



**AIR MOVEMENT AND CONTROL
ASSOCIATION INTERNATIONAL, INC.**

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Test No. 33026-S1

May 18, 2016

TO: Dae Ryun Ind Ltd
115 Wanjusandan 7-ro
Bongdong-eup, Wanju-gun, Jeon-Buk, CA REPUBLIC OF KOREA 55318

ATTN: Song Eun Jung
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**SUBJECT: CONTRACT TESTING
MODEL No. DR-AF #4.5DD**

Attached are the test results of the subject model performed on April 12, 2016.

If you should have any questions concerning these data, please let us know.

Sincerely,
AIR MOVEMENT AND CONTROL
ASSOCIATION INTERNATIONAL, INC.

Josh Parent
Laboratory Manager

Attachment



Korea Testing Certification
 82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Test Information

Client: Daeryun Ind. LTD
 Test Purpose: Contract Test
 Date of Test: 2016-04-12
 Personnel: KTC_HONG
 Witness(es): None

Test Unit

Manufacturer: Daeryun Ind. LTD
 Type: DWDI Centrifugal
 Trade Name: DR-AF Series
 Model Number: DR-AF #4.5DD
 Nominal Size: 684 mm
 Number of Blades: 20
 Blade Setting: -
 Number of Stator Vanes: -
 Measured Impeller Diameter: 684 mm
 Measured Inlet Area: 0.407 m²
 Measured Outlet Area: 0.683 m²

Test Configuration

Setup: ANSI / AMCA Standard 300-14, Figure 2 (Inlet Sound)
 Installation Type: B (Unducted Inlet, Ducted Outlet)

Comments

Pre-Test & Post-Test Background Sound Pressures, L_{pb} (dB)

	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pb_PRE}	50.4	50.1	44.2	36.2	37.0	29.3	28.1	27.7	25.6	24.0	25.0	22.9
L_{pb_POST}	50.0	46.5	40.8	36.4	35.0	28.6	27.3	26.8	24.0	22.3	23.1	22.1
Difference	-0.4	-3.6	-3.4	0.2	-2.0	-0.7	-0.8	-0.9	-1.6	-1.7	-1.9	-0.8

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pb_PRE}	20.7	18.9	17.9	16.2	14.1	10.8	9.7	9.5	10.8	9.9	10.9	11.5
L_{pb_POST}	19.9	18.0	16.8	14.9	13.3	9.9	9.1	9.2	10.7	9.8	10.9	11.5
Difference	-0.8	-0.9	-1.1	-1.3	-0.8	-0.9	-0.6	-0.3	-0.1	-0.1	0.0	0.0



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Reference Sound Source

	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pqm} (dB)	59.8	59.4	62.2	62.6	65.0	65.1	65.9	66.1	66.1	66.4	67.1	67.7
L_{pb} (dB)	50.4	50.1	44.2	36.2	37.0	29.3	28.1	27.7	25.6	24.0	25.0	22.9
$L_{pqm} - L_{pb}$ (dB)	9.4	9.3	18.0	26.4	28.0	35.8	37.8	38.4	40.5	42.4	42.1	44.8
L_{pq} (dB)	59.3	58.9	62.1	62.6	65.0	65.1	65.9	66.1	66.1	66.4	67.1	67.7
L_{Wr} (dB)	78.8	79.8	78.3	80.2	78.9	79.5	80.1	80.0	79.9	80.1	80.3	80.9
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pqm} (dB)	69.6	70.1	71.0	70.8	70.8	69.1	66.9	65.7	63.8	61.6	58.6	55.9
L_{pb} (dB)	20.7	18.9	17.9	16.2	14.1	10.8	9.7	9.5	10.8	9.9	10.9	11.5
$L_{pqm} - L_{pb}$ (dB)	48.9	51.2	53.1	54.6	56.7	58.3	57.2	56.2	53.0	51.7	47.7	44.4
L_{pq} (dB)	69.6	70.1	71.0	70.8	70.8	69.1	66.9	65.7	63.8	61.6	58.6	55.9
L_{Wr} (dB)	83.0	83.7	84.9	85.4	86.0	84.5	83.2	83.3	82.7	81.8	80.3	78.4
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Data are not certified by AMCA



Korea Testing Certification
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Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 1 - One-Third Octave Band Analysis

Fan Inlet Test Conditions:

Test Conditions Converted to Standard Air:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)	P_s (Pa)	Q (m ³ /s)
101.85	15.8	11.6	15.8	98	1.22	999	96	7.088

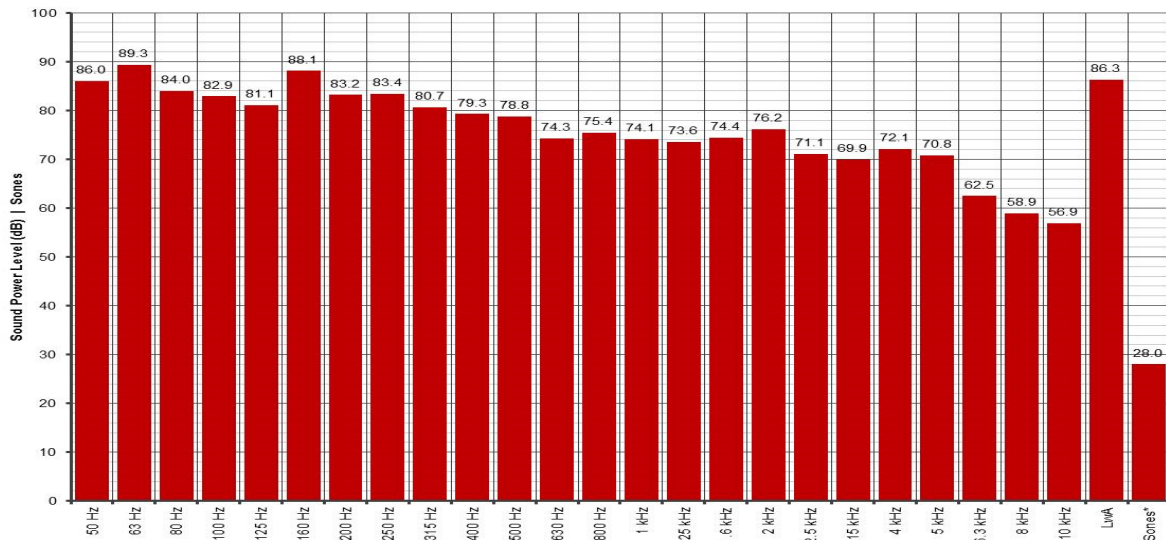
	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pm} (dB)	66.6	68.4	67.8	65.3	67.2	73.7	69.0	69.5	66.9	65.6	65.6	61.1
L_{pb} (dB)	50.3	46.7	41.7	37.2	35.5	30.1	28.4	26.5	24.4	22.9	23.0	21.6
$L_{pm} - L_{pb}$ (dB)	16.3	21.7	26.1	28.1	31.7	43.6	40.6	43.0	42.5	42.7	42.6	39.5
L_p (dB)	66.5	68.4	67.8	65.3	67.2	73.7	69.0	69.5	66.9	65.6	65.6	61.1
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	86.0	89.3	84.0	82.9	81.1	88.1	83.2	83.4	80.7	79.3	78.8	74.3
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	3.89	5.67	4.47	4.81	4.88	8.10	6.48	6.96	6.28	6.12	6.32	5.14

