

APPROVAL SPECIFICATION

TYPE: DC BRUSHLESS AXIAL – FLOW FAN
MODEL: K0510A-12H



Cofan USA, Inc.
43144 Christy Street
Fremont, CA 94538

1. SCOPE

THESE SPECIFICATIONS SHALL BE APPLIED TO THE D.C. BRUSHLESS AXIAL-FLOW FAN, MODEL_K0510A-12H MANUFACTURED BY THE MOTOR TEAM OF ORIENT CO., LTD. IN KOREA.

2. STANDARD OPERATIONAL CONDITIONS

- | | | |
|-----|------------------|---|
| 2.1 | RATED VOLTAGE: | D.C. 12 V |
| 2.2 | RATED CURRENT: | 0.12 A |
| 2.3 | RATED INPUT: | 1.44 W |
| 2.4 | AIR VOLUME: | NOR 0.18 m ³ /min
AT RATED VOLTAGE CONDITIONS |
| 2.5 | STATIC PRESSURE: | NOR 2.mm/H ₂ O
AT RATED VOLTAGE CONDITIONS |
| 2.6 | NOISE: | NOR 24 dB MEASURED AT FRONT
NOR 23 dB MEASURED AT SIDE |

COMMENT

- A. AIR VOLUME IS VERIFIED USING THE DOUBLE CHAMBER METHOD OF AMCA 210.
- B. NOISE IS MEASURED BY 0.2 METER ON AXIS OF FAN INTAKE FACE MOUNTED USING SOFT SUSPENSION AND CONVERTED INTO 1.0 METER IN THE SAME CONDITION.

3. ELECTRICAL CHARACTERISTICS

- 3.1 **OPERATING VOLTAGE:** DC 10.8 V - DC 13.2 V (FAN MOTOR)
BASED ON $\pm 10\%$ OF RATED VOLTAGE
DC 12 V
- 3.2 **RATED CURRENT:** RUNNING 0.12 A (AT DC 12 VOLT)
- 3.3 **STARTING OPERATING:** GOOD OPERATING WITHOUT "DEAD POINT"
IN MOTOR AT DC 9.6 V
- 3.4 **RATED SPEED:** 5500 RPM (-550 / +550)
- 3.5 **INSULATION RESISTANCE:** OVER 10 M Ω BETWEEN LEAD WIRE FRAME
AT DC 500 V_p ABOVE 10 M Ω
- 3.6 **VOLTAGE WITHSTAND:** AC 500 V, 1.0 MIN. BETWEEN LEAD WIRE
AND FRAME_p ABOVE 1.0 MIN
- 3.7 **AIR VOLUME:** MAX 0.20 m³/min AT OPERATING VOLTAGE
- 3.8 **STATIC PRESSURE:** MAX 3.0 mmH₂O AT OPERATING VOLTAGE
- 3.9 **FRONT NOISE:** MAX 26 dB AT 1.0 METER FROM
MICROPHONE IN THE CHAMBER ROOM
- 3.10 **START VOLTAGE:** D.C 9.0 V / MINIMUM AT SUDDEN POWER ON

COMMENT: CHARACTERISTIC DEFINITION

- A. RATED CURRENT, SPEED, AND RATED INPUT POWER SHALL BE MEASURED AFTER 30 MINUTES CONTINUOUS ROTATION AT RATED VOLTAGE.
- B. STARTING VOLTAGE IS THE MINIMUM VOLTAGE REQUIRED TO START FAN AT INITIAL POWER UP.

