



Wind Power Generation System Product Catalog

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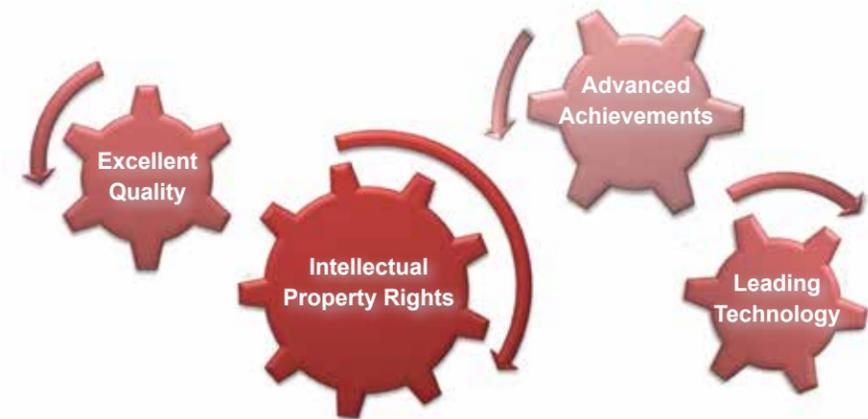


>> Company Profile

Shenzhen Hopewind Electric Co., Ltd. (Stock Code: 603063) focuses on the research, manufacture, sales and service of renewable energy & electric drive products, with main products of wind power generation products, photovoltaic generation products and industrial drive products. Furthermore, Hopewind owns independent development & testing platforms of integrated high-power power electric equipment and monitoring system. Through innovation in technology and service, Hopewind continuously creates value for customers, and has become one of the most competitive enterprises in renewable energy field.

In the renewable field, Hopewind products cover 850kW~10.0MW wind power converters, 3kW~1.6MW PV inverters and 1.0MW~6.4MW PV inverter-container integrated solutions; In the field of industrial drive, Hopewind provides solutions with the power range from 0.4kW to 60MW, which is widely used in metallurgy, petroleum, chemical industry and other various industrial applications. In the field of power quality improvement and management, Hopewind provides APF and SVG solutions with 30kVar~40MVar single-machine capacity, and special power supply products, which are widely used in the field of subway, telecommunication, metallurgy, petroleum industry, automobile manufacturing, papermaking and so on. In the field of port, Hopewind provides 100kVA~30000kVA shore power supply system, widely used in frequency-/voltage-change power supply occasions, such as large ports, large cruise terminals and a variety of specific wharfs.

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Headquarter · Shenzhen

6 R&D and manufacturing bases: Shenzhen, Suzhou, Dongguan, Yancheng, Xi'an, Heyuan

30+ Global service bases: Deployed worldwide, and provides comprehensive services for global customers

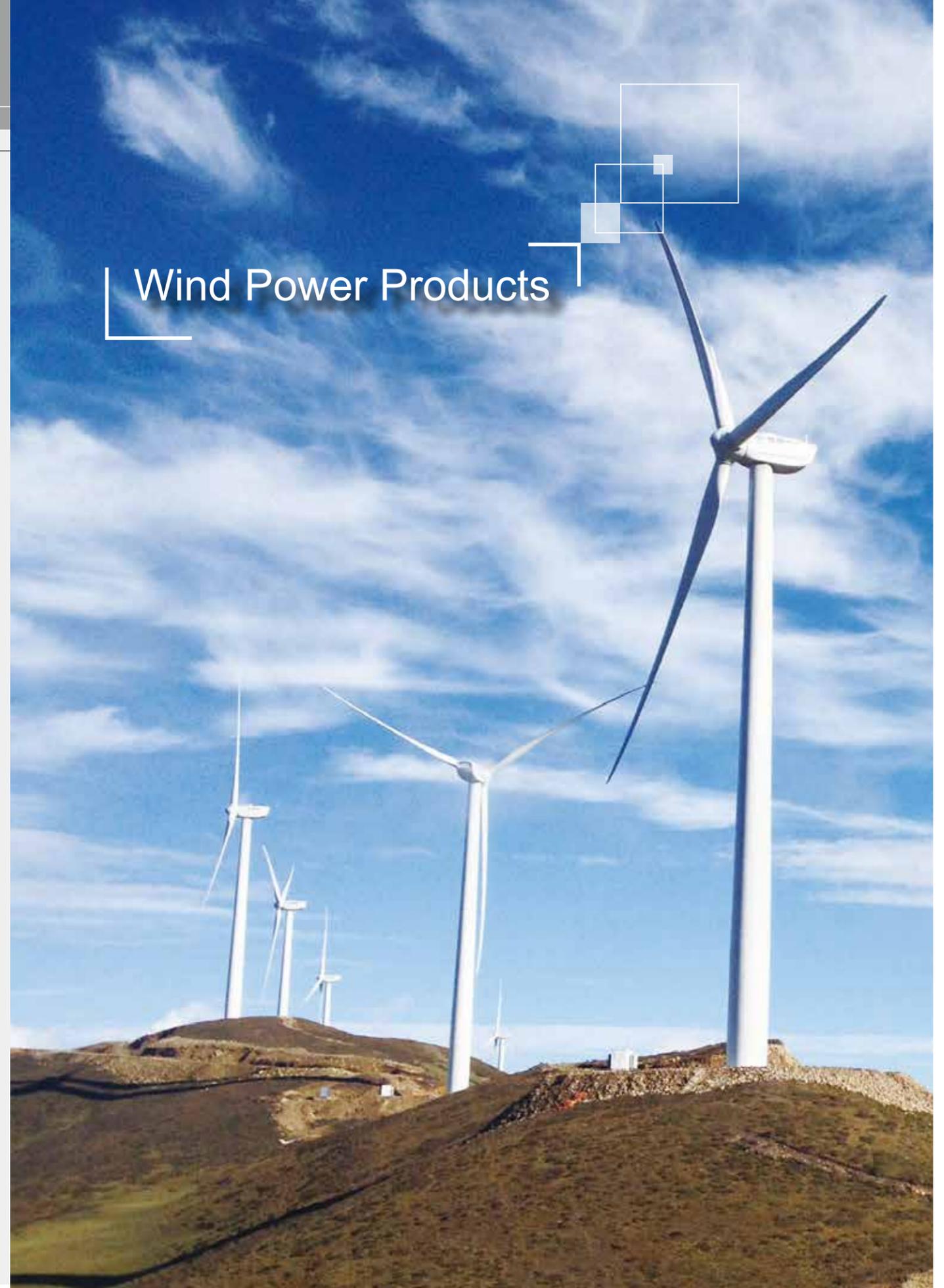




Company Performance:

Dongxinying, Hebei	Erenhot, Inner Mongolia	Liaoning, Liaoning	Jinchang, Gansu	Luxi, Yunnan
Chongli, Hebei	Huade, Inner Mongolia	Fushun, Liaoning	Lanzhou, Gansu	Xundian, Yunnan
Dahulun, Hebei	Hailar, Inner Mongolia	Daqing, Heilongjiang	Guyuan, Ningxia	Luliang, Yunnan
Zhangjiakou, Hebei	Bayan Nur, Inner Mongolia	Zhaoyuan, Heilongjiang	Zhongwei, Ningxia	Qiubei, Yunnan
Yudaokou, Hebei	Manzhouli, Inner Mongolia	Suibin, Heilongjiang	Ningdong, Ningxia	Eryuan, Yunnan
Cangzhou, Hebei	Ulanqab, Inner Mongolia	Wendeng, Shandong	Zhanjiang, Guangdong	Jianchuan, Yunnan
Tangshan, Hebei	Urat Houqi, Inner Mongolia	Laizhou, Shandong	Lianzhou, Guangdong	Tianzhen, Shanxi
Daan, Jilin	Chifeng, Inner Mongolia	Pingdu, Shandong	Guangzhou, Guangdong	Xinzhou, Shanxi
Anguang, Jilin	Huitengliang, Inner Mongolia	Yantai, Shandong	Dongguan, Guangdong	Zuoyun, Shanxi
Gonghe, Qinghai	Xininghaote, Inner Mongolia	Yangzhou, Jiangsu	Hezhang, Guizhou	Shuozhou, Shanxi
Delingha, Qinghai	Zhurihe, Inner Mongolia	Jiujiang, Jiangxi	Sanmenxia, Henan	Yuhuan, Zhejiang
Golmud, Qinghai	Hohhot, Inner Mongolia	Dechang, Sichuan	Xixia, Henan	Ningbo, Zhejiang
Yengisar, Xinjiang	Fuxin, Liaoning	Yulin, Shanxi	Fuchuan, Guangxi	Hangzhou, Zhejiang
Yiwu, Xinjiang	Yingkou, Liaoning	Guazhou, Gansu	Linwu, Hunan	Wuxi, Jiangsu
Tongliao, Inner Mongolia	Zhangwu, Liaoning	Changma, Gansu	Longhui, Hunan	Suzhou, Jiangsu
Baolongshan, Inner Mongolia	Faku, Liaoning	Jiuquan, Gansu	Guiyang, Hunan

Wind Power Products



Product Overview

Wind energy is a kind of clean and renewable energy. As the most important utilization form of wind energy, wind power generation has good environmental and economic benefits.

In wind power generator system, the wind power converter converts the output electric energy of generator, whose frequency and amplitude are variable, into CVCF electric energy by AC-DC-AC Conversion, and then the CVCF electric energy will be fed to the grid, so as to realize the variable-speed constant-frequency control of the wind power generator.

The wind power converters can be classified into doubly-fed converter, full power converter and medium voltage converter, which are respectively matched with doubly-fed induction generator, low voltage permanent magnet/electric excitation generator and medium voltage permanent magnet generator.

Product Series	Name	Model	Power	Application Environment
Wind Power Products	Doubly-fed Converter	Air Cooling	1.5MW~6.0MW	Standard Type Plateau Type Low Temperature Type Coastal Type Sea-based Type
		Liquid Cooling		
	Full Power Converter	Low-speed Permanent Magnetic	1.0MW~10.0MW	
		Medium-speed Permanent Magnetic		
		High-speed Permanent Magnetic		
		Electric Excitation		
	High-speed Asynchronous Machine			
Medium Voltage Converter	Permanent Magnet Motors	5.0MW~10.0MW	Coastal Type Sea-based Type	

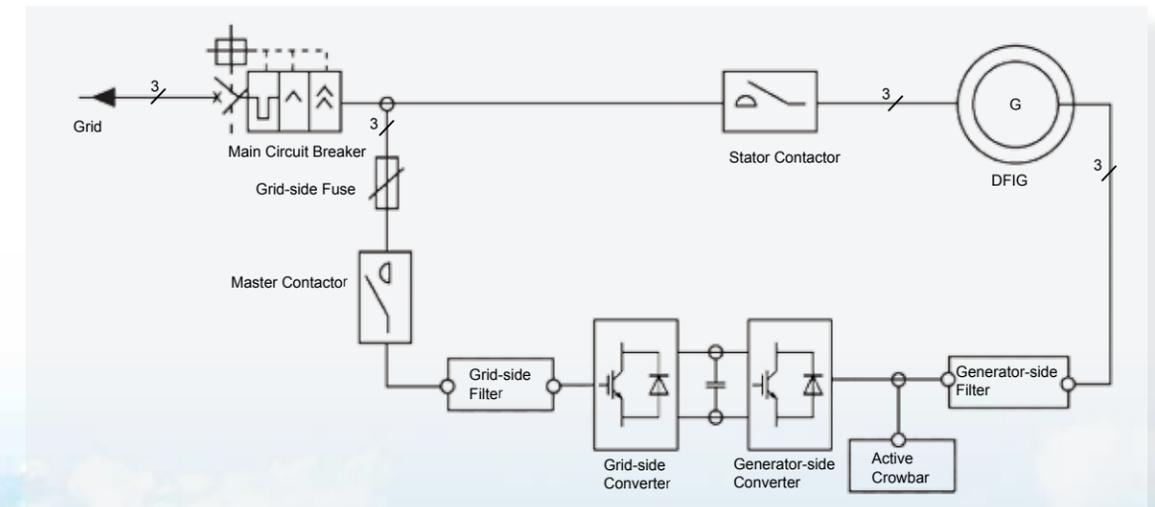


Principle Overview

The Doubly-fed Converter is mainly used together with DFIG in wind power generation system, so as to obtain the optimizing generating efficiency and power quality. When generator speed varies with wind speed, the converter will change the magnetic field of the rotor by controlling the rotor's excitation to make the frequency and amplitude of generator's output voltage the same with power grid voltage, so as to realize the variable-speed constant frequency power generation of the wind power system. The adjustment of frequency, the active power and reactive power can be realized by varying the rotor excitation current's frequency, amplitude and phase position.

Hopewind Electric provides Doubly-fed Converters of different specifications including 1.0MW, 1.5MW, 2.0MW, 2.5MW, 3.2MW, 5.0MW. Based on the cooling type, the converters can be classified into air cooling type, liquid cooling type and air conditioning cooling type. The Doubly-fed Converter series respectively offer different application configurations including standard type, plateau type, low temperature type, coastal type and sea-based type.

