

**Manduria Oria Wind Energy S.r.l**

**Giugno 2022**

# **Parco Eolico “Manduria” sito nel Comune di Manduria**

**Scheda tecnica e certificazioni  
aerogeneratori**



REGIONE  
PUGLIA



Provincia di  
Taranto



Committente:

**Manduria-Oria Wind Energy S.r.l.**  
via Sardegna, 40  
00187 Roma (RM)  
P.IVA/C.F. 15856951007

Documento:

**PROGETTO DEFINITIVO**

Titolo del Progetto:

**PARCO EOLICO "MANDURIA"**

Elaborato:

**Scheda tecnica e certificazioni  
aerogeneratori**

CODICE PROCEDURA:

VK8K04

ID PROGETTO	DISCIPLINA	CAPITOLO	TIPO	REVISIONE	SCALA	FORMATO
IT-VesMaO-Gem	GEN		TR	0	NA	A4

NOME FILE: **IT-VesMaO-Gem-GEN-TR-01.c-Rev.0**

**Progettazione:**



**Ing. Saverio Pagliuso**

**Ing. Mario Francesco Perri**

**Ing. Giorgio Salatino**

**Ing. Claudio Coscarella**

Rev:	Prima Emissione	Descrizione Revisione	Redatto	Controllato	Approvato
00	06/2022	PRIMA EMISSIONE	GEMSA	GEMSA	MANDURIA-ORIA

# V162-6.0 MW™ IEC S

## Facts & figures

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**POWER REGULATION** Pitch regulated with variable speed

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**OPERATING DATA**

Rated power 6,000kW  
 Cut-in wind speed 3m/s  
 Cut-out wind speed\* 25m/s  
 Wind class IEC S  
 Standard operating temperature range from -20°C\* to +45°C

\*High Wind Operation available as standard  
 \*\*Subject to different temperature options

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**SOUND POWER**

Maximum 104.3dB(A)\*\*  
 \*\*\*Sound Optimised Modes available dependent on site and country

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**ROTOR**

Rotor diameter 162m  
 Swept area 20,612m<sup>2</sup>  
 Aerodynamic brake full blade feathering with 3 pitch cylinders

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**ELECTRICAL**

Frequency 50/60Hz  
 Converter full scale

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**GEARBOX**

Type two planetary stages

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**TOWER**

Hub height 119m (IEC S/DIBt S), 125m (IEC S), 149m (IEC S), 166m (IEC S), 169m (DIBt S)

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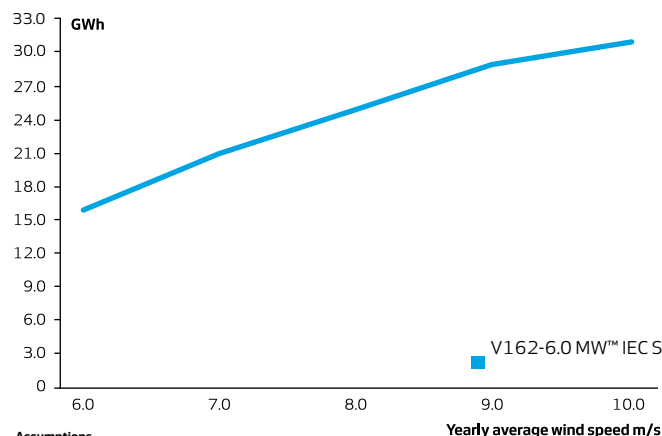


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**TURBINE OPTIONS**

- Condition Monitoring System
  - Oil Debris Monitoring System
  - Service Personnel Lift
  - Low Temperature Operation to -30°C
  - Vestas Ice Detection™
  - Vestas Anti-Icing System™
  - Vestas IntelliLight®
  - Vestas Shadow Detection System
  - Aviation Lights
  - Aviation Markings on the Blades
  - Fire Suppression System
  - Vestas Bat Protection System
  - Lightning Detection System
  - Load Optimised Modes
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**ANNUAL ENERGY PRODUCTION**



**Assumptions**  
 One wind turbine, 100% availability, 0% losses, k factor =2,  
 Standard air density = 1.225, wind speed at hub height

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## EU Declaration of Conformity

In accordance with EN ISO 17050-1:2010

This declaration of conformity is issued under the sole responsibility of the manufacturer