4. ENDURANCE CHARACTERISTICS

- 4.1 OPERATING TEMPERATURE: -10 °C ~ +60 °C
CONDITIONS ⇒
- 1) RATED VOLTAGE DC 12 V
 - 2) ROOM TEMPERATURE & ROOM HUMIDITY
 - 3) IC OPERATING TEMPERATURE
- 4.2 STORAGE TEMPERATURE: -15 °C ~ +70 °C
CONDITIONS ⇒
- 1) RATED VOLTAGE DC 12 V
 - 2) ROOM TEMPERATURE & ROOM HUMIDITY
 - 3) IC OPERATING TEMPERATURE
- 4.3 TEMPERATURE WITHSTAND: WITHIN ± 800 RPM AFTER TEST
CONDITION ⇒
- 1) RATED VOLTAGE DC 12 V
 - 2) TEMPERATURE: -10 °C ~ +70 °C
 - 3) ROOM HUMIDITY
- 4.4 VIBRATION WITHSTAND: WITHIN ± 800 RPM AFTER TEST
CONDITION ⇒
- 1) CYCLE: 10 ~ 500 Hz
 - 2) AMPLITUDE: 10 ~ 57Hz (1.5 m)
 - 3) TIME: 2 HOURS FOR EACH THREE RIGHT ANGLE DIRECTIONS
- 4.5 SHOCK WITHSTAND: WITHIN ± 800 RPM AFTER TEST
CONDITION ⇒
- 1) PEAK VALUE: 50G
 - 2) NORMAL DURATION: 6 MSEC
 - 3) EACH THREE RIGHT ANGLE DIRECTIONS
- 4.6 LIFE EXPECTANCY: 35,000 HRS. IN RUNNING CONDITIONS
CONDITIONS ⇒
- 1) RATED VOLTAGE DC 12 V
 - 2) ROOM TEMPERATURE & ROOM HUMIDITY
 - 4) RATED DIRECTION
- :UP 20,000 HRS AT 45 °C OF AMBIENT TEMPERATURE
:UP 15,000 HRS AT 55 °C OF AMBIENT TEMPERATURE

5. MECHANICAL CHARACTERISTICS

- 5.1 FAN SIZE: FAN MOTOR > 50 X 50 X 10 MM
- 5.2 WEIGHT: 23.0 G
- 5.3 BEARINGS: NSK P5 GRADE BALL BEARING
NTN SLEEVE BEARING
- 5.4 LEAD WIRE: UL 1007 #26 AWG, RATED 300 V, 80 °C VW-1
- 5.5 FRAME(CASE): POLY BUTYLENE TEREPHTHALATE (P.B.T):
UL94V-0 GLASS FIBER 15% OR 30% ADDITION.
- 5.6 IMPELLER: POLY AMIDE NYLON GF 15%
- 5.7 P.C.B: GLASS – EPOXY, UL 94-0
- 5.8 MECHANICAL SHOCK: FREE DROP TO A THICK WOODEN BOARD 10 CM
HIGH IN THE SMALLEST PACKING UNIT BY
DROPPING ON X, Y AND Z FACES WITH NO
POWER APPLIED.

6. PROTECTION

6.1 LOCKED ROTOR PROTECTION

FAN SHALL BE FREE OF BURN DAMAGE WHEN IT IS SUBJECTED TO THREE (3) DAYS OF LOCKED ROTOR CONDITION AT THE RATED VOLTAGE OF (12 V DC).

6.2 POLARITY PROTECTION

CAPABLE OF WITHSTANDING REVERSE CONNECTION OF POSITIVE AND NEGATIVE LEADS AT RATED VOLTAGE OF 12 V DC.

7. TYPE DESIGNATION

K 0510 A - 12 H

K : CORELESS TYPE 2
0510 : NOMINAL SIZE OF MOTOR (50MM X 10MM)
A : STANDARD TYPE
12 : DC FAN RATED VOLTAGE (DC 12 VOLT)
H : FAN SPEED (HIGH TYPE)

