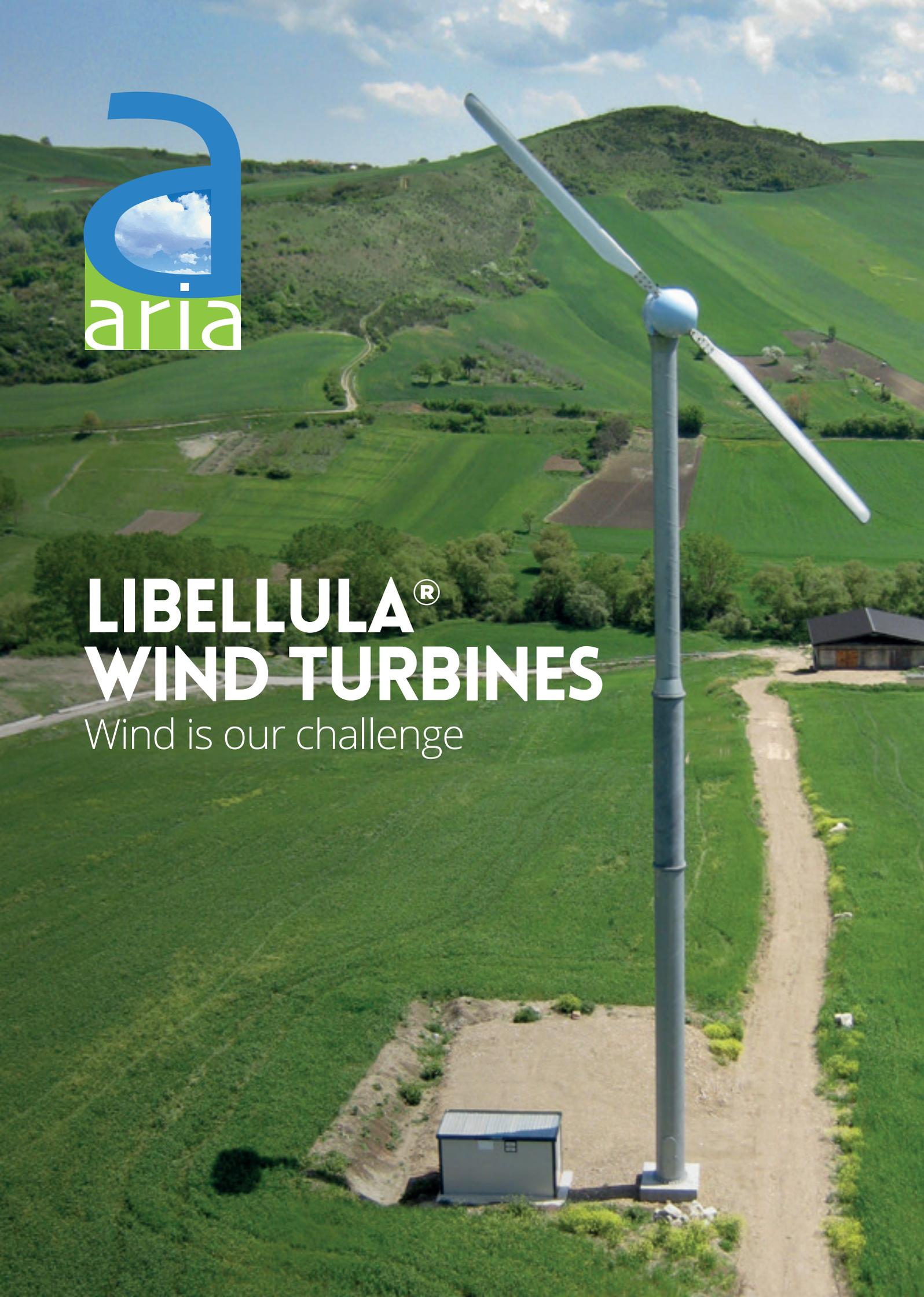


LIBELLULA[®] WIND TURBINES

Wind is our challenge



LIBELLULA® WIND TURBINES

Italian quality small wind turbines

LIBELLULA wind turbines are 100% made in Italy. They are produced with high quality components and the best engineering standards. Designed to achieve **minimum cost per kWh of produced energy**, LIBELLULA wind turbines grant the same reliability of big size wind turbines. They are conceived as large, high-power industrial installations: equipped with an active yaw system with gear motor, professional wind direction and wind speed sensors, they stand on a load-bearing tubular tower with internal ladder. They benefit of long term skills developed in Northern Europe, but also of patents and ideas originated from the technical research carried out at Aria's facilities. The choice of first quality industrial, instead of custom, components makes them reliable and long lasting: **industrial spare parts are always available on the market and can be quickly delivered.**

SIMPLE AND ROBUST: LIBELLULA 55+

LIBELLULA 50-55kW is a simple and robust turbine that can reach up to 57 kW.

