



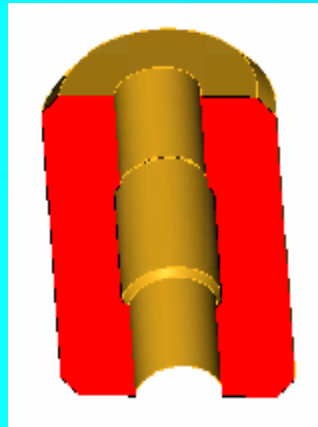
# ***HYPRO Bearing Introduction***

**Version : R0.01**  
**Date : 2005.06.16**

# Content

- n 1. HYPRO Bearing Composition
- n 2. HYPRO Bearing Inner Structure
- n 3. Hitachi EAK-3 Data Sheet
- n 4. The Comparison Table for Different Bearing Types
- n 5. New Dust-proof Structure for HYPRO
- n 6. Recommendation for HYPRO Bearing Application
- n 7. Reliability Test form HYPRO Fan
- n Appendix

# 1. HYPRO Bearing Composition



## 1. The composition of “HYPRO”

**Material : Copper-Ferrite alloy ( Hitachi EAK-3 )**

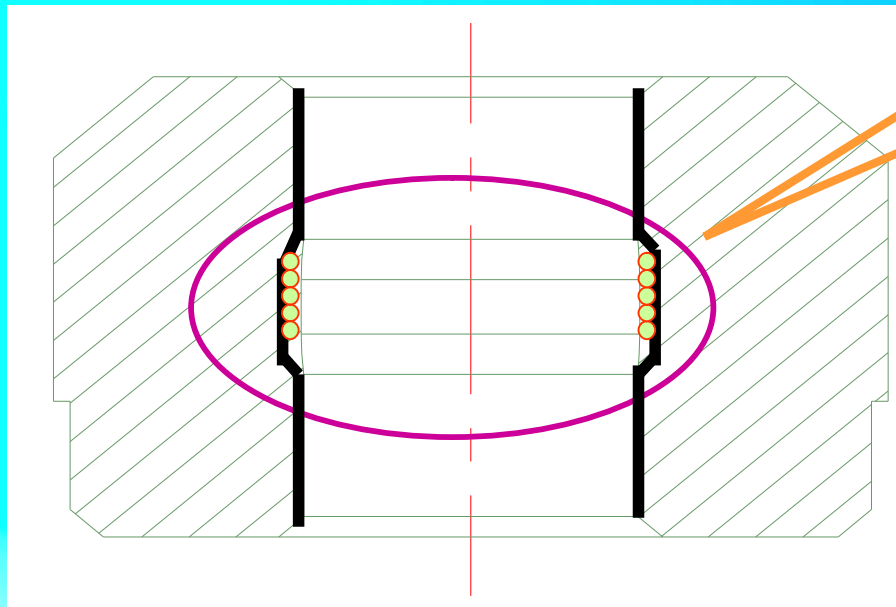
**Oil content : 18% Vol. Min.**

**Density : 6.1 g/cm<sup>3</sup>**

**Oil : GLY 2100**

## 2. Its manufacturing process is “Powder Metallurgy”

## 2. HYPRO Bearing Inner Structure



- 1. Oil Storage
- 2. Reduce about 1/3 Friction Area

# 3. Hitachi EAK-3 Data Sheet

**Bronze Layer Iron Bearing**

## NIKKALOY® EAK-3

■ CHEMICAL COMPOSITION (Wt.%)

	Fe	Cu	Sn	C	P	Others
EAK-3	Bal	50-55	1-3	<1	0.1~0.5	<1

BEARING SURFACE

MICROSTRUCTURE

■ APPLICATION

- SPINDLE MOTOR  
(CD-ROM, DVD, HDD, MD, LBP)
- FAN MOTOR
- STEPPING MOTOR

日立粉末冶金 Hitachi Powdered Metals (S) PTE. LTD.



# 4. The Comparison Table for Different Bearing Types

	<b>HYPRO Bearing</b>	<b>1S1B</b>	<b>2B</b>
<b>Cost</b>	Lowest	Middle	Higher
<b>SPL</b>	Middle	Highest	Lowest
<b>Life expectancy (L10)</b>	40K Hrs. under 40°C	50K Hrs. under 40°C	50K Hrs. under 40°C
<b>Operation Temperature</b>	-10 ~ +70°C	-10 ~ +70°C	-10 ~ +70°C



