



INTERNATIONAL STANDARD

**Environmental testing –
Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance
for solar radiation testing and weathering**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 19.040

ISBN 978-2-8322-5514-8

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 General remarks.....	8
4.1 Overview.....	8
4.2 Irradiance of solar radiation	8
4.3 Spectral irradiance of solar radiation.....	8
4.4 Radiation source.....	9
5 Test method Sa: thermal effect test	9
5.1 Conditioning.....	9
5.1.1 General	9
5.1.2 Temperature	9
5.1.3 Humidity	9
5.1.4 Ozone and other contamination gases	9
5.1.5 Surface contamination	10
5.1.6 Mounting of test specimen(s).....	10
5.1.7 Test facility.....	10
5.1.8 Test apparatus	10
5.2 Initial measurements.....	11
5.3 Testing	11
5.3.1 General	11
5.3.2 Procedure Sa 1 – 24 h cycle, 8 h irradiation and 16 h darkness, repeated as required	11
5.3.3 Procedure Sa 2 – 24 h cycle, 20 h irradiation and 4 h darkness, repeated as required	11
5.3.4 Procedure Sa 3 – Continuous irradiation as required	11
5.4 Final measurements.....	13
6 Test method Sb: Weathering test with or without wetting	13
6.1 Test apparatus.....	13
6.1.1 Laboratory radiation source	13
6.1.2 Test chamber.....	14
6.1.3 Temperature	14
6.1.4 Humidity	15
6.1.5 Spray cycle.....	15
6.1.6 Mounting of test specimen(s).....	15
6.1.7 Ozone and other contaminating gases	15
6.1.8 Surface contamination	15
6.2 Initial measurements.....	15
6.3 Testing	15
6.3.1 General	15
6.3.2 Test duration	16
6.3.3 Test procedure	16
6.3.4 Ancillary environmental conditions	16
6.4 Final measurements.....	16

7	Information to be given in the relevant specification.....	17
8	Information to be given in the test report.....	17
	Annex A (informative) Standard solar spectral irradiance.....	18
	Annex B (informative) Radiation source.....	20
	B.1 General.....	20
	B.2 Filters.....	20
	B.3 Uniformity of irradiance.....	20
	Annex C (informative) Typical apparatus for weathering.....	21
	Annex D (informative) Instrumentation.....	23
	D.1 General.....	23
	D.2 Measurement of irradiance.....	23
	D.3 Measurement of spectral irradiance.....	23
	D.4 Measurement of temperature.....	23
	D.5 Difference between insulated black panel and uninsulated black panel thermometer.....	23
	Bibliography.....	24
	 Figure 1 – Global solar spectral irradiance at sea level.....	 8
	Figure 2 – Test procedures Sa 1, Sa 2 and Sa 3.....	13
	Figure C.1 – Example of test apparatus.....	21
	Figure C.2 – Example of test apparatus with flat array.....	22
	 Table 1 – Spectral irradiance.....	 9
	Table 2 – Minimum and maximum levels of the relative spectral irradiance.....	10
	Table 3 – Relative spectral irradiance of xenon-arc lamp(s) with daylight filters.....	14
	Table 4 – Relative spectral irradiance for xenon-arc lamp(s) with window glass filters.....	14
	Table 5 – Exposure cycles.....	16
	Table A.1 – Comparison of basic atmospheric conditions used for the solar spectrum defined in ASTM G 177 and that defined in CIE 85:1989, Table 4.....	19
	Table A.2 – Irradiance comparison for the ASTM G 177 solar spectrum and the CIE 85:1989, Table 4, solar spectrum.....	19

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60068-2-5 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This third edition cancels and replaces the second edition of published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the title of this document has been modified;
- b) the current thermal effect test method, specified as "Test method Sa" has been retained and the weathering test method specified as "Test method Sb" has been added.

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

CDV	Report on voting
104/735/CDV	104/789/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 60068 series, published under the general title *Environmental testing*, 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
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This part of IEC 60068 describes methods of simulation designed to examine the effect of solar radiation on equipment and components at the surface of the earth. The main characteristics of the environment to be simulated are the spectral irradiance of solar radiation, as observed at the earth's surface, and the intensity of received energy, in combination with controlled temperature conditions. However, the combination of solar radiation with other environments, for example temperature, humidity, water spray (to simulate wetting) and air velocity, should be considered. Two different methods are described, one aiming at the thermal effects, a second aiming at the weathering effects.

ENVIRONMENTAL TESTING –

Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering

1 Scope

This part of IEC 60068-2 specifies the methods for testing equipment or components under simulated solar radiation conditions.

This document is applicable to the equipment and components at the surface of the earth.

The purpose of testing is to investigate to what extent the equipment or components are affected by simulated solar radiation in the presence of moisture to reproduce the weathering effects (temperature, humidity and/or wetting) that occur when they are exposed in actual end-use environments to daylight or to daylight filtered through window glass. This document specifies two test methods, test method Sa: thermal effect test, and test method Sb: weathering test.

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, *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*