IEC 60068-2-52

Edition 3.0 2017-11

REDLINE VERSION

colour inside

Environmental testing –
Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 19.040

ISBN 978-2-8322-5027-3

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 8
4 General description of the test 8
4.1 Description of each test condition 8
4.1.1 General 8
4.1.2 Salt mist 8
4.1.3 Dry condition 8
4.1.4 Humid condition 9
4.1.5 Standard atmosphere 9
5 Test apparatus 9
5.1 General 9
5.2 Salt mist chamber 9
5.3 Humidity chamber 10
5.4 Standard atmosphere chamber 10
5.5 Dry chamber 10
6 Salt solution 10
6.1 Preparation of the sodium chloride solution 11
6.2 pH adjustment 11
6.2.1 Neutral salt solution 11
6.2.2 Acidified salt solution 11
6.3 Filtration 11
~~6 Severities~~ .....
7 Initial measurements 12
8 Preconditioning 12
9 Testing 12
9.1 Test chamber 13
9.2 Arrangement of the test specimen(s) 13
9.3 Conditions during salt mist 13
9.4 Test methods 14
9.4.1 General 14
9.4.2 Test method 1 14
9.4.3 Test method 2 14
9.4.4 Test method 3 14
9.4.5 Test method 4 14
9.4.6 Test method 5 14
9.4.7 Test method 6 14
9.4.8 Test method 7 14
9.4.9 Test method 8 15
9.5 Test cycles for test methods 1 to 8 15
9.6 Removal of the test specimen(s) 16
10 Recovery (at the end of testing) 16
11 Final measurements 17

12 Information to be given in the relevant specification 17
13 Information to be given in the test report 17
Annex A (informative) Typical apparatus for cyclic salt mist, humid condition, dry condition and standard atmosphere corrosion tests 19
Annex B (informative) Description of each test method 20
B.1 Test methods 1 and 2 20
B.2 Test methods 3 to 6 20
B.3 Test methods 7 and 8 20
Bibliography 21

~~Figure 1 – Schematic time-scale of the different test severities (1) to (6) .....~~
Figure A.1 – Example of test apparatus 19

Table 1 – Test cycles for test methods 1 to 8 16

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ENVIRONMENTAL TESTING –

Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)

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.

DISCLAIMER
This Redline version is not an official IEC Standard and is intended only to provide the user with an indication of what changes have been made to the previous version. Only the current version of the standard is to be considered the official document.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60068-2-52 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This third edition cancels and replaces the second edition published in 1996. This edition constitutes a technical revision.

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

a) the entire content has been harmonized with ISO 9227 as far as possible;
b) an introduction has been added;
c) the scope has been simplified;
d) normative references have been updated;
e) the general description of the test has been changed;
f) a dry chamber has been added to the test apparatus;
g) severities have been changed to test methods;
h) test methods 7 and 8 have been added;
i) information on the test report has been added;
j) Figure 1 has been changed to Table 1;
k) a typical test apparatus example has been added in a new Annex A;
l) a description of each test method has been added in a new Annex B;
m) bibliographical references have been added.

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

FDIS	Report on voting
104/751/FDIS	104/761/RVD

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.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

The mechanism of ~~salt~~ corrosion on metallic materials in a chloride-containing atmosphere is electrochemical, whereas the degradation effects experienced on non-metallic materials are caused by complex chemical reactions of the salts with the materials involved. The rate at which corrosive action takes place is dependent, to a large extent, on the supply of oxygenated salt solution to the surface of the test specimen(s), the temperature of the test specimen(s) and the temperature and humidity of the environment.

Apart from the corrosive effects, this cyclic salt mist test may be used to indicate deterioration of some non-metallic materials by assimilation of salts. In the various test methods described in this document, the period of spraying with the relevant salt solution is sufficient to wet the test specimen(s) thoroughly. Because this wetting is repeated after intervals of storage under humid conditions ~~(severities (1) and (2)) and in some cases severities ((3) to (6)) –~~ supplemented by storage under a standard atmosphere ~~for testing~~, it goes some way to reproducing the effects of natural environments.

Furthermore, considering natural environments for corrosion on metallic materials, neutral or acidified salt solution spray, humid, and dry conditions are also important factors as a cyclic corrosion test. Each condition is repeated after intervals of other conditions in different combinations to achieve corrosion on metallic materials and to get acceleration of corrosion.

The tests described in this document are accelerated compared with most expected conditions of use. As a result, it may be difficult to establish an overall acceleration factor for all kinds of test specimens. This also means that it is often not possible to use results gained from these tests as a comparative guide to the long-term behaviour of different coating systems since the corrosion stress during these tests differs significantly from the corrosion stresses encountered during use. Nevertheless, the method described gives a means of checking that the comparative quality of a metallic material is maintained.

This document may involve hazardous materials, operations and equipment. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

ENVIRONMENTAL TESTING –

Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)

1 Scope

~~This test is intended for application to components or equipment designed to withstand a salt-laden atmosphere, depending on the chosen severity. Salt can degrade the performance of parts manufactured using metallic and/or non-metallic materials.~~

~~Severities (1) and (2) are intended to be used for testing products which are used in a marine environment, or in close proximity to the sea. Severity (1) should be used to test products which are exposed to the environment for much of their operational life (e.g. ship radar, deck equipment). Severity (2) should be used to test products which may be exposed to the marine environment from time to time but will normally be protected by an enclosure (e.g. navigational equipment which will normally be used on the bridge or in a control room).~~

~~Additionally, severities (1) and (2) are commonly used as a general corrosion test in component quality assurance procedures.~~

~~Severities (3) to (6) are intended for products where, under normal use, there is a frequent change between salt-laden and dry atmosphere, e.g. automobiles and their parts.~~

~~Severities (3) to (6), compared to severities (1) and (2), therefore include an additional storage under a standard atmosphere for testing.~~

~~The period of dry atmosphere may happen, in practice, during breaks of operation, e.g. during the weekend. This inclusion of such a dry period in severities (3) to (6) leads to corrosion mechanism which can be quite different from those under constant humid conditions.~~

~~The test is accelerated compared with most service conditions. However, it is not possible to establish an overall acceleration factor for all kinds of specimens (see IEC 60355).~~

This part of IEC 60068-2 specifies the application of the cyclic salt mist test to components or equipment designed to withstand a salt-laden atmosphere as salt can degrade the performance of parts manufactured using metallic and/or non-metallic materials.

