

Door Hinge Durability Test Cycle

1.0 Objective & Quality Standard

The objective of this procedure is to verify that the door hinge assembly can withstand 50,000 full open-close cycles without degradation in torque, alignment, or structural integrity. The hinge must maintain a consistent closing torque within ± 0.2 Nm of the initial measurement and show no visible deformation, cracking, or loosening of fasteners. The door must remain aligned within 1.0 mm of its original position relative to the cabinet frame after the test.

2.0 Required Tools & Gauges

- Automated hinge cycle tester (capable of 10-15 cycles per minute, adjustable stroke)
- Digital torque screwdriver (range 0.1-5.0 Nm, accuracy ± 0.02 Nm)
- Digital caliper (0-150mm, accuracy ± 0.02 mm)
- Feeler gauge set (0.05-1.00mm)
- Marking pen or scribe for reference marks
- Test fixture or cabinet mock-up with mounting holes matching production spec
- Stopwatch or timer (for cycle rate verification)
- Inspection checklist (ShopDocs QA module)

3.0 Safety & Material Handling

- Wear safety glasses and cut-resistant gloves when operating the cycle tester.
- Ensure the cycle tester is securely anchored to the workbench to prevent tipping.
- Keep hands and loose clothing away from moving parts during operation.
- Handle hinges and doors with clean, dry hands to avoid contamination of pivot points.
- Place test fixture on a non-slip mat to prevent movement during cycling.

4.0 Step-by-Step Procedure

1. Mount the hinge to the test fixture using the specified production screws. Torque each screw to the production specification (e.g., 0.8 Nm) using the digital torque screwdriver.
2. Attach the test door to the hinge. The door must match the production weight and dimensions (e.g., 600mm x 400mm x 18mm, 3.5 kg).
3. Using the digital caliper, measure and record the initial door gap at three points: top, middle, and bottom relative to the fixture frame. Record the initial alignment offset.
4. Using the digital torque screwdriver, measure and record the initial hinge closing torque at the door handle position. Take three readings and calculate the average.

5. Set the cycle tester to perform a full open (90°) to full close cycle at a rate of 12 cycles per minute. Verify the stroke and speed with the stopwatch.
6. Start the cycle tester and run the hinge for 10,000 cycles. Pause the tester and visually inspect the hinge for any signs of wear, loosening, or deformation.
7. After 10,000 cycles, re-measure the door gap at the three points and the closing torque. Record the values. If the torque has changed by more than ± 0.2 Nm or the gap has shifted by more than 0.5 mm, flag the unit for investigation.
8. Resume cycling and repeat the inspection and measurement at 25,000 cycles and 50,000 cycles. At each interval, record all measurements and note any anomalies.
9. At the completion of 50,000 cycles, perform a final measurement of door gap and closing torque. Compare to initial values. The hinge passes if the torque change is within ± 0.2 Nm and the door gap shift is within 1.0 mm.
10. Remove the door and hinge from the fixture. Inspect the hinge for cracks, deformation, or fastener loosening using a magnifying glass if necessary. Document any visible defects.
11. Clean the hinge and fixture with a lint-free cloth. Return all tools to their designated storage locations.
12. Complete the inspection checklist in ShopDocs, attaching all measurement data and photos of any defects.

5.0 Verification & Defect Reporting

1. If the hinge fails the torque tolerance (± 0.2 Nm) or alignment shift (1.0 mm) at any inspection interval, immediately stop the test and red-tag the hinge with a non-conformance label.
2. Photograph the defect and document the cycle count at which failure occurred. Record the failure mode (e.g., torque loss, alignment drift, cracking).
3. Submit the non-conformance report through the ShopDocs QA module. Include the hinge part number, batch number, and test data.
4. Segregate the failed hinge in the designated quarantine area for root cause analysis by the engineering team.
5. If the hinge passes all criteria, mark the test as complete and archive the data in the ShopDocs QA module for traceability.

Regulatory Disclaimer: This document is a generic quality assurance template. The end-user assumes all liability for validating all dimensional tolerances, testing procedures, and engineering specifications against actual production requirements before deployment.