49019 HONGHUA SOUND TEST PROCEDURE

On noise test at Enercon facility, Enercon must provide all necessary equipment and personnel for the test. The average noise level has to be at most 85 dBA at 1 meter at full load; otherwise Enercon has to modify the product to meet 85 dBA at 1 meter or below at own cost.

1 hour load test at unity power

Connect genset to fuel source in testing area

Connect to resistive load banks and test cell devices

Perform test comprised of:

- Warm-up period
- ¼ hour @ 50% load
- ½ hours @ 100% load
- ¼ hour cooldown period

Hand record of time, kW, voltage, amperage, RPM, water temperature, and any additional engine instruments at 30 minute intervals plus certified strip chart recording during entire period of test.

Take sound readings at 1m, 7m and 23m (only 1m required, but would be good to take at all distances)

Take 8 points around the unit at the specified distance and approximately 5' off the ground. (middle of each side and end, and diagonal to each corner)

Try to isolate and shield load bank noise as much as possible.

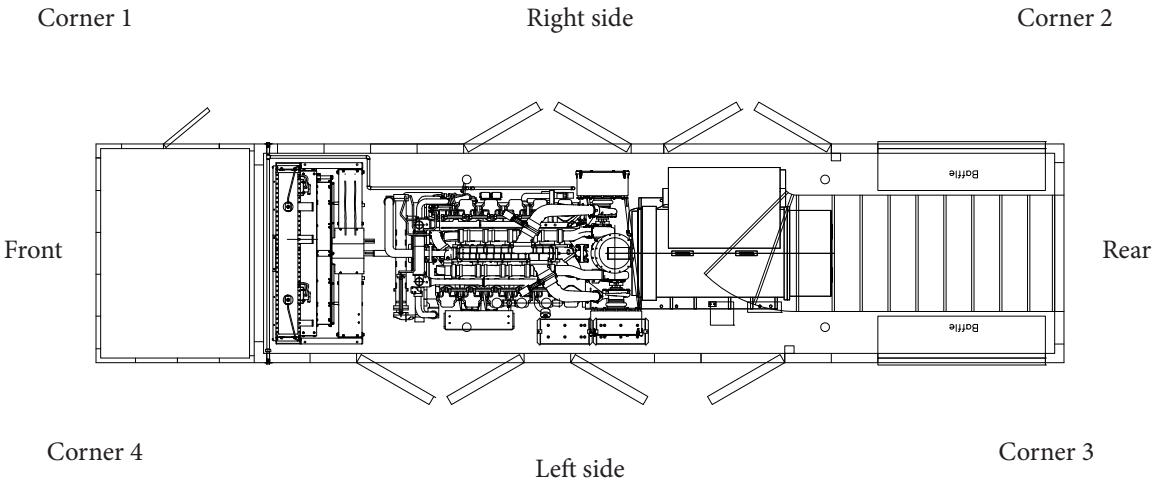
Take readings for the following conditions:

1) Ambient, no genset, no load bank
2) Load bank only running (if possible) no genset
3) No load no load bank running, Genset running (optional)
4) No load with load bank running, Genset running (optional)
5) Full load with load bank running, Genset running

Disconnect after test, touch up paint and prepare for shipment

Enclosure Sound Test Readings

A WEIGHT



AMBIENT, NO GENSET, NO LOAD BANK		
	1m	7m
Front	51.1	53.2
Corner 1	50.5	50.8
Right Side	50.4	50.2
Corner 2	49.6	51.1
Rear	49.1	49.8
Corner 3	49.1	49.1
Left Side	49.1	49.1
Corner 4	49.3	49.1

