

# TECHNICAL REPORT



**Durability test methods for electronic displays –  
Part 2-12: Environmental tests – Environmental conditions of use, storage  
and transportation of electronic displays**

IEC TR 63211-2-12:2020

<https://standards.iteh.ai/catalog/standards/sist/514a22e1-9a4d-45e7-9fd-e560ae2aa4c7/iec-tr-63211-2-12-2020>



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INTERNATIONAL  
ELECTROTECHNICAL  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DURABILITY TEST METHODS FOR ELECTRONIC DISPLAYS –****Part 2-12: Environmental tests – Environmental conditions of use, storage and transportation of electronic displays**

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IEC TR 63211-2-12, which is a technical report, has been prepared by IEC technical committee 110: Electronic displays.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
110/1102/DTR	110/1122A/RVDTR

Full information on the voting for the approval of this technical report 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 63211 series, published under the general title *Durability test methods for electronic 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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## INTRODUCTION

The IEC 63211 series covers the durability test methods of electronic displays and related components. This series describes the evaluation of resistance of two or more electronic displays and their related components to environmental stress, mechanical stress, a combination of environmental and mechanical stress, contact with chemicals, and other stresses.

This part of IEC 63211 focuses on environmental aspects and describes the environmental conditions of displays, when in use, stored or transported.

The main environmental factors that influence the durability of electronic displays are the temperature and relative humidity of the air and the level of light exposure. These factors have been described in the IEC 60068 series as the general conditions of environmental testing for electrotechnical products. However, in the IEC 60068 series, the conditions are merely listed and cover an extremely wide range of diverse values. For example, the conditions of dry heat temperature are stipulated in IEC 60068-2-2 [1]<sup>1</sup> as the range from 30 °C to 1 000 °C. They are merely listed as a series of temperature values such as, (30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 100, 125, 155, 175, 200, 250, 315, 400, 500, 630, 800 and 1 000) °C. Temperatures of several hundreds of degrees are too severe to maintain the original functions of most electronic displays, and so these elevated temperatures have no valuable meaning as a test condition.

Therefore, environmental tests for electronic displays have been documented for each type of technology, such as LCD, PDP and OLED, as shown in Table 1. They were originally created using the IEC 60068 series documents as a reference, and some modifications were introduced to be suitable for electronic displays. For example, the conditions of the dry heat temperature test are limited in IEC 61747-10-2 [2] to the range from 30 °C to 100 °C.

[IEC TR 63211-2-12:2020](#)

The environmental test documents for electronic displays summarised in Table 1 have two problems. The first is that each document focuses on a specific display technology. The second is that the conditions are merely listed so users are required to choose several conditions that are fit for their intended purpose.

Most environmental stresses are not very different, even if the technologies under test are different. The test methods and test conditions should be discussed, and the most appropriate test should be chosen based on the application and the intended usage, rather than the technology used in the displays.

This document describes the data and information on the environmental conditions relevant to how electronic displays are actually used, stored or transported in various use profiles. They are intended to be used as a reference when the test conditions are determined. Even though the test conditions should be harsher than the actual conditions, in order to accelerate the tests, it is important to consider the actual conditions when the accelerated test conditions are discussed.

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<sup>1</sup> Numbers in square brackets refer to the Bibliography.



**Table 1 – Documents related to environmental tests for electronic displays**

IEC document (scope)	Title	Status and date of publication
IEC 61747-10-2 [2] (LCD)	Liquid crystal display devices – Part 10-2: Environmental, endurance and mechanical test methods – Environmental and endurance	Edition 1.0 2014-09-03
IEC 61988-4-1 [3] (PDP)	Plasma display panels – Part 4-1: Environmental testing methods – Climatic and mechanical	Edition 1.0 2015-03-25
IEC 62341-5 [4] (OLED)	Organic light emitting diode (OLED) displays – Part 5: Environmental testing methods	Edition 1.0 2009-11-20
IEC 62679-4-2 [5] (EPD)	Electronic paper displays – Part 4-2: Environmental test methods	Edition 1.0 2016-08-29
IEC 62715-6-2 [6] (FDD)	Flexible display devices – Part 6-2: Environmental testing methods	Edition 1.0 2017-05-24
IEC 62908-13-10 [7] (TID)	Touch and interactive displays – Part 13-10: Reliability test methods of touch displays – Environmental durability test methods	Edition 1.0 2016-11-25