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pm} (dB)	62.0	60.5	59.7	59.8	61.0	55.7	53.6	54.5	51.9	42.3	37.2	34.4
L_{pb} (dB)	19.5	17.1	16.2	14.5	13.0	9.5	8.9	9.2	10.7	9.6	10.8	11.4
$L_{pm} - L_{pb}$ (dB)	42.5	43.4	43.5	45.3	48.0	46.2	44.7	45.3	41.2	32.7	26.4	23.0
L_p (dB)	62.0	60.5	59.7	59.8	61.0	55.7	53.6	54.5	51.9	42.3	37.2	34.4
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	75.4	74.1	73.6	74.4	76.2	71.1	69.9	72.1	70.8	62.5	58.9	56.9
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	5.77	5.68	5.84	6.56	7.68	6.04	5.96	7.24	7.12	4.60	3.92	3.19

L_{WA}
86.3

Sones*
28

Determination 1 Results



* Sone calculation based on a hemispherical free field at 1.524 m.



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Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 2 - One-Third Octave Band Analysis

Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	190	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
187	6.699

	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pm} (dB)	67.4	68.4	68.2	64.7	66.3	74.0	68.3	68.2	66.0	64.3	64.4	59.8
L_{pb} (dB)	50.3	46.7	41.7	37.2	35.5	30.1	28.4	26.5	24.4	22.9	23.0	21.6
$L_{pm} - L_{pb}$ (dB)	17.1	21.7	26.5	27.5	30.8	43.9	39.9	41.7	41.6	41.4	41.4	38.2
L_p (dB)	67.3	68.4	68.2	64.7	66.3	74.0	68.3	68.2	66.0	64.3	64.4	59.8
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	86.8	89.3	84.4	82.3	80.2	88.4	82.5	82.1	79.8	78.0	77.6	73.0
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	4.13	5.67	4.61	4.59	4.55	8.25	6.20	6.44	5.92	5.65	5.84	4.75

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pm} (dB)	60.5	59.0	58.7	58.7	59.3	54.3	53.3	53.3	49.0	41.3	36.8	33.9
L_{pb} (dB)	19.5	17.1	16.2	14.5	13.0	9.5	8.9	9.2	10.7	9.6	10.8	11.4
$L_{pm} - L_{pb}$ (dB)	41.0	41.9	42.5	44.2	46.3	44.8	44.4	44.1	38.3	31.7	26.0	22.5
L_p (dB)	60.5	59.0	58.7	58.7	59.3	54.3	53.3	53.3	49.0	41.3	36.8	33.9
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	73.9	72.6	72.6	73.3	74.5	69.7	69.6	70.9	67.9	61.5	58.5	56.4
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	5.32	5.23	5.53	6.12	7.00	5.56	5.84	6.76	5.96	4.30	3.80	3.09

L_{WA}
85.2

Sones*
27

Determination 2 Results



* Sone calculation based on a hemispherical free field at 1.524 m.



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Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 3 - One-Third Octave Band Analysis

Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	358	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
351	5.960

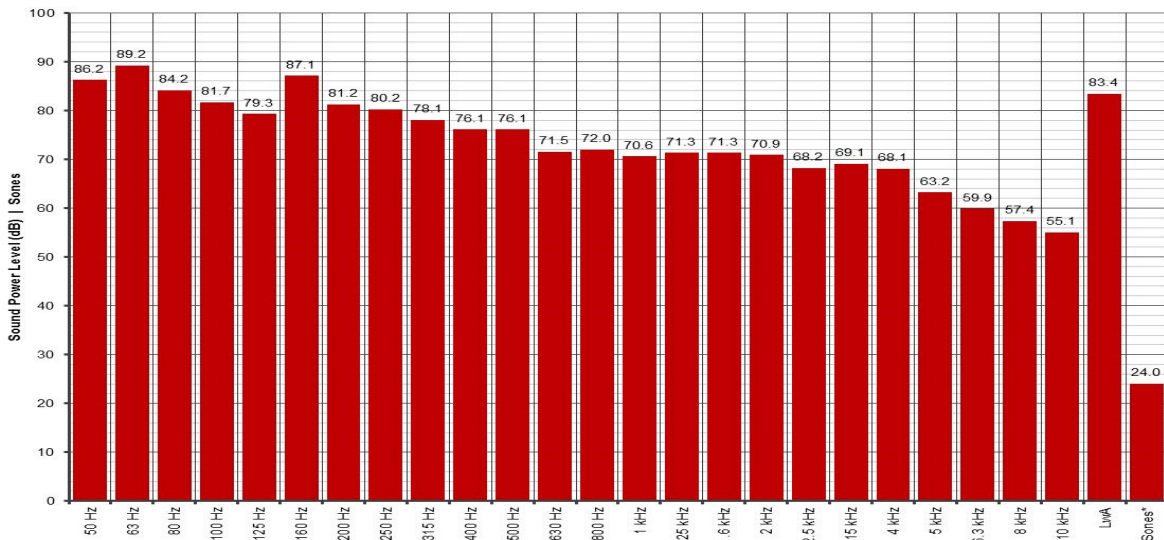
	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pm} (dB)	66.8	68.3	68.0	64.1	65.4	72.7	67.0	66.3	64.3	62.4	62.9	58.3
L_{pb} (dB)	50.3	46.7	41.7	37.2	35.5	30.1	28.4	26.5	24.4	22.9	23.0	21.6
$L_{pm} - L_{pb}$ (dB)	16.5	21.6	26.3	26.9	29.9	42.6	38.6	39.8	39.9	39.5	39.9	36.7
L_p (dB)	66.7	68.3	68.0	64.1	65.4	72.7	67.0	66.3	64.3	62.4	62.9	58.3
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	86.2	89.2	84.2	81.7	79.3	87.1	81.2	80.2	78.1	76.1	76.1	71.5
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	3.95	5.64	4.54	4.37	4.25	7.64	5.71	5.71	5.38	5.08	5.38	4.30

