	Aircon GmbH & Co. KG Nessestraße 27 DE-26789 Leer	Tel.: 0491-454100 Fax: 0491-4541026 E-Mail: info@aircon-international.com
---	---	--

North American Distributor
Acterra Group, Inc.
319.377.6357 | www.acterragroup.com

Summary Details for Performance, Duration and Acoustic Measurements for the
Aircon 10S Wind Turbine
UK MCS Certification Summary



Certificate Number MCS TUV0007
Small Wind Turbine

Certification Summary	07.11.2011	Seite 1 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
Nessestraße 27
DE-26789 Leer

Tel.: 0491-454100
Fax: 0491-4541026
E-Mail: info@aircon-international.com

List of contents

1. Introduction.....	3
2. Power Curve.....	4
3. Annual Energy Production.....	6
4. Noise Immission.....	7
5. Duration Test.....	8
6. Reference Reports	8

List of tables

Table 1 - BWEA Definition Results
Table 2 - Power performance results at sea Level air density, 1.225 kg/m ³ (1/2)
Table 3 - Power performance results at sea Level air density, 1.225 kg/m ³ (2/2)
Table 4 - BWEA Reference Annual Energy
Table 5 - Estimated annual energy production
Table 6 - Reference Sound Levels
Table 7 - Summary duration test

List of figures

Figure 1 - Power curve with combined standard uncertainty
Figure 2 - Noise Label

Certification Summary	07.11.2011	Seite 2 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
Nessestraße 27
DE-26789 Leer

Tel.: 0491-454100
Fax: 0491-4541026
E-Mail: info@aircon-international.com

1. Introduction

This document summarizes the results of UK MCS product certification conducted on an Aircon 10S wind turbine.

Certification Summary	07.11.2011	Seite 3 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
 Nessestraße 27
 DE-26789 Leer

Tel.: 0491-454100
 Fax: 0491-4541026
 E-Mail: info@aircon-international.com

2. Power Curve

Measured power curve							
Reference air density: 1,225kg/m ³					Category A	Category B	Category A B
Bin	Hub height wind speed	No. of data sets 1min. Avg.	Power output	C _p	Standard uncertainty	Standard uncertainty	Standard uncertainty
[l]	[m/s]	[N]	[kW]		[kW]	[kW]	[kW]
1	1,50	0	0,000	0,0000	0,000	0,000	0,000
2	2,00	0	0,000	0,0000	0,000	0,000	0,000
3	2,60	7	-0,132	-0,2747	0,036	0,017	0,039
4	3,03	36	-0,079	-0,1036	0,012	0,019	0,022
5	3,54	58	0,009	0,0070	0,013	0,041	0,043
6	4,02	34	0,312	0,1744	0,024	0,072	0,076
7	4,57	32	0,680	0,2587	0,032	0,099	0,104
8	5,00	75	1,120	0,3253	0,025	0,131	0,134
9	5,52	125	1,650	0,3564	0,020	0,151	0,153
10	6,00	248	2,203	0,3706	0,018	0,186	0,187
11	6,49	286	2,855	0,3798	0,019	0,225	0,226
12	6,99	260	3,600	0,3827	0,022	0,258	0,259
13	7,48	177	4,344	0,3779	0,030	0,285	0,286
14	7,99	130	5,159	0,3681	0,042	0,322	0,324
15	8,48	150	6,022	0,3587	0,041	0,347	0,350
16	9,01	143	6,892	0,3430	0,045	0,382	0,385
17	9,50	163	7,826	0,3317	0,039	0,367	0,369
18	10,00	199	8,500	0,3088	0,039	0,326	0,329
19	10,51	191	9,186	0,2882	0,042	0,285	0,288
20	10,99	142	9,608	0,2629	0,046	0,250	0,254
21	11,46	177	10,080	0,2433	0,039	0,202	0,206
22	11,99	103	10,310	0,2176	0,061	0,118	0,133
23	12,47	81	10,400	0,1950	0,068	0,108	0,127
24	12,98	59	10,570	0,1756	0,091	0,080	0,121
25	13,52	71	10,480	0,1541	0,072	0,077	0,105
26	14,02	78	10,600	0,1399	0,063	0,082	0,104
27	14,53	110	10,570	0,1252	0,038	0,077	0,086
28	14,98	140	10,600	0,1148	0,034	0,077	0,084
29	15,52	139	10,560	0,1029	0,034	0,077	0,084
30	15,98	137	10,600	0,0945	0,044	0,078	0,090
31	16,47	88	10,600	0,0863	0,057	0,095	0,111
32	17,00	56	10,740	0,0796	0,109	0,167	0,199
33	17,53	46	10,990	0,0743	0,109	0,113	0,157
34	17,98	34	10,940	0,0685	0,145	0,080	0,165
35	18,50	50	10,980	0,0631	0,104	0,083	0,133
36	18,97	45	10,990	0,0586	0,102	0,087	0,134
37	19,48	41	11,050	0,0544	0,099	0,080	0,128
38	19,99	54	10,990	0,0500	0,080	0,099	0,127

