CATALOGUE

of SMALL WIND TURBINES

** under 50 kW*

8th Edition

2016

series
OPEN KNOWLEDGE

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ISBN 978-87-7778-137-7
Folkecenter Print
June 2016

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With special thanks to the Chinese Wind Energy Association for their contribution to the 2016 edition and continued partnership in promoting small wind energy.

Editorial

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ISBN 978-87-7778-137-7
OPEN Knowledge Series 3 | Folkecenter Print, June 2016

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MiEV

Foreword

We have the pleasure to present the 8th edition of the "Catalogue of Small Wind Turbines". The 2016 catalogue has been developed by the Chinese Wind Energy Association, CWEA, and the Nordic Folkecenter for Renewable Energy in cooperation with the World Wind Energy Association, WWEA, the Danish Small Wind Turbine Association, the Ashikaga Institute of Technology and the Indian Wind Power Association.

The catalogue presents manufacturers of small windmills of up to 50 kW. There are small windmills from 28 countries coming from 104 companies that market 302 types of wind turbines.

Since the relaunch of the catalogue in 2014 in a new form, where we added content matter, changed layout and editorial team, the catalogue has been developing - and in this year's edition we cooperate with more associations; the World Wind Energy Association presents its newest overview on the small wind industry and exclusively for us, Frits Ogg wrote a guide "How to choose a small wind turbine".

Like in previous editions, not all small wind turbines are represented in the catalogue, also not all data for each model is complete. We make every effort to present detailed and well documented information about every manufacturer and type. For this purpose, we try to contact every known supplier and ask to fill out a questionnaire. But if no response is provided, we in general do not include the product in the catalogue unless we have sufficiently detailed and reliable information from other sources.

We warmly encourage manufacturers of small wind turbines from all over the world and others to contact us at info@folkecenter.dk with details and printable pictures for the next edition. New entries and additions are most welcome to make the catalogue even more representative for the small windmill world community.

Preben Maegaard
Director emeritus, Nordic Folkecenter for Renewable Energy
Founding President, World Wind Energy Association

June 2016

About us














Nordic Folkecenter for Renewable Energy

The Nordic Folkecenter for Renewable Energy is an independent, non-profit institution, managed by a board of 11 members representing trades, local authorities, energy organisations, sciences and concerned citizens. Folkecenter is member of various international networks including partners in all parts of the world.

Since its foundation in 1984, Folkecenter provides research, development of technology, training and information for the manufacture, industrial innovation and implementation of renewable energy technologies and energy savings in Denmark and throughout the world. Folkecenter's goal is to achieve measurable increases in the utilization of renewable energy technologies and thereby significant reductions in environmental pollution associated with energy use in Denmark and elsewhere.

Folkecenter's mission:

INFORM, INSPIRE & INVOLVE

Folkecenter provides information within sustainable energy solutions in Denmark and elsewhere to local citizens, small and medium companies, political decision makers focused on decentralized solutions, trainees and wider public. Folkecenter serves as consultant to manufacturers, local consumer groups, and initiators within renewable energy. Creative thinkers at the Folkecenter have always been challenging political, technological and economical *status quo* of renewable energy to come up with innovative solutions, serving as inspiration for other organisations and individuals. It is the aim of Folkecenter to involve local communities for the development of decentralized energy solutions for a future ecological society.

TEST & DEMONSTRATE

Folkecenter contributes to development and implementation of efficient renewable energy systems: hybrid autonomous systems with integration of solar, wind and biomass; CO_2-neutral transportation with electricity, hydrogen and plant oil. Folkecenter's facilities are equipped for testing of small-scale wind power, photovoltaic systems and wave energy systems. Folkecenter's advantage is hands-on experience on site and demonstration of practical and experimental examples of integration of several renewable energy solutions, solar and passive housing, water recycling systems.

TRANSFER TECHOLOGY

Since many years Folkecenter has been transferring technology and sustainable solutions to many other countries. It is crucial to share the knowledge in order to achieve more balanced energy systems based on the use of renewable energy mix. Among others, Folkecenter supports technology transfer to Sri Lanka, Mali, Burkina Faso and Uganda.

Chinese Wind Energy Association (CWEA)

BACKGROUND

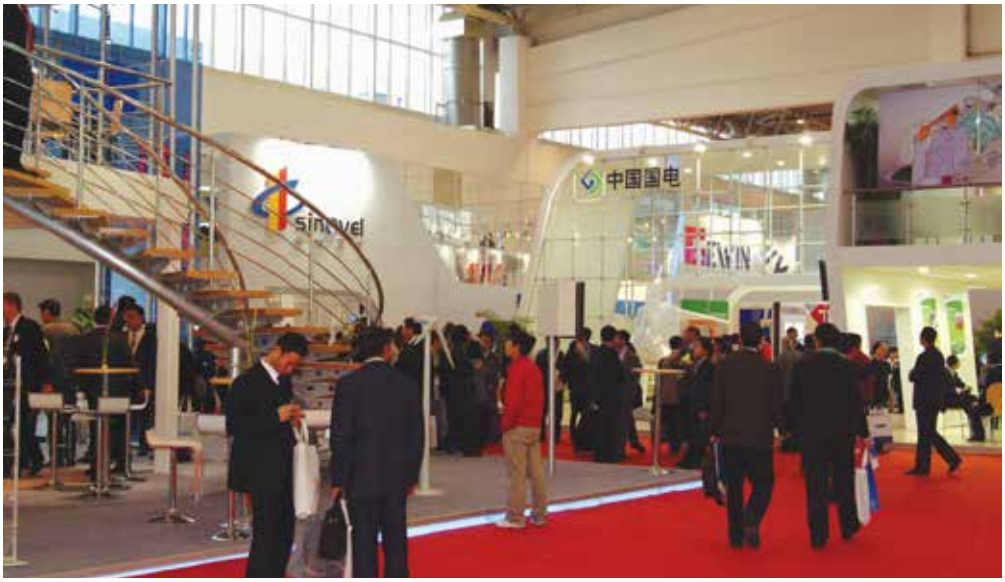
The Chinese Wind Energy Association (CWEA) was founded in 1981. It is a non-profit social entity officially registered through the Ministry of Civil Affairs of China. In 2002 CWEA joined the World Wind Energy Association (WWEA).

MISSION

CWEA's mission is to function as the window of Chinese wind society to the world, promote international academic and technical cooperation, perform a bridge between the government and institutions, establish good relationships with domestic and overseas wind societies, cooperate with similarly associations, communicate with scientists and engineers closely, and contribute to the development of wind energy technology and industry.

MEMBERS

CWEA is composed of group members and individual members that are from various institutions such as wind power education, scientific research, engineering, production, application and administration. Institutions and experts of wind energy are warmly welcome to join CWEA and jointly dedicate their efforts to further development of wind energy technology in China.



www.cwea.org.cn

World Wind Energy Association (WWEA)

WWEA is an international non-profit association embracing the wind sector worldwide, with more than 500 members in around 100 countries. WWEA works for the promotion and worldwide deployment of wind energy technology.
- WWEA provides a platform for the communication of all wind energy actors worldwide.
- WWEA advises and influences national governments and international organisations.
- WWEA enhances international technology transfer.

WWEA SMALL WIND

The WWEA Small Wind Section is entirely focussed on small wind and aims to provide the most comprehensive and the most useful database of small wind manufactures, and suppliers to the industry. It is complementary to the country small wind associations who are best placed to know the local market dynamics.

WWEA Small Wind also follows the WWEA five working principles:
1. Wind energy shall serve as one cornerstone and a driving force for the immediate application of a world energy system driven by renewable energies to completely substitute fossil and nuclear sources.
2. Global dissemination of grid-connected and stand-alone wind energy solutions should rely on experience gained from the most successful implementation strategies, based on favourable legal, political and social framework conditions as initiated by national associations. Local and rural communities and people should be involved and should benefit directly.
3. WWEA shall stimulate and support the foundation of national and regional wind energy associations and encourage national governments to set ambitious targets and political frameworks for priority strategies in favour of a fast and sustainable development of all renewable energies.
4. WWEA organises together with continental, national and regional wind energy associations World Wind Energy Conferences and further international events for mobilising a wide range of the different wind energy applications.
5. WWEA plays an active role in the World Council for Renewable Energies and cooperates with further international renewable energy organisations in order to work for a full substitution of all polluting and hazardous waste causing energies.

www.wwindea.org
www.small-wind.org

Danish Small Wind Turbine Association (Denmark)

Within six years, 2009 to 2015, the application of small-size wind turbines have re-created broad public interest in land-based wind power, awareness of the importance of renewable energy and enabled citizens to make energy self-supply a lifestyle issue. Household wind turbines can help decentralized energy solutions, improve local employment, local economy and local energy supply in Denmark.

The Small Wind Turbine Association, SWTA, has a leading role in the launch of small-scale wind power at the political and general public level. The SWTA was founded in June 2009 to promote the interest of wind power for the supply of individual homes, SMEs and the smaller farms with a capacity up to 25 kW. It is a manufactures association that represents and promotes also diversity, in small-size wind power in Denmark. The Small Wind Turbine Association represents the providers of wind turbines in Denmark, manufacturers, importers, dealers and suppliers to wind turbines, subject to authorization schemes in a swept area of 1.1m^2 to 200m^2.

OUR MISSION:

- To work for the spread of household wind power in Denmark
- To manage the association's political interests in Denmark, Europe and globally in cooperation with other organizations at national and international level
- To enhance members' competitiveness, unity and reputation
- To strive for a high quality of members' products
- To provide a forum and focal point for the industry through the network generating activities.

In addition, the association also a popular acceptance of wind turbines among others through a fair description of the performance, economy, local conditions and locations as well as testing of wind turbines and their components.

MEMBERS:

- CIRKEL Energi ApS
- Eocycle Denmark
- Fortis Wind Energy
- LS Stoker-Vindmøller
- Nordic Folkecenter for Renewable Energy
- Thy Windpower ApS
- Victor Energy ApS
- Solid Wind Power A/S
- Solenergi Danmark A/S

Ashikaga Institute of Technology (AIT)

Ashikaga Institute of Technology was an engineering courage which was established in 1967. (Although it has no direct relation to Ashikaga School.)

WIND AND SUN SQUARE

AIT has long been engaged in research within sustainable uses of natural energy sources. The symbol of our engagement is the Wind and Solar Power Park, originally founded as field experimental facility for small-scale wind turbines in 1995. It covers an area of 12,000m^2, and offers exhibits of various devices and instruments based on the concept of four types of natural energy source: wind, light, water, and wood. The exhibition includes three 13-meter-long windmill blades, 30 small wind power generators with output ranging between 50W and 3kW, a solar clock, a water clock, a non-powered fountain device, and a biotope as well as the Triple Hybrid Renewable Energy Generation System. The park provides an opportunity to experience and learn about next-generation energy.

Indian Wind Power Association (IWPA)

The Indian Wind Power Association (IWPA) was set up in 1996 as a non-profit organization. The Association, which began with 21 members, now has 1,352 members spread all over India. The National Office of the Association is located at Chennai and has regional offices at Ahmedabad, Bengaluru, Delhi, Hyderabad, Jaipur and Mumbai. Since its inception it has worked consistently, towards removing barriers to wind power development and creation of an enabling regulatory and policy environment for investments in this sector. The Association is working closely with several national industry bodies such as the Indian Renewable Energy Development Agency, Ministry of New and Renewable Energy, Ministry of Power,Ministry of Environment,CWET,CERC,CEA,Confederation of Indian Industry, State utilities, State Electricity Regulatory Commissions,State Nodal Agencies,World Wind Energy Association,Bonn,Germany etc. IWPA Publishes monthly Windpro Journal for dissemination of information to members and conducts annual International Conference & Exhibition on Wind Energy.

OUR VISION

The vision is to main stream Wind Energy IN INDIA as a commercially viable utility scale power plans with 20% grid penetration by 2020 by ADDRESSING the key & critical technical or policy related or capacity building issues ahead and creating a roadmap. The Indian Wind Power Association is a 1000 member strong pan Indian Association of the people who have invested in wind power sector. The other stake holders like the turbine manufacturers, ancillary equipment manufacturers and service providers are also members of the Association. The Association's activities are governed by a National Council having 21 members. The headquarters of the Association is located at Chennai and has its state outfit at Hyderabad, Ahemedabad, Bengaluru and Jaipur. The main objective of the Association is to promote the wind power in the country.

OUR MISSION

The Wind Power Industry is acclaimed to be driver of growth. The nature has given us every thing. It is only for us how to make the best use of it. In the present circumstance, wind merits to be encouraged in a big way because of various advantages available with the wind energy. Development of any sector is possible only when that sector is healthy and active. To achieve this we need to increase the penetration of wind energy in the grid to at least to 20% by the year 2020. The mission of this conference is to provide an update on the Wind Industry, to discuss the emerging policy and regulatory environment, and to showcase emerging technologies and noteworthy projects.

Small Wind Power

SMALL WIND WORLD MARKET: BACK ON THE TRACK AGAIN

SMALL WIND WORLD MARKET STABILIZES AFTER A DIFFICULT 2013

The world market for small wind has stabilized after the fall in 2013 both in terms of units and capacity installed. The two biggest markets, China and USA, have seen a similar growth in terms of new units as in 2013, 10% and 1% respectively. The highest growth was seen in the UK with a 19% growth in terms of units compared with only 2% in 2013. As of the end of 2014, a cumulative total of at least 945 000 small wind turbines were installed all over the world. This is an increase of 8.3% (7.4% in 2013) compared with the previous year, when 872 000 units were registered.

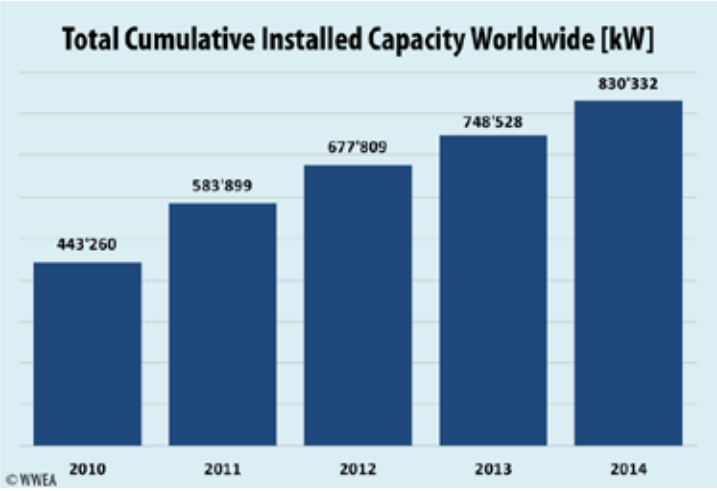
The numbers presented here are based on available figures and even exclude major markets such as India. WWEA therefore estimates an actual total number of more than one million units to be installed worldwide.

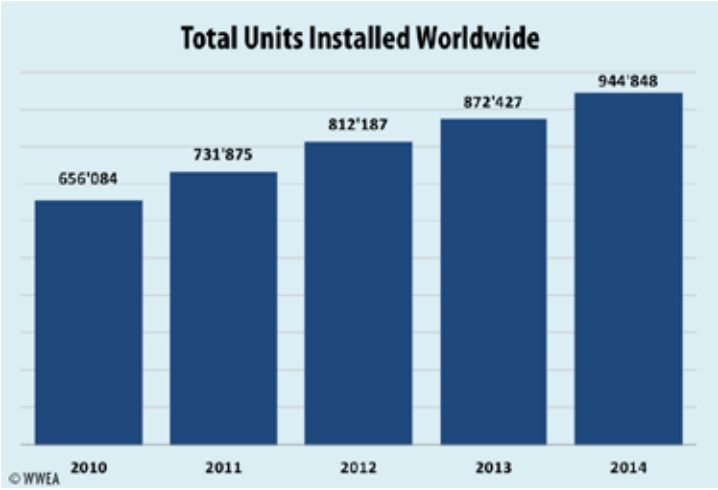
China continues to lead by far the market in terms of installed units. 64 000 units were added in 2014, 9000 more than in 2013, reaching 689 000 units installed by the end of 2014. The Chinese market represents 72% of the world market in terms of total installed units. According to estimations, around half of the turbines continue to produce electricity in China given that this market started already in the early 1980s.

In the USA, the number of units installed in a year felt to 1600 units in 2014, down after 2700 units in 2013. With a total cumulative units installed of 159 300, USA is the second largest market, clearly behind China, but well ahead of a number of medium-sized small wind markets.

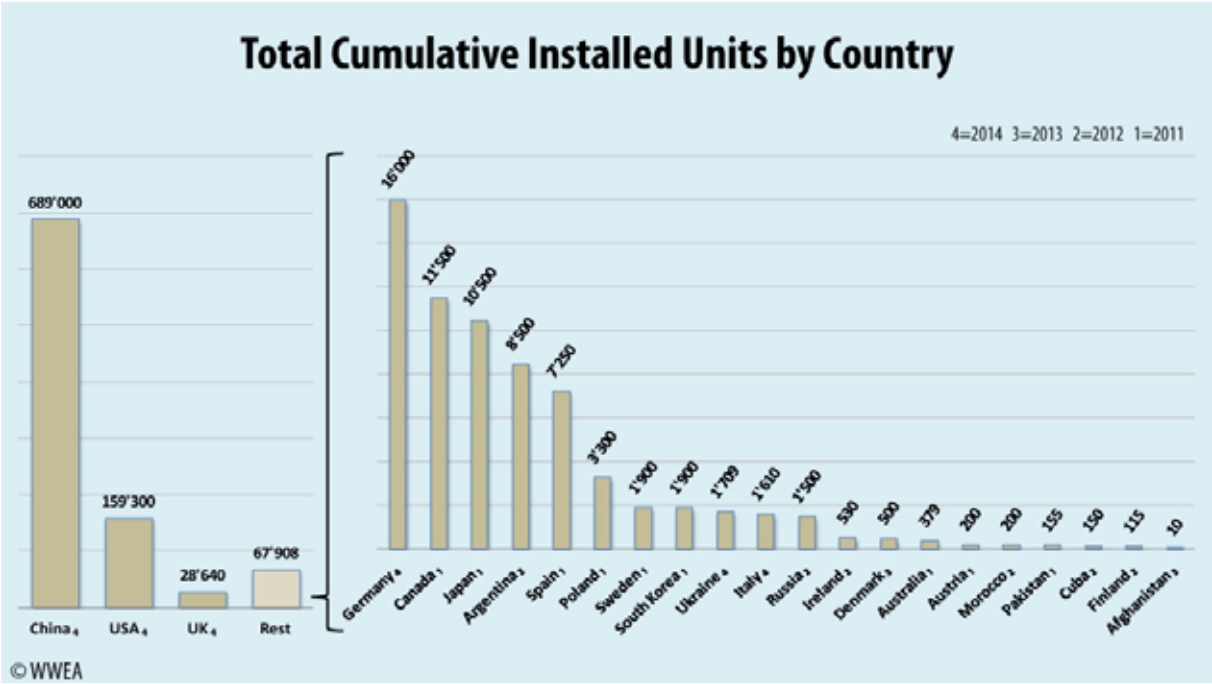
The small wind market in the UK saw an increase in the number of installations in 2014 despite the unfortunate changes in the Feed-In scheme introduced in the UK in November 2012. 2237 SWTs were installed in 2014, a substancial increase compared with only 500 units installed during 2013, but still far from the numbers reached in 2012. An interesting fact is that for every turbine installed in the UK, one is also exported overseas, 2614 units were exported to markets like continental Europe, the USA, and Asia[1].

The booming market of the recent years, Italy, grew by 71% reaching 1610 units by the end of 2014. Germany, Canada, Japan and Argentina are all medium-sized markets with total number of small wind turbines between 8500 and 16 000 units.





[1] *2015, Small and Medium Wind UK Market Report, RenewableUK*



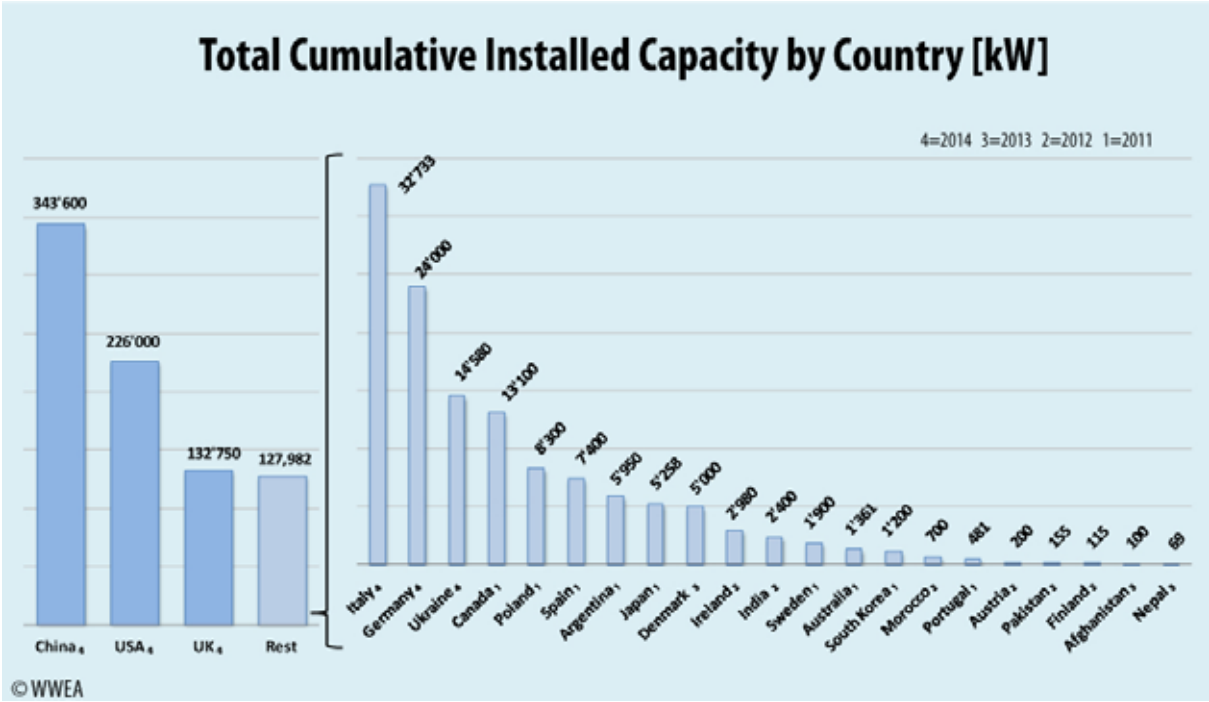
STRONG RECOVERY IN GLOBAL SMALL WIND CAPACITY

The recorded small wind capacity installed worldwide has reached more than 830 MW as of the end of 2014. This represents a growth of 10,9% compared with 2013, when 749 MW were registered. The previous year's growth rates, 10,4% in 2013 and 16,1% in 2012, demonstrate a strong recovery of the world market for SWT.

In terms of installed capacity, China accounts for 41% of the global capacity, the USA for 30% and UK for 15%. The USA small wind market grew only by 3,7 MW in 2014, a 34% decline in new capacity compared with 2013 and 80% declined compared with 2012.

The small wind market accounted for $20 million in investment, $16 million less than in 2013[2].

In the UK and Italy, the over-20 kW segment exploded during 2014. In the UK, installed capacity in the range 15-100 kW grew by 75,6%; in Italy, the range 20-60 kW grew by 85,4%. The rest of the segments remained very stable in the UK and saw small growth in Italy. In both countries, the structure of the Feed-in tariff was the impulse for the small wind sector. However, the structure of the feed-in tariff benefited larger turbines over the smaller machines.

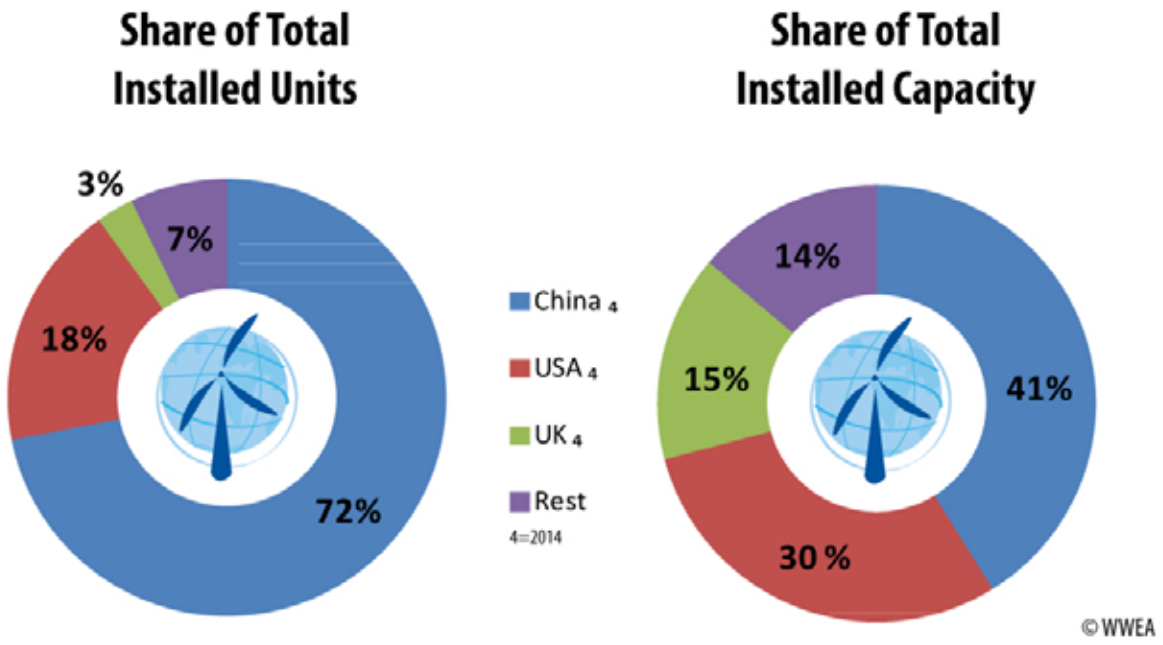


[2] *2014 Distributed Wind Market Report, U.S. Department of Energy*

Globally, an increase in the average size of small wind turbines can be observed: In 2010, the average installed size was 0,66 kW, in 2011 0,77 kW, in 2012 0,84 kW, in 2013 0,85 kW, and in 2014 it has already reached 0,87 kW.

Countrywise, the average size is quite diverse: While the average Chinese turbine has a capacity of 0,5kW, small wind turbines in the US have an average capacity of 1,4 kW and in the UK the capacity has reached 4,7 kW (3,7 kW in 2012). It is important to mention that the market for medium scale turbines (over 100 kW) has increased rapidly in the UK during 2013 and 2014. Starting with no market in 2010, the market size for new machines in 2012 was of 9,02MW and in 2014 has already reached 69,78 MW[3].

Morten V. Petersen, Chair of WWEA Small Wind: *"The small wind industry around the world is ready to upscale its investments in manufacturing as well as mass production and in assuring the quality buyers of small wind turbines do expect. More favourable policies and harmonized technical standards would give us the additional support we need."*



SMALL WIND TURBINE MANUFACTURING

Five countries (Canada, China, Germany the UK and the USA) account for over 50% of the small wind manufacturers. By the end of 2011, there are over 330 small wind manufacturers that have been identified in the world offering complete one-piece commercialised generation systems, and an estimate of over 300 additional firms supplying parts, technology, consulting and sales services.

Based on the world distribution of turbine manufacturers, the production of small wind remains concentrated in few world regions: in China, in North America and in several European countries. Developing countries continue to play a minor role in small wind manufacturing.

More than 120 new small wind manufacturers were established between 2000 and 2010 worldwide. China alone has an exceptional manufacturing capacity of more than 180 000 units per annum (as of 2011).

[3] *2015, Small and Medium Wind UK Market Report, RenewableUK*

TECHNOLOGY AND MAJOR APPLICATIONS

The early HAWT technology has dominated the market for over 30 years. Based on the study of 327 small wind manufacturers as of the end of 2011, 74% of the commercialised one-piece small wind manufacturers invested in the horizontal axis orientation while only 18% have adopted the vertical design. 6% of the manufactures have attempted to develop both technologies. As the majority of the vertical axis models have been developed in the past 5 to 7 years, the scale of market share remains relatively small. The average rated capacity of VAWT is estimated to be 7,4 kW with a median rated capacity of merely 2,5 kW.

In comparison with the traditional horizontal axis orientation, the average and median rated capacity are much smaller. Out of the 157 models of vertical turbines catalogued in this report, 88% are below 10 kW and 75% are below 5 kW. This corresponds well with the actual market demand, as the average unit sold in 2011 had a capacity of 1,6 kW.

Despite a market trend that leans towards a grid-tied system with larger capacity, off-grid applications continue to play an important role in remote areas of developing countries. Off-grid applications include rural residential electrification, telecommunication stations, off-shore generation, and hybrid systems with diesel and solar. Over 80 % of the manufacturers produce stand alone applications. In China, off-grid units comprised 97% of the market in 2009, and 2,4 million households still lack electricity. In USA, off-grid small wind turbines account for most of the units deployed in distributed wind applications. For these reasons off-grid systems will continue to play a significant role, in China and in many other countries with non-electrified areas.

DRIVING FACTORS

Costs

There are a many of factors that influence the project installation costs for a small wind project. These range from transportation of equipment to remote locations to permitting requirements in urban areas. Therefore, we do not recommend using the values presented in this report as a basis of comparison between small wind support policies from different countries or as a cost reference for projects in any other region.

The most recent Distributed Wind Market Report from the U.S. Department of Energy, has showed the installation cost of projects in the USA grouped in three different groups depending on their sizes. After combining the installed cost records from 2013 and 2014, the average installed costs were:

- less than 2,5 kW projects: 8200 USD/kW
- 2,5-10 kW projects: 7200 USD/kW
- 11-100 kW projects: 6000 USD/kW

Considering only the new small wind capacity installed in the USA in 2014, the average installed cost was 6230 USD/kW after 6940 USD/kW in 2013.

In the UK, the Small and Medium Wind Strategy presented by RenewableUK in November 2014 shows the installed costs of small wind project divided in two ranges. In the range 1,5–15k W, the average installed cost was 4354 GBP/kW (about 6181 USD/kW) and in the range 15-100 kW an average cost of 3436 GBP/kW (about 4876 USD/kW). This represents a 10,6% cost decline from 2011, or an annual average decrease of 2,7%.

The Chinese small wind industry yielded, in comparison, a significantly lower average turnover of 12 000 Yuan/kW (1900 USD–1500 EUR) in 2011.

Stefan Gsänger, WWEA Secretary General: *"To grow further, the small wind industry needs supportive frameworks: in the industrialized countries, incentives instead of barriers for self-consumption of electricity and simple permission procedures would help a lot. In the so called developing countries, large-scale investment programmes for wind hybrid systems should be established which also include strong components of domestic capacity building programmes."*

Table. Small Wind Feed-in Tariff Pricing Worldwide

Country/ Region	Size Limit	EUR/kWh	Country/ Region	Size Limit	EUR/kWh
Bulgaria	< 30kW	0,084	**Japan**	< 20kW	0,464
Canada				≥ 20kW	0,185
Nova Scotia	< 50kW	0,340	**Lithuania**	< 10kW	0,081
	> 50kW	0,089		11-350kW	0,075
China (off-grid)	0,2–3kW	0,140		> 351kW	0,064
(on-grid)	5-20kW	0,110	**Portugal**	< 3,68kW	0,432
Chinese Taipei	1-20kW	0,237	**Slovenia**	< 1 MW	0,095
	> 20kW	0,078	**Switzerland**	< 10MW	0,195
Denmark	< 10kW	0,330	**UK**	< 100kW	0,110
	10-25kW	0,200	**USA**		
Greece	< 50kW	0,250	**Hawaii**	< 20kW	0,198
Italy	< 1MW	0,300		20-100kW	0,125
Israel	< 15kW	0,250	**Indiana**	3-10kW	0,209
	15-50kW	0,320		10-200kW	0,125
			Vermont	< 15kW	0,200

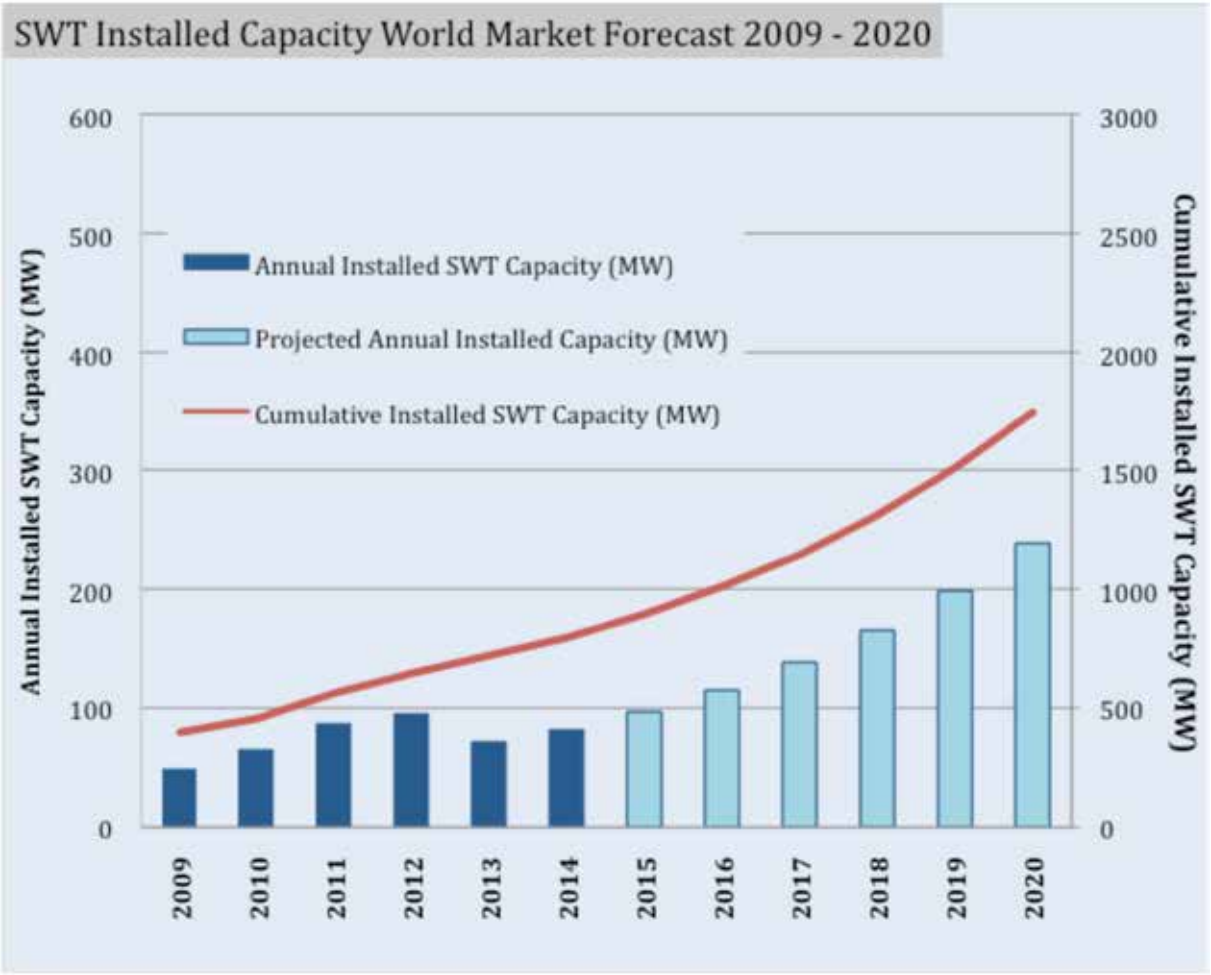
There are more countries with feed-in tariffs policies which are not included in this table. Most of them are under the 0,08 EUR/KWh level.

