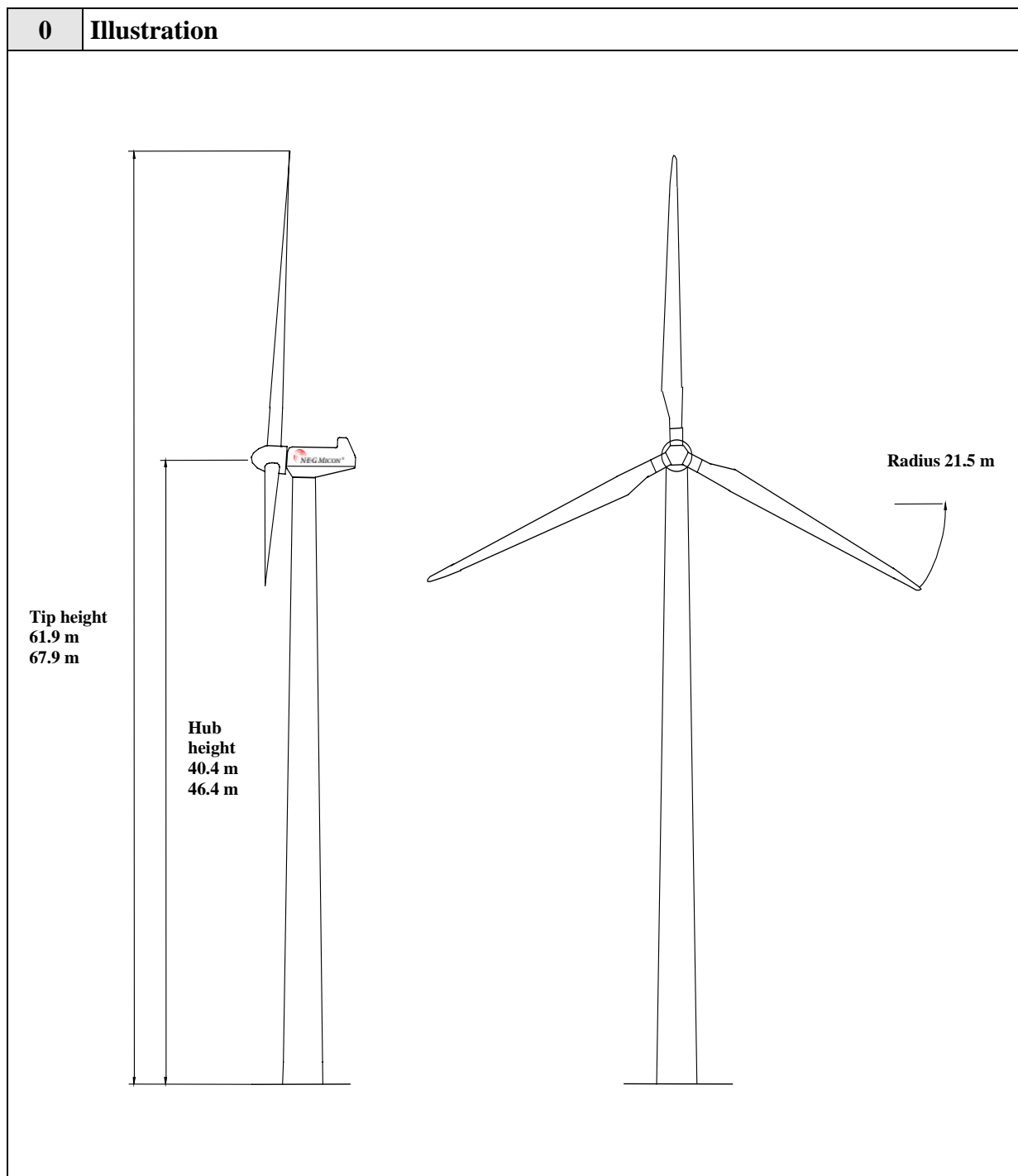


# Main Specification

NM 600/43

NVN 11400-0



<b>1</b>	<b>Main Data</b>		
	Nominal power	600	kW
	Rotor diameter	43.0	m
	Swept area	1452	m <sup>2</sup>
	Hub height	40.4, 46.4	m
	Rotational speed approx.	27/18	rpm