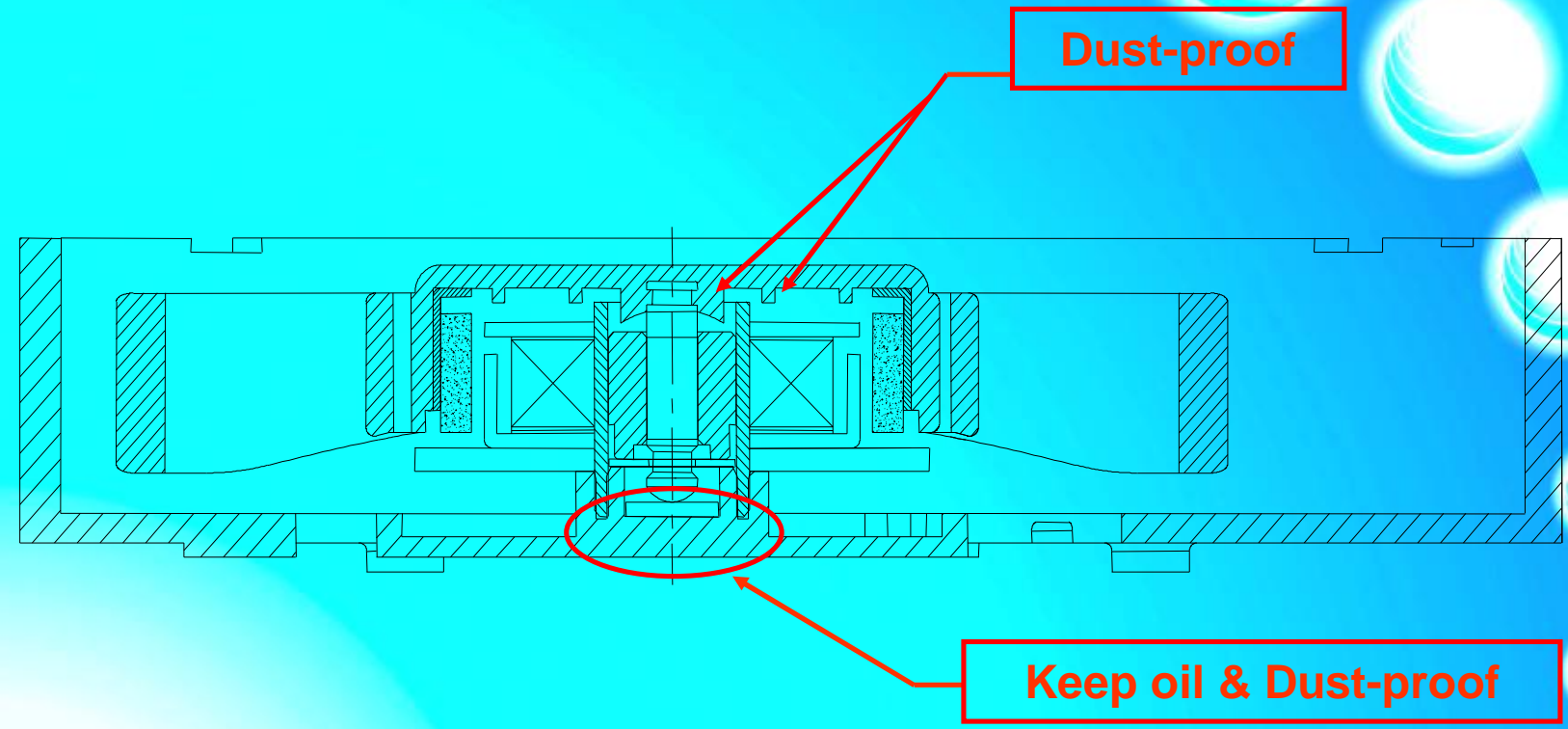
**Acoustic Test for 2B**



**Acoustic Test for HYPRO**



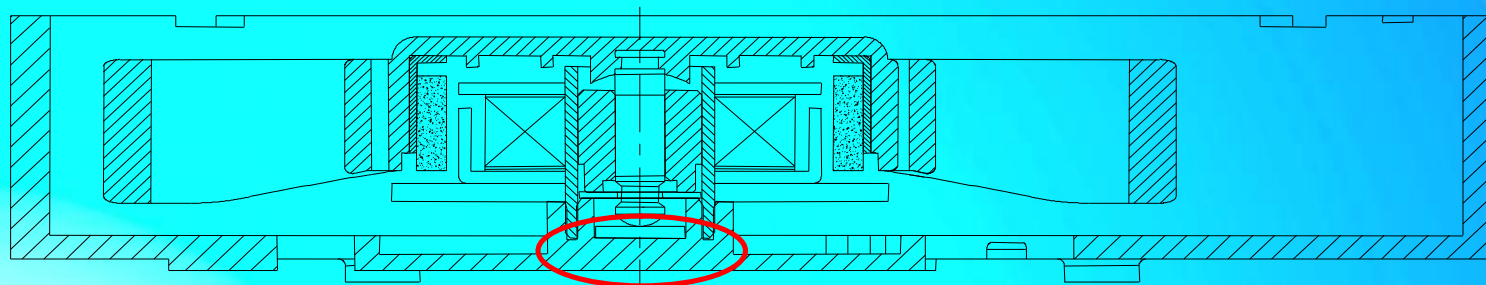
# 5. New Dust-proof Structure for HYPRO n Blower fan



ADDA US Patent

# Advantages for New Dust-proof Structure for Blower Fan

- n **Housing** – Use closed structure at bottom of housing to keep oil & prevent dust.

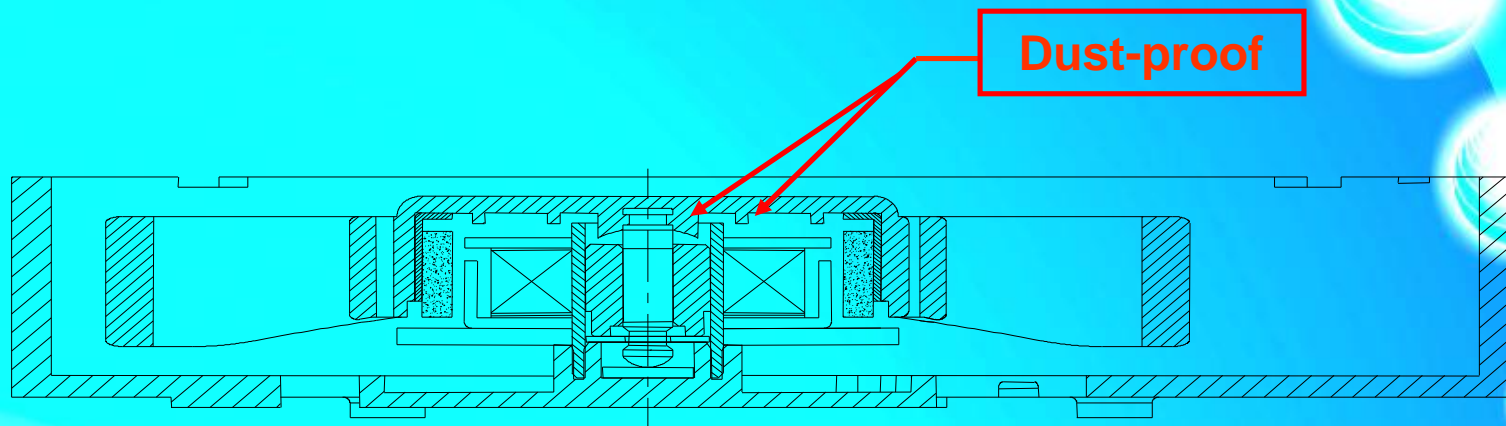


**Keep oil & Dust-proof**



n **Inner Impeller –**

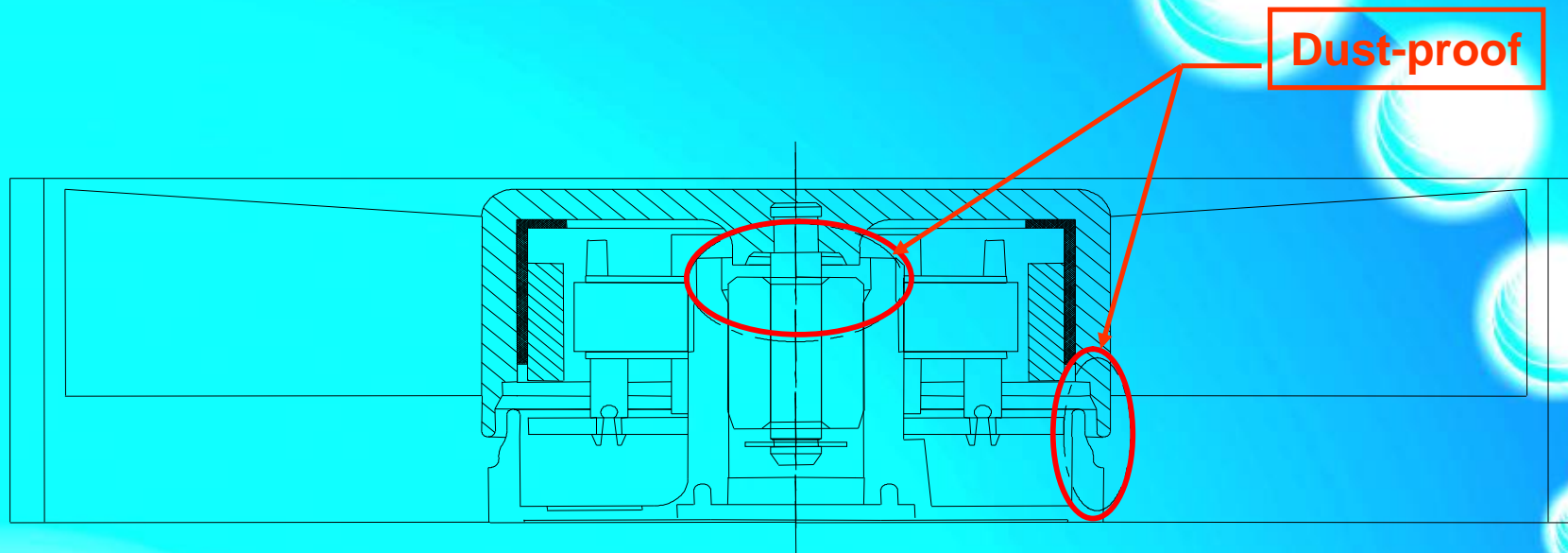
1. Modify the shape around the shaft to recycle and reduce the loss of oil.
2. Increase the ribs(rings) inner impeller to prevent dust.



