Power Curve &

Sound Power Level

REpower MM92

[2050 kW]

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Table of Content

Applicable Documents

The documents referred to in the table below are included for information only. Reference to them in this product description does not make them part of the contract.

Title	Document no.

* If the products referred to in the table above are to be included within the project, the relevant product descriptions in their current version will be amended to the contract.

List of Abbreviations and Units

Abbreviation/Unit	Description
cp	Power coefficient
ct	Thrust coefficient
FGW	Fördergesellschaft Windenergie e.V.
IEC	International Electrotechnical Commission
WEC	Wind Energy Converter

1 Introduction

This document shows the guaranteed power curve and sound power level of the *REpower MM92 [2050kW]* and the corresponding guarantee and measurement conditions.

2 Conditions for guarantee and measurement of power curve and sound power level

2.1 General information

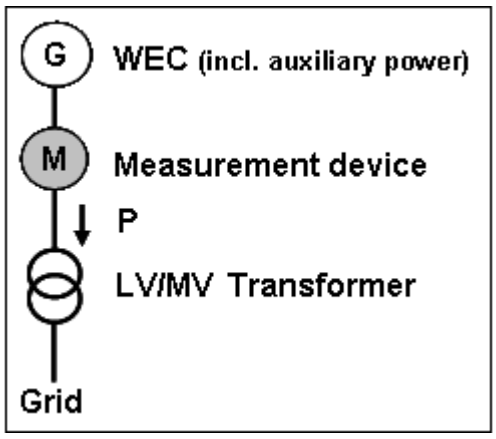
Rotor diameter:	92.5	m
Air density:	1.225	kg/m³
Cut in wind speed:	approx. 3.0	m/s
Cut out wind speed:	24	m/s
Wind speed at hub height:	10 minutes mean values	
Blades:	clean, no ice/snow formation	

2.2 Conditions for power curve guarantee and measurement

Verification according to IEC 61400-12-1: 2005[1]		
Turbulence intensity:	6 to 12	%
Terrain:	not complex according to IEC 61400-12-1: 2005[1]	
Vertical wind shear coefficient (measured between hub height and hub height minus rotor diameter divided by 2):	≤ 0.2	
air density at location (10 minutes mean value):	≥ 1.13	kg/m³
Temperature range:	≤ 35	°C
Power factor:	cos phi ~ 1	
Anemometer type:	Thies First Class	
Voltage level for measurement:	690 V (50 Hz) / 575 V (60Hz)	

[1] For obstacle assessment according to 61400-12-1: 2005 Annex A.2 the following condition applies:

No obstacles with a height greater than 1/3 of the distance between the ground and the lower blade tip shall exist in the measurement sector within 0-4 rotor diameters of the wind turbine or met mast.



Arrangement of a measuring unit for the power curve measurement of a *REpower MM92*

2.3 Conditions for sound power level guarantee and measurement

Verification according to IEC 61400-11: 2002 + A1: 2006[2]

Roughness length (average peak): 0.05 m

[2] Method 1, as outlined in section 7.3 of the IEC standard 61400-11

3 Guaranteed electrical power curve und guaranteed sound power level[3]

The sound power level guaranteed by REpower includes a measurement uncertainty of approx. 1 dB(A). REpower warrants that there is no tonal audibility > 0 dB.

3.1 Sound power level according to IEC for wind speed at hub height

Wind speed v [m/s]	Power P [kW] [4]	Sound Power Level L_{WA} [dB(A)] [5]	Thrust coefficient ct [-]	Power coefficient cp [-]
3.0	20	--	0.98	0.180
4.0	94	--	0.87	0.357
5.0	205	--	0.79	0.398
6.0	391	100.4	0.79	0.440
7.0	645	101.8	0.79	0.457
8.0	979	103.3	0.79	0.465
9.0	1375	104.2	0.74	0.458
10.0	1795	104.2	0.69	0.436
11.0	2000	104.2	0.54	0.365
12.0	2040	104.2	0.39	0.287
13.0	2050	104.2	0.29	0.227
14.0	2050	104.2	0.23	0.182
15.0	2050	104.2	0.19	0.148
16.0	2050	104.2	0.15	0.122
17.0	2050	104.2	0.13	0.101
18.0	2050	104.2	0.11	0.085
19.0	2050	104.2	0.09	0.073
20.0	2050	104.2	0.08	0.062
21.0	2050	104.2	0.07	0.054
22.0	2050	104.2	0.06	0.047
23.0	2050	104.2	0.06	0.041
24.0	2050	104.2	0.05	0.036

[3] Valid for unrestricted operation only. During sound reduced operation different power and sound levels are effective.

[4] Guaranteed on 690 V (for 50 Hz) / 575 V (for 60Hz) voltage level

[5] Sound power level at hub height

3.2 Sound power level according to IEC for wind speed at 10 m height

HH	v_{10} [m/s]	4.0	5.0	6.0	7.0	8.0	9.0	10.0
68.0 – 68.5 m	L_{WA} [5] [dB(A)]	95.7	101.2	103.1	104.2	104.2	104.2	104.2
78.0 – 80.0 m	L_{WA} [5] [dB(A)]	96.0	101.4	103.3	104.2	104.2	104.2	104.2
98.0 – 100.0 m	L_{WA} [5] [dB(A)]	96.4	101.7	103.4	104.2	104.2	104.2	104.2

All sound power levels above are based on wind speeds of v_{10} at 10 m height. The data of the noise level are based on the requirements of the IEC 61400-11: 2002 + A1: 2006.

The calculation of the wind speed in 10 m height is based on a roughness length of 0.05m.

3.3 Sound power level according to FGW Guideline at 95% of rated power

The sound power level measured according to the "Technische Richtlinie für Windenergieanlagen Teil 1: Rev. 18 der FGW" at 95 % of the rated power is independent of the hub height:

$$\mathbf{L_{WA,\,95\%} = 104.2\ dB(A)}$$