Table 2 – Power performance results at sea Level air density, 1.225 kg/m³ (1/2)

BWEA Reference Power [kW]	9.6
Cut- in Wind Speed [m/s]	2.5
Maximum Power [kW]	11.16

Table 1 – BWEA definition results

Certification Summary	07.11.2011	Seite 4 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
 Nessestraße 27
 DE-26789 Leer

Tel.: 0491-454100
 Fax: 0491-4541026
 E-Mail: info@aircon-international.com

Measured power curve							
Reference air density: 1,225kg/m ³					Category A	Category B	Category A_B
Bin	Hub height wind speed	No. of data sets 1min. Avg.	Power output	C _p	Standard uncertainty	Standard uncertainty	Standard uncertainty
[l]	[m/s]	[N]	[kW]		[kW]	[kW]	[kW]
39	20,51	31	10,920	0,0460	0,072	0,115	0,136
40	20,95	21	11,160	0,0442	0,121	0,220	0,252
41	21,41	17	11,310	0,0419	0,146	0,082	0,168
42	21,99	9	11,160	0,0382	0,187	0,156	0,243
43	22,66	2	11,560	0,0361	0,000	0,000	0,000
44	23,00	0	0,000	0,0000	0,000	0,000	0,000
45	23,34	1	11,480	0,0329	0,000	0,000	0,000
46	24,00	0	0,000	0,0000	0,000	0,000	0,000
47	24,50	0	0,000	0,0000	0,000	0,000	0,000
Bin-Summe		4193					

Table 3 – Power performance results at sea Level air density, 1.225 kg/m³ (2/2)

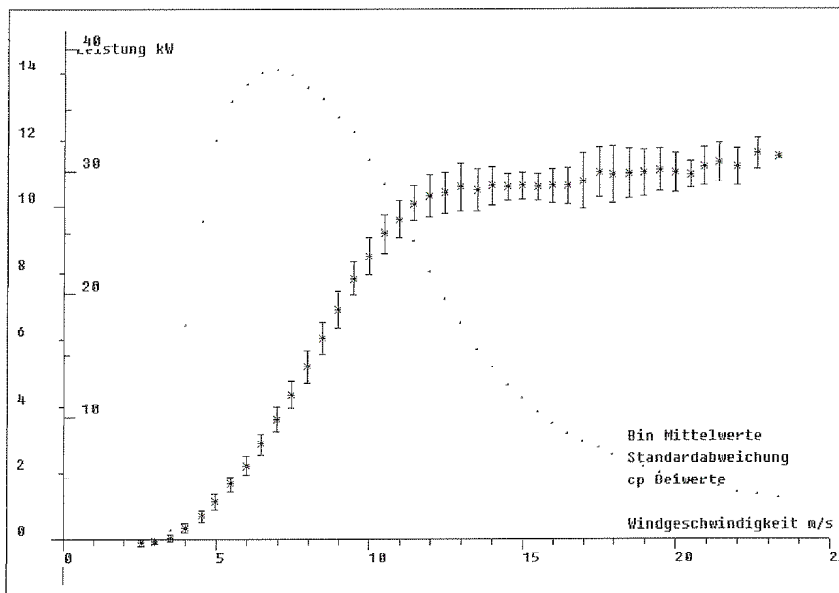


Figure 1 – Power curve with combined standard uncertainty

Certification Summary	07.11.2011	Seite 5 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
 Nessestraße 27
 DE-26789 Leer