The peculiarity of LIBELLULA 50-55kW is the **patented converter system** with one main generator for energy production and one auxiliary generator for grid connection. This choice makes LIBELLULA 50-55 a **robust industrial turbine that easily fulfills local regulations** as regards electrical connection.

THE BEST PERFORMANCE

LIBELLULA 60i is the **best performing turbine** amongst the Libellula series. In this model, the converter group has been replaced by a last generation inverter (Made in Italy). This feature improves the turbine's power output up to 60kW, granting an **unbeatable cost-performance ratio.**

Annual Energy Production (AEP) 60i-19m ($K_{Weib}=2$)

Mean wind speed (m/s)	4	5	6	7	8
Gross annual energy production (MWh/y)	69	123	179	230	275



EN 61400-1 CERTIFICATION: certified design and safety

VERIFIED POWER CURVE: guaranteed performance

VERIFIED NOISE LEVELS: respect of environmental limits

MAN-SIZED NACELLE: simple and safe maintenance

TOWER WITH INTERNAL LADDER: maintenance in bad weather conditions

HIGH QUALITY COMPONENTS: high reliability

2 BLADED ROTOR: simple and cheap installation

ASYNCHRONOUS GENERATORS: standard and robust components

PATENTED CONVERTER SYSTEM: innovation

LONG LASTING AND RELIABLE

With 1.300.000 working hours corresponding to 150 years of service, LIBELLULA 60i and LIBELLULA 50-55kW have proven to be reliable and robust in many installations through the years, achieving high energy production with great cost-performance ratio.

CHEAP AND SIMPLE O. & M.

One of the most interesting characteristics of LIBELLULA is that it allows cheap and safe O.& M. even in case of bad weather conditions. This is due to certain technical features such as the two bladed rotor, the spacious man-sized nacelle and most of all the tubular tower which is provided with internal ladder with direct access to the nacelle. Furthermore the 2 bladed rotor reduces installation costs because the nacelle can be assembled on the ground and lifted up with only one crane. The above characteristics maximize the turbine's working hours and minimize stops.

CERTIFICATION

Amongst small sized wind turbines LIBELLULA received important recognitions of its performances.

- » Power Curve Measured and Verified by RSE spa according to IEC Standard (EN 61400-12-1 - EN 61400-2)
- » EN61400-1 certification
- » Patent n.1393324: Libellula 55 converter system
- » Due diligence Report Nomisma Energia: Libellula 60i



Libellula 55+

Libellula 60i

GENERAL

Turbine type	HAWT	HAWT
Wind class	IIIA	IIIA
Cut-in wind speed	3 m/s	3 m/s
Nominal wind speed	11 m/s	11 m/s
Cut-out wind speed	25 m/s	25 m/s
Extreme wind speed	$V_{e50} = 52,5$ m/s	$V_{e50} = 52,5$ m/s
Generator nominal power	55kW	55kW
Max Power	57 kW	59.9kW
Nominal voltage	400V \pm 10% 3 ph 50Hz	400V \pm 10% 3 ph 50Hz

ROTOR

Number of blades	2	2
Diameter	18m - 19m	18m - 19m
Rotational speed	variable 55 - 95 rpm	variable 30 - 95 rpm

GENERATOR

Generator type	asynchronous - 4 poles	asynchronous - 4 poles
Nominal power	55 kW	55 kW
Nominal voltage	400 V	400 V

POWER CONVERTER

Converter type	combined: inverter + rotating asynchronous converter	inverter
Conversion principle	AC-DC-AC + rotating converter	AC-DC-AC
Grid connection	asynchronous generator 55 kW	transformer
Nominal voltage	400 V	400 V
Frequency	50 Hz	50 Hz

TOWER

Tower type	cylindrical pipe	cylindrical pipe
Number of sections	2 or 3	2 or 3
Hub height	19m - 25m - 31m	19m - 25m - 31m
Material	hot dip galvanised steel	hot dip galvanised steel
Location ascent	internal	internal

CONTROL SYSTEM

Remote control	Yes	Yes
Yawning system	active	active
Yawning motor	n. 1	n. 1
1° safety system	passive blade pitch	passive blade pitch
2° safety system	yawning out of the wind	yawning out of the wind

WEIGHTS

Rotor	900 kg	900 kg
Nacelle including rotor	2.900 kg	2.900 kg
Tower without nacelle	7.700 kg (H=31m)	7.700 kg (H=31m)



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