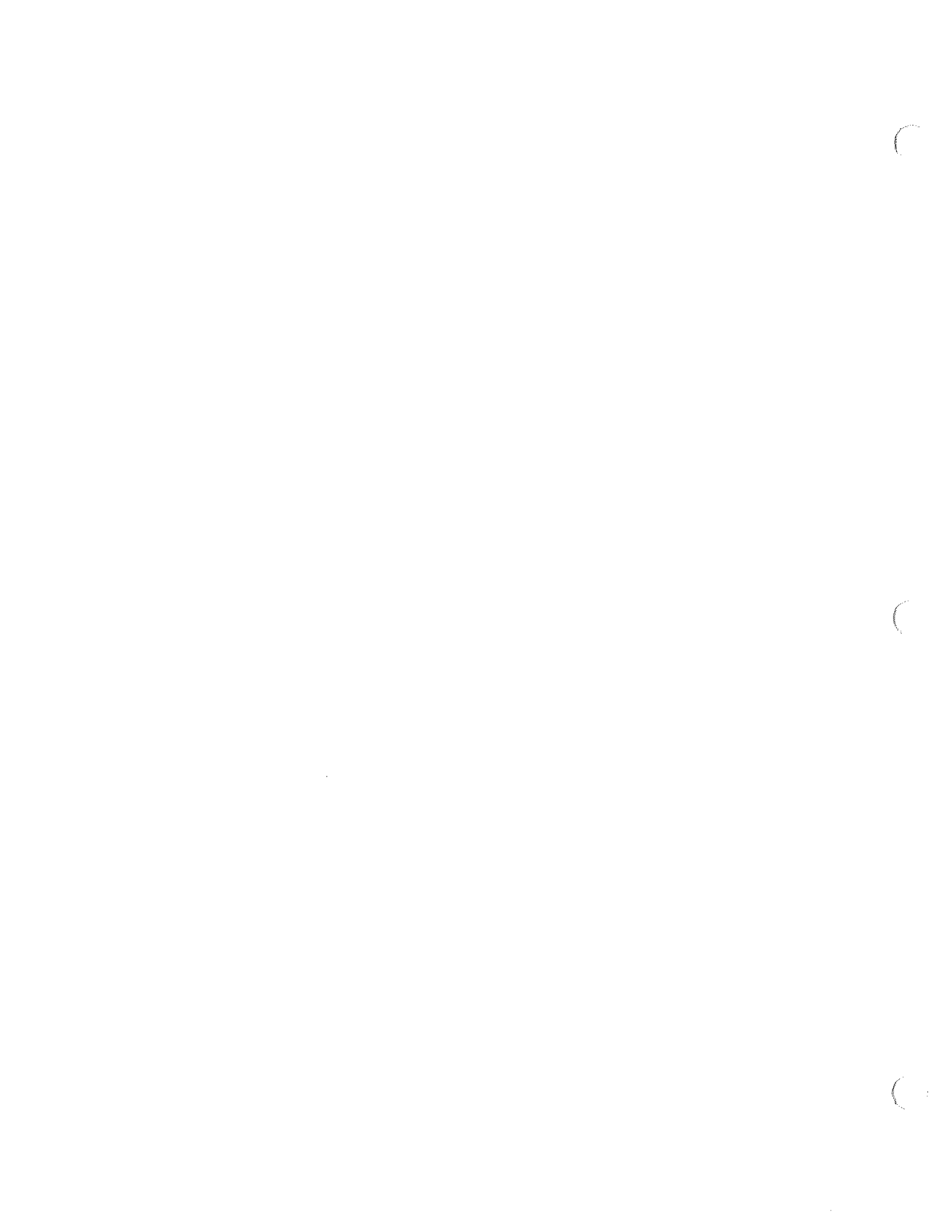


Exhibit 6
Drawings and Specifications for Vestas V82 Turbine

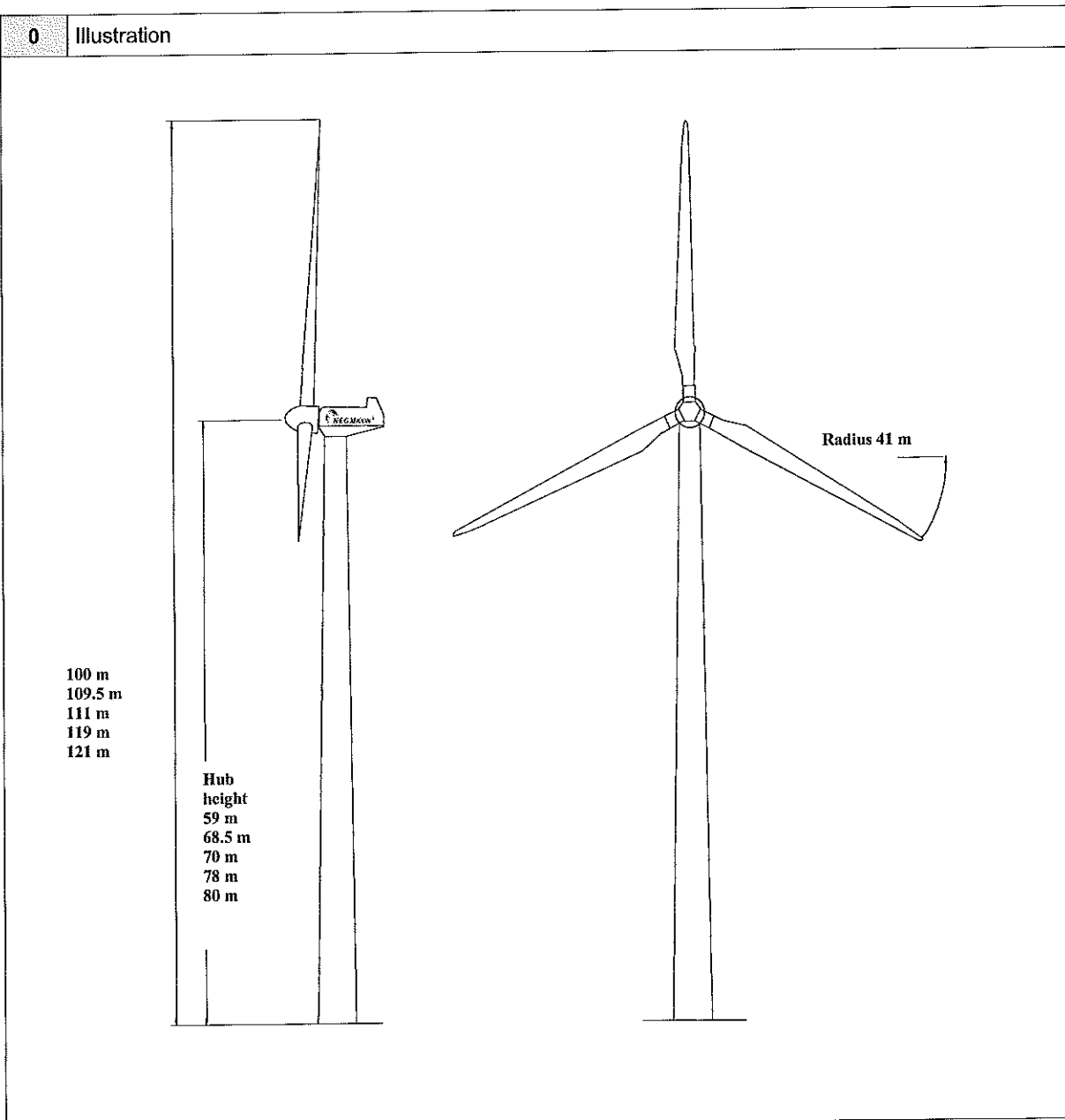


Class I
TSD 4000258-01 EN
2004-10-07

General Specification

V82-1.65 MW MK II

NM82/1650 Vers. 2



1 Main Data			
	50 Hz	60 Hz	60 Hz UL
Nominal Power	1650 kW	1650 kW	1650 kW
Rotor diameter	82 m	82 m	82 m
Swept area	5281 m ²	5281 m ²	5281 m ²
Hub height. IEC IIb	59 m, 68.5 m, 70 m, 78 m	70 m, 78 m.	59 m, 70 m, 80 m
Rotational speed	14.4 rpm	14.4 rpm	14.4 rpm

2 Nacelle Base Frame		
	50Hz	60Hz
Material	EN-GJS-400-18U-LT	EN-GJS-400-18U-LT
Standard colour	RAL 7035	RAL 7035
Corrosion class, outside	Acc. to DS EN ISO 12944:C5 I	Acc. to DS EN ISO 12944:C5 I

