



Pinewoods Wind Farm Substation & Grid Connection

Annex 11.2: Noise Monitor Calibration Certificate

Pinewood Wind Ltd

Galetech Energy Services

Clondargan, Stradone, Co. Cavan Ireland

Telephone +353 49 555 5050

www.galetechenergy.com





AcSoft Calibration
Bedford Technology Park
Thurleigh, Bedford, MK44 2YA
U.K
Tel.: +44 (0) 1234 639551
Fax: +44 (0) 1234 639561
Email: sales@svantek.co.uk
www.svantek.co.uk

CALIBRATION CERTIFICATE

Date of issue: 01-11-2018

Certificate No: 14010846-4

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OBJECT OF CALIBRATION	Sound level meter type SVAN 977, No 46437, manufacturer Svantek with preamplifier type SV12L, No 58575, manufacturer SVANTEK and microphone type 7052E, No 63962, manufacturer ACO.
APPLICANT	Galetech Energy Tullyco, Cootehill, Co.Cavan Ireland
CALIBRATION METHOD	Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.
ENVIRONMENTAL CONDITIONS	Temperature: (22.0 - 22.9) °C Ambient pressure: (99.3 - 99.6) kPa Relative humidity: (39 - 46) %
DATE OF CALIBRATION	01-11-2018
UNCERTAINTY OF MEASUREMENTS	Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.
CONFORMITY WITH REQUIREMENTS	On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.
CALIBRATION RESULTS	<p>The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.</p> <p>The results are presented on pages 2 to 7 of this certificate (including measurement uncertainty).</p>
APPROVED BY	B. Hunt

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CALIBRATION RESULTS

Calibration results are the following:

1. Indication at the calibration check frequency

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV31, No 17681, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

(0.0 ± 0.2) dB

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

2. Self-generated noise with microphone installed

Frequency weighting	A
The highest level of self-generated noise stated in the instruction manual [dB]	19.0
Indication [dB]	12.7

3. Self-generated noise with microphone replaced by the electrical input signal device

Frequency weighting	A	C	Z
The highest expected level of self-generated noise stated in the instruction manual [dB]	12.0	12.0	17.0
Level of self-generated noise [dB]	7.2	7.2	9.4

4. Acoustical signal tests of a frequency weighting C

Frequency	Relative frequency-weighted free-field response	Design-goal frequency weighting	The deviation of frequency weighting	Extended uncertainty	Acceptable limits
Hz	dB	dB	dB	dB	dB
125.0	-0.08	-0,2	0.1	0.3	±1.5
1000.0	0.02	0,0	0.0	0.3	±1.1
4000.0	-0.77	-0,8	0.0	0.4	±1.6
8000.0	-2.50	-3,0	0.5	0.4	-3.1; +2.5

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5. Electrical signal tests of frequency weightings

Frequency	Design-goal frequency weighting			The deviation of frequency weighting			Extended uncertainty	Acceptable limits
	A	C	Z	A	C	Z		
Hz	dB	dB	dB	dB	dB	dB	dB	dB
63	-26,2	-0,8	0,0	0.1	0.0	0.0	0,3	±1,5
125	-16,1	-0,2	0,0	0.0	0.0	0.0	0,3	±1,5
250	-8,6	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
500	-3,2	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
1000	0,0	0,0	0,0	0.0	0.0	0.0	0,3	±1,1
2000	1,2	-0,2	0,0	0.0	0.0	0.0	0,3	±1,6
4000	1,0	-0,8	0,0	0.0	0.1	0.0	0,3	±1,6
8000	-1,1	-3,0	0,0	0.1	0.1	0.0	0,4	-3,1; +2,1
16000	-6,6	-8,5	0,0	-0.2	-0.2	0.0	0,6	-17,0; +3,5

6. Frequency and time weightings at 1 kHz

Frequency weighting	Sound level				Time-averaged sound level
	A	A	C	Z	A
Time weighting	Fast	Slow	Fast	Fast	-
Indication [dB]	114.0	114.0	114.0	114.0	114.0
The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB]	X	0.0	0.0	0.0	0.0
Extended uncertainty [dB]	X	0.1			
Acceptable limits [dB]	X	±0.3	±0.4	±0.4	±0.3