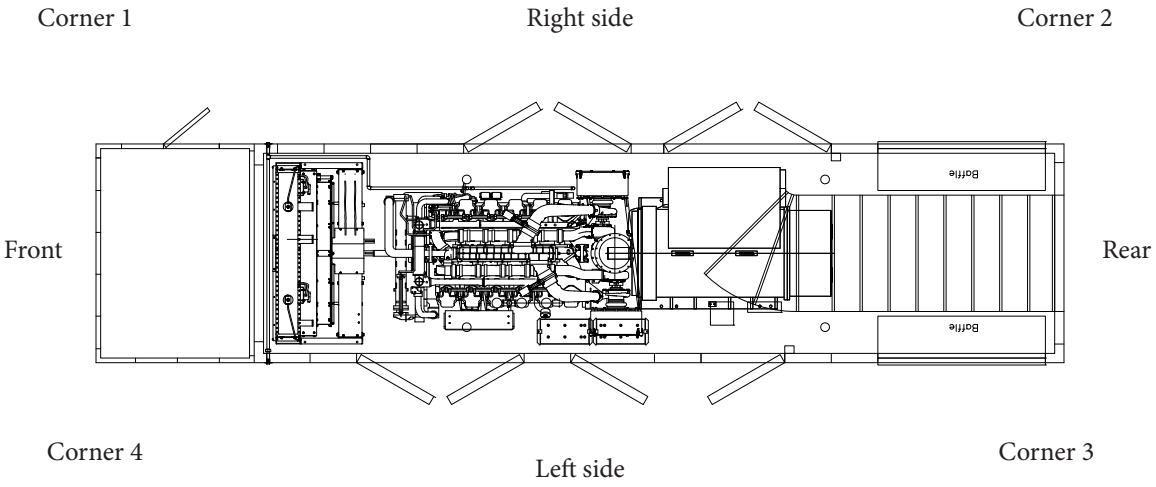
LOAD BANK ONLY, NO LOAD		
	1m	7m
Front	82.3	79.1
Corner 1	86.4	84.1
Right Side	87.0	86.6
Corner 2	90.0	90.3
Rear	92.2	88.5
Corner 3	85.8	81.2
Left Side	76.0	83.6
Corner 4	81.2	74.4

NO LOAD, NO LOAD BANK RUNNING, GENSET RUNNING		
	1m	7m
Front	81.3	71.6
Corner 1	80.4	75.0
Right Side	80.3	75.1
Corner 2	78.9	73.8
Rear	77.7	71.0
Corner 3	79.5	68.6
Left Side	81.9	71.5
Corner 4	81.1	72.2

FULL LOAD WITH LOAD BANK RUNNING, GENSET RUNNING		
	1m	7m
Front	85.0	81.4
Corner 1	88.2	85.7
Right Side	88.8	87.3
Corner 2	90.7	90.6
Rear	92.3	88.4
Corner 3	87.4	83.2
Left Side	86.5	77.7
Corner 4	83.9	77.3

Enclosure Sound Test Readings

C WEIGHT



AMBIENT, NO GENSET, NO LOAD BANK		
	1m	7m
Front	69.2	58.6
Corner 1	58.9	63.4
Right Side	61.5	59.0
Corner 2	59.6	63.3
Rear	59.5	59.9
Corner 3	59.7	57.7
Left Side	59.6	58.6
Corner 4	59.3	57.2

LOAD BANK ONLY, NO LOAD		
	1m	7m
Front	90.9	89.3
Corner 1	94.5	94.0
Right Side	96.2	95.2
Corner 2	96.2	96.3
Rear	98.1	92.4
Corner 3	95.7	87.9
Left Side	92.3	87.7
Corner 4	90.7	83.4

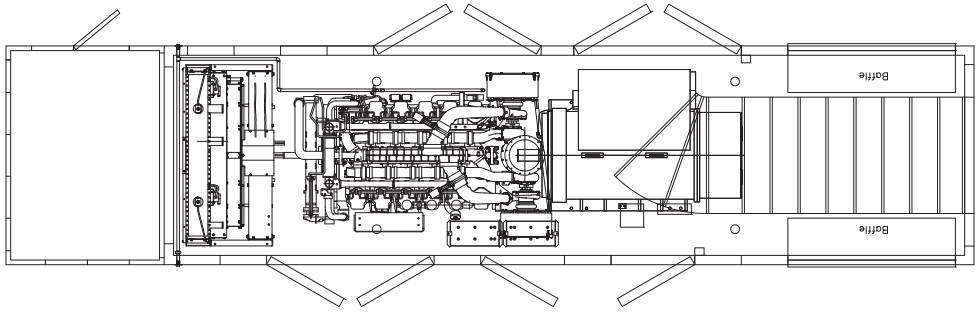
NO LOAD, NO LOAD BANK RUNNING, GENSET RUNNING		
	1m	7m
Front	91.0	80.9
Corner 1	91.6	83.5
Right Side	90.0	85.5
Corner 2	88.6	82.8
Rear	88.0	83.8
Corner 3	90.5	79.3
Left Side	91.2	81.7
Corner 4	91.5	79.2

