



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 0048 : 1999
(IEC 60068-2-60 : 1995)

**Environmental testing—
Part 2 : Tests—Test Ke : Flowing
mixed gas corrosion test**

The code number of this Standard
changed from JIS C 0048 to the
following from 20 March 2004.

JIS C 60068-2-60:1999

ICS 19.040; 29.020

Descriptors : corrosion, corrosion tests, electrical components, switchgear, environmental testing, electrical testing, mixtures, gases, electrical equipment, electronic equipment and components

Reference number : JIS C 0048 : 1999 (E)

C 0048 : 1999 (IEC 60068-2-60 : 1995)

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

Date of Establishment: 1999-02-20

Date of Public Notice in Official Gazette: 1999-02-22

Investigated by: Japanese Industrial Standards Committee

Divisional Council on Electricity

JIS C 0048:1999, First English edition published in 1999-12

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 1999

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

Contents

	Page
Introduction	1
1 General	1
1.1 Scope	1
1.2 Normative references	1
2 Test apparatus	2
3 Severities	2
4 Pre-conditioning	3
5 Initial measurements	3
6 Testing	3
6.1 Test specimens	3
6.2 Corrosivity monitoring materials	3
6.3 Testing procedure	4
7 Recovery	6
8 Final measurements	6
9 Information to be given in the relevant specification	6
10 Information to be given in the test report	6
Annex A (normative) Corrosion monitoring copper coupons	8
A.1 Nature and dimension	8
A.2 Cleaning procedure	8
Annex B (informative) Description of test apparatus	9
B.1 General	9
B.2 Climatic system	11
B.3 Test enclosure	12
B.4 Gas delivery system	13

C 0048 : 1999 (IEC 60068-2-60 : 1995)

B.5	Analyzing system	13
B.6	Other corrosion monitoring methods	14
B.7	Calibration of the chamber	15
Annex C (informative)	Guide to the selection of methods and test duration	16
C.1	Introduction	16
C.2	Function of corrosive gases used in the tests	16
C.3	Use of the different test methods	16

Environmental testing—Part 2 : Tests— Test Ke : Flowing mixed gas corrosion test

Introduction This Japanese Industrial Standard has been prepared based on IEC 60068-2-60 *Environmental testing—Part 2 : Tests—Test Ke : Flowing mixed gas corrosion test* published in 1995 as the second edition, without modifying its technical contents.

The portions with dotted underlines show the matters not included in the original International Standard.

The IEC Standard number is based on the new numbering system of IEC Standards put in force on January 1st 1997, and the Standard published before the said date is numbered by adding 60000 to the former number. This is only the change in the numbering system and the contents remain unchanged.

1 General

1.1 Scope This Standard determines the corrosive influence of operating and storage indoor environments on electromechanical products components, equipment and materials, particularly contacts and connections, considered separately, integrated into a subassembly or assembled as a complete equipment.

It provides test methods giving information, on a comparative basis, to aid the selection of materials, choice of production processes and component design, with regard to corrosion resistance.

Annex A (normative) specifies kinds and sizes of corrosion monitoring copper coupons and the cleaning method of coupons to be carried out before the tests.

The description of test apparatus in Annex B (informative) and the guide to selection of methods and test duration in Annex C (informative) supplement the matters relating with this test and do not form a part of this specification.

Remarks : The International Standard corresponding to this Standard is given below.

IEC 60068-2-60 : 1995 *Environmental testing—Part 2 : Tests—Test Ke :
Flowing mixed gas corrosion test*

1.2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The editions of the standards indicated below shall be applied.

All these Standards are subjected to revision, and parties relating with these Standards are encouraged to investigate the possibility of applying the most recent editions of the Standards indicated below.

JIS C 5441-1994 *Testing methods of switches for use in electronic equipment*

Remarks : The above is identical with IEC 60512-2 :1985 *Electromechanical components for electronic equipment ; basic testing procedures and measuring methods Part 2 : General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests.*

JIS H 2123-1990 *Copper billets and cakes*

Remarks : The above is corresponding to ISO 431 : 1981 *Copper refinery shapes*.

JIS K 8102-1994 *Ethanol (95)*

Remarks : The above is corresponding to ISO 6353-2 : 1983 *Reagents for Chemical analysis—Part 2 : Specifications*.

JIS K 8576-1994 *Sodium hydroxide*

Remarks : The above is corresponding to ISO 6353-2 : 1983 *Reagents for Chemical analysis—Part 2 : Specifications*.