3 Rotor		
	50Hz	60Hz
Number of blades	3 pieces	3 pieces
Tip speed (synchronous)	61.8 m/s	61.8 m/s
Rotor shaft tilt	5°	5°
Eccentricity (tower center to hub center)	3447 mm	3447 mm
Solidity (Total blade area/rotor area)	5.0 %	5.0 %
Power regulation	Active Stall®	Active Stall®
Rotor orientation	Upwind	Upwind

4 Blades		
	50Hz	60Hz
Type description	AL 40	AL 40
Blade length	40 m	40 m
Material	Carbon/wood/glass/epoxy	Carbon/wood/glass/epoxy
Standard colour	RAL 7035	RAL 7035
Gloss	Class 2: (30-70%) in accordance with (1), to be measured acc. to DS/ISO2813	Class 2: (30-70%) in accordance with (1), to be measured acc. to DS/ISO2813
Type of rotor air brake	Full blade	Full blade
Blade profiles	• FFA -W3, NACA 63.4	• FFA - W3, NACA 63.4
Twist	20°	20°
Largest chord	3.08 m	3.08 m
Blade area (projected)	86 m ²	86 m ²
Note! (1) Technical Criteria for Danish Approval Scheme for Wind Turbines		

5	Blade bearing		
		50 Hz	60 Hz
	Type description	Ball bearing	Ball bearing
	Number of bearings	3 pcs.	3 pcs.

6	Hub		
		50Hz	60Hz
	Type description	Spherical	Spherical
	Material	EN-GJS-400-18U-LT	EN-GJS-400-18U-LT
Corrosion class, outside	Acc. to DS EN ISO 12944:C5 I	Acc. to DS EN ISO 12944:C5 I	

7	Main shaft		
		50Hz	60Hz
	Type description	Forged shaft and flange	Forged shaft and flange
	Material	34CrNiMo6 + QT	34CrNiMo6 + QT
Corrosion class	Acc. to DS EN ISO 12944:C2	Acc. to DS EN ISO 12944:C2	

8	Main Bearing		
		50Hz	60Hz
	Type description	Spherical roller bearing	Spherical roller bearing
	Number of	1 piece	1 piece
Lubrication	Oil pump	Oil pump	

9	Main Bearing Housing		
		50Hz	60Hz
	Type description	Flange bearing	Flange bearing
Material	EN-GJS-400-18U-LT	EN-GJS-400-18U-LT	

10	Gearbox		
		50 Hz	60Hz
	Type description	1. step planet, 2. step helical	1. step planet, 2. step helical
	Gear house material	Cast	Cast
	Ratio	1:70.2	1:84.3
	Mechanical power	1800 kW	1800 kW
	Bending strength acc. to ISO 6336	$S_F > 1.6$	$S_F > 1.6$
	Surface durability acc. to ISO 6336	$S_H > 1.25$	$S_H > 1.25$
	Scuffing safety acc. to DNV 41.2	$S_S > 1.3$	$S_S > 1.3$
	Shaft seals	Labyrinth	Labyrinth
Oil sump	App. 250 l	App. 250 l	

11	Cartridge Gear Heater - for Arctic Version only		
		50 Hz	60 Hz
	Rating	800 W/ pcs.	800 W/ pcs.
Number of	4 pieces	4 pieces	

12	Oil pump		
	Voltage	50 Hz 3 x 690 V	60Hz 3 x 480 V
13	Heat Exchange Unit (Water/Oil)		
	Cooling capacity	50 Hz 41.3 kW	60 Hz 41.3 kW
14	Oil Cooler		
	Cooling capacity	50 Hz 37.5 kW	60 Hz 37.5 kW
15	Water Pump		
	Voltage	50 Hz 1 x 230 V	60Hz 3 x 480 V
16	Water Cooler/ Radiator		
	Cooling capacity	50 Hz 46.2 kW	60 Hz 46.2 kW
17	Electrical Nacelle Heater - for Arctic Version only		
	Voltage	50 Hz 3 x 690 V	60Hz 3 x 600 V
	Power	20 kW	20 kW
	Number of heaters	2 pieces	2 pieces
18	Mechanical Shaft Brake		
	Type description	50 Hz Active Brake	60Hz Active Brake
	Brake disc	Steel, mounted on high speed shaft	Steel, mounted on high speed shaft
	Number of callipers	2 piece	2 piece
19	Hydraulic Power Unit for Mechanical Shaft Brake		
	Voltage	50 Hz 3 x 690 V	60Hz 3 x 480 V
	Working pressure range	140-150 bar	140-150 bar
	Oil capacity	11 l	11 l
20	Coupling		
	Type description	50 Hz Flexible coupling, constant rpm	60Hz Flexible coupling, constant rpm

