

Creation Date / Fecha Creación	12/06/08	Author / Autor	Alberto Fernández García
Revision Date / Fecha Revisión		Revision / Revisión	Jose Rubio
Version / Versión	0	Approval / Aprobación	Jose Rubio
Subject / Título	MTBF 50/11 mechanism		

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1 Test target

The target of this test is to demonstrate the good performance of the whole life of two panels central opening doors and two panels side opening doors, with mechanism 50/11.

2 Test object

The test will be done with a:

- 50/11 Two panels central opening door (800 x 2000)
- 50/11 Two panels telescopic door (800 x 2000)

3 Test strategy

The method to demonstrate the test target has been the "Success-Run" method. The target will be verified if the **tests are running without any failure during 3 Millions of cycles.**

If a failure occurs, a root cause analysis shall be performed to decide if the failure is relevant for reliability demonstration.

To reduce test time the doors will work continuously.

4 Test description

4.1 Test procedure

The door systems should run at 240 cycles per hour at beginning of the test, with a cooling system. This cooling system is used to low the temperature of the motor to the normal temperature that it should have, working in real conditions (see section 4.2).

Cycles number	Operation
750'000	Intern review of test Start load case 1 during 8'000 cycles
800'000	Start load case 2 during 500 cycles
1'500'000	Intern review of test Start load case 1 during 8'000 cycles
1'550'000	Start load case 2 during 500 cycles
2'250'000	Start load case 1 during 8'000 cycles
2'300'000	Start load case2 during 500 cycles
3'000'000	End of endurance test
3'000'000	Analysis of wear parts, measurement of key characteristics End of tests analysis review

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4.2 Motor temperature – cooling system

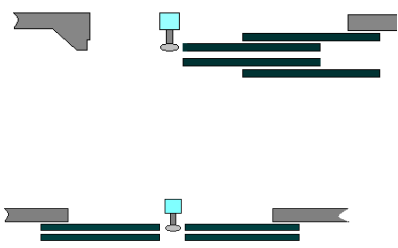
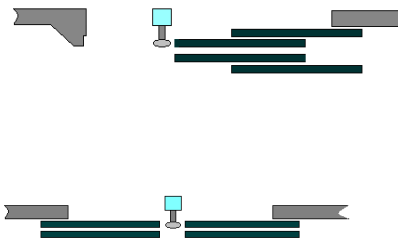
Only the motor can be affected by running at higher cycle frequency than the specified. It has been decided to add a cooling system to the motor.

The cooling system must be adjusted:

- To get the motor temperature during 23 hours (or 2 times 11.5hours) per day simulating doors running at 120 cycles per hour (motor axis temperature must be 70°C).
- To get the motor temperature during the remaining 1 hour (or 2 times 0.5hours) per day simulating doors running at 240 cycles per hour (peak of activities). (motor axis temperature must be 90°C).

4.3 Load cases

In addition to the normal working cycle the test will have two types of load cases or obstructions. One is done at 150mm and the other at 1500mm from the sill. See images below on how the system will work with the load cases.

<p>Load case 1</p>	<p>Obstacle during closing procedure on hoistway door, 1500 mm from bottom. Position where velocity is greatest</p>		<p>Obstacle with rubber coating (approx. 30 mm thick), Obstacle fixed in position to be applied during 8'000²⁾ cycles</p>
<p>Load case 2</p>	<p>Obstacle during closing procedure, On hoistway door, Foot height at 150 mm Position where velocity is greatest</p>		<p>Obstacle with rubber coating (approx. 30 mm thick), Obstacle fixed in position to be applied during 500³⁾ cycles.</p>

2, 3) The door have to run onto the obstacle every time (load case1: 8'000 times and load case2: 500 times) with normal speed.

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4.4 Signals Monitoring

Must be monitored electrically during cycles:

- Cabin contact
- Landing contact
- VVVF open door signal
- VVVF close door signal
- Total errors counter
- Total number of door cycles

4.5 Preventive Maintenance

During the visual inspection every 0.5 millions of cycles, maintenance (cleaning) can be done if necessary.

4.6 Test location

Test to be performed in a locked area, with restricted access.

5 Test Observation

5.1 Failure Definition

Inoperative, intermittent operation, broken or deformed parts, unusual noise, strong vibration, missing signals.

5.2 Reporting of Test Observation by TECNOLAMA

- A daily quick visual check.
- A weekly detailed observation to confirm the absence of failure in the systems is required.
- An analysis of wear parts and some defined control points to be done before start and after end of test (deterioration of material, abrasion, etc.)

6 Test results

Next a detailed summary of conclusions about the specific parts of a landing/car door in two panels Central and Telescopic doors is explained.



2 panels side opening door specimen and 2 panels centre opening mechanism

6.1 Rollers

The rollers have been proved to be able to resist the normal working living time of a 50/11 door; although by the end of the test the rollers present wear and noise, so a new roller will be installed in the future to improve these aspects.

6.2 Synchronization cable

The spring of the synchronization cable has lost some tension during these cycles, so the screw of the spring should be tightened after 3 Millions of cycles.

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6.3 Belt

On conclusion, the belt suffers a normal waste after 3 Millions of cycles. It is reflected on the next image.



6.4 Guide Shoes

The guide shoes after 3 Million cycles presents some wear and it is recommended its change.

6.5 Rubber stopper

With a correct regulation of the rollers of the locking device there is no deterioration at all.

6.6 Motor

There is not relevant waste in it. It can be working longer.

6.7 Idle pulley

The pulley has suffered waste but it continues working. Here is also recommended the substitution for a new one.

6.8 Electric contact

The electrical contact shows important waste but it continues working properly.

6.8 Landing locking device

After the test the any important deformation or waste has appeared.

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7. Conclusions

There is not any failure detected on the components of the doors. They are all capable to resist up to the 3 Million cycles.