

INTERNATIONAL STANDARD



**Touch and interactive displays –
Part 13-10: Reliability test methods of touch displays – Environmental durability
test methods**

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**Touch and interactive displays –
Part 13-10: Reliability test methods of touch displays – Environmental durability
test methods**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TOUCH AND INTERACTIVE DISPLAYS –

**Part 13-10: Reliability test methods of touch displays –
Environmental durability test methods**

FOREWORD

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The text of this International Standard is based on the following documents:

CDV	Report on voting
110/748/CDV	110/790A/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62908 series, published under the general title *Touch and interactive displays*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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- replaced by a revised edition, or
- amended.

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INTRODUCTION

This part of IEC 62908 was developed in response to the demand for standardization of the test methods for the endurance of touch displays.

The touch display is one of the most important interfaces between a user and a display. Various technologies for touch displays have been developed, and it is expected that touch display technology will make rapid progress in the future. This document is especially effective for capacitive and resistive touch displays.

Durability is one of the most important aspects of touch display modules. Touch displays connected to display modules are used under a variety of environmental conditions, including indoor/outdoor, hot/cold, dry/humid, for long periods of time and may be subjected to severe environmental stress.

This document describes standardized test methods to evaluate the durability of touch displays subjected to environmental stresses. It is valid for research and development, quality assurance, and comparison of devices when making purchasing decisions.

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TOUCH AND INTERACTIVE DISPLAYS –

Part 13-10: Reliability test methods of touch displays – Environmental durability test methods

1 Scope

This part of IEC 62908 specifies the methods for testing the environmental durability of touch display modules, touch sensor modules and test pattern cells, and can be used for devices at the production level, the prototype level or the trial model level when they are exposed to environmental stress.

This document is applicable for touch displays that use capacitive or resistive detection sensors. It may also be applicable to other types of sensors as well as to touch display modules with both flat and flexible displays.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30, *Environmental testing – Part 2: Tests – Test Db: Damp heat, cyclic (12 + 12 h cycle)*

IEC 60068-2-78, *Environmental testing – Part 2: Tests – Test Cab: Damp heat, steady state*

IEC 61747-30-1:2012, *Liquid crystal display devices – Part 30-1: Measuring methods for liquid crystal display modules – Transmissive type*

IEC 62908-1-21, *Touch and interactive displays – Part 1-2: Generic – Terminology and letter symbols*

IEC 62908-12-10², *Touch and interactive displays – Part 12-10: Measurement methods of touch displays – Touch and electrical performance*

¹ Under preparation. Stage at the time of publication: IEC CDV 62908-1-2:2016.

² Under preparation. Stage at the time of publication: IEC CDV 62908-12-10:2016.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62908-1-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

DUT device under test

4 Device under test (DUT)

4.1 General

The DUT shall be carefully prepared to fulfill the purpose of the test. When it is operated during the test in order to measure performance, it shall be operated in accordance with the actual operation mode of the touch displays or the specific operation mode that is appropriate for the purpose of the test.

4.2 Preparation of the DUT

The following type of DUT can be tested using this document:

- 1) touch display module;
- 2) touch sensor module;
- 3) test pattern cell.

In cases of 1) and 2), the DUT shall be selected or prepared as a DUT that represents the product distribution, or at least the DUT used shall be identified in the report.

In case of 3), in which the DUT is not the complete final product, it shall be prepared carefully enough that the DUT represents the performance of the final products. For example, each component shall be carefully fitted and packaged in order to prevent abnormal phenomena from occurring that would not be observed in the real final products.

The definition of each DUT is described in Annex A.

4.3 Setup of touch display modules

Turn on the power supply and signal generator and warm up the system for stabilisation if stabilisation is required. Power on and send the signal pattern to the touch display module as specified for each inspection.

4.4 Setup of touch sensor modules

When the test requires the operation of the sensor module, turn on the power supply and warm up the system for stabilisation if stabilisation is required. Power on the sensor module as specified for each inspection. The warm-up time for the sensor module shall be sufficiently long to obtain a stable state necessary for the test.