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<b>2</b>	<b>Nacelle Bed</b>		
	Type description		20 t platform
	Material		Welded steel plate
	Standard colour		RAL 7035
	Corrosion class, outside		Acc. to ISO/DIS 12944: C5 I
	Weight (without components mounted)	5.5	tons
	Total weight (without rotor and tower)	20	tons
<b>3</b>	<b>Rotor</b>		
	Number of blades	3	pieces
	Diameter	43.0	m
	Swept area	1452	m <sup>2</sup>
	Tip speed (synchronous)	60.8	m/s
	Rotor shaft tilt	5	°
	Eccentricity	2109	mm
	Solidity (Total blade area/rotor area)	4.5	%
	Power regulation		Stall
	Rotor orientation		Upwind
	Total weight with hub and blade extenders	app. 12.5	tons
<b>4</b>	<b>Blades</b>		
	Manufacturer		LM Glasfiber A/S
	Type		LM 19.1
	Blade length	19.04	m
	Material		Glass fibre-PE/Carbon fibre-epoxy
	Type of rotor air brake		Pivotable blade tip
	Blade profiles		FFA-W3, NACA 63-serie
	Twist	20	°
	Tip angle (standard)	-2.5	°
	Largest cord	1.65	m
	Tip cord (at blade tip bottom)	0.774	m
	Blade area	21.9	m <sup>2</sup>
	Weight each (incl. extenders)	app. 1.9	tons
<b>5</b>	<b>Hub</b>		
	Type description		Spherical
	Material		Meehanite SFF 400
	Corrosion class, outside		Acc. to ISO/DIS 12944: C5 I
	Weight (excl. bolts and blade extenders)	app. 2.1	tons
<b>6</b>	<b>Rotor shaft</b>		
	Type description		Die forged shaft and flange
	Material		34CrNiMo6V
	Corrosion class		Acc. to ISO/DIS 12944: C2
	Weight	app. 2.9	tons
<b>7</b>	<b>Main bearing</b>		
	Type description		Spherical roller bearing
	Number of	1	piece
<b>8</b>	<b>Main Bearing Housing</b>		
	Design/Type		NEGM/Flange bearing
	Number of	1	piece

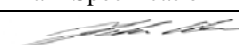
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<b>9</b>	<b>Gearbox</b>		
	Manufacturer		Flender PEAC 4280.7
	Type description		1. step planet, 2.step parallel shafts
	Gear house material		Cast
	Ratio	1:55.4	
	Mechanical power	642	kW
	Safety against fatigue in cog root acc to DIN 3990		$S_F > 1.6$
	Safety against pitting acc to DIN 3990		$S_H > 1.25$
	Safety against scuffing acc to DNV 41.2		$S_S > 1.3$
	Shaft seals		Maintenance free labyrinth-type
	Lubrication		Splash – with lubrication channels
	Oil sump approx.	app. 60	l
	Oil type		Mobilgear SHC XMP 320
	Weight without oil	app. 5.5	tons
<b>10</b>	<b>Oil Pump</b>		
	Voltage	3 x 400	V
	Pump capacity	35	l/min.
<b>11</b>	<b>Heat Exchange Unit (Water/Oil)</b>		
	Cooling capacity	18	kW (20 °C ambient)
<b>12</b>	<b>Water Pump</b>		
	Voltage	3 x 400	V
	Pump capacity	30	l/min.
<b>13</b>	<b>Radiator</b>		
	Cooling capacity	40	kW (20 °C ambient)
<b>14</b>	<b>Mechanical Brake</b>		
	Type description		Fail safe – hydraulic release
	Brake disk		Steel, mounted on high speed shaft
	Number of calibres	1	piece
<b>15</b>	<b>Hydraulic Power Unit for Mechanical Brake</b>		
	Voltage	3 x 400	V
	Working pressure range	140-180	bar
	Oil type	SHC 524	Mobil
	Oil capacity	2.5	l
<b>16</b>	<b>Coupling</b>		
	Type description		Flexible coupling, constant velocity