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## DURABILITY TEST METHODS FOR ELECTRONIC DISPLAYS –

### Part 2-12: Environmental tests – Environmental conditions of use, storage and transportation of electronic displays

#### 1 Scope

This part of IEC 63211 provides data and information on the environmental conditions when electronic displays are used, stored and transported.

This document covers the temperature, relative humidity and light of the environment of electronic displays.

The information provided by this document is related to the following electronic displays:

- a) indoor displays for consumer homes and offices, such as TVs or PC monitors,
- b) indoor displays for commercial applications, such as signage and show cases,
- c) mobile displays, such as smartphones, tablets, e-books and mobile PCs,
- d) wearable displays, such as eyewear displays and smart watches,
- e) in-vehicle displays, and
- f) outdoor displays, such as signage for public information and advertising.

#### 2 Normative references

[IEC TR 63211-2-12:2020](https://standards.iteh.ai/catalog/standards/sist/514a22e1-9a4d-45e7-9f6d-e560e2a4c7/iec-tr-63211-2-12-2020)

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There are no normative references in this document.

#### 3 Terms and definitions

No terms and definitions are listed in this document.

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>

#### 4 Overview

##### 4.1 Use cases and stress factors

Stress factors on electronic displays vary according to the type of use. An overview of the stress factors in each use case is shown in Table 2. The number of “+” symbols indicates how serious the stress factor is in each case; “+++++” means seriously affected, “+” means slightly affected and “-” means not affected. "Duration" indicates the typical length of time of exposition to the stress factor, “long” means several years to twenty years, “middle” means several months to a few years and “short” means several days to a few months.

**Table 2 – Overview of the stress factors for each type of use case**

Use case		Environmental stress factors			Duration
		Heat	Humidity	Light	
Usage	Indoor/home and office	++	++	+	long
	Indoor/commercial	+	+	++	middle to long
	Mobile	+++	++++	+++	middle
	Wearable	+++	++++	+++	middle
	In vehicle	+++++	+++	++++	middle
	Outdoor/not exposed to rain	++++	+++++	++++	middle
	Outdoor/exposed to rain	++++	+++++	+++++	middle
Storage	With air conditioning	++	++	-	middle
	Without air conditioning	++++	++++	-	middle
Transportation of products		+++	++	-	short

## 4.2 Test conditions in existing standards

A summary of the test conditions described in the standards for electronic displays issued by IEC/TC 110 is shown in Annex A. The standards for each type of display technology, such as LCD, PDP and OLED, have been documented. Originally, the standards were created by reference to a document of the IEC 60068 series, which describes the environmental testing of electrotechnical products in general. The related documents of the IEC 60068 series are shown in Annex B.

The test conditions of the standards for electronic displays are stipulated by IEC/TC 110 with reference to the IEC 60068 series with some modification if necessary. They are applicable to each sort of display in general but each set of conditions covers too wide a range for any single specific usage.

The data and information on the environmental conditions when electronic displays are actually used, stored or transported in various situations are described in Clause 5 to Clause 8 of this document. These clauses provide a reference for when testing conditions need to be determined. Even though the test conditions should be harsher than the actual conditions, in order to reduce the time to perform the test, it is indispensable to consider the actual conditions whenever accelerated test conditions are discussed.

## 5 Indoor

### 5.1 General

In the case of indoor use, the structures of houses or buildings divide the atmosphere into either inside or outside. Inside houses or buildings, the atmosphere is intentionally conditioned for living, meaning that the indoor temperature, humidity and light conditions are largely different from the outdoor climatic conditions.