Manufacturer:	Vestas Wind Systems A/S Hedeager 42 8200 Aarhus N Denmark
Authorized to compile the Technical File within EU:	QSE Lead – EnVentus Turbines, at manufacturer
Product name:	Wind Turbine Generator
Product types:	V150 – 5.0/5.4/5.6/6.0 MW V162 – 5.4/5.6/6.0/6.2 MW
Serial Number(s)	[From V000001 to V999999]

The product is in conformity with the EU Machinery Directive 2006/42/EC		
Conformity Assessment Procedure		Internal Production Control (No Notified Body involved)
Essential Requirement	Concerning	Presumption of conformity by application of specification
Annex 1 part 1	General health and safety	EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction
Annex 1 part 1.5.1	Electrical safety *	EN 60204-1:2018 Safety of machinery – Electrical equipment of machines - Part 1: General requirements
Annex 1 part 2	Certain categories	N/A
Annex 1 part 3	Mobility of machinery	N/A
Annex 1 part 4	Lifting operations	Covered through Risk Management
Annex 1 part 5	Underground work	N/A
Annex 1 part 6	Lifting of persons	Covered through Risk Management

\* The Machinery Directive 2006/42/EC precedes the essential requirement of the Low Voltage Directive 2014/35/EU. A Declaration of Conformity pursuant to the Low Voltage Directive 2014/35/EU must therefore not be made.

<b>The product is in conformity with the EU Electromagnetic Compatibility (EMC) Directive 2014/30/EU</b>		
<b>Conformity Assessment Procedure</b>		<b>Internal Production Control (No Notified Body involved)</b>
<b>Essential Requirement</b>	<b>Concerning</b>	<b>Presumption of conformity by application of specification</b>
Article 6	EMC emission & immunity	DS/EN 61400-1:2019 Wind turbines – Part 1: Design requirements  EN 55011:2015/A1:2017 (A11:2020) / CISPR 11:2015 +AMD1:2016+AMD2:2019: Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement

<b>The product is in conformity with the EU Pressure Equipment Directive 2014/68/EU</b>		
<b>Conformity Assessment Procedure</b>		<b>Internal Production Control (No Notified Body involved)</b>
<b>Essential Requirement</b>	<b>Concerning</b>	<b>Presumption of conformity by application of specification</b>
Annex 1 part 1	General	Installation of pressurized equipment in the turbine is evaluated for safety in accordance with the Machinery Directive. Equipment subject to the directive is CE marked by the equipment manufacturer.
Annex 1 part 2	Design	N/A
Annex 1 part 3	Manufacturing	N/A
Annex 1 part 4	Materials	N/A
Annex 1 part 5	Fired or heated equipment	N/A
Annex 1 part 6	Piping	The piping in the turbine is Category I or lower and is evaluated for safety in accordance with the Machinery Directive.
Annex 1 part 7	Specific quantitative req's	N/A

<b>The product is in conformity with the following additional references:</b>	
Design and the erection of electrical power installations	EN 61936-1:2010/AC:2012/A1:2014 Power Installations exceeding 1 kV a.c. – Part 1: Common Rules
Rules, Operational Documents under the IECRE	IECRE OD-501-1:2017 Conformity assessment and certification of Blade by RECB

The undersigned hereby declares that the specified product types comply with the applicable essential requirements and other relevant requirements of the listed directives in this document.

Aarhus, 2021.18.03



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Signature

Martin Skov Jensen

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Full name

Vice President, Product Owner, EnVentus Turbines

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Position

Aarhus, Denmark

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Place



# TYPE CERTIFICATE

Certificate No.:  
TC-DNVGL-SE-0074-07983-0

Issued:  
2021-08-20

Valid until:  
2026-02-17

Issued for:

## EnVentus V162

Specified in Annex 1

Issued to:

## Vestas Wind Systems A/S

Hedeager 42  
8200 Aarhus N  
Denmark

According to:

### DNVGL-SE-0074:2018-01 Type and component certification of wind turbines according to IEC 61400-22

Based on the document:

FER-TC-DNVGL-SE-0074-07983-0

Final Evaluation Report, dated 2021-08-20

Additional references according to above report are given in Annex 2.

Changes of the system design, the production and erection or the manufacturer's quality system are to be approved by DNV.