DFIG Wind Power System Structure



>> Doubly-fed Converter Air-cooled Compact Type

Performance Characteristics

- High reliability: Strong capability to withstand harsh climate, vibration and other adverse working conditions
- Rich and flexible interface: Perfect match with various generators and control systems
- Leading control technologies: Active adaptability to harsh grid to ensure customer ROI
- High power density: Miniaturized components and modules can be installed and maintained quickly
- Air-cooled system, easy maintenance, simple, cost-effective, especially suitable for high altitude, high temperature, low temperature and other environments
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



>> Doubly-fed Converter Air-cooled Compact Type

Performance Characteristics

- With/without grid-connection cabinet design, more compact structure; suitable for the stringent requirements of the structural space of the occasion; suitable for the transformation with retaining original grid-connected cabinet
- High reliability design: Tolerance to the working environment with harsh climate, vibration and so on
- Rich and flexible external interface: Perfectly match with various types of motors and control systems
- Leading control technology: Adapt to the harsh environment of the grid, protect the user's investment proceeds
- High power density: Miniaturization design of components and modules to make the installation and maintenance easy and rapid
- Air-cooled system, easy and simple maintenance; high cost performance: Especially suitable for the situations with high altitude, high temperature, low temperature and so on
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



Technical Specifications

Parameters	Power	1.0MW	1.5MW	2.0MW	2.5MW
Operating Voltage		552V~759V ^①			
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz ^②			
Rated Current		967A	1450A	2000A	2417A
Grid Side Current		205A	305A	420A	550A
Grid Side Overload Current (10sec/6min)		340A	510A	540A	600A
Generator Side Current		390A	580A	800A	1000A
Generator Side Overload Current (10sec/6min)		430A	640A	880A	1100A
Grid Voltage Harmonic Endurance		≤5%			
Grid Voltage Unbalance Endurance		≤8%			
Efficiency		>97%			
Noise		<82dB			
Operating Temperature		-40℃~+50℃ (Operation with derating at +45℃~+50℃)			
Storage Temperature		-40℃~+70℃			
Altitude		Normal: ≤2000m, Plateau Model: 2000~5000m ^③			
Cooling Type		Air-cooled			
Ingress Protection		Distribution Cabinet: IP23, Control Box: IP54, Power Cabinet: IP23 (IP54 with option)			
LVRT		National standard and E.ON2006			
Dimensions (W*H*D) (mm)		2500*2000*600		2600*2000*600	

① Support running under 1.3 times of rated voltage

② Please consult Hopewind for the solutions of other frequency range

③ Please consult Hopewind for the solutions of 4000m above

* Above ①②③ are common to the entire series of doubly-fed converters

Technical Specifications

Parameters	Power	1.5MW	2.0MW	2.5MW
Operating Voltage		552V~759V		
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz		
Rated Current		1450A	2000A	2417A
Grid Side Current		305A	420A	550A
Grid Side Overload Current (10sec/6min)		510A	540A	600A
Generator Side Current		580A	800A	1000A
Generator Side Overload Current (10sec/6min)		640A	880A	1100A
Grid Voltage Harmonic Endurance		≤5%		
Grid Voltage Unbalance Endurance		≤8%		
Efficiency		>97%		
Noise		<82dB		
Operating Temperature		-40℃~+50℃ (+45℃~+50℃ derating)		
Storage Temperature		-40℃~+70℃		
Altitude		Standard Type: ≤2000m, Plateau Type: 2000m~5000m		
Cooling Type		Air-cooled		
Ingress Protection		Control Box: IP54, Cabinet: IP23		
LVRT		National standard and E.ON2006		
Dimensions (W*H*D) (mm)		1300*2200*600 (without grid-connection cabinet) 1900*2000*600 (with grid-connection cabinet)		

>> Doubly-fed Converter Liquid-cooled Type

Performance Characteristics

- Rich and flexible interface: Perfect match with various generators and control systems
- Leading control technologies: Active adaptability to harsh grid to ensure customer ROI
- High reliability: Strong capability to withstand harsh climate, vibration and other adverse working conditions
- High power density: Miniaturized components and modules can be installed and maintained quickly
- Water-cooled system with high protection degree and high reliability, especially suitable for high salt spray, high pollution and high humidity environment
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



>> Doubly-fed Converter Liquid-cooled Integrated Type

Performance Characteristics

- **Structural integration**
 - Optimize the design of external pipelines, saving pipeline length
 - The bottom inlet and outlet of the water pipe can be effectively used to save the installation hole
 - The ingress protection of the liquid cooler and the converter is the same as IP54, which is convenient to be used in harsh environment
 - Liquid coolers and converters with integrated structure, compact structure, convenient transportation and lifting
- **Control integration**
 - More accurate data detection of converter inlet and outlet water temperature and pressure
 - The liquid cooler is controlled by the converter independently, without external participation, with better logic, the converter can respond to the abnormal situation of water coolers in time
 - The water cooler can be directly powered by the converter without any external power supply, saving external auxiliary power supply requirements and better meeting LVRT function
- **Maintenance integration**
 - Can be through the remote network monitoring system for cooling system operation and maintenance
 - Maintained by the Hopewind unified maintenance, service response and spare parts reserves consistent with the converter
 - Unified background monitoring software, real-time monitoring of water cooler operating status and fault records, unified customer service inspection



Technical Specifications

Parameters	Power	2.0MW	2.5MW	3.2MW	5.0MW
Operating Voltage		552V~759V			
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz			
Rated Current		2000A	2417A	2975A	4686A
Grid Side Current		420A	550A	700A	1020A
Grid Side Overload Current (10sec/6min)		640A	600A	770A	1200A
Generator Side Current		800A	1000A	1250A	1940A
Generator Side Overload Current (10sec/6min)		880A	1100A	1400A	2140A
Grid Voltage Harmonic Endurance		≤5%			
Grid Voltage Unbalance Endurance		≤8%			
Efficiency		>97%			
Noise		<70dB			
Operating Temperature		Ambient Temperature: -40℃~+50℃, Cooling Liquid Temperature: +5℃~+55℃ (Operation with derating at 50℃~55℃)			
Storage Temperature		-40℃~+70℃			
Altitude		Normal: ≤2000m, Plateau Model: 2000~5000m			
Cooling Type		Liquid Cooling			
Ingress Protection		IP54			
LVRT		National standard and E.ON2006			
Dimensions (W*H*D) (mm)		2300*2000*640 (Line-styled) 1650*2200*1300 (Back-to-back)	2300*2000*640 (Line-styled) 1650*2200*1300 (Back-to-back)	3600*2200*640 (Line-styled)	

Technical Specifications

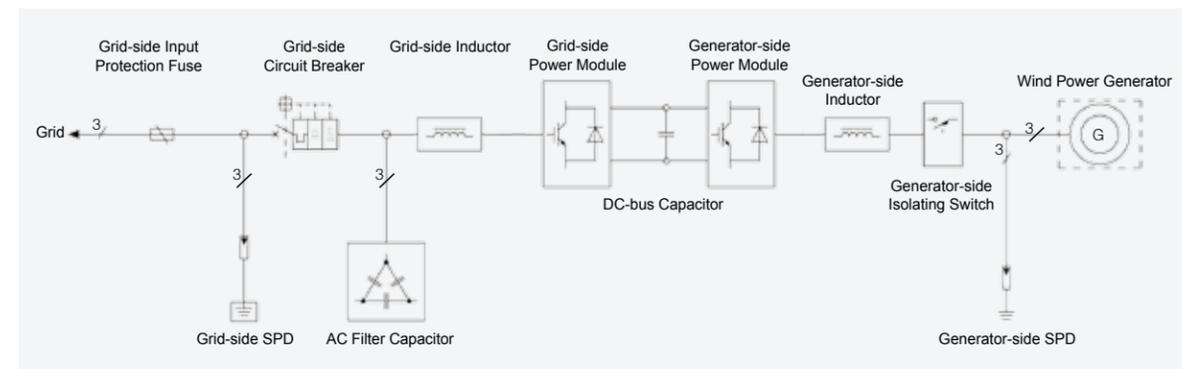
Parameters	Power	2.0MW	2.5MW	3.2MW
Operating Voltage		552V~759V		
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz		
Rated Current		2000A	2417A	2761A
Grid Side Current		420A	550A	700A
Grid Side Overload Current (10sec/6min)		540A	600A	770A
Generator Side Current		800A	1000A	1250A
Generator Side Overload Current (10sec/6min)		880A	1100A	1400A
Grid Voltage Harmonic Endurance		≤5%		
Grid Voltage Unbalance Endurance		≤8%		
Efficiency		>97%		
Noise		<70dB		
Operating Temperature		Ambient Temperature: +40℃~+50℃ (Operation with derating at 45℃~50℃)		
Storage Temperature		-40℃~+70℃		
Altitude		Normal: ≤2000m, Plateau Model: 2000~5000m		
Cooling Type		Liquid Cooling		
Ingress Protection		IP54		
LVRT		National standard and E.ON2006		
Dimensions (W*H*D) (mm)		2700*2200*640		

Overview of the Principle

The full power converter of Hopewind Electric supports the use of permanent magnet synchronous generator, electro-magnetic synchronous generator or high-speed asynchronous generator in the wind power system, which is composed of generator-side converter and grid-side converter, the both are connected by DC Bus. The generator-side converter connected to generator stator realizes the control of the variable speed and constant frequency of the motor, obtains the best efficiency, and transmits power to grid-side converter through DC-link. Being connected to the power grid, the grid-side converter provides the power grid with high-quality electric energy, in the meanwhile, balances the voltages at both DC sides. The full power converter can realize zero impact on the set in grid connection/disconnection, has excellent fault ride-through capability and can ensure grid connects with turbine friendly, when used together with generator. Moreover, the grid-side converter is of superior active power, reactive power and voltage regulation performance.

Hopewind Electric provides different specifications of full-power wind power converters including 1.0MW, 1.5MW, 2.0MW, 2.5MW, 3.0MW, 4.0MW, 5.0MW, 6.0MW and 8.0MW, which obtains a number of patented technology, and owns completely independent proprietary knowledge. Depending on generators, the full power converter of Hopewind Electric can be divided into permanent magnet and electro-magnetic full power converter. According to different application environments, we can respectively offer different application configurations including standard type, plateau type, low temperature type, coastal and sea-based type, etc.

Full Power Wind Power Generation System Structure



Performance Characteristics

- The unique user customization: It can customize power, the interface of signal or outer loop according to customer's requirements.
- Excellent electric energy quality: Leading control technology ensures zero impact on the set in grid connection/disconnection; Adjustable grid-side power factor.
- Excellent power grid adaptability: Effectively adapt to the weak power grid; Be able to adapt to and inhibit the harmonic wave and flickering; Meet the national LVRT standard.
- Extensive environmental adaptability: With IP54 protection class and high reliability; Apply to various harsh environments such as plateau, low temperature and salt mist.
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



Technical Specifications

Parameters	Power	1.0MW	1.5MW	2.0MW	2.5MW	3.0MW	4.0MW	5.0MW	6.0MW	8.0MW
Operating Voltage		552V~759V ^①								
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz ^②								
Grid Side Maximum continuous current		978A	1468A	1957A	2446A	2930A	3915A	4893A	5860A	7830A
Grid Side Overload Current (10sec/6min)		1076A	1614A	2153A	2691A	3229A	4307A	5382A	6446A	8614A
Generator Side Maximum continuous current		1000A	1500A	2000A	2500A	3000A	4200A	5000A	6000A	8200A
Generator Side Overload Current (10sec/6min)		1100A	1650A	2200A	2750A	3300A	4620A	5500A	6600A	9240A
Grid Voltage Harmonic Endurance		≤5%								
Grid Voltage Unbalance Endurance		≤8%								
Efficiency		>97%								
Noise		<70dB								
Operating Temperature		Ambient Temperature: -30°C~+50°C, The Coolant Temperature: +5~+55°C (Operating with derating at +50°C~+55°C)								
Storage Temperature		-40°C~+70°C								
Altitude		Normal: ≤2000m, Plateau Mode: 2000m~5000m ^③								
Cooling Type		Liquid Cooling								
Ingress Protection		IP54								
LVRT		National standard and E.ON2006								
Dimension (W*H*D) (mm)		Size A	Size A Size B	Size C Size D	Size D	SizeE	SizeF	SizeG	SizeH	

Size A: W*H*D=1200*2200*600 (Line-styled)

Size B: W*H*D=2200*2200*640 (Line-styled)

Size C: W*H*D=2910*2200*640 (Line-styled)

Size D: W*H*D=2200*2200*1300 (Back-to-back)

Size E: W*H*D=2700*2200*1300 (Back-to-back)

Size F: W*H*D=2200*2200*(2*1300) (Two 2.5MW converters in parallel)

Size G: W*H*D=2200*2200*(2*1300) (Two 3.0MW converters in parallel)