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pm} (dB)	58.6	57.0	57.4	56.7	55.7	52.8	52.8	50.5	44.3	39.7	35.7	32.6
L_{pb} (dB)	19.5	17.1	16.2	14.5	13.0	9.5	8.9	9.2	10.7	9.6	10.8	11.4
$L_{pm} - L_{pb}$ (dB)	39.1	39.9	41.2	42.2	42.7	43.3	43.9	41.3	33.6	30.1	24.9	21.2
L_p (dB)	58.6	57.0	57.4	56.7	55.7	52.8	52.8	50.5	44.3	39.7	35.7	32.6
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	72.0	70.6	71.3	71.3	70.9	68.2	69.1	68.1	63.2	59.9	57.4	55.1
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	4.75	4.63	5.14	5.44	5.62	5.11	5.68	5.68	4.51	3.92	3.58	2.86

L_{WA}
83.4

$Sones^*$
24

Determination 3 Results



* Sone calculation based on a hemispherical free field at 1.524 m.



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Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 4 - One-Third Octave Band Analysis

Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	423	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
415	5.240

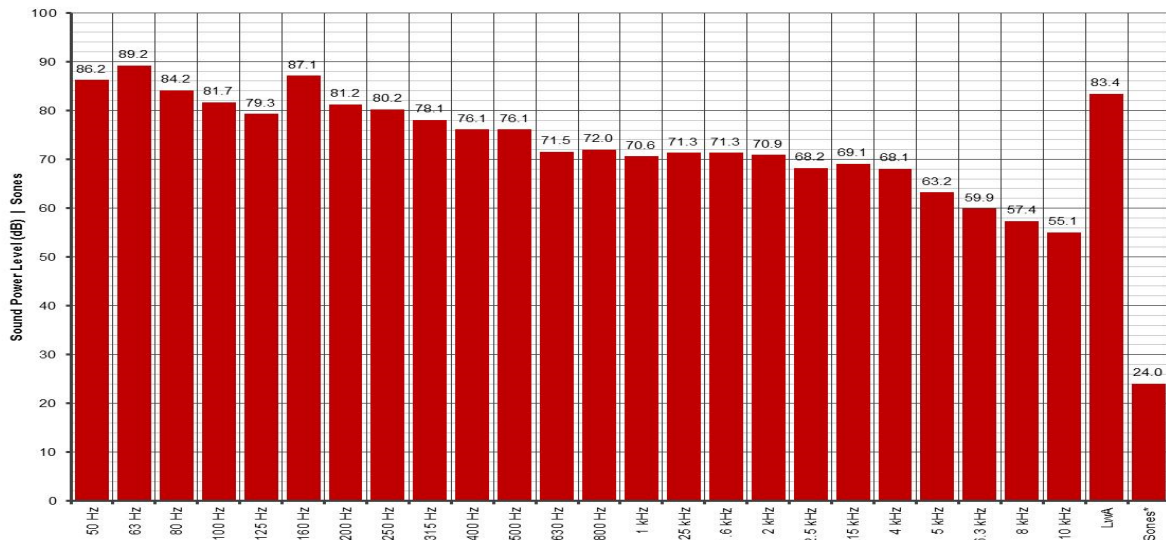
	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pm} (dB)	62.7	64.3	65.2	63.0	64.2	73.6	65.4	64.2	62.6	60.5	61.4	56.1
L_{pb} (dB)	50.3	46.7	41.7	37.2	35.5	30.1	28.4	26.5	24.4	22.9	23.0	21.6
$L_{pm} - L_{pb}$ (dB)	12.4	17.6	23.5	25.8	28.7	43.5	37.0	37.7	38.2	37.6	38.4	34.5
L_p (dB)	62.4	64.2	65.2	63.0	64.2	73.6	65.4	64.2	62.6	60.5	61.4	56.1
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	82.0	85.2	81.3	80.6	78.1	88.0	79.6	78.1	76.4	74.2	74.6	69.3
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	2.90	4.21	3.68	4.07	3.91	8.05	5.23	5.08	4.87	4.51	4.93	3.76

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pm} (dB)	55.4	53.3	55.1	54.6	53.8	51.7	51.6	45.9	40.3	36.7	33.1	29.7
L_{pb} (dB)	19.5	17.1	16.2	14.5	13.0	9.5	8.9	9.2	10.7	9.6	10.8	11.4
$L_{pm} - L_{pb}$ (dB)	35.9	36.2	38.9	40.1	40.8	42.2	42.7	36.7	29.6	27.1	22.3	18.3
L_p (dB)	55.4	53.3	55.1	54.6	53.8	51.7	51.6	45.9	40.3	36.7	33.1	29.6
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	68.8	66.9	69.0	69.2	69.0	67.1	67.9	63.5	59.2	56.9	54.8	52.1
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	3.89	3.68	4.45	4.81	5.05	4.78	5.32	4.30	3.54	3.28	3.05	2.41

L_{WA}
81.7

$Sones^*$
22

Determination 3 Results



* Sone calculation based on a hemispherical free field at 1.524 m.