n **Effect Verification Methods – Dust Test** 

ADDA uses “Dust Test” to verify the effect of dust-proof thru independent lab.

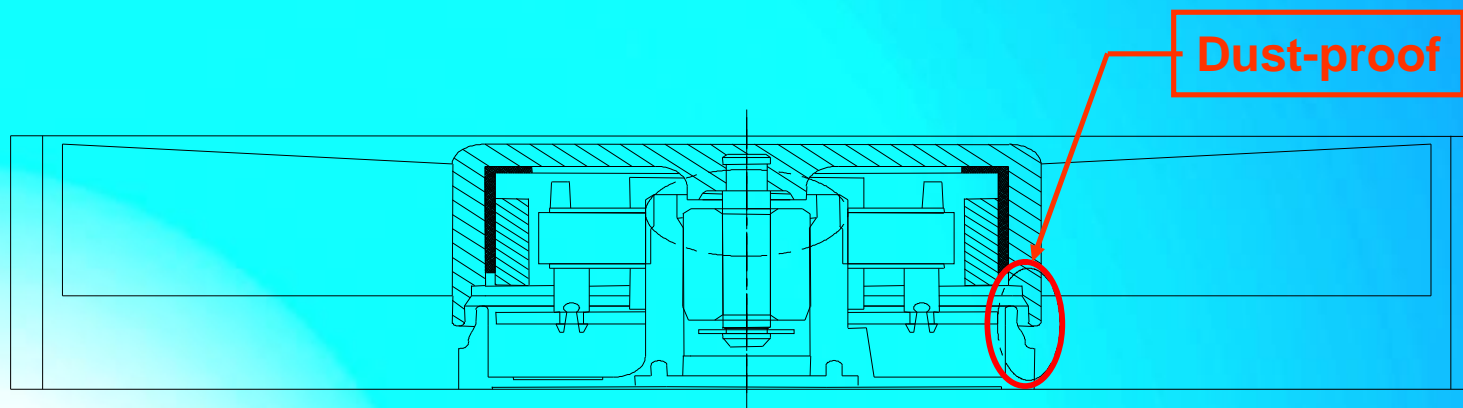
# § Axial Fan



# Advantages for New Dust-proof Structure of Axial Fan

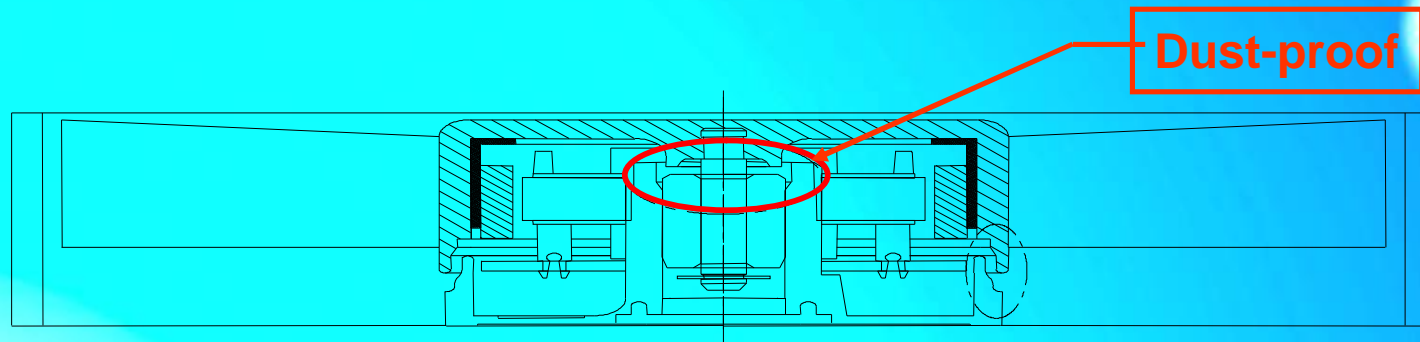
## n Housing –

1. Increase the ribs(rings) outer the motor holder of the housing to reduce the gap between the impeller and the housing.



n **Inner Impeller –**

1. Modify the shape around the shift to recycle and reduce the loss of oil.
2. Increase the ribs(rings) inner impeller to reduce the gap between the impeller and the housing.



n **Effect Verification Methods – Dust Test** 

ADDA uses “Dust Test” to verify the effect of dust-proof thru independent lab.

## **6. Recommendation for HYPRO Bearing Application**

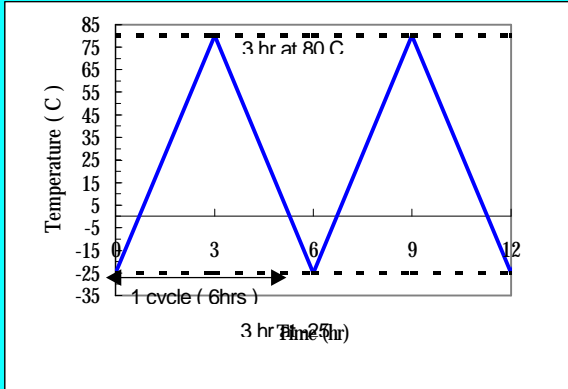
- 1. The thickness of fan is large than 10mm.**
- 2. The application temperature is less than 70°C.**