8. ATTENTION FOR HANDLING

8.1 USE SCOPE: PLEASE PAY ATTENTION TO THE FOLLOWING CONDITIONS FOR OPTIMAL “FUNCTION” AND “LIFE EXPECTANCY”

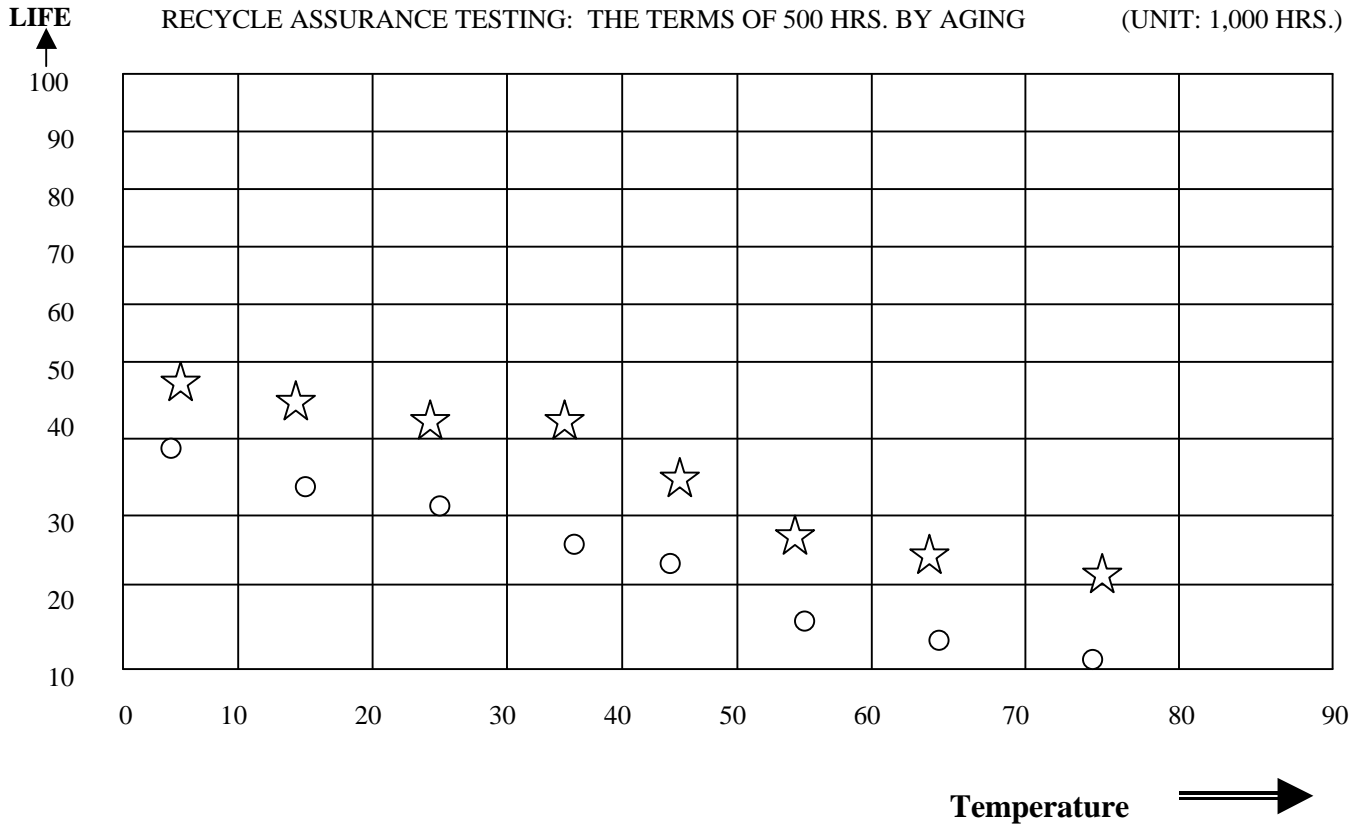
8.2 STORAGE: IN ORDER TO ACHIEVE LONG LIFE. AVOID EXTREMELY “LOW TEMP,” “LOW HUMIDITY,” “HIGH TEMP,” OR “HIGH HUMIDITY” AS THESE EXTREME STORAGE CONDITIONS COULD RESULT IN LESS THAN IDEAL PERFORMANCE.

8.3 HANDLING: PLEASE AVOID ANY MECHANICAL SHOCK OR VIBRATION.

9. APPENDIX

9.1 FAN MOTOR PERFORMANCE	1 SHEET
9.2 BEARING GREASE REPORT	1 SHEET
9.3 FAN SPEED INDICATOR OUTPUT	1 SHEET

9-1 FAN MOTOR LIFE CURVE



<< CONDITIONS >>

A. USED "NICHIMOLY" GREASE OF CR SERIES & "FOIL" 948P.

B. ☆ : IN CASE OF "BALL BEARING TYPE"
 ○ : IN CASE OF "SLEEVE BEARING TYPE"

C. TEST MOTOR TYPE AND MODEL
 - D.C. BRUSHLESS AXIAL TYPE - FLOW FAN
 - D0510A TYPE

9.2 BEARING GREASE REPORT

1. LIFE OF MOTOR AND BEARING GREASE

LIFE OF THE MOTOR WILL OFTEN BE DETERMINED BY THE LIFE OF THE BEARING GREASE USED.

THE SELF-COOLING FEATURE OF THE LUBRICANT RESULTS IN COMPARATIVELY LOW TEMPERATURES AND LONGER LIFESPAN WHEN COMPARED TO COMMONLY USED GREASES.

