



# WT1500 系列风力发电机组

## WIND TURBINE SERIES



根据风电场特定的风资源、地理气候等环境特点，同时结合客户需求，在标准设计的基础上对风电机组开展配置、功能、参数的个性化定制和深度优化。针对风场海拔高度特点，WT1500系列双馈风电机组包含高原（常、低温）型、平原（常、低温）型；针对风资源较贫乏地区，特别推出低风速机型。

该系列风电机组具有优越的低电压穿越能力和友好的电网适应性，获得中国电力科学研究院各项测试认证报告。

Based on specific wind resources, geography, climate and other environmental features, together with customer demand, CSR Wind Power continuously launches customization and optimization on configuration, functionality, and parameter on the basis of standard design. Special WT1500 doubly-fed wind turbine series are designed for different altitude and different wind speed. Besides, Low wind speed wind turbines are specially designed suitable for poor wind resource areas.

The series has excellent wind turbine low voltage ride through capability and friendly grid adaptation, and obtained all kinds of testing certificates from China EPRI.



# WT1500 系列风力发电机组

## WIND TURBINE SERIES

### 主要性能及特点

### Main Performance and Features

#### 优越的发电性能，电网友好型的设计

- ◆ 优化的功率曲线。
- ◆ 优异的电能质量，额定功率下总电流谐波畸变率小于1%。
- ◆ 便捷的能量管理平台，高效的有功，无功功率调节能力。
- ◆ 采用优异气动性能的叶片，并融合多项先进控制技术，最大限度地提升风电机组的发电性能。

#### 紧凑型机组设计

- ◆ 采用紧凑型的双馈型水冷变流器，机舱布局合理，维护空间大。
- ◆ 尺寸小，重量轻，便于运输。

#### 环境适应性模块化设计

- ◆ 针对特定风场项目环境可配置的抗低温、凝露、盐蚀、风沙、雷暴、紫外线辐射等各种模块化解决方案。

#### Superior power performance, grid-friendly design

- ◆ Optimized power curve.
- ◆ Excellent power quality, the total current harmonic distortion under rated power: less than 1%.
- ◆ Convenient energy management platform, highly efficient active and reactive power regulation.
- ◆ Using blades with excellent aerodynamic performance, and integration of a number of advanced control technology to maximally optimize the performance of wind turbine power generation.

#### Compact design

- ◆ Compact water-cooling doubly-fed converter, reasonable cabin layout, large maintaining space.
- ◆ Small size, light weight, easy to transport.

#### Modular design for different environment

- ◆ Modules for special condition like cold climate, condensation, salt corrosion, dust, thunderstorms, ultraviolet radiation etc. are available.

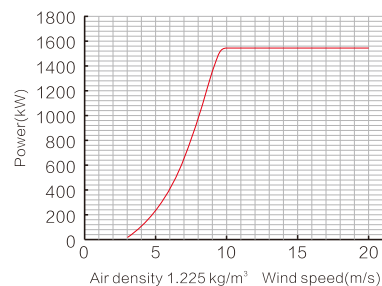
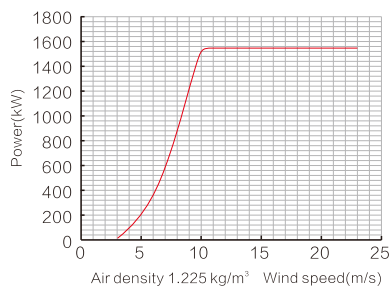
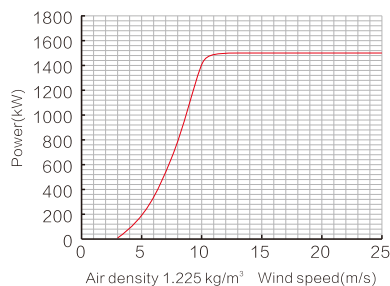
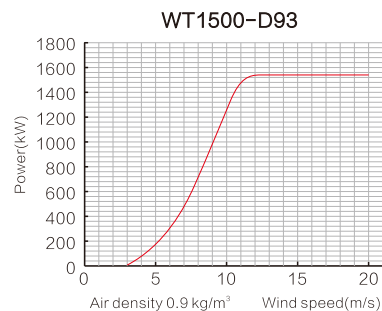
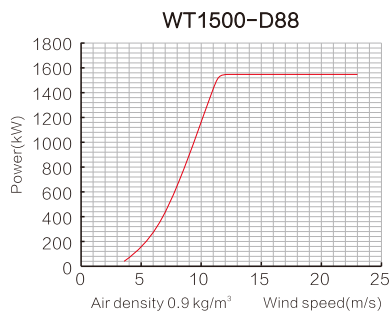
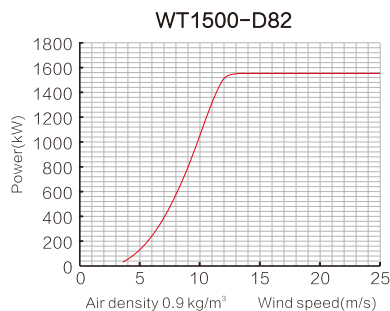
### 主要技术参数

