



# *Wind Energy Systems*





## AC 120, AC 240

Small wind turbine for charging batteries

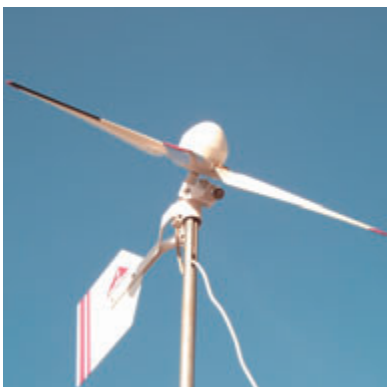
12 or 24 Volt

Typical uses: holiday homes, mountain huts, measuring stations, telecommunications, maritime applications etc.

AeroCraft small wind turbines are a product line of Gödecke Energie- und Antriebstechnik GmbH in Rotenburg (Wümme), Germany. They are the only units in the sub-kilowatt class being manufactured industrially in Europe in small batches. Designed for professional use in both strong-wind and weak-wind areas, they offer an extremely efficient and high-quality alternative to the "big players" of the industry. AeroCraft systems unite the valuable experience gained from over 20 years in the wind energy market with the know-how from many hundreds of units installed worldwide. Their robustness and durability, the fact that they can already start up at wind speeds of 3 m/s, and the great variety of possible applications have made AeroCraft the technology leader for small wind turbines.

AeroCraft wind turbines are designed and manufactured according to the latest technical developments with particular regard for reliability and ease of maintenance. Frequent wind tunnel trials and testing under realistic conditions, coupled with quality assurance during all phases of production, ensure the highest possible product safety and reliability and the greatest power output at a wide range of wind speeds.

All components and assemblies are manufactured by specialized European suppliers: the generators are made in a production line for servomotors, the GRP rotor blades by an ultralight aircraft manufacturer, and the grid-feeding systems in cooperation with the company SMA Technologie AG.





#### AC 500, AC 750

Small wind turbine for charging batteries

24, 48 Volt and other voltages

Typical uses: weekend cottages, pumping systems, measuring stations, telecommunications, wind/solar hybrid systems etc.



#### AC 1002H

Small wind turbine producing 1 kW

3 x 230 V

As a complete system for heating water

Typical uses: support for central heating systems, heating up of radiator and service water

AeroCraft delivers everything that is necessary for the smooth running of your wind generator station – from the inverter for transforming the DC battery voltage to AC (real 230 V / 50 Hz sine wave), up to the fully climbable modular mast.

With the models AC 120 and AC 240, the storm safety system guarantees that it can withstand speeds of up to 40 m/s, thanks to a "helicopter" mechanism. When the wind speed reaches 15–25 m/s, the rotor head tilts progressively and the output is reduced. This is achieved by a hinge which connects the generator and the support frame and pushes the rotor head into the helicopter position. The models AC 502, AC 752 and AC 1002 are fitted with an eclipse control system for storm survival: when the wind speed reaches approx. 15 m/s, the rotor head is progressively turned out of the wind by a hinge connecting the generator and the wind vane.

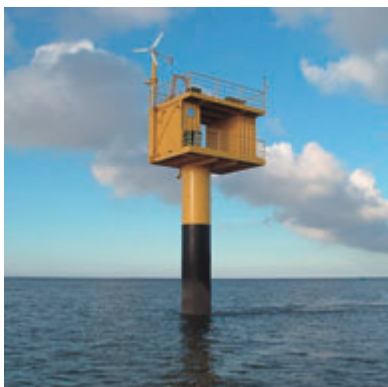
AeroCraft wind turbines are designed for coastal and inland locations. Optimum stability of the system has been achieved through the reduction of moving parts, which also makes the servicing much simpler, and by using non-corrosive materials of high quality. AeroCraft wind turbines are characterized by their low-maintenance operation.

AeroCraft guarantees that the AC wind generator stations will not have any material or manufacturing flaws. The AeroCraft guarantee is valid for 24 months.

