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**Methods of adhesion test
for metallic coatings**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently JIS H 8504 : 1996 is replaced with JIS H 8504 : 1999.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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Methods of adhesion test for metallic coatings

Introduction This Japanese Industrial Standard has been prepared based on the corresponding parts of the International Standard indicated in Remarks of 1 Scope, without any modification in technical contents, but the items not specified in the corresponding International Standard are supplemented as a part of the Japanese Industrial Standard.

1 Scope This Japanese Industrial Standard specifies the methods of adhesion test for electrodeposited and chemically deposited coatings on metallic substrates.

Remarks: The International standard corresponding to this Standard is as follows.
ISO 2819: 1980 *Metallic coatings on metallic substrates — Electrodeposited and chemically deposited coatings — Review of method available for testing adhesion*

Informative reference: Methods of adhesion test for metallic coatings are mostly of a qualitative nature though they include some methods of a quantitative nature. This means that they are not satisfactory from the viewpoint of the quality control of a plated product, but the limit of the adhesivity of the metallic coatings can be understood by the tests if the test methods suitable for each product are selected.

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

JIS B 4703	<i>Files</i>
JIS B 4704	<i>Set files</i>
JIS B 7721	<i>Verification of the force measuring system of the tensile testing machine</i>
JIS B 7729	<i>Erichsen cupping testers</i>
JIS G 3502	<i>Piano wire rods</i>
JIS G 4401	<i>Carbon tool steels</i>
JIS H 0400	<i>Glossary of terms used in electroplating</i>
JIS R 6001	<i>Bonded abrasive grain sizes</i>
JIS R 6252	<i>Abrasive papers</i>
JIS Z 1522	<i>Pressure sensitive adhesive cellophane tapes</i>
JIS Z 2201	<i>Test pieces for tensile test for metallic materials</i>
JIS Z 2241	<i>Method of tensile test for metallic materials</i>
JIS Z 2247	<i>Method of Erichsen cupping test</i>

JIS Z 3282 *Soft solders—Chemical compositions and forms*

3 Definitions For the purposes of this Standard, the definitions given in JIS H 0400 and the following definition apply.

a) **significant surface** Surface of a product which is coated or to be coated and whose coating affects the major performance and appearance.

4 Kinds of test methods The kinds of test methods shall be as follows:

Examples of application of coatings to various adhesion test methods are shown in Attached Table 1.

a) **Grinding method for adhesion test**

1) File test method

2) Grinding test method

b) **Spatula-squeezing test method**

c) **Push-out test method**

d) **Erichsen test method**

e) **Shot peening test method**

f) **Ball burnishing test method**

g) **Peel test method**

1) Tape test method

2) Soldering test method

h) **Chisel test method**

i) **Scribe and grid test method**

j) **Bending test method**

k) **Twisting test method**

l) **Tensile test method**

m) **Thermal test method**

1) Heating test method

2) Thermal shock test method

n) **Cathodic test method**

5 Sample

5.1 Handling of sample The sample shall be handled, not by bare hand, but by hand in glove.

5.2 Sampling The sample shall be taken from the significant surface of the product or shall be the product itself. However, where testing or judgment on the product is difficult, tests may be conducted on the test pieces substituting for the product.

In that case, the test pieces shall be representative of the product ⁽¹⁾⁽²⁾

Notes (1) It is desirable that the composition of the basis material, manufacturing conditions, and the condition of finishing before metallic coating are the same as those of the product.

(2) It is desirable that the pretreatment for metallic coating and the coating operation should be carried out by using the same baths and under the same conditions as for the product, and at the same time as the product so that the same influence of the operation conditions may be reflected on the test pieces.

5.3 Size of sample The size of the sample shall be agreed upon by the supplier and the purchaser.

5.4 Treatment of test surface The surface to be tested shall be treated with a suitable solvent (3) selected according to the degree of staining of the surface.

Note (3) It is desirable to use ethyl alcohol, petroleum benzine, volatile oil or the like.

5.5 Conditioning of sample Prior to test, the sample shall, as a rule, be conditioned by being allowed to stand in a room or in a thermohygrostat at a temperature of 23 ± 2 °C and a relative humidity of 65 % or lower. However, the conditioning may be omitted by agreement between the supplier and the purchaser where the omission is considered not to influence the test.