21 Generator		50 Hz	60 Hz
Type description		1 speed generator, water cooled	1 speed generator, water cooled
Rated power	P_N	1650 kW	1650 kW
Apparent power	S_N	1805 kVA	1808 kVA
Rated current	I_N	1510 A	1740 A
Max power at Class F	P_{Fmax}	1815 kW	1815 kW
Max current at Class F	I_{Fmax}	1661 A	1914 A
No load current	I_0	400 A	430 A
Reactive power consumption at rated power (tolerance. acc to IEC 60034-1)	Q_N	731 kvar	740 kvar
Reactive power consumption at no load (tolerance. acc to IEC 60034-1)	Q_0	478 kvar	447 kvar
Number of poles	P	6	6
Synchronous rotation speed	n_0	1000 rpm	1200 rpm
Rotation speed at rated power	n_N	1012 rpm	1214 rpm
Slip at rated power	S_N	1.20 %	1.17 %
Voltage	U_N	3 x 690 V	3 x 600 V
Frequency	F	50 Hz	60 Hz
Coupling		Δ	Δ
Enclosure		IP54	IP54
Insulation class/ Temperature increase		F/B	F/B

22 Yaw System – Ball Bearing Slewing Ring		50 Hz	60 Hz
Type description		Ball bearing, internal gearing	Ball bearing, internal gearing

23 Yaw System – Yaw Gear and Motors		50 Hz	60 Hz
Type description		Planetary gear motor	Planetary gear motor
Gear ratio of yaw gear unit		app. 1:1687	app. 1:1687
Voltage		3 x 690 V	3 x 480 V
Rotational speed at full load		920 rpm	1140 rpm
Number of yaw gears		6 pieces	6 pieces

24 Yaw System – Yaw Brake		50 Hz	60 Hz
Type Description		Hydraulic disc brake	Hydraulic disc brake
Number of Yaw Friction Units		6 pieces	6 pieces

25 Hydraulic Power Unit for Yaw Brake		50 Hz	60 Hz
Voltage		3 x 400/ 3x 690 V	3 x 480 V
Working pressure range		140-150 bar	140-150 bar
Oil capacity		App. 10 l.	App. 10 l.

26	Tower		
		50 Hz	60 Hz
Type Description	Conical, tubular	Conical, tubular	Conical, tubular
Material	Welded steel plate	Welded steel plate	Welded steel plate
Corrosion class, outside	Acc. to DS EN ISO 12944: C5 I	Acc. to DS EN ISO 12944: C5 I	Acc. to DS EN ISO 12944: C5 I
Colour	RAL 7035	RAL 7035	RAL 7035
Access conditions	Internal, safety harness, ladder cage	Internal, safety harness, ladder cage	Internal, safety harness, ladder cage

27	Wind Turbine Main Panel/ Control panel/ phase comp. panel		
		50 Hz	60 Hz
Voltage	3 x 690 V	3 x 600 V	3 x 600 V
Frequency	50 Hz	60 Hz	60 Hz
Cut-in system	Soft with thyristors	Soft with thyristors	Soft with thyristors
Design Standard	IEC	UL	UL

