

NOTE



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Elsam A/S

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HB - CERTIFICATION OF SMALL WIND TURBINE:

Gaia 11 kW

HB-101 Rev. 3
Certification no.

October 2, 2003
Date of Issue

Issued to:

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Valid until

This certification has been made according to Act no. 837 of October 7, 1992 and ministerial order no. 270 dated May 2, 1991 by the Danish Energy Agency. The certification has been made based on Technical Specifications for the Certification of wind turbines with blade diameter of 2-13 meters, dated November 1, 1999.

This document covers the **certification of small wind turbines** (HB certification). The certification covers the erection of wind turbines in Denmark, excluding Faroe Islands and Greenland.

Appendices are listed in the table of contents.

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APPENDICES TO CERTIFICATION HB-101, REV. 3

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Appendix 1: Climatic and Site Conditions

The turbine is designed for the simplified loads specified in the guidelines for certification of small wind turbines of December 1994. Accordingly, this type of turbine can be erected without further documentation of climatic conditions in connection with buildings anywhere in Denmark, excluding the Faroe Islands and Greenland.

The certification covers:

15-m and 18-m tube tower
15-m and 18-m lattice tower

Operating parameters

Minimum wind speed (10 min.):	2.5 m/s
Maximum wind speed (10 min.):	25.0 m/s
Temperature tolerance during production:	-20°C to +50°C

The Danish electricity safety code (Stærkstrømsbekendtgørelsen), paragraph 413.1.4.2, demands all installations fitted with HFI or HPFI circuit breakers for safety reasons. The circuit breakers should be mounted as specified in the "Instruction Manual" handed over to the turbine owner.

In HB-101, rev. 3, a new teeter hub (9722820) has been implemented.
In HB-101, rev. 2, the main bearing has been fitted with shrink bush whereas in HB-101, rev. 1, it was fitted with a split bush.

Appendix 2: Technical Specifications, Gaia 11 kW connected to the grid

Main specifications

Rated power output:	:	11 kW
Number of blades	:	Two
Control	:	Stall
RPM (nom.)	:	56
Rotor placement	:	Downwind
Nominal wind speed	:	13 m/s
Maximum wind (10 min.)	:	25 m/s
Temperature tolerance	:	-20° - +50°C
Hub height	:	18.2 m / 15.2 m

Mounting weight

Generator	:	138 kg
Gear	:	143 kg
Blade	:	200 kg
Rotor (incl. hub and blades)	:	235 kg
Nacelle (incl. rotor)	:	900 kg

Rotor

Rotor diameter	:	13 m
Rotor area	:	133 m ²
Direction of rotation	:	Left
Rotor speed (nom.)	:	56 rev./min.
Rotor speed (max.)	:	62 rev./min.
Coning angle	:	4°
Tilt	:	0°
Blade angle	:	-2°

Blade

Type	:	Gaia T202
Blade material	:	Glass fibre
Blade length	:	6,500 mm
Blade profile	:	NACA 44-XX
Chord width	:	Max. 0.552 m; min. 0.124 m
Air brakes	:	Centrifugally activated tip brakes; tip (1,000 mm) of blade
Weight	:	200 kg

Hub

Type : Fork
Material : GG 40.3
Weight : 32 kg

Main shaft

Type : $\varnothing 90 \times 1,630$
Material : Ck45
Weight : 80 kg
Nominal moment : 2,085 Nm
Brake moment : 4,170 Nm ($2 \times M_{nom}$)

Bearings

Location/type : Main shaft/spherical roller bearing
Type : FAG 22220E

Main gearbox

Manufacture : Kumera Cumpact
Type : TF - 2160 - RB
Gear ratio : 1:18
Rated output : 36 kW
Lubrication : Splash lubrication
Capacity : 11.4 l

Coupling, main shaft gear

Type : Integrated, rigid

Coupling, gear generator

Type : Turning shaft

Foundation

Type : C-iron frame

Yaw system

Yaw type : Free
Max. yaw speed : 0.698 rad/sec. ($\sim 40^\circ/\text{sec.}$)
Nom. yaw speed : 0.349 rad/sec. ($\sim 20^\circ/\text{sec.}$)
Yaw bearing, manufacture : INA
Yaw bearing, type : Roller bearing, VLU20 0544
Yaw bearing, weight : 31 kg

Mechanical brake

Brake manufacture and calibre: Brembo, MP 2.1.22
Actuator manufacture : Linak LA 12.2-130
Location : Behind generator, on generator shaft
Brake moment : Set at 81-89 Nm
Weight : 6 kg

Generator

Manufacture : WEG
Type : 11-6-160L/B3T
Rated output : 11 kW
Voltage : 3-phased 400V@50 Hz
No. of poles : 6
Revolutions (synchronic) : 965 rpm
Insulation class : IP55 /Marine design
Safety class : Kl. F
Weight : 114 kg

Control system

Manufacture : MITA E00011
Type : Integrated microprocessor

Towers

Manufacture : Gaia Wind
Type : Lattice tower
Height : 18.0 / 15.0 m
Weight : 1,500 / 1,300 kg

Manufacture : Gaia Wind
Type : Tube tower
Height : 18.0 / 15.0 m
Weight : 1,950 kg / 1,585 kg

Appendix 3: Drawing and Document List

Main drawings

The following assembly drawings provide general information and documentation of the turbine. The new drawing number format is described in “Manual regarding system of numbering parts and drawings”

Assembly/drawing number	Description	Rev. date	Replaced drawing
P00201	Gaia Mølle 11kW	2003-10-28	110-000-000
P00001	Foundation complete	2003-02-20	110-800-000
P00004	Nacelle complete	2003-10-28	110-100-000
2020310	Lattice Tower 15/18m complete	1999-11-05	110-600-000
110-300-000	Tube tower 15m complete	2001-03-22	
110-950-000	Tube tower 18m complete	1998-04-01	
110-900-110	Controlbox complete	2001-09-01	
Mita E00011	Information	2000-05-04	

Manuals

Six manuals are available for the Gaia 11 kW turbine:

Name:	Rev.
Mounting manual*	2003-01-27
Installation manual*	2003-01-27
Turbine Erection Manual*	2003-01-27
Users Manual	2003-02-10
Service Manual	2003-01-28
Manual regarding system of numbering parts and drawings*	Oct. 2003

* Manuals mainly for internal use.