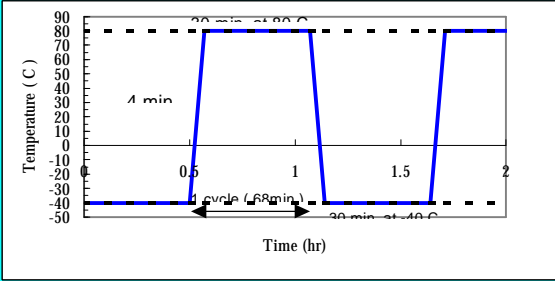
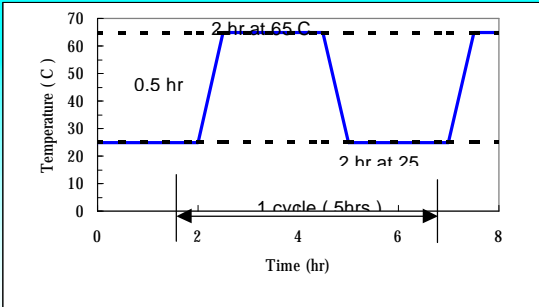


## **7. Reliability Test form HYPRO Fan**

- 1. Power & Thermal Cycling Test**
- 2. Vibration Test**
- 3. Impeller Locked Test**
- 4. Mechanical Shock Test**
- 5. Thermal Shock Test**
- 6. Humidity Test**
- 7. MTTF Test**

# Reliability Test Plan

Test Item	Planning Beginning Date	Planning Finished Date	Status	days	Test condition
<b>1. Power &amp; Thermal Cycling Test (4.3)</b> 	2005.02.25	2005.03.10		13	1. Sample size 90 pcs 2. Each cycle temperature rise from -25C to 80C with ramp rate 35c/hr (3hrs) then down from 80 C to -25 C with ramp rate -35 C/hr (3hrs) 3. Control the fan power to be 90 seconds—on and 30 seconds—off. The total are 60min x 300hrs/2 min = 9000 times(on-off). 4. Each 5 cycles, measure 30 pcs (Current, speed, and check noise ) All of sample need to check noise and speed 5. 6 hrs each cycle, total 50 cycles( 300 hrs ) 6. Before test and end of test : (1) Measure S.V., speed , current , noise level (2) Check FG
<b>2. Vibration Test (4.4)</b>	2005.03.07	2005.03.14		10	1. Sample size 15+15 pcs 2. Directon: X, Y , Z axis 3. 1 hr/per axis 4. OP :2G (15 pcs) 5. Non OP:4.32G (15 pcs)
<b>3. Impeller Locked Test (4.5)</b>	2005.02.21	2005.02.25		10	1. Sample size 30 pcs 2. Input the voltage to be 20% more than the rated voltage 3. Stay 96 hours at 70 C

Test Item	Planning Beginning Date	Planning Finished Date	Status	days	Test condition
<b>4. Mechanical Shock Test (4.6)</b>	2005.03.08	2005.03.15		5	1. Sample size 5+5 pcs 2. OP : 1-2ms, From 180G to 330G By 50G Step(5pcs) 3. Non OP : 1-2ms, From 230G to 330G By 50G Step(5pcs) 4. Half-sine wave, 3 shocks for each six faces
<b>5. Thermal Shock Test (4.7)</b> 	2005.03.17	2005.03.22		10	1. Sample size 30 pcs 2. Each cycle stay 30 minutes at -40 C and 30 minutes at 80 C, ramp rate 30 C/min. (4 minutes) 3. Non-operation 4. 68 min. each cycle, total 100 cycles (114 hrs)
<b>6. Humidity Test</b> 	2005.03.14	2005.03.23		9	1. Sample size 30 pcs 2. Humidity 90~95 % (65 C) 3. Non-operation 4. Each cycle stay 2 hrs at 25C and 2 hrs at 65 C, ramp rate 80C/hr (0.5 hrs) 5. Total 42 cycles (210 hrs)
<b>7. MTBF Test (4.9)</b>	2005.02.18	2005.03.31		42	1. Sample size 100 pcs. 2. Stay at least 1000hrs ( until fail) at 70C. 3. Measure 20 pcs (speed, S.V., current, check FG) every 200 hrs . All of samples need to check noise and speed 4. Before test and after 1000 hrs : (1) Measure S.V., speed , current , noise level



# ADDA CORPORATION



## Power & Thermal Cycling Test

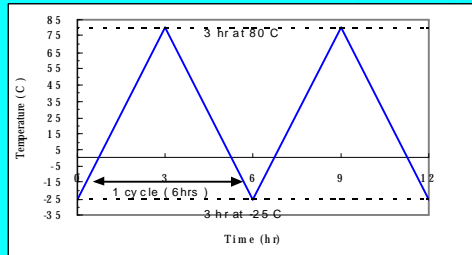
Customer:xxx

Model:AB0605UX-TB3(TCW X1D)

Test Time: 2005.02.25 started ; until 2005.03.10 finished

Test Condition:

1



Test Equipment:

Chamber (TEN BILLION/ TTH-E3SP)



2.Test Q'ty:90pcs

3.Total cycle:50 cycles(300hrs)

4.Input Volts:5.0VDC

5.On(90sec)→ Off(30sec)

6.Currents: 320mA+7% MAX

7.Speeds: 4500RPM±7%

8.Noise: 37.0dB/A+3dB/A MAX

Test Outcome:Before the test all characters meets the specifications.

Before the test:

Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
<b>Max</b>	<b>4754</b>	<b>303</b>	<b>31.9</b>	
<b>Min</b>	<b>4458</b>	<b>292</b>	<b>31.1</b>	
$\bar{x}$	<b>4608.5</b>	<b>297.6</b>	<b>31.52</b>	
$\delta$	<b>91.36</b>	<b>3.41</b>	<b>0.235</b>	

After the test:

Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
<b>Max</b>	<b>4790</b>	<b>304</b>	<b>32.3</b>	
<b>Min</b>	<b>4450</b>	<b>292</b>	<b>31.4</b>	
$\bar{x}$	<b>4613.0</b>	<b>298.1</b>	<b>31.82</b>	
$\delta$	<b>102.81</b>	<b>3.70</b>	<b>0.279</b>	

Result: After the performance test, 90pcs fans of speeds, currents and noise all meet the specifications, test is ok.

Approved By : 吳明家 Mingka Wu

Checked By : 李嶽屏 Arthur Lee

Prepared By : 余柏樹 Penny Yu



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# ADDA CORPORATION



## Vibration test

Customer:xxx

Model:AB0605UX-TB3(TCWX1D)

Test Time: 2005.03.07 started ; until 2005.03.14 finished

Test Condition:

1. OP Vibration:Operation 15PCS
  - a.PSD Grms:2.0Grms.
  - b.Frequency Range:5~500Hz.
  - c.Direction:X, Y, Z axis.
  - d.Duration time:1hr/axis.
2. NOP Vibration:NON-Operation 15PCS
  - a.PSD Grms:4.32Grms.
  - b.Frequency Range:5~500Hz.
  - c.Direction:X, Y, Z axis.
  - d.Duration time:1hr/axis.
- 3.Voltage:5.0VDC
- 4.Currents:320mA+7% MAX
- 5.Speeds:4500RPM±7%
- 6.Noise:37.0dB/A+3dB/A MAX

Test Outcome:Before the test all characters meets the specifications.