GREASE LIFE (L) OF THE SEALED BALL BEARING CAN BE CALCULATED BY THE FOLLOWING EQUATION.

$$\text{LOG } L = 6.35 - 1.98 (N/N_{\text{max}}) - \{ 0.025 - 0.0092 (N/N_{\text{max}}) \} T$$

L > GREASE LIFE (Hr.) N > SPEED (RPM)
N_{max} > MAX SPEED (RPM)

$$\# \text{ SPEED : } 0.25 \leq N/N_{\text{max}} \leq 1.0 \text{ WHEN } N/N_{\text{max}} < 0.25$$

$$N/N_{\text{max}} = 0.25$$

$$\# \text{ DRIVE TEMPERATURE : } 40^{\circ}\text{C} \leq T = 40^{\circ}\text{C} \text{ WHEN } T < 40^{\circ}\text{C}$$

$$T = 40^{\circ}\text{C}$$

$$\# \text{ RADIAL LOAD IS } C/10 \text{ OR LESS (C: BASIC RATED LOAD KGF)}$$

LIFETIME CAN BE PROLONGED BY TWO TIMES OR MORE BY CONTROLLING THE INTERMIXTURE OF HARMFUL ELEMENTS SUCH AS DIRT, CONTAMINATION OR WATER.

THE GREASE WHICH IS USED IN OUR PRODUCTS WAS SELECTED AFTER CONSIDERING THE LIFE AND NOISE CHARACTERISTICS OF THE BEARINGS WHEN VARIOUS LUBRICANTS WERE TESTED.

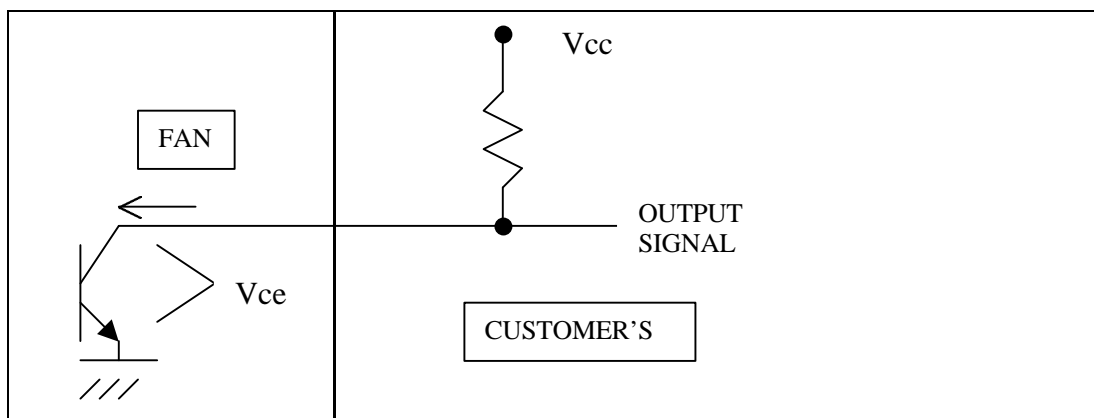
9-3. FAN SPEED INDICATOR OUTPUT

1. CIRCUIT BLOCK

MOST ORITEK FANS MAY BE OBTAINED WITH AN ADDITIONAL OUTPUT INTENDED FOR MONITORING THE SPEED OF ROTATION. THIS SIGNAL CAN ALSO BE USED TO INDICATE THAT THE FAN IS NOT TURNING. THE SIGNAL TAKES THE FORM OF AN OPEN COLLECTOR OUTPUT.

THESE SPECIFICATIONS MUST BE OBSERVED;

$i_c = 10\text{mA (MAX)}$, $V_{ce} = +30\text{V (MAX)}$



(SPEED INDICATOR CIRCUIT)