Korea Testing Certification
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Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 5 - One-Third Octave Band Analysis

Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	546	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
536	4.464

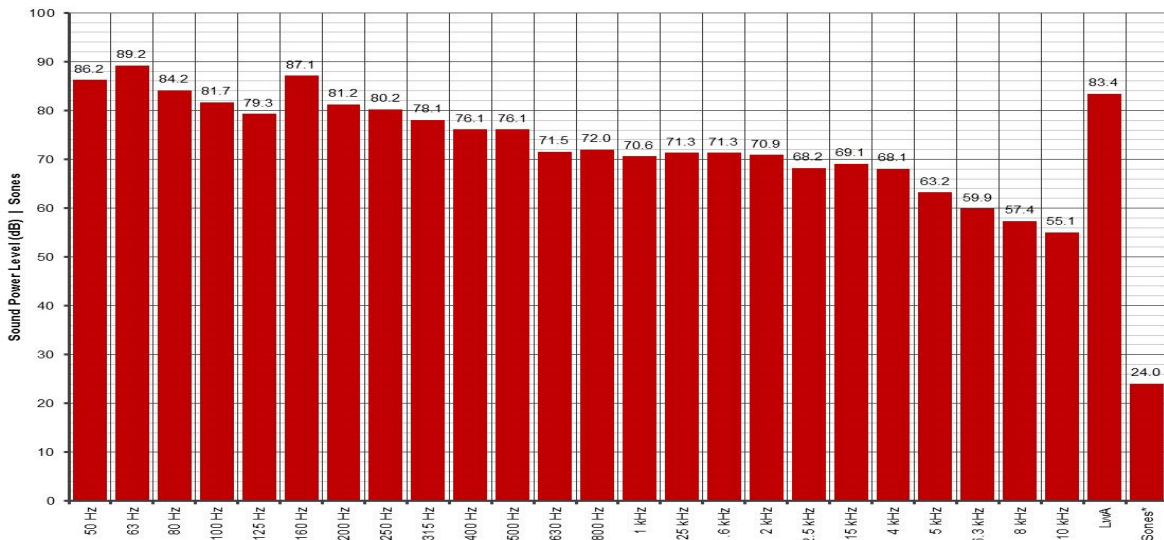
	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pm} (dB)	64.4	65.0	65.7	61.9	63.0	68.3	63.1	62.9	61.3	58.3	59.9	54.0
L_{pb} (dB)	50.3	46.7	41.7	37.2	35.5	30.1	28.4	26.5	24.4	22.9	23.0	21.6
$L_{pm} - L_{pb}$ (dB)	14.1	18.3	24.0	24.7	27.5	38.2	34.7	36.4	36.9	35.4	36.9	32.4
L_p (dB)	64.2	64.9	65.7	61.9	63.0	68.3	63.1	62.9	61.3	58.3	59.9	54.0
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	83.8	85.9	81.9	79.5	76.9	82.7	77.3	76.8	75.1	72.0	73.1	67.2
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	3.30	4.44	3.83	3.72	3.58	5.88	4.54	4.69	4.48	3.95	4.48	3.34

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pm} (dB)	54.0	51.7	54.3	53.4	52.3	50.3	49.7	44.9	39.8	36.2	33.0	29.5
L_{pb} (dB)	19.5	17.1	16.2	14.5	13.0	9.5	8.9	9.2	10.7	9.6	10.8	11.4
$L_{pm} - L_{pb}$ (dB)	34.5	34.6	38.1	38.9	39.3	40.8	40.8	35.7	29.1	26.6	22.2	18.1
L_p (dB)	54.0	51.7	54.3	53.4	52.3	50.3	49.7	44.9	39.8	36.2	33.0	29.4
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	67.4	65.3	68.2	68.0	67.5	65.7	66.0	62.5	58.7	56.4	54.7	51.9
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	3.58	3.36	4.24	4.45	4.60	4.36	4.75	4.10	3.44	3.18	3.03	2.38

L_{WA}
79.7

Sones*
19.4

Determination 3 Results



* Sone calculation based on a hemispherical free field at 1.524 m.



Korea Testing Certification
82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 6 - One-Third Octave Band Analysis

Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	640	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
628	3.727