6 General conditions of testing room

6.1 Testing place The testing place shall, as a rule, be in a room at a temperature of 23 ± 2 °C and a relative humidity of 65 % or lower. However, other suitable places may be chosen by agreement between the supplier and the purchaser unless a consequence unfavorable for the test is anticipated.

6.2 Arrangement of test apparatus The test apparatus shall be installed properly and stably on a rigid experiment base so as to prevent the occurrence of abnormal movement during the test. In addition, the appliances used for the test shall preliminarily be regulated so that they can always serve under the definite conditions.

7 Judging method The judging method shall be as follows unless otherwise specified.

The portion to be tested shall be visually observed, and the coating adhesion shall be judged to be improper when peeling or blistering of the coatings is clearly observed.

Where it is difficult to judge on the adequacy of the adhesion by visual observation, the adhesion of the coatings shall be examined by observation with a magnifying glass having a magnification of about 4.

Where judgment on the coating adhesion is still difficult by the above procedure (4), the test may be supplemented by other test methods subject to agreement between the

supplier and the purchaser.

Note (⁴) For example, there are cases where it is difficult to judge whether an abnormality observed is derived from the blistering of the coatings or from a defect of the basis material. In such cases, the true cause of the abnormality should be clarified by peeling off the coatings.

8 Recording The following items shall be recorded in the report of test results.

- a) Kind of metallic coatings and operation conditions
- b) Name of test method
- c) Test conditions
- d) Date of test
- e) Other required items

9 Grinding method for adhesion test

9.1 File test method

9.1.1 Summary This test is to examine the adhesion of metallic coatings by shaving the sample with a file.

Remarks: This test is not applicable to metallic coatings harder than a file [about HRC 62 (about HV 700)], such as chromium coatings and hard nickel coatings.

9.1.2 Test appliance The file used in the test shall be a flat type file of second cut specified in JIS B 4703 or JIS B 4704.

9.1.3 Sample The sample shall be as specified in 5.

9.1.4 Test Method The test method shall be as follows.

- a) Fix the sample securely.
- b) File the cross section or edge surface of the sample cut perpendicularly to the coated surface at an angle of 45 degrees to the coated surface in the direction from the basis metal to the coating as shown in Fig. 1.

9.1.5 Judging method The judging method shall be as specified in 7.

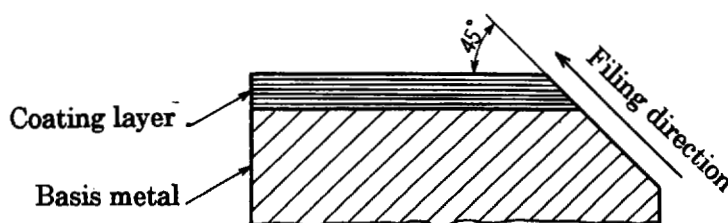


Fig. 1 Example of filing

9.2 Grinding test method

9.2.1 Summary This test is to examine the adhesion of the coating by grinding the sample surface with a grindstone.

Remarks: This test is applied mainly to hard and thick metallic coatings such as industrial chromium coatings.

9.2.2 Test apparatus and grindstone A grinding machine, a portable grinding machine, or a desk grinding machine shall be used as the test apparatus, and the grindstone used shall have a grain size #60 specified in JIS R 6001 and grades of H to M.

9.2.3 Sample The sample shall be as specified in 5.

The test surface shall be plane or cylindrical.

9.2.4 Test method The test method shall be as follows.

- Either attach the sample to a grinding machine or fix it with a suitable jig.
- Grind it gently at the grindstone peripheral speed of 10 m to 33 m per sec and with a cutting depth of 5 μm or under per passage using a sufficient quantity of grinding oil or soap solution. The metal grinding allowance shall be at least 30 μm . A clogged grindstone shall not be used.

Remarks: A metallic saw may be used in place of a grindstone.

9.2.5 Judging method Whether or not abnormalities have occurred in the portion under test shall be examined. Where partial peeling or blistering occurs, it is judged to be improper adhesion, but small cracks perpendicular to the grinding direction shall not be judged to be improper adhesion.

10 Spatula-squeezing test method

10.1 Summary This test is to examine the adhesion of the coating by rubbing the sample surface using a metallic or agate tool for spatula-squeezing.

Remarks: This test is applicable only for detection of a coating film which is extremely inferior in adhesion, and not applicable to a coated product