

Australian Standard™

Electroplated coatings—Silver



This Australian Standard was prepared by Committee MT-009, Metal Finishing. It was approved on behalf of the Council of Standards Australia on 2 June 2004. It was published on 7 July 2004.

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Australian Chamber of Commerce and Industry
Australian Industry Group
Australian Institute of Metal Finishing
Australian Paint Manufacturers Federation
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This Standard was issued in draft form for comment as DR 04017.

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1856—2004

Electroplated coatings—Silver

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Technical Committee MT-009 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 20 March 2017.

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NOTES

Australian Standard™

Electroplated coatings—Silver

Originated in part as AS K161—1966, AS CK12—1966 and AS 1857—1976.
Previous edition AS 1856—1991.
Third edition 2004.

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Published by Standards Australia International Ltd GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 6114 3

PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee MT-009, Metal Finishing at the request of industry to supersede AS 1856—1991, *Electroplated coatings—Silver*. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify the requirements for silver electroplated coatings.

The objective of this revision is to include new plating classifications, applications and hydrogen embrittlement treatments.

In the preparation of this Standard cognizance was taken of ISO 4521:1985, *Metallic coatings—Electrodeposited silver and silver alloy coatings for engineering purposes*, and ASTM B700-97:2002, *Electrodeposited coatings of silver for engineering use*.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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FOREWORD

Silver electroplated coatings for engineering purposes are required primarily to fulfil non-decorative functional tasks, while those for decorative purposes are required when the appearance of the finished article is of prime importance. However, protection against corrosion may be a requirement in both cases.

Electrodeposited silver and silver alloy coatings for engineering applications are chosen because of their extremely good electrical conductivity. However, in many conditions of service, the presence of sulfide films on coatings may increase the electrical contact resistance of the silver electroplated mating surfaces, making them unsuitable for use in low voltage electronic circuits. Because silver sulfide films offer only limited electrical resistance, they may not be detrimental to other electrical contacts where higher voltages or higher contact pressures are used.

Packaging materials such as paper and cardboard should be free from significant contamination by sulfur compounds to prevent the tarnishing of silver and silver alloy electrodeposited coatings. Anti-tarnish treatments may be applied to prevent or delay tarnishing, but these treatments may increase contact resistance and may only prove useful in certain cases.

Attention is drawn to the following possible resulting effects of silver coatings:

- (a) Ionic migration of silver in electronic circuits, particularly if the insulating material is damp.
- (b) Galling (cold welding) when two similar silver surfaces (for example two ‘bright’ or two ‘dull’ coatings) are used in sliding contact.

STANDARDS AUSTRALIA

Australian Standard

Electroplated coatings—Silver

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for the electrodeposited coatings of silver used for engineering purposes that may be matt, bright, or semi-bright and are not less than 98 percent silver purity.

The requirements also specify thickness, quality and testing of electroplated coatings of silver on metallic and non-metallic materials for decorative, protective, electrical contact characteristics, high electrical and thermal conductivity, thermocompression bonding, wear resistance of load-bearing surfaces, spectral reflectivity, solderable surfaces and other general engineering applications.

NOTES:

- 1 The guidelines for the purchasing requirements are shown in Appendix A.
- 2 The means of demonstrating compliance with this Standard are shown in Appendix B.
- 3 Applications for the electrodeposition of silver coatings are shown in Appendix C.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1199	Sampling procedures for inspection by attributes
1199.0	Part 0: Introduction to the ISO 2859 attribute sampling system
1199.1	Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
1627	Metal finishing—Preparation and pretreatment of surfaces
1627.1	Part 1: Removal of oil, grease and related contamination
1627.2	Part 2: Power tool cleaning
1627.4	Part 4: Abrasive blast cleaning
1627.5	Part 5: Pickling
1627.6	Part 6: Chemical conversion treatment of metals
1817	Metallic materials—Vickers hardness test
1817.1	Method 1: Test methods (ISO 6507-1:1997, MOD)
2331	Methods of test for metallic and related coatings
2331.1.1	Method 1.1: Local thickness tests—Micrographic examination of cross-sections
2331.1.5	Method 1.5: Local thickness tests—Beta-backscatter method
2331.1.6	Method 1.6: Local thickness tests—Taper section method
2331.2.1	Method 2.1: Tests for average coating mass per unit area or for thickness—Dissolution methods—Strip and weigh, and analytical
2331.3.4	Method 3.4: Corrosion and related property tests—Thioacetamide anti-tarnish and porosity tests