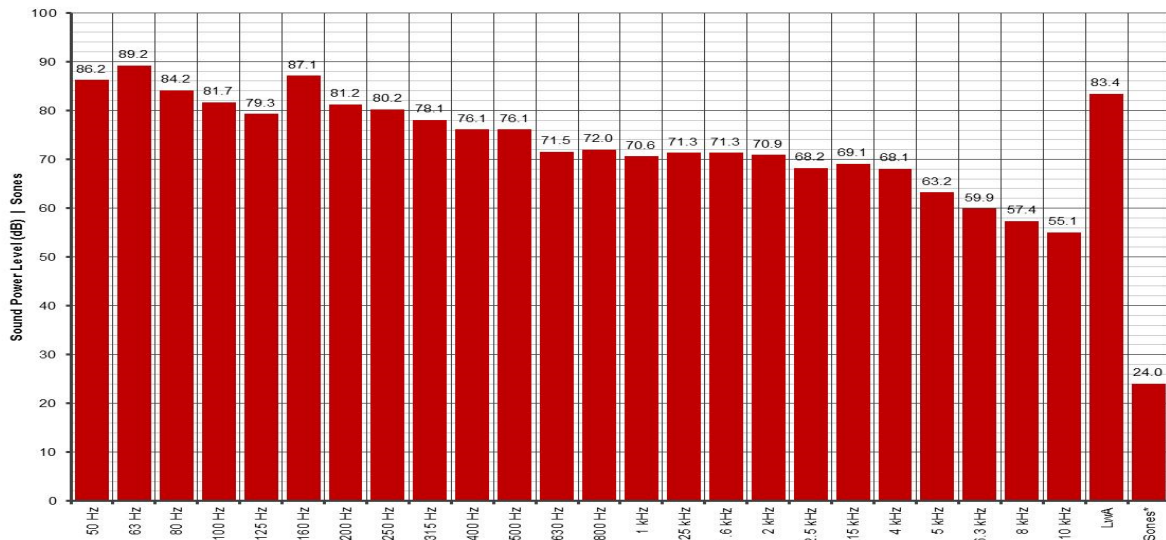
	One-Third Octave band Center Frequency (50 Hz - 630 Hz)											
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
L_{pm} (dB)	67.0	68.2	68.4	67.2	69.7	69.9	64.8	64.8	62.7	77.8	61.0	55.6
L_{pb} (dB)	50.3	46.7	41.7	37.2	35.5	30.1	28.4	26.5	24.4	22.9	23.0	21.6
$L_{pm} - L_{pb}$ (dB)	16.7	21.5	26.7	30.0	34.2	39.8	36.4	38.3	38.3	54.9	38.0	34.0
L_p (dB)	66.9	68.2	68.4	67.2	69.7	69.9	64.8	64.8	62.7	77.8	61.0	55.6
$L_{Wr} - L_{pq}$ (dB)	19.5	20.9	16.2	17.6	13.9	14.4	14.2	13.9	13.8	13.7	13.2	13.2
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	86.4	89.1	84.6	84.8	83.6	84.3	79.0	78.7	76.5	91.5	74.2	68.8
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	4.02	5.60	4.68	5.49	5.79	6.52	5.05	5.26	4.90	12.60	4.81	3.66

	One-Third Octave band Center Frequency (800 Hz - 10 kHz)											
	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
L_{pm} (dB)	66.6	54.4	60.2	56.6	53.7	51.0	51.4	49.0	45.8	40.4	34.7	31.8
L_{pb} (dB)	19.5	17.1	16.2	14.5	13.0	9.5	8.9	9.2	10.7	9.6	10.8	11.4
$L_{pm} - L_{pb}$ (dB)	47.1	37.3	44.0	42.1	40.7	41.5	42.5	39.8	35.1	30.8	23.9	20.4
L_p (dB)	66.6	54.4	60.2	56.6	53.7	51.0	51.4	49.0	45.8	40.4	34.7	31.8
$L_{Wr} - L_{pq}$ (dB)	13.4	13.6	13.9	14.6	15.2	15.4	16.3	17.6	18.9	20.2	21.7	22.5
E (dB)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
L_{Wm} (dB)	80.0	68.0	74.1	71.2	68.9	66.4	67.7	66.6	64.7	60.6	56.4	54.3
Background:	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
s	7.60	3.95	6.04	5.41	5.02	4.57	5.26	5.23	4.96	4.12	3.38	2.73

L_{WA}
88.5

Sones*
30

Determination 3 Results



* Sone calculation based on a hemispherical free field at 1.524 m.



Korea Testing Certification
82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 1 - Full Octave Band Analysis

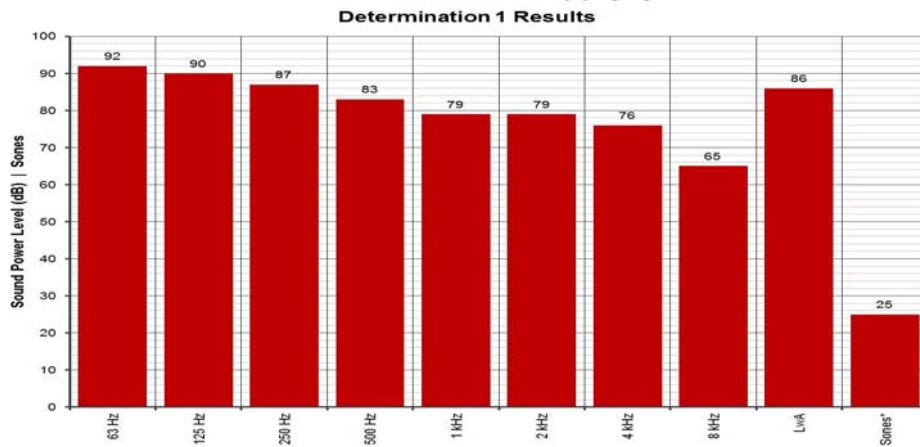
Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	98	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
96	7.088

L_{wm} (dB) s	Full Octave band Center Frequency								L_{WA} 86	Sones*
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
	92	90	87	83	79	79	76	65		25
	6.8	8.5	8.7	7.9	7.7	9.1	8.9	5.6		



* Sone calculation based on a hemispherical free field at 1.524 m.

Determination 2 - Full Octave Band Analysis

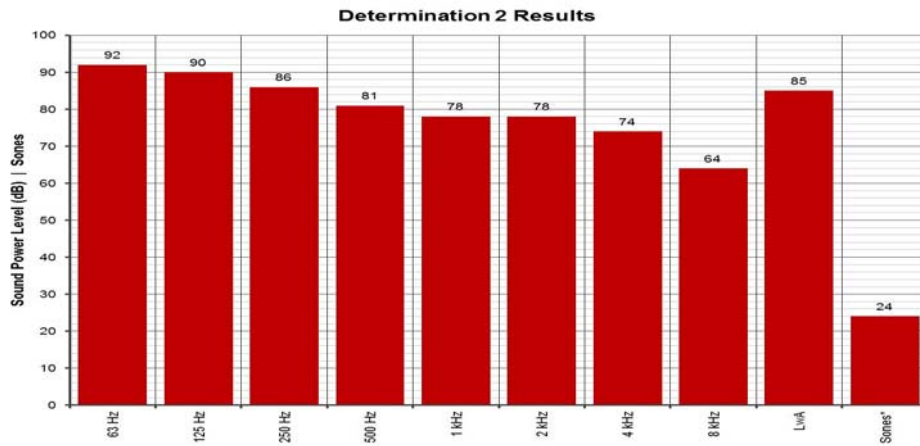
Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	190	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
187	6.699

L_{wm} (dB) s	Full Octave band Center Frequency								L_{WA} 85	Sones*
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
	92	90	86	81	78	78	74	64		24
	7.0	8.5	8.2	7.4	7.1	8.4	8.3	5.4		



* Sone calculation based on a hemispherical free field at 1.524 m.