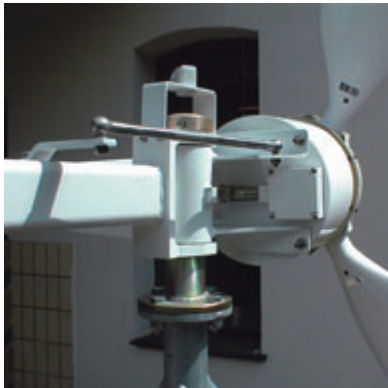


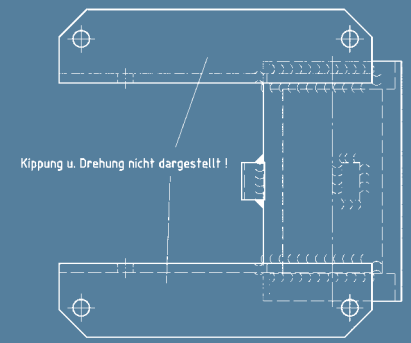
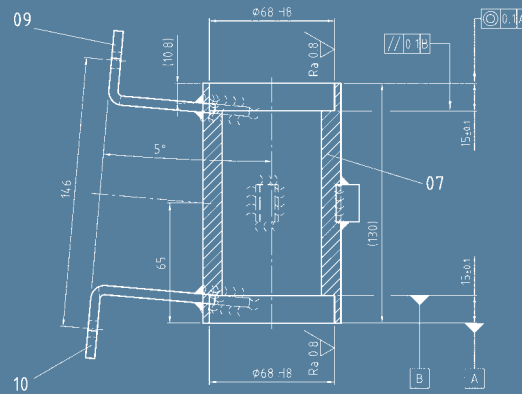
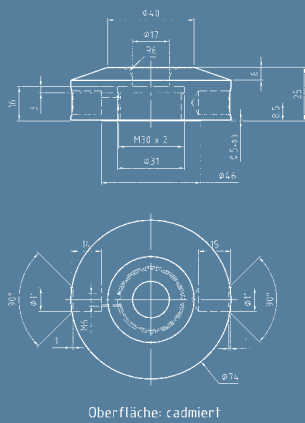


Type	AC 120   AC 240	AC 502   AC 752/NE	AC 1002 H
Generator	18-pole	16-pole	16-pole
Power output	120 W   240 W	500 W   750 W	1000 W
System voltage	12/24 V	12/24 V   24/48 V	230V
Rated output at	9 m/s	9 m/s	9 m/s
Cut-in wind speed	3 m/s	3 m/s	3 m/s
Critical wind speed	40 m/s	40 m/s	40 m/s
Rotational speed	700 rpm	600 rpm	600 rpm
Number of rotor blades	5   3	3	3
Material of rotor blades	GRP	GRP	GRP
Diameter of rotor blades	120 cm   165 cm	240 cm	240 cm
Swept area of rotor blades	1.13 m <sup>2</sup>   2.14 m <sup>2</sup>	4.5 m <sup>2</sup>	4.5 m <sup>2</sup>
Azimuth control	Wind vane	Wind vane	Wind vane
Azimuth bearing	Dual ball bearing	Dual ball bearing	Dual ball bearing
Power transmission	Slip rings	Cable 3 x 2.5 mm	Cable 3 x 2.5 mm
Storm safety system	Helicopter position	Eclipse control	Eclipse control
Weight	17 kg   19 kg	41 kg   43 kg	45 kg
Mast mounting	Flange 130 mm	Flange 130 mm	Flange 130 mm



# *AeroCraft - Specifications*





## Special Features of the AeroCraft Small Wind Turbines

- Formidable performance and very quiet running, thanks to direct drive
- High-performance permanent magnet generator with completely self-contained casing
- Generator shaft made of stainless steel, with front shaft additionally protected by a watertight seal
- AeroCraft generators produce three-phase current, which allows covering greater distances with negligible loss.

## General Installation Tips

- We simplify the construction process for you by pre-assembling the parts, although we detach the rotor blades and the wind vane for transport.
- If you want to use an existing or self-made mast, please make sure that the top of the mast can withstand a wind pressure of up to 1000 N.
- The flange and the corresponding azimuth bearing for attaching the turbine to the mast is delivered with the system.
- When using the original AeroCraft mast, this mounting flange is permanently fitted to the top of the mast.

