



Quality Dept.

INTERNAL COMMUNICATION

MOTOR RELIABILITY & LIFE TESTS

The purpose of these tests is to verify performance and integrity of the different parts of the motor when running in different and extreme ambient conditions in order to evaluate its expected life.

Since the life of a sleeve bearing motor is strictly related to the reliability of the bearing & lubricant system, the main tests are performed to verify lubricant conditions, its capacity to maintain oil film between shaft & sintered sleeve bearing and consequent bearing wear & expected life.

Performance of the electrical insulation system is checked on 100% of motor production for safety and for integrity of the electrical connections. Insulation system life normally exceeds the bearing/lubrication system one. Reliability of the electrical insulation system and internal connection is also tested by an ON/OFF cycle test.

Sleeve bearing & Lubrication System tests

Considering that typical refrigeration application has 60-65% duty cycle, a continuous running life test of 30,000 hours will be equivalent to about 5.5-6 years of field motor life and can be considered as a good reference point for motor reliability qualification.

SLEEVE BEARING & LUBRICANT LIFE

During accelerated life test, bearing life should exceed 30.000 hours of continuous running and lubricant lost should not exceed 20% of original weight. Sleeve bearing expected life is related to bearing working temperature and is reduced as temperature rises (see enclosed chart).

NOISE EMISSION

Allowed tolerance 1dBA in the -4°F to +106°F (-20°C to +40°C) temperature range, 1.5dBA below -4°F (-20°C) and above +106°F (+40°C). Allowed 2 dBA variation after 30,000 hours of continuous running.

Electrical tests

Electrical tests are performed in purpose to verify safety, integrity of electrical connections and compliance of motor performance to original specifications.

SAFETY

The following test are performed on 100% of motor production

- dielectric withstand (hipot) test (1000V + 2 * Vnom. for 60 seconds according to EN60335-1 European norm)
- insulation resistance test ($R > 2M\Omega @ 500Vdc$ for 60 seconds according to EN60335-1 European norm)
- leakage test

PERFORMANCES

100% of motor production is also tested for:

- winding resistance
- no-load test (current, input power & RPM)
- locked rotor test
- start-up test
- surge (short-cut between coils), when applicable

INTERNAL LIFE TESTS (ELCO'S LAB)

Tests were performed on 30 assorted fans from 5W to 34W fitted with fan blades with diameter from 8" (200mm) to 12" (300mm), in different ambient and cycle conditions in order to check bearing wear (life expectancy) and lubricant remaining quantity & conditions. Tests started May 1998; first check was made after 25,000 hours.

Common purposes to all below listed life tests (at various temperatures):

- verify lubricant system (grease + synthetic oil mix)
- verify sleeve bearing expected life
- verify insulation system conditions before and after the test
- verify noise emission
- verify vibrations
- verify electric performances
- verify motor performance before and after the test

High temperature test

- Climate chamber temperature: + 122°F (+50°C) , humidity rate: 70%
- Running time: continuous
- Test main purpose: verify performance of sleeve bearing lubricant system at extremely high temperature. Life should exceed 30.000 hours of continuous running and lubricant lost should not exceed 20% of original weight. Moreover high ambient humidity rate should not affect motor metal parts and cause grounding or leakage (short-cuts).

Low temperature test

- Climate chamber temperature: -40°F (-40°C)
- Frequency: 15min ON / 30min OFF. Motor takes about 5 sec. to reach running condition.
- Test main purpose: check lubricant system performance at low temperature, allowing enough OFF time for ice deposit on motor and blades. Verify motor start up capability in these extreme ambient conditions. Ice deposit on fan blade causes unbalance that may affect bearing life.

Ambient temperature test

- Chamber temperature: + 77°F (+25°C)
- Running cycle: continuous
- Test purpose: bearing & lubricant wear & life

Final test results after 30,000 hours:

- Lubricant resulted in good conditions and quantity complied to specifications.
- Noise and vibrations complied to original specifications.
- All motors successfully passed safety & performance electrical tests.

LIFE TESTS PERFORMED BY THIRD PARTIES (CLIENT'S LAB)

LIFE TEST A - CONDENSING UNITS - reported November, 2004

1.) Start/Stop test

Frequency: 3sec ON / 3sec OFF

Running time 24 Hrs./day since October 26, 2000

Total cycles exceeds 26.7 million - no failures

On test quantities: 4pcs 6W, 115V 60Hz. Motors with 4VEA009 plastic Fan Blade dia. 200mm (8"), 28° pitch

Fan Motors and blades assembled as in a standard CU

NOTES: no unusual noises, Motors running very good

2.) Vibration test

Vibration is created with a misbalanced blade.

Blade is misbalanced with 1/4-20 bolt located at 4.0 inches from blade centre.

Test started on October 4, 1999, @ 24Hrs/Day, non-stop

Test started with 3 combinations, 6W, 115V 60Hz.

Motors, one set with aluminium blade and two sets with plastic blades:

- Assembly with aluminium blade failed after 30575 hours.

