



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS H 8682-2 : 2013

(JAPA/JSA)

**Anodizing of aluminium and its
alloys—Measurement of abrasion
resistance of anodic oxidation
coatings—Part 2: Abrasive jet
abrasion resistance test**

ICS 25.220.20;77.120.10

Reference number : JIS H 8682-2 : 2013 (E)

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H 8682-2 : 2013

Date of Establishment: 1999-08-20

Date of Revision: 2013-05-20

Date of Public Notice in Official Gazette: 2013-05-20

Investigated by: Japanese Industrial Standards Committee

Standards Board

Technical Committee on Non-Ferrous Metals

JIS H 8682-2:2013, First English edition published in 2015-03

Translated and published by: Japanese Standards Association
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

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Printed in Japan

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Aluminium Products Association (JAPA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently, **JIS H 8682-2:1999** is replaced with this Standard.

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JIS H 8682 series consists of the following 3 parts under the general title “*Anodizing of aluminium and its alloys—Measurement of abrasion resistance of anodic oxidation coatings*”:

Part 1: Abrasive-wheel-wear abrasion resistance test

Part 2: Abrasive jet abrasion resistance test

Part 3: Falling sand abrasion resistance test

Anodizing of aluminium and its alloys— Measurement of abrasion resistance of anodic oxidation coatings—Part 2: Abrasive jet abrasion resistance test

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 8251** published in 2011 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JB.

1 Scope

This Standard specifies the test method for obtaining the wear characteristics such as wear resistance by jetting abrasive particles on the surface of anodic oxidation coatings exceeding 5 µm in thickness (hereafter referred to as “coatings”) applied to the products manufactured from aluminium and aluminium alloys (hereafter referred to as “products”) under a fixed pressure.

NOTE 1 There are an abrasive-wheel-wear abrasion resistance test, abrasive jet abrasion resistance test and falling sand abrasion resistance test in the test methods. In this Standard, an abrasive jet abrasion resistance test method is specified.

NOTE 2 The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows:
ISO 8251:2011 *Anodizing of aluminium and its alloys—Measurement of abrasion resistance of anodic oxidation coatings* (MOD)

The symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are **IDT** (identical), **MOD** (modified), and **NEQ** (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 1202 *Circuit testers*

JIS H 0201 *Glossary of terms used in the surface treatment of aluminium*

JIS H 8680-2 *Test methods for thickness of anodic oxide coatings on aluminium and aluminium alloys—Part 2: Eddy current method*

JIS R 6111 *Artificial abrasives*

JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8801-1 *Test sieves—Part 1: Test sieves of metal wire cloth*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in JIS H 0201, and the following apply.

3.1 test specimen

specimen for testing the wear characteristics such as wear resistance

3.2 standard specimen

specimen to correct the discrepancy of test results caused by the difference in test apparatus, lot of abrasive used or the like for the comparison with the test specimen

3.3 reference specimen

specimen prepared under the condition agreed between the purchaser and the manufacturer, which is used for the reference to the test specimen

4 Feature

This test gives the method for obtaining the wear characteristics of coatings by the projected of abrasive particles onto a test specimen and the mean wear characteristics of coatings may be determined. The method is applicable to all coatings of thickness more than 5 µm on aluminium or its alloys. It is also applicable to surfaces which are not flat.

NOTE 1 Different batches of the same abrasive are liable to give different results. For this reason, the test is a comparative one.

NOTE 2 With a suitably designed abrasive jet test apparatus and a measuring instrument for coating thickness with a small probe, it is possible to perform a depth survey for wear resistance (see Annex B). However, for these characteristics, the abrasive-wheel-wear test is preferred.

NOTE 3 This method is particularly suitable for small test specimens because the test area to be abraded is only about 2 mm in diameter.

5 Summary

In this test, the abrasive jet test apparatus is employed and dry silicon carbide material is projected in a stream of dry air or inert gas, and the time until the substrate of aluminium is exposed is obtained. The wear characteristics of coatings are calculated from the time taken of silicon carbide material used and the coating thickness measured before the test. For the test results, the wear resistance, wear resistance coefficient, etc. are calculated by comparison with those obtained using a standard specimen (Annex A or Annex JA) or a reference specimen (3.3).

6 Test apparatus and measuring instruments

6.1 Test apparatus The abrasive jet test apparatus shall consist of a hopper for abrasive, shutter, guiding tube, jet nozzle, test specimen supporting stage, mechanical

pressure gauge, differential manometer, pressure control valve, air compressor and others. The requirements in table 1 shall be satisfied. An example of abrasive jet test apparatus is shown in Annex C.

The test apparatus shall be housed in a transparent box made of synthetic-resin ¹⁾ to prevent the dispersing of abrasives.

Note ¹⁾ In order to keep the humidity in test surroundings within the specified range, the dehumidified air may be introduced in the box.