28	Electrical Grid Requirements		
		50 Hz	60Hz
Max. voltage	+10 % (60 sec.)	+10 % (60 sec.)	+10 % (60 sec.)
Min. voltage	-10 % (60 sec.)	-10 % (60 sec.)	-10 % (60 sec.)
Max. voltage	+12.5 % (0.1 sec.)	+12.5 % (0.1 sec.)	+12.5 % (0.1 sec.)
Min. voltage	-15 % (0.1 sec.)	-15 % (0.1 sec.)	-15 % (0.1 sec.)
High frequency	+1 Hz (0.2 sec.)	+1 Hz (0.2 sec.)	+1 Hz (0.2 sec.)
Low frequency	- 2 Hz (0.2 sec.)	- 2 Hz (0.2 sec.)	- 2 Hz (0.2 sec.)
Maximum asymmetri current	15 % (60 sec.) – phase to ground	15 % (60 sec.) – phase to ground	15 % (60 sec.) – phase to ground
Maximum asymmetri voltage	2 % (60 sec.) – phase to ground	2 % (60 sec.) – phase to ground	2 % (60 sec.) – phase to ground
Maximum short circuit current	25 kA at 690V	30 kA at 600V	30 kA at 600V
Single harmonic	Max 1% of any single harmonic	Max 1% of any single harmonic	Max 1% of any single harmonic
Total harmonic distortion	Max 3% total harmonic distortion	Max 3% total harmonic distortion	Max 3% total harmonic distortion
Connection	<ul style="list-style-type: none"> Solidly grounded wye at secondary (690 V) side of transformer. 	<ul style="list-style-type: none"> Solidly grounded wye at secondary (600 V) side of transformer 	<ul style="list-style-type: none"> Solidly grounded wye at secondary (600 V) side of transformer

29	Integrated Grid Connection System, IGC System, Transformer in tower - Optional (IGC is not delivered in the US)		
	Power Transformer incl. Metal Enclosure		
		50 Hz	60 Hz
Type description	Cast Resin (dry type)	Cast Resin (dry type)	Cast Resin (dry type)
Apparent power	1800 kVA	1800 kVA	1800 kVA
Primary voltage	10 – 24 kV+/- 2 x 2.5 %	10 – 24 kV+/- 2 x 2.5 %	10 – 24 kV+/- 2 x 2.5 %
Secondary voltage	0.690 kV	0.600 kV	0.600 kV
Frequency	50 Hz	60 Hz	60 Hz
Coupling group	Dyn, Solidly grounded wye at 690 V	Dyn, Solidly grounded wye at 600 V	Dyn, Solidly grounded wye at 600 V
Switch gear			
Type description	Gas insulated SF6 ring main unit	Gas insulated SF6 ring main unit	Gas insulated SF6 ring main unit
Nominal voltage	24 kV	24 kV	24 kV
Frequency	50 Hz	60 Hz	60 Hz

31 Climate and Site Conditions regarding structural design		
	50 Hz – IEC IIb	60 Hz – IEC IIb
Design life time	20 years	20 years
Temperature interval for operation	See specifications below	See specifications below
Temperature interval for structure	See specifications below	See specifications below
A-factor	9.59 m/s	9.59 m/s
Form factor, c	2.0	2.0
Annual average wind speed	8.5 m/s	8.5 m/s
Wind shear	0.20	0.20
Extreme wind speed	42.5 m/s (10 min. average)	42.5 m/s (10 min. average)
Survival wind speed	59.5 m/s (3 sec. average)	59.5 m/s (3 sec. average)
Automatic stop limit	20 m/s (10 min. average)	20 m/s (10 min. average)
Re-cut in	18 m/s (10 min. average)	18 m/s (10 min. average)
Characteristic turbulence intensity acc. to IEC 61400-1 (15 m/s)	16% (including wind farm turbulence)	16% (including wind farm turbulence)
Air density	1.225 kg/m ³	1.225 kg/m ³
Maximum in-flow angle	8°	8°

32 Specific Climate and Site Conditions			
	Standard (only 50 Hz)	Tropical -20 to +40°C (50 + 60 Hz)	Arctic (50 + 60 Hz)
Temperature interval for operation ^{1,2,3}	-20 to +30°C	-20 to +35°C (+40°C)	-30 to +30°C
Temperature interval for structure	-20 to +50°C	-20 to +50°C	-40 to +50°C
¹ Note! For Tropical! Rated power is reduced to 1500 kW for temperature between +35°C and +40°C. ² Note! No operation if temperature is below -10°C in control panel or gear oil sump. Heating systems are optional. ³ Note! If the windturbine is placed more than 1000m above sea level, a higher temperature rise than usual might occur in the generator, the transformer and other electrical components. In this case a periodic reduction of rated power might occur, even if the ambient temperature is within specified limits. Furthermore increased risk of icing up occur at sites more than 1000m above sea level.			