AS

- 2331.3.8 Method 3.8: Corrosion and related property tests—Humidity test—24 h cycle, damp heat
- 2331.4.1 Method 4.1: Physical tests—Qualitative adhesion tests
- 2400 Packaging
- 2400.6 Part 6: Paper and paperboard
- 2400.21 Part 21: Packaging of dangerous goods
- 2483 Metal finishing—Recommended sampling plans for the inspection and testing of coatings (ISO 4519:1980, MOD)
- 4108 Metal finishing—Glossary of terms used in electroplating and related processes
- 4291 Mechanical properties of fastener made of carbon steel and alloy steel
- 4291.1 Part 1: Bolts, screws and studs

AS/NZS ISO

- 9001 Quality management systems—Requirements
- 9004 Quality management systems—Guidelines for performance improvements
- HB 18 Guidelines for third-party certification and accreditation
- HB 18.28 Guide 28—General rules for a model third-party certification scheme for products

IEC

- 60068 Environment testing
- 60068-2-43 Part 2-43: Tests—Test Kd: Hydrogen sulphide test for contacts and connections
- 60512 Connectors for electronic equipment—Test and measurements
- 60512-2-2 Part 2-2: Electrical continuity and contact resistance tests—Test 2b: Specified test current method

ISO

- 12686 Metallic and other inorganic coatings—Automated controlled shot-peening of metallic articles prior to nickel, autocatalytic nickel or chromium plating, or as a final finish

ASTM

- E1004 Standard practice for determining electrical conductivity using the electromagnetic (Eddy-Current) method

1.3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 4108 and those below apply.

1.3.1 Coated specimen

A test piece made from the same basis metal as the plated item and which has been processed at the same time as the plated item.

1.3.2 Finished state

The condition of the item at the completion of all electroplating operations.

1.3.3 Rack-plating

An electrodeposition process in which articles to be coated are mounted on racks or other fixtures during the process.

1.3.4 Significant surface

That part of the surface to be covered by the coating and which is essential to the appearance and serviceability of the item.

NOTE: The significant surface is deemed to be that surface, specified in a product specification or by the purchaser, on which the coating is required to comply with all specified requirements, including appearance. In most cases the significant surface will be evident to the electroplater but at times, because of the complex nature of items or specific service requirements, the purchaser may require specific parts of the surface to be treated as part of the significant surface. In such cases the purchaser should provide suitably marked drawings or suitably marked specimens.

1.3.5 Strike

An electrodeposition process of short duration applied to the basis metal or undercoat to assist the adhesion of subsequent electrodeposits and to limit metallic contamination of the electrolyte and/or subsequent electrodeposits.

1.3.6 Surface

The surface of the items on which the electroplater is to work.

1.4 TEST SPECIMENS

Whenever possible coating tests should be carried out on the coated items. Where the direct determination of any particular property of the coating cannot be carried out, separate specimens should be used. In such cases, the basis material shall be the same as the items being plated and be of similar size and shape. These separate specimens shall be introduced at regular intervals into the production batches of the items they are to represent, at the stage prior to initial cleaning before plating, and shall not be separated from a production batch until the entire process is complete.

The conditions likely to affect the quality of plating on the separate specimens, such as spacing and positioning in relation to anodes and the other items being coated, shall correspond as nearly as possible to those of the items they represent.

NOTE: When test specimens are used to represent a coated article in a thickness test, the specimens will not necessarily have the same thickness and thickness distribution as the article unless the specimens and the articles are of the same general size and shape. Therefore, before coated articles may be accepted on the basis of a thickness test performed on test specimens, the relationship between the thickness on special test specimens and the thickness on the part needs to be estimated. The criterion of acceptance is that the thickness on the specimen corresponds to the required thickness on the articles.

1.5 SAMPLING

Sampling of electroplated components shall be in accordance with AS 2483.

1.6 MARKING

All silver-plated items for engineering uses and those over 30 µm for decorative purposes shall be clearly and durably marked with their designation, (see Clause 2.5).

Examples:

- (a) Decorative—98 Ag 40
- (b) Engineering—Cu—/Ag10/T1/A/N

NOTES:

- 1 Manufacturers making a statement of compliance with this Standard on a product, or on packaging or promotional material related to that product, are advised to ensure that such compliance is capable of being verified.
- 2 Where physical reasons exists, such as size, that prohibit the durable marking of each item, agreement should be reached with the customer on a suitable means of identification.
- 3 The marking should be on a non-significant surface or as agreed otherwise between customer and supplier.

1.7 PACKAGING

Some packaging materials may emit fumes that can be deleterious to the appearance or performance, or both, of electroplated silver surfaces. Useful guidelines for commercial packaging are described in AS 2400.6 and AS 2400.21.