Hellerup, 2021-08-20

For DNV Renewables Certification

**Bente Vestergaard**  
Service line leader



By DAkKS according DIN EN IEC/ISO 17065 accredited Certification Body for products. The accreditation is valid for the fields of certification listed in the certificate.

Hellerup, 2021-08-20

For DNV Renewables Certification

**Mark Wollenberg**  
Project manager

The accredited certification body is Germanischer Lloyd Industrial Services GmbH, Brooktorkai 18, 20457 Hamburg. DNV Renewables Certification is the trading name of DNV's certification business in the renewable energy industry.

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# TYPE CERTIFICATE – ANNEX 1

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## General

Wind Turbine class	IEC S
Power regulation	Pitch-controlled
Rotor orientation	Upwind
Rotor tilt	6°
Cone angle	-6°
Rated power	5400 kW / 5600 kW / 6000 kW
Rated wind speed $v_r$	See annex 3
Rotor diameter	162 m
Hub height(s)	119m / 125 m, see annex 3 for details
Hub height operating wind speed range $v_{in} - v_{out}$	3-24 m/s
Design lifetime	20 years
Software version	2020.26

## Wind conditions

Reference turbulence intensity NTM at $V_{hub}$	See annex 3
Reference turbulence intensity ETM at $V_{hub}$	0.16
Annual average wind speed at hub height $v_{ave}$	See annex 3
Weibull shape factor $k$	See annex 3
Wind shear exponent for normal wind conditions $\alpha$	See annex 3
Mean flow inclination	8°
50 Year mean wind speed (10min avg.), $V_{50}$	See annex 3
1 Year mean wind speed (10min avg.), $V_1$	See annex 3

## Electrical network conditions

Normal supply voltage and range	720 V $\pm$ 10 %
Normal supply frequency and range	50 / 60 Hz
Voltage imbalance	<2%
Maximum duration of electrical power network outages	Two 3 months periods
Number of electrical network outages	Max. 50 times per year

## Other environmental conditions

Normal and extreme temperature ranges	
Operating temperature	-30 °C to +45 °C (operating)
Extreme temperature, stand still	-40 °C to +50 °C (survival)
Relative humidity of the air	Up to 95%
Air density	See annex 3
Solar radiation	1000 W/m <sup>2</sup>
Description of lightning protection system	Designed acc. to IEC 61400-24 Ed.2, Protection Level I
Other design conditions:	Max. installation height 1000m (2000 m optional)





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## Major components

<b>Blade</b>	Type	EnVentus V162
	Manufacturer	Vestas Wind Systems A/S
	Material	Carbon- and Glass-fibre reinforced plastic
	Blade length	79.35 m
	Number of blades	3
	Drawing / Data sheet / Part no.	A005-7881, Rev 6 A007-1149, Rev. 1 and A007-1150, Rev. 2 (AAO Assembly Drawings)
<b>Blade bearing</b>	Type	Three row roller bearing
	Manufacturer	Vestas Wind Systems A/S
	Drawing / Data sheet / Part no.	DWG: 29156026, Rev. 2 TPS: 0023-3088, Rev. 7
<b>Pitch system</b>	Type	Double acting hydraulic cylinder
	Manufacturer	Vestas Wind Systems A/S
	Controller type	Hydraulic
	Motor / Actuator	Double acting hydraulic cylinder
	Drawing / Data sheet / Part no.	29156825, Rev. 1
<b>Main shaft</b>	Type	Cast Iron
	Material	EN-GJS-500-14
	Drawing / Data sheet / Part no.	29203608, PDM Rev. 3.3
<b>Main bearing</b>	Type	Two single row tapered roller bearings
	Manufacturer	Schaeffler Technologies AG & Co. KG
	Drawing / Data sheet / Part no.	EDD F-636693.TR1-WPOS 000, Rev. AD EDD F-636694.TR1-WPOS 000, Rev. AC
	Type	Two single row tapered roller bearings
	Manufacturer	Thyssenkrupp, Rothe Erde Germany GmbH
	Drawing / Data sheet / Part no.	PSL612-436, Rev. 1 PSL612-437, Rev. 2
	Type	Two single row tapered roller bearings
	Manufacturer	SKF GmbH
	Drawing / Data sheet / Part no.	BT1-8235 A, Rev. 1 BT1-8236 A, Rev. 5
<b>Gearbox</b>	Type	2 stage planetary gearbox, EF 1205
		EF1205A-001 (5.0 / 5.4 / 5.6 MW)
		EF1205B-001 (5.0 / 5.4 / 5.6 MW)