33 Conditions for Power Curve (at hub height)		
	50 Hz	60Hz
Air density	1.225 kg/m ³	1.225 kg/m ³
Wind shear	0.12-0.16	0.12-0.16
Turbulence intensity	11-16 %	11-16 %
Blades	Clean	Clean
Ice/snow on blades	No	No
Leading Edge	No damage	No damage
Rain	No	No
Terrain	IEC 61400-12	IEC 61400-12
Inflow angle	0±2 °	0±2 °
Grid frequency	50 ±0.5	60±0.5 Hz
Verification acc. to	IEC 61400-12	IEC 61400-12

Noise Measurement Summary, NM82/1650

1

2

3

Noise measurement summary, NM82/1650

Page 1 of 2

1. Identification of Measuring institute

Windtest Grevenbroich GmbH
Frimmersdorfer str. 73
D 41517 Grevenbroich, Germany

Windtest Grevenbroich is accredited by DAR (DPT-DL-3175.00) to perform noise measurements on wind turbines.

2. Report identification

Acoustic report for a wind energy converter type
NEG Micon NM 82/1650, hub height 93,6m
Report SE03007B1

Authorised signatory: Dr. Markus Koschinsky

3. Measurement date:


May 12. 2003, Grevenbroich test site

4. Description of wind turbine and surroundings

Wind turbine: NM82/1650
Rotor blades: AL 40
Main Gear: Flender PEAS 4390
Generator: ELIN MCS556M31Z7B
Terrain: Flat
Surface: Grass, low vegetation, a few tree lines
Measurement conditions: Optimal

5. Standard of measurement

IEC 61400-11:1998 " Wind turbine generator systems – Part 11: Acoustic noise measurement techniques"

	Name:	Date:	Signature:
Written by:	ESL	19/01/2003	
Approved by:			
Filename:	Noise measurement summary NM82-1650.doc rev 1		
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Noise measurement summary, NM82/1650

6. Measurement results

6.1 Apparent sound power level and uncertainty:

	6 m/s	7 m/s	8 m/s	95% RP (8,6 m/s)
L_{WA} [dB re 1 pW]	100,3	100,7	101,7	101,8
uncertainty	0,9	0,9	>0,9	>0,9

6.2 Frequency analysis at 8 m/s

A-weighted 1/1 octave analysis of the sound power level at 8 m/s

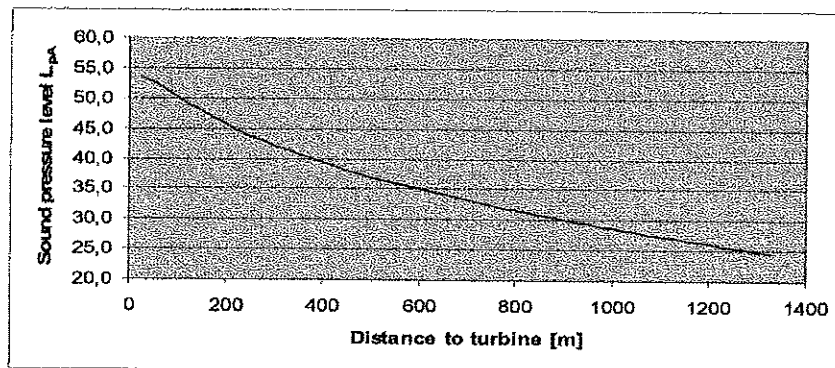
Octave band	63 Hz	125 Hz	250 Hz	500 z	1 kHz	2 kHz	4 kHz	8 kHz
L_{WA} [dB]	83,3	90,3	94,9	95,0	95,9	92,9	91	81,5

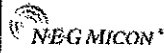
6.3 Tonality

The noise from the turbine did not contain any tonal peaks with a calculated ΔL_m above the IEC 61400-11:1998 expression (9). According to IEC 61400-11:1998 no audible tones is present in the noise.

7 Sound pressure level at distances from turbine

The graph below shows the sound pressure level L_{pA} 1.5 m above the ground at a wind speed 10 m above ground of 8 m/s as function of the distance from the turbine. It is calculated for 78 m hub height, and includes air absorption (0.005 dB(m)). At 218 meters distance from the turbine the sound pressure level is 45 dB(A), and at 376 meters distance form the turbine, the sound pressure level is 40 dB(A).



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Approved by:			
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