0.048	39.7		L2	27.7
	L3	74.0	0.050	40.0		L3	27.4
	N	60.2					

Centralized monitoring System

GLOBAL APPLICATION

Industrial Manufacturing

Food and beverage, plastic, paper, semiconductor, chemistry, pharmacy, paper, cement, oil drilling, automotive

Infrastructure

Airport-metro and railway, tunnel, water treatment, schools/campus, museums, hospital, government building

More than 2.5million Ampere installation around the world

Application cover Automation Manufacturing, Infrastructure, ECO building, IDC

Application cover indoor/outdoor, high altitude hot/cold mechanical environment/dusty application, land/offshore severe environment

ECO Building

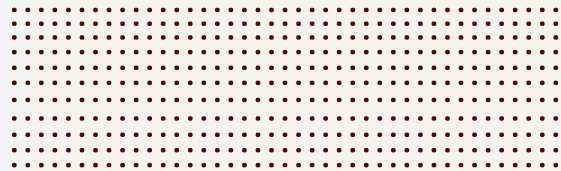Skyscraper-Commercial building, shopping mall, apartments

IDC

Telecom, bank, internet companies

Canada, Hylife Food, AHF 1440A

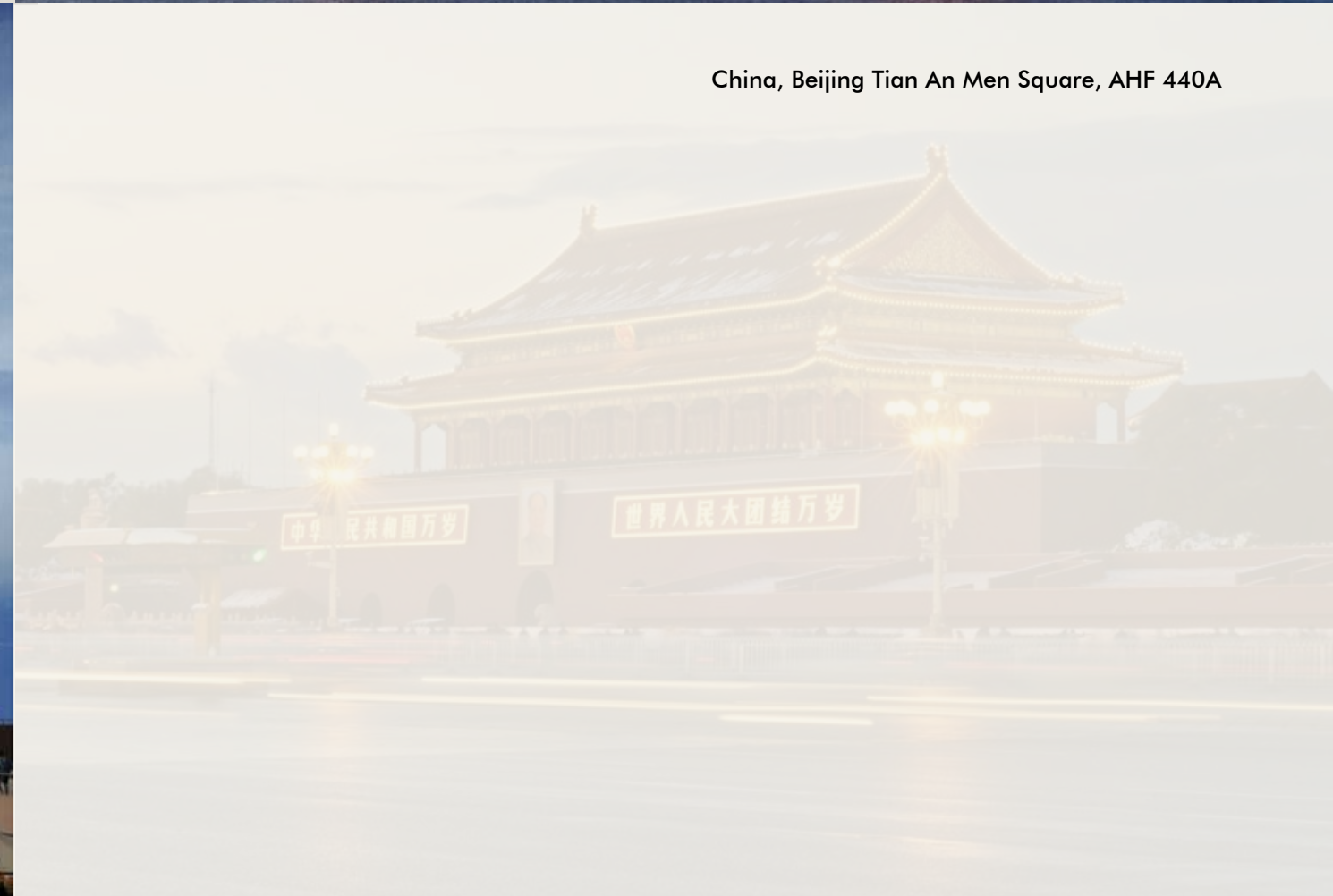The United Kingdom, Glabina cheese, AHF 350A

Industrial Manufacturing

Infrastructure

Australia, Sydney Opera house, AHF 200A

China, Beijing Tian An Men Square, AHF 440A

Hong Kong International Airport, AHF 6500A

Dubai International Airport, AHF 700A

Singapore Changi Airport, AHF 1950A

Gothenburg-Land Vetter Airport, SVG 270kvar

Infrastructure

ECO building

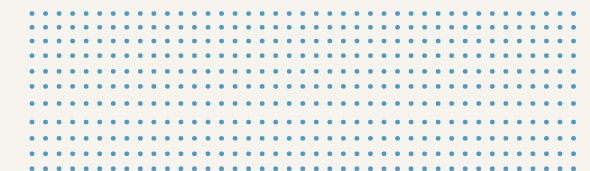Singapore, Microsoft Headquarter of Southeast Asia, AHF 1800A

IDC

South Korea
Daegu bank AHF 150A/SVG 400kvar

HongKong(China)
China Unicom Data Centre, AHF 4425A

GLOBAL APPLICATION

Sinexcel AHF application covers Asia, Oceania, Europe, Africa, North America, South America.