Size H: W*H*D=2700*2200*(2*1300) (Two 4.0MW converters in parallel)

① Support running under 1.3 times of rated voltage

② Please consult Hopewind for the solutions of other frequency range

③ Please consult Hopewind for the solutions of 4000m above

* Above ①②③ are common to the entire series of full-power converters

>> Full Power Converter Liquid-cooled Integrated Type

Performance Characteristics

Structural integration

- Optimize the design of external pipelines, saving pipeline length
- The bottom inlet and outlet of the water pipe can be effectively used to save the installation hole
- The ingress protection of the liquid cooler and the converter is the same as IP54, which is convenient to be used in harsh environment
- Liquid coolers and converters with integrated structure, compact structure, convenient transportation and lifting

Control integration

- More accurate data detection of converter inlet and outlet water temperature and pressure
- The liquid cooler is controlled by the converter independently, without external participation, with better logic, the converter can respond to the abnormal situation of water coolers in time

Maintenance integration

- Can be through the remote network monitoring system for cooling system operation and maintenance
- Maintained by the Hopewind unified maintenance, service response and spare parts reserves consistent with the converter
- Unified background monitoring software, real-time monitoring of water cooler operating status and fault records, unified customer service inspection



>> Full Power Converter Electric Excitation Type

Performance Characteristics

- Extensive adaptation range: It can match these two wind turbines, Brushless electric excitation and Direct excitation wind turbine.
- The unique user customization: It can customize power, the interface of signal or outer loop according to customer's requirements.
- Compatible with permanent magnet and electro-magnetic: With excitation module in converter, the overall size in line with permanent magnet full power converter.
- Excellent electric energy quality: Leading control technology ensures zero impact on the set in grid connection/disconnection; Adjustable grid-side power factor.
- Good adaptability to the grid: Effective to adapt to the weak poor power grid, and can adapt to and restrain harmonic and flicker, Meet the national low wear standard.
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



Technical Specifications

Parameters	Power	2.0MW	2.5MW	3.0MW
Operating Voltage		552V~759V		
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz		
Grid Side Maximum continuous current		1957A	2446A	2930A
Grid Side Overload Current (10sec/6min)		2153A	2691A	3229A
Generator Side Maximum continuous current		2000A	2500A	3000A
Generator Side Overload Current (10sec/6min)		2200A	2750A	3300A
Grid Voltage Harmonic Endurance		≤5%		
Grid Voltage Unbalance Endurance		≤8%		
Efficiency		>97%		
Noise		<70dB		
Operating Temperature		Ambient Temperature: -30℃~+50℃ (Operating with derating at 45℃~50℃)		
Storage Temperature		-40℃~+70℃		
Altitude		Normal: ≤2000m, Plateau Mode: 2000m~5000m		
Cooling Type		Liquid Cooling		
Ingress Protection		IP54		
LVRT		National standard and E.ON2006		
Dimension (W*H*D) (mm)		2700*2380*1300		

Technical Specifications

Parameters	Power	1.5MW	2.0MW	2.5MW	3.0MW
Operating Voltage		552V~759V			
Operating Frequency (Grid Side)		47.5Hz~52.5Hz / 57Hz~63Hz			
Grid Side Maximum continuous current		1468A	1957A	2446A	2930A
Grid Side Overload Current (10sec/6min)		1614A	2153A	2691A	3229A
Generator Side Maximum continuous current		1500A	2000A	2500A	3000A
Generator Side Overload Current (10sec/6min)		1650A	2200A	2750A	3300A
Grid Voltage Harmonic Endurance		≤5%			
Grid Voltage Unbalance Endurance		≤8%			
Efficiency		>97%			
Noise		<70dB			
Operating Temperature		Ambient Temperature: -30℃~+50℃, The Coolant Temperature: +5℃~+55℃ (Operating with derating at 50℃~55℃);			
Storage Temperature		-40℃~+70℃			
Altitude		Normal: ≤2000m, Plateau Mode: 2000m~5000m			
Cooling Type		Liquid Cooling			
Ingress Protection		IP54			
LVRT		National standard and E.ON2006			
Dimension (W*H*D) (mm)		Size A	Size A Size B	Size B	

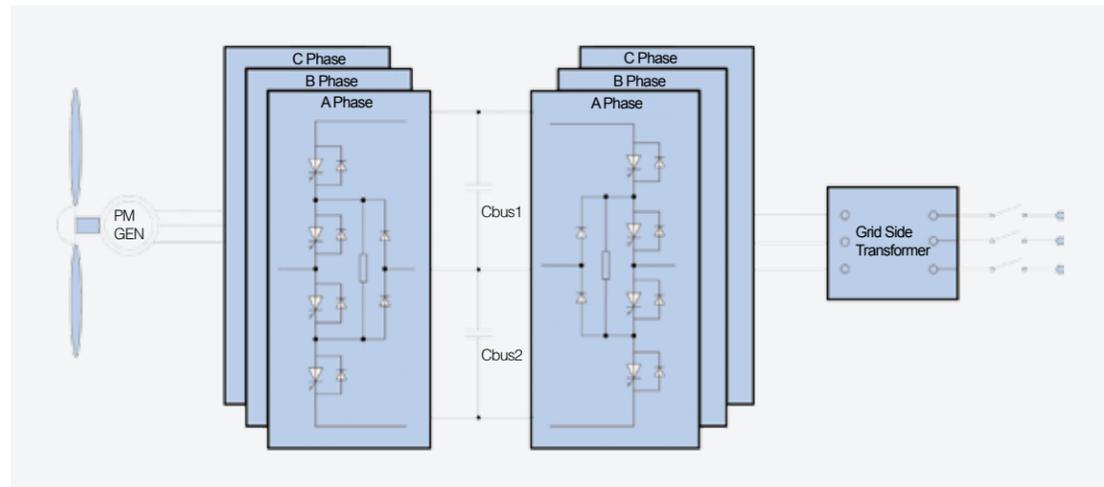
Size A: W*H*D=2910*2200*640 (Line-styled)
Size B: W*H*D=2200*2200*1300 (Back-to-back)

Principle Overview

The medium-voltage full power permanent-magnet wind power converter of Hopewind Electric is used in wind power generation system compatible with medium-voltage permanent magnet synchronous generator, adopt three-level converter technology of diode clamping type, with 3 kV system voltage, it can match the motor of corresponding voltage grade.

Through Grid side adopting PWM rectifier, the converter realizes AC/DC voltage stability and boost conversion, and gets stable DC-voltage source, which is inverted into three-phase AC source connected to motor stator through motor PWM inverter unit, thus achieving the control of electromagnetic torque and magnetic field of the motor. Thereby, the output AC source of frequency and amplitude changing from turbine merges with frequency constant power grid.

Medium Voltage Wind Generation System Structure



► Medium Voltage Converter-Standard Cabinet

Performance Characteristics

- Less cable, engineering installation facilities
- High power density, up to 8.0MW
- Adopt diode-clamp three-level technology
- Small size, good compatibility and high reliability
- High equivalent switching frequency, small harmonics, and great dynamic response
- Suitable for high-power wind turbine units, especially the sea-based high-power units
- Hopewind can also provide medium pressure container-type wind power converter according to customer demands with higher level of protection
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



► Medium Voltage Converter-Integrated Container

Overview of the Principle

In offshore wind power applications, wind turbine will encounter damp, salt mist, difficult to maintain and other issues. Application of medium voltage wind power converter in the offshore wind power system can be used in the form of containers, converters and their corresponding auxiliary equipments installed in the container.

Performance Characteristics

- Using standard containers, to facilitate the standard design of the outer platform of the tower
- Placed in the tower outer platform, assist the optimization of tower design to cost saving
- Great sealing performance, with high Ingress Protection of the converter itself, to ensure the safe operation of the converter
- Perfect system monitoring and fault diagnosis: hopeInsight™ monitoring software can realize remote monitoring and fault diagnosis of single converter, hopeView™ network monitoring system can realize networking and monitoring of converters in the wind field and remote scheduling of converters' active and reactive power



Technical Specifications

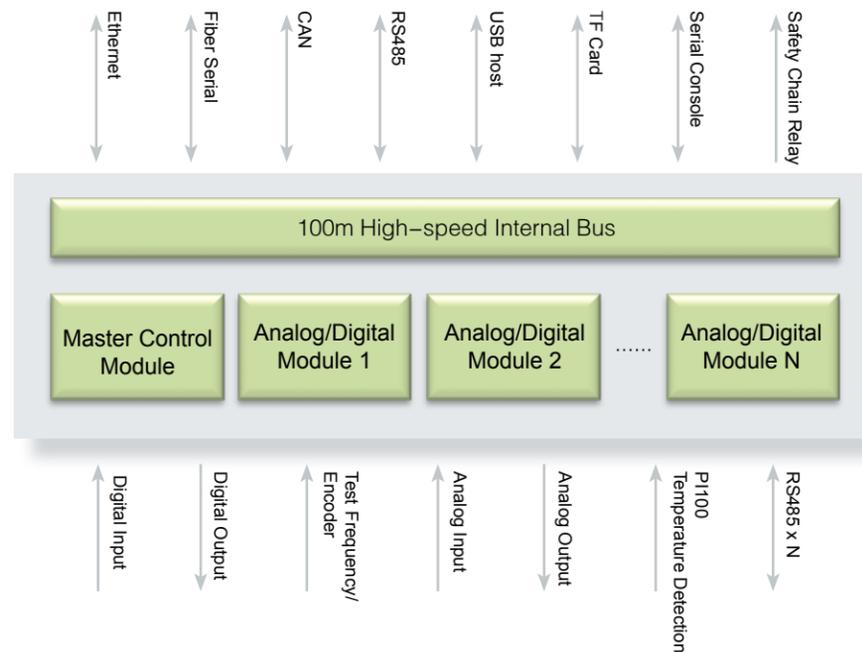
Parameters	Power	5.0MW	6.0MW	7.0MW	8.0MW
Grid-side Operating Voltage		3000V			
Grid-side Operating Frequency		47Hz~53Hz			
Grid-side Rated Current		1112A	1334A	1556A	1750A
Generator-side Operating Voltage		3100V			
Generator-side Rated Current		1112A	1334A	1556A	1750A
Grid Voltage Harmonic Endurance		≤5%			
Grid Voltage Unbalance Endurance		≤8%			
Efficiency		≥98%			
Noise		≤80dB			
Operating Temperature		-30℃~+45℃			
Storage Temperature		-40℃~+70℃			
Altitude		≤1000m			
Cooling Type		Liquid Cooling			
Ingress Protection		IP54			
LVRT		National standard			
Dimension (W*H*D) (mm)		3600*2200*2300			

► HIM Series Controller

As a kind of controller which is able to change the control countermeasures by program or software configuration, the master control development platform of Hopewind fully incorporates the domestic and international advanced technology as well as design ideas and configures with high-performance CPU and real-time Linux operation system. With the distributed type design and 100M high-speed internal bus, the product is characterized by convenient programming, flexible expansion, fast communication and reliable performance. The product is suitable to serve as the master control development platform of wind power generation (both applicable for single cabinet and double cabinets layout). Moreover, it is also applicable for the control systems development in other industrial control fields.

Overall Composition: main control module, digital module, analog module and back panel components

System Diagram



Performance Characteristics

- Support for real time wave recording
- High performance ARM processor
- Can remote upgrade module
- Strong anti-interference and anti-vibration
- TF card, USB mass storage
- Support C and ST language program development
- Linux real-time kernel, support $\leq 10\text{ms}$ program execution cycle
- Using EtherCAT backboard bus connection, fast and stable signal transmission
- Providing rich signal interface, through the module configuration to fully meet the development and application of wind turbine master control



Technical Specifications

Specification	Introduction
Operating Voltage	24VDC $\pm 10\%$
Operating Frequency	400 / 500Mhz
Operating Temperature	-30 $^{\circ}\text{C}$ ~+55 $^{\circ}\text{C}$
Digital Input	9~24VDC
Digital Output	9~24VDC
Code Input	Isolated encoder signal input
Frequency Input	0~10kHz Pulse Input
Analog Input	0~20mA or 0~10V
Analog Output	0~20mA
Pt100 Input	-60 $^{\circ}\text{C}$ ~+150 $^{\circ}\text{C}$
CAN Interface	125k / 250k / 500k / 1Mbps
RS485 Interface	9600 / 19200 / 38400 / 57600 / 115200bps
Ethernet Interface	10 / 100M self-adaption
USB Host	480Mbps USB2.0
Optical Fiber Interface	9600 / 19200 / 38400 / 57600 / 115200 / 230400 / 460800 / 921600bps
Storage Temperature	-40 $^{\circ}\text{C}$ ~+70 $^{\circ}\text{C}$
Altitude	<4000m
Cooling Type	Free Cooling
Ingress Protection	IP20

► Main-control Packaged Solution

Hopewind has the design, production and testing capacities of main control electrical system. According to the electrical topology of the wind turbine unit, we can provide single cabinet type and make the design and production of the double cabinet type package plan. The system meets the corresponding standards of GB 7479-2010/IEC 60446:2007, GL2010 and so on.