WORLD MARKET FORECAST 2020

As predicted in 2015, the global small wind market stop decreasing during 2014 and it is expected that it will increase again from 2015, at least in terms of capacity installed, mainly because an increase in the size of the new turbines installed in China and Europe. A minimum growth rate of 11% is anticipated to continue until 2016. At least 115 MW of new capacity are expected in 2016.

Within this time frame, individual countries and the international small wind community will be able to establish more rigorous and structured standards and policies to regulate the market and support investments. Based on a conservative assumption, the market could subsequently see a steady compound growth rate of 20% from 2015 to 2020. The industry is forecasted to reach approximately 240 MW of newly installed capacity added annually in 2020 and achieves a cumulative installed capacity of about 1,75 GW by 2020.

Authors:
Stefan Gsänger and **Jean-Daniel Pitteloud (WWEA)**
Data source: WWEA's Member Survey



DEFINITION OF SMALL WIND

Technically, there are several definitions of small wind turbines: The most important international standardisation body, the IEC, defines SWTs in standard IEC 61400-2 as having a rotor swept area of less than 200 m^2, equating to a rated power of approximately 50 kW generating at a voltage below 1000 V AC or 1500 V DC. In addition to this standard, several countries have set up their own definition of small wind. The discrepancy of the upper capacity limit of small wind ranges between 15 kW to 100 kW for the five largest small wind countries. The major pattern of today`s upper limit capacity leans towards 100 kW. This is largely caused by the leading role of the North American and European market. Over the past decades, a growing average size of the small wind capacity has been observed. This pattern is largely caused by the increasing interest in larger grid-connected systems and a comparatively diminishing market of standalone systems. Nevertheless, in order to create a standardised and healthy small wind market share, an agreeable definition of small wind should be agreed upon.

This report intends to bring forward the discussion on the definition of small wind and aims to create eventually a unanimous international classification system of small wind accepted by all parties of the industry. For the purpose of generating comparable graphs, figures and charts in this report, 100 kW is chosen as the temporary reference point. The definition, however, requires further discussion until a globally harmonised agreement is reached.

In practise, the major pattern of today's upper limit capacity leans towards 100 kW. In order to create a standardised and healthy small wind market share, an agreeable definition of small wind should be agreed upon.

Testing of small wind turbines

TESTING OF SMALL WIND TURBINES

Wind Energy Today

The market for small wind turbines has expanded significantly during the last decade. The primary markets can be found in un-served areas in the developing countries and in the industrialized countries among people living in rural areas who choose a more ecological way of living. Small wind turbines allow people to reduce significantly their CO_2 emissions and to be energy self-sufficient while using an innovative technology at a reasonable cost.

Certification and standards for small wind turbines

The market potential for small windmills market is evident but the industry is still relatively small and fragmented in comparison to other sources of renewable energy, such as photovoltaic solar power and large-scale windmills.

Testing and certification of small wind turbines is crucial for fulfilling quality requirements for the performance. In some countries testing of small wind turbines is not mandatory, except some subsidized programs, and it may be a costly process. This results in selling poor quality wind turbines without any quality standards. Many customers have no knowledge about small wind turbines and the requirements for the technology and performance. Therefore, it is important that small wind turbine market provides quality technology that is tested, certified and approved by appropriate quality bodies.

Today, the conditions for approval and installation of small wind turbines vary according to national and local standards. However, most wind turbines, big and small, are tested under UL, CSA, IEC, AWEA and EN standards as well as EU Directives (CE marking).

IEC Standards related to small wind turbines:

- IEC 61400-2: 2006 Ed 2 "Design requirements for small wind turbines"
- IEC 61400-11: 2006 Ed 2.1 "Acoustic noise measurement techniques"
- IEC 61400-12-1: 2005 Ed 1 "Power Performance measurements of electricity produced wind turbines"
- IEC 61400-14: 2005 Ed 1 "Declaration of apparent sound level and tonality values"
- IEC 61400-21: 2008 Ed 2: "Measurement and assessment of power quality characteristics of grid connected wind turbines"
- IEC 61400-22 2010 Ed 1: "Conformity testing and certification"
- IEC 61400-23: 2001 Ed 1: "Full scale structural testing of rotor blades"

In some countries a small wind turbine can be defined by its rotor size and height to blade tip while in others can be defined by the capacity of the generator. By now, only few countries have implemented specific schemes for small wind turbines. In Denmark there are new certifications rules made especially for small wind turbines which are defined according to the swept area and by the power it produces:

- **Less 1,1 m^2 swept area** (micro wind turbines, no approvals)
- **From 1,1 m^2 swept area to 15 m^2** (ca. 700 W, CE marking)
- **From 5 m^2 to 40 m^2 swept area** (up to 6 KW, Special Danish rule)
- **From 40 m^2 to 200 m^2 swept area** (up to 25 KW IEC 61400-2)

Folkecenter Small Windmill Test Station, Denmark

TESTING AT THE FOLKECENTER SMALL WINDMILL TEST STATION

Since its foundation in 1983, the Nordic Folkecenter for Renewable Energy has been dedicated to provide research, development, testing and implementation of renewable energy systems. Practical examples of small scale windmills are constantly being tested, measured or demonstrated for national and international clients at the Folkecenter Small Windmill Test Station.

The test site has platforms and foundations of different types for testing of electricity windmills of up to 40 kW and mechanical wind pumps. The test station is equipped with data loggers, wind measurement masts, towers for installation of wind turbines and water wells where the performance of small windmills for electricity and water pumping can be measured by international standards.

The importance of the Folkecenter's test station relies on good wind resources and the center's years of experience within testing. The test center aims to support the manufacturers to control quality of components and systems by testing on site before going to the market or during the approval and certification the windmills by a third party.

Vertical or horizontal windmills that are still at the prototype stage, can be put to the test during the last phases of development. By doing this, the companies can modify the design according to real data given by the test station. A windmill tested at the Folkecenter can go through various tests from the prototype stage.

1. INITIAL OPERATION OF PROTOTYPE:

Estimation of Vibrations, Noise and Performing

For the small wind turbine market, it is important to test the prototypes in a real life scenario to see what the actual performance of such turbine would be during its operational life. By prototype testing and monitoring of the windmill vital information such as the performance and noise, the behavior of a new small wind turbine design will be available for the manufacturer that is actively involved in the testing process.

A prototype often has never before been in operation. The initial will prove whether the calculated performance can be verified under real wind conditions. With wind speeds at Folkecenter Small Windmill Test Station that can go up to 30 m/s and beyond, the ability of the prototype to survive wind extremes is crucial. Loads and noise of the windmill will be verified as part of the initial testing.

Being so, the manufacturer can make the necessary basic modifications before proceeding to the next step.

2. TRIMMING:

Adjustments, Optimization of Components and Operation

After the first phase of testing, the manufacturer can see if the prototype lived up to its expectations. Adjustments and optimization can be made of various components to obtain the best possible performance of the actual design of the wind turbine. The trimming will typically include various blade angles and software adjustments.

3. TESTING OF COMPONENTS:

Load Test of Tower, Blades and Protection against Runaway

Besides power and noise, security is an important matter for any kind of windmill, small or big. It is important to test the safety of the windmill. Household wind turbines are especially likely to be close to the residence of the owner.

As part of the certification a range of full-scale structural static and fatigue tests are conducted. At the Folkecenter test station static tests of tower, foundation and blades are made according to the requirements of the Danish approval procedure.
All turbines, big and small, need to have a reliable overspeed protection system. Runaway can lead to critical loss of control over the turbine and its components and cause accidents. As the Folkecenter Small Windmill Test Station is located in a region where wind speeds over 20 m/s occur during most winter periods, real life high wind tests are part of the testing process.

4. POWER CURVE

Measurements for Documentation

Once the small wind turbine's design has been optimized and its components have been tested for safety, it is time for the measurements and documentation during a specified period of time. In this way a real and authentic power curve can be made in accordance to international standards by an independent body.

5. FINAL REPORT

The final report will include the measurements and an assessment of the windmill and its components. By this stage, the windmill should be ready for certification by a third party for sale in national and international markets.

In conclusion, since the small wind turbine market is making its way into mainstream renewable energy, it is important for the industry to develop reliable products for on-grid and off-grid customers to allow the governments to enact supportive policies and economic incentives for a clean and fossil-fuel future.

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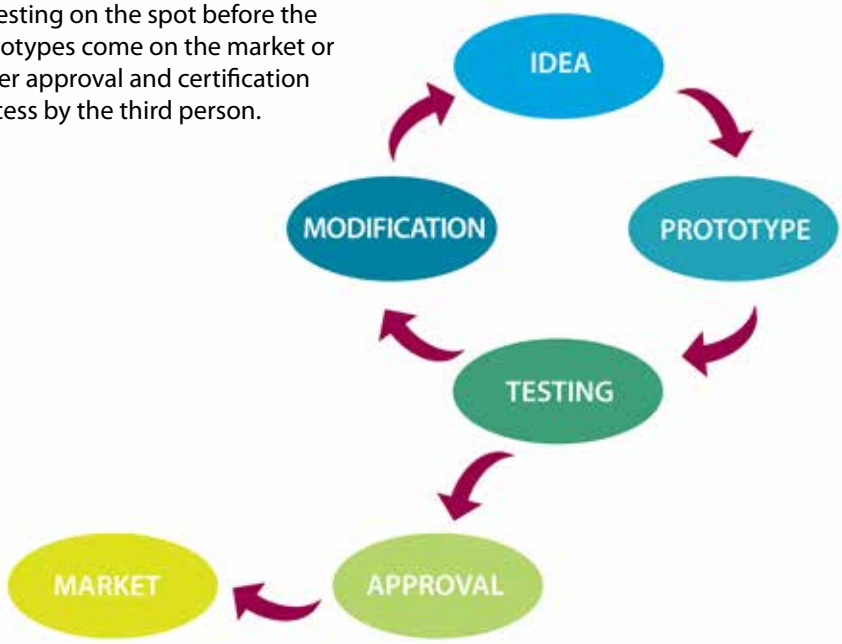
www.folkecenter.net

Folkecenter's mission is to support manufacturers to measure the quality of components and systems by testing on the spot before the prototypes come on the market or under approval and certification process by the third person.



Folkecenter's small wind turbine references, 2015:

» Victor Energy, 5 kW
» Easy Wind, 6 kW
» Wind Harvester, 70 kW
» Gennemprøvet, Kingspan 2,2 kW
» Windspot, 3,5 kW
» Kessler, 10 kW
» UNI 1, 5,5 kW
» Calorius, 4 kW
» Windtalker, 400 W
» Turbina, 4 kW
» Wind Heat 3 til 4 kW
» WWA, 10 kW
» Hugh Piggott, 1,5 meter vinge
» Bergey Windpower, 1 kW
» Fortis Wind Energy, 1,4 kW
» Envergate, 3 kW
» Envergate, 10 kW
» Haue Holding Aps, 1,2 kW
Component test: Orbital, DVE SmartPower, Olsen vinger.

200m² SMALL WIND TURBINE CERTIFICATES (IEC61400-2)

Fabrikant Manufacturer	Betegnelse Type	Størrelse Power [kW]	Rotor [m]	Areal Swept area [m²]	Navhøjde Hub height [m]	Godkendelses nummer Approval Number	Dato for udstedelse Issuance date	Dato for udløb Expiry date
Gaia Wind A/S	Gaia Wind 133-10 kW	10	13	133	18.2	DTU 2014-3 TC	12-10-2014	12-10-2019
HSWind ApS	Viking 25	25	13	133	18	DTU 2014-2TC-A	01-07-2014	30-06-2017
Solid Wind Power A/S	SWP25-14TG20	25	14	154	18	DTU 2015-1 TC-A	09-03-2015	09-03-2020
Solid Wind Power A/S	SWP10-14TG20	10	14	154	18	DTU 2015-2 TC-B	10-03-2015	10-03-2016
Osiris Energy Co., Ltd	Osiris10	10	9,7	74	15.5	TD-TA-101-0-1	30-04-2014	01-05-2019

40m² SMALL WIND TURBINE CERTIFICATES (DANISH)

Fabrikant Manufacturer	Betegnelse Type	Størrelse Power [kW]	Rotor [m]	Areal Swept area [m²]	Navhøjde Hub height [m]	Godkendelses nummer Approval Number	Dato for udstedelse Issuance date	Dato for udløb Expiry date
Hagi Vertikalvindkraft og Energiteknik ApS	Ropatec Big Star Vertikal	25	8x4,3	34,4	N/A	SO-DV-13001	20-07-2013	20-07-2016
LS Stoker Lars Sørensen	Sonkyo Windspot 3.5	3.5	4.1	13.20	18	SO-DV-14002	16-05-2014	16-05-2017
Thy Møllen Leif Pinholt	TWP 40-6 TWP 40-10	6 10	7.13	39.9	21	SO-DV-13010	15-11-2013	15-11-2016
Kingspan Environmental Ltd	Kingspan 6 kW	6	5,6	24	17 og 22	SO-DV-15002	10-02-2015	18-02-2018
KVA Diesel	KVA 6-10	6 10	7.1	39,6	18 21	SO-DV-13009	06-11-2013	06-11-2016
Zenia Energy	Zenia ZA6	6	7,13	39,9	16,5 18	SO-DV-13007	16-09-2013	16-09-2016
Zenia Energy	Zenia ZA10	10	7,13	39,9	18	SO-DV-14007	19-11-2014	19-11-2017

Asian Small Wind Turbine Test and Training Center, China

In China, the accumulated installation of Chinese made small wind turbines reached over 625,000 units. About 400,000 households, 2 million people, have solved their power supply problems by using small wind generators. Small wind generators are suitable for Chinese windy rural conditions, they also promote social development of remote areas.

From 2009 to 2014, more than 200,000 units of Chinese made small-size wind turbines have been exported to other countries, and made beneficial contributions to wind energy application worldwide. On grid application of small-size wind generators will have a very promising development in the future in both developed and developing countries.

Through more than 30 years of development in China, small wind power technologies become mature, products more reliable, and performances improve step by step. The national production rate is 100%, but market demand is still growing. To ensure a healthy market development, the quality of small wind generators needs to be improved continually. Therefore, there is the need to test and certify the growing number of small wind turbine models produced in China.

The Chinese Wind Energy Equipment Association (CWEEA) and Chinese Wind Energy Association (CWEA) have established the Asian Small Wind Turbine Test and Training Center, located in a large flat area near the Yellow River in the economic development zone of Dongying City, Shangdong Province. The test center occupies 100.000m^2 of flat land, with rich wind resources, yearly average wind speed is 5,2m/s (at 10 m height). There are six test bases, which can hold tests for 100kW, 50kW, 30kW, 5kW and under 5kW, and are specialised for various environments: marine, high salt and fog. The test site is now completed, connected to the grid. Several sets of wind energy equipments have already been tested and measured.

The test center will adopt international standards to test various kind of small wind turbines, that provide data basis for product certification. When suitable conditions are met, it is planned to make the products in a mutual recognition measurement management, and form an authentication system together with Taiwan. The next step for the centre is to focus on the action program of testing and authentication mechanisms, to form a certification system as soon as possible to meet the international test certification standards.

Choosing
a small wind turbine

A Guide

How to choose a small wind turbine?

Small wind turbines provide electricity. However, wind turbines are not suitable for every place. There are many factors one must consider when choosing a wind turbine system. Even small wind turbines require an amount of space for installation and sufficient wind for the wind turbine to function. What matters?

TEXT: **Frits Ogg**

1. PERMISSIONS
No permit, no wind turbine. Regulations differ from country to country so you have to search for your national or regional regulations. The national wind association can help you with this.

2. WIND RESOURCES
Is the wind resource at your site good enough to justify your investment in a small wind turbine system is a key question. Monitoring by a wind resource measurement system at a site provides the best picture of the available resource but it has a cost. Wind measurement systems are available; whether this expense is justified depends on the nature of the proposed small wind turbine system and its costs. The measurement equipment must be installed high enough to avoid turbulence created by trees, buildings, and other obstructions. The most useful readings are those taken at hub height at the supposed place of the wind turbine generator. You can also measure with two wind-loggers. One on the preferred location at hub height at least for one year. The other at alternative locations for some time to see if there are better places, with the fixed wind-logger as a reference. You may consider hiring an experienced small wind site assessor who can determine the wind resource and/or where the turbine should be located on your property.

3. LOCATION
The positioning of your small wind turbine is very important because it will determine the actual performance of the turbine. You can have varied wind resources within the same property. In addition to measuring or finding the annual wind speeds, you need to know the prevailing directions of the wind at your site. You need to consider existing obstacles such as trees and buildings, and you need to plan for future obstructions such as new buildings or trees that have not reached their full height. Your turbine needs to be sited upwind of buildings and trees, and it needs to be 10m above all obstacles within a 100m horizontal radius.
You also need enough room to raise and lower the tower for maintenance, and if your tower is guyed, you must allow room for the guy wires.

4. ENERGY USE YOU WANT TO MEET
You need to know how much electricity you use per year. Depending on the average wind speed and your demand, a wind turbine for a home rated in the range of 2 to 15 kW would be required to make a significant contribution to the demand. Without storage or grid coupling with feed-in tariff a wind turbine should deliver about 50-60% of your energy consumption.

5. HORIZONTAL OR VERTICAL AXIS?
There are basically two types of turbines to choose from, vertical axis and horizontal axis wind turbines. Horizontal axis wind turbines dominate the majority of the wind industry. Horizontal axis means the rotating axis of the wind turbine is horizontal, or parallel to the ground. In recreational and residential wind applications, vertical axis

turbines can have their place. With vertical axis wind turbines the rotational axis of the turbine stands vertical or perpendicular to the ground. Due to the lower efficiency, the vertical axis will capture less energy for the same swept area. As small wind turbines have a low hub height, small wind turbines will be often placed in a place with turbulence. The vertical axis is not as sensitive as is the horizontal to the effects of turbulence. The savings that a vertical axis may enjoy due to lower drive train and maintenance costs are unlikely to balance the lower energy capture and higher initial rotor costs.

6. WHAT SIZE DO I NEED? MISINFORMATION AND PROVABLE TRACK RECORD

The size of the wind turbine you need depends on the application. Small turbines range in size from 10 Watts to 100 kilowatts (kW). The smaller (10 to 500Watt) turbines are used in applications such as charging batteries for recreational buildings and sailboats. Turbines used in residential applications can range in size from 400 Watts to 15 kW and for farmers and small&medium enterprises applications, the size can range from 15 kW to 100 kW. Comparing small wind turbines can be tricky without an understanding of exactly what affects the amount of energy they produce. Small wind turbines are usually compared by their rated power in W or kW. It is important to look at these values with care, because there is no standard in rating the output of a small wind turbine. The rated power of a wind turbine, given for a wind speed of 12.5 m/s is three times higher than the value given for a wind speed of 9 m/s. The same machine can be labelled with a very different rated power only depending on the wind speed, which is used as basic value. Only at the windiest sites of the world turbines will operate for a significant time span at a wind speed of 12,5 m/s. At most sites such high winds are very rare. Unfortunately, it has become common for wind turbines to be compared by looking at their maximum power output or 'rated power' in kilowatts (kW). Looking at the rated power of a wind turbine one must compare the wind speed used in the rating procedure with the expected wind speeds at your own location (4-9 m/s). The manufacturer, dealer, or installer can provide you with the expected annual energy output of a turbine as a function of the annual average wind speed at your site.

Then there is the size of the rotor. The technical term applied to the rotor is called the 'swept area', which literally means the size of the area 'swept' by the blades as they turn. The bigger the rotor, the more wind it captures and therefore the more energy it generates. The relationship between swept area and output is linear, so if you double the swept area of a turbine you get double the output.

Ask the manufacturer, dealer, or installer for references from past customers with installations similar to the one you are considering. Ask the system owners about performance, reliability, and maintenance and repair requirements, and whether the system is meeting their expectations.

7. CERTIFICATION

To justify the investment in a small wind turbine, you want assurances that your turbine model has been evaluated for safety, performance, and functionality. Certification differs from country to country. More information can be found at the www.small-wind.org website.

8. WARRANTY

Find out how long the warranty lasts and what it includes.

9. COSTS

Installation costs vary greatly depending on local zoning, permitting, off-grid or utility interconnection costs. Depending on these considerations, as well as the turbine size, small wind energy systems have according to the "U.S. Department of Energy 2014 Distributed Wind Market Report"[1] an average cost of approximately USD 6230 (EUR 5660) per kilowatt installed.

10. INSTALLATION AND STEWARDSHIP

Whether the system is stand-alone or grid-connected, you need to consider the length of the wire run between the turbine and the load (house, batteries, water pumps, etc.). Electricity can be lost as a result of the wire resistance—the longer the wire run, the more electricity is lost. The manufacturer, dealer, or installer has to provide you with instructions how to handle in case of problems and safety.

More background information can be found in fine books on small wind turbines like "Wind Energy Basics" of Paul Gipe.

ing. **Frits Ogg**, euro I.E BEd
Author | consultant | teacher energy conservation and sustainable energy
O2G Sustainable Energy Solutions

[1] http://bit.ly/2014DWMR8-7

CATALOGUE

of SMALL WIND TURBINES

** under 50 kW*

Abstract

This catalogue contains information about wind turbines that are manufactured and distributed worldwide. The information is a basic representation of the turbines, please be aware that there are many factors and regional variables that prevent an accurate comparison between different models. Rated wind speeds are different for all models so please keep this in mind when comparing the rated outputs. Prices as well are not comparable as they may or may not include the tower, cables, shipping, taxes, etc.

This data is subject to change since many of these machines are constantly undergoing testing and development. As of June 2016 this information is accurate to the best of our knowledge, however we can not guarantee that all information in the following pages is up to date. For more information about a wind turbine contact the company listed or find a distributor in your area.

The companies listed are primarily manufacturers, however, if information is only available from a distributor their company information accompanies that of the turbine even though it is produced elsewhere. This catalogue is not a promotion of any of these companies or products. Information comes from the companies listed, not from direct knowledge or testing of these machines.

All information and photos included in the following pages are credited to the manufacturers/distributors. Many thanks to all those people who provided this information, their help is very much appreciated. If any of these pages are to be reproduced please reference this publication as the source.

This catalogue is the eighth edition with revisions planned for the future. If you have information about wind turbines that are not described here, or corrections to existing pages please contact the Nordic Folkecenter for Renewable Energy.

A note about the terminology

(in order of appearance in the following specification charts)

Model ..... The name of a specific wind turbine, used to distinguish it from others.

Orientation ..... The relation of the rotor of a Horizontal Axis Wind Turbine (HAWT) to the tower,
- Upwind of the tower; the rotor faces the wind and is yawed, in most cases by a tail vain.
- Downwind of the tower; the machine is yawed, in most cases by the blades themselves.

A Vertical Axis Wind Turbine (VAWT) is omni-directional and is not classified as upwind or downwind.

Rated Output (W/kW) ..... The power produced by a wind turbine in watts at its rated wind speed. Please keep in mind that the rated wind speed is not a standard, the average used in the small wind industry is 11 m/s, but rated wind speed can range anywhere from 6 m/s all the way to 20 m/s. The power available in the wind increases eight times with every doubling of the wind, so the same turbine at 12 m/s will produce approximately eight times as much as it would at 6 m/s. Different turbines are rated at different wind speeds. Another indicator, possibly more appropriate, of a turbine's size is its rotor diameter and/or swept area, i.e. the physical size of the machine.

Peak Output (W/kW) ..... Maximum power output of a wind turbine.

Output Voltage (V) ..... In the context of this catalogue this term refers to any or all of the following: the voltage produced directly from the turbine, or the voltage once it has been inverted/rectified for the purpose of charging batteries or connection to a utility network.

Generator Type ..... The type of generator or alternator that is used to convert mechanical energy to electrical energy.

Stand Alone ..... The wind turbine is intended for use in remote applications where the excess electricity is stored in batteries.

Grid Connection ..... The wind turbine is designed to be connected to the utility grid.

Direct Heating ..... A heating system that stores energy generated from the wind as hot water which can be used for space heating and hot water use.

Pumping ..... These wind turbines/mills pump water either mechanically or in combination with an electrical pump.

Controller Type ..... The system that monitors the condition of the wind turbine and its environment. Depending on these conditions, the controller can adjust the operation of the machine to prevent damage or to optimize performance.

Overspeed Protection ..... Mechanism or device for limiting the maximum speed of the rotor to prevent the rotor from self-destruction. This can generally be called governing and some examples include;
- Furling: the rotor swings out of the wind either sideways or up to lessen the size of the swept area exposed to the wind,
- Stall regulation: the blades of a fixed pitch wind turbine can be designed to stall in high wind speeds (stall = less lift and more drag),
- Pitch control: the speed is controlled by varying the angle of the blade to its direction of travel.

Blade Material ..... The materials used in construction of the blades.

Much of the above terminology is referenced from the "1997 Glossary of Wind Energy Terms" by Paul Gipe and Bill Canter.

# of Blades ..... The number of blades on a wind turbine rotor.

Rotor Diameter (m) ..... Diameter of the circle swept by the rotor of a wind turbine, for vertical axis turbines this is the length of the rotor cross arm.

Rotor Height (m) ..... The height of the blades. Only data for the blade height of vertical axis turbines is included in the following pages.

Swept Area (m^2) ..... The area of the wind stream swept by a wind turbine rotor.
HAWT: Area = 3.14 x $Radius^2$
VAWT: Area = Diameter x Height

Wind speed (m/s) ..... (note: 1m/s = 2.24mph = 3.60km/h = 1.94 knot)

Rated ..... Wind speed at which a turbine produces its rated power. As mentioned earlier this is not a standard. Different turbines are rated at different wind speeds.

Cut-in ..... Wind speed at which a wind turbine begins to produce power.

Cut-out ..... Wind speed at which a wind turbine is stopped from producing electricity to prevent over speeding and damage to the machine. Many small turbines have no cut-out wind speed but will instead control the rotational speed of the rotor.

Governing ..... Wind speed at which the machine will begin controlling rotor speed to prevent over speeding.

Survival ..... The maximum wind speed a turbine can withstand without suffering irreparable damage.

Head Weight (kg) ..... The weight of the nacelle, the rotary components within the nacelle, the tail vain, and the weight of the rotor. In short, this is the weight of the wind turbine excluding the tower.

Tower Type ..... The type of tower that is recommended or available for a specific wind turbine.

Tower Height (m) ..... The recommended or available height for the tower in order for the machine to function at its rated capacity.

Product Life (years) ..... Number of years that a specific model of wind turbine is expected to operate.

Warranty (years) ..... Amount of time in which any defect in the turbine or components will be repaired or replaced by the company it was purchased from.

Units sold ..... The number of a specific model that have been sold.

Years on the market ..... Amount of time that a specific model has been available for purchase.

Price ..... Cost of the wind turbine. This data is not comparable as the price may or may not include the control system, tower, cables, shipping, taxes, etc. For specific cost information contact the manufacturer/distributor.

Certificate ..... Certificate for the specific model of wind turbine.

Power Curve ..... Power delivered by the turbine as a function of steady wind speed between the cut-in and cut-out speeds.

Index

The index of featured companies is arranged by country and company name with rated output (in Watts and/or kW) of offered wind turbines.

COUNTRY	COMPANY	RATED OUTPUT (W; kW)	PAGE
	Lely Aircon	9.8 /29.8 kW	78
	PSW Energiesysteme	4.6 /10 /14.5 kW	79
	S&W Energiesysteme	7.5 /25 kW	80
	Superwind	350 W	81
	Thümler	6 kW	82
	Turbina Energy	1 /1.5 kW	83
Greece	Energotech	1 /3 /6 kW	84
India	Sun N Wind Renewables	600 W; 1 /2 /3 /5 kW	85
	E-Hands Energy	600 /800 W; 1 /3.5 /3.5 kW	86
	LeanWay Energy	500 W; 1.2 /2.2 /3 kW	87
	Supernova Technologies	700 W; 1.4 /3.5 kW	88
	Unitron Energy Systems	650 W; 1.5 /1.8 /3.3 /4.2 /5.1 kW	89
	Vaigunth Ener Tek	200 /300 /500 W; 1 /2 /5 /7.5 /20 /30 kW	90
	WiSH Energy Solutions	400 W; 1 /3.2 /4.5 kW	91
Italy	En-eco	1 /3 kW	92
	Interwind	1.8 /2.3 /3.3 kW	93
	Jonica Impianti	30 kW	94
	Minvento	400 W; 1.5 kW	95
	Ropatec	10 /10 /15 /30 kW	96
Japan	Birumen Kagoshima	4 kW	97
	Matsumura Machinery	50 W; 1 kW	98
	Nakanishi Metal Works	200 /500 W; 1 /50 kW	99
	Sinfonia Technology	1.07 /1.84 /1.01 /1.74 kW	100
	Wind-Smile	200 W; 1 /5 kW	101
	Windlens	3 /5 kW	102
	Winpro	145 W; 5 /5x4 kW	103
	Zephyr Corporation	1 (1.1) kW	104
Kenya	Craftskills East Africa	3 kW	105
The Netherlands	Fortis Wind Energy	1.4 /5 /6 /10 kW	106
	Home Energy International	200 /700 W	107
	Wind Energy Solutions	50 kW	108
New Zealand	Gusto Energy	1.8 kW	109
	Powerhouse Wind	2 kW	110
Peru	Denertec	200 W	111
Poland	Dr Zaber	3 /5 /10 /12 /20 /25 /30 /40 /50 kW	112
Portugal	Silentwind - Rulis Electrica	420 /450 /500 W	113
Scotland	Gaia Wind	11 kW	114
	Kingspan Renewables	2.5 /5.2 kW	115
	Renewable Devices	1.5 kW	116
	Scoraig Wind Electric	200 /350 /700 W; /1 /1 kW	117
South Africa	African Wind Power	1.5 /3.5 kW	118
	Kestrel Renewable Energy	600 /800 W; 1 /2.5 kW	119

COUNTRY	COMPANY	RATED OUTPUT (W; kW)	PAGE
	Winglette Wind Machines	3 /5 kW	120
Spain	Bornay Windturbines	600 /800 W; 1.5 /3 /6 kW	121
	Ennera	3.2 kW	122
	Kliux Energies	1.8 kW	123
	Sonkyo Energy	1.5 /3.5 /7.5 kW	124
	Zytech Aerodyne (Spain/USA/China)	400 /600 W; 1 /2 /3 kW	125
Sweden	GiroVind Energi	43.5 kW	126
	Windon	12.5 kW	127
Switzerland	Aventa	6.5 kW	128
Taiwan	Boltun Corporation	300 /600 W; 1.2 kW	129
Ukraine	GRESA-GROUP	800 W; 1.6 /4 /20 kW	130
	WindElectric	2 /4 /7 /10 /16 kW	131
USA	Bergey Windpower	1 /5.5 /7.5 /10 kW	132
	DragonflyPower	140-180 W	133
	Otherpower	800 W	134
	Selsam Innovations	1.2 kW	135
	Urban Green Energy	1 /3.2 /10 kW	136
	Ventera Energy	10 kW	137
	Wind Turbine Industries	20 kW	138
	XZERES (USA/Japan/Europe/India)	2.1 /10.4 kW	139

IVS - 4500 – BT

IVS - 4500 – ANTARTIDA

INVAP Ingenieria S.A. (Argentina)

Av. Cmte. Luis Piedrabuena 4950
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Río Negro, Argentina

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Contact: Alfredo Carlos De Napoli
E-mail: denapoli@invap.com.ar

Established 1972
Distribution: Direct from factory

Model	IVS - 4500 – BT	IVS - 4500 – ANTARTIDA
Orientation	Upwind	
Rated Output	4.2 kW	
Peak Output	4.5 kW	
Output Voltage (V)	48V, 380V 3 phase (variable voltage and frequency.)	380V 3 phase (variable voltage and frequency.)
Generator Type	Multipole PMG direct drive	
Applications	Stand Alone, Direct Heating, Pumping	
Controller Type	Electronic rectifier and battery charger regulator	
Overspeed Protection	Side furling and electronically controlled dumploads	Active electronically controlled side furling actuator
Blade Material	Fiberglass reinforced plastic and expanded polyurethane core	Same as the BT with anti-icing coating
Number of Blades	2 with Delta-3 improvement	
Rotor Diameter (m)	4.5	
Swept Area (m2)	15.9	
Windspeed (m/s)		
Rated	12	
Cut-in	4.2	
Cut-out	none	34 (electronic sensing of wind speed and electric actuator)
Governing	13 (starts progressive furling)	13
Survival	44	60
Head Weight (kg)	120	143
Tower Type	Guyed lattice or guyed tubular	Tubular
Tower Height (m)	9; 14; 20	9
Product Life (years)	15	
Warranty (years)	3	
Units sold	23	NA
Years on the market	Since 2001	
Price (USD)	8 900	20 900
	Two bladed wind generator, Free on Board (FOB)	
Certificate		

Renewable Energy Solutions Australia Holdings Ltd (Australia)

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michael@ecowhisper.com.au
Contact: Michael Le Messurier

