

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1457

ELECTROPLATED COATINGS OF COPPER PLUS NICKEL
PLUS CHROMIUM ON STEEL (OR IRON)

1st EDITION

April 1970

COPYRIGHT RESERVED

The copyright of ISO Recommendations and ISO Standards belongs to ISO Member Bodies. Reproduction of these documents, in any country, may be authorized therefore only by the national standards organization of that country, being a member of ISO.

For each individual country the only valid standard is the national standard of that country.

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 1457, *Electroplated coatings of copper plus nickel plus chromium on steel (or iron)*, was drawn up by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, the Secretariat of which is held by the Ente Nazionale Italiano di Unificazione (UNI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1457 which was circulated to all the ISO Member Bodies for enquiry in May 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Israel	Spain
Czechoslovakia	Italy	Sweden
Finland	Netherlands	Switzerland
France	New Zealand	Thailand
Germany	Norway	Turkey
Hungary	Poland	U.A.R.
India	Portugal	United Kingdom
Iran	South Africa, Rep. of	U.S.A.

No Member Body opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in April 1970, to accept it as an ISO RECOMMENDATION.

FOREWORD

This ISO Recommendation covers a range of coatings of copper plus nickel plus chromium on steel (or iron) for various service conditions. In this ISO Recommendation the surface condition of the basis metal prior to plating is not specified and agreement should be reached between the plater and the purchaser regarding the degree of roughness of the basis metal that is acceptable.

The purchaser should specify the service condition number denoting the severity of the conditions the coating is to withstand. It is not necessary to state the classification number of the coating, defined in terms of the nature, thickness and properties of the deposits it comprises, but the purchaser may include this if he wishes.

For copper, nickel and chromium deposits, the minimum thickness requirements apply only to those portions of the significant surface that can be touched by a ball 20 mm in diameter. If the design of the article is such that it cannot at all points be touched by a 20 mm ball, the minimum thickness permitted on specified areas should be agreed between the purchaser and the supplier.

The duration of the laboratory corrosion tests is varied according to the service condition number. Acceptance or rejection of an article subjected to corrosion tests is governed by the extent of basis metal corrosion. Surface deterioration of the coating itself will occur on some types of coating, and it is recommended that the extent to which this can be tolerated should be subject to agreement between supplier and purchaser.

IT IS ESSENTIAL THAT THE PURCHASER STATE THE BASIS METAL AND THE SERVICE CONDITION NUMBER; IN ADDITION HE MAY ALSO STATE THE CLASSIFICATION NUMBER.

MERELY TO ASK FOR PLATING TO BE CARRIED OUT IN ACCORDANCE WITH ISO RECOMMENDATION R 1457 WITHOUT THIS ADDITIONAL INFORMATION IS INSUFFICIENT.

ELECTROPLATED COATINGS OF COPPER PLUS NICKEL PLUS CHROMIUM ON STEEL (OR IRON)

1. SCOPE

This ISO Recommendation defines the characteristic properties as well as the classification and the symbols of electroplated coatings of copper plus nickel plus chromium on steel (or iron). Furthermore, it describes, in annexes, the test methods for these coatings.

2. FIELD OF APPLICATION

This ISO Recommendation applies to electroplated coatings defined in section 1, *except* for the following :

- coatings applied to machine screw threads (with tolerance);
- coatings applied to sheet, strip or wire in the unfabricated form, or to coil springs;
- coatings applied for other than protective and decorative purposes.

3. DEFINITION

For the purposes of this ISO Recommendation the following definition applies :

Significant surface. The part of the surface which is essential to the appearance or serviceability of the article and which is to be covered by the coating.

When necessary, the significant surface should be the subject of agreement, and should be indicated on drawings, or by provision of suitably marked samples.

4. APPEARANCE

Over the significant surface, the plated article should be free from clearly visible plating defects such as blisters, pits, roughness, cracks or unplated areas, and should not be stained or discoloured. The extent to which blistering can be tolerated on non-significant surfaces should be the subject of agreement between supplier and purchaser. On articles where a contact mark is inevitable, its position should also be the subject of agreement between the supplier and the purchaser.

The article should be clean and free from damage. The purchaser should state the appearance required, for example bright, dull or satin. Alternatively, a sample showing the required finish should be supplied or approved by the purchaser.

5. HEAT TREATMENT FOR STEEL

When required by the purchaser, heat treatment as described below should be performed on certain steels to reduce the risk of damage by hydrogen embrittlement.

5.1 Stress relief before plating

- 5.1.1 Severely cold-worked steel parts, or parts made from steel of tensile strength of about 1000 MN/m² (100 kgf/mm²) or greater which have been ground or subjected to severe machining after tempering, should normally be stress relieved. As a guide, they may be maintained, preferably, at the highest temperature within the limit imposed by the tempering temperature for 30 minutes, or maintained at 190 to 210 °C for not less than 1 hour.
- 5.1.2 Some steels which have been carburized, flame-hardened or induction-hardened and subsequently ground would be impaired by the treatment given as guidance in clause 5.1.1, and should instead be stress relieved at a lower temperature; for example at 170 °C for not less than 1 hour.

5.2 Heat treatment after plating

- 5.2.1 Components subject to fatigue or sustained loading stresses in service and made from severely cold-worked steels or from steels of tensile strength of about 1000 MN/m² (100 kgf/mm²) or greater should be heat treated after plating. Guidance is given in Annex L.
- 5.2.2 Where the proposed temperature of heat treatment would be harmful, as for some surface-hardened parts, a lower temperature for a longer time may be required.

6. COATING REQUIREMENTS

6.1 Manner of specifying requirements

When ordering the plating of articles in accordance with this ISO Recommendation, the purchaser should state, in addition to the number of the ISO Recommendation, the service condition number denoting the severity of the conditions the coatings are required to withstand (see clause 6.2). He need not, but he may if he wishes, also state the classification number of the particular coating required (see clause 6.3). If the service condition number is quoted and not the classification number, the supplier is free to supply any of the classes of coating corresponding to the service condition number, but he should inform the purchaser of the classification number of the coating supplied.

6.2 Grading of service conditions

The service condition number indicates the severity of the service conditions in accordance with the following scale :

- 4 — exceptionally severe
- 3 — severe
- 2 — moderate
- 1 — mild

6.3 Classification of coatings

The classification number comprises the following elements :

- the chemical symbol, Fe, for the basis metal (steel or iron), followed by an oblique stroke;
- the chemical symbol for copper, Cu;
- a number indicating the minimum thickness (in micrometres) of the copper coating;
- the chemical symbol for nickel, Ni;
- a number indicating the minimum thickness (in micrometres) of the nickel coating;
- a letter designating the type of nickel deposit;
- the chemical symbol for chromium, Cr;
- a letter designating the type of chromium deposit and its minimum thickness.