OP Before the test:

OP After the test:

Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark	Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
Max	4752	303	31.9		Max	4764	302	32.1	
Min	4474	293	31.1		Min	4456	293	31.4	
$\bar{x}$	4594.4	298.5	31.5		$\bar{x}$	4568.6	295.4	31.79	
$\delta$	97.21	3.33	0.239		$\delta$	106.85	2.61	0.226	

Result:After the performance test, 15pcs fans of speeds, currents and noise all meets the specifications, test is ok.

Approved By : 吳明家Mingka Wu

Checked By : 李嶽屏 Arthur Lee

Prepared By : 余柏樹 Penny Yu



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# ADDA CORPORATION



## Impeller locked test

Customer:xxx

Model:AB0605UX-TB3(TCWX1D)

Test Time: 2005.02.21 started ; until 2005.02.25 finished

Test Condition:

- 1.Test Q'ty:30pcs
- 2.Input Volts: 6.0VDC.
- 3.Currents: 320mA+7%MAX
- 4.Speeds: 4500RPM±7%.
- 5.Noise: 37.0dB/A+3dB/A MAX
- 6.Test time: 96hrs.
- 7.Test temp:70°C.
- 8.Fan with impeller locked.



Test Outcome:Before the test all characters meets the specifications.

Before the test:

After the test:

Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark	Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
Max	4744	303	31.8		Max	4779	304	32.3	
Min	4474	292	31.1		Min	4496	292	31.5	
$\bar{x}$	4611.9	296.4	31.52		$\bar{x}$	4663.8	298.4	31.86	
$\delta$	65.77	3.26	0.217		$\delta$	83.57	3.60	0.246	

Result:After performing the test, 30pcs fans of speeds, currents and noise all meets the specifications, test is ok.

Approved By : 吳明家Mingka Wu

Checked By : 李嶽屏Arthur Lee

Prepared By : 余柏樹Penny Yu

<http://www.adda.com.tw>



# ADDA CORPORATION

## Mechanical shock test



Customer:xxx

Model:AB0605UX-TB3(TCW X1D)

Test Time: 2005.03.08 started ; until 2005.03.15 finished

Test Condition:

1. Operation shock:Units power on (5pcs)
  - a.Pulse shape:half-sine wave
  - b.Acceleration:330G
  - c.Duration of pulse:2ms
  - d.Number of shocks:3 shocks for each 6 sides
2. Non-Operation shock:Units power off (5pcs)
  - a.Pulse shape:half-sine wave
  - b.Acceleration:330G
  - c.Duration times:2ms
  - d.Number of shocks:3 shocks for each 6 sides
- 3.Voltage:5.0VDC
- 4.Currents:320mA+7% MAX
- 5.Speeds:4500RPM±7%
- 6.Noise:37.0dB/A+3dB/A MAX

Test Equipment:

Mechanical Shock Tester (King-Design/ DP-1200-45)



Test Outcome:Before the test all characters meets the specifications.

OP Before the test:

No.	Item	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
	Max	4696	303	31.9	
	Min	4526	292	31.1	
	$\bar{x}$	4623.4	298.2	31.51	
	$\delta$	71.94	4.85	0.270	

OP After the test:

No.	Item	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
	Max	4771	303	32.3	
	Min	4502	294	31.4	
	$\bar{x}$	4602.6	298.9	31.86	
	$\delta$	117.93	3.56	0.348	

Result:After the performance test, 5pcs fans of speeds, currents and noise all meets the specifications, test is ok.

NOP Before the test:

No.	Item	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
	Max	4711	301	31.7	
	Min	4504	293	31.2	
	$\bar{x}$	4596.5	297.5	31.49	
	$\delta$	93.69	3.86	0.23	

NOP After the test:

No.	Item	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
	Max	4775	300	32.1	
	Min	4632	296	31.6	
	$\bar{x}$	4670.3	298.5	31.84	
	$\delta$	80.79	1.50	0.319	

Result:After the performance test, 5pcs fans of speeds, currents and noise all meets the specifications, test is ok.

Approved By : 吳明家 Mingka Wu

Checked By : 李嶽屏 Arthur Lee

Prepared By : 余柏樹 Penny Yu



<http://www.adda.com.tw>



# ADDA CORPORATION

## Thermal shock test



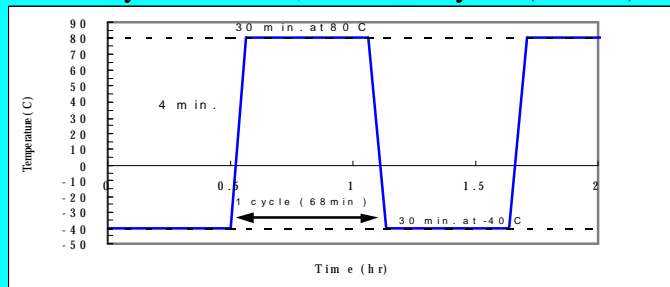
Customer:xxx

Model:AB0605UX-TB3(TCWX1D)

Test Time: 2005.03.17 started ; until 2005.03.22 finished

Test Condition:

- 1.Test Q'ty:30pcs
2. Each cycle 68 mins, total 100 cycles(114hrs)



Test Equipment:

Thermal shock tester (TEN BILLION/TBST-A2S)



3.Non-operation

4.Currents:320mA+7% MAX

5.Speeds:4500RPM±7%

6.Noise:37.0dB/A+3dB/A MAX

Test Outcome:Before the test all characters meets the specifications.

Before the test:

After the test:

Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark	Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
Max	4733	302	31.9		Max	4781	304	32.2	
Min	4462	292	31.1		Min	4461	292	31.4	
$\bar{x}$	4605.3	297.3	31.45		$\bar{x}$	4623.9	298.1	31.83	
$\delta$	83.65	3.22	0.215		$\delta$	93.52	3.77	0.283	

Result:After the performance test, 30pcs fans of speeds, currents and noise all meets the specifications, test is ok.