Established 2010
Distribution: Domestic, international
Direct from factory

Model	Eco Whisper 325	Eco Whisper 650
Orientation	HAWT	
Rated Output		
Peak Output	5 kW	20 kW
Output Voltage (V)		
Generator Type	Axial flux permanent generator and VoltLogic inverter	
Applications		
Controller Type	Dynamic slew drive	
Overspeed Protection		
Blade Material		
Number of Blades	30 blades extending outwards	
Rotor Diameter (m)	3.25 m blade diameter	6.5 m blade diameter
Swept Area (m2)		
Windspeed (m/s)		
Rated		
Cut-in	1.7	
Cut-out		
Governing		
Survival		
Head Weight (kg)		
Tower Type	Automated hydraulic lift monopole design	
Tower Height (m)	18 m	17.74 m
Product Life (years)	20+	
Warranty (years)	5	
Units sold		
On the market since	2011	
Price		
Certificate	Australian Building Codes AS1170 and IEC 61400	

SOMA POWER PTY LTD
(Australia)

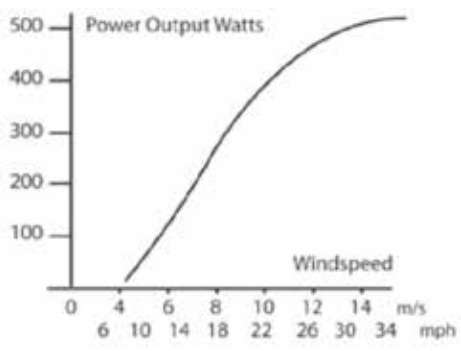
8/62 Lords Place
Orange NSW 2800, Australia

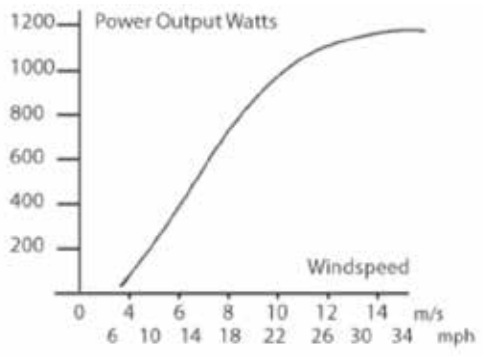
www.somawindgenerators.com.au
Tel: +61 414 986 830
Mob: +61 414 986 830
E-mail: info@somawindgenerators.com.au

Established: 1978
Distribution: Domestic, international
Direct from factory

harness nature's energy
Soma Wind Generators

Model	SOMA 400	SOMA 1000
Orientation	Upwind	
Rated Output	400 W	1 kW
Peak Output	500 W	1.2 kW
Yearly Production (Wh/y) at 4/5/6 m/s	1220 / 2327 / 3450	2800 / 4000 / 7300
Output Voltage (V)	12, 24,32, 36, 48, 110, 120	24, 32, 36, 48, 110, 120
Generator Type	PMG 3 phase	
Applications	Domestic power supply, telecommunications, yachts and any remote power applications	
Controller Type	Voltage controlled relay	Mosfet switching
Overspeed Protection		
Blade Material	GRP	
Number of Blades	2	
Rotor Diameter (m)	2.0	2.7
Swept Area (m2)		
Windspeed (m/s)		
Rated	10	10
Cut-in	4	3.5
Cut-out		
Governing		
Survival	50	50
Head Weight (kg)		
Tower Type		
Tower Height (m)		19.5
Product Life (years)		
Warranty (years)	1	1
Units sold		
On the market since		
Price		
Certificate		





SFT-V-4-2

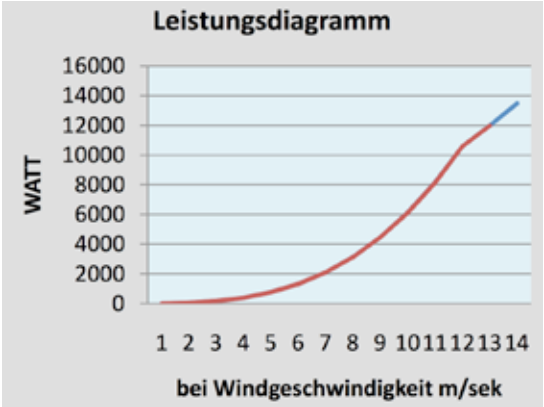
Silent Future Tec GmbH (Austria)

Bundesstraße 7-9
4341 Arbing

www.silentfuturetec.at
Tel: +43 699 101 16 233
E-mail: info@silentfuturetec.at
Contact: Michael Broser

Established 2009
Distribution: Domestic, international and through distributors

Model	SFT-V-4-2	SFTV 8/12
Orientation	VAWT	
Rated Output	4.2 kW	8 kW
Peak Output	4.5 kW	12 kW
Output Voltage (V)	230 VAC 50 Hz	
Generator Type	Permanent magnet generator	
Applications	Grid connected	
Controller Type	SPS	
Overspeed Protection		
Blade Material	Glassfibre	
Number of Blades	3	
Rotor Diameter (m)	4	6
Swept Area (m2)	16	31.8
Windspeed (m/s)		
Rated	11.3	11.5
Cut-in	3	3
Cut-out	12 continuous	13
Governing		
Survival	50	50
Head Weight (kg)	520	820
Tower Type	Monopole, steel or concrete	
Tower Height (m)	7 - 20	
Product Life (years)	Minimum 20	
Warranty (years)	2; rotor 5 years	
Units sold	14	
On the market since	2009	
Price	Contact company for prices	
Certificate		



STEP Energysystems (Austria)

Sonnleitberg 60a
8616 Gasen

www.step-gmbh.at
Tel: +43 3171 560-0
Fax: +43 3171 560-12
E-mail: office@step-gmbh.at
Contact: Rudolf Pessl

Established 1998

Distribution: Domestic, international sales via partner companies, Direct from factory

Model	**STEP V2GL**
Orientation	Downwind
Rated Output	15 kW
Peak Output	15 kW
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s	
Output Voltage (V)	0-400VAC
Generator Type	Permanent Magnet Generator PMG, gearless
Applications	Stand Alone, Grid Connection, Direct Heating and Pumping
Controller Type	Bachmann: The wind turbine is controlled by an innovative TCP/IP control system which enables a 24/7 remote control and monitoring via web, video cam and mobile phone, with data-logging.
Overspeed Protection	Patented hydraulic pitch control system
Blade Material	Glass fiber reinforced plastic, aerodynamic and noise optimized blades
Number of Blades	3
Rotor Diameter (m)	9
Swept Area (m2)	63.6
Windspeed (m/s)	
Rated	10.5
Cut-in	3
Cut-out	25
Governing	10
Survival	50
Head Weight (kg)	Approx. 1000
Tower Type	Galvanized tubular tower including ladder and service platform, 18m tower with rising system available
Tower Height (m)	18, 24 or 30
Product Life (years)	2
Warranty (years)	
Units sold	60 000 including tower
On the market since	2011
Price	
Certificate	IEC 61400-2 certified. Made in Austria.

Verne555

Notus 138

Gerar246

Enersud Indústria e Soluções Energéticas Ltda.
(Brazil)

Rua Dr. Heitor da Costa Matta,
31 Quadra 10
Inoã - Maricá - RJ
RJ - CEP: 24.9430-000

www.enersud.com.br
Tel: +55 (21) 3710-0896
E-mail: enersud@enersud.com.br
Contact: Luiz C. S. Pereira

Established: 2004
Distribution: Domestic, international
Direct from factory

ENERSUD
energia limpa

Model	DISCONTINUED	Notus138	Gerar246	Verne555
Orientation	Upwind			
Rated Output	250 W	380 W	1 kW	6 kW
Peak Output				
Output Voltage (V)	12 / 24	12 / 24	12 / 24 / 48 / 220	120 / 220 / 400
Generator Type	Axial flux			
Applications	Stand Alone, Direct Heating	Stand Alone, Grid Connection, Direct Heating, Pumping		
Controller Type				
Overspeed Protection	Active stall			
Blade Material	Fibregalss			
Number of Blades	3			
Rotor Diameter (m)	1.12	1.38	2.46	5.55
Swept Area (m2)	0.98	1.5	4.75	24.18
Windspeed (m/s)				
Rated	12			
Cut-in	3			
Cut-out	17			
Governing	Pitch control			
Survival	55			
Head Weight (kg)	9.5	10	35	198
Tower Type				
Tower Height (m)				
Product Life (years)	20			
Warranty (years)	2			
Units sold	20	450	230	24
On the market since		2004	2004	2008
Price		USD 700	USD 1875	USD 9000
Certificate				

ALTERNATE POWER
(Canada)

P.O. Box 1236
Oakville, Ontario
L6J 5C7

www.vpturbines.com
Tel: +1 (905) 599-5393
E-mail: info@vpturbines.com
sales@vpturbies.com
Contact: Paul Stearns

Established: 2007
Distribution: Direct from factory

Model	**EXTRACTOR**
Orientation	Upwind
Rated Output	300 W (12V DC system)
Peak Output	
Output Voltage (V)	
Generator Type	Permanent Magnet Alternator
Applications	Stand Alone, Direct Heating, Pumping
Controller Type	Mechanical
Overspeed Protection	Variable Pitch Blade Actuation
Blade Material	Aluminum alloy 6063 T6
Number of Blades	3
Rotor Diameter (m)	1.52
Swept Area (m2)	1.81
Windspeed (m/s)	
Rated	10
Cut-in	2.7
Cut-out	Cut-out is unnecessary
Governing	Furling is unnecessary
Survival	>39
Head Weight (kg)	6.1
Tower Type	
Tower Height (m)	
Product Life (years)	20 with periodic maintenance
Warranty (years)	2, shipping not included
Units sold	
On the market since	5
Price	Turbine: USD 979 / Charge controller: USD 110
Certificate	

S-343

G-3120 / E-3120

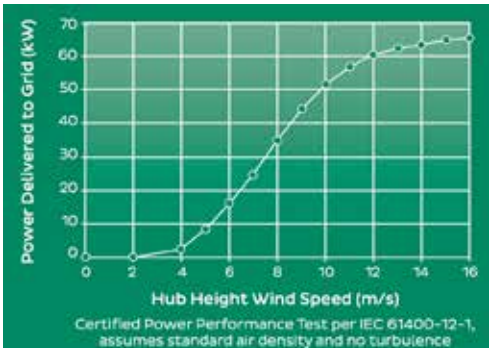
Endurance Wind Power (Canada)

107, 19052-26th Avenue
Surrey, BC V3S 3V7, Canada

www.endurancewindpower.com
Tel: 1 888 440-4451
Contact: Ana Kozjak
E-mail: info@endurancewindpower.com

Established 2010
Distribution: Domestic, international

Model	S-343	G-3120	E-3120
Orientation	Upwind	Downwind	
Rated Output	5.2 kW	35 kW	50 kW
Peak Output			60 kW
Output Voltage (V)	240V 60Hz single phase	480	400, 480
Generator Type	Induction	Induction, 3 phase 60Hz	Induction, 3 phase & Single phase, 50Hz & 60Hz
Applications	Grid Connection		
Controller Type	PLC based is standard	PLC based is the standard, other options are available	
Overspeed Protection	Rapid fail-safe mechanical brake, Redundant fail-safe mechanical brake	Rapid fail-safe brake on high speed shaft; Pitch Control system (over speed regulation) using passive spring loaded mechanism.	
Blade Material	Epoxy / Fiberglass	Fiberglass / Polyester	
Number of Blades	3		
Rotor Diameter (m)	6.37	19,2	
Swept Area (m2)	31.9	290	
Windspeed (m/s)			
Rated	11	9,5	
Cut-in	4.1	3.5	
Cut-out	24	25	
Governing	NA		
Survival	52		
Head Weight (kg)	300	3990	
Tower Type	Freestanding monopole tilt-up, or Tubular guyed tilt-up	Freestanding monopole or lattice	
Tower Height (m)	27.5 or 31.1, 36.6	24, 30, 36, 42 (monopole & lattice)	
Product Life (years)	20 years, provided service and maintenance schedules are followed		
Warranty (years)	5 years parts and labour		
Units sold	Contact for more information		
On the market since	6	5	
Price	Contact dealer for pricing		
Certificate			



E-3120

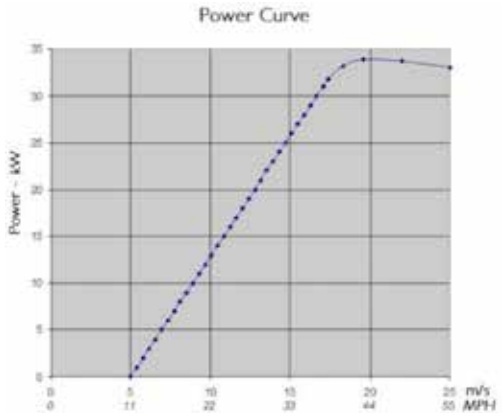
Wenvor Technologies Inc. (Canada)

P.O. Box 1482
Guelph, Ontario
N1H 6N9

www.wenvortechnologies.com
Tel: +1-519-767-5227
Fax: +1-519-767-5228
E-mail: info@wenvortechnologies.com
Contact: Randy Seager

Established 1990
Distribution: Domestic, international
Direct from factory

Model	**WTI 30 kW**
Orientation	Upwind, Horizontal Axis
Rated Output	30 kW
Peak Output	30 kW
Output Voltage (V)	600VAC @ 60 Hz or 50 Hz specified voltage
Generator Type	Induction
Applications	Stand Alone, Grid Connection
Controller Type	CSA approved automatic control system. Optional controls for stand-alone, battery charging, or wind diesel sites are available.
Overspeed Protection	2 stage pitch regulation
Blade Material	Carbon composite with aluminum tips and internal copper cable for lightning protection.
Number of Blades	2
Rotor Diameter (m)	10
Swept Area (m2)	78.54
Windspeed (m/s)	
Rated	
Cut-in	4
Cut-out	N/A
Governing	N/A
Survival	
Head Weight (kg)	1250
Tower Type	Tilt-up guy wire
Tower Height (m)	24, 30
Product Life (years)	20
Warranty (years)	2
Units sold	
On the market since	Since 1996
Price	Contact Wenvor Technologies for prices
Certificate	



H10.0-30 kW

H9.0-20 kW

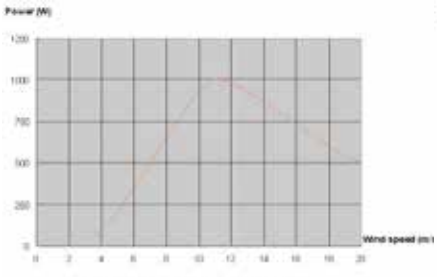
Anhui Hummer Dynamo Co., Ltd (China)

Room 302, No. E2 building
HuaYi Science Park, Tian Da Road,
Hefei, Anhui, China Province

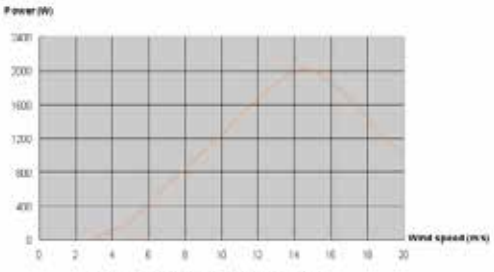
www.chinahummer.cn
Tel: +86-551-63441231
Fax: +86-551-63442991
E-mail: csc@chinahummer.cn

Established 2005
Distribution: Domestic, international
Direct from factory

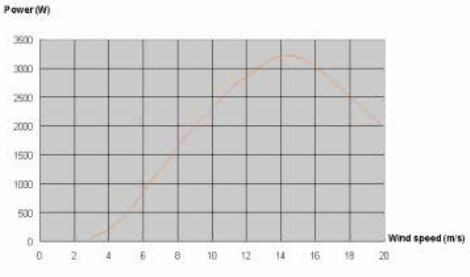
Model	H1.25-400W	H1.25-600W	H2.7-500W	H3.1-1kW	H3.8-2kW
Orientation	400	600	500	1000	2000
Rated Output	600	800	1000	2000	3200
Peak Output					
Output Voltage (V)	12	24	24	60	120
Generator Type	Permanent Magnet Alternator				
Applications					
Controller Type					
Overspeed Protection	Yawing + Electromagnetism braking				
Blade Material	GRP				
Number of Blades	3				
Rotor Diameter (m)	1.25		2.5	3.1	3.8
Swept Area (m2)					
Windspeed (m/s)					
Rated	11		7	9	9
Cut-in	2.5		3	3	3
Cut-out					
Governing	3-25				
Survival	50				
Head Weight (kg)	5.5	7	6.5	15	25
Tower Type					
Tower Height (m)					
Product Life (years)					
Warranty (years)					
Units sold					
On the market since					
Price	Contact Anhui Hummer Dynamo Co., Ltd for prices				
Certificate	ISO9001 quality management system, European CE certification, USA UL certification, Germany VDE certification and IEC61.400 certification. The factory has been audited by SGS and BV.				



HUMMER-500W Wind Generator



HUMMER-1KW Wind Generator



HUMMER-2KW Wind Generator

First Wind Turbine Manufacturing Co., Ltd (China)

Building B. NO.8, Shentang First Road,
No.3 Industrial Zone, Tanzhou Town,
Zhongshan City,
Guangdong Province

www.firstwindturbine.com
Tel: +86-760-86737965
Fax: +86-760-86983422
E-mail: sales@firstwindturbine.com
Contact: Joyce

Established 2010
Distribution: Domestic, international
Direct from factory

Model	WK-450	WK-750	WH-1000	WH-2000	WH-3000	WH-5000	WH-10000	WH-20000
Orientation	Upwind							
Rated Output	450 W	750 W	1 kW	2 kW	3 kW	5 kW	10 kW	20 kW
Peak Output	600 W	900 W	-					
Output Voltage (V)	12, 24, 48	24, 48	48	240	48		240	480
Generator Type	Permanent Magnet, Brushless							
Applications	Stand Alone, Grid Connection							
Controller Type								
Overspeed Protection	Tail furl and electronic controller							
Blade Material	Reinforced fibreglass							
Number of Blades	3							
Rotor Diameter (m)	1.4	1,8	2.8	3.2	4	5	8	10
Swept Area (m²)	1.54	2,54	6.15	8.04	12,56	19.63	38.46	78.50
Windspeed (m/s)								
Rated	12		9		10			
Cut-in	3							
Cut-out	25							
Governing								
Survival	35		40					
Head Weight (kg)								
Tower Type								
Tower Height (m)	6			9	12		16	18
Product Life (yrs)	20 to 25							
Warranty (years)	3							
Units sold								
On the market since								
Price	Contact company for prices							
Certificate								

HY-400

HY-1000

HY-1500

HY-3000

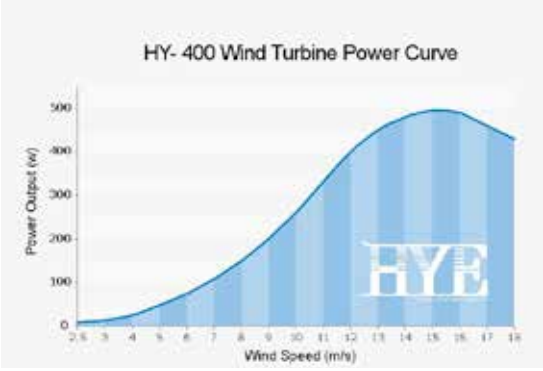
Guangzhou HY Energy Technology Ltd Corp. (China)

No.10 Yongfa Road,
Huadu, Guangzhou
510800

www.hyenergy.com.cn
Contact
Tel: +86 (0)20 36888000
Fax: +86 (0)20 36892823
E-mail: hy@hyenergy.com.cn
Contact: Joanna Wu
Mobile: +86 18666087021
E-mail: sales@hyenergy.com.cn

Established 2001
Distribution: Direct from factory

Model	HY-400	HY-600W	HY-1000	HY-1500	HY-3000
Orientation	Upwind				
Rated Output	400 W	600 W	1 kW	1.5KW	3 kW
Peak Output	500 W	750 W	1.2 kW	1.8KW	3.5 kW
Output Voltage (V)	12 / 24 DC	24 / 48 DC	Off Grid: DC 24/48 Grid Tie: DC 48/110	Off Grid: DC 48/110 Grid Tie: DC 48/120/180	Off Grid: DC 48 / 110 Grid Tie: DC 110/220
Generator Type	PMG (Permanent Magnetic Generator)				
Applications	Stand Alone, solar & wind hybrid (grid tie/off grid), grid tie systems, wind & solar hybrid street light				
Controller Type	PWM controller with dump-load				
Overspeed Protection	Aerodynamic and electro-magnetic braking system				
Blade Material	Reinforced nylon glassfibre				
Number of Blades	5				
Rotor Diameter (m)	1,55	1,75	1,96	2,05	3
Swept Area (m2)	1,89	2,4	3	3,3	7,07
Windspeed (m/s)					
Rated	12				
Cut-in	2.5				
Cut-out	>18				
Governing					
Survival	50			60	
Head Weight (kg)	22	25	28	35	70
Tower Type	Galvanized self-supporting monopole				
Tower Height (m)	8-12				
Product Life (years)	15				
Warranty (years)	3				
Units sold					
On the market since	10	10	6	3	8
Price	Contact HY Energy for current cost information				
Certificate					



Hohhot Boyang Renewable Energy (China)

No.2, Xixiang, Accessories Factory,Haixi Road,Hohhot City,Inner Mongolia, China

www.boyangenergy.com
Tel: 0471-3966770
Fax: 0471-3966770
E-mail: boyangenergy@163.com

博洋能源
BYE

Model	FD2.5-0.5/10	FD3.0-1/10	FD5.0-5/10	FD8-10/12
Orientation	Horizontal	Horizontal	Horizontal	Horizontal
Rated Output	0.5kW	1kW	5kW	10kW
Peak Output	1kW	1.3kW	5.5kW	10.5kW
Output Voltage (V)	DC24V	DC48V	DC110V	DC220V
Generator Type	PMG	PMG	PMG	PMG
Applications	Off grid	Off grid	Off grid/On grid	Off grid/On grid
Controller Type	SCM/PLC	SCM/PLC	SCM/PLC	SCM/PLC
Overspeed Protection	Mechanical/ electric	Mechanical/ electric	Mechanical/ electric	Mechanical/ electric
Blade Material	Glass/wood	Glass/wood	Glass/wood	Glass/wood
Number of Blades	3	3	3	3
Rotor Diameter (m)	2.5	3	5	8
Swept Area (m2)	4.9	7.06	19.63	50.24
Windspeed (m/s)				
Rated	10	10	10	12
Cut-in	3	3	3	3.5
Cut-out	18	18	18	18
Governing	3-18	3-18	3-18	3.5-18
Survival	50	50	50	50
Head Weight (kg)	40	65	150	230
Tower Type	Steel tube	Steel tube	Single tower	Single tower
Tower Height (m)	6	6	8/10	10/12
Product Life (years)	20	20	20	20
Warranty (years)	1.5	1.5	1.5	1.5
Units sold	20000	15000	2000	500
On the market since	2001	2004	2010	2010
Price	RMB 7600	RMB 9600	RMB 36000	RMB 80000
Certificate	CE/ROTH/ISO900	CE/ROTH/ISO900	CE/ROTH/ISO900	CE/ROTH/ISO900

Airforce 1.5L

Airforce 2.0

Airforce 4.1

V1 Vertical Axis

Hopeful Wind Energy Technology Co., Ltd. (China)

Building C, No.18 7th Keji Road,
National Hi-Tech Zone,
Jinding District, Zhuhai

www.hopefulenergy.com
Tel: +86 756-3819866 / +86 756-3819868
Fax: +86 756-3882362
E-mail: info@hopefulenergy.com
Contact: Zhuang Miao

Established 2005
Distribution: Domestic, international
Direct from factory

HOPEFUL
WIND ENERGY TECHNOLOGY

Model	V1 Vertical axis	Airforce 1.5L	Airforce 2.0	Airforce 4.1	V1.8
Orientation	Upwind	Upwind	Upwind	Downwind	Upwind
Rated Output	300 W	600 W	1 kW	5 kW	1.5 kW
Peak Output	350 W	750 W	1.35 kW	5.1 kW	1.8 kW
Output Voltage (V)	14.5 VDC	12/24 VDC	48 VDC		180 Vac
Generator Type	Disk Generator	3 phases PMG	Synchronous PMG, multiple pole, direct drive		Disk Generator
Applications		Stand Alone, Grid Connection, Direct Heating, Pumping			
Controller Type		Full Automatic Control	Full Automatic Control	Full Automatic Control	
Overspeed Protection		Electromagnetic brake control system	Electronical brake and controlled dump loads	Disc brake	
Blade Material	FRP	Nylon and fiberglass		FRP, reinforced carbon fiber and steel frame	FRP
Number of Blades	1	3	3	3	1
Rotor Diameter (m)	0.9	1,5	2	4,1	1.5 m
Swept Area (m2)		1,77	3,14	13,2	
Windspeed (m/s)					
Rated	12	12			180 rpm
Cut-in	4	3,5	3,5	2	2
Cut-out			25	20	
Governing		12~25	12~25	12~20	
Survival	65	60			
Head Weight (kg)	25	20	30	120	110
Tower Type			Guyed steel pipe	3 step hydraulic monopole	
Tower Height (m)	8	8	8	12	10
Product Life (years)		15			
Warranty (years)	2	2			2
Units sold			2890	230	
On the market since			3	4	
Price			1 024 $	6 730 $	
	Price includes; wind turbine, controller, inverter (not the Airforce 4.1), tower				
Certificate					


FS-200


FS-300


FS-2000


FS-3000

Ningbo Winpower Group Co., (China)

5th Fl, C14, 299 Guanghua Rd, R&D Park
National High-Tech Zone, Ningbo, China

www.winpower.cc
Tel: +86-574-87882650
Fax: +86-574-87884853
E-mail: winpower@winpower.cc

Established 2005
Distribution: Direct from factory

Model	FS-200	FS-300	FS-400	FS-600	FS-1000	FS-2000	FS-3000	FS-5000
Orientation	Upwind							
Rated Output	200W	300 W	400 W	600 W	1 kW	2 kW	3 kW	5 kW
Peak Output	250W	400 W	500 W	720 W	1.17 kW	2.4 kW	3.5 kW	5.3 kW
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s								
Output Voltage (V)	12, 24		24, 48			120, 240		240
Generator Type	PMG							
Applications	Stand Alone, Grid Connection							
Controller Type	PWM or dump load							
Overspeed Protection	Centrifugal brake and electrical brake					Pitch control		
Blade Material	Aluminum alloy / polyamid					GRP (glassfibre reinforced plastic)		
Number of Blades	3							
Rotor Diameter (m)	1,5	2	2,2	2,5	2,8	4	4,2	5,2
Swept Area (m2)	2,5	3,14	3,8	4,91	6,15	12,56	13,85	21,23
Windspeed (m/s)								
Rated	10					12		
Cut-in	2,5	3				4		
Cut-out	20	25				40		
Governing	10-25					12-40		
Survival	50							
Head Weight (kg)	10	32	35	37	44	160	180	220
Tower Type	Guyed steel tower or pole tower							
Tower Height (m)	6-12							
Product Life (years)	15							
Warranty (years)	1-2							
Units sold	200-300 sets each year							
On the market since	10							
Price	Negotiable							
Certificate	Certification: ISO \ CE (SGS) \ TUV \ ROHS							

Osiris Energy
(China)

F3, No.3 Building, No.335 Guodi
Yangpu District, Shanghai,
200433, China

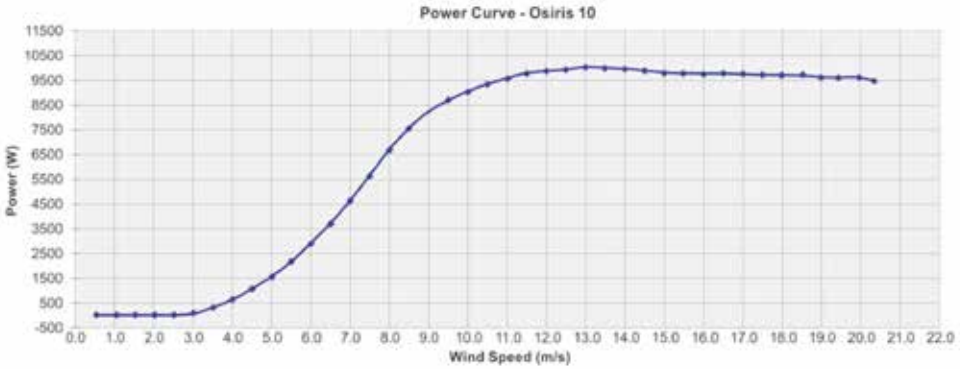
www.osirisenergy.com
Tel: (+1)866 438 8408
Fax: (+)86 21 3503 0633
E-mail: sales@osirisenergy-usa.com
Contact: Andy Tang

Established 2010

Distribution: Domestic, international
Direct from factory

Osiris Energy

Model	**Osiris 10**
Orientation	Downwind
Rated Output	10 kW
Peak Output	12 kW
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s	
Output Voltage (V)	230V Single phase or 400V Three phase
Generator Type	PMG (permanent magnet generator)
Applications	Grid Tied
Controller Type	Central monitoring and controller with active pitching function
Overspeed Protection	Passive pitch, active pitch and electrical brake
Blade Material	Carbon fiber composite
Number of Blades	3
Rotor Diameter (m)	9,7
Swept Area (m2)	15,54
Windspeed (m/s)	
Rated	9,5
Cut-in	3
Cut-out	25
Governing	Pitch controlled
Survival	59,5
Head Weight (kg)	950
Tower Type	Tubular steel
Tower Height (m)	20
Product Life (years)	5
Warranty (years)	7
Units sold	2000
On the market since	
Price	USD 25 000 (with turbine head, blades, inverters, master controller and dump load)
Certificate	IEC 61400-2; AWEA 9.1; CE



AH-20 kW (pitch control) AH-30 kW (pitch control)

Qingdao Anhua New Energy Equipment Co., Ltd (China)

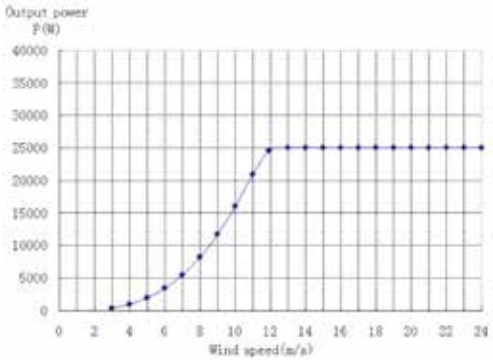
No.69 Zhuzhou Road, Qingdao,
Shandong Province

www.chinawindenergy.com
Tel: +86-532-80626816
Fax: +86-532-80626816
E-mail: anhua@chinawindenergy.com
Contact: Larry Lu
ane.wind66@gmail.com
Mobile: +86-18669716198

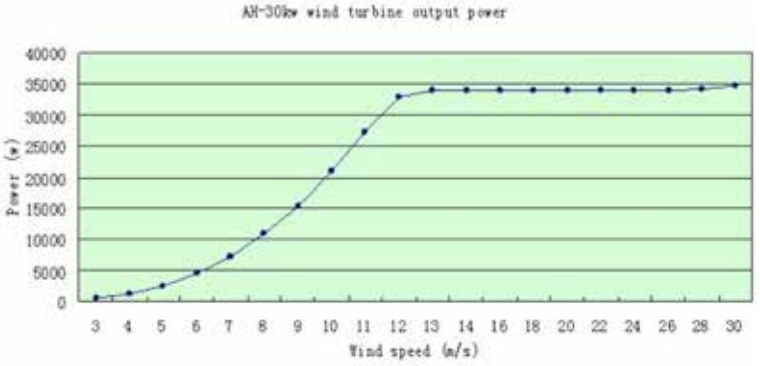
Established 1982
Distribution: Domestic, international
Direct from factory

ANE®

Model	AH-20kW	AH-30kW
Orientation	Upwind	Upwind
Rated Output	20 kW	30 kW
Peak Output	22 kW	34 kW
Output Voltage (V)	360/500 DC	500
Generator Type	Three phase, Permanent Magnet Generator	
Applications	Stand Alone and Grid Connection	
Controller Type	PWM dump load, on grid and off grid	
Overspeed Protection	Pitch control / yawing	
Blade Material	Reinforced fiberglass GRP	
Number of Blades	3	
Rotor Diameter (m)	9,2	10,5
Swept Area (m2)		95
Windspeed (m/s)		
Rated	12	
Cut-in	2,5	
Cut-out	30	
Governing		
Survival	60	
Head Weight (kg)	985	1600
Tower Type	Free-standing / hydraulic tower	
Tower Height (m)	≥15	18/25/30
Product Life (years)	15	
Warranty (years)	1	
Units sold		
On the market since	3	
Price	Contact Anhua or an Anhua distributor for detailed price.	
Certificate	Certification: ISO9001:2008, CE, IEC61400-2	



AH-20 kW



AH-30 kW


FZY600


FZY3kW


FZY1kW


FZY10kW

Qingdao Windwings Wind Turbine Co., Ltd (China)

Jiaonan City, Qingdao,
Shandong Province

www.qdfzy.com
Tel: +86-532-88178817
Fax: +86-532-86198619
E-mail: windturbine2006@gmail.com
MSN: windwings@live.cn
Contact: Ally Yang

Established 2010
Distribution: Direct from factory

Model	FZY-600W	FZY-1KW	FZY-2KW	FZY-3KW	FZY-5KW	FZY-10KW
Orientation	Upwind					
Rated Output	600 W	1 kW	2 kW	3 kW	5 kW	10 kW
Peak Output	750 W	1.5 kW	2.5 kW	4 kW	6 kW	12 kW
Output Voltage (V)	24	48	48 / 72 / 96	120 / 240	240	360
Generator Type	PMG					
Applications	Stand Alone, Grid Connection					
Controller Type	PWM and dump-load					
Overspeed Protection	Yaw & magnetic resistance					
Blade Material	FRP (composite material)					
Number of Blades	3					
Rotor Diameter (m)	2,5	2,8	3,2	4,5	5,5	7
Swept Area (m2)	4,91	6,15	12,56	15,9	23,75	38,47
Windspeed (m/s)						
Rated	8		9	10		11
Cut-in	3					
Cut-out	25					
Governing						
Survival	40					
Head Weight (kg)	40	60	80	100	230	430
Tower Type	Pulling Tower					
Tower Height (m)	6			8	9	12
Product Life (years)	15 - 20					
Warranty (years)	Wind generator 2 years, parts 1 year					
Units sold						
On the market since	6					
Price	Contact WINDWINGS Wind Turbine Company for current cost information.					
Certificate	Certification: CE & ISO9001					