### Main Technical Data

产品型号 Type	WT1500-D82	WT1500-D88	WT1500-D93	WT1500-D82	WT1500-D88	WT1500-D93
额定功率 Rated power	1500 kW			1500 kW		
设计空气密度 Air density	0.9 kg/m <sup>3</sup>			1.225 kg/m <sup>3</sup>		
功率控制方式 Power control method	变桨变速 Variable speed pitch regulated			变桨变速 Variable speed pitch regulated		
切入风速 Cut-in wind speed	3.5 m/s	3.5 m/s	3 m/s	3 m/s		
额定风速 Rated wind speed	12 m/s	11.5 m/s	11 m/s	10.5 m/s	10 m/s	9.5 m/s
切出风速 Cut-out wind speed	25 m/s	23 m/s	20 m/s	25 m/s	23 m/s	20 m/s
生存风速 Survival wind speed	59.5 m/s	52.5 m/s	52.5 m/s	52.5 m/s		
风机等级 Wind turbine class	IEC S			IEC III A	IEC III B	IEC III B
系统寿命 System life	20 years			20 years		
安全环境温度 Survival Ambient temperature	-25℃~+45℃ (常温Normal climate) -40℃~+45℃ (低温Cold climate)			-25℃~+45℃ (常温Normal climate) -40℃~+45℃ (低温Cold climate)		
运行环境温度 Operation Ambient temperature	-15℃~+35℃ (常温Normal climate) -30℃~+35℃ (低温Cold climate)			-15℃~+35℃ (常温Normal climate) -30℃~+35℃ (低温Cold climate)		
风轮直径 Rotor diameter	82 m	88 m	93 m	82 m	88 m	93 m
轮毂高度 Hub height	70 / 80 m			70 / 80 m		

### 功率曲线

### Power Curve



# WT2000 系列风力发电机组

WIND TURBINE SERIES



WT2000系列双馈风电机组具有多款机型，适用于不同的风资源地带。其中WT2000-D110风电机组针对低风速区域（低于6.5m/s）开发，是国内首款通过北京鉴衡认证和中国电力科学研究院低电压穿越测试的低风速机型，并已在华中等低风速地区批量安装运行。

WT2000 series doubly-fed wind turbine suits for different wind resource areas. WT2000-D110 wind turbine is designed for low wind speed area (less than 6.5m/s), which is the first low wind speed wind turbine certified by CGC and was tested by China EPRI for LVRT. Moreover, this type has been widely installed and operated in central China and other low wind regions.



### 主要性能及特点

### Main Performance and Features

#### 环境适应性专项设计

- ◆ 多重系统防护，具备优异的对抗低温、凝露、盐蚀、风沙、雷暴、紫外线辐射等能力。
- ◆ 采用无功控制系统——能量管理平台，使风电场具备无功、有功功率调节能力。调节过程无需停机，大幅度降低风电对电网的影响，提高风电的接入容量。

#### 高效率发电性能保障设计

- ◆ 叶片部件具有优异的气动性能，在同等风资源条件下，单位千瓦扫风面积较常规机型更大。
- ◆ 机组融合“最优桨距角调度”、“模态增益优化设计及调度”和“基于风向补偿的最优偏航对风”等多项先进控制技术，最大限度地提升风电机组的发电性能。

#### 严格的安全保障设计

- ◆ 按照最新版本的IEC 2005 (Ed 3) 和GL 2010最新标准设计，对机组安全性要求更为苛刻。
- ◆ 独立研发的SCADA风场监控系统，可根据用户要求定制特定功能，最大限度满足用户需要。
- ◆ 电气系统分别由不同的电源供电，抗干扰能力强。

#### Special design for environmental adaptability

- ◆ Multi- system protection, with excellent ability under conditions like low temperature, condensation, salt corrosion, dust, thunderstorm, ultraviolet radiation.
- ◆ Energy management platform based on reactive power control system allows wind farms to have active and reactive power regulation. Adjustment process with no shutdown greatly reduce the impact of wind power on grid, thus to improve wind power access capacity.

#### High-efficiency power generation performance security design

- ◆ Blade with excellent aerodynamic performance realizes a larger swept area per kW compared to conventional models under the same wind conditions.
- ◆ Advanced control technology like "optimal pitch angle scheduling", "modal gain optimal design and adjusting" and "yaw wind compensation based on optimal wind" help to maximize the performance of wind turbine power generation.

