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Electroplated coatings of chromium for engineering purposes

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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 the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently, **JIS H 8615 : 1993** is replaced with this Standard, **JIS H 8615 : 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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Electroplated coatings of chromium for engineering purposes

Introduction This Japanese Industrial Standard has been prepared based on the corresponding International Standard as shown in the Remarks to 1 Scope without any modification of technical contents, but some items which are not specified in corresponding International Standard are supplemently specified in this Japanese Industrial Standard.

1 Scope This Japanese Industrial Standard specifies electroplated coatings (hereinafter referred to as coating) of chromium on the significant surface of iron, steel, or nonferrous basis metal for the engineering purpose to improve abrasion resistance or other properties.

Remarks: The International Standard corresponding to this Standard is as follows.

ISO 6158:1984 Metallic coatings—Electroplated coatings of chromium for engineering purposes

Informative reference: The services and the thickness of this coatings are shown as an example in Informative Attached Table 1.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard.

JIS B 0601 *Surface roughness—Definitions and designation*

JIS B 7502 *Micrometer callipers*

JIS B 7515 *Cylinder gauges*

JIS H 0400 *Glossary of terms used in electroplating*

JIS H 0404 *Graphical symbol for electroplated coating*

JIS H 8501 *Methods of thickness test for metallic coatings*

JIS H 8502 *Methods of corrosion resistance test for metallic coatings*

JIS H 8503 *Methods of wear resistance test for metallic coatings*

JIS K 8951 *Sulfuric acid*

JIS K 8983 *Copper (II) sulfate pentahydrate*

JIS Z 2244 *Vickers hardness test—Test method*

JIS Z 9031 *Random sampling methods*

3 Definitions For the purpose of this Standard, the definitions in JIS H 0400 apply, and the rest of the terms are as follows.

- a) **significant surface** The surface of the parts which is plated or to be plated and whose coating is essential for performance and appearance.
- b) **porous chromium coatings** This is chromium coatings on which grooves or holes are formed, and classified into the following two types.

- 1) **Etching type** After electroplating, the surface of coating is electrolytically etched to make its surface porous, and this type is subclassified into channel type, pinpoint type, and intermediate type.
- 2) **Knurling type** Basis material is mechanically processed to make it porous, and thus the plated surface gets micropores.
- c) **porosity** Porosity is defined by the percentage ratio of the area occupied by grooves or holes to whole area to an arbitrary area on the plated coating of porous chromium coating.

Informative reference: For special applications, chromium coatings other than regular chromium coatings may be required.

- 1) **Crack-free chromium coatings** These coatings, which are less hard, less brittleness, and essentially are free from cracking, offers greater corrosion resistance than regular chromium coating. The deposit should not normally exceed 25 μm in thickness, and shall not finished by grinding nor used on highly loaded surface. The heat treatment applied on this surface may adversely affect the corrosion protection.
- 2) **Porous chromium coatings** Porous chromium coatings are produced either by mechanical, chemical, or electrochemical treatment to obtain oil-retaining surface. The method for the determination of the degree or type of porosity (for example channel or point) and criteria of acceptance shall be specified.
- 3) **Cracked chromium coatings** Cracked chromium coatings are intentionally made by micro-crack pattern which is invisible with naked eyes and has more than 250 cracks per centimeter in any direction over the whole of the significant surface. In case of macro-cracked coatings, it has fewer than 250 cracks per centimeter. Cracked chromium coatings are usually equivalent in hardness to regular chromium coating, and due to their structure, retain oil more readily. Micro-cracked chromium coatings confer increased corrosion protection when compared to macro-cracked chromium, if applied over an undercoat of nickel.
- 4) **Duplex chromium coatings** This coating comprises a layer of regular chromium applied over an undercoat of crack-free chromium. Its hardness is, therefore, similar to that of regular chromium but it confers greater corrosion protection.

4 Symbol for coating The symbol for coating adopts the chemical symbol of element for chromium "Cr" following the symbol "I" expressing industry, and the rest of the symbols are according to **JIS H 0404** and Table 1.