Shandong Huaye Wind Power Equipment Co., Ltd. (China)

Hongdu Road, Dezhou
Economic Development Zone
Shandong Province, China

www.huayegroup.cc
Tel: +86 534 2556116
Fax: +86 534 2722118
Email: sc@huayekeji.com
Contact: Denny Xue
Email: xuejc@huayekeji.com
Mobile: +86 180 534 05111

华业风能

Model	**GLB-50kW**
Orientation	Upwind
Rated Output	50 kW
Peak Output	
Output Voltage (V)	380+/- 15%
Generator Type	3 Phase, Asynchronous / Permanent magnet
Applications	
Controller Type	PLC intelligent control
Overspeed Protection	Blade brakes; motor brake (fail-safe type); yawing dumping brake
Blade Material	GRP
Number of Blades	3
Rotor Diameter (m)	16,2
Swept Area (m2)	206
Windspeed (m/s)	
Rated	13
Cut-in	3
Cut-out	20
Governing	
Survival	
Head Weight (kg)	3500
Tower Type	Monopole
Tower Height (m)	
Product Life (years)	
Warranty (years)	
Price	Contact company for prices
Certificate	Certificate CE ISO9001:2008 / OHSAS18001 / ISO14001:2004 / TUV ISO12100:2010 / EN 60204-1:2006 + A1:2009 + AC:2011


FDQ2.0-0.3/8


FDQ4.0-2/9


FDQ8.0-10/10

Shanghai Forevoo Windpower Technology Co., Ltd. (China)

Building-8, No.1 East Kangqiao Road,
Kangqiao Industrial Park,
Shanghai, 201319

Tel: +86 021-68190999
Fax: +86 021-38128099
E-mail: sales1@forevoo.com
Contact: Lana Niu

Established 2009

Distribution: Domestic, international
Direct from factory

Model	FDQ2.0-0.3/8	FDQ2.5-0.5/8.5	FDQ3.0-1/9	FDQ4.0-2/9	FDQ5.0-5/10	FDQ8.0-10/10	FDQ10-20/11	FDQ12-30/12	FDQ14-50/13
Orientation	Upwind								
Rated Output	300 W	500 W	1 kW	2 kW	5 kW	10 kW	20 kW	30 kW	50 kW
Peak Output	450 W	650 W	1.3 kW	2.7 kW	5.5 kW	12 kW	25 kW	35 kW	55 kW
Output Voltage (V)	12/24 DC		24/48 DC	48/110DC	220 DC	240/460 DC		460 AC	
Generator Type	Permanent-magnet								
Applications	Stand Alone				Stand Alone, Grid Connection				
Controller Type	Wind-Solar Hybrid				Wind-Solar Hybrid / Off-grid / On-grid				
Overspeed Protection	Mechanical + electric-control								
Blade Material	Fibre Reinforced Plastic (FRP)								
Number of Blades	3, + 10/20								
Rotor Diameter (m)	2	2,5	3	4	5	8	10	12	14
Swept Area (m2)	3,14	4,89	7,06	12,56	19,62	50,24	78,5	113	154
Windspeed (m/s)									
Rated	8	8,5	9		10		11	12	13
Cut-in	2,5				2,5				3
Cut-out									
Governing									
Survival	40								
Head Weight (kg)	31	45	95	173	263	600	1450	2000	2500
Tower Type	Free standing								
Tower Height (m)	9		8		9	12	16 / 18	18 / 20 / 25	20 / 25 / 30
Product Life (yrs)	20								
Warranty (yrs)	2								
Units sold									
On the market since	2008		2009		2010			2011	
Price	Contact Shanghai Forevoo Windpower for current cost information								
Certificate									

FD7.5-10/10


FD13-50/12

Shanghai Ghrepower Green Energy Co., Ltd. (China)

No. 1281 Ronghua Road
Shanghai 201611

www.ghrepower.com
Main Tel: +86-13818696885
Tel: +86-21-37832358
Fax: +86-21-37832356
E-mail: info@ghrepower.com
Contact: Marvin Chin

Distribution: Domestic, international
Direct from factory

GHREPOWER
致远绿色能源

Model	FD3-1/9	FD4-2/9	FD5- 5/10	FD7.5-10/10	FD12- 30/12	FD13-50/12
Orientation	Upwind					
Rated Output	1 kW	2 kW	5 kW	10 kW	30 kW	50 kW
Peak Output	1.25 kW	3 kW	5.8 kW	12.4 kW	35 kW	55 kW
Output Voltage (V)	56	230		230 / 460	460	
Generator Type	3 Phase PMG					
Applications	Stand Alone, Grid Connection					
Controller Type	Dump Load, Over Voltage, Monitoring					
Overspeed Protection	Yaw Regulating, Electromagnetic Brake and Passive Stall					
Blade Material	Fiberglass					
Number of Blades	3					
Rotor Diameter (m)	3	4	5	7,5	12	13
Swept Area (m2)	7	12,6	19,6	44,2	113	132,7
Windspeed (m/s)						
Rated	9		10		11	12
Cut-in	3					
Cut-out	25					
Governing						
Survival	50					
Head Weight (kg)	50	126	167	600	2000	2900
Tower Type	Monopole					
Tower Height (m)	8		9	12	16 / 20	20 / 25
Product Life (years)	15					
Warranty (years)	2					
Units sold						
On the market since	6	12		6	5	
Price						
Certificate	CE					

CXF-300W

CXF-600W

CXF-100W

CXF-3000W

Shenzhen TYPMAR Wind Energy Co., Ltd (China)

6FL Yinshan BLDG,
Huaide, Fuyong Town
beside 107 NR,
518013
Baoan District, Shenzhen, China

www.cntimar.com
Tel: +86 (0)755 33872751
Fax: +86 (0)755 33872752
E-mail: timar@cntimar.com
Contact: Jimmy Lv
Mobil: +86 13480892975
E-mail: jimmy@cntimar.com

Established 2009
Distribution: Direct from factory

Model	CXF300W	CXF600W	CXF1000W	CXF3000W
Orientation				
Rated Output	300 W	600 W	1 kW	3 kW
Peak Output				
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s				
Output Voltage (V)	12V/24V	24V/48V	48V	48V/96V
Generator Type	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Applications	Off/on Grid			
Controller Type	Hybrid	Hybrid	Hybrid	Hybrid
Overspeed Protection	20 m/s	20 m/s	20 m/s	15 m/s
Blade Material	Aluminium	Aluminium	Aluminium	Aluminium
Number of Blades	3	3	3	3
Rotor Diameter (m)	1.24m	1.54m	2.4m	3.6 m / 4.57 m
Swept Area (m2)	0.8	1.36	3.6	10.8/ 12
Windspeed (m/s)	1	1	2	2
Rated	12	15	15	12
Cut-in	1,3	1,3	3	2,5
Cut-out	15m/s	15m/s	15m/s	15m/s
Governing	45m/s	45m/s	45m/s	45m/s
Survival				
Head Weight (kg)	27	49	88	429/929
Tower Type	N/A	N/A	N/A	N/A
Tower Height (m)	5M-12M	3M-8M	3M-5M	3M-5M
Product Life (years)	10	10	10	10
Warranty (years)	2	2	2	2
Units sold	N/A	N/A	N/A	N/A
On the market since	2009	2009	2009	2009
Price				
Certificate	CE	CE	CE	IEC By Intertek

UGE-3M

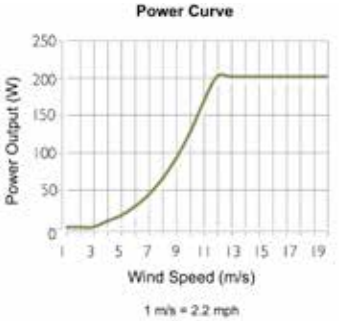
UGE-5M

Urban Green Energy (China)

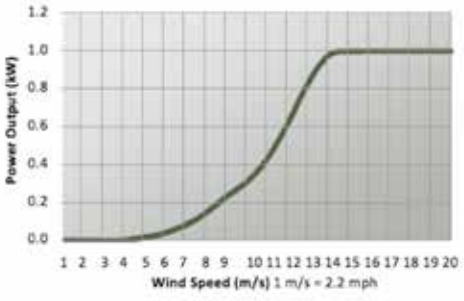
Beijing Urban Green Energy Co.,Ltd
Nobel Center Tower 2,#128,
Southwest 4th Ring Rd, Fengtai, Beijing

www.Ugechina.com
E-mail: info@ugechina,com
Tel: 86 10 83634577; 88495579
Fax: 86 10 88495578

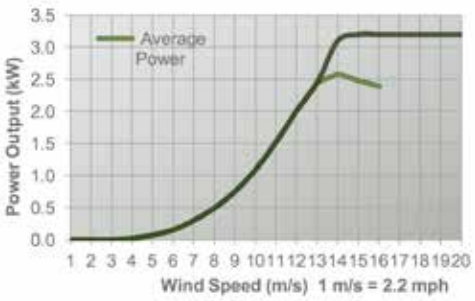
Model	HoYi! (UGE-1M)	VisionAir3 (UGE - 3M)	VisionAir5 (UGE - 5M)
Orientation	Vertical	Vertical	Vertical
Rated Output	200 W	1 kW	3.2 kW
Peak Output		1.2 kW	3.2 kW
Output Voltage (V)	24 Vdc (off grid)	530 V	530 V
Generator Type	3-phase PMG	Brushless 3-phase PMG	
Applications	Grid and off-grid		
Controller Type		5 kW wind controller	20 kW wind controller
Overspeed Protection		Electromagnetic & blade aerodynamic braking	
Blade Material	Fiberglass		
Number of Blades	3	3	3
Rotor Diameter (m)	0.8	1.8	3.2
Swept Area (m2)	0.84	5.76	16.6
Windspeed (m/s)			
Rated	12 m/s	11 m/s	11 m/s
Cut-in	2.5 m/s	3.5 m/s	3.5 m/s
Cut-out	30 m/s	20 m/s	20 m/s
Governing			
Survival	50 m/s	50 m/s	50 m/s
Head Weight (kg)	41 kg	274 kg	756 kg
Tower Type	Self-supporting,tilt-up tower or rooftop mounting etc.		
Height (m)	1.3 m	3.2 m	5.2 m
Product Life (years)	20 years	20 years	20 years
Warranty (years)		3 years	3 years
Units sold			
On the market since			
Price			
Certificate	CE Certified ISO 9001	UL 1004 / CSA C22.2 ISO 9001; CE	UL 1004 / CSA C22.2 IEC 61400-11; IEC 61400-12; ISO 9001; CE



HoYi! (UGE-1M)



VisionAir3 (UGE - 3M)



VisionAir5 (UGE - 5M)

ZH3KW

YUEQING ZONHAN WINDPOWER CO., LTD. (China)

NO.195, Chengxi Road,
Yuecheng, Yueqing, Zhejiang

www.windgenerator.cn
Tel: +86-577-62529820
Fax: +86-577-62529821
E-mail: info@windgenerator.cn

Established: 2006
Distribution: Direct from factory

Model	ZH750W	ZH1.5KW	ZH2KW	ZH3KW	ZH5KW	ZH10KW
Orientation	Upwind					
Rated Output	750 W	1.5 kW	2 kW	3 kW	5 kW	10 kW
Peak Output	900 W	1.8 kW	2.5 kW	3.5 kW	6.5 kW	15 kW
Output Voltage (V)	24VDC			48VDC		120VDC
	Nominal (higher voltage optional)					
Generator Type	Permanent Magnet Alternator					
Applications	Stand Alone, Grid Connection, Direct Heating, Pumping					
Controller Type	PWM Wind/PV hybrid controller					
Overspeed Protection	Auto furl					
Blade Material	Fibre glass reinforced					
Number of Blades	3					
Rotor Diameter (m)	2,7	3,2	3,6	4	6	8
Swept Area (m2)	5,7	8,1	10,2	12,6	28	50,24
Windspeed (m/s)						
Rated	9			10		11
Cut-in	2,5		3			
Cut-out	35					
Governing	None					
Survival	50					
Head Weight (kg)	65	78	88	105	327	980
Tower Type	Guy wires				Guy wires / free standing	
Tower Height (m)	6		9		12	15
Product Life (years)	15					
Warranty (years)	2					
Units sold						
On the market since						
Price	$ 550	$ 750	$ 950	$ 1 350	$ 3 900	$ 7 800
	Prices for turbine incl.; nose cone, blades, hub, generator, rotor, tail rod					
Certificate						

KVA Diesel A/S
(Denmark)

Borrisvej 10, Astrup
DK-6900 Skjern

www.KVA-Diesel.dk
Tel: +45 9736 4111
Fax: +45 9736 4013
E-mail: info@kva-diesel.dk

Established: 1983
Distribution: Domestic and direct from supplier

Model	**KVA Vind 6-10**
Orientation	Upwind
Rated Output	10 kW
Peak Output	6.6 kW
Output Voltage (V)	3 x 400 volt AC/ 50
Generator Type	Permanent Magnet Generator
Applications	Grid Connection
Controller Type	Microcontroller
Overspeed Protection	Automatic weight-based pitch regulation
Blade Material	Reinforced fiberglass
Number of Blades	3
Rotor Diameter (m)	7.1
Swept Area (m2)	39.6
Windspeed (m/s)	
Rated	9
Cut-in	2.5
Cut-out	25
Governing	Pitch regulating between 3-12 m/s
Survival	60
Head Weight (kg)	450
Tower Type	Polygonal monopole, galvanized
Tower Height (m)	18 / 20.5
Product Life (years)	15
Warranty (years)	2
Units sold	138
On the market since	5
Price	Check website for an updated price list
Certificate	

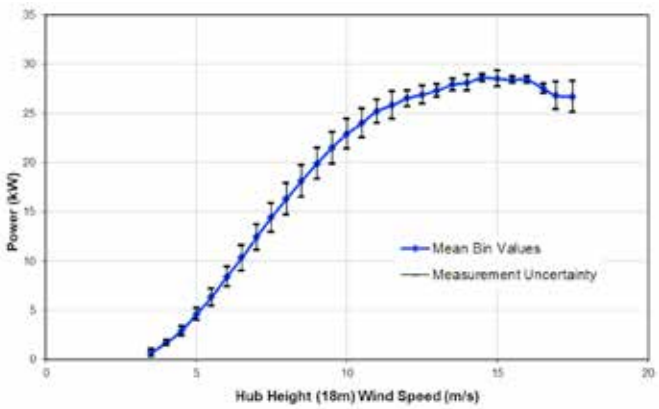
Solid Wind Power
(Denmark)

Frejasvej 4
DK-6950 Ringkøbing, Denmark

www.solidwindpower.com
Tel: +45 9732 3322
Fax: +45 9732 0978
E-mail: mail@solidwindpower.com
Contact: Morten S. Kristiansen

Established 2013
Distribution: Domestic, international
Direct from factory

Model	**SWP – 25 -14TG20**
Orientation	Horizontal axis with upwind rotor
Rated Output	24.5 kW
Peak Output	28.6 kW
Output Voltage (V)	230 V
Generator Type	Asynchronous induction
Applications	Grid Connection
Controller Type	Orbital A/S TMC3
Overspeed Protection	Stall/ Tip Brakes, Electromagnetic fail-safe braking
Blade Material	Fiberglass
Number of Blades	3
Rotor Diameter (m)	14
Swept Area (m2)	154
Windspeed (m/s)	
Rated	12,5
Cut-in	3
Cut-out	25
Governing	
Survival	
Head Weight (kg)	1929 (Nacelle + Rotor)
Tower Type	Tubular Steel Tower
Tower Height (m)	18m, total height 25m
Product Life (years)	20
Warranty (years)	
Units sold	Total 301 units; of this 10 kW 211 units; 25 kW 90 units.
On the market since	2013
Price	Contact Solid Wind Power for more Information
Certificate	ISO/IEC 17025



THY WindPower (Denmark)

Oddesundvej 183
Visby
7755 Bedsted

www.thymoellen.dk
Tel: +45 53574088
E-mail: lp@thyml.dk
Contact: Leif Pinholt

Established 1986
Distribution: Domestic, Direct from factory

THYmøllen

Model	TWP 40 - 6 kW	TWP 40-10 kW
Orientation	Upwind	Upwind
Rated Output	6 kW	10 kW
Peak Output	6.6 kW	11 kW
Output Voltage (V)	3 x 400	3 x 400
Generator Type	Asynchronous	Asyncronous
Applications	Grid Connection	Grid Connection
Controller Type	PLC	PLC
Overspeed Protection	Blade tip brakes	Blade tip brakes
Blade Material	Wood / Glassfiber	Glassfiber
Number of Blades	3	3
Rotor Diameter (m)	7,13	7,13
Swept Area (m2)	40	40
Windspeed (m/s)		
Rated	10 m/sec.	10 m/sec
Cut-in	3,5	3,5
Cut-out	25	25
Governing		
Survival	plus 60 m/sec	plus 60 m/sec.
Head Weight (kg)	900	1000
Tower Type	Lattice and tubular	Lattice and tubular
Tower Height (m)	21 m	21 m
Product Life (years)	25 to 30	25 to 30
Warranty (years)	2	2
Units sold	207	200
On the market since	6	3
Price	Contact THY WindPower	
Certificate		

Viking Wind (Denmark) (former HS Wind)

Viking Wind
Holger Danskes Vej 23 D
DK-8960 Randers SØ

www.Viking-wind.energy
Tel. +45 43 33 56 92
E-mail: info@viking-wind.energy

Established: 2009/2016
Distribution: Domestic, international
Direct from factory

Model	**Viking VS**
Orientation	Upwind
Rated Output	25 kW (adjustable to 10 kW, 20 kW or 25 kW)
Peak Output	28 kW
Yearly Production (kWh/y) at 3.5/5.5/6.5 m/s	31 000 / 56 000 / 76 500
Output Voltage (V)	3 x 400V + N
Generator Type	Asynchronous / VEM Motors GmbH
Applications	Grid Connection
Controller Type	
Overspeed Protection	Stall with tip brake
Blade Material	GRP
Number of Blades	3
Rotor Diameter (m)	13
Swept Area (m2)	133
Windspeed (m/s)	
Rated	13 m/s
Cut-in	3 m/s
Cut-out	25 m/s
Governing	
Survival	No limit
Head Weight (kg)	1300
Tower Type	Tubular/guyed
Tower Height (m)	18
Product Life (years)	20-25
Warranty (years)	2 years reinsurance warranty on all components
Units sold	51
On the market since	
Price	Contact company for current cost information
Certificate	Type approval according to IEC 61400-2 standard

Eclectic Energy Ltd
(England)

Unit 22 Sherwood Networkcentre
Sherwood Energy Village
Ollerton, Nottinghamshire, NG22 9FD

www.eclectic-energy.com
www.duogen.co.uk
Tel: +44 (0) 1623 835400
Fax: +44 (0) 1623 860617
E-mail: sales@eclectic-energy.com
Contact: Peter Anderson

Established 1999
Distribution: Domestic, international
Direct from factory

Model	D400	StealthGen
Orientation	Upwind	
Rated Output	400 W	400 W
Peak Output	>600 W	>600 W
Output Voltage (V)	12, 24, 48 DC	150 DC
Generator Type	3 phase, direct drive, PMG	
Applications	Stand Alone	Stand Alone, Grid Connection
Controller Type	Independent	
Overspeed Protection	Stall Regulation	
Blade Material	Glass-filled Polyamid	
Number of Blades	5	
Rotor Diameter (m)	1,1	
Swept Area (m^2)	0,95	
Windspeed (m/s)		
Rated	14	
Cut-in	2.6	
Cut-out	none	
Governing		
Survival		
Head Weight (kg)	17,2	
Tower Type	50 - 75mm monopole	
Tower Height (m)	Variable	
Product Life (years)		
Warranty (years)	2	
Units sold	3400	170
On the market since	8	5
Price	£1 225	£1 225 £2 372.42 (including VAT) for grid linked system includes; turbine, wall mount bracket, controller and G83 grid tie inverter.
Certificate		

R9000

H15 Class IV

H15 Class IV

Ecotricity Group (England)

Unicorn House,
7 Russell Street, Stroud
Gloucestershire GL5 3AX

www.britwind.co.uk
Tel: +44-(0)1453-590210
Email: enquiries@britwind.co.uk

Established 1995

Distribution: Domestic, International & Direct from factory

Model	R9000	H15 Class IV	H15 Class II
Orientation	Upwind	Upwind	Upwind
Rated Output	5kW	11kW	15kW
Peak Output	5.1kW	15kW (1 sec avg)	20kW (1 sec avg)
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s	6,980 (4.5 m/s) 11,400 (5.5 m/s) 15,800 (6.5 m/s)	30,300 (4.5 m/s) 41,800 (5.5 m/s) 50,890 (6.5 m/s)	21,830 (4.5 m/s) 35,525 (5.5 m/s) 48,930 (6.5 m/s)
Output Voltage (V)	Grid connected via inverters		
Generator Type	Direct drive PMG		
Applications	Grid connect, Direct Heating, Stand Alone		
Controller Type	Reactive Pitch™ Control	Stall Regulated	Stall Regulated
Overspeed Protection	Mircoprocessor controlled ElectroBrake™	Microprocessor controlled electrical brake and aerodynamic brake	Microprocessor controlled electrical brake and aerodynamic brake
Blade Material	GRP Composite		
Number of Blades	Three		
Rotor Diameter (m)	5.5 m	13.1 m	10.4 m
Swept Area (m2)	23.75	135	85
Windspeed (m/s)			
Rated	12	10	12
Cut-in	3.0	2.5	3.5
Cut-out	None	15	20.5
Governing	12	-	-
Survival	60	42	60
Head Weight (kg)	325	1500	1450
Tower Type	Free-standing RAM-tilt		
Tower Height (m)	10, 12, 15, 18 m	18 m	14.5, 23 m
Product Life (years)	20 years	20 years	20 years
Warranty (years)	5 years	5 years	5 years
Units sold	>2000	New product	New product
On the market since	2004	2016	2016
Price	Contact local Distributor or Britwind direct		
Certificate	MCS certification (MCS006 Issue 1.5) ClassNK Japan	MCS certification expected May 2016 (MCS006 Issue 2.1 – this is the new MCS standard based on IEC 61400-2 ed3)	MCS certification expected May 2016 (MCS006 Issue 2.1 – this is the new MCS standard based on IEC 61400-2 ed3)

FuturEnergy Ltd
(England)

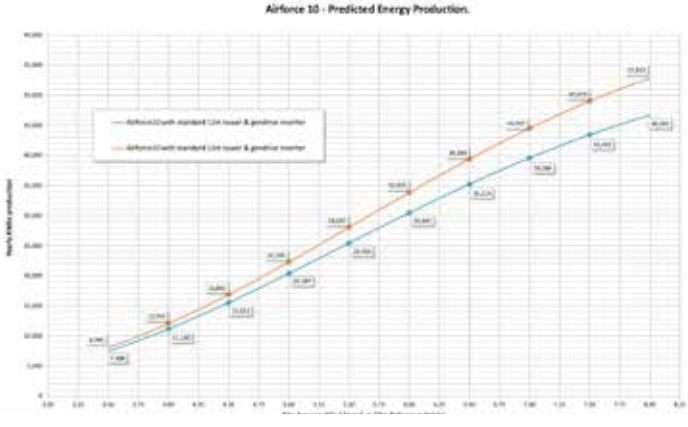
12 Ettington Park
Business Centre,
Stratford upon Avon,
Warwickshire, CV37 8BT

www.futurenergy.co.uk
Tel: +44 (0) 1789 450280
E-mail: info@futurenergy.co.uk

Distribution: Domestic, international
Direct from factory

FUTURENERGY

Model	Airforce1	Airforce10
Orientation	Upwind	Upwind
Rated Output	1 kW (600W / 12V version)	10 kW @ 10.5 m/s
Peak Output	1 kW (48V) 1.132 kW	13 kW
Output Voltage (V)	12, 24, 48 DC	3 phase / Single Phase / Split phase
Generator Type	3 phase PMG	Direct drive PMG
Applications	Grid Connection, Battery Charging & Water Heating	Grid Connection or Battery Charging
Controller Type		PLC
Overspeed Protection	Automatic Stop via FuturEnergy interface	Failsafe hydraulic brake (SIL 3 - safety standards)
Blade Material	Glass filled polyamid	Glass / epoxy
Number of Blades	3	3
Rotor Diameter (m)	1.8	8
Swept Area (m^2)	2.54	50,27
Windspeed (m/s)		
Rated	12.5	10,5
Cut-in	3.2	3,5
Cut-out	14	20
Governing	Automatic Stop via FuturEnergy interface	Governing braking / controlled slew / hydraulic braking
Survival	50	52,5
Head Weight (kg)	18	300
Tower Type	Tilt-down guyed pole	Tilting galvanised steel tube
Tower Height (m)	8	12 or 15
Product Life (years)	20	20
Warranty (years)	2	5 (TBA)
Units sold	5000 +	
On the market since	8	
Price	Grid Solution: £2,499 Battery Solution: £1,416 Water Heating Solution: £1,249.00	
Certificate		



LE-450

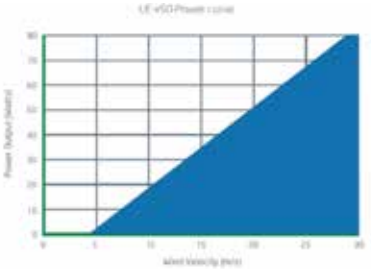
Leading Edge Turbines (England)

Skyrrid Farm, Pontrilas
Hereford

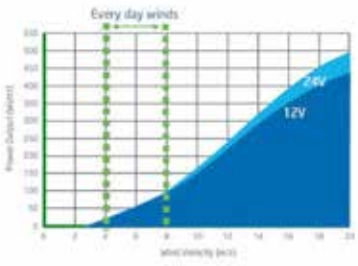
www.leturbines.com
Tel: +44 (0) 845 652 0396
E-mail: dave.samuel@leturbines.com
Contact: Dave Samuel

Established: 2009
Distribution: Domestic, international
Direct from factory

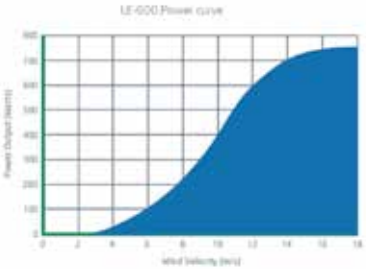
Model	LE-v50	LE-v150	LE-300	LE-450	LE-600
Orientation	Vertical	Vertical	Upwind Horizontal		Downwind Horizontal
Rated Output	12 W	28 W	85 W		160 W
Peak Output	70 W	200 W	300 W	450 W	700 W
Output Voltage (V)	12 or 24	12, 24 or 48	12, 24, 48, Grid-tie		
Generator Type	PMG				
Applications	Stand Alone, Grid Connection			Off-grid	Stand Alone, Grid Connection
Controller Type	Battery charge controller				
Overspeed Protection	no need				No need
Blade Material	Aluminium		Glass reinforced polyamid	Glass Reinforced, UV resistant Nylon	Glass reinforced polyamid
Number of Blades	3	3	3	5	3
Rotor Diameter (m)	0,456	0,918	1	1	1,54
Swept Area (m^2)	0,13	0,25	0,78	0,785	1,86
Windspeed (m/s)					
Rated	8	8	8	8	8
Cut-in	4	4	3	3	3
Cut-out	varies			none	varies
Governing	-				
Survival	45				
Head Weight (kg)	9	13	6		19,5
Tower Type	Mount on pole	Mount on pole	Guyed tower		Guyed tower
Tower Height (m)			3		3
Product Life (years)	20				
Warranty (years)	2	2	5	2	2
Units sold	230	50	850		45
On the market since	3	1st year	7		2
Price	£499 (turbine only)	£699	£460 (turbine only)	£899.95	£830
Certificate					



LE-v50



LE-450



LE-600

Rutland 504, 913, FM 910-3

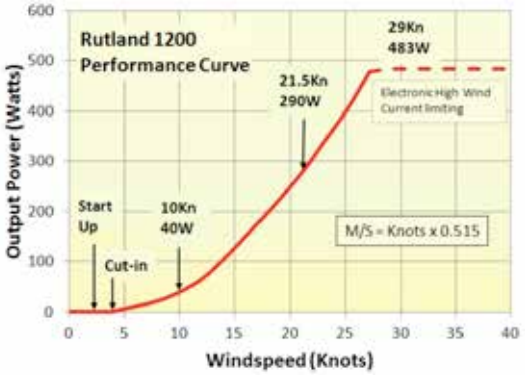
Marlec Engineering (England)

Rutland House, Trevithick Rd
Corby Northants, NN17 5XY

www.marlec.co.uk
Tel: +44 (0) 1536 201588
Fax: +44 (0) 1536 400211
E-mail: sales@marlec.co.uk
Contact: Angela Lovell

Established: 1981
Distribution: Domestic, international
Direct from factory

Model	Rutland 1200	Rutland 504	Rutland 913	Rutland FM 910-3	Rutland 914i	Rutland FM 1803
Orientation		Upwind				
Rated Output	500 W	25 W	90 W	90 W	140 W	340 W
Peak Output		60 W	250 W	200 W		750 W
Output Voltage (V)	12, 24 DC	12 DC	12 or 24 DC			
Generator Type	Low friction 3 phase rare earth magnets, brushless	PMG				
Applications	Stand Alone					
Controller Type		HRS503 /HRSi / HRDi	HRSi / HRDi			MPC1
Overspeed Protection		Side-furling			Electronic	Side-furling
Blade Material	Glass Reinforced Polyamid Injection Moulding					Glass fiber
Number of Blades		6 (with diffuser ring)	6			3
Rotor Diameter (m)	1.22	0.51	0.91			1.8
Swept Area (m²)	0.62	0.20	0.65			2.54
Windspeed (m/s)						
Rated		10			11	10
Cut-in	2.5					
Governing				15		
Head Weight (kg)		3,5	10,5	14	11	38.5
Tower Type	Tower selection depends on application, options include; guyed or freestanding and pole mounting for on land. Separate marine mounting kits also available.					
Tower Height (m)		2m on boat	2.4m on boat			>6m
Product Life (years)		5-7 typical	5-10 typical		5-10 exptd.	10 typical
Warranty (years)	2	1				
Units sold		>5000	>20000	>10000	new	>2000 all 1803
On the market since	1	16	21	29	4	14
Price	£1,195.00	£345,00	£550,00	£656,00	£630	£1 796
Certificate		ISO9001				



VWT Power Ltd trading as Quiet Revolution (England)

11 Edison Road
St Ives
Cambridgeshire PE27 3LF

www.quietrevolution.com
vwtpower.com
Tel: +44(0)1480 277360
E-mail: info@vwtpower.com

VWT Power

Model	**Qr6**
Orientation	VAWT
Rated Output	4.2 kW
Peak Output	7.4 kW
Output Voltage (V)	
Generator Type	Direct-drive permanent magnet synchronous generator integrated into the base of the rotor
Applications	Grid Connection
Controller Type	Peak power tracking constantly optimises turbine output for all sites and wind speeds
Overspeed Protection	Overspeed braking above 14m/s wind speed, auto shutdown in high wind speeds (above 25m/s)
Blade Material	Carbon fibre and epoxy resin blades and connection arms
Number of Blades	3
Rotor Diameter (m)	3.1
Swept Area (m^2)	5.3
Windspeed (m/s)	16
Rated	AMWS 5.0
Cut-in	11
Cut-out	4.5
Governing	25
Survival	
Head Weight (kg)	52.5 m/s
Tower Type	550
Tower Height (m)	Turbines are building/roof mounted on 6m tilt down masts, or ground mounted on 15m or 18m tilt down mast
Product Life (years)	25 years (annual inspections recommended)
Warranty (years)	Two years on components
Units sold	
On the market since	
Price	Contact quietrevolution for current cost information
Certificate	

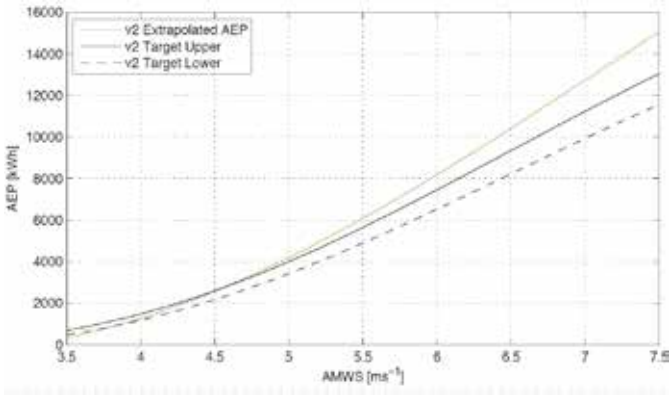


Figure 11. The extrapolated AEP forecast for v2 according to the IEC method, compared to the v2 "upper" and "lower" targets. The turbine beat the upper target from an AMWS of 4.55 m/s onwards.

my!WIND Ltd
(Estonia)

Soola 1a
51013 Tartu

www.mywind.ee
Tel: +372 53 49 1171
Fax: +372 62 21 866
E-mail: info@mywind.ee
Contact: Jana Morozov

Established: in 2011
Distribution: Domestic and International

Model	**my!WIND 5**
Orientation	Downwind
Rated Output	5 kW
Peak Output	5 kW
Output Voltage (V)	240 AC through inverter (not included)
Generator Type	High torque multi-pole Synchronous Permanent Magnet
Applications	Stand Alone (battery charging), Grid Connection, Direct Heating
Controller Type	via CPU controlled power converter (e.g. SMA WindyBoy)
Overspeed Protection	Mechanical pitch
Blade Material	Fiberglass
Number of Blades	3
Rotor Diameter (m)	6
Swept Area (m2)	28,3
Windspeed (m/s)	
Rated	11
Cut-in	2,5
Cut-out	none
Governing	n/a
Survival	59,5
Head Weight (kg)	200
Tower Type	Guy-wired mast, optionally free standing monopole
Tower Height (m)	10 (20 available)
Product Life (years)	20
Warranty (years)	2
Units sold	
On the market since	2012
Price	Target price starting from 5 000 € (turbine excl. power converter)
Certificate	Wind class II (according to IEC 61400-2)

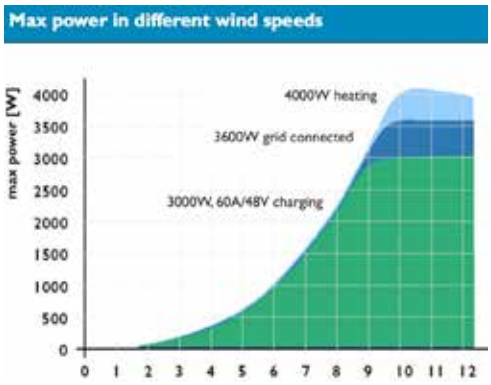
Finnwind Oy
(Finland)