Korea Testing Certification
82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number
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Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 3 - Full Octave Band Analysis

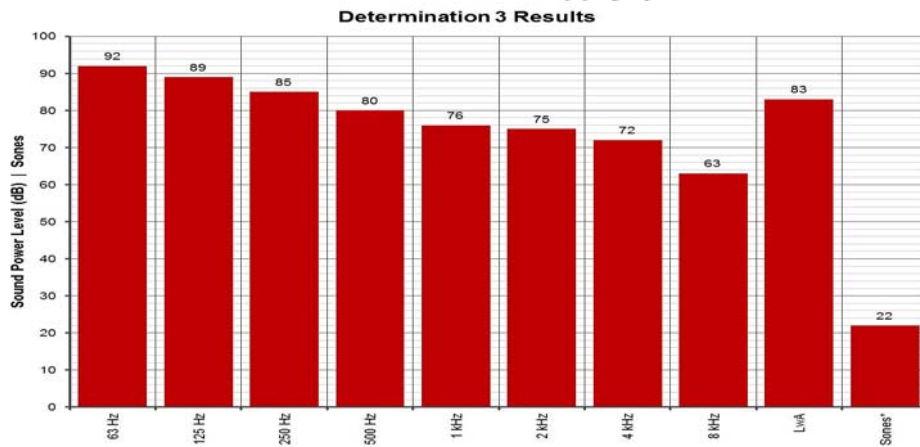
Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	358	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
351	5.960

L_{wm} (dB) s	Full Octave band Center Frequency								L_{WA} 83	Sones*
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
	92	89	85	80	76	75	72	63		
	6.9	7.9	7.5	6.7	6.4	7.2	7.3	4.9		22



* Sone calculation based on a hemispherical free field at 1.524 m.

Determination 4 - Full Octave Band Analysis

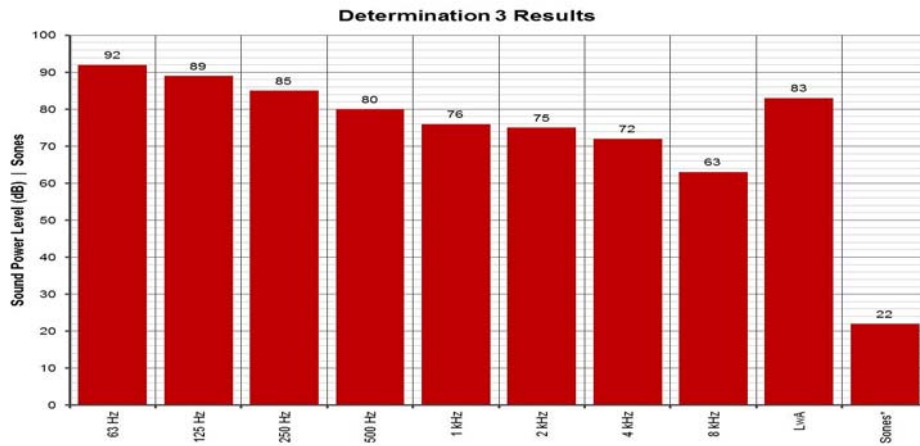
Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	423	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
415	5.240

L_{wm} (dB) s	Full Octave band Center Frequency								L_{WA} 82	Sones*
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
	88	89	83	78	73	73	70	60		
	5.2	8.1	6.8	6.0	5.4	6.5	6.3	4.2		20



* Sone calculation based on a hemispherical free field at 1.524 m.



Korea Testing Certification
82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Determination 5 - Full Octave Band Analysis

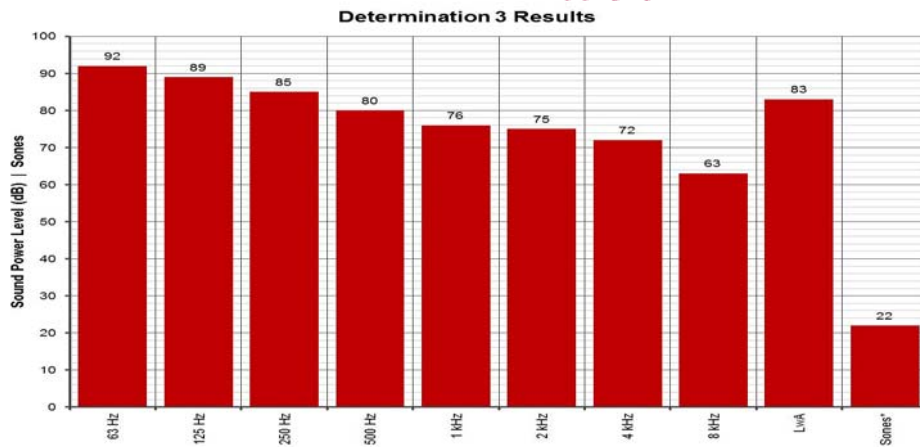
Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	546	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
536	4.464

L_{wm} (dB) s	Full Octave band Center Frequency								L_{WA} 80	Sones*
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
	89	85	81	76	72	72	68	59		17.8
	5.6	6.4	6.1	5.4	5.0	6.0	5.7	4.1		



* Sone calculation based on a hemispherical free field at 1.524 m.