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~~: 1988~~, *Environmental testing – Part 1: General and guidance*

~~IEC 60068-2-3: 1969, *Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state*~~

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

~~IEC 60355: 1971, *An appraisal of the problems of accelerated testing for atmospheric corrosion*~~

ISO 9227, *Corrosion tests in artificial atmospheres – Salt spray tests*

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

IEC 60068-2-52

Edition 3.0 2017-11

INTERNATIONAL STANDARD

Environmental testing –
Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)



IEC 60068-2-52:2017-11(en)

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 General description of the test 7
4.1 Description of each test condition 7
4.1.1 General 7
4.1.2 Salt mist 8
4.1.3 Dry condition 8
4.1.4 Humid condition 8
4.1.5 Standard atmosphere 8
5 Test apparatus 8
5.1 General 8
5.2 Salt mist chamber 8
5.3 Humidity chamber 8
5.4 Standard atmosphere chamber 9
5.5 Dry chamber 9
6 Salt solution 9
6.1 Preparation of the sodium chloride solution 9
6.2 pH adjustment 9
6.2.1 Neutral salt solution 9
6.2.2 Acidified salt solution 9
6.3 Filtration 9
7 Initial measurements 9
8 Preconditioning 9
9 Testing 9
9.1 Test chamber 9
9.2 Arrangement of the test specimen(s) 10
9.3 Conditions during salt mist 10
9.4 Test methods 10
9.4.1 General 10
9.4.2 Test method 1 10
9.4.3 Test method 2 10
9.4.4 Test method 3 10
9.4.5 Test method 4 11
9.4.6 Test method 5 11
9.4.7 Test method 6 11
9.4.8 Test method 7 11
9.4.9 Test method 8 11
9.5 Test cycles for test methods 1 to 8 11
9.6 Removal of the test specimen(s) 12
10 Recovery (at the end of testing) 12
11 Final measurements 13
12 Information to be given in the relevant specification 13

13 Information to be given in the test report 13
Annex A (informative) Typical apparatus for cyclic salt mist, humid condition, dry condition and standard atmosphere corrosion tests 14
Annex B (informative) Description of each test method 15
B.1 Test methods 1 and 2 15
B.2 Test methods 3 to 6 15
B.3 Test methods 7 and 8 15
Bibliography 16

Figure A.1 – Example of test apparatus 14

Table 1 – Test cycles for test methods 1 to 8 12

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ENVIRONMENTAL TESTING –

Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)

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 60068-2-52 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This third edition cancels and replaces the second edition published in 1996. This edition constitutes a technical revision.

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

a) the entire content has been harmonized with ISO 9227 as far as possible;
b) an introduction has been added;
c) the scope has been simplified;
d) normative references have been updated;
e) the general description of the test has been changed;

f) a dry chamber has been added to the test apparatus;
g) severities have been changed to test methods;
h) test methods 7 and 8 have been added;
i) information on the test report has been added;
j) Figure 1 has been changed to Table 1;
k) a typical test apparatus example has been added in a new Annex A;
l) a description of each test method has been added in a new Annex B;
m) bibliographical references have been added.

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

FDIS	Report on voting
104/751/FDIS	104/761/RVD

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

The mechanism of corrosion on metallic materials in a chloride-containing atmosphere is electrochemical, whereas the degradation effects experienced on non-metallic materials are caused by complex chemical reactions of the salts with the materials involved. The rate at which corrosive action takes place is dependent, to a large extent, on the supply of oxygenated salt solution to the surface of the test specimen(s), the temperature of the test specimen(s) and the temperature and humidity of the environment.

Apart from the corrosive effects, this cyclic salt mist test may be used to indicate deterioration of some non-metallic materials by assimilation of salts. In the various test methods described in this document, the period of spraying with the relevant salt solution is sufficient to wet the test specimen(s) thoroughly. Because this wetting is repeated after intervals of storage under humid conditions supplemented by storage under a standard atmosphere, it goes some way to reproducing the effects of natural environments.

Furthermore, considering natural environments for corrosion on metallic materials, neutral or acidified salt solution spray, humid, and dry conditions are also important factors as a cyclic corrosion test. Each condition is repeated after intervals of other conditions in different combinations to achieve corrosion on metallic materials and to get acceleration of corrosion.

The tests described in this document are accelerated compared with most expected conditions of use. As a result, it may be difficult to establish an overall acceleration factor for all kinds of test specimens. This also means that it is often not possible to use results gained from these tests as a comparative guide to the long-term behaviour of different coating systems since the corrosion stress during these tests differs significantly from the corrosion stresses encountered during use. Nevertheless, the method described gives a means of checking that the comparative quality of a metallic material is maintained.

This document may involve hazardous materials, operations and equipment. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

ENVIRONMENTAL TESTING –

Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)

1 Scope

This part of IEC 60068-2 specifies the application of the cyclic salt mist test to components or equipment designed to withstand a salt-laden atmosphere as salt can degrade the performance of parts manufactured using metallic and/or non-metallic materials.

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

ISO 9227*, Corrosion tests in artificial atmospheres – Salt spray tests*