FULL LOAD WITH LOAD BANK RUNNING, GENSET RUNNING		
	1m	7m
Front	94.3	90.1
Corner 1	95.7	94.1
Right Side	96.3	96.2
Corner 2	97.2	97.4
Rear	97.7	97.2
Corner 3	95.5	89.2
Left Side	94.0	88.8
Corner 4	91.3	85.7

Enclosure Sound Test Readings

A WEIGHT (corrected for load bank contribution)

Corner 1 Right side Corner 2



Corner 4 Left side Corner 3

LOAD BANK CONTRIBUTION FORMULA
$L_\Sigma = 10 \cdot \log_{10}\left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + \cdots + 10^{\frac{L_n}{10}}\right)\ \mathrm{dB}$

LOAD BANK CONTRIBUTION	
	1m
Front	75.4
Corner 1	85.14
Right Side	85.96
Corner 2	89.65
Rear	92.04
Corner 3	84.64
Left Side	81.9
Corner 4	64.77

FINAL READING; FULL LOAD MINUS LOAD BANK CONTRIBUTION		
	1m	
Front	84.49	
Corner 1	85.24	
Right Side	85.62	
Corner 2	84.02	
Rear	79.89	
Corner 3	84.12	
Left Side	84.65	Spec requirement is **85 dB(A)** at 1 meter. Enclosure sound test results are within requirements.
Corner 4	83.85	
Average Reading	**83.985**	

Certificate of Calibration

Certificate Number: 150995
Document Number: 107474

Customer Details:

Customer Name: ALTORFER INC

Instrument Details:

Manufacturer: EXTECH INSTRUMENTS
Description: SOUND LEVEL METER
Model Number: 407736
Serial Number: Z317355
Equip. ID Number: N/A

Calibration Date: June 14, 2016
Calibration Due: June 14, 2017
Cal. Interval: 12 MONTHS
As Received: IN TOLERANCE

Environmental Details:

Temperature: 21 Deg. +/- 5 C

Relative Humidity: 40 % +/- 15 %

Procedures Used:

Calibration Procedure: EICM407736-CP

Certification

Extech Instruments certifies that the instrument listed above meets the specifications of the manufacturer at the completion of its calibration. Standards used are traceable to the National Institute of Standards and Technology (NIST), or have been derived from accepted values, natural physical constants, or through the use of the ratio method of self-calibration techniques. Methods used are in accordance with ISO 10012-1 and ANSI/NCSL Z540-1-1994. This certificate is not to be reproduced other than in full, except with prior written approval of Extech Instruments Corporation. All the calibration standards used have an accuracy ratio of 4:1 or better, unless otherwise stated.

Technicians Notes:

Technician: STEVE SOUSA

Approved By: _____

Certificate of Calibration

Certificate Number: 150995

Document Number: 107474

Model Number: 407736 **S/N:** Z317355

As Received

Calibration Data

Standard	UUT	Accuracy	High Limit	Low Limit	Error	Status
Function: *dB (A Weighting Curve Ref IEC 651 Type 2)*						
74.6dB (31.5 Hz)	75.3	+/-(3.0 dB)	77.6	71.6	0.7	PASS
87.8dB (63.0 Hz)	88.8	+/-(2.0 dB)	89.8	85.8	1.0	PASS
98.0dB (125 Hz)	98.5	+/-(1.5 dB)	99.4	96.4	0.5	PASS
105.0dB (250 Hz)	105.7	+/-(1.5 dB)	106.9	103.9	0.7	PASS
110.8dB (500 Hz)	111.0	+/-(1.5 dB)	112.3	109.3	0.2	PASS
114.0dB (1000 Hz)	114.5	+/-(1.5 dB)	115.5	112.5	0.5	PASS
115.0dB (2000 Hz)	115.9	+/-(2.0 dB)	117.0	113.0	0.9	PASS
115.0dB (4000 Hz)	115.8	+/-(3.0 dB)	118.0	112.0	0.8	PASS
112.9dB (8000 Hz)	112.9	+/-(5.0 dB)	117.9	107.9	0.0	PASS
Function: *dB (C Weighting Curve Ref IEC 651 Type 2)*						
111.0dB (31.5 Hz)	112.6	+/-(3.0 dB)	114.0	108.0	1.6	PASS
113.2dB (63.0 Hz)	114.2	+/-(2.0 dB)	115.2	111.2	1.0	PASS
113.8dB (125 Hz)	114.7	+/-(1.5 dB)	115.3	112.3	0.9	PASS
114.0dB (250 Hz)	114.9	+/-(1.5 dB)	115.5	112.5	0.9	PASS
114.0dB (500 Hz)	114.8	+/-(1.5 dB)	115.5	112.5	0.8	PASS
114.0dB (1000 Hz)	114.7	+/-(1.5 dB)	115.5	112.5	0.7	PASS
113.8dB (2000 Hz)	114.4	+/-(2.0 dB)	115.8	111.8	0.6	PASS
113.2dB (4000 Hz)	113.7	+/-(3.0 dB)	116.2	110.2	0.5	PASS
111.0dB (8000 Hz)	110.5	+/-(5.0 dB)	116.0	106.0	-0.5	PASS

Certificate of Calibration

Certificate Number: 150995
Document Number: 107474

Final Reading

Calibration Data

Standard	UUT	Accuracy	High Limit	Low Limit	Error	Status
Function: *dB (A Weighting Curve Ref IEC 651 Type 2)*						
74.6 dB (31.5 Hz)	75.2	+/-(3.0 dB)	77.6	71.6	0.6	PASS
87.8 dB (63.0 Hz)	88.0	+/-(2.0 dB)	89.8	85.8	0.2	PASS
98.0 dB (125 Hz)	98.1	+/-(1.5 dB)	99.4	96.4	0.1	PASS
105.0 dB (250 Hz)	105.2	+/-(1.5 dB)	106.9	103.9	0.2	PASS
110.8 dB (500 Hz)	110.6	+/-(1.5 dB)	112.3	109.3	-0.2	PASS
114.0 dB (1000 Hz)	114.0	+/-(1.5 dB)	115.5	112.5	0.0	PASS
115.0 dB (2000 Hz)	115.5	+/-(2.0 dB)	117.0	113.0	0.5	PASS
115.0 dB (4000 Hz)	115.3	+/-(3.0 dB)	118.0	112.0	0.3	PASS
112.9 dB (8000 Hz)	112.4	+/-(5.0 dB)	117.9	107.9	-0.5	PASS
Function: *dB (C Weighting Curve Ref IEC 651 Type 2)*						
111.0 dB (31.5 Hz)	112.2	+/-(3.0 dB)	114.0	108.0	1.2	PASS
113.2 dB (63.0 Hz)	113.8	+/-(2.0 dB)	115.2	111.2	0.6	PASS
113.8 dB (125 Hz)	114.3	+/-(1.5 dB)	115.3	112.3	0.5	PASS
114.0 dB (250 Hz)	114.4	+/-(1.5 dB)	115.5	112.5	0.4	PASS
114.0 dB (500 Hz)	114.4	+/-(1.5 dB)	115.5	112.5	0.4	PASS
114.0 dB (1000 Hz)	114.2	+/-(1.5 dB)	115.5	112.5	0.2	PASS
113.8 dB (2000 Hz)	114.0	+/-(2.0 dB)	115.8	111.8	0.2	PASS
113.2 dB (4000 Hz)	113.2	+/-(3.0 dB)	116.2	110.2	0.0	PASS
111.0 dB (8000 Hz)	110.0	+/-(5.0 dB)	116.0	106.0	-1.0	PASS

UUT-Unit Under Tes

Standards Used

Manufacturer	Model #	Serial #	Description	Cal. Due Date
BRUEL & KJAER	4226	2590973	ACOUSTIC CALIBRATOR 4226	November 13, 2016

Personnel Present for Sound Test:

Christian Lee (Enercon)

Haoming Xiao (Honghua)

Dennis Black (Hardin)

Jeff Harms (Altorfer)