Approved By : 吳明家 Mingka Wu

Checked By : 李嶽屏 Arthur Lee

Prepared By : 余柏樹 Penny Yu





# ADDA CORPORATION

## Humidity test



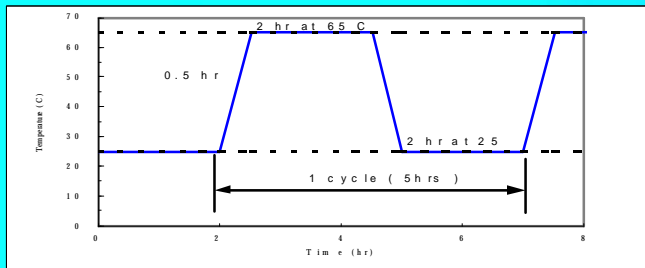
Test Equipment:  
Chamber (TEN BILLION/ TTH-E3SP)

Model:AB0605UX-TB3(TCWX1D)

Test Time: 2005.03.14 started ; until 2005.03.23 finished

Test Condition:

1



- 2.Test Q'ty:30pcs
- 3.Total cycle:42 cycles(210hrs)
- 4.Humidity:90~98%
- 5.Non-operation
- 6.Currents:320mA+7% MAX
- 7.Speeds:4500RPM±7%
- 8.Noise:37.0dB/A+3dB/A MAX

Test Outcome:Before the test all characters meets the specifications.

Before the test:

After the test:

Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark	Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
Max	4745	302	31.8		Max	4770	304	32.3	
Min	4465	292	31.1		Min	4449	293	31.4	
$\bar{x}$	4598.7	297.4	31.37		$\bar{x}$	4608.9	297.4	31.93	
$\delta$	95.95	2.91	0.220		$\delta$	104.35	3.79	0.269	

Result:After the performance test, 30pcs fans of speeds, currents and noise all meets the specifications, test is ok.

Approved By : 吳明家 Mingka Wu

Checked By : 李嶽屏 Arthur Lee

Prepared By : 余柏樹 Penny Yu



# ADDA CORPORATION



## MTBF Test

Customer:xxx

Model:AB0605UX-TB3(TCWX1D)

Test Time: 2005.02.18 started ; until 2005.03.31 finished

Test Condition:

- 1.Test Q'ty:100pcs
- 2.Temperature:70°C
- 3.Confidence level:95%
- 4.Time:If the fan's no fail during test then test time about 1000hours(about 42days)
- 5.Input Voltage:5.0VDC
- 6.Currents:320mA+7% MAX
- 7.Speeds:4500RPM±7%
- 8.Noise:37.0dB/A+3dB/A MAX

Test Equipment:

Oven



Test Outcome:Before the test all characters meets the specifications.

## MTBF test data

Before the test:					After the test:				
Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark	Item No.	Speeds (RPM)	Currents (mA)	Noise (dB/A)	Remark
Max	4751	303	31.9		Max	4790	304	32.3	
Min	4467	292	31.1		Min	4452	292	31.4	
$\bar{x}$	4613.3	297.1	31.45		$\bar{x}$	4600.7	298.1	31.86	
$\delta$	82.28	2.83	0.234		$\delta$	103.88	3.47	0.282	

Result:After the performance test, 100pcs fans of speeds, currents and noise all meets the specifications, test is ok.