Koiranojanrinne 4A
33880 Lempäälä, Finland

www.finnwind.fi
Tel: +33 5845 6502156
E-mail: matti.kantonen@finnwind.fi
Contact: Matti Kantonen

Established: 1993
Distribution: Domestic, international
Direct from factory

Model	**Tuule 200**
Orientation	Upwind
Rated Output	3.6 kW Grid Connected, 4 kW Direct Heating and Stand Alone
Peak Output	4 kW Direct Heating and Stand Alone
Output Voltage (V)	Generator Nominal Voltage: 0 - 400 V AC
Generator Type	3 phase PMG
Applications	Stand Alone. Max Charging power 3 kW, excess power for heating, Grid Connected, Direct Heating, Pumping.
Controller Type	
Overspeed Protection	Auto furling
Blade Material	Composite
Number of Blades	3
Rotor Diameter (m)	5
Swept Area (m2)	19,6
Windspeed (m/s)	
Rated	10 m/s
Cut-in	Stand Alone and Direct Heating approx 2 m/s, Grid Connected 2.5 m/s
Cut-out	none
Governing	6 m/s
Survival	50 m/s
Head Weight (kg)	140
Tower Type	Guyed monopole
Tower Height (m)	18
Product Life (years)	20
Warranty (years)	5
Units sold	> 40
On the market since	8
Price	Price: 11 077 € (order quantity 5 pcs), 11 786 € (order quantity 2 pcs), 12 854 € (order quantity 1 pc). Price includes either Tuule 200 with 3,6 kW grid inverter and 18 m guyed mast with groundings or Tuule 200 with 800 W charging power (excess for heating) and 18 m guyed mast with groundings
Certificate	



Oy Windside Production (Finland)

Keskitie 4
FI-44500 Viitasaari, Finland

www.windside.com
Tel: +358-208-350 700
Fax: +358-208-350 701
E-mail: finland@windside.com

Established: 1982
Distribution: Domestic, international
Direct from factory

Model	WS-0,15 (B, Bplus)	WS-0,30 (A, B, Bplus)	WS-2 (A,B city)	WS-4 (A, B)	WS-12
Orientation	VAWT				
Rated Output	135 W (9A/12V)		500 W (20A/12V)	1 kW (30A/12V)	20 kW
Peak Output					
Output Voltage (V)	12, 24, 48 DC / 1-400 AC				
Generator Type	PMG				
Applications	Stand Alone				Stand Alone, Direct Heating, Pumping
Controller Type	Windside WGU-22		Windside	Windside	Customised
Overspeed Protection	None required				
Blade Material	Fiber Glass				Aluminium
Number of Blades					
Rotor Diameter (m)	0.3	0.3	1	1	2
Swept Area (m2)	0.5	1	2	4	6
Windspeed (m/s)	0.15	0.3	2	4	12
Rated	20				30
Cut-in	3.8	2.8 (3 for A)	2	1.5 (1.9 for A)	1
Cut-out	none				
Governing					
Survival	60 for A, 50 for Bplus, 40 for B				
Head Weight (kg)	42	45	120-1000 kg	800-1000 kg	3500
	These weights differ between specific models (A, Bplus or B)				
Tower Type	Wood / Metal			Metal	
Tower Height (m)	10 minimum				
Product Life (years)	50 plus				
Warranty (years)	2 standard - 10 years warranty available				
Units sold	Specific breakdown of units by model not available but overall sales are in the thousands.				
On the market since	Since 1982				
Price	Contact Windside for current cost information				
Certificate					

AC-120

AC-240

AC-752

AC-1002

AeroCraft
(Germany)

Gödecke Energie- und Antriebstechnik GmbH
Am Bahnhof 12
27356 Rotenburg/W.

www.aerocraft.de
Tel: +49 (4261) 9439-0
Fax: +49 (4261) 9439-19
E-mail: info@aerocraft.de

Established 1995
Distribution: Domestic, international
Direct from factory

Model	AC-120	AC-240	AC-752	AC-1002
Orientation	Upwind			
Rated Output	120 W	240 W	750 W	1 kW
Peak Output				
Output Voltage (V)	12, 24 V DC		24, 48 V DC	230
Generator Type	18 pole PMG		16 pole PMG	
Applications	Off Grid			Heating, On Grid
Controller Type				
Overspeed Protection	Upward furling		Eclipse control	
Blade Material	GPR			
Number of Blades	5	3		
Rotor Diameter (m)	1.2	1.65	2.4	
Swept Area (m2)	1.13	2.14	4.52	
Windspeed (m/s)				
Rated	9			
Cut-in	3			
Cut-out	25			
Governing	15			
Survival	60		40	
Head Weight (kg)	17	19	43	45
Tower Type				
Tower Height (m)	7 to 12 expandable in 1.75m steps			
Product Life (years)				
Warranty (years)				
Units sold				
On the market since				
Price	Contact AeroCraft for detailed price information.			
Certificate				

ANTARIS 2.5 kW

ANTARIS 9.5 kW

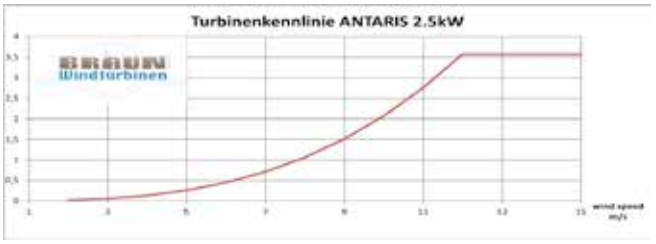
BRAUN Windturbinen (Germany)

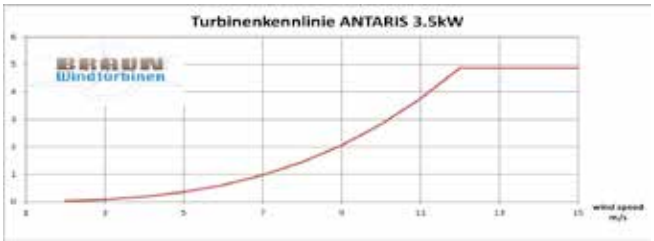
Südstraße 19
D-57583 Nauroth

www.Braun-Windturbinen.com
Tel: +49 2747-930585
Fax: +49 2747 914053
E-mail: info@braun-windturbinen.com
Contact: Rüdiger Braun

Established: 1993
Distribution: Domestic, international
Direct from factory

Model	ANTARIS 2.5 kW	ANTARIS 3.5 kW	ANTARIS 6.5 kW	ANTARIS 9.5 kW
Orientation	Upwind			
Rated Output	2.5 kW	3.6 kW	6.5 kW	9.5 kW
Peak Output	4 kW	7 kW	11.5 kW	20.0 kW
Output Voltage (V)	350 VAC or 48 VDC for battery charging			
Generator Type	PMG Protection class IP56, Winding 180°, Magnets 150°			
Applications	Stand Alone, Grid Connection	Stand Alone, Grid Conn. Direct Heating	Stand Alone, Grid Connection, Direct Heating, Pumping	
Controller Type	Internal development	Internal development, electronic overvoltage protection with dump load 3.5 - 20.0 kW		
Overspeed Protection	Helicopter position			
Blade Material	Carbon / Glassfiber			
Number of Blades	3			
Rotor Diameter (m)	3,0 m	3,5 m	5,3 m	6,5 m
Swept Area (m2)	7,06	9,61	22	33,1
Windspeed (m/s)				
Rated	11			
Cut-in	2,5	2,8	3	2,8
Cut-out	13			
Governing				
Survival	> 58			
Head Weight (kg)	85	105	230	450
Tower Type	Pole or lattice tower			
Tower Height (m)	10 - 15	12 - 18	15 - 30	15 – 30
Product Life (years)	over 20			
Warranty (years)	2			
Units sold	200	430	480	35
On the market since	20	9	5	2
Price	Please contact Braun Windturbinen for pricing details			
Certificate				





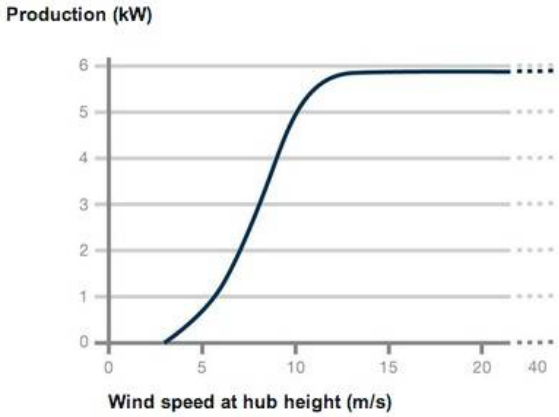
EasyWind GmbH
(Germany)

Lecker Str. 7
25917 Enge-Sande

www.easywind.org
Tel: +49 (0)4662 - 88 431 0
Fax: +49 (0)4662 - 88 431 99
E-mail: mailto@easywind.org

Distribution: International

Model	EasyWind 6 AC	EasyWind 6 DC
Orientation	Upwind	
Rated Output	6 kW	7.5 kW
Peak Output	6 kW	7.5 kW
Output Voltage (V)	400 VAC, 3-phase, 50 Hz	48, 120 or 240 VDC
Generator Type	Asynchronous (pole-changeable)	Asynchronous
Applications	Grid Connection	Stand Alone
Controller Type	AC-Box	DC-Box
Overspeed Protection	Passive Pitch	
Blade Material	Steel / Fiber-glass composite structure	
Number of Blades	4	
Rotor Diameter (m)	6	
Swept Area (m2)	28.27	
Windspeed (m/s)		
Rated	11,5	11.5
Cut-in	3	
Cut-out	none	
Governing	disc brake system, pitch regulator	
Survival	70	
Head Weight (kg)	363	
Tower Type	Guy-wired tower/ Hydraulic Pole	
Tower Height (m)	7, 13 or 19	
Product Life (years)	20	
Warranty (years)	2	
Units sold	> 300	
On the market since		
Price	Contact EasyWind for current price information	
Certificate	IEC 61400-2 SWT Class 1	



FuSystems SkyWind (Germany)

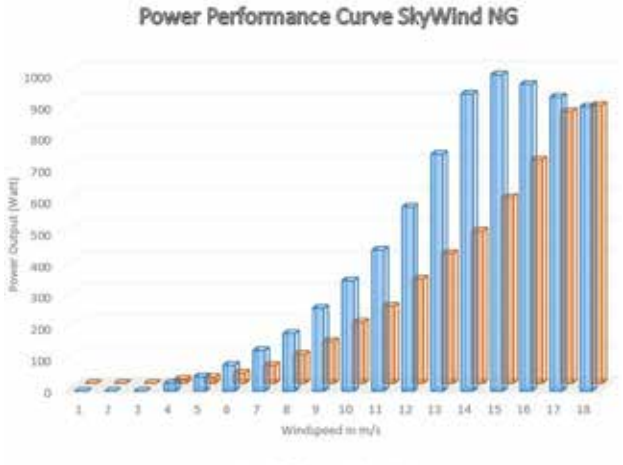
Bayernstrasse 3
30855 Langenhagen, Germany

www.fusystems.com
Tel: +49 30 5268495290
Fax: +49 30 5268495299
E-mail: inquiries@fusystems.com
Contact: Fritz Unger

Established 2009
Distribution: Domestic, international
Direct from factory

FuSystems SkyWind
Next Generation Windpower

Model	SkyWind NG (Standard Edtition)	SkyWind NG (Edition EX)
Orientation		
Rated Output	1 kW	1 kW
Peak Output		
Output Voltage (V)	15-79 V with grid inverter (110 / 230 V, 50 - 60 Hz) or battery inverters	
Generator Type	Generator RAL 7016	
Applications	Rooftop	
Controller Type		
Overspeed Protection		
Blade Material	Aircraft grade aluminum	Stainless steel
Number of Blades	2	
Rotor Diameter (m)	1,5	
Swept Area (m2)	1,8	
Windspeed (m/s)		
Rated	14	
Cut-in	4	
Cut-out	5,5	
Governing		
Survival		
Head Weight (kg)		
Tower Type		
Tower Height (m)	1,5	
Product Life (years)		
Warranty (years)		
On the market since		
Price	Minimum order quantity: 5 Price: Beginning @ 1.973,95 €/Pc.	Minimum order quantity: 10 Price: Beginning @ 2.226,05 €/Pc.
Certificate		



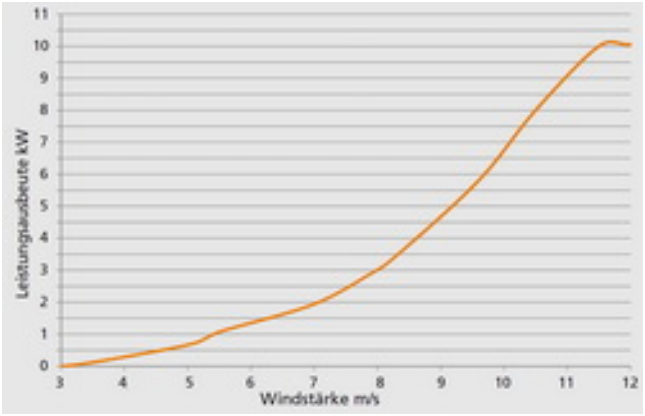
KESSLER Energy
(Germany)

Franz-Kessler-Str. 2
D-88422 Bad Buchau

www.kessler-energy.de
Tel: +49 7582 809 0
Fax: +49 7582 809 170
E-mail: energy@ranz-kessler.de

Distribution: Domestic, International
Direct from factory

Model	**Kessler SpinWind**
Orientation	Vertical
Rated Output	10 kW
Peak Output	15 A
Output Voltage (V)	
Generator Type	Permanent Magnet Generator
Applications	Grid Connection
Controller Type	Grid Inverter
Overspeed Protection	Frequency Convertor
Blade Material	Aluminium
Number of Blades	3
Rotor Diameter (m)	4,7
Swept Area (m2)	39,9
Windspeed (m/s)	
Rated	16
Cut-in	3,5
Cut-out	
Governing	
Survival	
Head Weight (kg)	500
Tower Type	Tubular Tower
Tower Height (m)	14,15
Product Life (years)	
Warranty (years)	
Units sold	
On the market since	
Price	Contact Kessler Energy for more Information
Certificate	



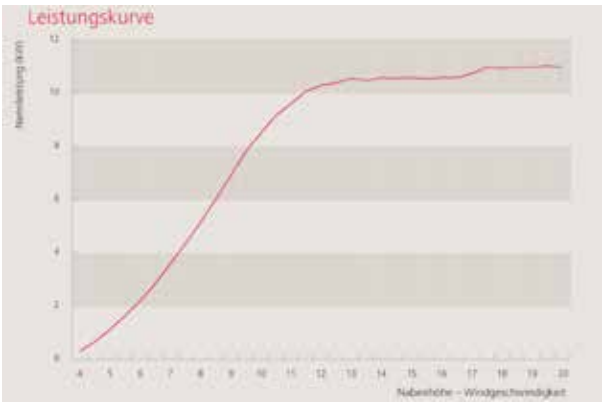
Lely Aircon B. V.
(Germany)

Am Emsdeich 7
26789 Leer, Germany

www.lely.com/energie
Tel: +49 4914 54100
Fax: +49 4914 541026
E-mail: energy@lely.com
Mr. Hackmann

Established 2004
Distribution: Domestic, international
Direct from factory

Model	Lely Aircon 10	Lely Aircon 30
Orientation	Upwind	Upwind
Rated Output	9.8 kW	29.8 kW
Peak Output		
Output Voltage (V)	400	400
Generator Type	Synchronous PMG	Synchronous PMG
Applications	Grid Connection, Direct Heating	Grid Connection
Controller Type	Digital	Digital
Overspeed Protection	Active Stall	Active Stall
Blade Material	GRP	GRP
Number of Blades	3	3
Rotor Diameter (m)	7,5 / 8,5 m	13,12 m
Swept Area (m2)	39.9	135,1
Windspeed (m/s)		
Rated	11	12
Cut-in	3.5	3.5
Cut-out	25	25
Governing		
Survival	52	52
Head Weight (kg)	650	1800
Tower Type	Lattice / Tubular	Lattice / Tubular
Tower Height (m)	10.00 - 30.00	18.00 - 42.00
Product Life (years)	>20	>20
Warranty (years)	2	2
Units sold	200	
On the market since	12	35
Price	On inquiry	On inquiry
Certificate	MCS, EN50438 grid connection certificate	MCS in approval phase, VDE AR-N4105 grid connection certificate



AIRCON 10

AIRCON 30

EN-Drive 2000.2/10-M
(7.1m motor)

EN-Drive 2000.2/15-L
(8.5m motor)

PSW Energiesysteme (Germany)

Fischerstrasse 93,
D-29227 Celle

www.psw-energiesysteme.com
Tel: +49 5141 48705-15
Fax: +49 5141 48705-50
E-mail: info@psw-energiesysteme.com
Contact: Mr. M. Huskic

Established 2007
Distribution: Domestic, international
Direct from factory

Model	EN-Drive®2000.2/5	EN-Drive® 2000.2/10	EN-Drive® 2000.2/15
Orientation	HAWT, Upwind		
Rated Output	4.6 kW	10 kW	14.5 kW
Peak Output	5.5 kW	15 kW	20 kW
Output Voltage (V)	230 V AC	230 / 400 V AC	
Generator Type	PMG		
Applications	Stand Alone, Grid Connection, Direct Heating, Pumping		
Controller Type	Micro-processor controller		
Overspeed Protection	Active yaw-control / Disc brake		
Blade Material	Aluminium		
Number of Blades	3		
Rotor Diameter (m)	5.2 / 7.1 / 8.5	7.1 / 8.5	7.1 / 8.5
Swept Area (m2)	21.2 / 39.6 / 56.7	39.6 / 56.7	39.6 / 56.7
Windspeed (m/s)			
Rated	8.8 - 10.3	10.4 - 11.3	10.9 - 11.8
Cut-in	1.8 - 2.4	2.1 - 2.3	2.2 - 2.4
Cut-out	18 – 20		
Governing			
Survival	51		
Head Weight (kg)	150 – 180		
Tower Type	Tubular steel tower, free-standing		
Tower Height (m)	7.3 - 19 (S/M/L-Version)		
Product Life (years)	>15		
Warranty (years)	2		
Units sold	10	28	19
On the market since			
Price	Price on request		
Certificate			

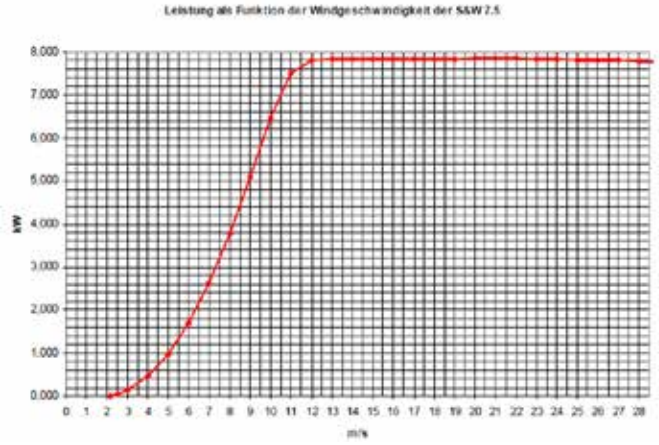
S&W Energiesysteme (Germany)

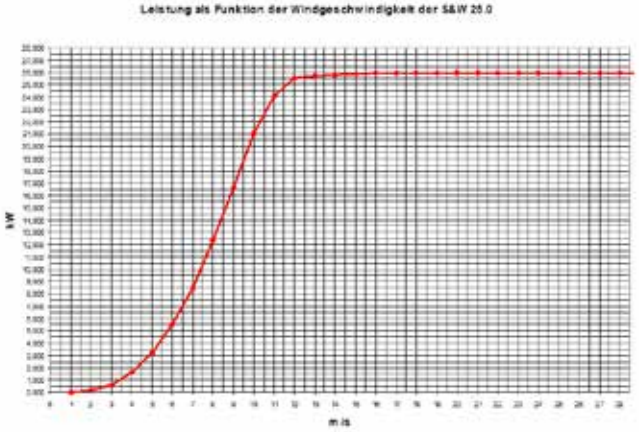
Martha-Eberhard-Straße 2
37269 Eschwege

www.s-und-w-energie.de
Tel: +49 5651 76381
E-mail: info@s-und-w-energie.de
Contact: Wolfgang Hahn

Established 2004
Distribution: Direct from factory

Model	S&W 7.5	S&W 25.0
Orientation	Upwind	
Rated Output	7.5 kW	25 kW
Peak Output	7.6 kW	25 kW
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s		
Output Voltage (V)	400V AC	
Generator Type	Asynchronous	
Applications	Stand Alone, Grid Connection, Direct Heating	
Controller Type		
Overspeed Protection	Torque-Control	
Blade Material	CRP	GFK
Number of Blades	3	
Rotor Diameter (m)	5,5	11,18
Swept Area (m2)	23,75	62,2
Windspeed (m/s)		
Rated	11,3	11,6
Cut-in	2,5	2,2
Cut-out	36	
Governing	11,5	
Survival	55	
Head Weight (kg)	250	950
Tower Type	Guyed Monopole	
Tower Height (m)	22	24,4
Product Life (years)	20	
Warranty (years)	5	
Units sold		
On the market since	5	
Price		
Certificate		





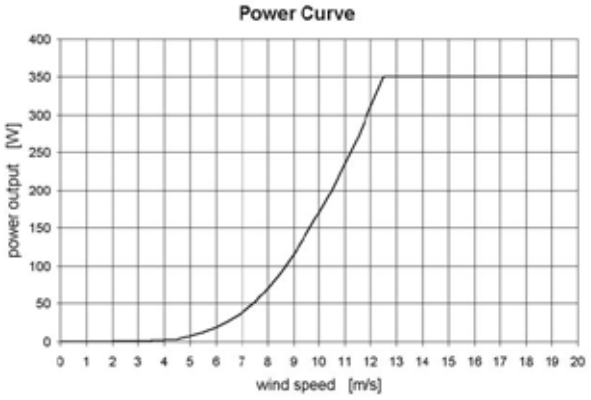
Superwind GmbH
(Germany)

Am Rankewerk 2-4
D-50321 Brühl

www.superwind.com
Tel: +49-2232-577 357
Fax: +49-2232-577 368
E-mail: kk@superwind.com
Contact: Klaus Krieger

Established 1991
Distribution: Domestic, international
Direct from factory

Model	**Superwind 350**
Orientation	Upwind
Rated Output	350 W
Peak Output	350 W
Output Voltage (V)	12 or 24 DC (48 on request)
Generator Type	PMG
Applications	Stand Alone
Controller Type	Battery charger SCR Marine
Overspeed Protection	Pitch controlled (feathering)
Blade Material	Carbon reinforced plastic (CRP)
Number of Blades	3
Rotor Diameter (m)	1.2
Swept Area (m2)	1.13
Windspeed (m/s)	
Rated	12.5
Cut-in	3.5
Cut-out	none
Governing	none
Survival	45
Head Weight (kg)	11.5
Tower Type	various
Tower Height (m)	various
Product Life (years)	20
Warranty (years)	3
Units sold	> 2000
On the market since	Since May 2004
Price	1 310 € (not incl. VAT)
Certificate	



Thümler GmbH
(Germany)

90455 Nürnberg
Hans Traut Str. 25

www.aluwindrad.de
www.grip.de
Tel: +49 (0) 9122 - 78711
Fax: +49 (0) 9122 - 73127
E-mail: info@grip.de
Contact: Manfred Thümler

Model	**Alu Windrad**
Orientation	Upwind
Rated Output	6 W
Peak Output	6 W
Output Voltage (V)	12 DC
Generator Type	2 bicycle generators
Applications	Stand Alone
Controller Type	Included is a little electronic controller to load a 12V battery.
Overspeed Protection	Side furling
Blade Material	Aluminum 1mm blades, fully calculated in a computer simulation under Reynolds laminar profile.
Number of Blades	3
Rotor Diameter (m)	0.84
Swept Area (m2)	0.55
Windspeed (m/s)	
Rated	5.5
Cut-in	3
Cut-out	10 to 12
Governing	
Survival	
Head Weight (kg)	3
Tower Type	The vertical axis of the rotor is fastened with 2 screws to a pipe.
Tower Height (m)	4
Product Life (years)	25
Warranty (years)	
Units sold	3000
On the market since	33
Price	80 €, shipping cost out of Germany with UPS is 20 €
Certificate	

TURBINA ENERGY AG (Germany)

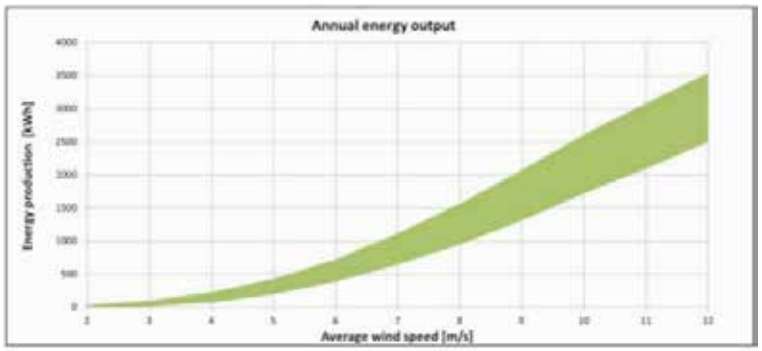
Grünwalder Weg 13
82008 Unterhaching
Germany

www.turbina.de
Tel: +49 89 6146622 0
Fax: +49 89 6146622 18
E-mail: info@turbina.de

Established 2004
Distribution: Domestic and international, direct from factory

TURBINA
smart solutions for power, mobility & communication

Model	**TURBINA TE20**
Orientation	Vertical axis wind turbine (VAWT)
Rated Output	
Peak Output	1.0 kW or 1.5 kW (depending on type of inverter / controller)
Output Voltage (V)	TE20 FI: 230 VAC, 50 Hz TE20 BC: 24 or 48 VDC
Generator Type	PMG
Applications	Stand alone and grid connection
Controller Type	Suitable for various controllers / inverters
Overspeed Protection	Not necessary
Blade Material	Aluminium
Number of Blades	10
Rotor Diameter (m)	1.29
Swept Area (m2)	2.19
Windspeed (m/s)	
Rated	
Cut-in	1.5 m/s start rotation 2.5 m/s start power production
Cut-out	None
Governing	
Survival	50 m/s (tested in wind tunnel)
Head Weight (kg)	280
Tower Type	Monopole tower or roof sub-construction
Tower Height (m)	7.8 m
Product Life (years)	20 years
Warranty (years)	2 years, extension up to 5 years
Units sold	Contact for more information
On the market since	10 years
Price	Price list on request
Certificate	



Energotech S.A.
(Greece)

602a Vouliagmenis Ave.
164 52 Argyroupoli, Athens
Postal address:
PO Box 72 509
164 01 Argyroupoli, Athens

www.energotech.gr
Tel: +30 - 210 - 99 59 021
Fax: +30 - 210 - 99 59 022
E-mail: energogr@otenet.gr
wind@energotech.gr

Established 1993
Distribution: Direct from factory

ENERGOTECH SA
Research & Development of Renewable Energy Sources

Model	BF 1 K	BF 3 K	BF 6 K
Orientation	Downwind		
Rated Output	1 kW	3 kW	6 kW
Peak Output	1.5 kW	3.5 kW	7 kW
Output Voltage (V)	12, 24, 48 DC for battery charge, or 230 AC for grid connect		
Generator Type	3 phase Synchronous PMA, multi pole		
Applications	Stand Alone, Grid Connection		
Controller Type	Automatic battery charger with wide range voltage input (10 – 125 VDC)		
Overspeed Protection	Down wind orientation - blades are pushed together by strong wind		
Blade Material	Carbon epoxy / stainless steel		
Number of Blades	3		
Rotor Diameter (m)	3	4.5	4.8
Swept Area (m2)	7.06	15.9	18.1
Windspeed (m/s)			
Rated	10		
Cut-in	3		
Cut-out	non-stop		
Governing	12		
Survival	55		
Head Weight (kg)	21.5	56	78
Tower Type	Guyed monopole		
Tower Height (m)	12		
Product Life (years)			
Warranty (years)			
Units sold			
On the market since			
Price	Contact Energotech for price information		
Certificate			

Sun N Wind Renewables (India)

Gonai, Sr. No. 242, Plot No. 34B, Tejaswini Hsg.,
Soc., New D. P. Road,
Nr. Medipoint Hospital, Aundh, Pune 411007

www.sunnwindhk.com
Mr. Sandeep Hambir, CMD
+91-20-27297585

Established 2013
Distribution: Domestic, International
Direct from factory

Model	SnW Vayu 0.6	SnW Vayu 1	SnW Vayu 2	SnW Vayu 3	SnW Vayu 5
Orientation	Upwind	Upwind	Upwind	Upwind	Upwind
Rated Output	600Watts	1000Watts	2000Watts	3000Watts	5000Watts
Peak Output	1000	1500	2600	4000	7500
Output Voltage (V)	24	24/48	48	96	120
Generator Type	PMG	PMG	PMG	PMG	PMG
Applications	Domestic use	Domestic use	Domestic use	Domestic use	Domestic use
Controller Type	Wind Charge Controller	Wind Charge Controller	Wind Charge Controller	Wind Charge Controller	Wind Charge Controller
Overspeed Protection	Electromagnetic brake, Tail Vane leaning	Electromagnetic brake, Tail Vane leaning	Electromagnetic brake, Tail Vane leaning	Electromagnetic brake, Tail Vane leaning	Electromagnetic brake, Tail Vane leaning
Blade Material	FRP	FRP	FRP	FRP	FRP
Number of Blades	3 Nos.	3 Nos.	3 Nos.	3 Nos.	3 Nos.
Rotor Diameter (m)	2.5	2.7	3.8	4.5	5.4
Swept Area (m2)	4.91	5.72	11.34	15.9	22.89
Windspeed (m/s)					
Rated	8	8	9	9	9
Cut-in	3 m/s	3 m/s	3 m/s	3 m/s	3 m/s
Cut-out	25 m/s	25 m/s	25 m/s	25 m/s	25 m/s
Governing	Tail System	Tail System	Tail System	Tail System	Tail System
Survival	40m/s	40m/s	40m/s	40m/s	40m/s
Head Weight (kg)	35	54	75	120	180
Tower Type	Guy/Lattice	Guy/Lattice	Guy/Lattice	Guy/Lattice	Guy/Lattice
Tower Height (m)	6/12/18 Meter	6/12/18 Meter	6/12/18 Meter	6/12/18 Meter	6/12/18 Meter
Product Life (years)	20	20	20	20	20
Warranty (years)	2	2	2	2	2
Units sold	42	93	61	16	7
On the market since	2011	2011	2012	2013	2013
Price	INR 97,000	INR 1,30,000	INR 2,20,000	INR 3,65,000	INR 4,85,000
Certificate	-	C-WET provisional empanelled	-	-	-

E – Hands Energy (India)

No. G2, SAI PADUKA, 2/576,
Singaravelan Main Road,
Chinna Neelangarai, Chennai-600041

www.ehandsenergy.in
E-mail: enquiry@ehandsenergy.in
Contact: Raghuraman C

Established 2009
Distribution: Domestic, international
Direct from factory

E-Hands Energy
Inspiring Power

Model	E160i 600W	E230i 800W	e300i 1000W	e400n 3500W	e400nb3500W
Orientation	Horizantal Axis	Horizantal Axis	Horizantal Axis	Horizantal Axis	Horizantal Axis
Rated Output	600W	800W	1000W	3500W	3500W
Peak Output	700W	850W	1150W	3500W	3500W
Output Voltage (V)	12,24,36,48,110 & 200 VDC	12,24,36,48,110 & 200 VDC	12,24,36,48,110 & 200 VDC	48/110 /250 VDC	48/110 /250 VDC
Generator Type	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet
Applications	Battery Charging/Grid Tie/Hybrid	Battery Charging/Grid Tie/Hybrid	Battery Charging/Grid Tie/Hybrid/ water pumping	Battery Charging/Grid Tie/Hybrid/ water pumping	Battery Charging/Grid Tie/Hybrid/ water pumping
Controller Type	Charge or Voltage Limiter	Charge or Voltage Limiter	Charge or Voltage Limiter	Interface Module or Voltage Limiter	Interface Module or Voltage Limiter
Overspeed Protection	Rotor Turbulence	Pitch control	Pitch control	Pitch control	Pitch control
Blade Material	Fiber Glass	Fiber Glass	Fiber Glass	Fiber Glass	Fiber Glass
Number of Blades	5	3	3	3	3
Rotor Diameter (m)	1.6 m	2.3 m	3 m	4m	4m
Swept Area (m2)	2.05 m2	4.15 m2	7.07 m2	9.5 m2	9.5 m2
Windspeed (m/s)					
Rated	13.5 m/s	12.5 m/s	11 m/s	11 m/s	11 m/s
Cut-in	2.5 m/s	2.5 m/s	2.5 m/s	4 m/s	4 m/s
Cut-out	N/A	N/A	N/A	N/A	N/A
Governing	500 w in 11m/s	650w in 11m/s	850 w in 11m/s	2550w in 11m/s	2550w in 11m/s
Survival	60 m/s	60 m/s	60 m/s	70 m/s	70 m/s
Head Weight (kg)	30kg	45kg	75kg	230kg	230kg
Tower Type	Guyed/Mono Pole	Guyed/Mono Pole	Mono Pole	Mono Pole	Mono Pole
Tower Height (m)	9-18 m	9-18 m	12-18 m	12-15 m	12-15 m
Product Life (years)	20 years	20 years	20 years	20 years	20 years
Warranty (years)	1 year	1 year	1 year	1 year	1 year
Units sold					
On the market since	2009	2009	2009	2009	2009
Price					
Certificate	MCS and SWCC	MCS and SWCC	MCS and SWCC	MCS and SWCC	MCS and SWCC
				n- with out mechanical break	nb- with mechanical break

LeanWay Energy (India)

5, Sneh Avishkar
72/1 Erandawana, Pune

www.leanwayenergy.com
Tel: +91 988 124 8812
E-mail: info@leanwayenergy.com
Contact: Shrirang Chandekar