#### Strict security design

- ◆ The crew safety requirements are more demanding according to the latest versions of IEC 2005 (Ed 3) and GL 2010 latest design standards.
- ◆ Self-designed SCADA monitoring system can be customized according to user requirements to best meet user needs.
- ◆ Electrical systems are powered by different power source, which is equipped with anti-interference ability.

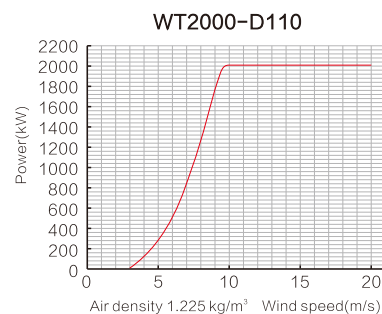
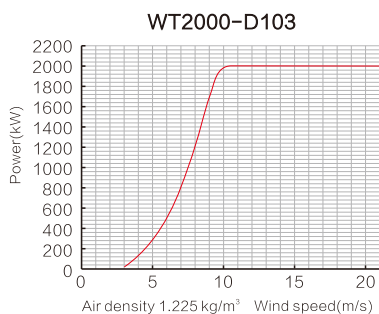
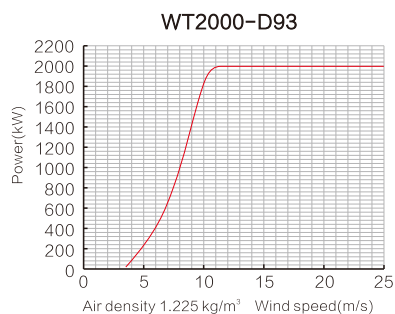
### 主要技术参数

### Main Technical Data

产品型号 Type	WT2000-D93	WT2000-D103	WT2000-D110
额定功率 Rated power	2000 kW		
设计空气密度 Air density	1.225 kg/m <sup>3</sup>		
功率控制方式 Power control method	变桨变速 Variable speed pitch regulated		
切入风速 Cut-in wind speed	3 m/s		
额定风速 Rated wind speed	10.5 m/s	10 m/s	9.5 m/s
切出风速 Cut-out wind speed	25 m/s	23 m/s	20 m/s
生存风速 Survival wind speed	59.5 m/s	52.5 m/s	52.5 m/s
风机等级 Wind turbine class	IEC II A	IEC III A	IEC S
系统寿命 System life	20 years		
安全环境温度 Survival Ambient temperature	-25℃~+45℃ (常温 Normal climate) -40℃~+45℃ (低温 Cold climate)		
运行环境温度 Operation Ambient temperature	-15℃~+40℃ (常温 Normal climate) -30℃~+40℃ (低温 Cold climate)		
风轮直径 Rotor diameter	93 m	103 m	110 m
轮毂高度 Hub height	80 / 85 m		

### 功率曲线

### Power Curve



# WT2500

濒海 / 内陆型  
风力发电机组  
COASTAL / INLAND WIND TURBINE



WT2500风力发电机组采用高速永磁同步发电机加全功率变流器设计方案，适用于沿海、内陆和潮间带等多种环境。

WT2500 wind turbine with high-speed permanent magnet synchronous generator plus full-power converter design, is suitable for coastal, inland and intertidal environments.



## 主要性能及特点

## Main Performance and Features

### 系统优化设计

- ◆ 采用紧凑型设计方案，机舱尺寸更小，重量轻。
- ◆ 免维护的高速永磁发电机。
- ◆ 模块化设计，规避多发故障点，可靠性更高，维护更便捷。

### System optimization design

- ◆ Compact design with smaller nacelle and lighter weight.
- ◆ Maintenance-free high-speed permanent magnet generator.
- ◆ Modular design, to avoid frequent failure points, higher reliability, and convenient maintenance.

### 高效率发电性能保障设计

- ◆ 先进的变桨变速功率控制方式，针对特定场址进行功率优化，电能质量优越，年发电量高。
- ◆ 采用全功率变流方案，效率高，具有较强的电网适应能力。

### High-efficiency power generation performance security design

- ◆ Advanced pitch control optimizes for particular site, results in superior power quality, high annual energy output.
- ◆ Full-power converter solution, results in high efficiency and strong ability to adapt to the power grid.

### 严格的安全保障设计

- ◆ 采用先进的整机载荷控制技术，关键零部件生命周期内疲劳载荷小，可靠性高。
- ◆ 电气系统分别由不同的电源供电，抗干扰能力强。
- ◆ 优化的传动链设计基于整机动力学建模仿真计算，提高了系统的抗振性能，延长了主轴承、齿轮箱使用寿命，具有更高的安全性。

### Strict security design

- ◆ Advanced load control technology, result in small fatigue loads and high reliability for key parts during life cycle.
- ◆ Electrical systems are powered by different power source, equipped with anti-interference ability.
- ◆ Optimized drivetrain design based on state-of-the-art dynamics modeling, leads to reduced vibration, also extends the life span of main bearings, gearbox with greater security.