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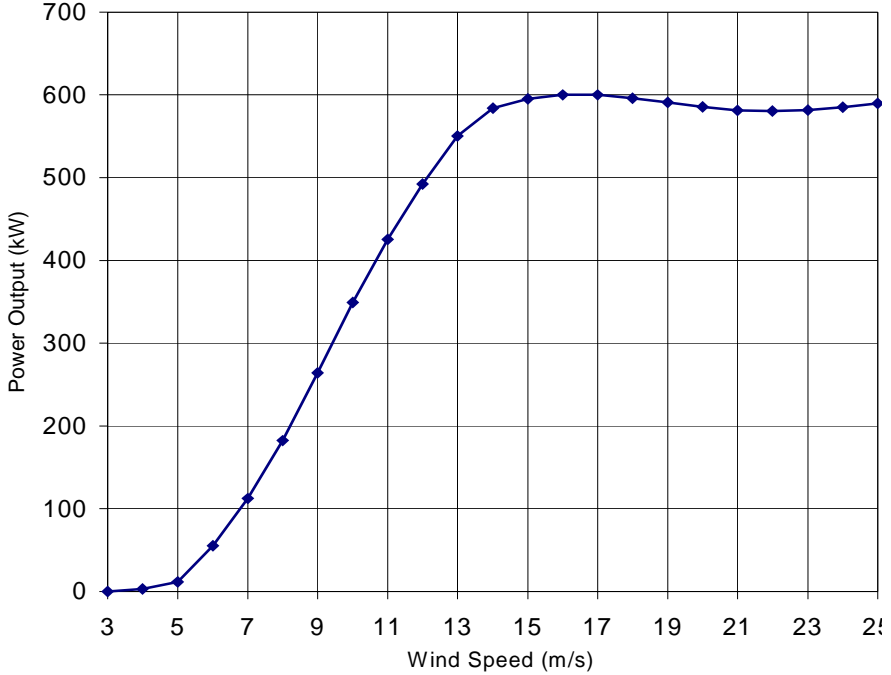
<b>17</b>	<b>Generator</b>			
	Manufacturer	Elin, Weier		
	Type description	2 speed generator, water cooled		
	Rated power	$P_N$	600	150 kW
	Apparent power	$S_N$	667	183 kVA
	Rated current	$I_N$	560	155 A
	Max power at Class F	$P_{Fmax}$	660	165 kW
	Max current at Class F	$I_{Fmax}$	616	171 A
	No load current	$I_0$	130	65 A
	Reactive power consum. at rated power	$Q_N$	290	106 kvar (toleranc. acc to IEC 60034-1)
	Reactive power consumption at no load	$Q_0$	155	78 kvar (toleranc. acc to IEC 60034-1)
	Number of poles	p	4	6
	Synchronous rotation speed	$n_0$	1500	1000 rpm
	Rotation speed at rated power	$n_N$	1511	1006 rpm
	Slip at rated power	$s_N$	0.70	0.60 %
	Voltage	$U_N$	3 x 690 V	
	Frequency	f	50 Hz	
	Coupling		$\Delta$	$\Delta$
	Enclosure	IP54		
	Insulation class/Temperature increase	Class F/Class B		
	Weight	3.6		tons
<b>18</b>	<b>Hydraulic Power Unit for Blade Tip Air Brakes</b>			
	Motor type			PM 50/42
	Voltage	24		V DC
	Working pressure range	77-82		bar
	Burst disc	107		bar
	Oil type	AERO HF		Mobil
	Oil capacity	3		l
<b>19a</b>	<b>Yaw System – Ball Bearing Slewing Ring</b>			
	Type description	Ball bearing, internal gearing		
<b>19b</b>	<b>Yaw System – Yaw Gear and Motors</b>			
	Ratio	1 : 2716		
	Voltage	3 x 400		V
	Rotational speed at full load	1380		rpm
	Number of yaw gears	3		pieces
<b>19c</b>	<b>Yaw System – Yaw Friction</b>			
	Type description	Hydraulic disc brake		
	Number of yaw friction units	3		pieces