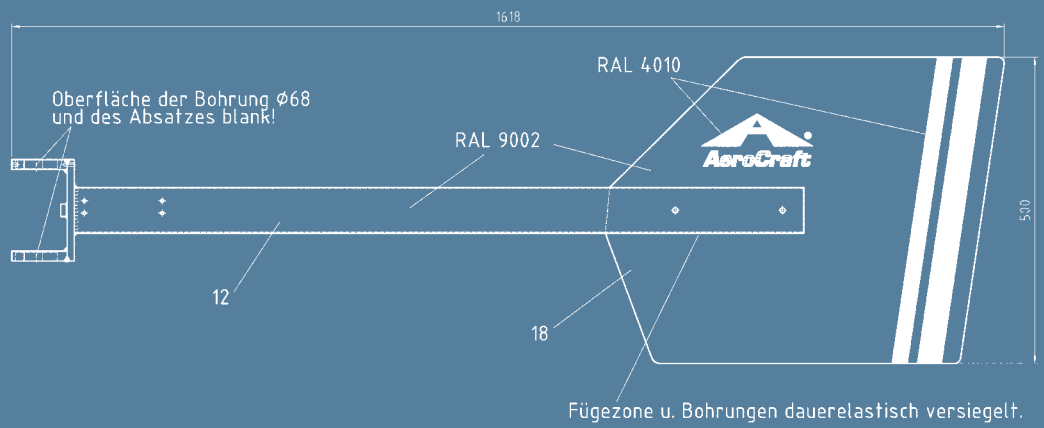
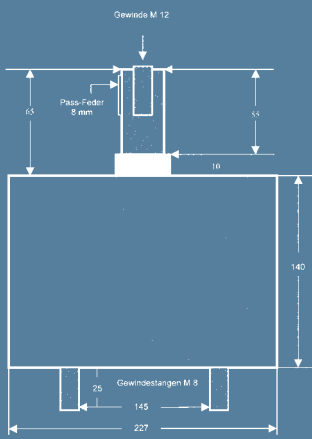
## Generator

The generators for AeroCraft wind turbines are manufactured in Europe using standard industrial parts. They are extremely robust and durable. Each generator is checked on a test stand before delivery and its performance is recorded in a test log.

## Technical Features

- Brushless multipole synchronous three-phase alternator
- Fan cooling is not required
- Weatherproof aluminium casing
- Generator shaft of stainless steel
- Protection class IP54; short-circuit-proof





The ball bearings are made of stainless steel (V2A), sealed and lubricated for life, i.e. maintenance-free! The permanent magnets are located on the rotor, while the stator bears the windings, which are of the three-phase type for enhanced efficiency. All generators can be run under no-load conditions without being damaged (insulation class F)! Thanks to the high quality of their magnet material, the permanent magnets retain their field strength indefinitely.

#### Grid Supply / AC 752 NE

For connecting to the electrical supply grid, we offer the regulator "PSR 60 V-20 A" to rectify and regulate the generator voltage, together with an inverter specially developed for the grid connection of small wind turbines and featuring a built-in interface for long-distance data transmission. An interface transformer and the Windows software for processing the data are included in the scope of delivery.

#### Special Version: AC 1002 "turbo"

AeroCraft offers a complete system for water heating purposes, as support for central heating systems. It is fitted with a 1000 W / 230 V generator and a control unit which delivers the energy uniformly to the electrical heating element (immersion heater).

#### AeroCraft Pump System

In conjunction with an electrical deep-well pump, AeroCraft-wind turbines can be used as an excellent pump system.