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		EF1205A-002 (5.0 / 5.4 / 5.6 / 6.0 MW)
		EF1205B-002 (5.0 / 5.4 / 5.6 / 6.0 MW)
		EF1205B-011 (5.0 / 5.4 / 5.6 MW)
		EF1205B-012 (5.0 / 5.4 / 5.6 / 6.0 MW)
	Manufacturer	ZF Wind Power
	Gear ratio	1:43.875 (EF1205A-001, EF1205B-001, EF1205A-002, EF1205B-002)
		1:44.100 (EF1205B-011, EF1205B-012)
	Drawing / Data sheet / Part no.	096-EF1205A002, Rev. A
		096-EF1205B001, Rev. A
<b>Yaw system</b>		
	Drive type	10 x 2.2 kW, 400 V, 50 Hz asynchronous motors
	Drive manufacturer	Lafert
	Drawing / Data sheet / Part no.	MY10AA4A-56087
	Drive type	10 x 2.5 kW, 400 V, 60 Hz asynchronous motors
	Drive manufacturer	Lafert
	Drawing / Data sheet / Part no.	MY10AA4A-56088
	Bearing type	Preloaded sliding bearing, PETP pads
	Bearing manufacturer	Vestas Wind Systems A/S
	Drawing / Data sheet / Part no.	29190369, Rev. 0
	Gear type	4 planetary stages, i = 946
	Gear manufacturer	Bonfiglioli
	Drawing / Data sheet / Part no.	I7090T014900, Rev. E
	Gear type	4 planetary stages, i = 948
	Gear manufacturer	Comer
	Drawing / Data sheet / Part no.	N07388_05, Rev. 5
	Brake type	10 x 2.2 kW, 400 V, 50 Hz asynchronous motors
	Brake manufacturer	Lafert
	Drawing / Data sheet / Part no.	MY10AA4A-56087
	Brake type	10 x 2.5 kW, 400 V, 60 Hz asynchronous motors
	Brake manufacturer	Lafert
	Drawing / Data sheet / Part no.	MY10AA4A-56088
<b>Generator</b>		
	Type	V14-7 / V14-14
		PMG
	Manufacturer	Vestas Wind Systems A/S
	Rated power range	6071 kW to 6478 kW
	Rated frequency	122.7 Hz
	Rated speed	409 RPM



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	Rated voltage	800 V
	Rated current range	5657 A to 6100 A
	Insulation class	H
	Degree of protection	IP54
	Drawing / Data sheet / Part no.	0085-6986, Rev. 2
<b>Converter</b>	Type	CubePower 4415 Full quadrant IGBT
	Manufacturer	Vestas Wind Systems A/S
	Rated grid voltage	720 V
	Rated grid side current range	4x1475 A to 4x1512 A
	Rated grid frequency	50 / 60 Hz
	Degree of protection	IP54
	Drawing / Data sheet / Part no.	0077-0958, Rev. 3
<b>Transformer</b>	Type	MINERA MP
	Manufacturer	Schneider Electric
	Rated voltage	33/0.72 kV
	Rated power	7000 kVA
	Rated grid frequency	50 Hz
	Drawing / Data sheet / Part no.	A006-0649, Rev. 0
	Type	MINERA MP
	Manufacturer	Schneider Electric
	Rated voltage	33/0.72 kV
	Rated power	7300 kVA
	Rated grid frequency	50 Hz
	Drawing / Data sheet / Part no.	A012-2583, Rev. 0
	Type	MINERA MP
	Manufacturer	Schneider Electric
	Rated voltage	34.5/0.72 kV
	Rated power	7000 kVA
	Rated grid frequency	60 Hz
	Drawing / Data sheet / Part no.	A008-6903, Rev. 00
	Type	MINERA MP
	Manufacturer	Schneider Electric
	Rated voltage	34.5/0.72 kV
	Rated power	7300 kVA
	Rated grid frequency	60 Hz
	Drawing / Data sheet / Part no.	A012-2585, Rev. 00
	Type	TDU-703A03W1N-TU
	Manufacturer	Siemens