Established 2011
Distribution: Domestic, international
Direct from factory

Model	YUVA 500	YUVA 1200	YUVA 2200	YUVA 3000
Orientation	Upwind			
Rated Output	500 W	1.2 kW	2.2 kW	3 kW
Peak Output	650	1.4 kW	2.5 kW	3.3 kW
Output Voltage (V)	12, 24, 48	12, 24, 48	As desired	As desired
Generator Type	Permanent Magnet			
Applications	Design according to the customer requirements			
Controller Type	Micro Controller Based			
Overspeed Protection	Electrical	Pitch Control	Pitch Control	Pitch Control
Blade Material	GRP	GRP	GRP	GRP
Number of Blades	3	2	2	2
Rotor Diameter (m)	1,8	3,2	3,6	3,8
Swept Area (m2)	2,5	8	10,2	11,3
Windspeed (m/s)				
Rated	12,5	12,5	12,5	12,5
Cut-in	2,75		2,75	2,75
Cut-out	13	13	13	13
Governing	12	12	12	12
Survival	45	45	45	45
Head Weight (kg)	35	120	125	150
Tower Type	Location Specifc			
Tower Height (m)	Location Specifc			
Product Life (years)	15	15	15	15
Warranty (years)	2	2	2	2
Units sold	40	2	5	5
On the market since	3			
Price	Contact LeanWay Energy			
Certificate				

Supernova Technologies (India)

I-103 Zone B 9 Phase IV B/H
Swiss Glasscoat GIDC ESTATE,
Vitthal Udyognagar 388121
Di: Anand Gujarat India

www.supernovawindsolar.com
Tel: + 91 2692 237037
Fax: + 91 2692 237035
E-mail: sntgujarat@yahoo.co.in
sntgujarat@gmail.com
Contact: Suresh Prajapati

Established 2001
Distribution: Domestic, international
Direct from factory

SUPERNOVA TECHNOLOGIES

Model	SNT 1	SNT 10	SNT 35
Orientation		Upwind	
Rated Output	700 W	1.4 kW	3.5 kW
Peak Output	700 W	1.4 kW	3.5 kW
Output Voltage (V)	12, 24	24, 48	48,96,120
Generator Type	PM 1 Phase Alt.	PM 2 Phase Alt.	PM 3 Phase Alternator
Applications	Stand Alone, lighting solution, Power backup for telecom tower, Power staggering users etc.		
Controller Type	Auto Electronics		
Overspeed Protection	Dump Switch manual and automatic and YAW movement		
Blade Material	FRP		
Number of Blades	3		
Rotor Diameter (m)	1,8	3	4,3
Swept Area (m2)	2,5	7	14,5
Windspeed (m/s)			
Rated	11 m/s	11 m/s	11 m/s
Cut-in	2 m/s	2,2 m/s	2,5 m/s
Cut-out	11 m/s	11 m/s	11 m/s
Governing	6 m/s	6 m/s	6 m/s
Survival	60 m/s	60 m/s	60 m/s
Head Weight (kg)	54	80	100
Tower Type	Tilting pipe	Tripod tower	Tripod tower
Tower Height (m)	6,1	6,1	8.23 or 13.41
Product Life (years)	20+ years	20+ years	20+ years
Warranty (years)	2 years	2 years	2 years
Units sold	90	88	60
On the market since	12 years	12 years	12 years
Price	$ 1 339	$ 2 158	$ 4 999
	Price includes: wind turbine and charge controller		
Certificate	MNRE certified model SNT 6 & ISO certified company		

UNITRON ENERGY SYSTEMS (India)

Plot No 25 , Sanjay Park
Air –Port Road , Pune 411032, India

www.unitronenergy.com
Tel.: 0091 20 26687006 / 26684399
E-mail: unitron@pn3.vsnl.net.in

Established 1991
Distribution: Domestic, international
Direct from factory

Model	UE6	UE15	Ue15plus	UE33	UE42	UE42plus
Orientation	HAWT upwind					
Rated Output	650 W	1.5 kW	1.8 kW	3.3 kW	4.2 kW	5.1 kW
Peak Output	750 W	1.7 kW	2.2 kW	3.6 kW	4.6 kW	5.4 kW
Yearly Production (kWh/y) at 4.5/5.5/6.5 m/s						
Output Voltage (V)	12V -48V	24V -180V	24V -180V	60V- 240V	60V- 240V	60V- 240V
Generator Type	PMG					
Applications	Off grid		Off/on grid		Off/on grid, water pumping	
Controller Type	PWM SHUNT					
Overspeed Protection	Tilt-up			Angle furl		
Blade Material	Carbon fibre					
Number of Blades	3					
Rotor Diameter (m)	2.20	3.20	3.40	4.65	4.90	5.24
Swept Area (m2)	3.7	9.2	9.4	16.4	19.0	21.4
Windspeed (m/s)						
Rated	10.5	10.5	10.5	10.5	11	11
Cut-in	2.6	2.6	2.6	2.6	2.7	2.7
Cut-out	As such small WTG units do not have mechanical brakes you may stop the turbine by applying electro dynamic stop switch. Under high winds tubine RPM drops darstically after going into Furling					
Governing	14 -15	14-15	14-15	14-15	15-16	15-16
Survival	50	50	50	50	55	55
Head Weight (kg)	23	34	39	77	89	100
Tower Type	Pipe		Pipe / welded lattice		Welded lattice	
Tower Height (m)	9-12	12-18	12-18	18-2	18-24	18-24
Product Life (years)	~ 20					
Warranty (years)	3					
Units sold	~ 3000	~ 2500	~2000	~1500	~400	~1000
On the market since	~12	~ 9	~9	~10	~9	~8
Price	Price of the turbines vary depending on application such as off Grid , On Grid , Water Pumping (WP) however for estimation purposes once can consider 0.95 to 1.20 USD / peak watt of the turbine rating					
Certificate	CE	CE	CE	CE/IEC61400-2	CE/IEC61400-2	CE/IEC61400-2

AR-500W

Vaigunth Ener Tek (India)

No-20 Rajesh Nager Main Road,
Narayanapuram, Pallikaranai, Chennai, 600100

www.v-enertek.com
Tel: +91-45575552 / +91-45575559
Fax: +91-45575551
E-mail: info@v-enertek.com
Contact: Manoharan.S

Established 1998
Distribution: Domestic, international
Direct from factory

Vaigunth Ener Tek (p) Ltd

Model	AR-200W	AR-300W HR	AR-500W	AR-1kW	AR-2kW	AR-5kW	AR-7,5kW	AR-20kW	AR-30kW
Rated Output	200 W	300 W	500 W	1 kW	2 kW	5 kW	7.5 kW	20 kW	30 kW
Peak Output	240 W		600 W	1.4 kW	2.4 kW	6.5 kW			33 kW
Output Voltage (V)	12 DC	24 DC		48 / 110 / 440				440 VAC	
Generator Type	PMDC								
Applications	Stand Alone			Stand Alone, Grid Connection			Grid connection		
Controller Type	Micro processor								
Overspeed Protection	Governor					Governor and Electromagnet			
Blade Material	Glassfibre reinforced plastic (GRP)								
Number of Blades	3								
Rotor Diameter (m)	1,7	1,6	2,2	3,4	4,5	6.8	7,5	10,5	13,9
Swept Area (m2)	2,26	2,01	3,79	9,07	15,89	36.3	44,2	86,54	151,5
Windspeed (m/s)									
Rated	9,3	11	9,4	9,5	9,7	9,4	9,7	10,5	10,5
Cut-in	3								
Cut-out	23								
Governing									
Survival	70								
Head Weight (kg)	23	75	34	75	115	225	370	950	750
Tower Type	Guyed			Guyed or Lattice			Lattice		
Tower Height (m)	6	8		12	15	18		25	
Product Life (yrs)	20								
Warranty (years)	3								
Units sold	150		200	85	60	200			15
On the market since	7				1	10			6
Price	$ 550		$ 1 150	$ 2 300	$ 3 400	$8 300			$ 33 000
Certificate	All prices include: turbine system and charge controller.								

WiSH Energy Solutions (India)

Gat No.1569/B, Off pune Saswad Road, Vadaki Village Pune 412308, India

Contact: Arun Nedungadi
Tel: 9343905060

Established 2007
Distribution: Domestic, international
Direct from factory

Model	Windistar 400	Whsiper 200	Whsiper 500	Windistar 4500
Orientation	Upwind			
Rated Output	400W	1000W	3200W	4500W
Peak Output	480W	1200W	3840	5400
Output Voltage (V)	12V/24V	12V/24V/48V/ 96V/120V/240V	12V/24V/48V/ 96V/120V/240V	12V/24V/48V/96V/120V/ 240V
Generator Type	Permanent Magnet Generator			
Applications	Offgrid battery charging	Offgrid battery charging And Ongrid system	Offgrid battery charging And Ongrid system	Offgrid battery charging And Ongrid system
Controller Type	Microprocessor - based external regulator with peak power tracking	Microprocessor-based external regulator		
Overspeed Protection	Electronic torque control	Angle Governer/ Furling/ Dump Load	Angle Governer/ Furling/ Dump Load	Angle Governer/ Furling/ Dump Load
Blade Material	Carbon Fiber composite	Polypropylene & carbon Fiber	Epoxy with carbon composite	Epoxy with carbon composite
Number of Blades	3	3	2	3
Rotor Diameter (m)	1.26m	2.72m	4.5m	4.6m
Swept Area (m^2)	1.24	5.80	15.89	16.61
Windspeed (m/s)				
Rated	12.5m/s	11.6m/s	12m/s	12m/s
Cut-in	3.6m/s	3.1m/s	3.1m/s	3.5m/s
Cut-out	NA	NA	NA	NA
Governing	Passive yaw and tail	Passive yaw and tail assembly	Passive yaw and tail assembly	Passive yaw and tail assembly
Survival	50m/s	49m/s	55m/s	55m/s
Head Weight (kg)	6.8	30	70	113
Tower Type	Turbular guy rope supported			
Tower Height (m)	8m/15m/18m			
Product Life (years)	15years			
Warranty (years)	1 years limited			
Units sold				
On the market since	2014	2007	2007	2014
Price	Rs.32000*	Rs.82500*	Rs.187000*	Rs 235750
Certificate	CE	CE, IEC	CE, IEC	CE, IEC(under testing)

En-eco SpA
(Italy)

Via O. Da Pordenone, 28-30-32
50127 Firenze

www.en-eco.com
Tel: +39 55-333017
Fax: +39 55-3217162
E-mail: info@en-eco.com
Contact: Giovanni Berti

Established 2003
Distribution: Domestic, international
Direct from factory

Model	SkyLine One	SkyLine Three
Orientation	VAWT	VAWT
Rated Output	1 kW	3 kW
Peak Output	1,2 kW	3,6 kW
Output Voltage (V)	24/200 V	
Generator Type	Axial fluid alternator, Permanent magnet synchronous alternator (NdFeB)	
Applications	On / off grid	
Controller Type	MPPT control	
Overspeed Protection	Electromagnetic brakes	
Blade Material	Composite (carbon fibre), aluminium arms	
Number of Blades	3	3
Rotor Diameter (m)	2	3,2
Swept Area (m^2)	4	11,2
Windspeed (m/s)		
Rated	12	12
Cut-in	3	3
Cut-out	16	16
Governing	none	none
Survival	42	42
Weight (kg)	68	190
Tower Type		
Height (m)	2	3,5
Product Life (years)		
Warranty (years)	2	2
Units sold		
On the market since		
Price		
Certificate	IV (IEC 61400-2)	

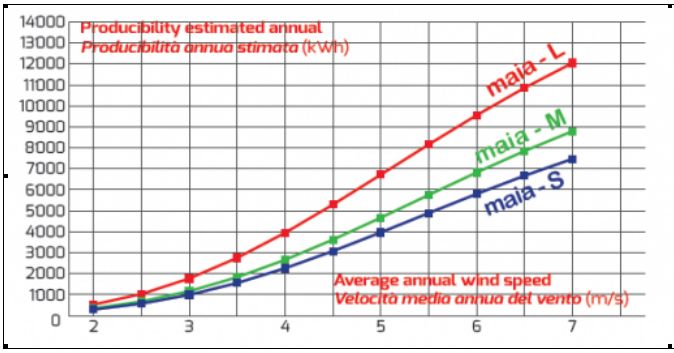
Interwind
(Italy)

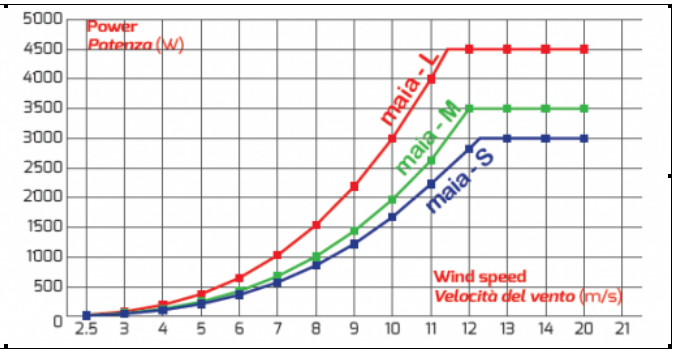
Via Amman 45 - 33084
Cordenons PN

www.interwind.it
Tel: +39 (0)43444183
Fax: +39 (0)43444184
E-mail: info@interwind.it

Established 2008
Distribution: Domestic, international
Direct from factory

Model	Maia - S	Maia - M	Maia - L
Orientation			
Rated Output	1.8 kW	2.3 kW	3.3 kW
Peak Output	3 kW (12,3 m/s)	3.5 kW (12,0 m/s)	4.5 kW (11,4 m/s)
Output Voltage (V)			
Generator Type	PMG Rare Earth		
Applications	On Grid and Off-grid connection		
Controller Type			
Overspeed Protection	Pitch Control		
Blade Material			
Number of Blades	6		
Rotor Diameter (m)	3,3	3,7	4,7
Swept Area (m²)	8,5	10,8	17,4
Windspeed (m/s)			
Rated	3,5	4	5,2
Cut-in	2,8	2,5	2,3
Cut-out	20	20	20
Governing			
Survival			
Head Weight (kg)	70	71	86
Tower Type	Folding Tower cod. 70		
Tower Height (m)	6 to 12		
Product Life (years)			
Warranty (years)			
Units sold			
On the market since			
Price	Contact InterWind for more Information		
Certificate			





Jonica Impianti
(Italy)

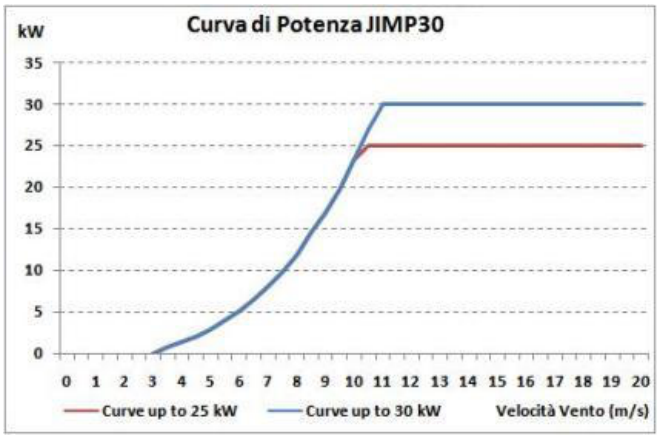
Via Poerio 226
74020 Lizzano (TA)

www.jimp.it
Tel: +39 (0) 99 955 12 08
Fax: +39 (0) 99 955 85 81
E-mail: jimpcoop@tin.it
Contact: Daniele Bino

Established 1994
Distribution: Domestic, international
Direct from factory

Jonica Impianti

Model	**JIMP30**
Orientation	Upwind
Rated Output	up to 30 kW
Peak Output	up to 30 kW
Output Voltage (V)	400 VAC
Generator Type	PMG
Applications	Grid Connection
Controller Type	Variable frequency
Overspeed Protection	Active pitch and stall control
Blade Material	Fiberglass epoxy
Number of Blades	3
Rotor Diameter (m)	10,4 - 11,6
Swept Area (m^2)	84,9 m2 - 105,6 m2
Windspeed (m/s)	
Rated	11
Cut-in	3,5
Cut-out	26
Governing	N.A.
Survival	42,5
Head Weight (kg)	900
Tower Type	Tubular
Tower Height (m)	30
Product Life (years)	20
Warranty (years)	2
Units sold	> 400
On the market since	
Price	Contact company for prices
Certificate	



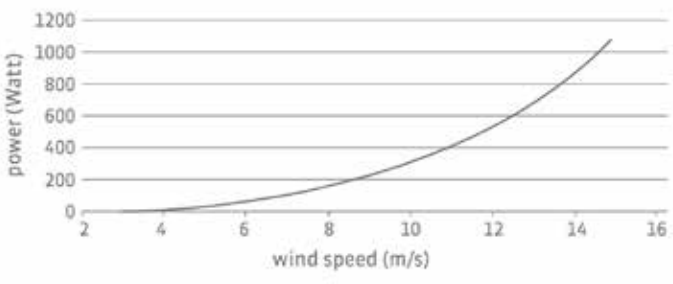
Minvento S.r.l.
(Italy)

Via Brigata GAP 24 Pesaro 61122 PU

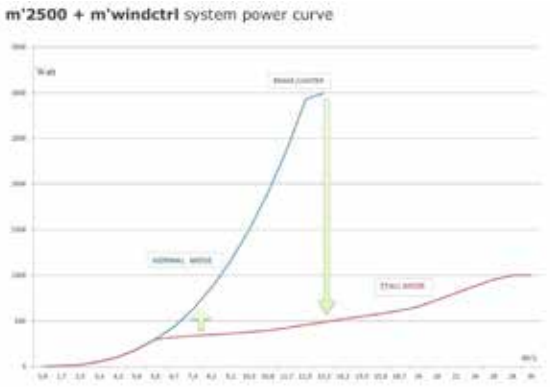
www.minvento.it
Tel: +39 (0)721 283772
Mobile: +39 320 1132244
Fax: +39 (0)721 283772
E-mail: info@minvento.it
Contact: Alessandro Cascini

Established 2008
Distribution: Domestic, international
Direct from factory

Model	m' 1000	m' 2500
Orientation	Upwind	
Rated Output	400 W	1.5 kW
Peak Output	1 kW	2.5 kW
Output Voltage (V)	Stand alone 12V or 24V or grid version up to 250V	Max 400V
Generator Type	PMG Axial flux	
Applications	Stand Alone, Grid Connection	Grid Connection
Controller Type	Passive furling	Active m'windctrl
Overspeed Protection	yes	
Blade Material	Oukumè (laminated wood)	
Number of Blades	3	3
Rotor Diameter (m)	2	3,2
Swept Area (m²)	3,14	8,04
Windspeed (m/s)		
Rated	10	10
Cut-in	3	3
Cut-out	15	15
Governing		
Survival	37	68
Head Weight (kg)		
Tower Type		
Tower Height (m)		
Product Life (years)		
Warranty (years)	2	
Units sold	> 50	> 20
On the market since	2010	
Price		
Certificate	IEC 61400-2	



m' 1000



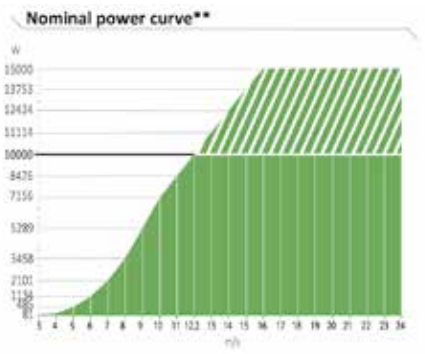
Ropatec (Italy)

Via Galvani 26, 39100 Bolzano

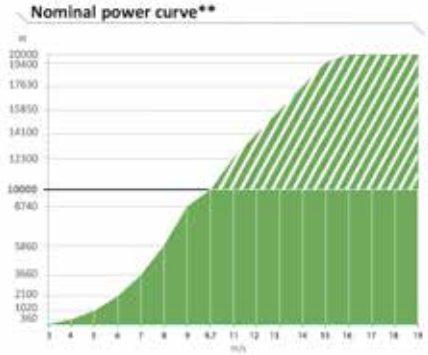
www.ropatec.com
Tel: +39 (0) 471 052010
Fax: +39 (0) 471 052012
E-mail: info@ropatec.com
Contact: Nargiz Shakikhanova

Distribution: Domestic, international
Direct from factory

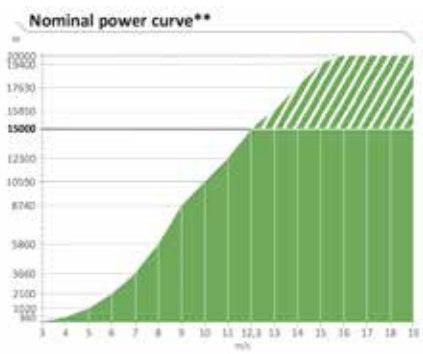
Model	SA-40	SA-70	SA-70proS	T30proS
Orientation	VAWT			
Rated Output	10 kW	10 kW	15 kW	30 kW
Peak Output	10 kW	10 kW	15 kW	30 kW
Output Voltage (V)	380V			
Generator Type	Direct drive permanent magnet			
Applications	On-grid and Off-grid			
Controller Type	Power curve MPPT			
Overspeed Protection	Hydraulic + electrical break			
Blade Material	Fiberglass			
Number of Blades	3			
Rotor Diameter (m)	7	7,8	7,8	11
Rotor Height/blade lenght (m)	5,7	9	9	12
Swept Area (m^2)	40	70	70	132
Windspeed (m/s)				
Rated				
Cut-in	3 m/s	3 m/s	3 m/s	4 m/s
Cut-out	26 m/s	19 m/s	19 m/s	23 m/s
Governing				
Survival	37,5 m/s (52,5 m/s)			
Head Weight (kg)	Turbine 1900 kg, mast 1600 kg or 2350 kg	Turbine 2100 kg Mast 2350 kg	Turbine 2100 kg Mast 2350 kg	Turbine 3500 kg
Tower Type	Monopole/lattice tower			
Tower Height (m)	12 or 18	18	18	24
Product Life (years)	ca. 25			
Warranty (years)	2 years within EU			
Units sold				
On the market since				
Price				
Certificate				



SA-40



SA-70



SA-70proS

BIRUMEN KAGOSHIMA (Japan)

4-6 Izumi-cho, Kagoshima City, Kagoshima Prefecture, Japan

www.tomonokaze.jp/en/
Tel: +81-99-226-6677
Fax: +81-99-223-6540

Established 1976

Model	**YG-4000**
Orientation	Passive yaw
Rated Output	4000
Peak Output	
Output Voltage (V)	48
Generator Type	Coreless Permanent Magnet System
Applications	
Controller Type	automatic variable pitch angle controller / Built-in flywheel
Overspeed Protection	automatic variable pitch angle controller / automatic emergency shutdown system
Blade Material	FRP
Number of Blades	3
Rotor Diameter (m)	4.16
Swept Area (m^2)	
Windspeed (m/s)	
Rated	12
Cut-in	1.5
Cut-out	20
Governing	
Survival	60
Head Weight (kg)	380
Tower Type	
Tower Height (m)	
Product Life (years)	
Warranty (years)	
Units sold	
On the market since	
Price	
Certificate	

MATSUMURA MACHINERY MFG Co.Ltd (Japan)

278-1, Nitta-Koganei-cho, Ota-shi, 370-0303, Japan

www.matsumurakikai.co.jp
Tel: +81-276-57-2060
Fax: +81-276-57-2063
E-mail: mmm@matsumurakikai.co.jp

Established 1967

MATSUMURA

Model	MWG-50/N50	NWG-1K
Orientation		
Rated Output	50	1000
Peak Output	130	1500
Output Voltage (V)	DC12/24	
Generator Type		
Applications		
Controller Type		
Overspeed Protection		
Blade Material	FRP	FRP
Number of Blades	5	3
Rotor Diameter (m)	0.95	2.0
Swept Area (m^2)		
Windspeed (m/s)		
Rated	8	12
Cut-in	3.5	
Cut-out		
Governing		
Survival		60
Head Weight (kg)	9.5	
Tower Type		
Tower Height (m)		
Product Life (years)		
Warranty (years)		
Units sold	2695	
On the market since		
Price		
Certificate		

Nakanishi Metal Works (Japan)

3-3-5, Tenmabashi, Kita-ku, Osaka 530-8566, Japan

www.nkc-j.co.jp/eng/index.html
Tel: +81-6-6351-4832
Fax: +81-6-6351-7822

Established 1941

NKC Nakanishi Metal Works Co., Ltd.

Model	NKC-400-380	NKC-1000-460	NKC-1000-200	NKC-5000-300
Orientation				
Rated Output	200	500	1000	5000
Peak Output	418 (3 phase,AC)	1000(3phase,AC)	1180(3phase,AC)	5000(3phase,AC)
Output Voltage (V)	DC24(Rectified)	DC24(Rectified)	AC220	AC210
Generator Type				
Applications				
Controller Type				
Overspeed Protection	Electric brake	Electric brake	Electric brake	Electrical brake/Mechanical brake
Blade Material	Aluminum alloy			
Number of Blades	4			
Rotor Diameter (m)	1.0	1.0	1.5	3.2
Swept Area (m^2)	1.6	1.6	3.75	12.8
Windspeed (m/s)				
Rated				
Cut-in	1.6	1.6	2.0	3.0
Cut-out				
Governing				
Survival	60			
Head Weight (kg)	250	250	500	1600
Tower Type	Structural carbon steel tube/sheet			
Tower Height (m)	5.93	5.93	6.82	6.50
Product Life (years)				
Warranty (years)				
Units sold				
On the market since				
Price				
Certificate				

Sinfonia Technology (Japan)

Shiba NBF Tower, 1-30,
Shiba-daimon 1-chome,
Minato-ku, Tokyo, 105-8564

www.sinfo-t.jp

Established 2004
Distribution: Domestic, international
Direct from factory

SINFONIA TECHNOLOGY CO., LTD.

Product Name	Gentle Breeze V-II			
Model	**WK18-20**	**WK32-20**	**WK18-20K**	**WK32-20K**
Orientation	VAWT			
Rated Output	1.07 kW	1.84 kW	1.01 kW	1.74 kW
Peak Output	1.32 kW	2.26 kW	1.25 kW	2.14 kW
Output Voltage (V)	100 (Inverter Output to Load)		100 / 200 (Inverter Output to Grid)	
Generator Type	3 Phase AC Brushless Permanent Magnet			
Applications	Stand Alone		Grid Connection	
Controller Type	Optimum Charging Control		Optimum Power Control	
Overspeed Protection	Electric Brake (Auto), Mechanical Brake (Auto & Manual)			
Blade Material	Aluminum Alloy			
Number of Blades	4			
Rotor Diameter (m)	1,8	3,2	1,8	3,2
Rotor Height (m)	2			
Swept Area (m^2)	3,6	6,4	3,6	6,4
Windspeed (m/s)				
Rated	13			
Cut-in	2		3	3,5
Cut-out	14			
Governing	None			
Survival	60			
Head Weight (kg)	140	230	140	230
Tower Type	Monopole			
Tower Height (m)	5,8			
Product Life (years)	10 year design life (in Japan)			
Warranty (years)	1			
Units sold	Total 900 units (including old model)			
On the market since	2004			
Price	Contact Sinfonia for current cost information.			
Certificate				

Wind-Smile Co., LTD.
(Japan)

7-4 Nihonbashi Nakasu,
Chuo-ku, Tokyo 103-0008

www.wind-smile.com
Tel: +81-48-467-2491
Fax: +81-48-467-2096
E-mail: h-yanase@nsi-asaka.co.jp
Contact: Nippon System Industries Corp.

Established 2007
Distribution: Domestic, international
Direct from factory

Model	Wind Smile 200W	Wind Smile 1kW	Wind Smile 5kW
Orientation	VAWT		
Rated Output	200 W	1 kW	5 kW
Peak Output	200 W	1 kW	5 kW
Output Voltage – stand alone (V)	12VDC	48VDC	
Output Voltage – grid connected (V)	-	Single Phase 220VAC	
Generator Type	Permanent-magnet core-less synchronous generator		
Applications	Stand Alone	Stand Alone, Grid Connection	
Controller Type	Safety Control, Over Voltage Control, Battery Charge Management		
Overspeed Protection	Electrical brake		
Blade Material	Corrosion-Resistant Aluminium Alloy		
Number of Blades	4		3
Rotor Diameter (m)	1	1.5	3.2
Rotor Height (m)	1	2,5	2.5
Swept Area (m^2)	1	3,75	8
Windspeed (m/s)			
Rated	12.5	9	15
Cut-in	1.3	2.5	3,5
Cut-out			
Governing			
Survival	60		
Head Weight (kg)	50	200	700
Tower Type	Tubular monopole free standing		
Tower Height (m)	1.4	3	
Product Life (years)	20 years (with appropriate regular maintenance)		
Warranty (years)	1		
Units sold	40	25	5
On the market since			
Price	Available on request		
Certificate			

Windlens Co. Ltd
(Japan)

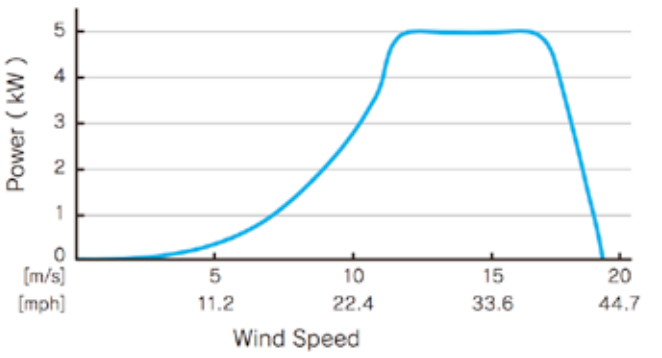
3-2-16, Kamikoga, Chikushino-shi, 818-0041, Japan

http://windlens.com
Tel: +81-92-555-2500
Fax: +81-92-555-2501
E-mail: sales@windlens.com

Established 2008

Windlens

Model	WL3000	WL5000
Orientation	Passive yaw	Passive yaw
Rated Output	3000	5000
Peak Output		
Output Voltage (V)	220V, 3phase	220V, 3phase
Generator Type	IPM	IPM
Applications	Battery	
Controller Type	Converter/ Inverter	Converter/ Inverter
Overspeed Protection	Electric brake/ Mechanical blake	Electric brake/ Mechanical blake
Blade Material		
Number of Blades	3	3
Rotor Diameter (m)	2.5	2.5
Swept Area (m^2)	3.4	3.4
Windspeed (m/s)		
Rated	10.5	12
Cut-in	3.0	3.0
Cut-out	17-20	17-20
Governing		
Survival	60	60
Head Weight (kg)	650	650
Tower Type	Concrete	Concrete
Tower Height (m)		
Product Life (years)		
Warranty (years)		
Units sold		
On the market since		
Price		
Certificate		



WL5000

WINPRO CO., Ltd.
(Japan)

Publicity Flex Building
Shinko-cho 19-8, Chuo-ku, Niigata-shi, Niigata-ken 950-0965, Japan

www.winpro.co.jp
Tel: +81-25-284-2240
Fax: +81-25-284-2251

Established 2003

WINPRO

Model	WPHB-01	WPGE-5.0 Type-B	WPGE-6.0 Type-B
Orientation			
Rated Output	145	5000	5000x4
Peak Output			
Output Voltage (V)	AC100V	AC100V	
Generator Type			
Applications			
Controller Type			
Overspeed Protection	Full automatic dual regenerative brake system manual regenerative brake system		
Blade Material	Aluminum alloy		
Number of Blades	3	4	6
Rotor Diameter (m)	1.35	5.0	11
Swept Area (m^2)	2.7	25	165
Windspeed (m/s)			
Rated	10	12	11
Cut-in	1.2	3.0	3.0
Cut-out			
Governing			
Survival	60	60	60
Head Weight (kg)	370	2000	2000
Tower Type	STK carbon steel pipe		
Tower Height (m)	7.0	9.8	30
Product Life (years)			
Warranty (years)			
Units sold			
On the market since			
Price			
Certificate			

Zephyr Corporation
(Japan)

Pacific Marks Shinjuku Park side
4-15-7 Nishi-Shinjuku, Shinjuku-ku
Tokyo, Japan 160-0023

www.zephyreco.co.jp
E-mail: infoweb@zephyreco.co.jp

Established: 1997

Model	**Airdolphin Z-1000**
Orientation	Upwind
Rated Output	1 kW (Mark zero and Pro), 1.1 kW (GTO)
Peak Output	
Output Voltage (V)	Mark zero = 24 DC; Pro = 48 DC; GTO = 250 DC
Generator Type	Synchronous, three-phase, Permanent Magnet
Applications	Stand Alone, Grid Connection
Controller Type	Built-in Zephyr-Original Power Management System (ZPMS), with: 1. Power-Assist Function 2. Stall Mode 3. Safety Control 4. Battery Charge Management (Mark zero and Pro) 5. Data Communication System
Built in Protection	1. Over Power 2. Over Rotation 3. Over Voltage 4. High Temperature 5. Open circuit
Overspeed Protection	RPM sensitive, electromagnetic brake.
Blade Material	Carbon-fiber skin
Number of Blades	3
Rotor Diameter (m)	1.8
Swept Area (m^2)	2.54
Windspeed (m/s)	
Rated	12.5
Cut-in	2.5
Cut-out	Not applicable
Governing	None
Survival	65
Head Weight (kg)	17.5 (Mark zero and Pro); 19.5 (GTO)
Tower Type	Guyless tilting, tower kit for rooftops, or the zephyr hybrid tower for wind / photovoltaic combination.
Tower Height (m)	4 to 20
Product Life (years)	Expected 15 years
Warranty (years)	5
Units sold	More than 5000
On the market since	Since 2006
Price	$6 500 ex works Japan (Jan. 2012)
Certificate	

Craftskills East Africa Ltd (Kenya)

P.O. Box 57357 CODE 00200
Nairobi

www.craftskillseastafrica.com
Tel: +254 724 324273
E-mail: simon@craftskillseastafrica.com
Contact: Simon Mwacharo

Established 2003
Distribution: Contact Craftskills for distribution information

Model	**WindCruiser**
Orientation	HAWT Upwind
Rated Output	3 kW
Peak Output	3.5 kW
Output Voltage (V)	48
Generator Type	PMG
Applications	Stand Alone, Grid Connection and Pumping
Controller Type	Hybrid wind/solar
Overspeed Protection	Hydraulic
Blade Material	Glass fiber
Number of Blades	3
Rotor Diameter (m)	4
Swept Area (m^2)	12.56
Windspeed (m/s)	
Rated	12
Cut-in	2
Cut-out	
Governing	
Survival	
Head Weight (kg)	65
Tower Type	Lattice
Tower Height (m)	12
Product Life (years)	20
Warranty (years)	2
Units sold	70
On the market since	11
Price	Contact Simon Mwacharo for current price information
Certificate	

Fortis Wind Energy
(The Netherlands)

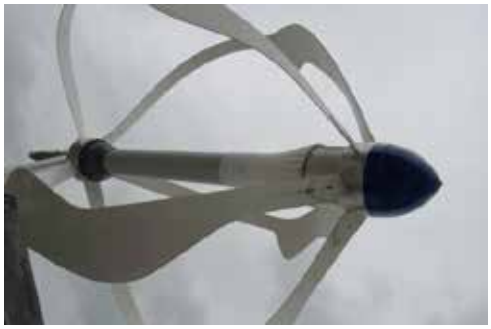
Botanicuslaan 14
9751 AC Haren

www.fortiswindenergy.com
Tel: +31 50 55 15 666
E-mail: jahn@fortiswindenergy.com
Contact: Eric Jahn

Established: over 33 years in business
Distribution: Domestic, International, Direct from Factory

Model	Passaat	Montana	Montana-Q	Alizé
Orientation	Upwind			
Rated Output	1.4 kW	5 kW	6 kW	10 kW
Peak Output	1.4 kW	5.8 kW		12 kW
Output Voltage (V)	24 to 350VDC standard	48 to 400VDC standard	400VDC standard	100 to 400VDC standard
Stand Alone (DC)	24, 48 and 240			
Grid Connection AC	1x230V	1x230V	3x400V	3x400V
Generator Type	Direct drive PMG			
Applications	Off-Grid Mini Grid and On Grid			
Controller Type	Rectifier / overvoltage protection by dumpload switching			
Overspeed Protection	Ecliptic - hinged vane			
Blade Material	Glass-fibre reinforced epoxy			
Number of Blades	3			
Rotor Diameter (m)	3.12	5.0	5.25	6.3 / 6.7 / 6.9
Swept Area (m^2)	7.64	19.63	21.6	31.2 / 34.2 / 37.4
Windspeed (m/s)				
Rated	16	14	12.5	13
Cut-in	2.5	2.5	2.5	3
Cut-out				
Furling	12-17	12-17	12-17	12-17
Survival	60			
Head Weight (kg)	75	200	200	385
Tower Type	Depends on site; guyed or tubular free standing towers			
Tower Height (m)	12-24	12-24	12-24	12-30
Product Life (years)	25			
Warranty (years)	5			
Units sold	>2000	>2500	>10	>150
On the market since	35	25	1	10
Price	Prices on request			
Certificate	Certified by C-WET India	Certified by C-WET India and Danish approval No.: SO-DV-11019.	Certification pending	Certification pending by C-WET India
	IEC 61400-2 Design requirements for small wind turbines.			