- The blade broke. The Fan motor was running o.k.

- On July 1, 2004 another test was stopped because the PVC base-plate broke.

- The Fan motor was running o.k.

3.) Grease Leaking test

Motors are assembled upside down and heated with lamps.

Quantities on Test: 2pcs 6W, 115V 60Hz. Motors with 4VEA009 plastic blades dia. 200mm (8"), 28° pitch

Running since June 27, 2001

No grease leakage detected

4.) Condenser Block Test

A standard CU is set up for test where the condenser is blocked (no air flow allowed through the condenser)

Quantities on test: 1 pc. 9W 115V 60Hz. Motor with 4VEA010 fan blade plastic dia. 200mm (8"), 34° pitch running since April 19, 2000 @ non stop condition, no cycles

LIFE TEST B - reported June, 2004

ACCELERATED LIFE TEST

Cycle: continuous @ 125°F (52°C)

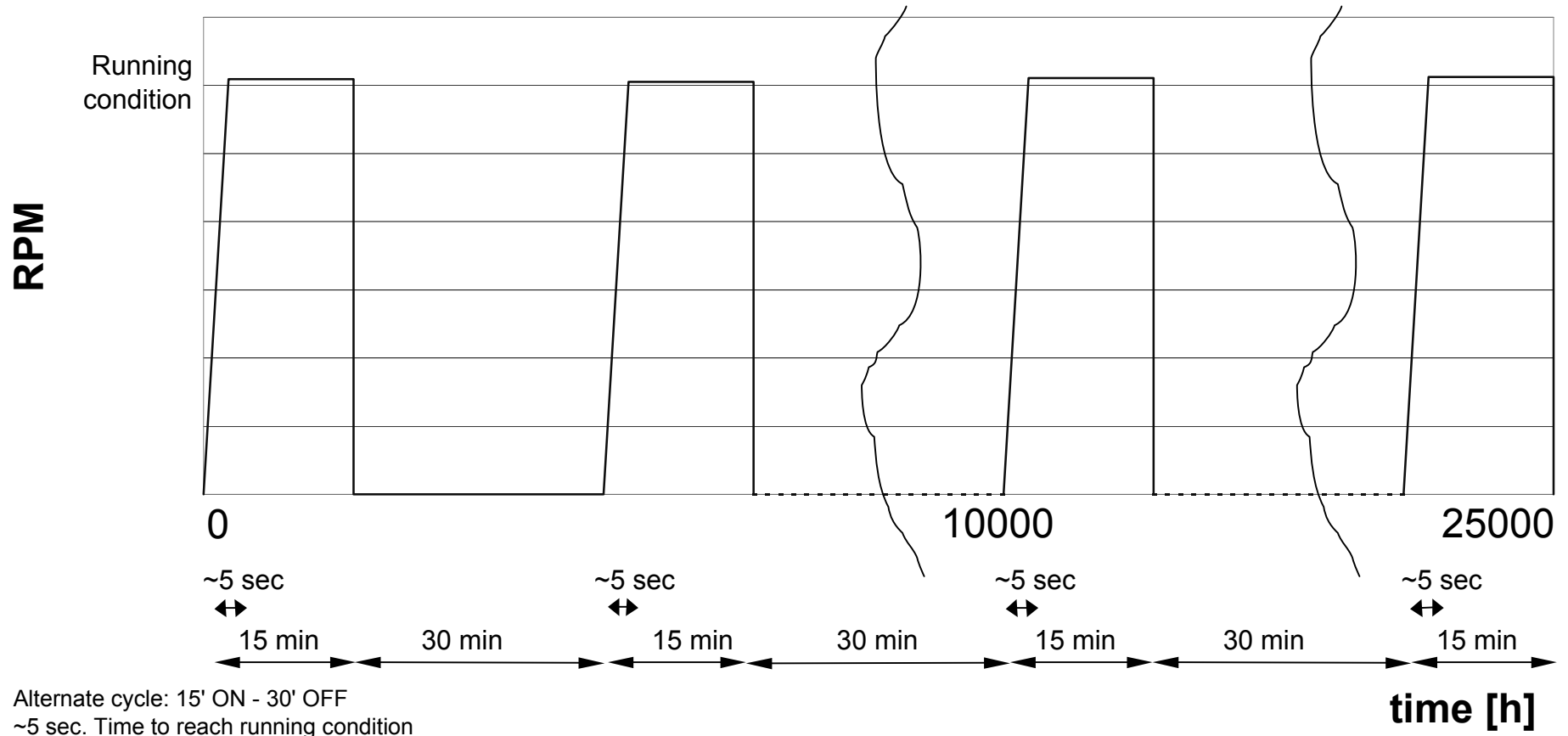
Running time 24 Hrs./day since March, 2004

On test quantities: 10pcs 25W, 115V 60Hz.

NOTES: Motors running OK, no unusual noise reported



Test in cold room -40°F (-40°C)



Cold room life test cycle

Sleeve bearing life