4.5 Setup of test pattern cells

4.5.1 General

Durability tests for test pattern cells shall be conducted in order to clarify the fundamental characteristics of the sensor component particularly for the out-cell type sensors. The DUT represents the performance of the production level.

4.5.2 Test pattern cells for capacitive detection sensors

The test pattern cell can be used in order to check the components of the touch sensor module. A specific circuit pattern that is appropriate for the purpose of the test may be created for the test, as shown in Figure 1. For example, the line width of the circuit pattern is 50 µm, and the distance between lines is 500 µm. The power supply should be the pulse wave. The applied pulse wave should be appropriate for the purpose of the test. An example of the applied pulse wave is shown in Figure 2.

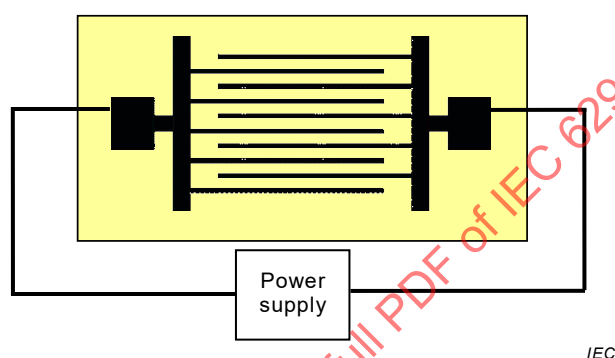
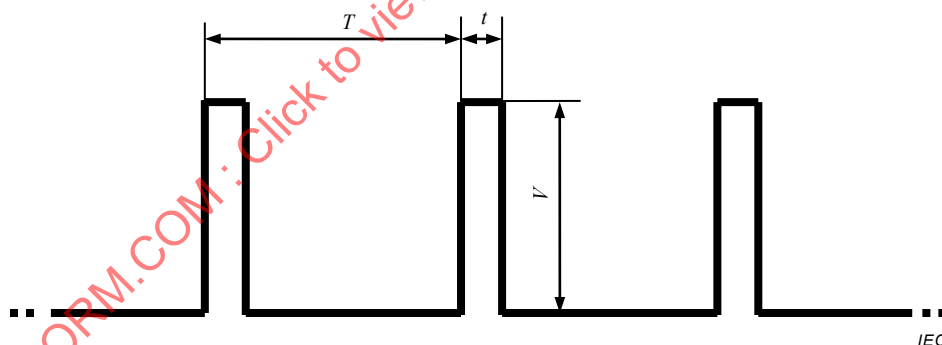


Figure 1 – Example setup of test pattern cell



NOTE V is the voltage of the applied pulse wave, T is the period, and t is the pulse duration. The duty ratio percent is calculated by $t/T \times 100$.

Figure 2 – Example of applied pulse wave for the test

4.6 Number of duplicates and reference touch display module

At least three duplicates of the touch display module should be prepared. It shall be confirmed that the performance of all three touch display modules is the same or within the required precise evaluation. One of the three shall be retained as the reference touch display module. The reference touch display module shall be stored under standard ambient conditions or controlled conditions where no change in the performance of the touch display module occurs.

5 Standard ambient conditions

Unless performed under environmental stress conditions, the test shall be carried out under the standard environmental conditions, at a temperature of $25\text{ °C} \pm 3\text{ °C}$, a relative humidity of 45 % to 75 %, and a pressure of 86 kPa to 106 kPa. When different environmental conditions are used, they shall be noted in the report.

6 Environmental test conditions

6.1 General

6.1.1 Standard environmental conditions

The standard environmental conditions consist of ambient conditions at a temperature of 23 °C and a relative humidity of 50 %. When different environmental conditions are used, they shall be noted in the report.

6.1.2 Recovery conditions

The recovery conditions specified in IEC 60068-1:2013, 4.4, shall be applied.

6.1.3 Operational control points for temperature and humidity

The operational control points shall be the target points for the tests.

6.1.4 Operational fluctuations of temperature and humidity

The temperature of the air shall be maintained and controlled throughout the test with an operational fluctuation within $\pm 4,0\text{ °C}$ of the target.