The main control cabinets designed and manufactured by Hopewind have all passed the internal type tests, such as ESD, radiated electromagnetic field immunity, insulation resistance, high voltage endurance, vibration, protection, high and low temperature, lightning protection, and overall machine whole functions on-site operation test. Hopewind can customized the cabinet size according to the customer requirements.



► Main-control Software

Hopewind has developed the main-control software with certain advantages compared to the traditional control software, through years of research and development and accumulated on-site practical experiences. Hopewind main-control software can run on Hopewind HIM controller or other controllers such as Beckhoff, Bachmann, which can show excellent platform versatility.

Performance Features

- Yawing optimization self-adaptive control**
 Based on the actual analysis of the on-site wind turbine units, the influence of the yawing system on the power generation of the wind turbine units is greater than that of the variable-speed variable-pitch control strategy. The control algorithm of Hopewind by improving the yawing control strategy, which greatly improves the efficiency and stability of the wind turbine units.
- Optimal torque control**
 The control method of a given rotational speed torque is adopted in the variable-pitch wind turbine units. In the traditional fan control strategy, the torque is given by means of look-up table method. The method cannot maximize the use of wind energy, especially the low efficiency before or after the rated wind speed. At present, the advanced control strategy uses the optimal tracking control algorithm, and the efficiency is improved obviously. Compared with the look-up table method, the full-generation wind speed can be reduced by 0.5m/s~1.0m/s, and power is increased by 1%-3% in 9m/s~11m/s wind speed segment.
- Cut-out wind speed section active power limit strategy, to extended power generation time**
 Hopewind main control optimizes the control strategy, that reduce the unit power actively while the cut- out wind speed section, under the premise of ensuring the safety of unit load, to extend power generation time and improve the strategy of cut-out wind speed, so as to improve the power generation.
- Variable pitch adaptive control**
 Compared to the common control algorithm, the main control algorithm has been optimized for special severe wind conditions, to solve the problems of over-speed caused by the gale and gust, grid-connecting difficulties/frequent grid separations during typhoon weather and other problems in the industry. By collecting the real-time speed and power of the wind turbine, the wind turbine low wind condition can be calculated, so as to adjust the current optimum pitch angle, and enhance the power generation 5%-10% in the weak wind conditions. In the same way, it can also change the propellers actively to prevent the unit from early stall before the rated power.
- The function of decreasing off-grid and increasing generation time in low wind**
 Through the transformation of the converter by Hopewind, the main control can be realized hot standby mode under the current low wind state. When the wind turbine is during the short-time low wind, the converter is keeping connected to the grid with the active power is 0, then in-time generation while wind speed rise.
- Redundancy function for two sets of wind speed direction instrument**
 Hopewind main control has the function of self-checking and mutual-checking for two sets of wind speed direction instrument. After the failure of the first set of wind speed and direction instrument is detected, the second set of instrument is automatically switched, and the stop time and statistical error caused by the failure are reduced.
- More perfect status code system, maximum protecting unit safety and quick diagnosis unit fault**
 Hopewind master control defines the master control status code system with wide coverage and rich attributes to ensure the safety of the unit to the maximum extent, especially the protection under bad working conditions, such as power curve monitoring and turbulence intensity monitoring under freezing working conditions. It has 5 kinds of attributes of brake level and stop state, which can quickly and accurately diagnose the unit fault when combined with Hopewind SCADA system.
- Complete log system**
 The controller stores a complete set of operation log, including the status code log, the fault log (multiple sampling period), the main status log, the ten minute statistics log, the controller access event log, etc..The history log storage period is long with data storage security.
 The controller will be periodically uploaded to the server for long time storage, and the logs can be queried and printed through the SCADA system.

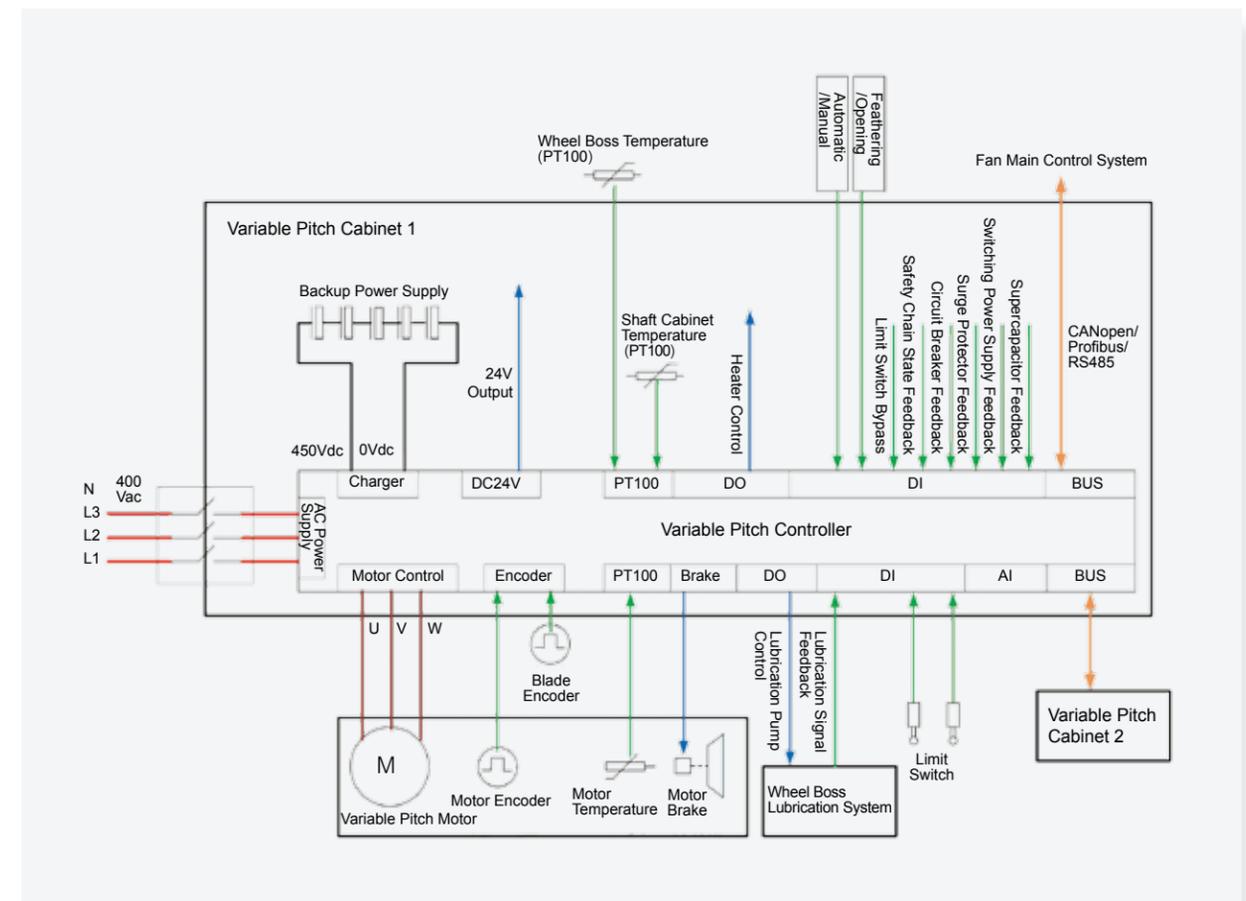
Technical Specifications

In view of the MW level wind turbine in wind power industry, Hopewind can provide the supported AC variable pitch control system, which can be divided into integrated scheme and distributed scheme.



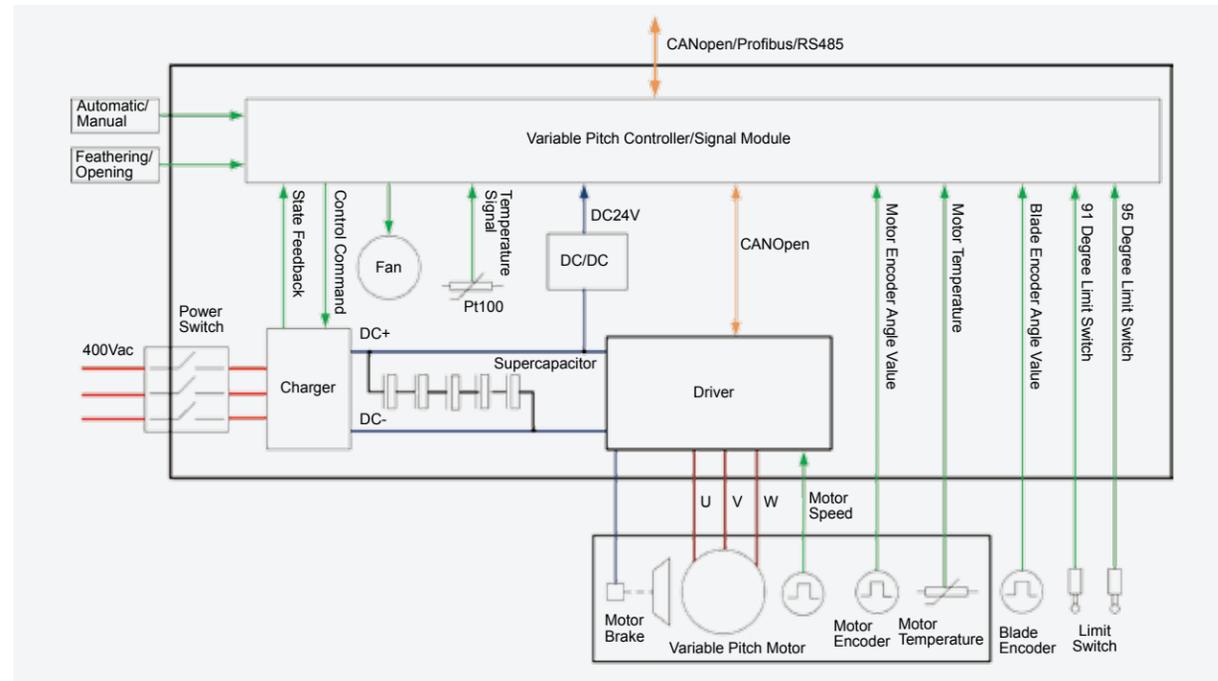
► Integrated Variable Pitch Control System

The driver of integrated variable pitch system has integrated the rectifier and inverter, motor control, signal acquisition, user programming, grid monitoring and other functions of the main power supply. the overall program structure is simple. The overall program structure is simple.



► Distributed Variable Pitch Control System

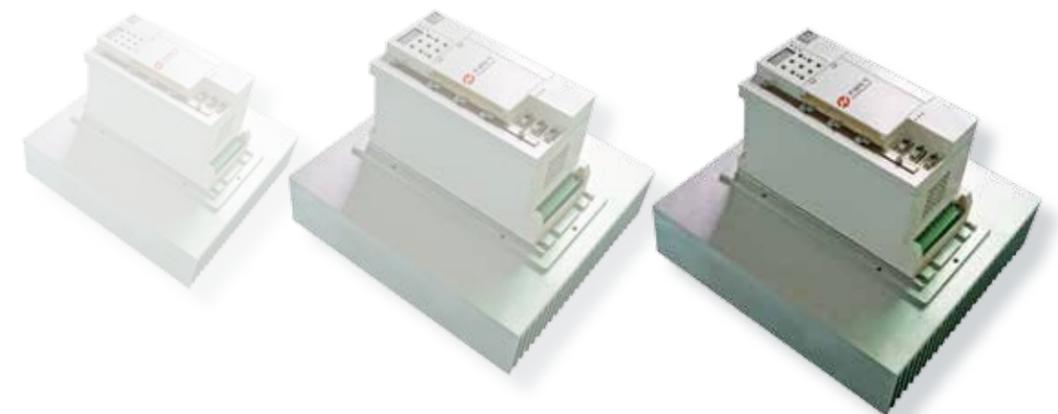
The scheme of distributed variable pitch system is shown as follows. The charger is used as a super capacitor charger and a driver power supply module, thus not requiring additional super capacitor charger and charging circuit. With large charger capacity, spare super capacitor charging time is short.



Performance Characteristics

- Position steady state error <0.05 degree
- Normal variable pitch follower deviation <1 degree
- Paddle synchronous angle deviation <0.5 degree
- Suitable for 1MW~6MW unit
- The operating temperature of ultra-low temperature type can be as low as -40°C
- The operating altitude of ultra-high altitude type can reach 4000 meters
- With the double security protection function of software and hardware
- Variable pitch control, position control mode and speed control mod
- Provide three cabinets, four cabinets, six cabinets or seven cabinet system according to the needs of users
- With excellent HVRT and LVRT capacity
- With CANopen, ProfibusDP, RS485 and other communication interface
- The software part has the functions of real-time fault, history fault record and fault snapshot
- The software part has a easy and direct human-machine interaction interface, and has the perfect parameter management function, manual operation function and super capacitor test function

Hopewind Electric provides different specifications of variable pitch servo drivers for wind power turbine including 7.5kW, 11kW, 15kW, 17kW, 23kW and 30kW. It is specially designed for the wind power pitch control system and it can be used together with DC servo motor, permanent magnet synchronous motor and AC asynchronous servo motor. It is suitable for the severe vibration and temperature conditions in the hub of the wind turbine. With excellent control accuracy and fast response, it satisfies the requirements for the high-performance pitch regulating control. It is suitable for the fast drive of blades which over 82m so as to effectively prevent the propeller racing caused by insufficient drive moment of blades.