Energy Ball V100



Energy Ball V200

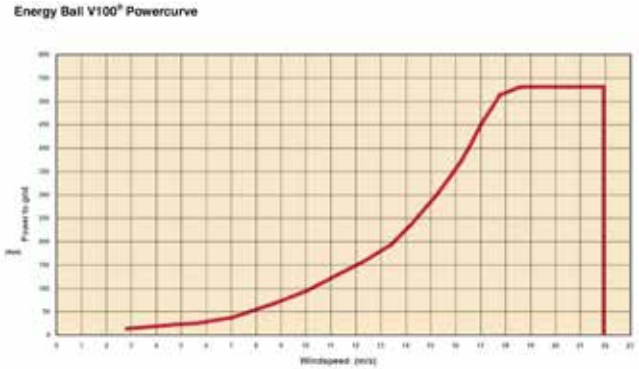
Home Energy International
(The Netherlands)

Buys Ballotstraat 9
4507 DA Schoondijke

www.home-energy.com
Tel: +31 (0) 23 558 0022
Fax: +31 (0) 23 558 1870
E-mail: info@home-energy.com
Contact: Erik Aurik

Established 2006
Distribution: Domestic, international
Direct from factory

Model	Energy Ball V100	Energy Ball V200
Orientation	Upwind	
Rated Output	200 W @ 12 m/s	700 W @ 12 m/s
Peak Output	500 W @ 16 m/s	2.25 kW @ 19 m/s
Output Voltage (V)	110 VAC / 230 VAC / 12 VDC / 24 VDC	
Generator Type	Permanent Neodymium	
Applications	Stand Alone, Grid Connection	
Controller Type	Home Energy inverter/charger	
Overspeed Protection	Not necessary	Automatic storm guard @ 21 m/s
Blade Material	Glass fibre reinforced polyester (GRP)	
Number of Blades	6	5
Rotor Diameter (m)	1,1	1,98
Swept Area (m^2)	1	3,1
Windspeed (m/s)		
Rated	12	
Cut-in	2	3
Cut-out	N/A	21 (automatic storm guard)
Governing	Automatic	
Survival	40	
Head Weight (kg)	30	90
Tower Type	Flat roof mast / pole	
Tower Height (m)	10 and 12	12 and 15
Product Life (years)	> 20	
Warranty (years)	5	
Units sold	> 1500	> 850
On the market since	from 2006	from 2008
Price	1 950 €	4 499 €
	Prices include; inverter / charger and cables	
Certificate		



Wind Energy Solutions BV
(The Netherlands)

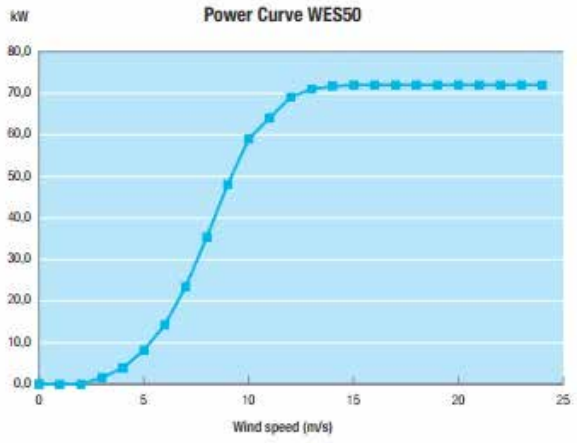
De Veken 206,
1716 KJ Opmeer, The Netherlands

www.WindEnergySolutions.nl
Tel: +31-226-425 150
Fax: +31-226-425 159
E-mail: info@windenergysolutions.nl

Established: Over 10 years in business
Distribution: International, Direct from factory

Model	**WES50**
Orientation	Upwind
Rated Output	50 kW
Peak Output	72 kW
Output Voltage (V)	400V AC
Generator Type	Asynchronous generator
Applications	Grid Connection, Stand Alone
Controller Type	IGBT Bact to Back Inverter
Overspeed Protection	Yes
Blade Material	Glass Carbon Fiber, CRP
Number of Blades	2
Rotor Diameter (m)	20
Swept Area (m²)	327 m2
Windspeed (m/s)	
Rated	9.5 m/s
Cut-in	< 3 m/s
Cut-out	25
Governing	10
Survival	52,5 m/s
Head Weight (kg)	3.300 kg
Tower Type	Stand alone, Lattice, Tilt up
Tower Height (m)	24 m, 30 m (31 m lattice)
Product Life (years)	20 years
Warranty (years)	5 years
Units sold	>500
On the market since	>20 years
Price	Contact WES dealer for current price information
Certificate	NEN1010 (Electrical), EN50308 (Safety), EN6096 (Wind Turbines) UI1741, G59/2 (Anti Islanding), IEC61346-2000 (Cabinet)

Wind speed (m/s)	Power kW
0	0,0
1	0,0
2	0,0
3	1,6
4	3,9
5	8,2
6	14,3
7	23,5
8	35,4
9	48,1
10	59,0
11	64,1
12	69,1
13	71,0
14	71,7
15	72,0
16	72,0
17	72,0
18	72,0
19	72,0
20	72,0
21	72,0
22	72,0
23	72,0
24	72,0



Gusto Energy Ltd
(New Zealand)

www.gustoenergy.com
Mobil: +64 21 522224
E-mail: duncan@gustoenergy.com
Contact: Duncan McMillan

Established 1998
Distribution: Direct from factory

Model	**Gusto 2.0 kW**
Orientation	Upwind
Rated Output	1.8 kW
Peak Output	2 kW
Output Voltage (V)	Variable speed, variable frequency, variable voltage
Generator Type	32 pole, 3 phase PMG
Applications	Stand Alone, Grid Connection, Direct Heating
Controller Type	Suitable for various controllers
Overspeed Protection	Passive side furling
Blade Material	Fibreglass, GRP
Number of Blades	3
Rotor Diameter (m)	3.2
Swept Area (m^2)	8.04
Windspeed (m/s)	
Rated	13
Cut-in	3.5
Cut-out	
Governing	17
Survival	Tested in excess of 25 m/s
Head Weight (kg)	125
Tower Type	Tilt-up guyed
Tower Height (m)	13 or 20
Product Life (years)	Indeterminate
Warranty (years)	2
Units sold	
On the market since	2003
Price	Price on application
Certificate	

Powerhouse Wind Ltd
(New Zealand)

3 Midland St
South Dunedin
Dunedin 9012, New Zealand

www.powerhousewind.co.nz
tinyurl.com/thinair-video
Tel: +64 3 4562288
E-mail: contact@powerhousewind.co.nz
Contact: Bill Currie

Established 2009
Distribution: Domestic,
International: Sample by arrangement
Direct from factory

thinair

Model	**Thinair 102**
Orientation	Downwind
Rated Output	2 kW
Peak Output	2.5 kW
Output Voltage (V)	180-450 VDC controller output sold with 230V 50Hz inverter or 48V battery
Generator Type	Permanent magnet, axial flux, 3 phase, direct drive
Applications	Stand Alone, Grid Connection, Direct Heating, Pumping
Controller Type	Powerhouse Wind electronic control
Overspeed Protection	Blade stall with two independent brake circuits
Blade Material	Carbon/glass fibre epoxy hybrid
Number of Blades	1
Rotor Diameter (m)	3.6
Swept Area (m^2)	10,8
Windspeed (m/s)	
Rated	10
Cut-in	2.5 to 3
Cut-out	20
Governing	2.5 to 20
Survival	80
Head Weight (kg)	75
Tower Type	Monopole Standard
Tower Height (m)	11.8 to 18
Product Life (years)	20+
Warranty (years)	5
Units sold	15
On the market since	2014
Price	EUR 10,780 Turbine, 11.8m hub height monopole, controller, 230V 3kW grid tie inverter
Certificate	

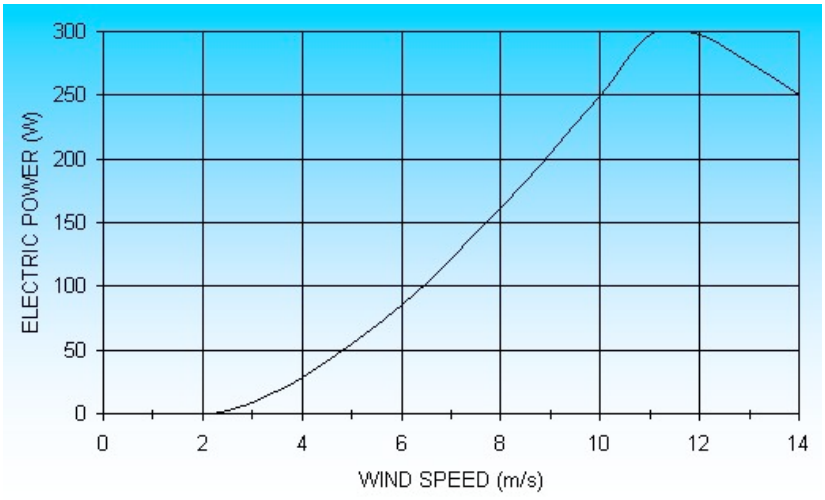
DENERTEC S.A.C.
(Peru)

Francisco de Cuellar 635,
Surco (Lima33), Lima, Peru
South America

www.denertec.com
Tel: +51-1 628-1727
E-mail: info@denertec.com
Contact: Rafael Cuba

Established 2001
Place of manufacture: Peru
Distribution: Direct from factory

Model	**WT 200**
Orientation	Upwind
Rated Output	200 W
Peak Output	300 W
Yearly Production (kWh/y)	37 (at 4.5m/s) / 57 (5.5 m/s) / 73 (6.5 m/s)
Output Voltage (V)	12, 24, 48 DC
Generator Type	Direct drive PMG
Applications	Stand Alone (battery charging), optional: Grid Tie and Water Pumping
Controller Type	Shunt, PWM (optional)
Overspeed Protection	Furling tail
Blade Material	Wood (cedar, pine)
Number of Blades	3
Rotor Diameter (m)	1.71
Swept Area (m^2)	2.3
Windspeed (m/s)	
Rated	9
Cut-in	2.5
Cut-out	None
Governing	11
Survival	32
Head Weight (kg)	30
Tower Type	Tubular
Tower Height (m)	9, 12 or 18
Product Life (years)	15
Warranty (years)	2
Units sold	4 WT 200s, 13 WT 200 Manufact Info, 2 WT & PMG Design Projects
On the market since	2003
Price	Contact us for a quotation
Certificate	



DR ZABER Ltd.
(Poland)

ul. Magazynowa 1
33-300 Nowy Sącz, Poland

www.zaber.com.pl
Tel. +48 18 415 60 21
Fax. +48 18 415 60 22
Email: biuro@zaber.com.pl
Contact: Krzysztof Ząber
Mobile: +48 664 410 357
Email: krzysztof@zaber.com.pl

Established: 20+ years in business
Distribution: Domestic and international
Direct from factory

Model	ZEFIR D7- Px- Ty	ZEFIR D10- Px- Ty	ZEFIR D14- Px- Ty	ZEFIR D21- Px- Ty
Orientation	HAWT, upwind, clockwise with active yaw and cable untwisting system			
Rated Output	3kW, 5kW	10kW, 12kW	10kW, 20kW, 25kW, 30kW, 40kW	40kW, 50kW
Peak Output	P_n +10%			
Yearly Production (kWh/y)	See the ZEFIR calculator at www.zaber.com.pl			
Output Voltage (V)	230V AC, 1~	400V AC, 3~		
Generator Type	Direct Drive Permanet Magnet Synchronous Generator			
Applications	On grid /off grid			
Controller Type	ZEFIR PLC			
Overspeed Protection	Actve pitch controll system + 2 independent disc brake callipers			
Blade Material	Reinforced fiberglass			
Number of Blades	3			
Rotor Diameter (m)	7.0	10.0	14.0	21.0
Swept Area (m^2)	38.5	78.5	153.9	346.4
Windspeed (m/s)				
Rated	7.0 (3kW) 8.8 (5kW)	8.0 (10kW) 8.8 (12kW)	6.9 (10kW) 8.0 (20kW) 8.8 (25kW) 9.6 (30kW) 10.5 (40kW)	7.8 (40kW) 8.8 (50kW)
Cut-in	2.5			
Cut-out	18.0			
Governing	$< V_r$			
Survival	II class according EN 61400-2			
Head Weight (kg)	418 ÷ 513	1018 ÷ 1096	2450 ÷ 2680	5820 ÷ 6400
Tower Type	Steel tubular monopole mast or tower			
Tower Height (m)	Tower 10.0 Mast 20.0, 25.0	Tower 12.0, 15.0 Mast 25.0	Tower 15.0, 18.0, 23.0	Tower 18.0, 25.0, 30.0, 36.0
Product Life (years)	25(125 000h calculated working time)			
Warranty (years)	5 years limited guaranty			
Units sold	5	2	2	1
On the market since	1998	2008	1998	2008
Price	18 800 ÷ 21 100	34 200 ÷ 42 100	74 700 ÷ 881 000	162 400 ÷ 207 600
Certificate	CE mark			

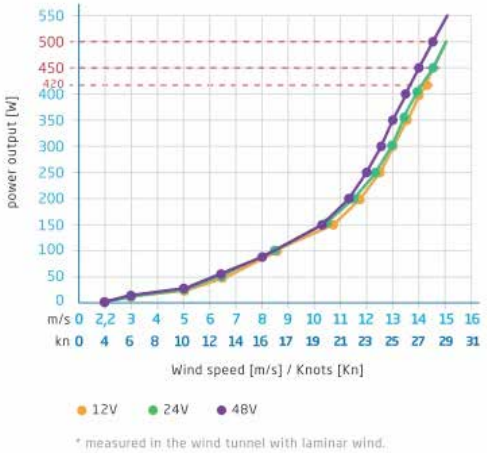
Silentwind - Rulis Eléctrica (Portugal)

Ass. e Serv. Técn. a Mat. Eléctricos, Lda.
Loteamento Industrial de Linhares, Lote 19
P-4805-486 S. Estevão de Briteiros/Guimarães

www.silentwindgenerator.com
Tel: +351 253572763
Fax: +351 253572764
E-mail: info@silentwindgenerator.com
Contact: Edgar Silveiredo

Established 2010
Distribution: Domestic, international
Direct from factory

Model	**SILENTWIND 12V / 24V**
Orientation	Upwind
Rated Output	420 W / 450 W / 500 W
Peak Output	500 W
Output Voltage (V)	12V / 24V /48V
Generator Type	PMG 3 phase AC
Applications	Stand Alone
Controller Type	Hybrid 600
Overspeed Protection	Electronic brake
Blade Material	CRP-handlaminated
Number of Blades	3
Rotor Diameter (m)	1,15
Swept Area (m²)	1,04
Windspeed (m/s)	
Rated	14
Cut-in	2.2
Cut-out	
Governing	
Survival	
Head Weight (kg)	6.8
Tower Type	
Tower Height (m)	
Product Life (years)	
Warranty (years)	3
Units sold	>1000
On the market since	4
Price	12V - 1238 € , 24V - 1278 € (wind generator, rotor blades, charge controller, nose cone, accessories)
Certificate	



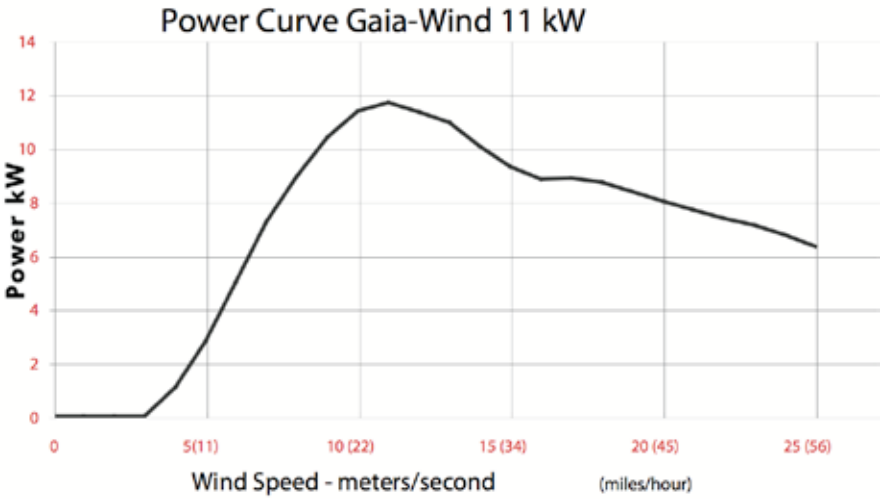
Gaia Wind
(Scotland)

100 High Craighall Road, Port Dundas,
Glasgow, G4 9UD, Scotland

www.gaia-wind.com
t: +44 (0) 845 871 4242
f: +44 (0) 141 354 1001
ukmail@gaia-wind.com

Established 1993
Distribution: Domestic, international
Direct from factory

Model	**Gaia Wind 133**
Orientation	Downwind
Rated Output	11 kW
Peak Output	10 kW
Output Voltage (V)	400 Volts @ 50 Hz (marine grade)
Generator Type	11 kW, 3 phase
Applications	
Controller Type	
Overspeed Protection	
Blade Material	glass fibre
Number of Blades	2 (on TEETER hub)
Rotor Diameter (m)	6.5 m
Swept Area (m^2)	133 m^2
Windspeed (m/s)	
Rated	9.5 m/s
Cut-in	3.5 m/s
Cut-out	> 25 m/s
Governing	
Survival	
Head Weight (kg)	nacelle and rotor - 900 kg, towers 1850/2200 kg
Tower Type	lattice or tubular (hot dip galvanized steel)
Tower Height (m)	18 m
Product Life (yrs)	20 years design life / service once yearly
Warranty (years)	
Units sold	over 500, 291 units sold in Denmark
On the market since	over 20 years
Price	
Certificate	C&F (CF20 and CF15) - MCS certified in January 2012; RISØ DTU 2009-01; UK 'Clear Skies' accreditation number WT5038



Kingspan Renewables
(UK, Scotland)

Wardhead Park
Stewarton, Ayrshire
KA3 5LH

www.kingspanwind.com
Tel: +44 (0) 1560 486 570
Fax: +44 (0) 1560 486 580
E-mail: info@kingspanwind.com
Contact: Gavin Kerr

Distribution:
Turbines available domestic,
international and direct from factory
via accredited installer network
or direct on specialist applications

Model	KW3	KW6
Orientation	Downwind, Self Regulating	
Rated Output	2.5 kW	5.2 kW
Peak Output	3.2 kW	6.1 kW
Output Voltage (V)	24V DC / 48V DC / 300V DC	48V DC / 300V DC
Generator Type	Brushless, direct drive, permanent magnet	
Applications	Direct heating, Pumping	
Stand Alone	24V DC / 48V DC	48V DC / 120V DC
Grid Connection	Yes - Single/Dual & Three Phase	
Controller Type	Rectifier, Inverter, Charge controller / Direct to heat	
Overspeed Protection	Blades pitch and cone to self regulate power intake while continuing to produce energy in high winds	
Blade Material	Glass thermoplastic composite	
Number of Blades	3	
Rotor Diameter (m)	3,9	5,6
Swept Area (m^2)	9,62	23,75
Windspeed (m/s)		
Rated	11	
Cut-in	3	
Cut-out	N/A	
Governing	N/A	
Survival	70	
Head Weight (kg)	600	1400
Tower Type	Monopole (Flanged / Taper / Hydraulic options)	
Tower Height (m)	6.5 or 11	9, 11.6, 15 and 20
Product Life (years)	25	
Warranty (years)	5	
Units sold	800	2500
On the market since	25	14
Price	from £19.000 installed	from £28.000 installed
Certificate		

Renewable Devices Group of Companies
(UK, Scotland)

AeroMarine House, 15 Roslin Glen
Roslin Country Park, Midlothian
EH25 9PX
Scotland, UK

www.renewabledevices.com
Tel: +44 (0) 131 448 0660
E-mail: info@renewabledevices.com

Established 2000
Distribution: Domestic, international
Direct from factory

Model	**SWIFT Wind Energy System**
Orientation	Upwind horizontal axis with patented acoustic diffuser ring
Rated Output	1.5 kW
Peak Output	1.5 kW
Output Voltage (V)	Territory Specific
Generator Type	Brushless PMG
Applications	Stand Alone, Grid Connection, Direct Heating
Controller Type	SWIFT Inverter
Overspeed Protection	Mechanical and electrical safety systems / Dynamic brake
Blade Material	Injection moulded nano-fibre reinforced polymer
Number of Blades	5
Rotor Radius (m)	1.0m / 1.04m Diffuser
Swept Area (m^2)	3.4
Windspeed (m/s)	
Rated	12
Cut-in	3.4
Cut-out	22
Governing	14
Survival	20
Head Weight (kg)	37kg (52kg including rotor assembly)
Tower Type	Custom designed mounting system for building mounted application. Stand alone wooden pole.
Tower Height (m)	
Product Life (years)	20
Warranty (years)	2
Units sold	1500
On the market since	13
Price	Site & country dependent, please contact Renewable Devices for prices
Certificate	Turbine class: BS EN 61400 Class 2 / Acoustic emissions: <35dB [A] [CE Certified BS EN 61400]

Scoraig Wind Electric
(UK, Scotland)

www.scoraigwind.com
Contact: Hugh Piggott
E-mail: hugh@scoraigwind.co.uk

Established 1984
Distribution of manual to build a wind turbine via the Scoraig website

Model	1200	1800	2400	3000	3600	4200
Orientation	Upwind					
Rated Output	200 W	350 W	700 W	800 W	1 kW	1 kW
Peak Output	Can surge to roughly double the rated					
Output Voltage (V)	12, 24, 48 V battery or grid tied inverter					
Generator Type	Axial flux neodymium permanent magnet					
Applications	Stand Alone, Grid Connection, Direct Heating					
Controller Type	None included					
Overspeed Protection	Furling tail					
Blade Material	Wood					
Number of Blades	3					
Rotor Diameter (ft)	4	6	8	10	12	14
Swept Area (m^2)	1.2	1.8	2.4	3	3.6	4,2
Windspeed (m/s)	1.13	2.54	4.52	7.07	10.18	13.85
Rated	12	11		10		9
Cut-in	3					
Cut-out	None					
Governing	At around rated windspeed					
Survival	Unknown					
Head Weight (kg)	Variable					
Tower Type	Usually a guyed tower					
Tower Height (m)	Depends on site					
Product Life (years)	Variable					
Warranty (years)	None					
Units sold	N/A					
On the market since	N/A					
Price	£12.00 Manual to build a wind turbine, including postage in the UK £13.00 including postage in Europe £14.00 including postage Worldwide					
Certificate						

African Wind Power
(South Africa)

www.africanwindpower.com
Tel: +27 84 4444118
Fax: +27 84 4444118
E-mail: wtdist@mweb.co.za
Contact: Oloff Smyth

Established 1986
Distribution: Domestic, international
Direct from factory

Model	AWP 3.7	AWP 4.2
Orientation	Upwind	
Rated Output	1.5 kW at 48V 2 kW in 110/220V Inverter Grid-Connect System	3.5 kW at 48V 4 kW in 110/220V Inverter Grid-Connect System
Peak Output		
Output Voltage (V)	3 Phase 'Wild' AC, 0-250Hz, 12V, 24V, 36V, 48V, 96V, 110/220V	3 Phase 'Wild' AC, 0-200Hz, 48V, 96V, 110/220V
Generator Type	30 Pole (Ceramic Magnet) Rotor, Laminated Axial Stator	
Applications	Stand Alone, Grid Connection, Direct Heating, Pumping	
Controller Type	Diversion, turbine side, high side switching	
Overspeed Protection	Side Furling Gravity Return Yaw System	
Blade Material	GRP Composite design	
Number of Blades	3	
Rotor Diameter (m)	3.7	4,2
Swept Area (m^2)	10.75	13,86
Windspeed (m/s)		
Rated	11	
Cut-in	3	
Cut-out	15	
Governing	9	
Survival	60	
Head Weight (kg)	120	150
Tower Type	Tilt Up Guyed	
Tower Height (m)	8, 14, 20 and 26	14, 20 and 26
Product Life (years)	15	
Warranty (years)	2 (5 years extended)	
Units sold	>700	
On the market since	>12	
Price	Contact African Wind Power for a quote	
Certificate	The AWP3.7 is manufactured in compliance with IEC Standards. Statement of Compliance with CE Certification	

e160i

e400nb

Kestrel Renewable Energy (South Africa)

PO Box 3191
North End, Port Elizabeth

www.kestrelwind.co.za
Tel: +27 41 401 2500
Fax: +27 41 394 8183
E-mail: kestrel.wind@eveready.co.za
Contact: Leon Gouws

Established 2000
Distribution: Domestic, international

Model	e160i	e230i	e300i	E400nb
Orientation	HAWT Upwind			
Rated Output	600 W	800 W	1 kW	2500 (at battery)
Peak Output	700 W			
Output Voltage (V)	110	110	48/110	48, 110, 250
Generator Type	Permanent-magnet Axial flux brushless			
Applications	Stand alone battery charging, Grid connected with approved inverter, Hybrid systems Water Pumping			
Controller Type	Shunt diversion or MPPT			MPPT
Overspeed Protection	Rotor Turbulence	Pitch Control		
Blade Material	Epoxy resin fibre glass			
Number of Blades	5	3		
Rotor Diameter (m)	1,6	2,3	3	4
Swept Area (m^2)	2	4,15	7.07	12.57
Windspeed (m/s)				
Rated	13,5	12,5	10,5	11
Cut-in	2,5	2,3	2,5	3
Cut-out	n/a			
Governing	n/a			11
Survival	>40			70
Head Weight (kg)	30	45	75	250
Tower Type	Monopole			
Tower Height (m)	12,00			12 to 18
Product Life (years)	20			
Warranty (years)	2 years (extendable)			
Units sold	906	266	654	480
On the market since (years)	14	10	10	6
Price	Contact Kestrel Wind Turbines for current cost information			
Certificate				

Winglette Wind Machines (South Africa)

Location and deliveries:
9 Badenhorst Street,
Harrismith, 9880
Mailing address:
P.O.Box 583,
Harrismith, 9880

www.Winglette.com
Tel: +27 586231836
+27 827738496
Fax: +27 58 622 3544
E-mail: info@winglette.com

Established 1996
Distribution: Domestic, international
Direct from factory

Model	W03	W05
Orientation	Upwind	
Rated Output	3 kW	5 kW
Peak Output	3.6 kW	5.4 kW
Output Voltage (V)	24, 36, 48, 150, 240	48, 240
Generator Type	PMG	
Applications	Stand Alone, Grid Connection, Direct Heating, Pumping	
Controller Type	Dump resistor	
Overspeed Protection	Furling tail	
Blade Material	Glassfibre, GRP	
Number of Blades	3	
Rotor Diameter (m)	3.6	4.0
Swept Area (m^2)	10.2	12.6
Windspeed (m/s)		
Rated	11.7	
Cut-in	3.4	
Cut-out	12	
Governing	11.7	
Survival	42	
Head Weight (kg)	85	115
Tower Type	Lattice	
Tower Height (m)	9, 12, 15, 18, 24	12, 15, 18, 24
Product Life (years)	25	
Warranty (years)	2	
Units sold	>120	50
On the market since	10	
Price	Contact Winglette for current price information	
Certificate		

Bornay Windturbines (Spain)

P.I. RIU, Cno. del Riu, s/n
03420 Castalla (Alicante)

www.bornay.com
Tel: +34 965 560 025
+34 966 543 077
Fax: +34 965 560 752
E-mail: bornay@bornay.com

Established 1973
Distribution: Domestic, international

Bornay

Model	Bornay 600	Bee 800	Bornay 1500	Bornay 3000	Bornay 6000
Orientation	Upwind	Downwind	Upwind		
Rated Output	600 W	800 W	1.5 kW	3 kW	6 kW
Peak Output	600 W	800 W	1.5 kW	3 kW	6 kW
Output Voltage (V)	12, 24, 48		24, 48, 120		48, 120
Generator Type	3-phase PMG				
Applications	Stand Alone, Pumping	Stand Alone	Stand Alone, Grid Connection, Pumping		
Controller Type	Battery charge controller / Grid connection inverter				
Overspeed Protection	Automatic tilt up	Stall	Automatic tilt up		
Blade Material	Fiberglass & carbon fiber	GRP	Fiberglass & carbon fiber		
Number of Blades	2	5	2		3
Rotor Diameter (m)	2	1,75	2,86	4	4
Swept Area (m^2)	3.14	2.75	6.42	12,56	12,56
Windspeed (m/s)					
Rated	11	12			
Cut-in	3.5				
Cut-out	None				
Governing	13	-	14		
Survival	60				
Head Weight (kg)	45	29	49	107	125
Tower Type	None				
Tower Height (m)	None				
Product Life (years)	20				
Warranty (years)	3				
Units sold	More than 5000 units				
On the market since	17	4	12	12	10
Price (EUR)	3 200	3 500	4 250	6 400	11 000
Certificate					

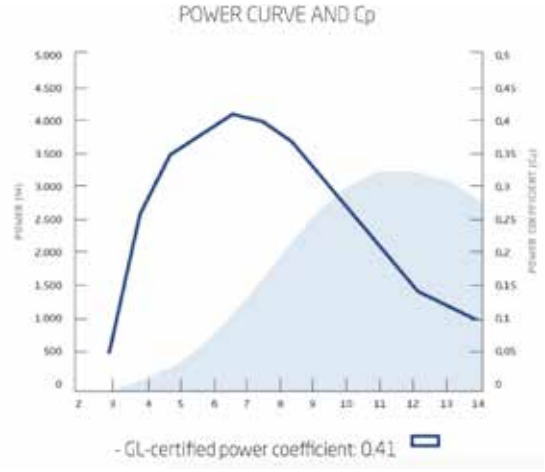
ENNERA
(Spain)

Apatta-Erreka
C/Uzturre 1 Office 209
20400 Ibarra (Gipuzkoa)

www.ennera.com
Tel: +34 943 028 676
E-mail: commercial@ennera.com

Established 2007
Turbines available domestic, international and direct from factory

Model	**WINDERA S**
Orientation	Upwind
Rated Output	3,2 kW
Peak Output	5,5 kW
Output Voltage (V)	230
Generator Type	Direct drive, PMG
Applications	Grid Connection
Controller Type	Speed variable through grid converter
Overspeed Protection	Electronic control and centrifugal brake
Blade Material	Carbon fibre, glass fibre and epoxy resin
Number of Blades	3
Rotor Diameter (m)	4,36
Swept Area (m²)	12,5
Windspeed (m/s)	
Rated	11
Cut-in	3
Cut-out	25
Governing	25
Survival	52,5
Head Weight (kg)	160
Tower Type	Free-standing tubular monopole
Tower Height (m)	12
Product Life (years)	20
Warranty (years)	2
Units sold	5
On the market since	3
Price	14,000,00 € EXW price for nacelle + tower (12 meters) + converter + remote monitoring
Certificate	Class III IEC 61400-2, MCS, from the UK, and Class NK, from Japan

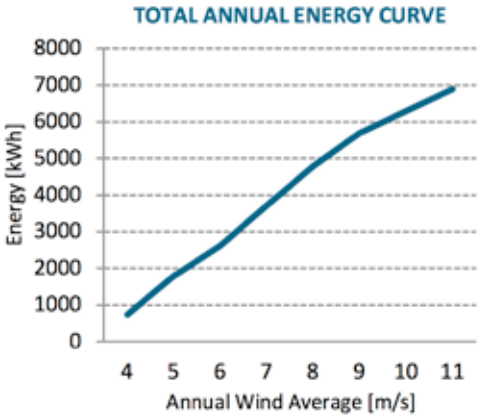


KLIUX ENERGIES
(Spain)

C/ Los Almendros 14
Polígono Industrial Cantabria II
26009 Logroño (La Rioja)

www.kliux.com
Tel: +34631882665
E-mail: info@kliux.com

Model	**KLIUX ZEBRA**
Orientation	Vertical
Rated Output	1,8 kW
Peak Output	2,2 kW
Yearly Production (kWh/y)	736 (4 m/s); 1789 (5 m/s); 2616 (6 m/s)
Output Voltage (V)	230 Vac. (± 15%)
Generator Type	Three-phase PMG
Applications	On grid and off grid connection
Controller Type	MPPT
Overspeed Protection	Resistance, electronic system
Blade Material	Expanded polyurethane
Number of Blades	2
Rotor Diameter (m)	2,36
Swept Area (m^2)	6
Windspeed (m/s)	
Rated	11
Cut-in	3
Cut-out	N/A
Governing	N/A
Survival	N/A
Head Weight (kg)	212
Tower Type	Steel mast
Tower Height (m)	Starting at 6m
Product Life (years)	25
Warranty (years)	3
Units sold	18
On the market since	3
Price	Contact KLIUX ENERGY for more information
Certificate	Certifications: ISO: 9001, 14001 y CE. Certifications in progress: IEC 61400 -2/ -11/ -12, AWEA 9.1, BWEA 2009 Standard.