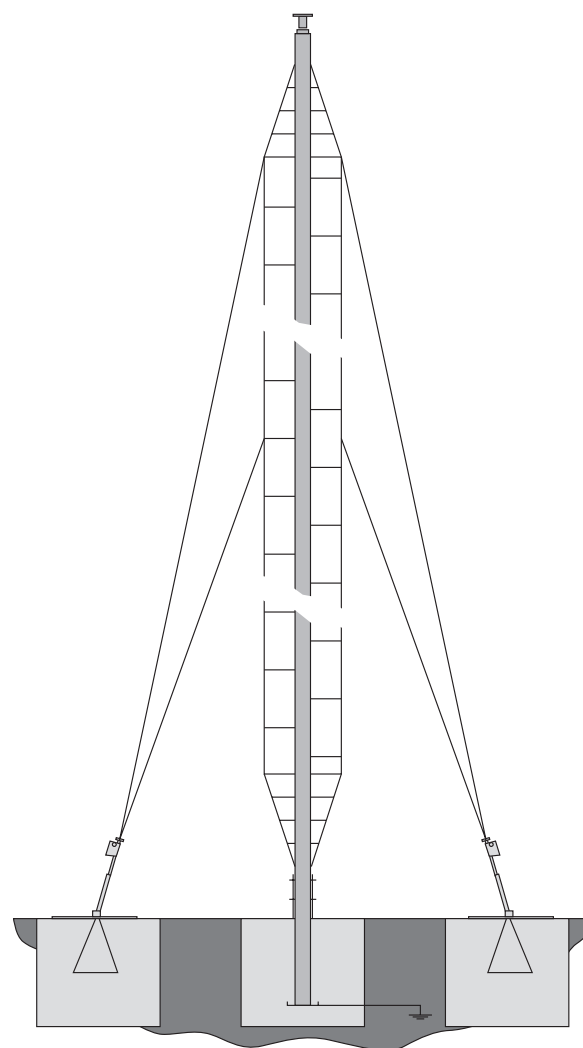


### AeroCraft's Modular Mast System

The AeroCraft modular mast system was especially developed for the installation of AeroCraft wind turbines. The modular system consists of elements with a length of 1.75 m, which can be assembled to form a mast with a total height of between 7 m and 12.25 m. This is then erected with the aid of a swivel joint which can be fastened once the mast is vertical. The individual parts of the mast lattice are fitted together with the aid of an inner cone and a force-transmitting connection is set up to the outer ties through bolts (included in the scope of supply).

After the mast has been put together on the ground, it is easily erected by means of a cable winch and a few helpers. Absolute structural integrity is then achieved through the bracing, with uniformly distributed stays leading at an angle of 30° from the mast connection point to the ground. The necessary steel cables are likewise included in the scope of supply.

The foundation is made by pouring concrete blocks with a volume of 1 m<sup>3</sup> each for the stays and the mast foot. The concrete foundations must be laid in the earth so as to be frost-free, depending on the height of the mast, at a defined distance from the mast and flush with ground level. Allow the concrete to set properly before the mast is erected.





After a proper foundation and secure bracing have been achieved, followed by bolting of the mast foot with counter-nuts, the AeroCraft mast is intrinsically stable and climbable.

For the erection of small wind turbines with a mast height of up to 7 m, it is often sufficient – according to guidelines of DIBt (Deutsches Institut für Bautechnik, Berlin) – to provide simplified verification with regard to the “structural integrity of tower and foundation”. To obtain clarity on what regulations apply in your city or municipality and what documents have to be submitted with the building application, the responsible authority should always be consulted before commencing any construction work.

**Mast Connection Box**

The interface between the connecting cable of the AeroCraft wind turbine and the underground cable to the consumers is provided by the mast connection box. It is installed directly on the mast, and is used to connect the underground cable via screwed contacts, and the turbine system via a 5-pole power plug. In this way, the AeroCraft wind turbine can quickly be disconnected whenever necessary, e.g. in case of critical wind conditions.

The mast connection box also has a 3-phase stop switch, with which the generator can be short-circuited and therefore slowed down. For use on areas at risk of lightning strikes, we offer an optional surge arrester.



# *AeroCraft - Grid Connection*





AeroCraft wind turbines are used mainly for charging batteries, as a power supply outside the public electricity grid, for heating purposes, as support for central heating systems, and for pumping water. However, another solution potentially offering great savings lies in feeding your energy directly back into the public electricity grid. To ensure the best possible efficiency, we rely on the market leader in grid-connected solar inverters, SMA Technologie AG. Here we use the "Windy Boy" inverter, which was especially developed for connecting small wind turbines to the grid.

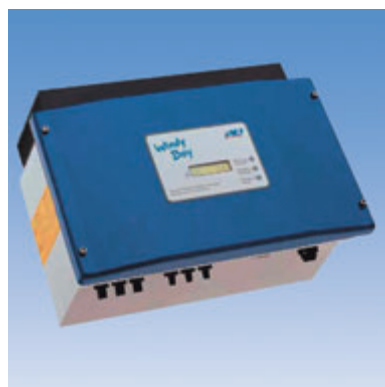
The Windy Boy family of inverters can be adapted to optimally fit the individual performance characteristics of a particular wind turbine. Because it considers realistic operating conditions, rapid and constant load cycles, strong-wind and weak-wind sites, as well as the possibility of adapting the power output to the corresponding generator characteristic, Windy Boy always achieves the highest efficiency and the best watt-specific price. Thanks to its particularly robust housing (IP 65) and waterproof plug connector, it is suitable for indoor and outdoor installation, e.g. directly on a mast, even under extreme climatic conditions.