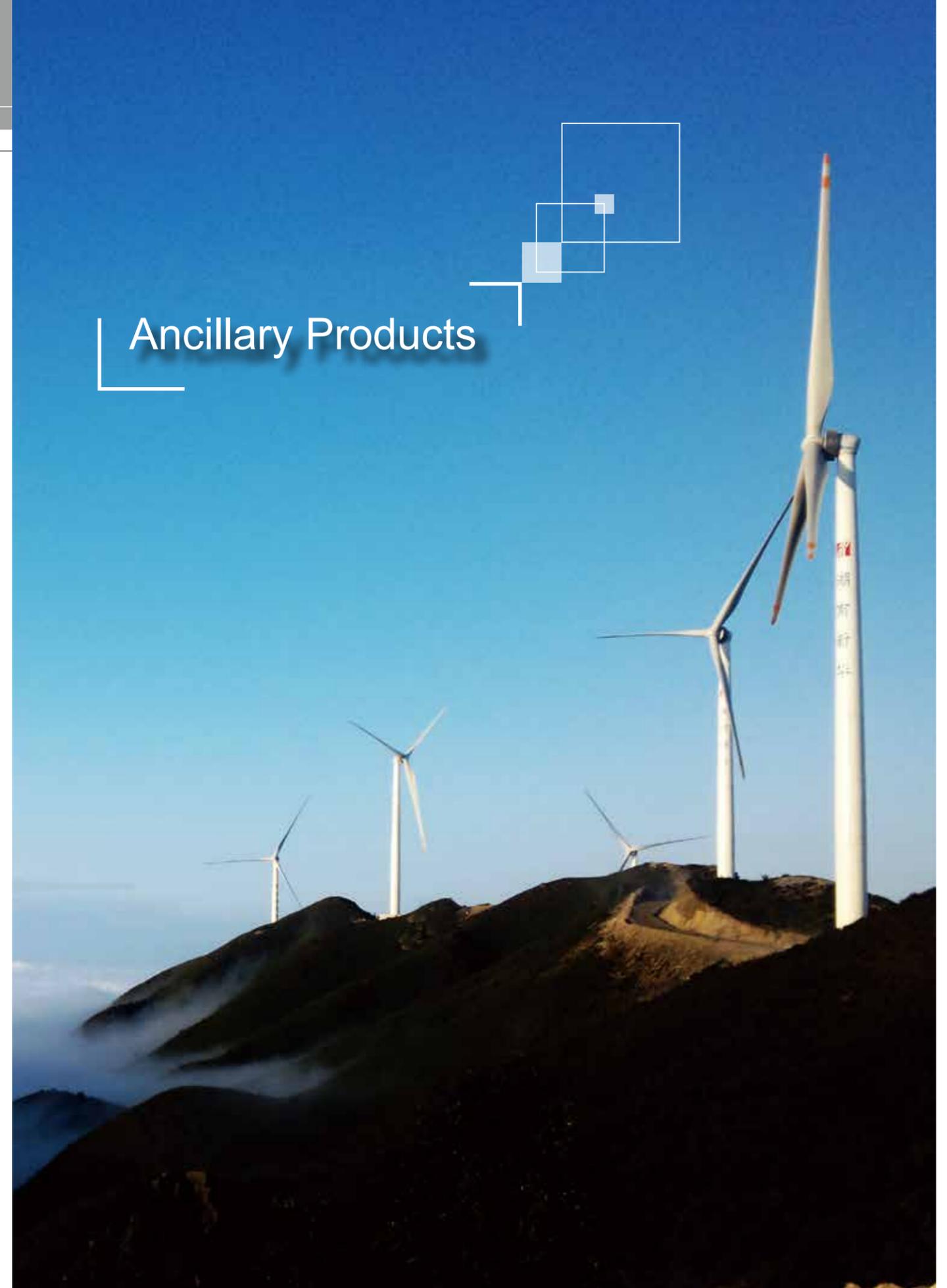


Variable-pitch Specific DC Servo Driver

Parameters	Power	7.5kW	11kW	15kW	17kW	23kW	30kW
Operating Voltage		150V / 275V, 3Ph AC					
Operating Frequency		50Hz±2Hz / 60Hz±2Hz					
Rated Input Current		14A	23A	28A	31A	43A	56A
DC Output		0V~210V / 365V, DC					
Rated Motor Power		3.9kW	5.8kW	7.9kW	8.9kW	12.1kW	15.8kW
Switching Frequency		2kHz~16kHz					
Rated Output Current		14.5A	21.5A	29A	33A	45A	59A
Max. Short-time Current		26A	38A	51.5A	59A	80A	105A
Motor Type		PMSM Servo Motor, ASM Servo Motor, AC Servo Motor					
Overload Ability		150%, 30s					
Brake Resistance		>390hm, 850hm recommended					
Max.Brake Current		21A					
Storage Temperature		-40°C~+70°C					
Operating Temperature		-30°C~+50°C					
Altitude		≤3000m, More than 3000m can be customized					
Dimensions (W*H*D) (mm)		Driver: 129*154*320, Heatsink: 300*84*320 (Customization available)					

Variable-pitch Specific AC Servo Driver

Parameters	Power	7.5kW	11kW	15kW	17kW	23kW	30kW
Operating Voltage	305V~500V, 3Ph AC						
Operating Frequency	50Hz±2Hz / 60Hz±2Hz						
Rated Input Current	14A	23A	28A	31A	43A	56A	
Rated Output Power	5kW	7.5kW	10kW	11kW	15kW	20kW	
Output Frequency	0Hz~400Hz						
Switching Frequency (SF)	2Hz~16kHz						
Rated Output Current	11A	16.5A	22A	24A	33A	44A	
Max. Short-time Current	21A	39A	43A	47A	65A	86A	
Stall Current	11A@4kHz SF	16.5A@4kHz SF	22A@4kHz SF	24A@4kHz SF	33A@4kHz SF	44A@4kHz SF	
	8.5A@8kHz SF	12.5A@8kHz SF	17A@8kHz SF	19A@8kHz SF	21.5A@8kHz SF	28A@8kHz SF	
	3.8A@16kHz SF	5.6A@16kHz SF	7.5A@16kHz SF	8.4A@16kHz SF	9.5A@16kHz SF	12.5A@16kHz SF	
Motor Type	PMSM Servo Motor, ASM Servo Motor, AC Servo Motor						
Overload Ability	150%, 30s						
Brake Resistance	>390hm, 850hm recommended						
Max.Brake Current	21A						
Storage Temperature	-40°C~+70°C						
Operating Temperature	-30°C~+50°C						
Altitude	≤3000m, More than 3000m can be customized						
Dimensions (W*H*D) (mm)	Driver: 129*154*320, Heatsink: 300*84*320 (Customization available)						



>> Wide Frequency Domain Grid Simulation System



Wide frequency domain grid simulation system of Hopewind Electric can be used to simulate the three-phase three-wire power system. It can simulate various operating state of power system, such as different voltage levels and different frequencies levels, etc., and then to test the power grid adaptability of different device under test (DUT) (such as wind power generation system and photovoltaic power generation systems, etc.). It can also be extended to test other power quality characteristics of the DUT.

Performance Characteristics

- Support 60Hz grid simulation testing
- Simple and intuitive HMI, providing higher operation efficiency
- 32-bit DSP-based real-time and intelligent control, with high accuracy of waveform and slew rate control, excellent steady and dynamic performance
- Three-phase voltage independent control, strong overload capacity, fully simulate various power grid amplitude, frequency deviation, and unbalanced, harmonic, flicker phenomenon

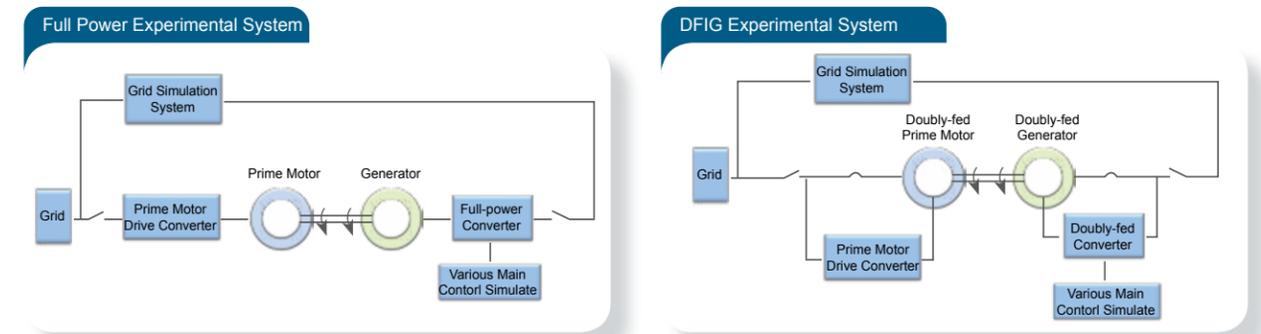
Technical Specifications

Parameters	Power	2.5MW	7.5MW
Topology		3 phase 3 wire, 4 quadrant IGBT converter	3 phase 3 wire, module-cascaded
HMI		Color Touch Screen	Color Touch Screen
Input Voltage		552V~759V	9kV~11kV
Input Frequency		45Hz~66Hz	45Hz~66Hz
Output Voltage Range		0V~759V	0kV~13kV
Output Frequency Range		0Hz~100Hz	0Hz~100Hz
Output Voltage Accuracy		1%	1%
Output Frequency Accuracy		0.1%	0.1%
THD		≤1%	≤1%
Three-phase Voltage Unbalance		<10%	<10%
Harmonics Injection		2~25	2~25
Output Voltage Flicker		Rate Settable	Rate Settable
Output Frequency Flicker		Rate Settable	Rate Settable
Overload Capacity		110% 1min / 10min	110% 1min / 10min
Efficiency		>97%	>95%
Noise		<70dB	<90dB
Storage Temperature		-40°C~+70°C	-30°C~+45°C
Operating Temperature		-30°C~+50°C (Operation with derating at 40°C~50°C)	-15°C~+40°C
Altitude		<4000m	<2000m
Cooling Type		Liquid Cooling	Air-cooled
Ingress Protection		IP54	IP23

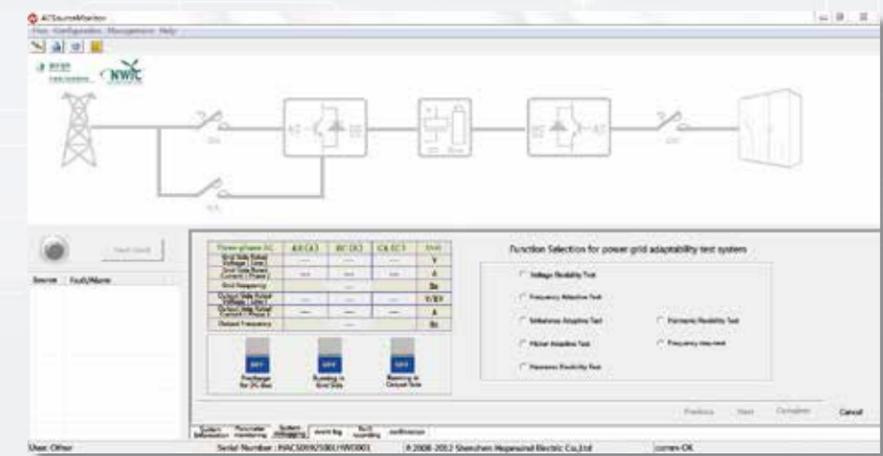
Wide frequency domain grid simulation system of Hopewind Electric can be used for test of power grid adaptability:

- Voltage Flexibility Test
- Frequency Adaptive Test
- Flicker Adaptive Test
- Harmonic Voltage Flexibility Test
- Three-phase Voltage Unbalance Adaptive Test