Determination 6 - Full Octave Band Analysis

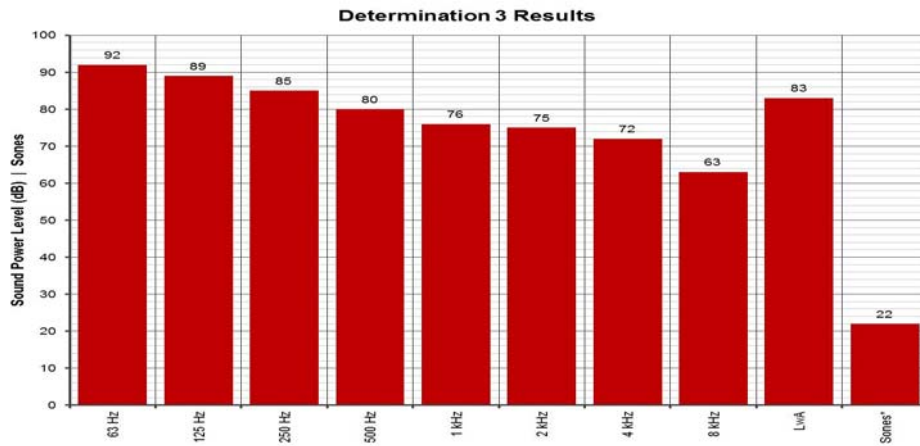
Fan Inlet Test Conditions:

P_b (kPa)	t_{d0} (°C)	t_{w0} (°C)	t_{d1} (°C)	P_{s1} (Pa)	ρ (kg/m ³)	N (rpm)
101.85	15.8	11.6	15.8	640	1.22	999

Test Conditions Converted to Standard Air:

P_s (Pa)	Q (m ³ /s)
628	3.727

L_{wm} (dB) s	Full Octave band Center Frequency								L_{WA} 90	Sones*
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
	92	89	83	92	81	74	71	63		28
	6.9	8.1	6.8	13.6	8.7	6.8	6.9	5.0		



* Sone calculation based on a hemispherical free field at 1.524 m.

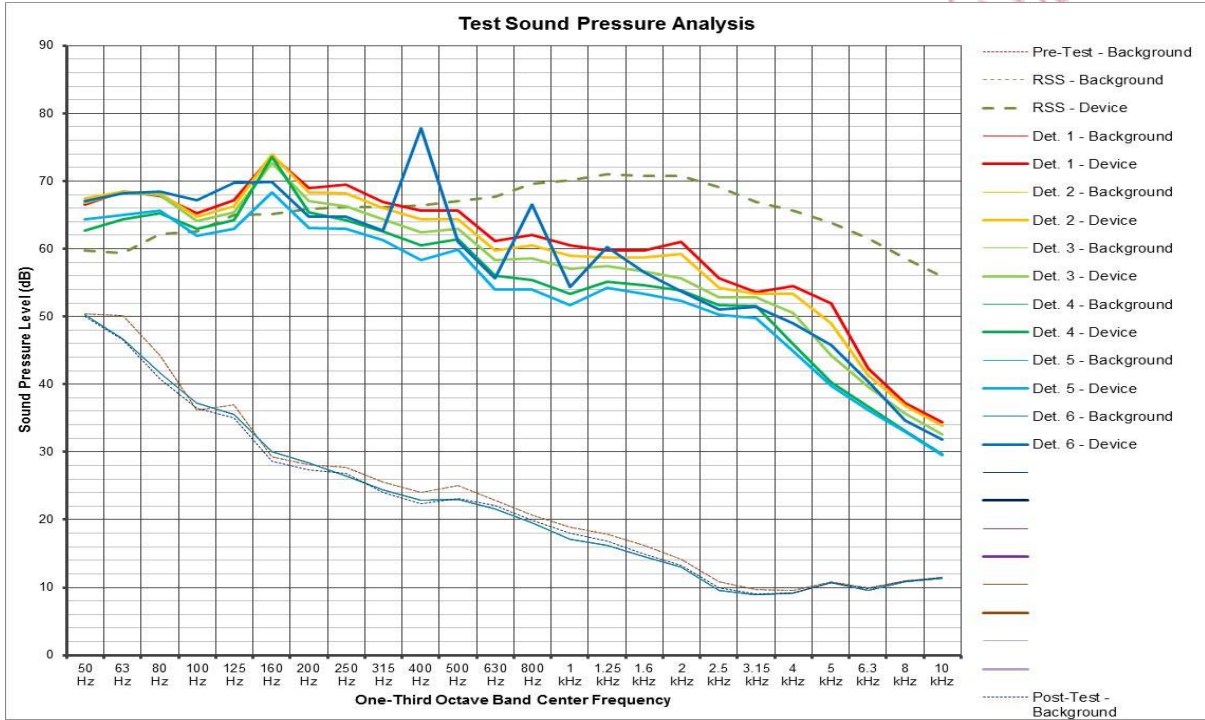


Korea Testing Certification
82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