Approved By : 吳明家Mingka Wu

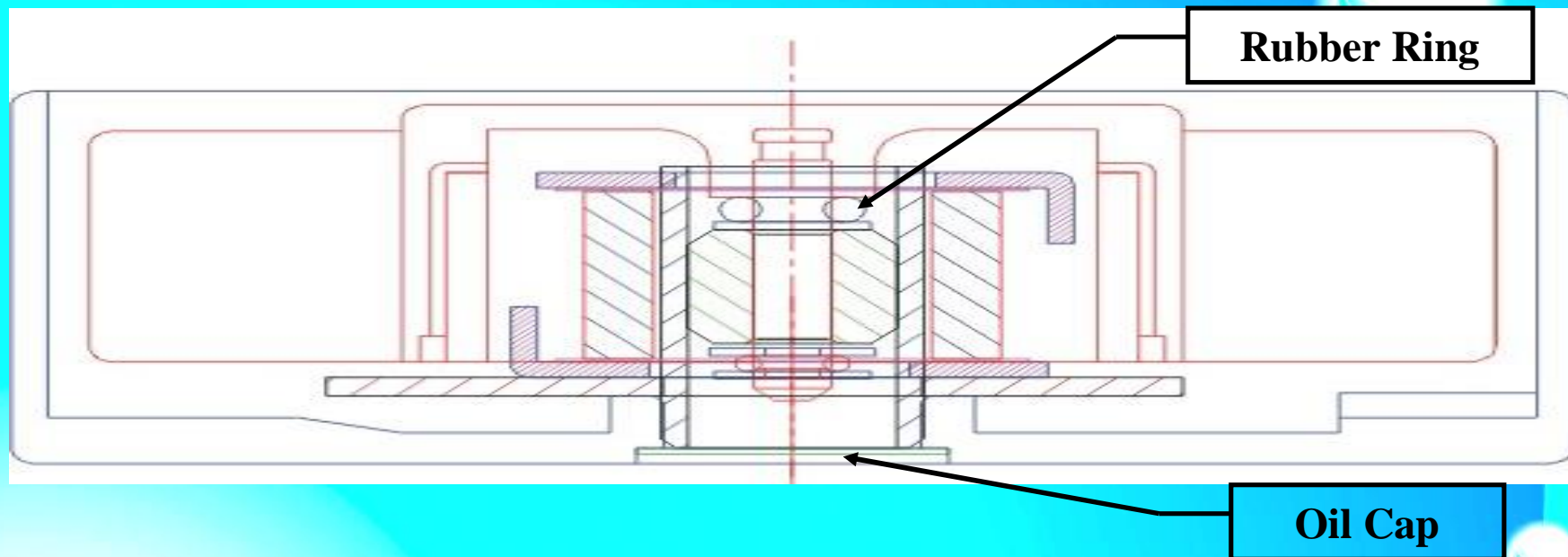
Checked By : 李嶽屏Arthur Lee

Prepared By : 余柏樹Penny Yu

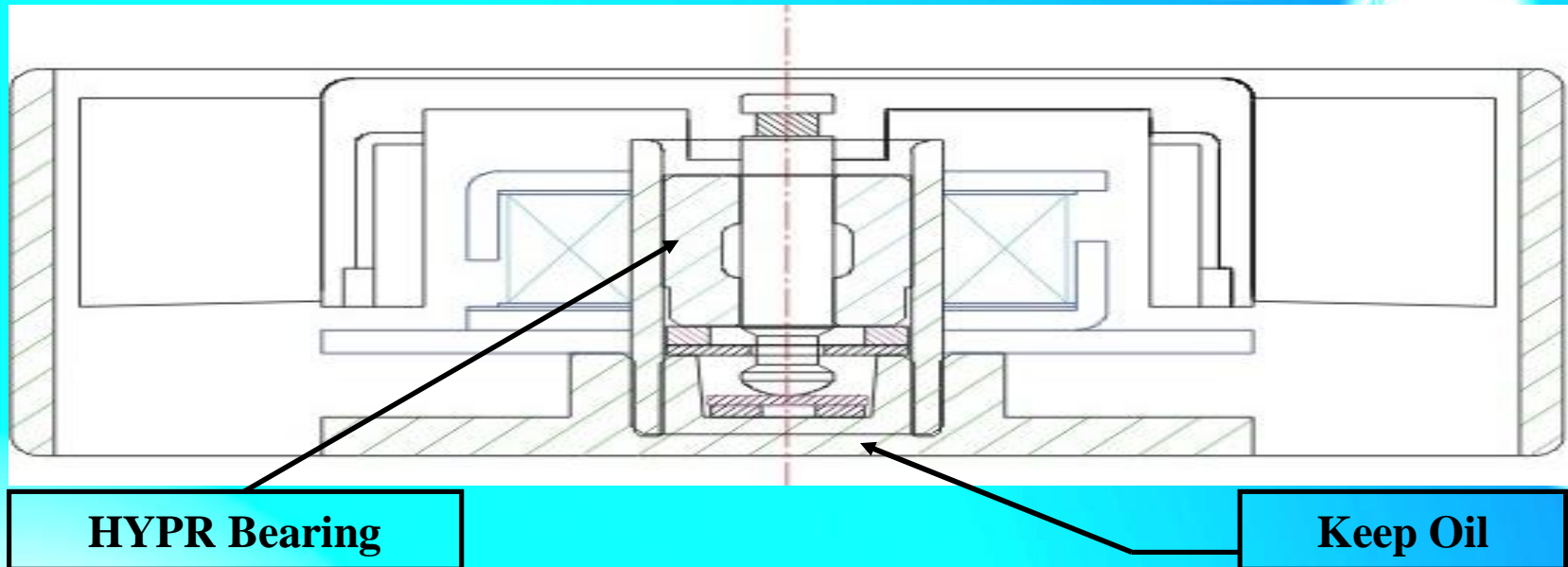
 <http://www.adda.com.tw>



# Appendix 1: Traditional Structure



# Appendix 2: ADDA US Patent



# Appendix 3. Dust Test Conditions

## n Test Equipments & Document

1. Test Equipments: Dust chamber
  - a. Agitation timer : Adjustable 1-30 seconds
  - b. Setting timer : Adjustable 1-30 minutes
  - c. Air purge : Solenoid controlled air flow from timer. The flow rate is manually adjustable.
  - d. Total test timer : Adjustable 1-24 hours
  
2. Laboratory Ambiance Condition
  - a. Temperature: 24°C ~ 25°C
  - b. Relative Humidity: 59% ~ 62%
  
3. Reference document: IEC 529 IP5X



## n Test Conditions

- |                          |  |
|--------------------------|--|
| 1. Type of dust          | :Talcum powder   |
| 2. Particle diameter     | :150um   |
| 3. Air pressure          | :7.0kg/cm2 MAX   |
| 4. Number of cycle       | :32 cycles (15 min/cycle)  |
| 5. Test duration         | :Introducing for fifteen seconds.<br>Setting for fourteen minutes<br>and forty-five seconds. |
| 6. Test duration         | :Total 8 hours   |
| 7. Fan operation voltage | :Rating voltage  |
| 8. Quantity              | :5pcs  |

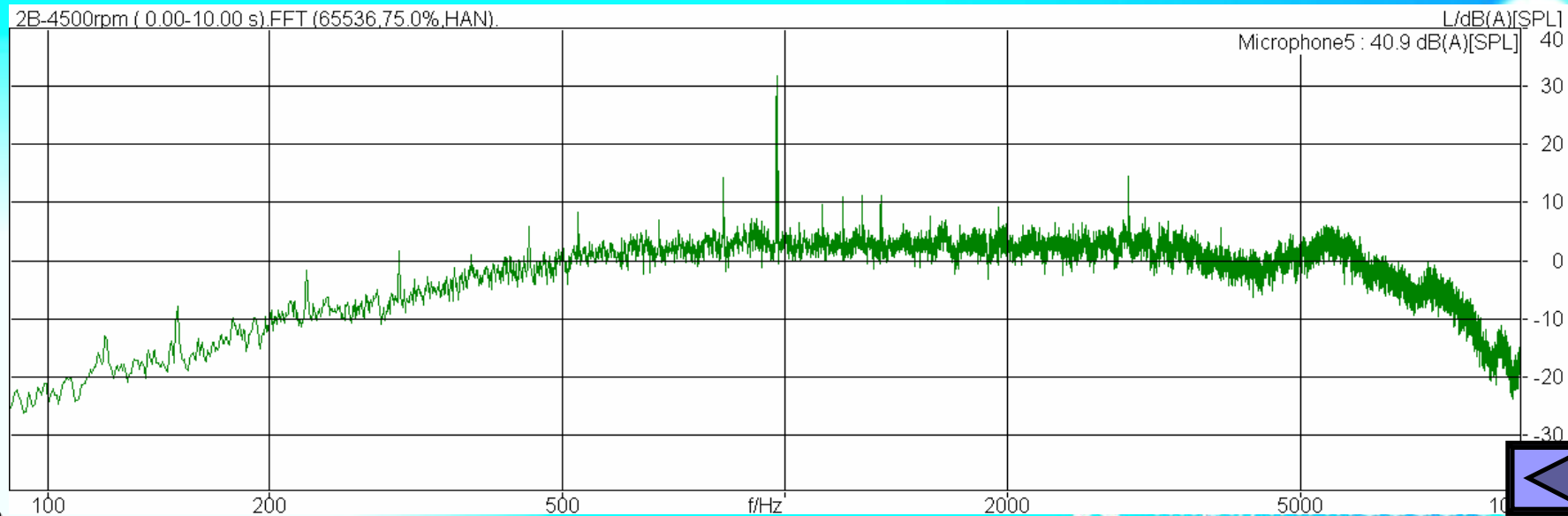
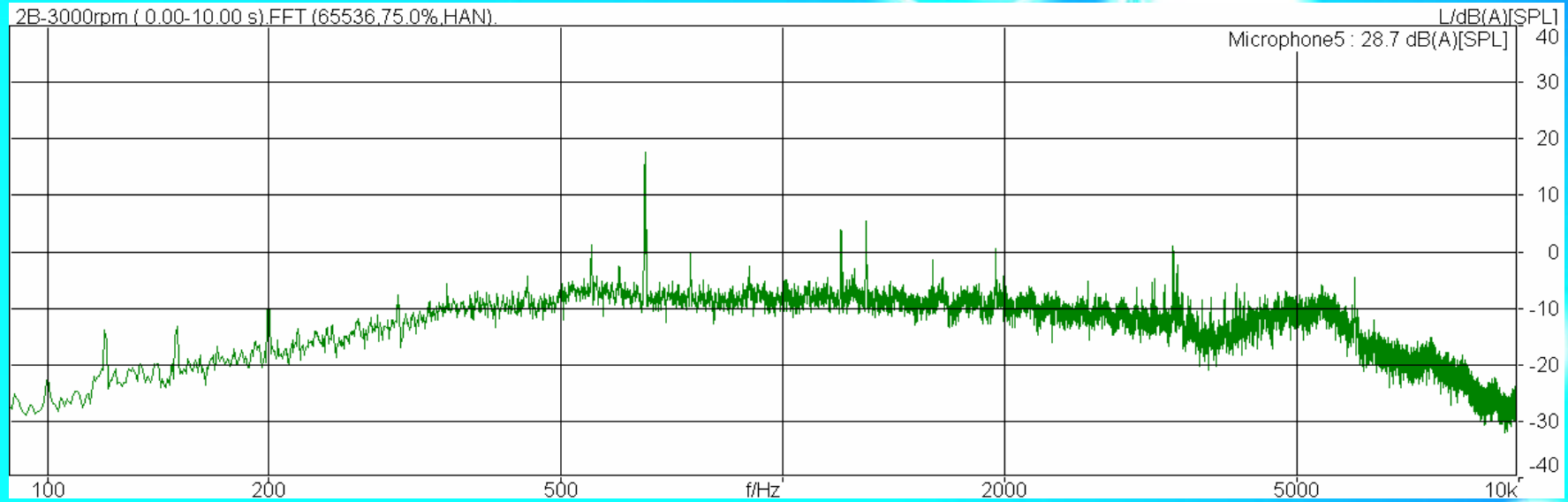