Tel.: 0491-454100
 Fax: 0491-4541026
 E-Mail: info@aircon-international.com

3. Annual Energy Production

Table 4 gives the BWEA Reference Annual Energy for the Aircon 10S. Table 5 shows the AEP estimations for hub height integer annual average wind speeds from 4m/s, up to the maximum wind speed for the turbine class II at sea level air density.

BWEA Reference Annual Energy [kWh]	17488
------------------------------------	-------

Table 4 – BWEA Reference Annual Energy

Estimated Annual Energy Production Reference Air Density: 1.225kg/m ³ Cut Out Wind Speed: No cut out wind speed but extrapolation taken up to 25m/s						
Wind-Rayleigh distribution	extrapolated			measured		
	Annual production	Uncertainty of the measure (standard deviation)		Annual production	Uncertainty of the measure (standard deviation)	
[m/s]	[kWh]	[kWh]	%	[kWh]	[kWh]	%
4	9065	880	9.7	9065	880	9.7
5	17488	1238	7.1	17488	1238	7.1
6	26714	1466	5.5	26714	1466	5.5
7	35599	1571	4.4	35599	1571	4.4
8	43549	1596	3.7	43549	1593	3.7
9	50307	1576	3.1	50307	1567	3.1
10	55731	1534	2.8	55731	1514	2.8
11	59788	1482	2.5	59788	1446	2.5

Table 5 – Estimated annual energy production

Certification Summary	07.11.2011	Seite 6 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
 Nessestraße 27
 DE-26789 Leer

Tel.: 0491-454100
 Fax: 0491-4541026
 E-Mail: info@aircon-international.com

4. Noise Immission

The noise label for the Aircon 10S is below in Figure 2. The key results are the Declared Apparent Emission Sound Power Level, $L_{Wd,8m/s}$, at 8m/s hub height wind speed and noise immission predictions for a range of slant distances and hub height wind speeds.