The system can be used almost anywhere in the world with minimum installation costs and simplified authorization procedures – thanks to its transformer-based concept, the "SMA grid guard" automatic disconnection device, its automatic 50 Hz / 60 Hz detection, and a number of special country approvals.

As well as a standard display, there are various options for diagnosis, data visualization, data storage and remote maintenance of your wind turbine system via optional interfaces (RS232 and RS485), SMA Powerline or wireless data transmission. The wide range of applications includes system monitoring via the Internet.

### Technical Features

With the Windy Boy inverter, it is now possible to operate small wind energy systems with permanent magnet generators and down-stream 3-phase rectifiers with a connection to the grid. Windy Boy converts the rectified DC voltage from a wind turbine, which varies with speed, into a grid-compliant AC voltage.





By adjusting the maximum output and nominal speed, and in particular by programming the turbine curve, it is possible to achieve the highest system yield at all times. By setting a start value along with 3 curve points, Windy Boy can be tuned to the chosen wind turbine, providing the optimum start-up behaviour and the ideal reaction speed. A soft start parameter can be activated to protect the mechanical components.

### Regulator PSR 60 V-20 A

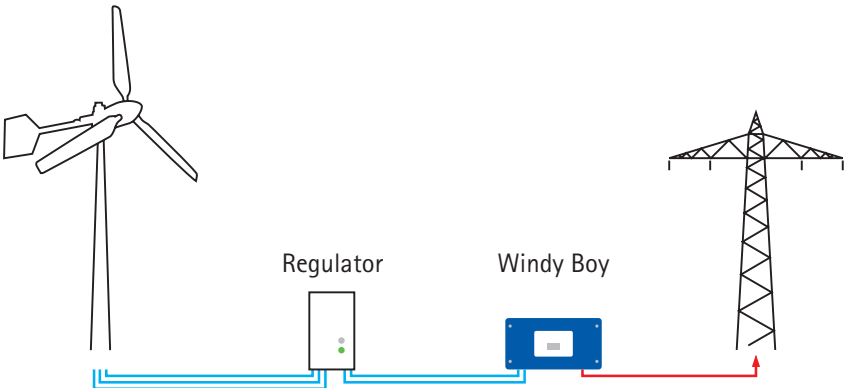
The regulator is designed for connecting 3-phase generators with a rated voltage of 48 V and a peak output of 1000 watts. It is simply connected between the wind turbine and inverter to offer effective protection against voltage surges. When the input voltage at the regulator rises above 24 Volt DC, the regulator electronics is activated and this is indicated by a green LED. If the voltage exceeds 58 Volt DC, the generator is slowed down through a short-circuit and a red LED indicates that the braking function has been triggered.

### Indirect and Direct Grid Supply

The energy produced by the wind turbine can be fed into the public grid in two ways. With the first method, the energy generated can either be consumed or supplied as excess energy to the public grid. This surplus feed-in or indirect supply mode ensures the greatest flexibility.

With direct feeding, on the other hand, the generated energy is fed into the public grid via a separate feed-in meter. The best possible feed-in method can be selected, depending on the remuneration rates and regulations applying in the countries of use.

No matter which method you choose: with grid-connected operation of your AeroCraft wind turbine, there is no longer any need for expensive and high-maintenance batteries.