The relative humidity of the air shall be maintained and controlled throughout the test with an operational fluctuation within $\pm 6\text{ % RH}$ of the target during each test period.

If the operation fluctuation does not meet the requirements, the variation shall be documented and explained.

6.2 Stressed environmental conditions during operation (performed after completion of the environmental durability test in the operational state)

6.2.1 Purpose

The purpose of this test is to evaluate the performance of the DUT after it has been operated under stressed environmental conditions which are different from the standard environmental conditions for a specific duration.

6.2.2 Test conditions

6.2.2.1 Stressed environmental conditions during operation at high temperature

IEC 60068-2-2 shall be applied.

The operational control points for the temperature shall be specified in the relevant specification. The values shall be selected from those given below:

$(80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30 [\pm 3])\text{ °C}$

The operational control points for the duration shall be selected from the values given below, as specified in the relevant specification:

(2, 16, 24, 48, 72, 96, 120, 192, 240) h

The operational control points for the absolute humidity of the atmosphere should not exceed 20 g/m³ (corresponding approximately to 50 % relative humidity at 35 °C). When testing is performed at a temperature lower than 35 °C, the relative humidity shall not exceed 50 %.

An example of such a stressed environmental condition during operation at high temperatures is listed in Table 1, entry H-L.

6.2.2.2 Stressed environmental condition during operation at low temperature

IEC 60068-2-1 shall be applied.

The operational control points for the temperature shall be specified in the relevant specification. The values shall be selected from those given below:

(–30, –25, –20, –15, –10, –5, 0 [± 3]) °C

The operational control point for the duration shall be selected from the values given below, as specified in the relevant specification:

(2, 16, 24, 48, 72, 96, 120, 192, 240) h

An example of this stressed environmental condition during operation at low temperature is given in Table 1, entry L.

6.2.2.3 Stressed environmental conditions during operation with high temperature and humidity

IEC 60068-2-78 shall be applied.

The operational control point for the combination of temperature and humidity shall be specified in the relevant specification. Both the temperature and humidity values shall be selected from those given as below:

Temperature

(80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30 [± 3]) °C

Humidity

(85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30 [± 3]) %

The operational control point for the duration shall be selected from the values given below, as specified in the relevant specification:

(2, 16, 24, 48, 72, 96, 120, 192, 240) h

An example of this stressed environmental condition during operation at both high temperature and high humidity is shown in Table 1, entry H-H.

6.2.2.4 Stressed environmental conditions during operation with cyclic test

IEC 60068-2-30 shall be applied.

An example of this cyclic test condition is shown in Table 1, entry "Cycle".

Table 1 – Examples of the stressed environmental durability test conditions for use during the operational state

	Temperature	Humidity	Duration	Note
H-L	80 °C	Dry	240 h	Hot and dry
L	-20 °C	Not specified	240 h	Cold
H-H	60 °C	80 %RH	240 h	Hot and humid
Cycle	-20 °C/+60 °C		10 cycles	Heat cycle test

6.3 Stressed storage/transport conditions (performed after completion of the environmental durability test in the non-operational state)

6.3.1 Purpose

The purpose of this test is to evaluate the performance of the DUT after it has remained in the non-operational state for a certain duration under stressed environmental conditions different from the standard environmental conditions. This test simulates transportation or long-term storage.

6.3.2 Test conditions

6.3.2.1 Stressed storage at high temperature

IEC 60068-2-2 shall be applied.

The operational control point for temperature shall be specified in the relevant specification. The values shall be selected from those given below:

(100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30 [± 3]) °C

The operational control point for duration shall be selected from the values given below, as specified in the relevant specification:

(2, 16, 24, 48, 72, 96, 120, 192, 240, 300, 500, 1 000) h

The operational control point for the absolute humidity of the atmosphere should not exceed 20 g/m³ (corresponding approximately to 50 % relative humidity at 35 °C). When testing is performed at a temperature lower than 35 °C, then relative humidity shall not exceed 50 %.