JIS K 8839-1995 *2-Propanol*

Remarks : The above is corresponding to ISO 6353-3 : 1987 *Reagents for Chemical analysis—Part 3 : Specifications*.

JIS K 8951-1995 *Sulfuric acid*

Remarks : The above is corresponding to ISO 6353-2 : 1983 *Reagents for Chemical analysis—Part 2 : Specifications*.

2 Test apparatus The test apparatus consists of a climatic system, test enclosure, gas delivery system and means for measuring gas concentration. Details of design and construction are optional but shall be such that the conditions specified for each method are fulfilled throughout the working volume and shall comply with the following requirements :

- water droplets or aerosols shall not be injected into the test enclosure ;
- air and water used shall be sufficiently clean in order not to affect performance of the test ;
- the test atmosphere shall flow through the enclosure in such a manner as to ensure uniform test conditions within the working volume ;
- the sampling point for gas analyses shall be in the working volume of the test enclosure ;
- the exhaust gases shall be treated in accordance with the relevant regulatory stipulations.

The working volume is the volume within which the individual corrosion (weight increase of copper coupons expressed in mg/ (dm² × day) according to Annex A at each location differs by maximum 15 % from the average corrosion of all coupons within the working volume.

3 Severities The test severity shall be given in the relevant specification. It is defined by :

- the test method, chosen from Table 1, and
- the test duration.

Preferred durations are 4, 7, 10, 14 and 21 days.

Four methods are defined. The different parameters for each method are summarized in the following Table 1. A guidance for the use of each method is given in clause C.3 of Annex C.

Table 1

Parameters	Method 1	Method 2	Method 3	Method 4
H ₂ S (10 ⁻⁹ vol/vol) ¹⁾	100 ± 20	10 ± 5	100 ± 20	10 ± 5
NO ₂ (10 ⁻⁹ vol/vol) ²⁾	—	200 ± 50	200 ± 50	200 ± 20
Cl ₂ (10 ⁻⁹ vol/vol) ³⁾	—	10 ± 5	20 ± 5	10 ± 5
SO ₂ (10 ⁻⁹ vol/vol) ⁴⁾	500 ± 100	—	—	200 ± 20
Temperature °C	25 ± 1	30 ± 1	30 ± 1	25 ± 1
RH %	75 ± 3	70 ± 3	75 ± 3	75 ± 3
Volume changes per hour	3 to 10	3 to 10	3 to 10	3 to 10
Weight increase of copper coupons mg/(dm ² × day) according to Annex A	1.0 to 2.0	0.3 to 1.0	1.2 to 2.2	1.2 to 2.4
1) H ₂ S : 1 µg/m ³ = 0.71 mm ³ /m ³ 2) NO ₂ : 1 µg/m ³ = 0.53 mm ³ /m ³ 3) Cl ₂ : 1 µg/m ³ = 0.34 mm ³ /m ³ 4) SO ₂ : 1 µg/m ³ = 0.38 mm ³ /m ³ 10 ⁻⁹ vol/vol = UNIT (µg/m ³), this holds for all of 1) to 4)				
Remarks : Since the nature of the corrosive attack is different for the test methods 1 to 4, neither their numbering nor the corresponding weight increase of copper coupons reflect their severity.				

4 Pre-conditioning The relevant specification may require pre-conditioning of specimens, for example cleaning or mechanical operation.

5 Initial measurements Initial measurements shall be carried out as required by the relevant specification. Generally these measurements are :

- contact resistance measurements for electromechanical product components (JIS C 5441 Sub-clause 7.1)
- insulation resistance measurements (JIS C 5441 Sub-clause 7.2)

6 Testing Samples exposed in the tests shall be :

- the specimens being evaluated ;
- corrosion monitor materials.

6.1 Test specimens The relevant product specification shall define the conditions of the specimens during the test, for example mated or unmated for connectors ; contacts open or closed for switches, operated or electrically loaded.

The duration of the operation or loading of heat-dissipating specimens, shall be such that the temperature and the relative humidity in the working volume remain within the specified tolerances.

The conditions of the specimens and the test chamber shall be such that condensation on the specimens shall not occur when they are introduced into the test chamber.

6.2 Corrosivity monitoring materials Copper coupons shall be exposed with the test specimens in order to verify the conformance of the test specimen. A minimum of five test