# *AeroCraft - Island Systems*

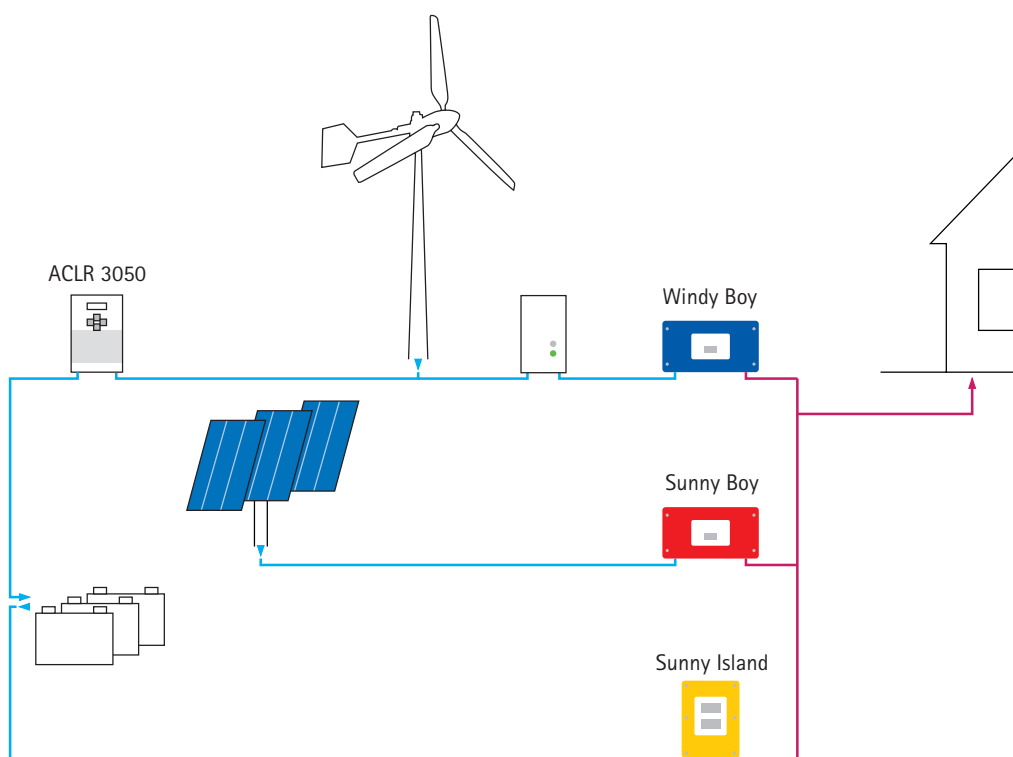




Wherever a stand-alone AC grid is needed, a reliable emergency power supply is required, or the public grid is unstable, island systems provide the answer. Here too, we rely on the know-how of the company SMA Technologie AG. With the "Sunny Island" system, SMA offers the ideal battery inverter for building up a reliable stand-alone grid with AeroCraft wind generators.

Connected to a small battery unit, Sunny Island forms an AC network offering the very highest quality standard, so that even the most sensitive devices can be operated. It controls all the necessary parameters, such as grid voltage and frequency, and channels any surplus energy to the batteries for storage. Conversely, in the event of an energy shortage, it supplies the AC grid with the energy buffered in the batteries.

The Sunny Island stand-alone grid is designed to accommodate almost any type of decentralized power generator: photovoltaic systems with Sunny Boy inverters, wind energy systems with Windy Boy inverters, water turbines and diesel generators which start automatically, e.g. as soon as the charge level of the batteries requires it and there is insufficient renewable energy available.





### Charging Regulator ACLR 3050 / 3050-D

The charging regulator fulfils a central function for the operation of the AeroCraft wind turbine in a stand-alone grid. AeroCraft charging regulators ensure that the batteries are always optimally charged.

The charging regulator ACLR 3050 embodies a novel regulating concept. It was specially designed for 3-phase permanent magnet generators and performs two tasks: the rectification of the generator's output voltage (3-phase AC) and the battery management, depending on the corresponding voltage level of the battery. This includes

- the charging of lead-acid batteries and gel block batteries,
- overcharging protection by braking the generator without the need for external surplus-consumers,
- deep-discharge protection by switching off the load output (load shedding), and
- overload protection in conjunction with a gassing circuit (for lead-acid batteries).

The deep-discharge protection disconnects the consumer positive line from the battery when the voltage falls too low. When the end-of-charge voltage is reached, the generator is electrically braked through short-circuiting. Connecting a load resistor is no longer necessary.

All settings and queries can be made conveniently with menu guidance, using four buttons located directly below the LCD display. This ensures user-friendly handling and operation. All parameters can be called up on the easily legible display with background illumination. The basic display shows the values for consumer demand, generator output and generator total power. The info menu can be used to call up another 16 parameters.

The charging regulator ACLR 3050 is available as the standard unit; a second version, the ACLR 3050-D, is supplied with a data logger and PC interfaces.