Table 1 Requirements to be provided with test apparatus

Test apparatus	Requirements to be provided
Hopper for abrasive	That capable of controlling the falling rate of abrasive by setting a control bar at the centre of hopper and the like.
Guiding tube	That of about 3.4 mm in inside diameter equipped with funnel type receptacle.
Jet nozzle	3.0 mm $\pm$ 0.1 mm in inside diameter for tip of nozzle.
Test specimen supporting stage	That capable of fixing test specimen with angle of $55^\circ \pm 1^\circ$ to the vertical direction (for curved test specimen, the angle between abrasive falling and central part of test surface to be $35^\circ \pm 1^\circ$), and of adjusting distance between tip of jet nozzle and test specimen to 10 mm $\pm$ 1 mm.
Differential manometer	That capable of reading to the nearest 65 Pa.
Air compressor	That not having any hindrance for testing, and giving little fluctuation to the regulated air pressure.

6.2 Circuit tester The circuit tester shall be that specified in **JIS C 1202** which shall satisfy the following specifications for detecting exposed substrate.

- Capable of adequately measuring the resistance of 5 000 Ω .
- The tip of stylus which contacts with the test surface for measurement shall be spherical with smooth surface.

6.3 Abrasive The abrasive shall be that of F100 of silicon carbide material C specified in **JIS R 6111**.

The number of times of reuse of abrasive shall be at most 50. For the reuse of abrasive, the abrasive which passes through the sieve of 212 μm in nominal aperture size and remains on the sieve of 75 μm in nominal aperture size specified in **JIS Z 8801-1** shall be used.

The abrasive used shall be dried, passed through a coarse sieve and stored in a tightly closed container.

NOTE : Ambient humidity has little effect on the test result, but can have a very considerable effect if the abrasive is reused without drying.

6.4 Measuring instrument for coating thickness For the measuring instrument for coating thickness, the eddy-current meter specified in **JIS H 8680-2** shall be used.

7 Test method

7.1 Standard specimen

The standard specimen prepared according to the specification in Annex A or Annex JA shall be used.

7.2 Reference specimen

The reference specimen prepared upon the agreement between the purchaser and the manufacturer shall be used.

7.3 Test specimen

The test specimen shall be as follows.

- a) A test specimen shall be sampled from the effective surface where the coatings applied on the surface of product shall absolutely satisfy the quality that suits the application.

When a test specimen cannot be sampled from a product, the test specimen prepared from the same material and under the same treatment condition as those of the product shall be used. The same material as that of the product means that the type/temper and the surface condition before treatment of material are the same as those of the product. Furthermore, the same treatment condition means that the pretreatment and the coating treatment are performed using the same bath composition of that of the product under the same treatment condition so that the same performance as that of the product can be obtained.

- b) The dimension of test specimen shall be about 100 mm × about 100 mm.
- c) Previously, the test specimen shall be cleaned using soft absorbent cotton, etc. moistened with appropriate organic solvent such as ethanol and acetone according to the dirt.

Such an organic solvent that it corrodes the test specimen or makes a protective film shall not be used.

7.4 Test conditions

The test environment shall be 65 % or under in the relative humidity at the ordinary temperature. The test conditions shall be as shown in table 2.

The test conditions for test specimen, standard specimen and reference specimen shall be the same.

Table 2 Test conditions

Items	Test conditions	
	Ordinary coatings ^{a)}	Hard coatings ^{b)}
Angle of test specimen	55° ± 1°	
Free falling rate of abrasive	25 g/min ± 1 g/min	
Pressure of flowing air or pressure of inert gas	Standard pressure 7.5 kPa	Standard pressure 15.0 kPa
Distance between lower end of jet nozzle and test specimen	10 mm ± 1 mm	
Notes ^{a)} Coatings applied for the purpose other than wear resistance.		
^{b)} Coatings applied for the purpose of wear resistance (see JIS H 8603).		

7.5 Procedure

7.5.1 General

The judgement method shall be according to either **7.5.2** or **7.5.3**.

7.5.2 Visual observation judgement method

The procedure shall be as follows.

- Fully fill the hopper with abrasive particles.
- Adjust the apparatus so that the free falling rate of abrasive may be set within the specified range. Since the falling rate of abrasive may change during the test, it shall be checked at a suitable frequency that it is within the limit of the specified value.
- Adjust the standard pressure of air supply or the standard pressure of inert gas so that it is within the specified range. In this case, do not perform the adjustment of pressure of flowing air supply or pressure of inert gas during the test.
- Select at least three test positions of the standard specimen or the reference specimen, and measure the coating thickness (d) before the test at each test area with the measuring instrument for coating thickness in **6.4**. Obtain the coating thickness (d) to the nearest 0.1 µm and rounded with the interval of 0.1 according to Rule A of **JIS Z 8401**.
- Fix the standard specimen or the reference specimen to the test specimen supporting stage so that the angle to the vertical direction becomes 55° ± 1° and the centre part of test surface locates at a distance of 10 mm ± 1 mm from the lower end of central line of the jet nozzle. However, for the curved test specimen, the angle between the abrasive falling and the centre part of test surface shall be 35° ± 1°.
- Open the on-off valve of air supply or inert gas. When testing continuously, the on-off valve of air supply or inert gas may be left open.
- Open the shutter for the abrasive falling and start a stopwatch simultaneously with making the abrasive fall.