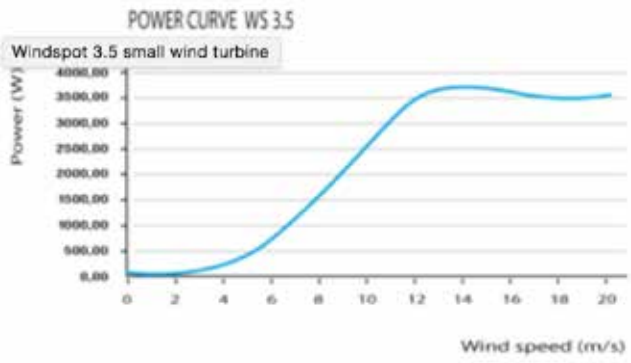
Sonkyo Energy (Spain)

Pol. De Raos P. 12 Nave B3
39600 Santander

www.windspot.es
Tel: +34 942319192
Fax: +34 942319193
E-mail: info@sonkyoenergy.com

Established 1984
Distribution: Domestic, International and direct from factory

Model	WINDSPOT 1,5	WINDSPOT 3,5	WINDSPOT 7,5
Orientation		Upwind	
Rated Output	1.5 kW	3.5 kW	7.5 kW
Peak Output	2.4 kW	4.8 kW	9 kW
Output Voltage (V)	24, 48	48, 110, 220	110, 220
Generator Type		PMG	
Applications	Stand Alone, Pumping	Stand Alone, Grid Connection, Pumping	Grid Connection
Controller Type	PWM		
Overspeed Protection	Passive centrifugal variable pitch system with shock absorber		
Blade Material	GRP		
Number of Blades	3		
Rotor Diameter (m)	4,1	4,1	6,3
Swept Area (m²)	11,33	11,33	31,1
Windspeed (m/s)			
Rated	11		
Cut-in	3		
Cut-out	NONE		
Governing	12 to 13		
Survival	60		
Head Weight (kg)	155	185	420
Tower Type	lattice and mechanical lay down system		
Tower Height (m)	12, 18	12, 18, 21	12, 18, 21
Product Life (years)	25		
Warranty (years)	5		
Units sold	200	600	50
On the market since	6	6	3
Price	Contact Sonkyo Energy for current price information.		
Certificate	ISO 9001:2008; JSWTA0001		



Zytech Aerodyne
(Spain/USA/China)

Zytech Aerodyne
Zueco Y Technology S.L.
Pol. Industrial Centrovía
C/ R. Janeiro, 12
E-50198 La Muela (Zaragoza)

www.zytechaerodyne.com
Tel. +34 976 141819
Fax +34 976 141818
spain@zytechaerodyne.com

Established 1992
Distribution: Domestic, international
Direct from factory

Model	Sioux 400	Sioux 600	Sioux 1000	Sioux 2000	Sioux 3000
Orientation					
Rated Output	400 W	600 W	1000 W	2000 W	3000 W
Peak Output	500 W	750 W	1200 W	2500 W	3500 W
Output Voltage (V)	DC 12/24	DC 24/48		Grid-off DC48/110 or Grid-on AC110/220	
Generator Type	Brushless 3 Phase/Permanent Neodymium Magnet				
Applications	Stand Alone; Hybrid System, etc.			Stand Alone; Hybrid System, Grid-Tie System etc.	
Controller Type	MPPT or PWM				
Overspeed Protection	Electromagnetic & Blade Aerodynamic Braking				
Blade Material	Reinforced Nylon Glass-fiber/carbon fiber				
Number of Blades	3	5			
Rotor Diameter (m)	1.5	1.75	1.96	2.8	3.05
Swept Area (m^2)	1.8	2.4	3	6.15	7.3
Windspeed (m/s)					
Rated	12				
Cut-in	3,0m/s(6,7mph)2, 5m/s(5,6mph)	2,5m/s(5,6mph)	3,0m/s(6,7mph)		
Cut-out					
Governing					
Survival	50				60
Head Weight (kg)	20	25	28	68	70
Tower Type					
Tower Height (m)					
Product Life (years)	15				
Warranty (years)	3				
Units sold					
On the market since					
Price					
Certificate	ISO9001:2000; CE; RoHS; ETL				

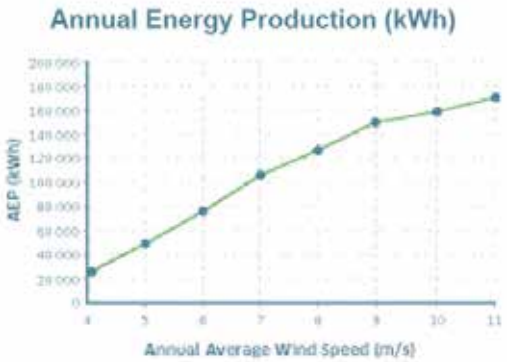
GiroVind Energi AB
(Sweden)

Andgatan14
SE-26436 Klippan
Manufacture adress:
Gamlavägen 5, Östra Ljungby, Sweden

www.winden.se
Tel: +46 (0) 732 613 888
E-mail: info@winden.se
Contact: Jörgen Bjerknäs

Established 2008
Distribution: Domestic, international
Direct from factory

Model	**WindEn 45**
Orientation	HAWT
Rated Output	43,5 kW
Peak Output	45 kW
Output Voltage (V)	3-phase, 400 VAC, 50 Hz
Generator Type	Asynchronous induction generator
Applications	Grid Connection
Controller Type	PLC
Overspeed Protection	1. Stall regulation 2. Fail safe disc brake 3. Blade tip brake
Blade Material	Glass-reinforced plastic, GRP
Number of Blades	3
Rotor Diameter (m)	14.6
Swept Area (m²)	166
Windspeed (m/s)	
Rated	13
Cut-in	3.5
Cut-out	20
Governing	
Survival	52.5
Head Weight (kg)	2500
Tower Type	Self supporting lattice & tubular tower
Tower Height (m)	18-36
Product Life (years)	20 design life
Warranty (years)	2
Units sold	51
On the market since	7
Price	Contact for price information
Certificate	



Windon AB
(Sweden)

Hajla 5
590 22 VÄDERSTAD, Sweden

www.windon.se
Tel: +46 (0)144301110
E-mail: info@windon.se

Established 2007
Distribution: Domestic, international
Direct from factory

windon
Ren energi på dina villkor

Model	**10kW**
Orientation	
Rated Output	12.5 kW
Peak Output	13.3 kW
Output Voltage (V)	240VAC, 3-phase
Generator Type	Custom
Applications	Grid Connection
Controller Type	Custom PLC
Overspeed Protection	Yes
Blade Material	Fibreglass
Number of Blades	3
Rotor Diameter (m)	8
Swept Area (m^2)	50.24
Windspeed (m/s)	
Rated	10
Cut-in	2
Cut-out	18
Governing	
Survival	
Head Weight (kg)	1000
Tower Type	Stand alone monopole, different towers available.
Tower Height (m)	12-16
Product Life (years)	20
Warranty (years)	2-10
Units sold	10
On the market since	5
Price	Contact company for prices
Certificate	

Aventa
(Switzerland)

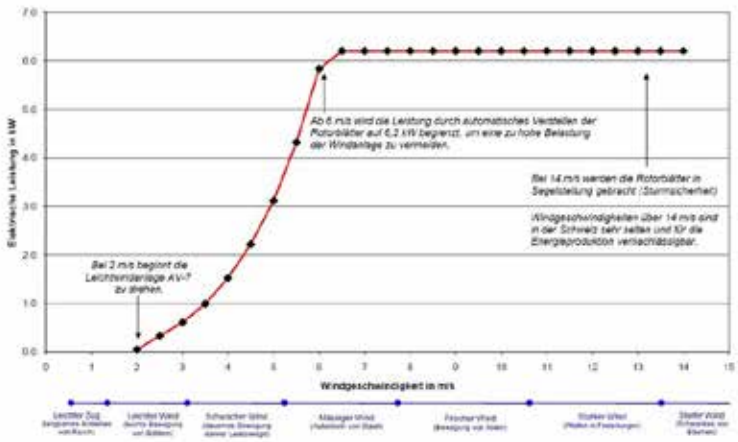
Leichtwindanlagen® zur Kesselschmiede 29
CH-8400 Winterthur

www.aventa.ch
Tel: +41 (0)76 465 44 73
E-mail: info@jura-energie.ch
Tel.: +41 (0) 32 961 17 57
Contact: Jean Oppliger

Distribution: Domestic, international

Model	**AV-7 LoWind**
Orientation	Upwind
Rated Output	6.5 kW
Peak Output	
Output Voltage (V)	3 x 400 V
Generator Type	PMG
Applications	
Controller Type	
Overspeed Protection	
Blade Material	
Number of Blades	3
Rotor Diameter (m)	12.9 m
Swept Area (m²)	129
Windspeed (m/s)	
Rated	6.0 m/s
Cut-in	2.0 m/s
Cut-out	14.0 m/s
Governing	
Survival	42 m/s
Head Weight (kg)	Nacelle 700 kg, generator 470 kg
Tower Type	Tubular tower, no guying
Tower Height (m)	18 m
Product Life (yrs)	
Warranty (years)	
Units sold	
On the market since	2002
Price	
Certificate	

Die Leistungskennlinie der Leichtwindanlage AV-7



BOWIND-1200

Boltun Corporation (Taiwan)

No. 1, Hsin Tien 2nd St.,
Jen-Der Hsiang, Tainan Hsien
P.O. Box: 275 Tainan, Taiwan

www.boltun.com/energy
Tel: +886-6-2794013
Fax: +886-6-2703413
E-mail: sales@boltun.com

Model	BOWIND-0300	BOWIND-0600	BOWIND-1200
Orientation	Upwind		
Rated Output	300 W	600 W	1.2 kW
Peak Output	350 W	800 W	1.4 kW
Output Voltage (V)	12 DC	24 DC	48 DC
Generator Type	Synchronous, 3-phase, Permanent Magnet Generator		
Applications	Stand Alone	Stand Alone, Grid Connection	
Controller Type	Auto safety control		
Overspeed Protection	Electronic stall regulation	Electronic stall regulation & auto furl	
Blade Material	PP+GF		
Number of Blades	3		
Rotor Diameter (m)	1,32	1,70	2,30
Swept Area (m^2)	1,37	2,27	4,15
Windspeed (m/s)			
Rated	12		
Cut-in	2,5		
Cut-out	none		
Governing	No	14	
Survival	60		
Head Weight (kg)	11	20	27
Tower Type	Guyed or self supported		
Tower Height (m)	6 - 30		
Product Life (years)	20		
Warranty (years)	2		
Units sold			
On the market since	5		
Price	Contact Boltun for current cost information.		
Certificate	EN 610000-6-4: 2007		

GRESA-GROUP Company (Ukraine)

03058 Kiev,
PO box 118
Nezhinskaya St., 29b

http://ggc.com.ua
Tel: +38 (044)401-11-88
+38 (044)457-12-87
Fax: +38 (044)401-10-88
E-mail: altenergy@ggc.com.ua
info@ggc.com.ua

Established 1991
Domestic and international
distribution via dealers network

Model	FLAMINGO AERO-3.1	FLAMINGO AERO-4.4	FLAMINGO AERO - 6.7	FLAMINGO AERO WES - 20
Orientation	Upwind			
Rated Output	800 W	1.6 kW	4 kW	20 kW
Peak Output	1.2 kW	2 kW	5 kW	23 kW
Output Voltage (V)	48			
Generator Type	PMG			
Applications	Stand Alone, Grid Connection, Direct Heating			
Controller Type	Charge controller with PDM regulation			Automatic control
Overspeed Protection	Aeromechanic, electrodynamic, and manual stop			
Blade Material	GRP			
Number of Blades	3			
Rotor Diameter (m)	3,1	4,4	6,7	12,5
Swept Area (m^2)	7,5	15,2	35,2	122,7
Windspeed (m/s)				
Rated	8			9
Cut-in	2,5			3
Cut-out	50			25
Governing				
Survival				
Head Weight (kg)	55	122	186	800
Tower Type				
Tower Height (m)	17	20	20 - 26	20 - 30
Product Life (years)	20			
Warranty (years)	1 - 3			
Units sold	500	60	6	3
On the market since	13	5	3	3
Price	$3 100	$4 650	$10 000	$32 000
	Delivery Set includes: FLAMINGO AERO - 3.1, 4.4, 6.7: Wind turbines are equipped with control system - charge controller, on-board controller, remote control information. FLAMINGO AERO WES - 20: Wind turbines are equipped with automatic control system and system pitch-control.			
Certificate				

Wind7

Wind10

WindElectric LTD
(Ukraine)

02132, Kiev-132,
Sadovaya street 53A,
House #126 Ukraine

57400 Sarrebourg, France
45, Route de Verdun

www.windelectric.ua
Tel: +38-044-467-77-88 (Ukraine)
Tel: +37-257-88-44-44 (Estonia)
Tel: +33-602-39-82-19 (France)
Fax: +38-044-467-77-89 (Ukraine)
E-mail: info@windelectric.kiev.ua

Established 1998
Distribution: Domestic, international
Direct from factory

Model	Wind2	Wind4	Wind7	Wind10	Wind16
Orientation	Upwind				
Rated Output	2 kW	4 kW	7 kW	10 kW	16 kW
Peak Output	2.5 kW	5 kW	8 kW	12 kW	20 kW
Output Voltage (V)	0-285				
Generator Type	3-phase				
Applications	Stand alone, grid connection				
Controller Type	MPPT with microcontroller management, with LCD display and GSM modem				
Overspeed Protection	Electrodynamic				
Blade Material	Aluminium				
Number of Blades	3				
Rotor Diameter (m)	3,4	3,9	4,8	6,2	7,5
Swept Area (m^2)	9,07	11,94	18,08	30,18	44,16
Windspeed (m/s)					
Rated	12				
Cut-in	2				
Cut-out					
Governing	25				
Survival	50				
Head Weight (kg)	54	131	175	275	650
Tower Type	Monopole				
Tower Height (m)	9 to 27			12 to 27	
Product Life (years)	15 to 20				
Warranty (years)	5				
Units sold	380	170	40	35	35
On the market since	9	9	5	5	4
Price	2 100 €	3 100 €	4 100 €	7 100 €	10 100 €
Certificate					

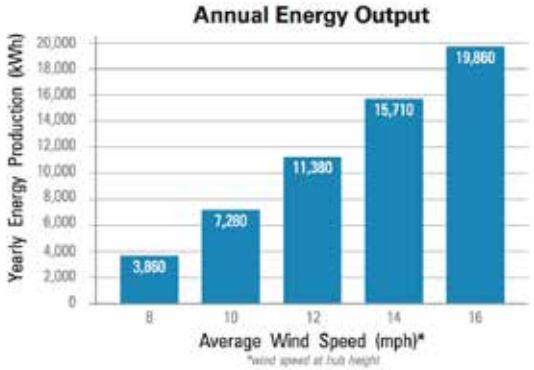
Bergey Windpower (USA)

2200 Industrial Blvd.
Norman, OK 73069

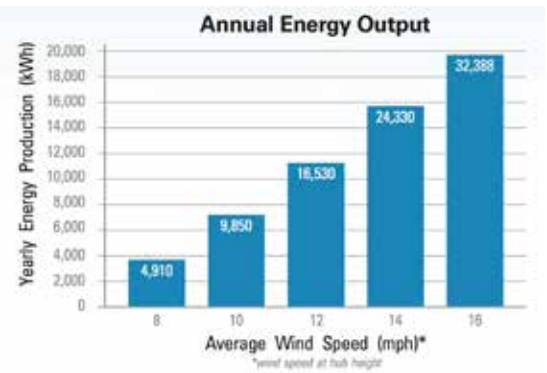
www.bergey.com
Tel: +1-405-364-4212
Fax: +1-405-364-2078
E-mal: sales@bergey.com
Contact: Scott Merrick

Established: 1981
Distribution: Domestic, International and Factory direct if no distributor available

Model	BWC XL.1	BWC Excel 6	BWC Excel-R	BWC Excel 10
Orientation	Upwind			
Rated Output	1 kW	5.5 kW	7.5 kW	10 kW
Peak Output	1.4 kW	6.2 kW	9 kW	12.5 kW
Output Voltage (V)	24, 48 DC	220-240 AC, 50/60 Hz	48, 120, 240 DC	220-240 AC, 50/60 Hz
Generator Type	Direct Permanent Magnet	Neo Permanent Magnet	Direct Permanent Magnet	Direct Permanent Magnet
Applications	Stand Alone	Grid Connection, no batteries req.	Stand Alone	Grid Connection, no batteries req.
Controller Type	Charge regulator	Charge regulator or inverter		Sync. inverter
Overspeed Protection	Autofurl			
Blade Material	Fiberglass			
Number of Blades	3			
Rotor Diameter (m)	2.5	6,2	6.7	7
Swept Area (m²)	4.9	30,2	37.5	38.5
Windspeed (m/s)				
Rated	12	11		11,6
Cut-in	3	2.5	3.6	2.2
Cut-out	None			
Governing	13	14	15	
Survival	54	60		
Head Weight (kg)	34	350	480	
Tower Type	Guyed tilt	Guyed lattice, tilt-up, non-guyed lattice, monopole		
Tower Height (m)	18, 24, 30	18-49		
Product Life (years)	30		30-50	
Warranty (years)	5		10	
Units sold	> 5000	10	> 500	> 1700
On the market since	13	3	30	
Price	3 560	21 995	26 870	31 770
	Prices include regulators and inverters			
Certificate		SWCC		SWCC, EN45011



Excel 6



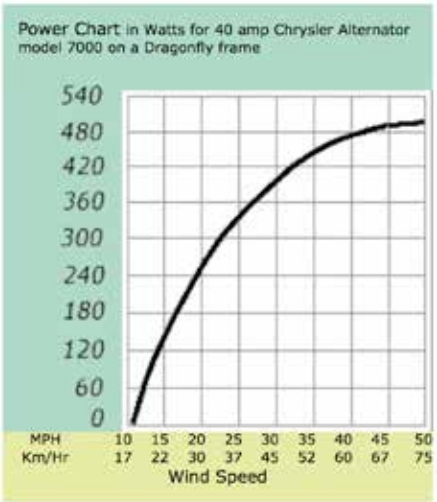
Excel 10

DragonflyPower
(USA)

www.dragonflypower.com
E-mail: info@dragonflypower.com
Contact: Bill Cornelius

Established: 1979
Distribution: Distributes manual to self-built wind turbine directly from website

Model	**Dragonfly**
Orientation	Upwind
Rated Output	Depends on selected drive configuration and generator/alternator, around 140 - 180 W @ 6.5 m/s
Peak Output	Depends on selected generator/alternator size; 500 - 800 W
Output Voltage (V)	Any
Generator Type	Almost any alternator or generator
Applications	Stand Alone
Controller Type	
Overspeed Protection	Horizontal furling - looks like a dragonfly
Blade Material	Wood and stainless steel
Number of Blades	3
Rotor Diameter (m)	2.74
Swept Area (m^2)	5.6
Windspeed (m/s)	
Rated	6.5
Cut-in	4.5 with standard automotive electronics, less with user tailored components
Cut-out	
Governing	Constant
Survival	>36
Head Weight (kg)	23
Tower Type	User supplied masthead
Tower Height (m)	Height is site dependent
Product Life (years)	Depends on maintenance; locally available repair parts
Warranty (years)	No warranty on other peoples' construction
Units sold	>500 plans have been sold
On the market since	28
Price	Plans: $10.00 available by e-mail as HTML format; Blade balance kit $15.00; Kit blade set $100.00 rough cut blades - not finished; Finished blade set $200.00 all blades unbalanced and unpainted; 1/3 blade kit or finished set
Certificate	



Otherpower
(USA)

2606 West Vine
Fort Collins, CO 80521

www.otherpower.com
Tel: +1 877-944-6247 (toll-free in USA)
or +1 970-484-7257
E-mail: info@otherpower.com
Contact: Dan Bartmann, Dan Fink

Established: 1999
Distribution: Domestic, international
Direct from factory

Model	**10 foot axial flux wind turbine kit**
Orientation	Upwind
Rated Output	800 W
Peak Output	1.5 kW
Output Voltage (V)	12, 24, or 48
Generator Type	Axial flux 3-phase permanent magnet alternator
Applications	Stand Alone or Grid Tied
Controller Type	Diversion load, not included
Overspeed Protection	Furling tail
Blade Material	Western red cedar
Number of Blades	3
Rotor Diameter (m)	3.05
Swept Area (m^2)	7.30
Windspeed (m/s)	
Rated	11.18
Cut-in	3.13
Cut-out	None
Governing	11.18
Survival	38
Head Weight (kg)	37
Tower Type	Customer supplied
Tower Height (m)	Customer supplied
Product Life (years)	20
Warranty (years)	2 year limited
Units sold	> 318
On the market since	15
Price	$2 250
Certificate	

Selsam Innovations (USA)

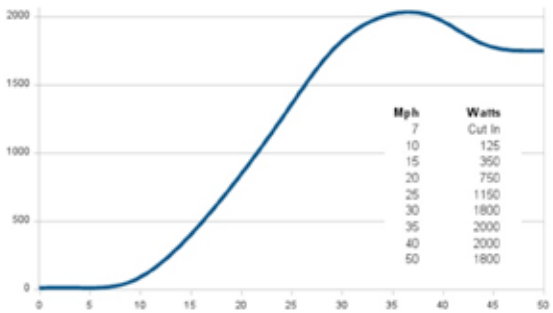
Selsam Innovations
14045 Mission St.
Oak Hills, California 92344 USA

www.selsam.com
Tel: +1 714 992 5594
Cel: +1 714 749 3909
E-mail: Doug@Selsam.com
Contact: Doug Selsam

Established: 1995
Distribution: Available direct from factory;
www.Selsam.com
www.dualrotor.com

Model	**SuperTwin**
Orientation	Dual rotor, Horizontal-Axis
Rated Output	1.2 kW
Peak Output	1.5 kW
Output Voltage (V)	The SuperTwin is available in 12-V, 24-V, 36-V 48-V, 96-V, 120-V, and 200-V versions. A wide range, for battery-charging or grid-tie-inverter use
Generator Type	3 phase PMA
Applications	Stand Alone and Grid Connection
Controller Type	Morningstar Tristar TS-60, 60 amp controller (or equiv.) for 24 or 48 V; or Grid-Tie Inverter
Overspeed Protection	Side-furling using inclined tail pivot
Blade Material	Wood or composite available
Number of Blades	2 per rotor, 2 rotors: 4 blades total
Rotor Diameter (m)	3 (10 feet)
Swept Area (m^2)	7.1 (per one rotor)
Windspeed (m/s)	
Rated	13
Cut-in	3.5
Cut-out	None
Governing	13
Survival	36
Head Weight (kg)	43
Tower Type	Owner's choice
Tower Height (m)	Owner's choice, dual rotor offers good performance at lower height
Product Life (years)	Unknown
Warranty (years)	5
Units sold	
On the market since	
Price	$3000; 10-feet (3m) diameter, $3200; 12-feet (3.6m) diameter (low wind speed version) Contact Selsam Innovations for further details
Certificate	

ST 2.0 ***California SuperTwin***™ Dual-Rotor 2.0 kW Wind Turbine
Rated Power: 2 kilowatts at over 30 mph



Urban Green Energy
(USA)

330 W 38th Street, Suite 1103
New York, NY 10018

www.urbangreenenergy.com
Tel: +1 917 720 5685
+1 877 586 6488
Fax: +1 917 536 9957
E-mail: info@urbangreenenergy.com
Contact: Ann Amarga

Established: 2008
Distribution: Domestic and International

Model	VisionAIR3	VisionAIR5	UGE9M
Orientation	VAWT	VAWT	VAWT
Rated Output	1 kW	3,2 kW	10 kW
Peak Output			
Output Voltage (V)	270 VDC Off-grid 530 VDC Grid-tie	270 VDC Off-grid 530 VDC Grid-tie	110,120,208, 220, 230, 240V 530 VDC Grid-tie
Generator Type	3-Phase PMG	3-Phase PMG	3-Phase PMG
Applications	Grid-compatible	Grid-compatible	Grid-compatible
Controller Type	Electronic	Electronic	Electronic
Overspeed Protection	Electronic	Electronic	Electronic
Blade Material	Fibreglass	Fibreglass	Fibreglass
Number of Blades	3	3	3
Rotor Diameter (m)	1,8	3,2	6,4
Swept Area (m^2)	3,2	5,2	9,6
Rotor Height (m)	5,76	16,6	61,4
Windspeed (m/s)			
Rated	11	11	12
Cut-in	<4	3,5	3,5
Cut-out	20	20	30
Governing			
Survival	50	50	50
Head Weight (kg)	274	756	4900
Tower Type	Monopole	Monopole	Monopole
Tower Height (m)			
Product Life (years)	20	20	20
Warranty (years)			
Units sold			
On the market since	3	4	5
Price	Prices vary, contact Urban Green Energy.	Prices vary, contact Urban Green Energy.	Prices vary, contact Urban Green Energy.
Certificate	UL 1004/CSA C22.2CE	IEC 61400-11 / IEC 61400-12	

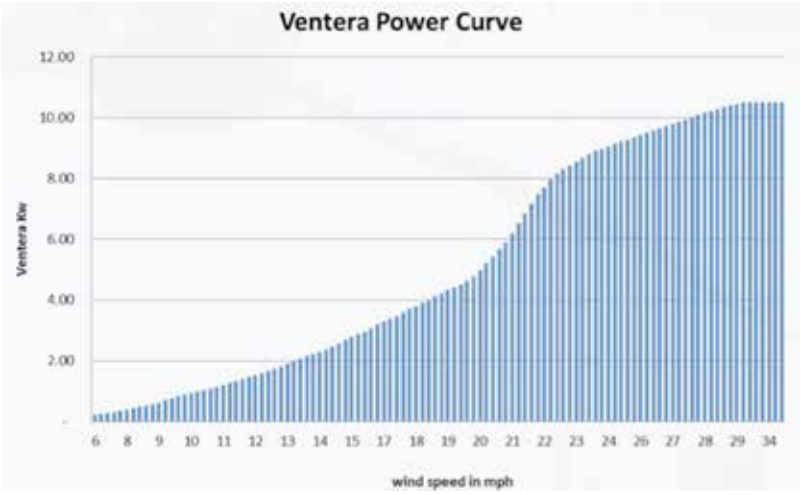
VENTERA Energy Corporation (USA)

5511 Waseca Industrial
Rd. WHSE#100
Duluth, MN 55807

www.venteraenergy.com
Tel: +1 218-624-4040
E-mail: info@venterawind.com
Contact: Manny Umpierre

Established: 2006
Distribution: Domestic, Direct from factory

Model	**VT10**
Orientation	Downwind
Rated Output	10 kW
Peak Output	11.5 kW
Output Voltage (V)	220 Volts AC
Generator Type	PMG
Applications	Grid connection
Controller Type	
Overspeed Protection	Blade furling (outer half)
Blade Material	Glass fiber engineered polypropylene
Number of Blades	3
Rotor Diameter (m)	6.7
Swept Area (m^2)	35
Windspeed (m/s)	
Rated	13
Cut-in	2.7
Cut-out	No cut-out
Governing	13
Survival	55
Head Weight (kg)	227
Tower Type	3-legged, self-supporting, fold-over (hinged at base), tapered leg, lattice with Ventera top adapter
Tower Height (m)	11, 14, 18, 21, 25
Product Life (years)	30
Warranty (years)	5
Units sold	110
On the market since	6
Price	Wind Turbine: $12 800; CSA Certified Hybrid Inverter: $8 400; UL Certified Inverter: $13 000; Towers: from $10 000 to $20 400
Certificate	



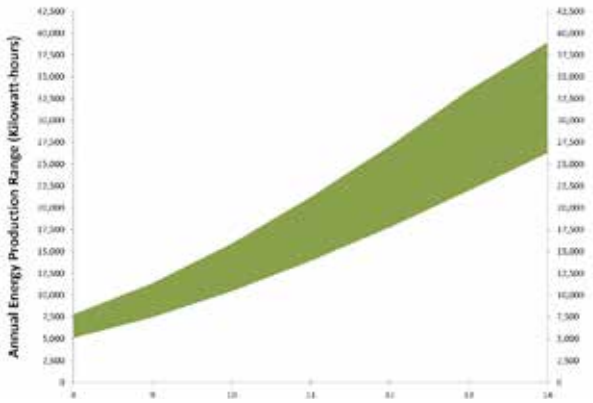
Wind Turbine Industries Corp. (USA)

16801 Industrial Circle SE
Prior Lake, MN. 55372

www.windturbine.net
Tel: +1 (952) 447-6064
Fax: +1 (952) 447-6050
E-mail: wtic@windturbine.net
Contact: Chad Palmer

Established: 1986
Distribution: Systems available through Dealer Network

Model	**Jacobs 31-20**
Orientation	Upwind
Rated Output	20 kW
Peak Output	21 kW
Output Voltage (V)	240
Generator Type	Synchronous brushless 3-phase with outboard exciter
Applications	Grid connection
Controller Type	Nexus (proprietary)
Overspeed Protection	Blade feather & side furl
Blade Material	Fiberglass
Number of Blades	3
Rotor Diameter (m)	9,45
Swept Area (m^2)	70
Windspeed (m/s)	
Rated	11.6
Cut-in	3,5
Cut-out	n/a
Governing	Blades feathering at 11.6 m/s and side furl at 18 m/s.
Survival	53
Head Weight (kg)	907
Tower Type	Lattice and monopole
Tower Height (m)	24.5 - 48.7
Product Life (years)	25
Warranty (years)	5
Units sold	1700
On the market since	28
Price	$ 63 000 - $ 78 000 (Price includes; turbine, tower and inverter)
Certificate	



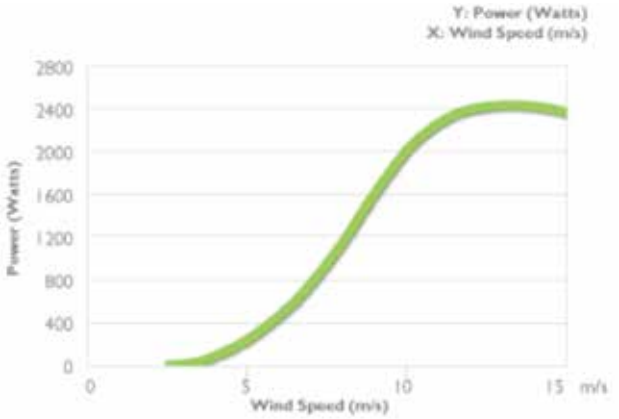
XZERES Corp.
(USA/Japan/Europe/India)

XZERES Corp.
9025 SW Hillman Court
Suite 3126
Wilsonville, OR 97070. USA
Phone: (503) 388-7369

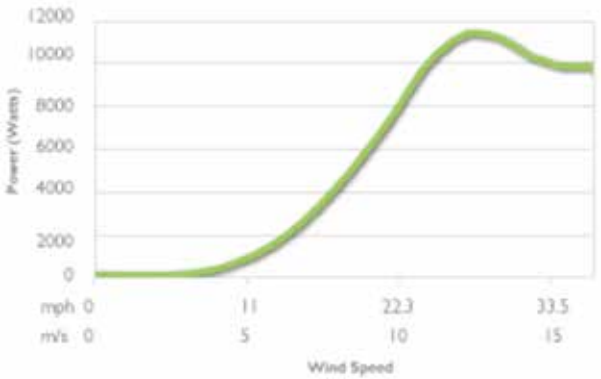
www.xzeres.com
www.xzeresenergy.com
Frank Greco, President
Email: fgreco@xzeres.com

Distribution: Domestic, international
Direct from factory

Model	Skystream 3.7	442 SR
Orientation	Downwind Horizontal Axiz	Upwind Horizontal Axiz
Rated Output	2.1 kW	10.4 kW
Peak Output	2.4 kW	12.2 kW
Output Voltage (V)	230 AC & 48 V DC	Single/Three Phase AC
Generator Type	Asynchronous Three Phase Perm Mag Alternator	Three Phase Perm Mag Neodymium
Applications	Residential/Commerical/ Telecommunication	Off Grid On Grid Commerical/Residential
Controller Type	Microprocessor Automatic Switching Electronics	Automatic Switching Electronics
Overspeed Protection	Electromagnetic Stall Regulation Built In	Stall Regulation
Blade Material	Fibre Glass Reinforced Composite	Moulded Fibre Glass
Number of Blades	3	3
Rotor Diameter (m)	3.7 m	7.2 m
Swept Area (m^2)	10.75	41
Windspeed (m/s)		
Rated	11	11
Cut-in	3.5 m/s	2.2
Cut-out	25.0 m/s	
Governing		
Survival	63.0 m/s	
Head Weight (kg)	94 KG Total	1045 KG Total
Tower Type	Lattice/Monopole	Lattice/Monopole
Tower Height (m)	Various	
Product Life (years)	20	20
Warranty (years)	5	5
Units sold	8000	350
On the market since	2009	2010
Price	On request	On request
Certificate	UL/GL/SWCC/NREL/AWEA /IEC/MCS	UL/IEC/MCS/SWCC/NK



Skystream 3.7



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ISBN 978-87-7778-137-7
Folkecenter Print
June 2016