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<b>20</b>	<b>Tower</b>						
	Material		Welded steel plate				
	Surface treatment		3-layer painting system				
	Corrosion class, outside		Acc. to ISO/DIS 12944: C5 I				
	Colour		RAL 7035				
	Access conditions		Internal, safety harness, ladder cage				
	Hub height over foundation		40.4	46.4	m		
	Tower height		39.0	45.0	m		
	Top diameter		1.64	1.64	m		
	Bottom diameter		3.00	3.00	m		
	Number of sections		2	2	pieces		
	Total weight		36	40	tons		
	Type (edged or round)		e	e			
<b>21</b>	<b>Wind Turbine Controller/Power Panel</b>						
	Voltage		3 x 690	V			
	Cut-in system		Soft with thyristors				
	Maximum power		675	kW (10 min. average)			
	Weight (total)		800	kg			
<b>21a</b>	<b>Electrical Grid Requirements</b>						
	Max. voltage		+10	% (60 sec.)			
	Min. voltage		-10	% (60 sec.)			
	Max. voltage		+12.5	% (0.1 sec.)			
	Min. voltage		-15	% (0.1 sec.)			
	High frequency		+1	Hz (0.2 sec.)			
	Low frequency		- 2	Hz (0.2 sec.)			
	Maximum asymmetri current		15	% (60 sec.)			
	Maximum asymmetri voltage		2	% (60 sec.)			
	Maximum short circuit current		20	kA (at 690 V)			
	Single harmonic		max 1	% of any single harmonic			
	Total harmonic distortion		max 3	% total harmonic distortion			
	Connection		Solidly grounded wye at secondary side of transformer				
<b>22</b>	<b>Power Factor</b>						
	Preconditions						
	Rated power	$P_N$	600	150	kW		
	Rated voltage	$U_N$	3 x 690		V		
	Frequency	$f$	50		Hz		
	Reactive power consump. at rated power	$Q_N$	290	106	kVAr (toleranc. acc to IEC 60034-1)		
	Reactive power consumption at no load	$Q_0$	155	78	kVAr (toleranc. acc to IEC 60034-1)		
	Capacitor banks:						
	Capacitors		175	kVAr, split into steps			
	Generator G, 4 poles, 600 kW:						
	Generator load	%	25	50	75	100	110
	Power factor before phase compensation (toleranc. acc to IEC 60034-1)	$\cos\phi$	0.67	0.84	0.88	0.90	0.89
	Power factor after phase compensation (toleranc. acc to IEC 60034-1)	$\cos\phi$	0.99	0.99	0.98	0.98	0.97
	Generator g, 6 poles, 150 kW:						
	Generator load	%	25	50	75	100	110
	Power factor before phase compensation (toleranc. acc to IEC 60034-1)	$\cos\phi$	0.42	0.65	0.75	0.82	0.83
	Power factor after phase compensation (toleranc. acc to IEC 60034-1)	$\cos\phi$	0.98	0.98	0.99	0.99	0.99
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<b>23</b>	<b>Climate and Site Conditions</b>	
	Calculated minimum life	20 years
	Temperature interval for structure	-20 to +35 °C
	Temperature interval for operation	-10 to +25 °C
	A-factor	9.9 m/s
	Form factor, k	2.3
	Yearly average wind in 50 m hub height	8.5 m/s
	Wind shear	0.14
	Extreme wind speed	40 m/s (10 min. average)
	Survival wind speed	60 m/s (2 sec. average)
	Automatic stop limit	25 m/s (10 min. average)
	Turbulence intensity acc. to IEC II low (15 m/s)	18 %
	Air density (max.)	1.28 kg/m <sup>3</sup>
	Distance between wind turbines in single rows	3 rotor diameters
	Distance between wind turbines in wind farms	5 rotor diameters
	Maximum in-flow angle	5 °
<b>24a</b>	<b>Conditions for Power Curve (at hub height)</b>	
	Air density	1.225 kg/m <sup>3</sup>
	Wind shear	0.12-0.16
	Turbulence intensity (15 m/s)	11-15 %
	Blades	Clean
	Leading Edge	No damage
	Rain	No
	Terrain	Flat
	Inflow angle (vertically)	0±2 °
	Grid frequency	50 ±0.5 Hz
	Measured acc. to	IEC 61400-12
	The power curve in this document is only related to air density.	

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<b>24</b>	<b>Power curve</b>																																																				
	<p>The power curve is shown at standard conditions according to DIN ISO 2533:          Air temperature 15 °C, air pressure 1013 hPa and maximum turbulence intensity of 15%.          Reference: Power curve of 10.11.98.</p>																																																				
	<table border="1"> <thead> <tr> <th>(m/s)</th> <th>Pe</th> </tr> </thead> <tbody> <tr><td>3</td><td>0</td></tr> <tr><td>4</td><td>3,0</td></tr> <tr><td>5</td><td>11,4</td></tr> <tr><td>6</td><td>55,3</td></tr> <tr><td>7</td><td>112,4</td></tr> <tr><td>8</td><td>182,4</td></tr> <tr><td>9</td><td>264,3</td></tr> <tr><td>10</td><td>349,4</td></tr> <tr><td>11</td><td>425,5</td></tr> <tr><td>12</td><td>492,2</td></tr> <tr><td>13</td><td>550,3</td></tr> <tr><td>14</td><td>583,8</td></tr> <tr><td>15</td><td>595,0</td></tr> <tr><td>16</td><td>600,1</td></tr> <tr><td>17</td><td>599,9</td></tr> <tr><td>18</td><td>595,8</td></tr> <tr><td>19</td><td>590,6</td></tr> <tr><td>20</td><td>585,2</td></tr> <tr><td>21</td><td>581,2</td></tr> <tr><td>22</td><td>580,2</td></tr> <tr><td>23</td><td>581,5</td></tr> <tr><td>24</td><td>585,1</td></tr> <tr><td>25</td><td>589,7</td></tr> <tr><td>&gt;25</td><td>0,0</td></tr> </tbody> </table>	(m/s)	Pe	3	0	4	3,0	5	11,4	6	55,3	7	112,4	8	182,4	9	264,3	10	349,4	11	425,5	12	492,2	13	550,3	14	583,8	15	595,0	16	600,1	17	599,9	18	595,8	19	590,6	20	585,2	21	581,2	22	580,2	23	581,5	24	585,1	25	589,7	>25	0,0	<p style="text-align: center;"><b>Power Curve - NM 600/43</b></p> 	
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<b>25</b>	<b>Sound Level</b>																																																				
	Official noise level for calculation purpose:	100	dB(A)																																																		
	Noise level measured with LM 19.1 blades:	98.7	dB(A) +/- 2 dB(A)																																																		

**NEG Micon A/S reserves the right to change specifications and to use components of alternative manufacture without prior notice. Alternative components will be of the same high quality and standard as in this survey.**

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