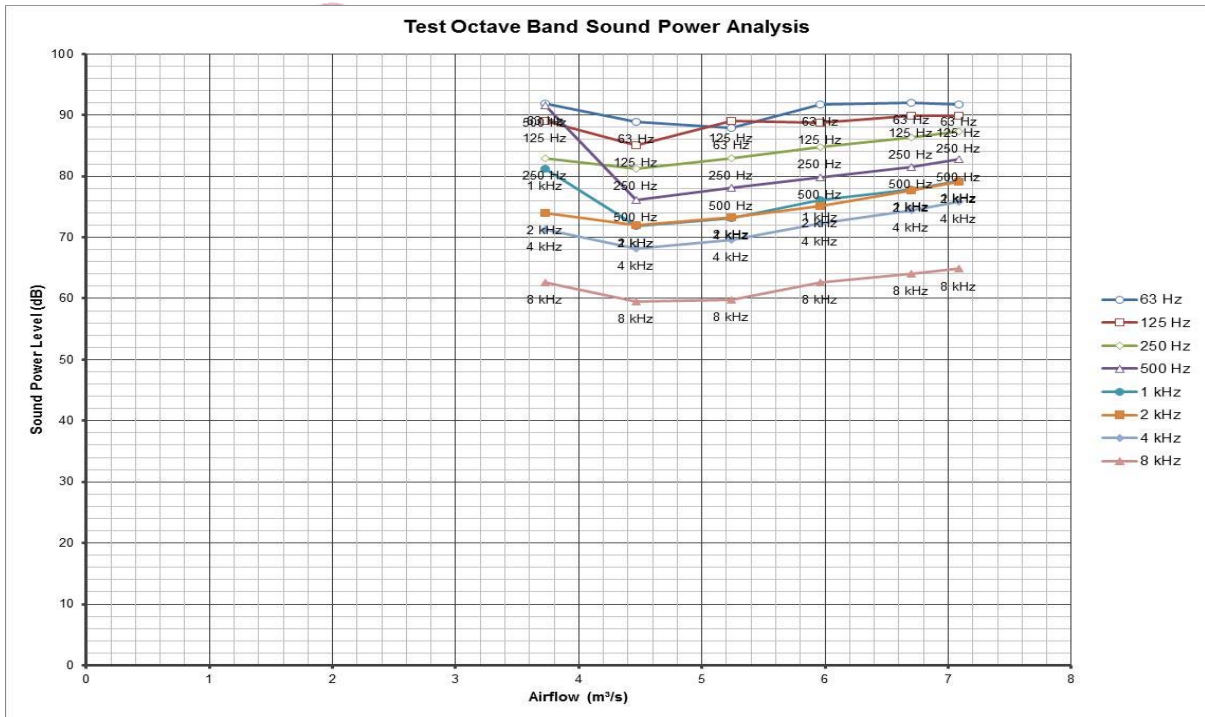
Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B

Test Sound Pressure Analysis



Test Octave Band Sound Power Analysis





Korea Testing Certification
82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number
33026-S1

Test Method per ANSI / AMCA Standard 300-14, Figure 2 Setup, Installation Type B



**KTC INSTRUMENT LIST**

Test Number: 33026-S1

Date: 12-Apr-16

Technician KTC_HONG

The following instrument, calibrated as applicable per the test standard were used for this test

Facility: KTC C 1260

Standard : AMCA 300-14

Figure : Figure 12

Pressure**Barometer**

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
■	3093-3	YOKOGAWA	UNE31-SHS2		0	6818BA030		2015-05-28	2016-05-28

Pressure Meter

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-33	YOKOGAWA	EJA110A	KTC R 1240	7	91G740641	-300-300 mmWg.	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-34	YOKOGAWA	EJA110A	KTC R 1240	5	91G740640	0 - 300 mmWg.	2015-05-28	2016-05-28
■	3093-25	YOKOGAWA	EJA110A	KTC C 1260	7	91HC23940	-300 - 700 mmWg.	2015-05-28	2016-05-28
■	3093-26	YOKOGAWA	EJA110A	KTC C 1260	5	91J208748	0 - 300 mmWg.	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-18	YOKOGAWA	EJA110A	KTC L 1560	8	91HA27332	-700 - 300 mmWg.	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-19	YOKOGAWA	EJA110A	KTC L 1560	5	91J208747	0 - 300 mmWg.	2015-05-28	2016-05-28

Temperature**RTD**

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-31	YAMARI	PT 100	KTC R 1240	5	1570329	-40-250 Celsius	2015-05-28	2016-05-28
■	3434-1	YAMARI	PT 100	KTC C 1260	5	1570318	-40-250 Celsius	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-20	YAMARI	PT 100	KTC L 1560	2	1570328	-40-250 Celsius	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-22	YAMARI	PT 100	KTC L 1560	8	646062	-40-250 Celsius	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-27	YAMARI	PT 100	KTC L 1560	5	1570317	-40-250 Celsius	2015-05-28	2016-05-28
■	4375-1	YAMARI	PT 100	-	0	837680	-40-250 Celsius	2015-05-28	2016-05-28
■	4375-2	YAMARI	PT 100	-	0	837681	-40-250 Celsius	2015-05-28	2016-05-28

Torque**Torque**

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-06	ONNOSOKKI	SS-201	-	-	2010359	0 - 200 Nm	2016-04-01	2016-05-01
■	3093-09	ONNOSOKKI	SS-501	-	-	5010499	0 - 500 Nm	2016-04-01	2016-05-01
<input type="checkbox"/>	3093-12	ONNOSOKKI	SS-102	-	-	1020158	0 - 1000 Nm	2016-04-01	2016-05-01
<input type="checkbox"/>	3336-01	ONNOSOKKI	SS-500	-	-	74302009	0 - 500 Nm	2016-04-01	2016-05-01
<input type="checkbox"/>	3338-01	ONNOSOKKI	SS-102	-	-	N/A	0 - 100 Nm	2016-04-01	2016-05-01

Torque Arm

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3421	KBR	N/A	-	-	N/A	-	2014-07-01	2016-07-01

Weights

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	4835	SATORIUS	MSE70200S	-	-	32602042	0-70.2 kg	2015-03-06	2016-03-06

Power

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3387	HIOKI	3169-20	-	-	3890	-	2015-05-29	2016-05-29

Speed**Speed**

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-07	ONNOSOKKI	MP-981	-	-	00303009	0-6000 r/min	2016-04-01	2016-05-01
■	3093-10	ONNOSOKKI	MP-981	-	-	00303101	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3093-13	ONNOSOKKI	MP-981	-	-	10304670	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3336-02	ONNOSOKKI	MP-981	-	-	N/A	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3308-02	ONNOSOKKI	MP-981	-	-	N/A	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3337	B&K	4912	-	-	Y0425N	-	2015-05-28	2016-05-28

Sound**Sound Pressure Level**

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
■	3218-3	B&K	4228	-	-	2484517	-	2015-08-17	2016-08-17
■	3218-5	B&K	4942	-	-	2518399	-	2015-08-22	2016-08-22

Sound Power level

	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
■	3218-1	B&K	4204	-	-	250111093	-	2013-01-31	2016-01-31