**Table 1 Symbol for processing
before and after plating**

Processing method	Before plating	After plating
Buffing	1BF	2BF
Porous processing	1P	2P
Lapping	1GL	2GL
Super finishing	1GSP	2GSP
Liquid honing	1LH	2LH
Blast finishing	1SB	2SB
Grinding process	1G	2G

Remarks 1 When two or more processes apply before and after plating, their symbols are put orderly from left to right with inserting comma between them.

2 The final surface roughness of coating shall follow **JIS B 0601**.

5 Quality

5.1 Appearance of coatings When appearance of coating is tested according to 8.2, its surface shall be flat and smooth, and free from detrimental defects to use such as burnt deposits or blisters. In the case of mat finish (for example, liquid honing, blast finishing, porous processing), however, flat and smooth surface are not necessarily needed.

5.2 Surface roughness of coatings The surface roughness of coatings shall relate only to the service highly regarding this quality, and its quality shall follow the agreement between the parties concerned with delivery.

5.3 The minimum thickness of coating and its tolerance The minimum thickness of coating and its tolerance shall relate only to the service highly regarding this quality, and the requirements on the quality, when being tested according to 8.3, shall follow the agreement between the parties concerned with delivery.

5.4 Porosity of coatings The porosity of coating shall relate only to the service highly regarding this quality, and the requirements on the quality, when being tested according to 8.4, shall follow the agreement between the parties concerned with delivery.

5.5 Adhesiveness of coatings When the adhesiveness of coatings is tested according to 8.5, there shall be no peeling or blister on the coating.

5.6 hardness of coatings When the hardness of coatings is tested according to 8.6, Vickers hardness shall be at least 750. Depending on its serviceability, however, the Vickers hardness may be left to the agreement between the parties concerned with delivery.

5.7 Abrasion resistance of coatings The abrasion resistance of coatings shall relate only to the service highly regarded this quality, and the requirements on the quality, when being tested according to 8.7, shall follow the agreement between the parties concerned with delivery.

5.8 Corrosion resistance of coatings The corrosion resistance of coating shall relate only to the service highly regarding this quality, and the requirements on the quality, when being tested according to 8.8, shall follow the agreement between the parties concerned with delivery.

6 Basis material The condition of basis material prior to plating gives serious influences on the quality of coatings. Especially, when the basis material is supplied from purchaser, the purchaser must indicate the information concerning the basis material on a process specification or others.

Remarks: Processor investigates with naked eyes whether the defects, that is, holes or cracks or films which are detrimental and undesirable for final finish, are existing or not. If these defects are found, they must be informed to the purchaser before coating process will start. Furthermore, if the coating becomes failure results because of the surface defects whose discovery is visually impossible, the processor should not take any responsibility for the failure.

7 Treatment of basis metal before and after electroplating

7.1 Shot-peening treatment When, for the purpose to improve its fatigue strength, shot-peening treatment is specified, the conditions for its treatment shall be left the agreement between the parties concerned with delivery.

Unless otherwise the strength of shot peening is specified, set up the strength of shot peening according to the method shown in Annex 1.

7.2 Plating of undercoat When, for the purpose to improve the corrosion resistance of coatings, undercoat is carried out, the type and thickness of the undercoat shall follow the agreement between the parties concerned with delivery.

7.3 Stress relief before electroplating When stress relief before electroplating is specified for such basis metal as steel, the conditions required for it shall follow the agreement between the parties concerned with delivery.

The conditions for thermal treatment for stress relief before electroplating, which have been stated in the corresponding International Standard, are shown in Annex 3 (informative).

7.4 Hydrogen embrittlement relief after electroplating When hydrogen embrittlement relief after electroplating is specified for such basis metal as iron or steel, the hydrogen embrittlement relief shall be carried out owing to thermal treatment within 4 hours after electroplating. The conditions for thermal treatment shall follow the agreement between the parties concerned with delivery.

The conditions for thermal treatment for hydrogen embrittlement relief after electroplating, which have been stated in the corresponding International Standard, are shown in Annex 4 (informative).