### 5.2 Temperature and humidity

#### 5.2.1 Consumer homes

Temperature and humidity data in consumer homes over a year was collected in eight cities around the world [8][9]. The cities where data was collected are shown in Table 3, and the results are shown in Table 4. Many documents of IEC/TC110 stipulate the measuring conditions for various types of testing; these are  $25\text{ °C} \pm 3\text{ °C}$  for temperature and from 25 % to 85 % for relative humidity. It is assumed that these documents cover around four times the standard deviation in consumer homes in the real world.

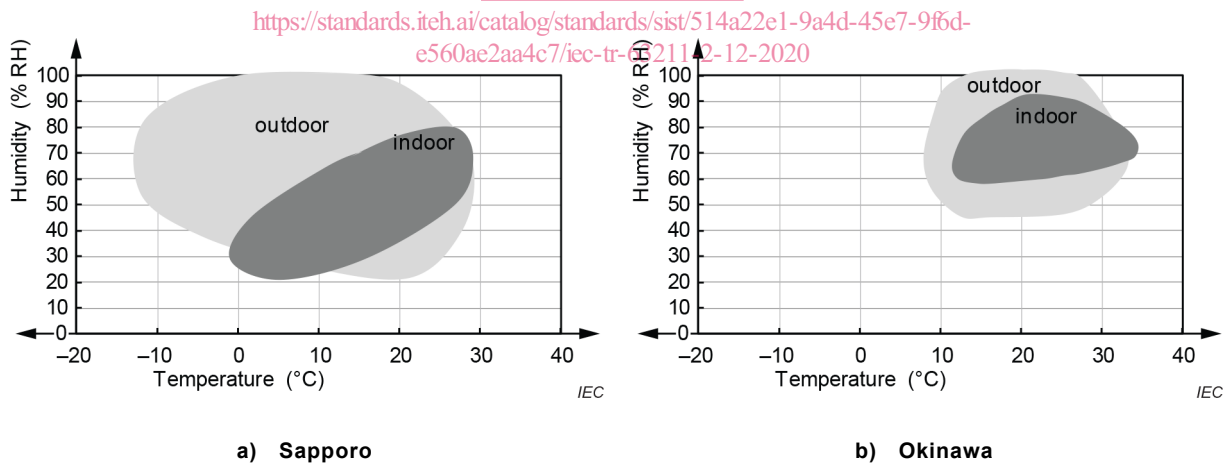
**Table 3 – Collection of condition data of consumer homes in eight cities**

No.	Region	Country	City
1	Europe	United Kingdom	London
2	North America	United States	Rochester
3			Los Angeles
4			Atlanta
5	South America	Brazil	Sao Paulo
6	Asia	Japan	Tokyo
7		China	Shanghai
8	Oceania	Australia	Melbourne

**Table 4 – Results of temperature and relative humidity of consumer homes**

	Temperature (°C)	Relative humidity (%RH)
Average	21,1	54
Standard deviation ( $\sigma$ )	3,9	13

The variation inside consumer homes was not large, even in severe climates, because any direct air flow from outdoors is shut out and air conditioners are used to keep the inhabitants comfortable. For example, a comparison of the outdoor and indoor conditions is shown in Figure 1 [10]. Sapporo is a northern Japanese city of subarctic climate, and Okinawa is a southern Japanese city of temperate but near subtropical climate. In both cities, the range in the variation in climate was smaller indoors than outdoors.



**Figure 1 – Range of year-round temperature and humidity in Sapporo (left) and Okinawa (right) in Japan**

**5.2.2 Office and commercial buildings**

In many countries, guidelines for temperature and humidity are set by each government to keep a healthy and comfortable environment for workers and visitors in office spaces and/or commercial buildings. Table 5 shows some examples of these guidelines [11].