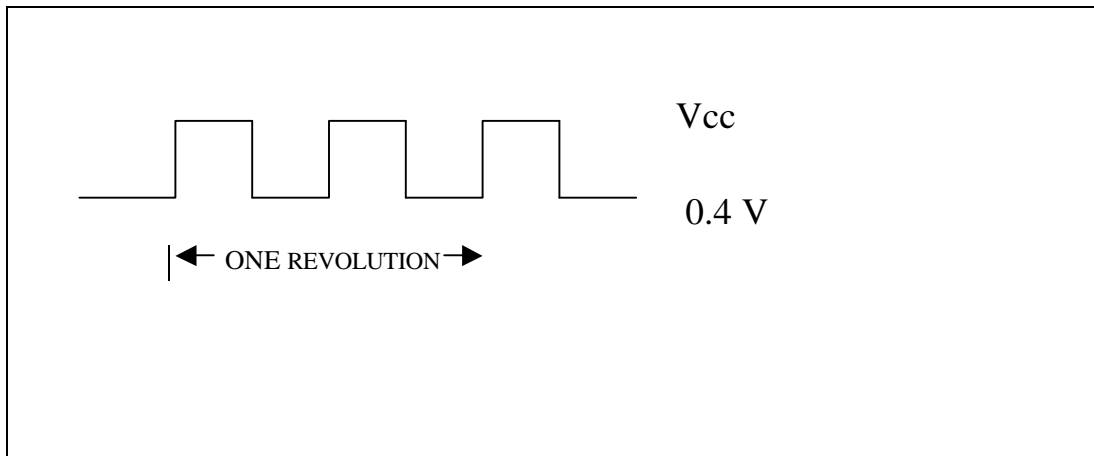
2. OUTPUT SIGNAL

WHEN THE FAN IS TURNING THE OUTPUT WILL TAKE THE FORM OF A TRAIN OF SQUARE WAVE PULSES.

WHILE THE DUTY CYCLE MAY VARY, TWO COMPLETE CYCLES ALWAYS OCCUR IN EXACTLY ONE FAN REVOLUTION. THIS OPENS THE POSSIBILITY OF CONTINUOUSLY MONITORING THE FAN RPM.

NOTE THAT WHEN THE FAN STOPS TURNING THE OUTPUT WILL BE A DC SIGNAL EITHER HIGH OR LOW.

AN EDGE TRIGGERED DETECTOR IS RECOMMENDED.



(OUTPUT WHEN FAN IS TURNING.)

10. FAN MOTOR DESIGN

Sleeve vs. Ball Bearings

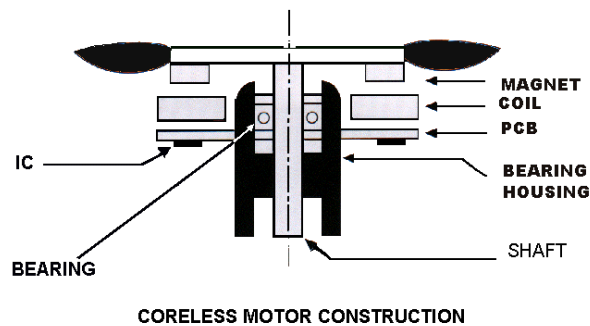
There are pros and cons to both sleeve and ball bearings. The primary advantage to using sleeve bearings is cost; sleeve bearings are less expensive. However ball bearings provide longer fan life, especially at elevated temperatures. Sleeve bearings are made of brass. Over time the brass wears and creates metal dust, which leads to fan stoppage.

Low Grade Bearings Used In Small DC Brushless Fans

NOT ALL BALL BEARINGS ARE THE SAME! Most fan manufacturers use lower grade (P1-P3) bearings to reduce cost. Due to inferior metals and lubrication the bearings tend to disintegrate causing fan stoppage. Cofan uses the best quality bearing (P5) manufactured in Japan. These are far superior and will last up to three times longer than others. However they do cost more.

The Coreless Fan Motor Design

Cofan uses a **coreless** motor design. This design has several features, which together provide long life at elevated temperatures coupled with high airflow and low noise. They are manufactured at our two factories in Korea under the names Cofan and Oritek. Final testing is done at our facility in California.



A patented design is employed in which the stator coils are wound flat on a metal plate. The corresponding rotor magnet is also flat. Other fans' coils are wound on a central core and their magnets are cylindrical. The flat coils and magnet also the reason why Cofan fans have such long demonstrated life.

It is not enough to use a ball bearing; that bearing must be of good quality and it must be loaded properly. **The ball bearing should be axially loaded. Radial loads can reduce the life** (this is what others use). Axial loading of the ball bearing is good for two reasons.

First, the rotor is designed so that its center of gravity is positioned directly over the front bearing. Second, the magnetic attraction between the flat magnet and steel plate keeps the rotor pressed against the inner race of the front bearing. This magnetic attraction is the strongest force in the fan, so axial loading is provided in any physical orientation.

As a result the front bearing is properly loaded and in fact carries the entire bearing load. Since the rear bearing is only necessary to stabilize the shaft an impregnated sleeve may be employed without sacrificing the life at elevated temperatures.

Cofan does not recommend placing stickers on the top of the fan hub. Our hub/blade assemblies are individually balanced. The weight of the sticker puts the fan out of balance. This will place stress on the bearing and will shorten its life.

Is it worth saving a dollar or two buying inferior protection for your several hundred-dollar CPU? The answer is a high quality fan mounted on a well-designed heat sink. Take a look at the products produced by Cofan USA. These products carry a 5-year warranty. You will be impressed.