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	Rated voltage	33/0.72 kV
	Rated power	7000 kVA
	Rated grid frequency	50 Hz
	Drawing / Data sheet / Part no.	A006-0648, Rev. 0
	Type	TDU-753A03W1N-TU
	Manufacturer	Siemens
	Rated voltage	31.5/0.72 kV
	Rated power	7300 kVA
	Rated grid frequency	50 Hz
	Drawing / Data sheet / Part no.	A012-2580, Rev. 0
<b>High-voltage switchgear</b>	Type	8DJH
	Manufacturer	Siemens
	Rated voltage Um	24 kV
	Rated current	630 A
	Rated grid frequency	50 / 60 Hz
	IAC classification	IAC AFLR 21 kA 1s
	Drawing / Data sheet / Part no.	0074-5221, Rev. 0
	Type	CGM.3
	Manufacturer	Ormazabal
	Rated voltage Um	36 kV
	Rated current	630 A
	Rated grid frequency	50 / 60 Hz
	IAC classification	IAC AFLR 25 kA 1s
	Drawing / Data sheet / Part no.	0060-9738, Rev. 0
	Type	SafePlus 36
	Manufacturer	ABB
	Rated voltage Um	36 kV
	Rated current	630 A
	Rated grid frequency	50 Hz
	IAC classification	IAC AFLR 25 kA 1s
	Drawing / Data sheet / Part no.	0074-5222, Rev. 1
	Type	SafePlus 36 -V (38kV)
	Manufacturer	ABB
	Rated voltage Um	38 kV
	Rated current	600 A
	Rated grid frequency	60 Hz
	IAC classification	IAC AFLR 25 kA 1s
	Drawing / Data sheet / Part no.	A005-9707, Rev. 0



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<b>Tower</b>	Type	Conical and cylindrical steel
	Manufacturer	Vestas Wind Systems A/S
	Number of sections	5
	Length	116.31 m (HH119)
	Drawing / Data sheet / Part no.	A007-7582, Rev. 02 (TA27701)
	Type	Conical and cylindrical steel
	Manufacturer	Vestas Wind Systems A/S
	Number of sections	5
	Length	122.27 m (HH125)
	Drawing / Data sheet / Part no.	A009-5384, Rev. 2 (TA27D00)
<b>Manuals</b>	Overview manual	0101-7630, Rev. 0
	O&M manual	0098-7505, Rev. 1
		0098-7507, Rev. 5
	Transport manual	0098-7497, Rev. 0
	Installation / Commissioning manual	0098-7502, Rev. 7
		0098-7504, Rev. 0



# TYPE CERTIFICATE – ANNEX 2

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The certification is based on the following documents, in addition to the document(s) listed on the front page of this certificate:

DB-DNVGL-SE-0074-07984-0	Design Basis Conformity Statement, dated 2021-08-20
DE-DNVGL-SE-0074-07985-0	Design Evaluation Conformity Statement, dated 2021-08-20
TT-DNVGL-SE-0074-07986-0	Type Test Conformity Statement, dated 2021-08-20
ME-DNVGL-SE-0074-07987-0	Manufacturing Evaluation Conformity Statement, 2021-08-20



# TYPE CERTIFICATE – ANNEX 3

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## Configuration matrix:

### General

Rated wind speed $v_r$ for	5400kW	10.0 m/s	10.3 m/s
	5600kW	10.2 m/s	10.5 m/s
	6000kW	10.5 m/s	10.8 m/s
Hub heights		HH119 m (TA27701)	HH125m (TA27D00)

### Wind conditions

Reference turbulence intensity NTM at $v_{hub}$	0.15	0.14
Annual average wind speed at hub height $v_{ave}$	7.4 m/s	8.5 m/s
Weibull shape factor $k$	2.48	2.3
Wind shear exponent for normal wind conditions $\alpha$	0.3°	0.2°
50 Year mean wind speed (10min avg.), V50	37.1 m/s	37.5 m/s
1 Year mean wind speed (10min avg.), V1	29.7 m/s	30.0 m/s

### Other environmental conditions

Air density	normal	1.220 kg/m <sup>3</sup>	1.134 kg/m <sup>3</sup>
	low temperature	1.325 kg/m <sup>3</sup>	1.325 kg/m <sup>3</sup>