## 主要技术参数

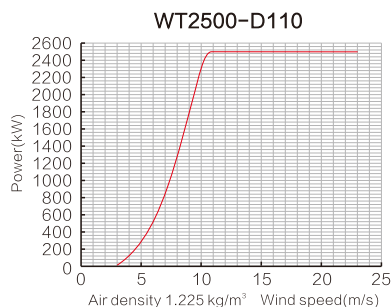
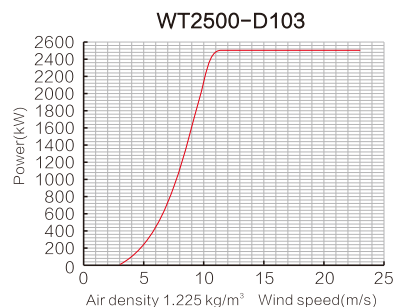
## Main Technical Data

产品型号 Type	WT2500-D103	WT2500-D110
额定功率 Rated power	2500 kW	
设计空气密度 Air density	1.225 kg/m <sup>3</sup>	
功率控制方式 Power control method	变桨变速 Variable speed pitch regulated	
切入风速 Cut-in wind speed	3 m/s	
额定风速 Rated wind speed	11 m/s	10.5 m/s
切出风速 Cut-out wind speed	23 m/s	
生存风速 Survival wind speed	52.5 m/s	
风机等级 Wind turbine class	IEC III A	IEC III B
系统寿命 System life	20 years	
安全环境温度 Survival Ambient temperature	-20℃~+50℃ (常温 Normal climate)	
	-40℃~+50℃ (低温 Cold climate)	
运行环境温度 Operation Ambient temperature	-15℃~+45℃ (常温 Normal climate)	
	-30℃~+40℃ (低温 Cold climate)	
风轮直径 Rotor diameter	103 m	110 m
轮毂高度 Hub height	80 m	



## 功率曲线

## Power Curve



# WT5000 海上风力发电机组 OFFSHORE WIND TURBINE



WT5000海上风力发电机组充分考虑了海上风资源气候及和洋流、波浪等复杂环境特点，能够有效降低机组载荷，具备强大的抗台风能力。

WT5000 offshore wind turbine fully fits offshore wind condition, climate and ocean currents, waves and other complex environment, and can effectively reduce the unit load, with strong anti-typhoon capability.



# WT5000 海上风力发电机组

## OFFSHORE WIND TURBINE

### 主要性能及特点

### Main Performance and Features

#### 高效率发电性能保障设计

- ◆ 适当提高机组额定转速，拓宽调速范围，增加风能捕获。

#### High-efficiency power generation performance security design

- ◆ An appropriate increase in rated speed, broadens speed range, increases wind energy capture.

#### 严格的安全保障设计

- ◆ 具备强大的抗台风能力。
- ◆ 采用IPC+状态空间控制策略，能有效降低机组疲劳载荷。
- ◆ 针对海上环境的高盐雾和高腐蚀性特点，着重对风机组的密封和防腐进行了强化设计。
- ◆ 采用成熟的传动链方案，优化机组系统结构，有效延长了维护保障周期。

#### Strict security design

- ◆ Strong anti-typhoon capability.
- ◆ IPC + status space control strategy can effectively reduce fatigue loads.
- ◆ Sealed and corrosion design is enhanced for high corrosive and salty environment.
- ◆ Mature drive chain which optimizes system structure, effectively extends the maintenance cycle.

### 主要技术参数

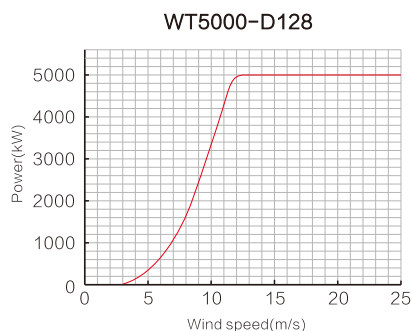
### Main Technical Data

产品型号 Type	WT5000-D128
额定功率 Rated power	5000 kW
功率控制方式 Power control method	变桨变速 Variable speed pitch regulated
切入风速 Cut-in wind speed	3 m/s
额定风速 Rated wind speed	12.0 m/s
切出风速 Cut-out wind speed	25 m/s
生存风速 Survival wind speed	70 m/s
风机等级 Wind turbine class	IEC IB (抗台风 Coastal Anti-Typhoon)
系统寿命 System life	20 years
安全环境温度 Survival Ambient temperature	-20℃ ~ +50℃
运行环境温度 Operation Ambient temperature	-10℃ ~ +40℃
风轮直径 Rotor diameter	128 m
轮毂高度 Hub height	90 m



### 功率曲线

### Power Curve





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