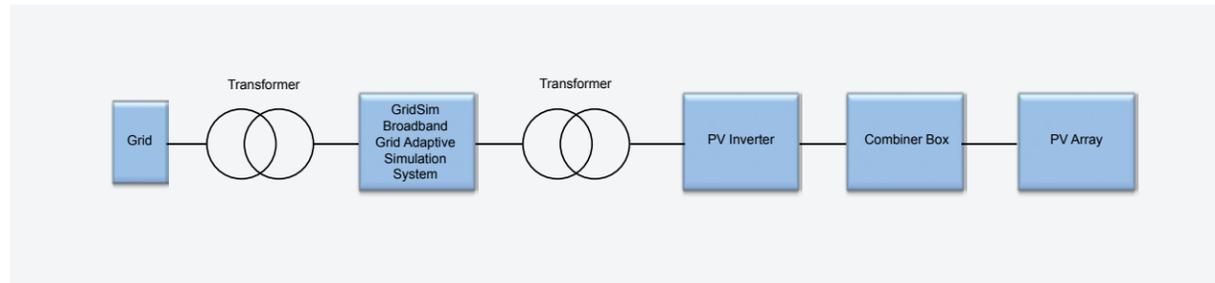
Application of GridSim Simulation System In Wind Power Industry



Operation Interface



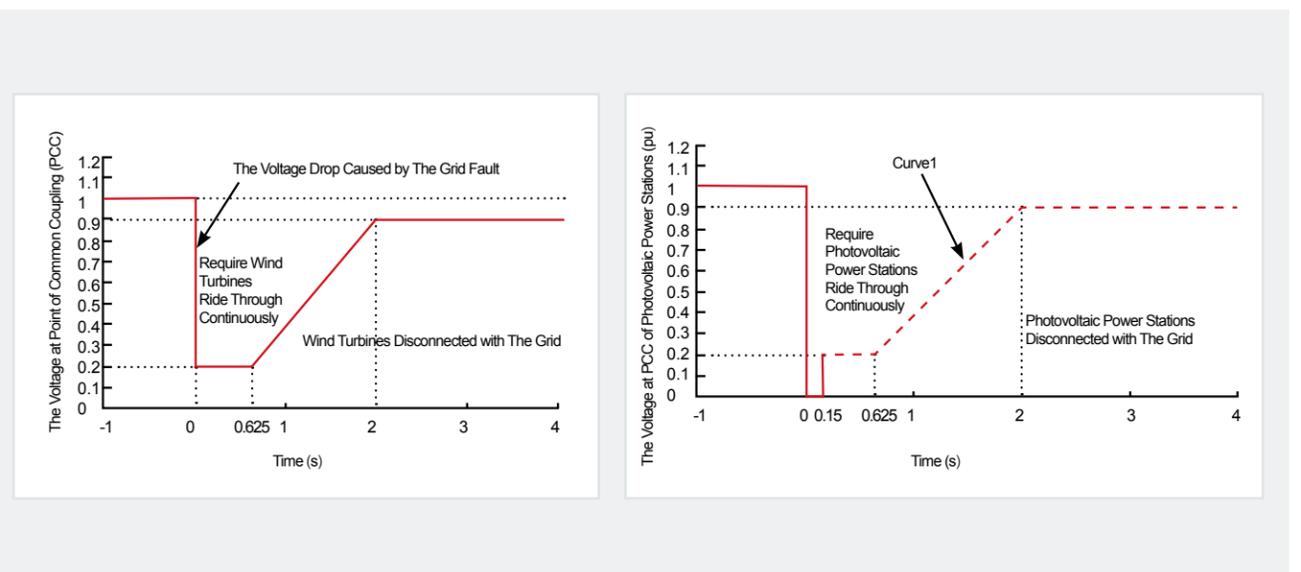
Application of GridSim Simulation System In Photovoltaic Industry



Low-voltage ride-through simulation system of Hopewind is able to faithfully simulate the various low-voltage faults of the power grid, including the grid voltage symmetrical dip and asymmetrical dip, the dip amplitude and dip duration of each stage can be set flexibly. It is used to test the LVRT capability of the DUT (such as wind power generation system and photovoltaic power generation systems, etc.)

According to the requirements of the scene, the LVRTSim system can be integrated to the vehicle-borne container, i.e., the movable low voltage ride-through testing device.

The device is applicable to low-voltage test of the wind Power Generator set which is Operating in the wind farm. The drop curve can meet the request of "GB/T 19963-2011 wind farm power system technical requirements". It can also be used for the low-voltage test of photovoltaic power plants, the drop curve can meet the request of "GB/T 19963-2012 photovoltaic power plants power system access technical provisions".



>> Liquid Cooling System

The liquid cooling system of Hopewind is developed and manufactured for High-Power power electronic products. It meets various requirements of 1.0MW~6.0 MW converters. Regards the harsh need of some special fields, Hopewind have taken some particular measures, for example, the cooling equipment works in low temperature, with commendation, with LVRT, etc, which does not only guarantee the reliability of good work, but also guarantee the rights and interests of customers. At the same time, the cooling system can be controlled automatically, it also can be controlled remotely through hotline or Modbus, Profibus, etc.

Technical Specifications

Parameters	Rated Cooling Capacity	40kW	60kW	100kW
Rated Power		8kW	12kW	18kW
Heat Exchanger Dimensions (W*D*H) (mm)		990*990*850	1900*950*850	2850*1090*850
Nominal Coolant Flow		10m³/h	12m³/h	18m³/h
Min. Coolant Temperature (operating)			5°C	
Pressure Difference			≤3bar	
Working Pressure			2bar~5bar	
Max. Pressure			8bar	
Main Cycling Precision(um)			300um	
PH Value			6~9	
Cooling Medium	The cooling liquids are prorylene glycol mixtured with water or the samelike. The volume of antiseptics between total liquids volume can be reach 0.5%, Prorylene glycol volume can be reached 50% maximum.			
Interface Mode	2" Heavy-type clamp			
Rated Voltage	360V~440V			
Rated Frequency	47.5Hz~52.5Hz / 57Hz~63Hz			
Operating Temperature	-40°C~+50°C			
Storage Temperature	-40°C~+70°C			
Altitude	<3000m, customize for more than 3000m			
Ingress Protection	IP23 (can be updated to IP54)			
Dimensions (W*H*D) (mm)	800*2000*640			



Remote Operation and Maintenance Products



System Overview

Hopewind remote intelligent operation and maintenance cloud service system using big data monitoring, gives full play to the advantages of Hopewind Electric, for the owners and the manufacturers to provide efficient, intelligent operation and maintenance services.

Through the big data display of the converters/inverters/drivers in the Hopewind operation and maintenance system, can real-time understand all converters/inverters/drivers operating conditions, timely acquire the operation data, event recording, fault recorder information; high-speed data and information acquisition, according to the acquired information, expert system intelligent diagnosis is for common faults; for complex faults, user data can be uploaded to Hopewind operation and maintenance cloud service system, the professional team will be the first time to deal with and feedback.

Product Overview

Hopewind remote intelligent operation and maintenance cloud service system's products include: hopeGate intelligent maintenance collector, hopeInsight monitoring software, hopeScan patrol assistant, hopeView network monitoring system, hopeCloud remote intelligent maintenance cloud service platform.

hopeGate Intelligent Maintenance Collector

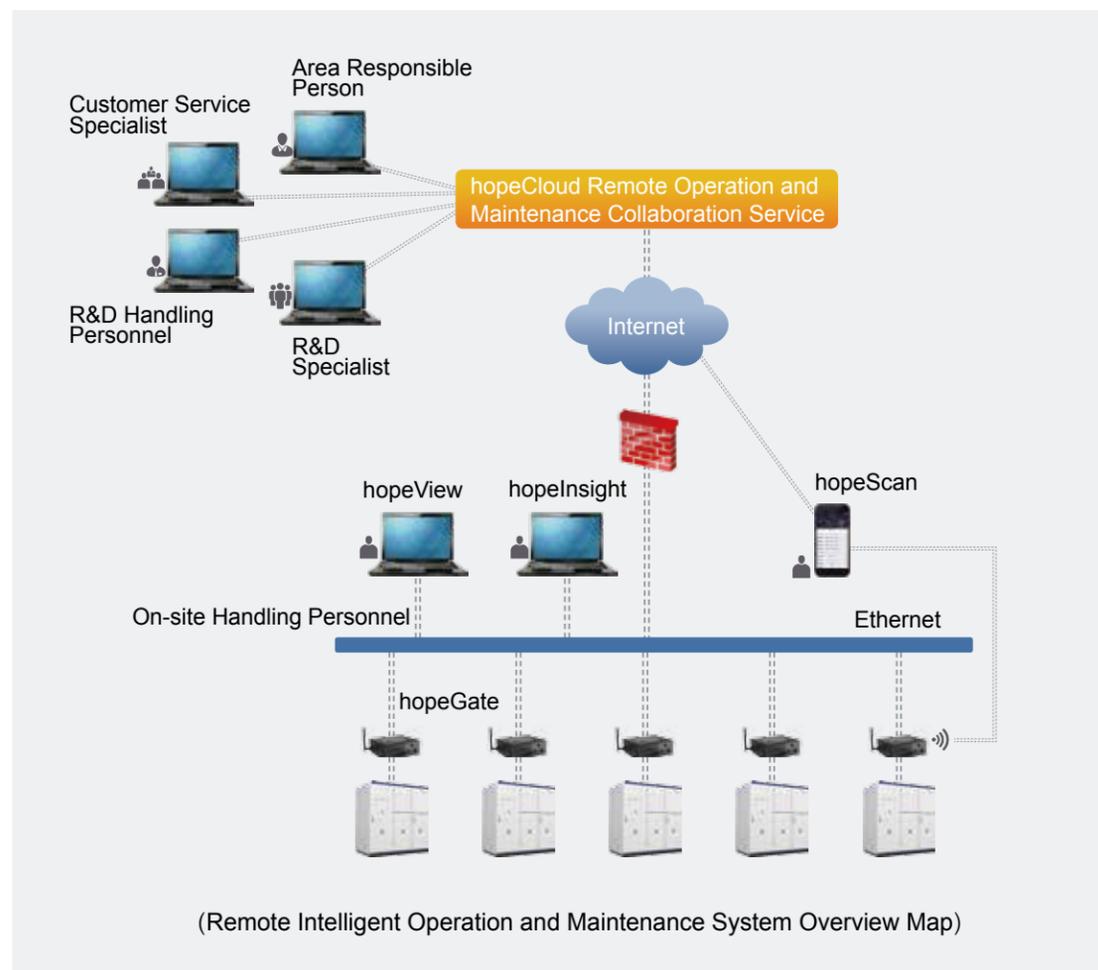
hopeGate intelligent maintenance collector can realize the remote data monitoring of inverters/converters. Not only can realize bridging between different physical communication interfaces, protocol conversion, centralized monitoring, friendly HMI; but also can remote monitoring to the corresponding equipments and provide safer working environment for personnels at the scene, enhance the industrial product experience and portability degree for the customers and customer service staffs' using, at the same time reducing the cost of product maintenance.



hopeGate intelligent maintenance collector is the basis of the Hopewind intelligent operation and maintenance network system.

Technical Specification

Spec.	Value	Instruction
Processor Platform	I.MX257	Core: ARM926EJ-S, 32 Bit, Main frequency: 400MHz, Memory: 32M (can be extended to 64M), NorFlash 8M+8M
Operating System and software	OS	Real time Linux, 2.6.x kernel
	File System	Supports JFFS2, FAT32, EXT2, NFS and other file systems
	Remote Access Support	HTTP / TELNET / Supporting Web server and CGI
	Protocol Support	Support the complete TCP / IP protocol stack; NTP network clock synchronization protocol; through the matching of different modules, can support the bus protocol (including CanOpen, ModBus, ProfiBus, DeviceNet, ControlNet, CC-Link, BACNet, CompoNet, LonWorks, Ethernet EtherCAT, ProfiNet, PowerLink, SERCOS, etc.)
Maximum Power Consumption	<6W	/
Operating Temperature	-30°C~+50°C	Free Cooling
Storage Temperature	-40°C~+70°C	/
Altitude	0~4000m	/
Mean Time Between Failures	>18000hours	Rated operating environment
Main Function Interface	Ethernet	10 / 100M adaptive Ethernet communication interface
	USB	USB 2.0 Host interface
	Fiber	monitoring software tuning converter fiber interface
	FX	10 / 100M adaptive Ethernet communication interface
	ProfiBus	ProfiBus DP Slave communication interface with baud rate up to 12Mbps
	CAN	CAN communication interface, baud rate up to 1Mbps
	RS485	RS485 communication interface, baud rate up to 921600bps
	Console	USB Device Interface Console, baud rate 115200bps serial console
	FX	10 / 100M adaptive Ethernet communication interface
	WiFi	Highest rate 150Mbps, communication distance 50m (no occlusion, open land)



► hopeInsight Monitoring Software

hopeInsight monitoring software, which is commonly known as the background software, is suitable for all products of our company. The software has a large number of professional debugging functions, such as batch parameter setting, fault data download and waveform analysis, high speed oscilloscope and a large number of editing functions, etc. The software supports serial port or Ethernet, so the software is able to maintain converters through the serial communication, also in the central control room through the Ethernet.

hopeInsight can be used for a single converter monitoring, also be used as a component of hopeView. Taking the converter as an example, the working schematic diagram is as follows:



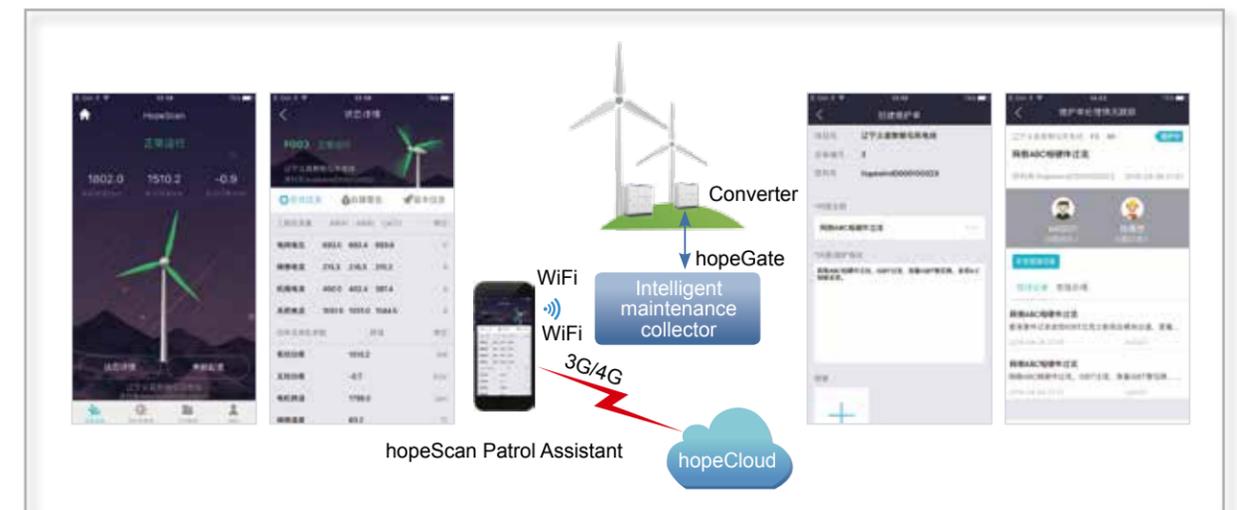
(hopeInsight Monitoring Software Schematic Diagram)

Functional Descriptions

- **Parameter monitoring:** View converter operation state, power generation, motor speed and other main information, view converter any parameter value information, to facilitate a detailed understanding of the converter working state
- **Equipment debugging:** Boot settings (converter clock calibration, models power configuration, rated frequency and other information, motor parameters setting), loading parameters file, modifying the writeable parameters
- **Data acquisition:** Save all the parameter values to the file, obtain the event record data, save the fault site record and the grid fault record, get the parameter real-time waveforms
- **Data analysis:** Load the parameter files and view each parameter values; load the event records, view the event records detailed information; load converter fault records/grid fault waveform files and view waveform information before and after the failures for each channel

► hopeScan Patrol Assistant

hopeScan patrol assistant, is a monitoring software applicable to mobile intelligent devices, can access the converter through WIFI, for viewing information and obtaining fault data. The Assistant can also upload the data downloaded from the converters to the hopeCloud™ cloud server to create maintenance lists, and access to the server for viewing the maintenance lists, to participate in the converter maintenances. The working schematic diagram is as follows:



(hopeScan Patrol Assistant Schematic Diagram)

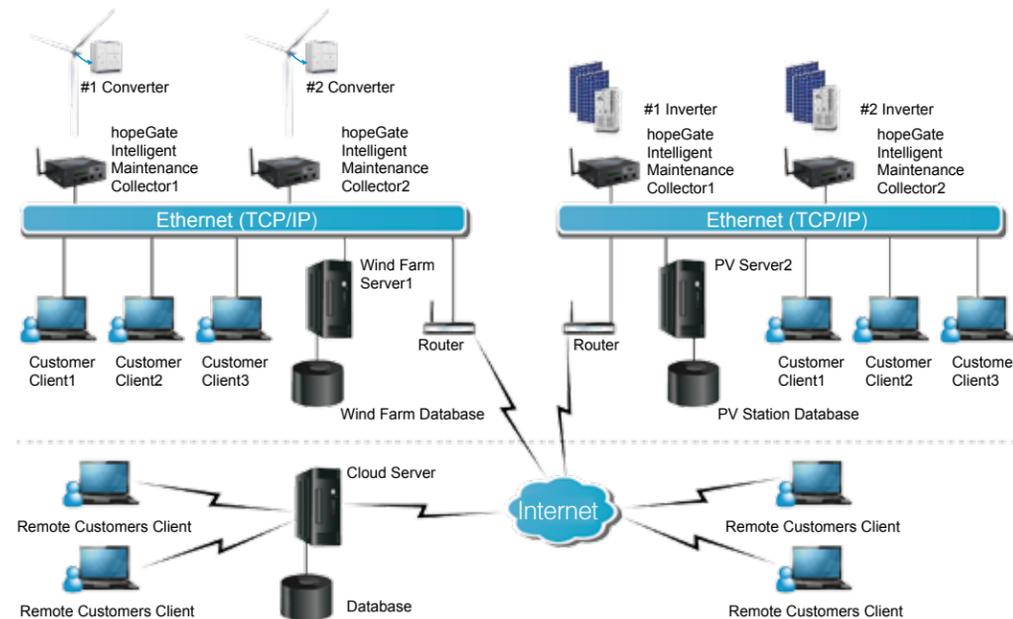
Functional Descriptions

- Upload fault data to the cloud
- View converter information
- Get fault data from converters
- Create maintenance lists, view lists, process lists, etc.
- Message push (maintenance policy with update, new maintenance list, assistance request)



► hopeView Network Monitoring System

hopeView Converter Monitoring System, developed by Hopewind Electric with patented technology, can easily integrate all converters in the wind farm and quickly form a dedicated monitoring network. It can be installed in the Centre Control Room to implement real-time monitoring of the operation status, detailed parameters and fault alarm information of all converters in the wind farm. It can also enable the user to perform other practical functions such as observing parameter waveforms or trend curves online, and downloading event logs, fault logs, and fault records ,etc. hopeView Converter Monitoring System can help wind farm owners to improve the efficiency of operation and maintenance of the converters and wind turbines, even the whole wind power plant. Therefore it will eventually reduce the operation and maintenance cost of the wind farm.



(hopeView Network Monitoring System Schematic Diagram)

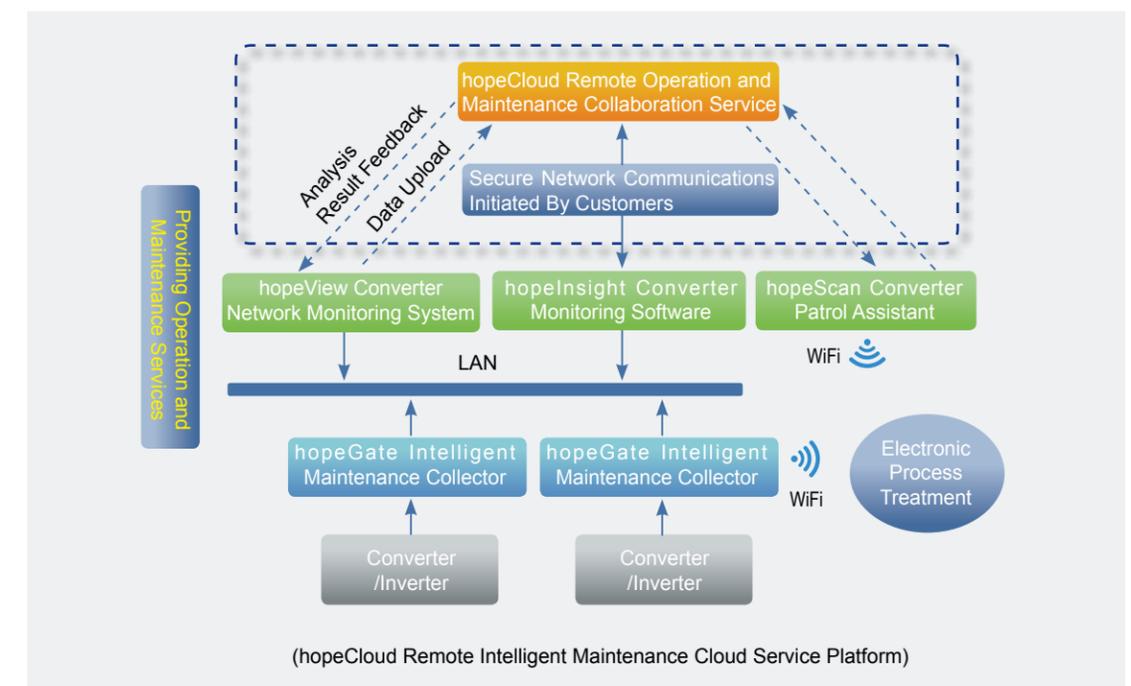
Functional Descriptions

- Support the display of basic parameters (up to hundreds of items) from all connected converters, and these parameters can be drawn into trend curves for monitoring and comparison.
- Support the display of all parameters and detailed fault information from the selected converter by the user, and these parameters can be drawn into waveforms with high sampling rate.
- Enable user to conveniently access event logs and fault logs of all the converters, provide user with statistical fault results by different time range, such as per half month, per month, per quarter, per half year, per year, etc..
- Enable user to conveniently access fault records of all converters with waveforms recorded before and after a field happening fault, and those fault records can be used for rapid diagnosis and troubleshooting of field faults of wind turbines.
- Enable user to modify configuration parameters of a stopped converter for rapid diagnosis and troubleshooting when necessary.
- Support Network Time Protocol (NTP) to get all the converters synchronized to the unique GPS time when a GPS time server is available and configured.

► hopeCloud Remote & Intelligent Cloud-based Service System

hopeCloud remote intelligent maintenance cloud service platform, is a system for electronic processes of fault remote maintenance, responsible for hopeInsight, hopeView and other products to provide remote operation and maintenance services.

hopeCloud establishes centralized and efficient intelligent application collaborative work platform, and realizes the collaborative work and rapid fault location analysis with on-site maintenance personnel, intelligent analysis system, responsible person of operation and maintenance, customer service experts group, and R&D experts group.



Hopewind Electric's remote intelligent operation and maintenance cloud service system by independent R&D and production, is to build intelligent cloud operation and maintenance of electric fields for the mission, based on the Internet and cloud data, driving electric fields to realize intelligent management for the purpose of economic benefit.

Feature One: Intelligent Fault Diagnosis

Hopewind Electric, based on the experience of deep computing and long term maintenance, has purposed two kinds of intelligent fault diagnosis methods:

Fault Diagnosis Wizard: In the expert system, there is a large number of maintenance experiences and historical failure analysis cases, and the summaries can be used for reference. When the fault occurs, users can find out the cause of the trouble quickly under the guidance of relevant cases.

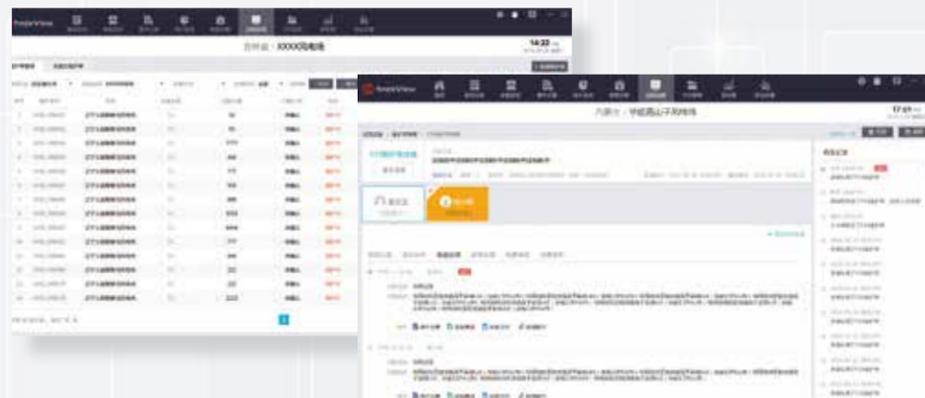
Intelligent Fault Diagnosis And Prediction: By monitoring the change trend of the specific parameters, and according to the specific algorithm to determine whether there may be hidden, so that pretreatment can be carried out in time; through the professional analysis of the fault recorder information, event records and so on, to locate the fault quickly and accurately, to realize the automation of fault analysis, and without artificial participation.



Feature Two: Remote Operation And Maintenance Collaboration Service

Converters/inverters/drivers are the center of the electrical components, both the power generation equipments and the intelligent sensors of electrical system. Therefore, when the equipment failure, it's not necessary that the devices have faults itself, but on the other related devices.

