

Steady-State Damp-Heat Testing

Preface

MAXMAC evaluates ion-module function under sustained high temperature and humidity. The procedure specifies a constant chamber condition, a repeated operating-mode schedule and functional inspection after natural recovery to room temperature.

Six modules completed the 10-day damp-heat program at $65 \pm 2^\circ\text{C}$ and $93 \pm 3\%$ RH. The report records Class A function before, during and after testing, with no visible damage or the listed internal-board abnormalities. The overall judgment was Pass.

Exposure Conditions

Parameter	Specified setting
Temperature	$65 \pm 2^\circ\text{C}$
Relative humidity	$93 \pm 3\%$ RH
Duration	10 days
Mode schedule	47 h in mode 2.1; 1 h in mode 3.2
Samples	6 modules; 19#-24#

Mode Schedule and Time Calculation

10 days $\times$ 24 h/day = **240 h**

$t(\text{cycle}) = 47\text{ h} + 1\text{ h} = \mathbf{48\text{ h}}$

$N = 240\text{ h} / 48\text{ h} = \mathbf{5\text{ cycles}}$

Mode 2.1: $5 \times 47\text{ h} = \mathbf{235\text{ h}}$

Mode 3.2: $5 \times 1\text{ h} = \mathbf{5\text{ h}}$

The mode totals are calculated from the specified schedule. The chamber remains set to the stated temperature and humidity while the operating modes alternate.



Figure 1 One 48-hour mode cycle; repeat five times for the specified 10-day exposure.

Arrangement and Test Steps

Maintain $\geq 100\text{ mm}$ between samples and from chamber walls. Arrange the connected modules on the chamber shelves.

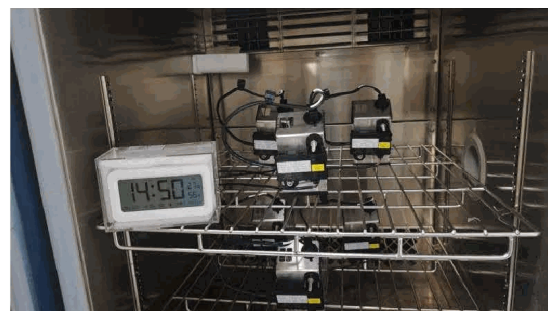


Figure 2 Original chamber arrangement.

1. Record the initial functional condition.
2. Set the chamber to $65 \pm 2^\circ\text{C}$ and $93 \pm 3\%$ RH.
3. Alternate 47 h in mode 2.1 with 1 h in mode 3.2 over the 10-day program.
4. Allow natural recovery to room temperature.
5. Complete the functional, external and internal visual inspections.

Test Basis and Equipment

Q/MAT 5502-2023, 9.11; DIN EN 60068-2-78.
 SU250C temperature/humidity chamber; DP310 DC supply;
 TH1941 and VC890C meters.
 Recorded laboratory conditions: $21\text{-}25^\circ\text{C}$ / $45\text{-}50\%$ RH.

Exposure Record, Function Checks and Observations

Original Chamber Record



Figure 3 Original temperature/humidity test curve.

Chamber Controller Evidence



Figure 4 Original equipment photograph.

Sample 19#: Before Exposure



Figure 5 Original pre-test functional checks.

Air-speed meter and ion counter above; functional monitoring and electrical measurement instruments below.

Sample 19#: After Exposure



Figure 6 Original post-test functional checks.

Air-speed meter and ion counter above; functional monitoring and electrical measurement instruments below.

Acceptance Checks and Recorded Observations

Inspection	Recorded observation
Functional status	Class A before, during and after the test.
External condition	No visible damage: cracking, distortion, expansion or softening.
PCBA condition	No whiskers, dendrites, delamination or solder-mask discoloration.
Conformal coating	No bubbles or cracking.
Internal condition	No burn marks, corrosion, carbon deposits or foreign material.
Overall judgment	Pass; samples 19#-24#.

Table 1 Functional and physical observations recorded in source p. 73; overall conclusion p. 79.

Records: Leg2 pp. 68-79. Test dates: 24 June-4 July 2025. Testing performed by Zhejiang Kezheng Electronic Information Product Inspection Co., Ltd. Original sample photographs cover 19#-24#; functional photographs are retained on pp. 73-78. Version 1.0: 26 October 2026.