Examples of these stressed storage/transport environmental conditions at high temperature are listed in Table 2, entry H-L.

6.3.2.2 Stressed storage at low temperature

IEC 60068-2-1 shall be applied.

The operational control point for the temperature shall be specified in the relevant specification. The values shall be selected from those given below:

(-50, -45, -40, -35, -30, -25, -20, -15, -10, -5, 0 [± 3]) °C

The operational control point for the duration shall be selected from the values given below, as specified in the relevant specification:

(2, 16, 24, 48, 72, 96, 120, 192, 240, 300, 500, 1 000) h

Examples of these stressed storage/transport environmental conditions at low temperature are shown in Table 2, entry L.

6.3.2.3 Stressed storage at high temperature and humidity

IEC 60068-2-78 shall be applied.

The operational control point for the temperature and humidity shall be specified in the relevant specification. The combination of temperature and humidity values shall be selected from those given below:

Temperature

(90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30 [± 3]) °C

Humidity

(90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30 [± 3]) %

The operational control point for the duration shall be selected from the values given below, as specified in the relevant specification:

(2, 16, 24, 48, 72, 96, 120, 192, 240, 300, 500, 1 000) h

Examples of these stressed storage/transport environmental conditions at high temperature and high humidity are shown in Table 2, entry H-H.

6.3.2.4 Stressed storage at cyclic test

IEC 60068-2-14 shall be applied.

An example of cyclic test condition is shown in Table 2, entry "Cycle".

Table 2 – Examples of the environmental durability test conditions for use in the non-operational state

	Temperature	Humidity	Duration	Note
H-L	80 °C	Dry	500 h	Hot and dry
L	-25 °C	not specified	500 h	Cold
H-H	60 °C	90 % RH	500 h	Hot and humid
Cycle	-25 °C/ +80 °C		500 cycles	Heat shock cycle test 1 cycle 1 h

7 Environmental test methods

7.1 General

Evaluation of the test results shall be performed using the following methods. Depending on the purpose of the test, only one, some, or all of the methods may be used:

- electrical test
- touch function test
- optical performance test

NOTE For the test pattern cell, 7.3 is effective for selecting the proper combination of material at the early stage of development. For the touch sensor module, 7.3 and 7.4 are effective for evaluating the basic performance of the touch sensor module at the final stage of development. For the touch sensor display, 7.3, 7.4, and 7.5 are effective for evaluating the entire performance of the touch sensor display at the production stage.

7.2 Test procedure

The following procedure shall be applied to the environmental tests:

- a) the DUT shall be left under the standard ambient conditions described in Clause 5;
- b) in the operational test, power on the DUT as specified for the test (see 4.3, 4.4, and 4.5);
- c) carry out the tests described in 7.3, 7.4, and 7.5;
- d) leave the DUT under the environmental test conditions described in 6.2 and 6.3;
- e) leave the DUT under the recovery condition described in 6.1.2;
- f) leave the DUT under the standard ambient conditions described in Clause 5;
- g) carry out the tests described in 7.3, 7.4, and 7.5;
- h) report the results.

7.3 Electrical test

7.3.1 Touch display module

Turn on the power supply and power on the display as specified for each inspection.

Report the touch sensor functions under the test conditions and identify any abnormalities in the displayed images, the touch functionality, and other performance characteristics.

Report that the electronic voltage is within the normal range.

7.3.2 Touch sensor module

Turn on the power supply and power on the touch sensor module as specified for each inspection.

Report the touch display module functions under the test conditions and identify any abnormalities in the touch functionality.

Report that the electronic voltages applied for the touch controller and the electronic voltages output from the touch controller are within the normal range.

7.3.3 Test pattern cell

Report that the applied voltage and duty ratio are within the normal range as described in Figure 2.

Report that there is no abnormal electronic current.

7.4 Touch function test

The touch function test shall be applied to the touch display module and the touch sensor module.

Refer to IEC 62908-12-10.

7.5 Optical performance test

The optical performance test shall be applied to the touch display module.

Refer to IEC 61747-30-1:2012, 6.7.4 and 6.7.5.