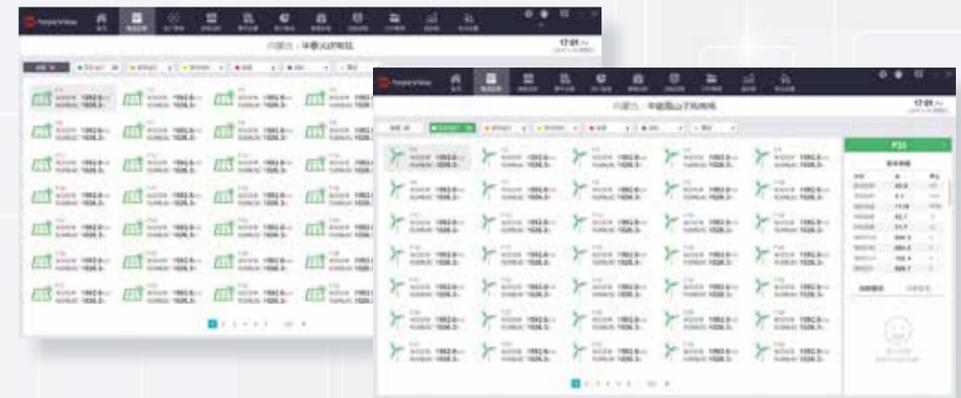
When the fault analysis is more complex to need the experts to assist in, users or owners can obtain the fault data packages through the hopeViewTM/hopeInsightTM operation and maintenance collaboration module, create and submit the operation and maintenance collaboration service request, and upload data to hopeCloudTM remote operation and maintenance collaboration service system.



Feature Three: Operation Data Monitoring

Single or multiple wind farms can be treated as monitoring objects, and the client can easily switch from multi-devices integrated information monitoring (hopeViewTM) to single-device detailed information testing (hopeInsightTM). Multi-devices integrated information monitoring page (hopeViewTM) can remotely monitor the real-time running status of all converters/inverters/drivers, including the information overview, key parameters monitoring, real-time trend map.

Detailed information monitored by single-device detailed information testing (hopeInsightTM) is more abundant, including the all important parameters of the single converter/inverter/driver. The software can be used in depth fault analysis, or be running high performance digital oscilloscope function.



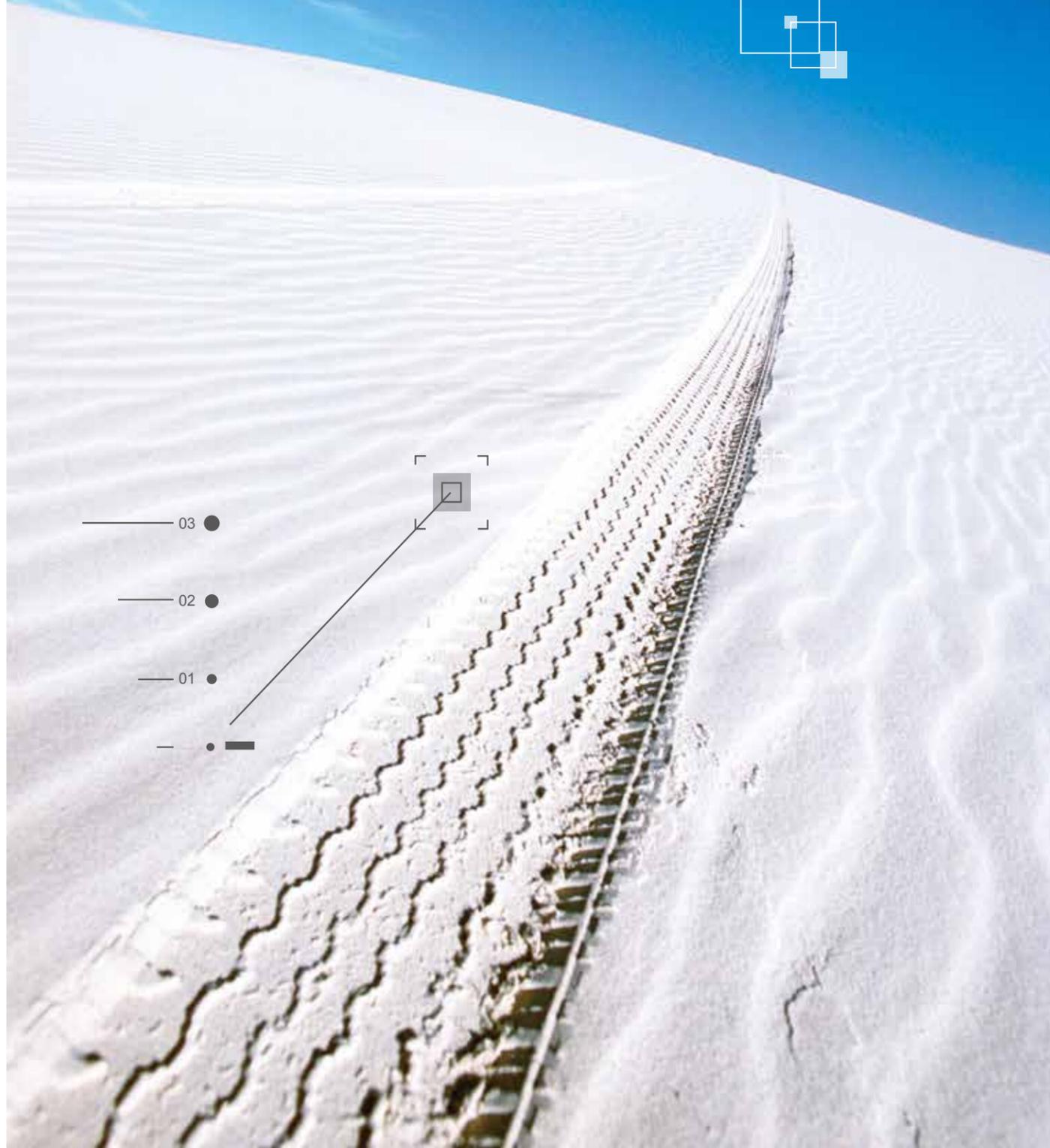
Feature Four: Big Data Statistics And Analysis

The system can obtain all the converters/inverters/drivers event records, fault record wave files, and can take classified statistics and analysis of the contents of the above.

The system can conveniently access to all the event records of the equipments in wind farms or PV plants, including fault, alarm and event record information (maximum 1 million records), and the records can be in accordance with the device name, event type, time period for the query, and can be saved as a file for offline analysis. Real time statistics of power generation, and real-time comparison of the current power generation, the cumulative power generation, etc.. At the same time, the system also has the statistical function of failure, can generate the converter fault statistics report in a half month, month, quarter, half year and whole year ways.



Typical Case Section



▶ Typical Case 1: Distributed wind power solutions

Time: 2013-2014

Address: Huolin River in the Summer Camp of Hologol City of Inner Mongolia

The wind farm of the Summer Camp of China Electric Investment at Huolin River is located at the Summer Camp of Hologol City of Inner Mongolia, which is a typical project of distributed type wind power. The area has an average altitude of 1,100 meters, which has a cold and long winter. and heavy ice and snow. The wind power generator set is running exposed to a poor environment of -25°C for a long time. The wind farm has a gross installed capacity of 300MW. The project is divided into three phases, 50 sets in each phase, totaling 150 sets, all using Hopewind 2.0MW distributed low-temperature plain type doubly-feed converter.

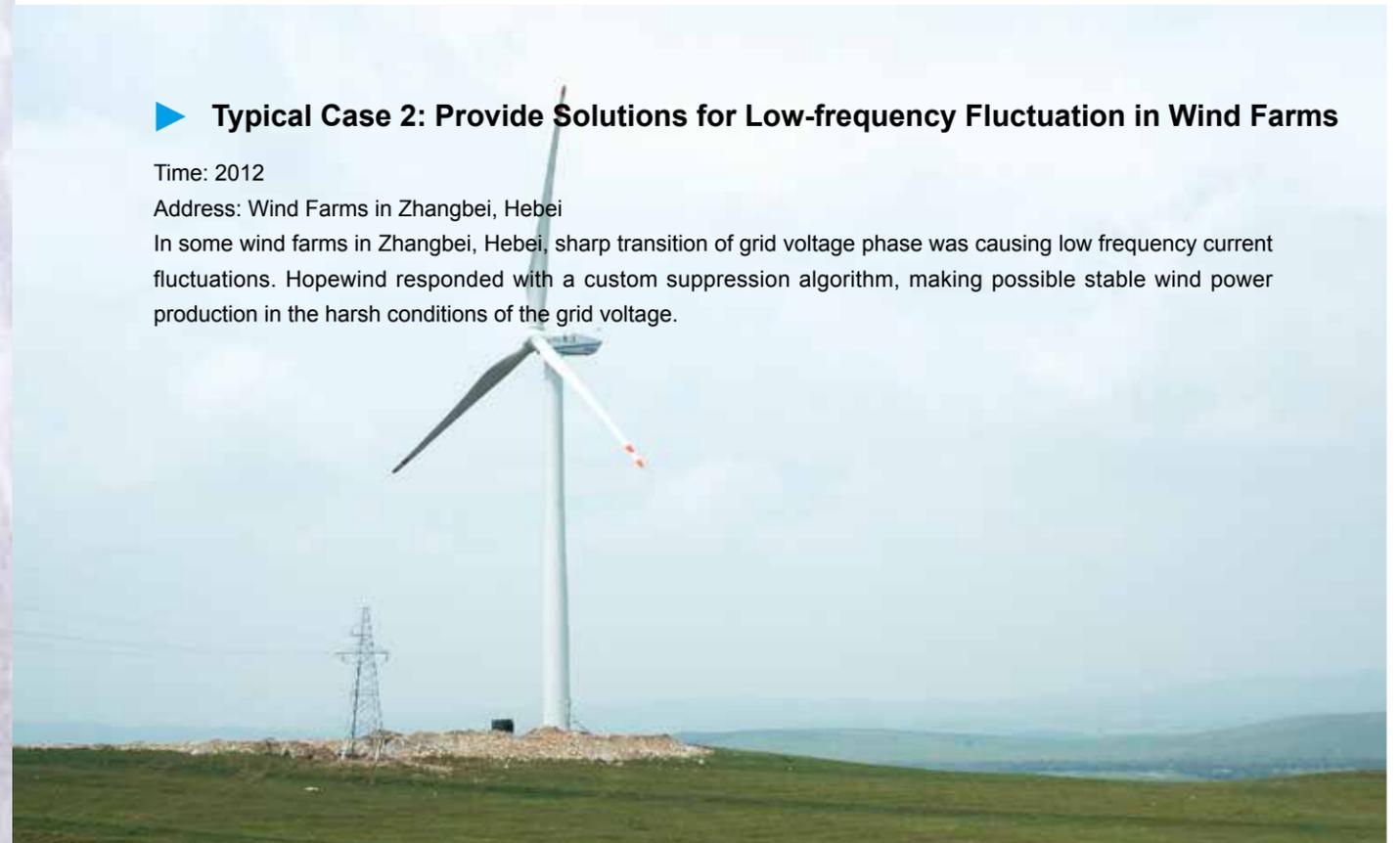


▶ Typical Case 2: Provide Solutions for Low-frequency Fluctuation in Wind Farms

Time: 2012

Address: Wind Farms in Zhangbei, Hebei

In some wind farms in Zhangbei, Hebei, sharp transition of grid voltage phase was causing low frequency current fluctuations. Hopewind responded with a custom suppression algorithm, making possible stable wind power production in the harsh conditions of the grid voltage.



▶ **Typical Case 3: Batch Operation of Converters in Plateau Environment**

Time: 2009-2013

Address: Luliang, Luxi, Xundian, Qiubei, Xuebangshan Wind Farms in Yunnan. Gonghe County Wind Farm in Qinghai.

At Luliang, Luxi, Xundian, Qiubei wind farms in Yunnan (Altitude of 2400~2800 meters), Shazhuyu wind farm in Gonghe County, Qinghai (Altitude of 3500 meters) and Xuebangshan wind farm in Dali, Yunnan (Altitude of 3662~3800 meters), 212 sets of converters supplied by Hopewind have been installed, and grid-connected.



▶ **Typical Case 4: Batches Operation of which Converters of Offshore Salt Fog-proof Type**

Time: 2009-2016

Address: Wendeng and Laizhou Wind Farms in Shandong

Following the successful case of coastal type prototype in Yingkou, Liaoning in 2009, Hopewind sequentially installed 83 sets of coastal rated converters at the wind farms in Shandong Province (Wendeng and Laizhou).



▶ **Typical Case 5: Batch Operation of Converters of Low-temperature Type**

Time: 2009

Address: Baolige Wind Farm in Inner Mongolia

The environment on the site of Baolige wind farm in Huiteliang, Inner Mongolia is harsh. The wind sand there is violent and the temperature is low, which is indeed a large trial for the equipment. Since 86 sets of the 1.5MW air cooling Doubly-fed Converters of Hopewind were adopted in the wind farm in 2009, the on-site operation is steady and good.



▶ **Typical Case 6: The First Company Solving the Difficulty Problem about the Ride Through of Electric Train in the World**

Time: 2009

Address: Wind Farm in Sanmenxia, Henan

Hopewind R&D provided custom solution to prevent wind inverters from tripping during severe power quality events caused by electric trains.



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If there is any change in product size and parameters, they shall be subject to the latest actual product

