KÖTTER CONSULTING ENGINEERS

Summary of Test Report (Measured hub height of 99 m) /1/

Master Data Sheet "Geräusche" (*Noise*), in accordance with "Technische Richtlinien für Windenergieanlagen, Teil 1: Bestimmung der Schallemissionswerte"
(Technical Guidelines for Wind Turbine Generators, Part 1: Determination of sound emission values)

Rev. 18 of February 1, 2008 (Editor: Fördergesellschaft Windenergie e.V. Stresemannplatz 4, D-24103 Kiel)

Extract of Test Report 213122-02.01 IEC
on noise emission of wind turbine generator of type E-101

General Data			Technical Data (manufacturer's specifications)	
Manufacturer of WTG:	Enercon GmbH		Rated power (generator):	3,050 (3,250) kW
Serial number:	1010002		Diameter of rotor:	101 m
Location of WTG (approx.):	49733 Haren		Hub height above ground:	99 m
Geographic co-ordinates:	GK longitude:	25.76.214	Type of tower:	conical tubular concrete
	GK latitude:	58.59.856	Power control:	Pitch
Complementary rotor data (manufacturer's specifications)			**Complementary data of gear unit and generator (manufacturer's specifications)**	
Manufacturer of rotor blade:	Enercon		Manufacturer of gear unit:	not applicable
Type of rotor blade:	E-101-1		Type of gear unit:	not applicable
Blade setting angle:	variable		Manufacturer of generator:	Enercon
Number of rotor blades:	3		Type of generator:	G-101/30-G2
Rotor speed range:	5 to 14.7 rpm. (mode OM I)		Rated speed of generator:	5 to 14.7 rpm. (mode OM I)

Calculated Performance Chart: Performance characteristic E101 3 MW OM I ; calculated by ENERCON (Rev. 1.0)

	Reference Point		Noise emission parameters	Observations
	standardized wind speed at a height of 10 m	true electrical power		
sound power level $L_{WA,P}$	6 ms^{-1}	1,414 kW	103.6 dB(A)	
	7 ms^{-1}	2,077 kW	104.3 dB(A)	
	8 ms^{-1}	2,751 kW	104.8 dB(A)	
	9 ms^{-1}	2,987 kW	104.6 dB(A)	(1)
	10 ms^{-1}	3,050 kW	--	(2)
tonal audibility $\Delta L_{a,k}$	6 ms^{-1}	1,414 kW	- 1.5 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)
impulse adjustment for immediate vicinity K_{IN}	6 ms^{-1}	1,414 kW	0 dB	
	7 ms^{-1}	2,077 kW	0 dB	
	8 ms^{-1}	2,751 kW	0 dB	
	9 ms^{-1}	2,987 kW	0 dB	(1)
	10 ms^{-1}	3,050 kW	--	(2)

Third-octave band sound power level for v_s = 6 ms^{-1} in dB(A)

Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	78.3	81.8*	83.0**	84.2	89.6	85.7*	89.2	92.7	94.1	94.6	95.1	94.9
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	93.5	91.6	90.0	89.0	85.4	84.1	82.3	79.3	74.8	67.8*	64.7**	65.3**

Octave band sound power level for v_s = 6 ms^{-1} in dB(A)

Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	85.6*	91.9	97.2	99.6	96.7	91.5	84.6	70.3*

Third-octave band sound power level for v_s = 7 ms^{-1} in dB(A)

Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	78.9	83.3	84.0	84.9	88.2	86.4*	89.6	94.7	94.9	95.4	95.8	95.5
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	94.0	92.0	90.4	89.3	86.1	84.7	82.9	79.9	74.4*	68.4*	64.6**	62.7**

Octave band sound power level for v_s = 7 ms^{-1} in dB(A)

Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	87.3	91.5	98.4	100.3	97.1	91.9	85.0	71.5**

Third-octave band sound power level	for v_s = 8 ms^{-1} in dB(A)											
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	82.1	82.8	84.4	88.4	86.8	90.1	94.8	95.0	95.6	96.3	96.2	82.1
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.0	93.3	91.5	90.4	86.7	85.4	83.7	80.9	75.9	69.7*	67.1**	65.5**

Octave band sound power level	for v_s = 8 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	86.3	91.6	98.6	100.8	98.3	92.8	86.0	73.3**

Third-octave band sound power level	for v_s = 9 ms^{-1} in dB(A)											
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
$L_{WA,P}$	78.6	81.9	82.4*	83.9	87.8	85.9*	88.6	93.8	94.2	95.1	96.0	96.3
Frequency	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000	6,300	8,000	10,000
$L_{WA,P}$	95.4	93.8	92.3	91.0	87.4	86.0	84.1	81.1	76.7	71.7	68.4	66.8*

Octave band sound power level	for v_s = 9 ms^{-1} in dB(A)							
Frequency	63	125	250	500	1,000	2,000	4,000	8,000
$L_{WA,P}$	86.0	90.8	97.6	100.6	98.8	93.5	86.4	74.2

This summary of the test report is valid only in combination with the manufacturer's certificate dated 12/03/2013.

These specifications do not replace the test report mentioned above (particularly for noise immission predictions).

Observations:
(1) Maximum value of standardized wind speed during the WTG-operation measurement v_s = 8,9 m/s
(2) Due to weather conditions, no data available during WTG operation
* Difference between working and background noise < 6 dB, correction by 1.3 dB
** Difference between working and background noise < 3 dB, values shall not be presented

/1/ Wind turbine generator systems – Part 11: Acoustic noise; measurement techniques (IEC 61400-11:2002 and A1:2006); German version DIN EN 61400-11:2007

Measured by: KÖTTER Consulting Engineers
- Rheine -

Date: 23/04/2013 Dipl.-Ing. Oliver Bunk Matthias Humpohl, B.Sc.

KÖTTER CONSULTING ENGINEERS
Bonifatiusstraße 400 · 48432 Rheine
Tel. 0 59 71 - 97 10.0 · Fax 0 59 71 - 97 10.43