# Appendix 4: Acoustic Test (2B)



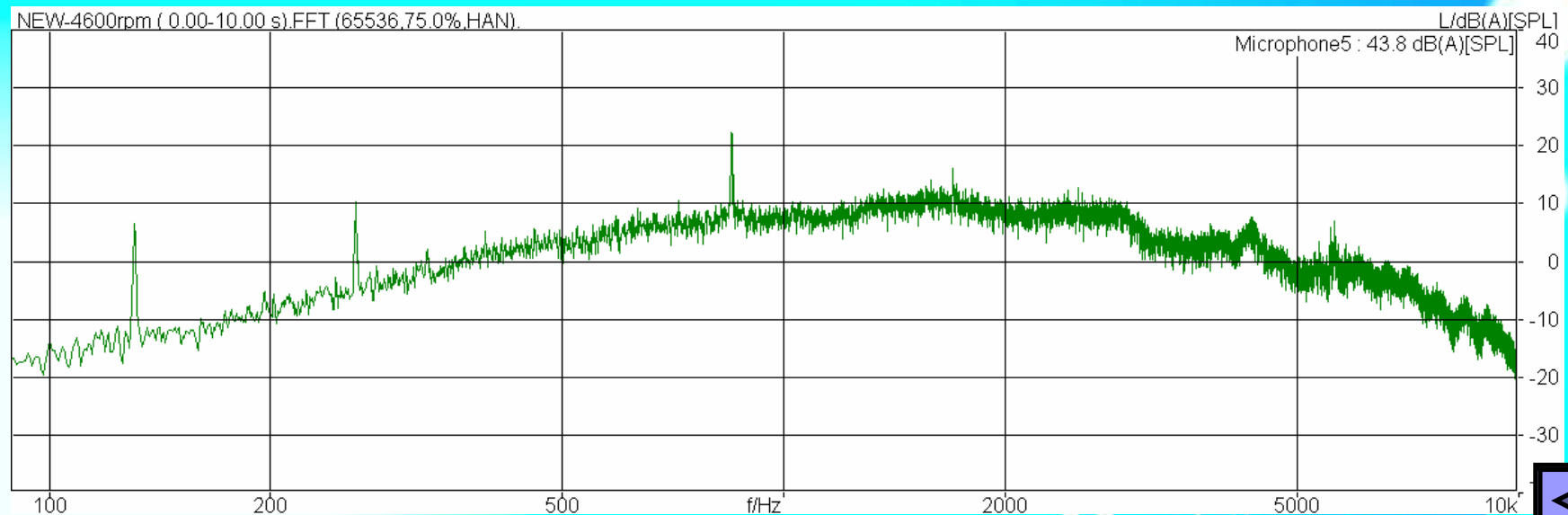
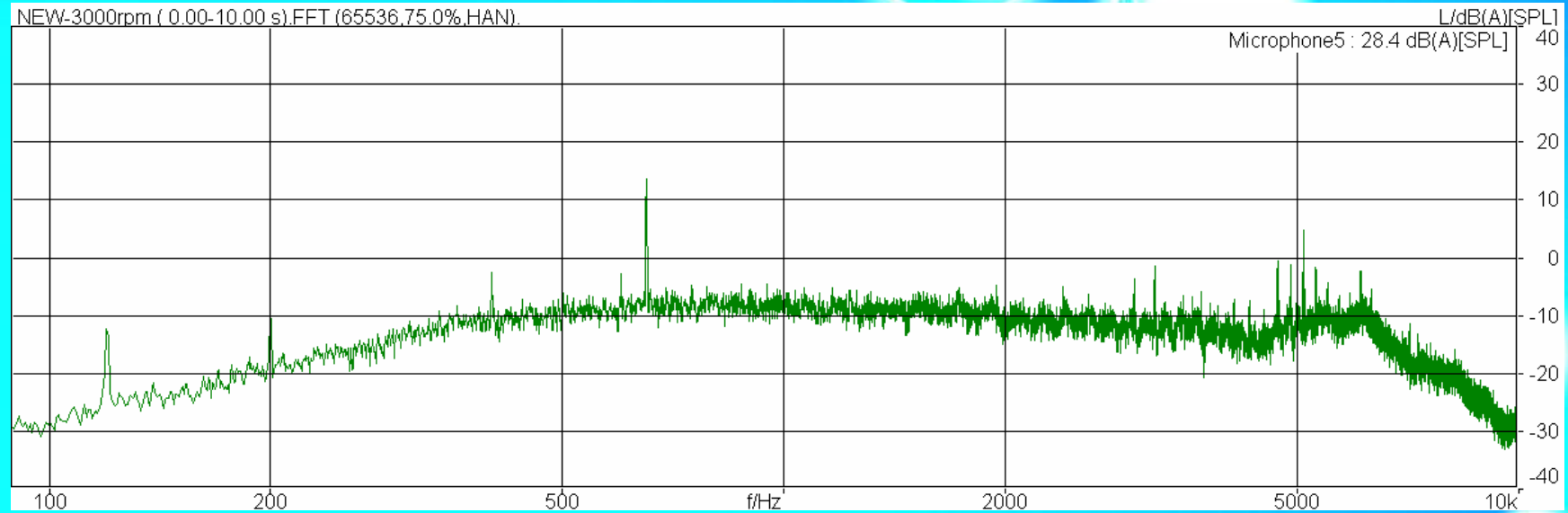
## For Example



# Appendix 5: Acoustic Test (HYPRO)



## For Example



*Thanks you !*

