

**ACOUSTIC NOISE TEST REPORT**

**Wind Turbine Generator System  
Acoustic Noise Test Report**  
for the  
**TUGE10**  
at  
**Lilla Båtskär / Åland**



## ACOUSTIC NOISE TEST REPORT

### SECTION 1.0 TEST SUMMARY

Testing and analysis of the TUGE10 wind turbine was performed in accordance with the first edition of *AWEA 9.1*. The third edition of *IEC 61400-11 Annex F* was used for additional guidance in determining integer value results at the bin centers following interpolation of 1/3 octave band spectra. Hereafter, these testing standards and their procedures are referred to as the "Standards." As required in *AWEA 9.1*, direct measurement of wind speed was employed versus determination of wind speed from the measured power curve.

Figure 1 on the following page is the summary of results from the acoustic noise test conducted on the TUGE10 wind turbine. In Figure 1, wind speed is normalized to standard meteorological conditions and adjusted to hub height, using a roughness length of 0.0001m as given in Table D.1 for water, as this testing location is on a small island in the Baltic Sea between Finland and Sweden. The amount of test data analyzed to produce Figure 1 is sufficient to meet the database requirements of the Standards. Table 1 below shows the specifications for the TUGE10 turbine under test.

<b>Turbine Manufacturer</b>	TUGE Energia OÜ
<b>Model</b>	TUGE10
<b>Rotor Diameter</b>	10.2 m
<b>Hub Height</b>	18.5 m
<b>Swept Area</b>	82 m <sup>2</sup>
<b>IEC 61400-2 SWT Class</b>	Class I
<b>Rated Electrical Power</b>	9900 Watts
<b>Cut-in Wind Speed</b>	3,5 m/s
<b>Cut-out Wind Speed</b>	25 m/s
<b>Rated Wind Speed</b>	11.0 m/s
<b>Survival Wind Speed</b>	50 m/s
<b>Rated Rotational Speed</b>	69 RPM
<b>Rotor Speed Range</b>	0-80 RPM
<b>Generator Identification</b>	TUGE Energia OÜ, GEN1069225 (serial number 001)
<b>Inverter Identification</b>	Orbital Grid Feed Inverter GFI-310K
<b>Controller Identification</b>	Orbital TMC3
<b>Number of Blades</b>	3
<b>Fixed or variable pitch</b>	Fixed
<b>Blade Pitch Angle</b>	0° at root
<b>Blade Specification</b>	Fiberglass / polyester, 8.9° twist, 4900mm blade length, 2.29 m <sup>2</sup> blade areas, 18 embedded nuts for mounting (10 mm / 8.8 grade), tip brakes
<b>Hub type</b>	Rigid
<b>Slip Ring Identification</b>	N/A
<b>Slip Ring Specification</b>	N/A
<b>Brake/Furl System Components and Identification</b>	Rotor Brake: Intorq GmbH, BFK455-28

**Table 1 - Manufacturer Turbine Specifications**

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**ACOUSTIC NOISE EMISSION TEST SUMMARY**

TUGE10

**Test Statistics:**

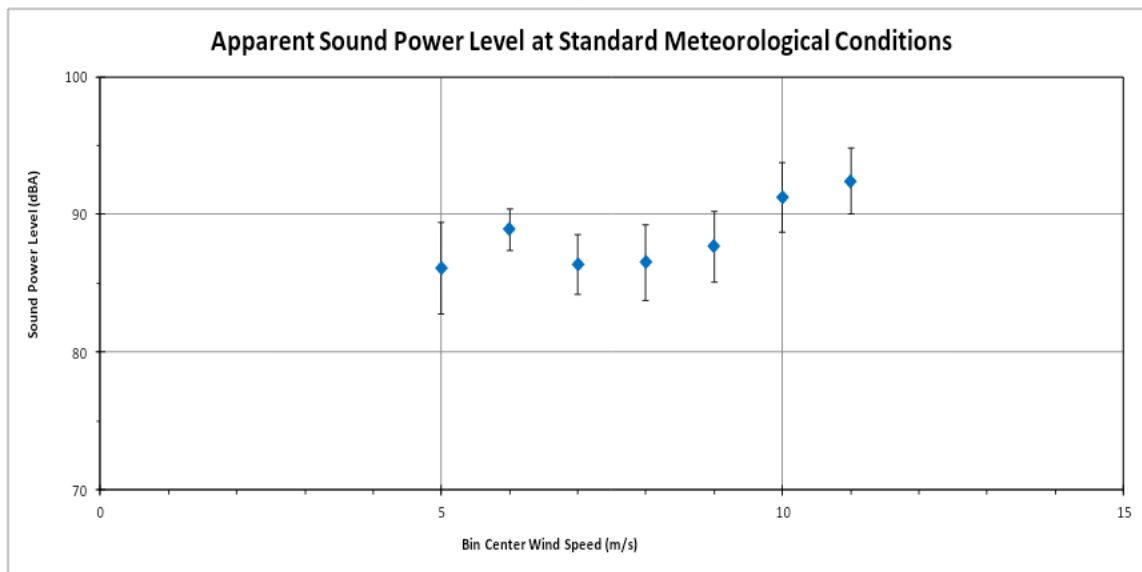
Measurement dates: 02-Aug, 16-Aug, 17-Aug  
Total # of data points: 250

**Turbine Specifications:**

Rated power: 9.9 {kW}  
Cut-in wind speed: 4.5 {m/s}  
Rated wind speed: 11.0 {m/s}  
Rotor diameter: 10.2 {m}  
Rotor swept area: 81.7 {m<sup>2</sup>}  
Control type: Active {-}  
Pitch setting: Fixed {-}  
Rotational speed: Variable {RPM}

Bin Center Wind Speed {m/s}	Apparent Sound Power Level {dB(A)}	Apparent Sound Combined Uncertainty {dB(A)}	AWEA Rated sound Level {dB(A)}
5	86.08	3.34	<b>43.7</b>
6	88.90	1.53	
7	86.36	2.16	
8	[86.50]	2.76	
9	[87.68]	2.56	
10	*91.24	2.51	
11	*92.42	2.41	

**Sound Power Results:**



**Figure 1 – Acoustic noise test results summary**