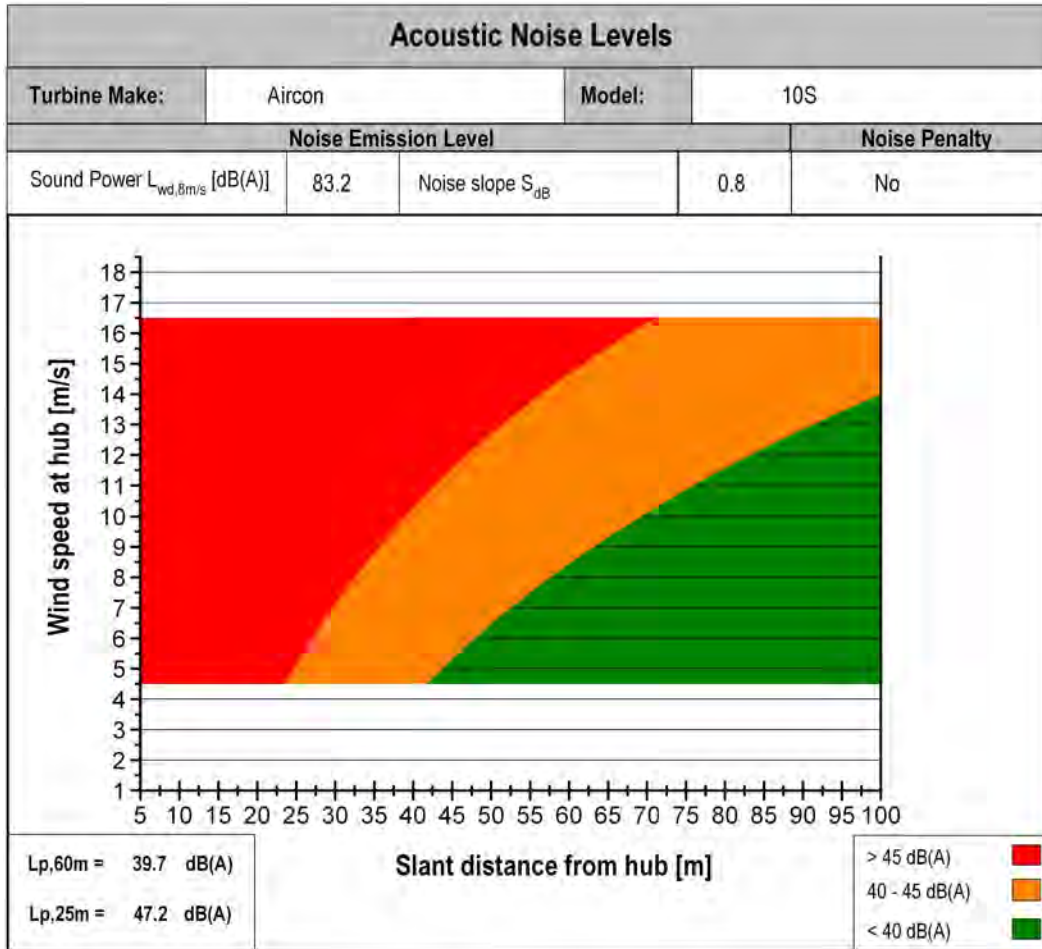


Figure 2 – Noise Label

The assessment established the turbine should not be declared as tonal and therefore no penalty should be applied.

The BWEA Reference Sound Levels at 25m and 60m at an 8m/s hub height wind speed are:

$L_{p,25m}$	47.2 dB(A)
$L_{p,60m}$	39.7 dB(A)

Table 6 – Reference Sound Levels

Certification Summary	07.11.2011	Seite 7 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		



Aircon GmbH & Co. KG
Nessestraße 27
DE-26789 Leer

Tel.: 0491-454100
Fax: 0491-4541026
E-Mail: info@aircon-international.com

5. Duration Test

Table 7 presents a summary of the results from the duration test. All the requirements were successfully achieved.

Test data:

Start date/time: 20/08/2010
End date/time: 12/03/2011
Mean hub height wind speed: 7.26m/s
Average turbulence intensity at 15m/s: 10.40%
Highest instantaneous wind speed: 31.00m/s

	Requirement	Duration Test Result	Pass/Fail
Operation	At least 6 months of operation	6 months 23days	Pass
	At least 2500 hours of power production in winds of any velocity	2561 hours	Pass
	At least 250 hours of power production in winds of $1.2V_{ave}$ and above	542 hours	Pass
	At least 25 hours in wind speeds of 15m/s and above	39 hours	Pass
	At least 25 hours of power production in winds of $1.8V_{ave}$ and above	116 hours	Pass
Reliability	Operational time fraction of at least 90%	97,5%	Pass
	No major failure of the turbine or components in the turbine system	No major failure	Pass

Table 7 – Summary duration test

6. Reference Reports

- 1.) Power and Performance Test: Tested in Witzwort/Germany from the engineering office Dr.-Ing. Frey
- 2.) Report of acoustical emissions: Tested in Witzwort/Germany, Report no.:GLGH-4286 11 07736 258-A-0001-A, GL Garrad Hassan Deutschland GmbH
- 3.) Duration Test: Tested in Witzwort/Germany from the engineering office Dr.-Ing. Frey

Certification Summary	07.11.2011	Seite 8 von 8
Revision 0	erstellt durch: dk	geprüft durch: vr
Verteiler: sa; as		
Pfad: X:\technische Daten\Certification\Qualitätsunterlagen\		