# *AeroCraft - Wind Heating*





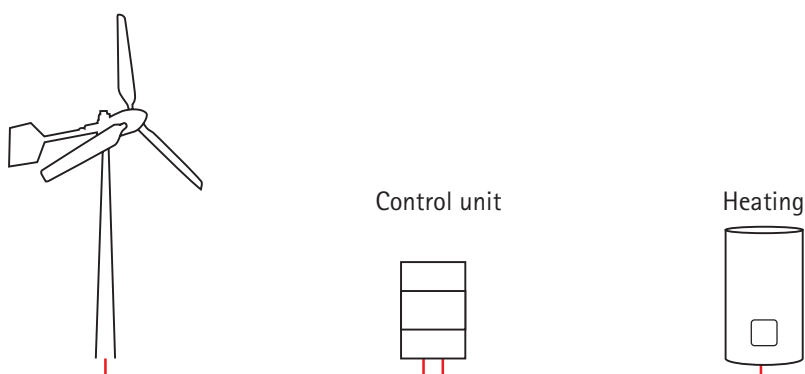
### AC 1002 turbo

The special version AC 1002 "turbo" is fitted with a 1000 W / 230V generator and a control unit. It distributes the energy produced by the generator uniformly amongst the electrical heating elements (immersion heaters) supplied with the system. The heating cartridges are available with an output of 1500 W or 2400 W to suit your individual requirements.

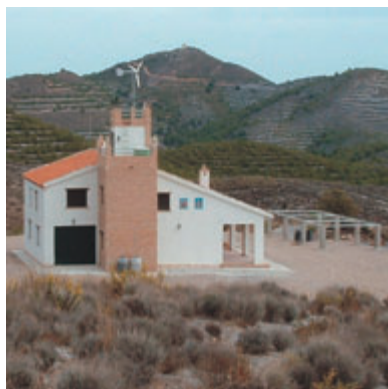
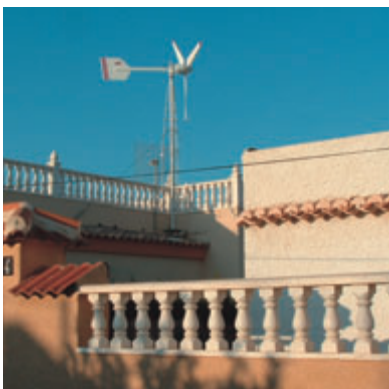
A wind heating system is of particular benefit where a heating system has already been installed with a buffer storage tank. In such cases, one or more electrical heating cartridges can be connected without any difficulty. Often, hot-water accumulators are already prepared for the installation of heating elements. All that needs to be done is to screw them in and connect them to the wind turbine via the control unit.

Because the heating period of the year, the autumn and winter months, is also the time in which the greatest amount of wind energy can be harvested, support for central heating systems through such a "heating mill" offers an extremely effective and cost-cutting solution.

The control unit ensures that the wind turbine is always able to deliver its maximum output to the heating elements. It helps the turbine to start up, smoothes out fluctuations, and provides the greatest possible heating power in relation to the prevailing wind speed.



# *AeroCraft - Wissen*





### Wind Speeds and Conversion Table

	Beaufort	knots	km/h	m/s	Effects of the Wind on Land
Calm	0	<1	<1	< 0,3	Smoke rises vertically.
Light air	1	1 - 3	1 - 5	0,3 - 1,5	Direction of wind shown by smoke, but not by wind vanes.
Light breeze	2	4 - 6	6 - 11	1,6 - 3,3	Wind felt on face; leaves rustle; ordinary vane moved by wind.
Gentle breeze	3	7 - 10	12 - 19	3,4 - 5,4	Leaves and small twigs in constant motion; wind extends light flag.
Moderate breeze	4	11 - 15	20 - 28	5,5 - 7,9	Raises dust and loose paper; small branches are moved.
Fresh breeze	5	16 - 21	29 - 38	8,0 - 10,7	Small trees in leaf begin to sway; crested wavelets form on inland waters.
Strong breeze	6	22 - 27	39 - 49	10,8 - 13,3	Large branches in motion; telegraph wires whistle; umbrellas used with difficulty.
Moderate gale	7	28 - 33	50 - 61	13,9 - 17,1	Whole trees in motion; effort needed to walk against the wind.
Fresh gale	8	34 - 40	62 - 74	17,2 - 20,7	Breaks twigs off trees; generally impedes progress.
Strong gale	9	41 - 47	75 - 88	20,8 - 24,4	Slight structural damage occurs (chimney pots and slates removed).
Storm	10	48 - 55	89 - 102	24,5 - 28,4	Trees uprooted; considerable damage to houses.
Violent storm	11	56 - 63	102 - 117	28,5 - 32,6	Widespread damage (experienced very rarely farther inland).
Hurricane	12	> 64	> 118	> 32,7	Considerable and widespread damage.





Do you have any more questions or do you need further details on our products? Please contact us by phone or email. Visit our website for detailed datasheets and assembly instructions on the AeroCraft family of wind generators.

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