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7. Level linearity

Reference level range: HIGH

Expected sound level	Indication	Level linearity error	Extended uncertainty	Acceptable limits
dB	dB	dB	dB	dB
136.0	136.0	0.0	0.2	±1.1
135.0	135.0	0.0		
134.0	134.0	0.0		
133.0	133.0	0.0		
132.0	132.0	0.0		
131.0	131.0	0.0		
130.0	130.0	0.0		
129.0	129.0	0.0		
124.0	124.0	0.0		
119.0	119.0	0.0		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0		
89.0	89.0	0.0		
84.0	84.0	0.0		
79.0	79.0	0.0		
74.0	74.0	0.0		
69.0	69.0	0.0		
64.0	64.0	0.0		
59.0	59.0	0.0		
54.0	54.0	0.0		
49.0	49.0	0.0		
44.0	44.0	0.0		
43.0	43.0	0.0		
42.0	42.0	0.0		
41.0	41.0	0.0		
40.0	40.0	0.0		

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Level range: LOW

Expected sound level	Indication	Level linearity error	Extended uncertainty	Acceptable limits
dB	dB	dB	dB	dB
120.0	120.0	0.0	0.2	±1.1
119.0	119.0	0.0		
118.0	118.0	0.0		
117.0	117.0	0.0		
116.0	116.0	0.0		
115.0	115.0	0.0		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0		
89.0	89.0	0.0		
84.0	84.0	0.0		
79.0	79.0	0.0		
74.0	74.0	0.0		
69.0	69.0	0.0		
64.0	64.0	0.0		
59.0	59.0	0.0		
54.0	54.0	0.0		
49.0	49.0	0.0		
44.0	44.0	0.0		
39.0	39.0	0.0		
34.0	34.0	0.0	0.3	
29.0	29.0	0.0		
24.0	24.1	0.1		
23.0	23.1	0.1		
22.0	22.1	0.1		
21.0	21.1	0.1		

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8. Level linearity including the level range control

Level range	LOW	HIGH
Indication for the reference sound pressure level [dB]	114.0	114.0
The deviation of indication [dB]	0.0	0.0
Anticipated level that is 5 dB less than the upper limit specified in the instruction manual for level range at 1 kHz [dB]	115.0	132.0
Indication [dB]	115.0	132.0
The deviation of indication [dB]	0.0	0.0
Extended uncertainty [dB]	0.2	
Acceptable limits [dB]	±1.1	

9. Toneburst response

Measurement quantity	Time weighting	Toneburst duration	The indications in response to toneburst relative to the steady sound level	Reference toneburst response relative to the steady sound level	The deviation of the measured toneburst response from the corresponding reference toneburst	Extended uncertainty	Acceptable limits
Time-weighted sound level	Fast	200	-1.0	-1.0	0.0	0.2	±0.8
		2	-18.0	-18.0	0.0		-1.8; +1.3
		0.25	-27.1	-27.0	-0.1		-3.3; +1.3
Time-weighted sound level	Slow	200	-7.4	-7.4	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
Sound exposure level	-	200	-7.0	-7.0	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
		0.25	-36.1	-36.0	-0.1		-3.3; +1.3

10. Peak C sound level

Numbers of cycles in test signal	Frequency of test signal	The deviation of indication	Extended uncertainty	Acceptable limits
	Hz	dB	dB	dB
One	8000	-0.5	0.2	±2.4
Positive half-cycle	500	-0.1		±1.4
Negative half-cycle	500	-0.1		

11. Overload indication

Frequency weighting A

The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication	Extended uncertainty	Maximum value of the difference
dB	dB	dB
0.1	0.3	1.8

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NOTES

1. All acoustic tests were carried out with the compensation filter set to Free-field whereas the remaining electrical tests were performed with the filter switched off as specified by the manufacturers.
2. The instrument was running firmware version 1.28.3
3. The measurements in this document are traceable to GUM (Central Office of Measures), Poland
4.

Signal Generator	Svantek	Type 401	# 124
Sound Level Calibrator	Svantek	Type SV30A	# 44775
Barometer	LAB-EL	Type LB706B	# 912
Voltmeter	Svantek	Type 912AE	# 15940

