UDC 669.248.87 : 620.198

Ref. No. : ISO/R 1458-1970 (E)

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1458

ELECTROPLATED COATINGS OF NICKEL

1st EDITION

April 1970

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 1458, *Electroplated coatings of nickel*, 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. 1458 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 nickel for various service conditions on steel (or iron), zinc alloys and copper or copper alloys.

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 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.

Nickel coatings without chromium topcoats are suitable for applications in which tarnishing is prevented by rubbing or handling in service or in which loss of lustre is of no importance. In many applications resistance to wear and abrasion is as important as resistance to corrosion, while in other applications resistance to fracture or deformation in service is an essential feature. Thus the requirements for hardness and ductility as well as lustre should be borne in mind when selecting the type and thickness of nickel to be used.

IT IS ESSENTIAL THAT THE PURCHASER STATE THE CLASSIFICATION NUMBER : MERELY TO ASK FOR PLATING TO BE CARRIED OUT IN ACCORDANCE WITH ISO RECOMMENDATION R 1458 WITHOUT THIS NUMBER IS INSUFFICIENT.

ISO Recommendation R 1458 April 1970

ELECTROPLATED COATINGS OF NICKEL

1. SCOPE

This ISO Recommendation defines the required properties as well as the classification and the symbols of electroplated coatings of nickel on steel (or iron), zinc alloys and copper and copper alloys. 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 the 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/m^2 (100 kgf/mm^2) 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 by 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/m^2 (100 kgf/mm^2) or greater, should be heat treated after plating. Guidance is given in Annex E.

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 classification number of the particular coating required (see clause 6.2).

6.2 Classification of coatings

The classification number comprises the following elements :

- the chemical symbol for the basis metal (or for the principal metal in the case of an alloy), followed by an oblique stroke;
- 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.

6.2.1 *Basis metal.* The following chemical symbols are used :

- Fe for steel (or iron);
- Zn for zinc alloy;
- Cu for copper or copper alloy.

6.2.2 *Nickel deposit*. The number following the chemical symbol Ni indicates, in micrometres, the minimum thickness of the nickel deposit, measured by the method given in Annex B, at points on the significant surface agreed between the purchaser and the supplier or at any point on the significant surface that can be touched by a ball 20 mm in diameter.

The type of nickel* is designated by the following symbols :

b – for nickel deposited in the fully bright condition;

p – for dull or semi-bright nickel requiring polishing to give full brightness containing less than 0.005 % sulphur**, and having an elongation greater than 8 % when tested by the method given in Annex A;

d – for a double-layer or triple-layer nickel coating, of which the bottom layer contains less than 0.005 % sulphur**, and has an elongation greater than 8 % when tested by the method given in Annex A and the top layer contains more than 0.04 % sulphur**; the thickness of the bottom layer in double-layer coatings should be not less than 60 % of the total nickel thickness and in triple-layer coatings should be not less than 50 % of the total nickel thickness, the thickness of the top layer in either case being not less than 20 % of the total nickel thickness. If there are three layers, the intermediate layer should contain more sulphur than the top layer and should not exceed 10 % of the total nickel thickness.

6.3 Coatings appropriate to each application grade

Tables 1 to 3 show, for the various basis metals, the coating classification number appropriate for each application grade.

TABLE 1 – Coatings on steel (or iron)

Application grade	Classification number
High*	Fe/Ni30b
Medium*	Fe/Ni20b
Low*	Fe/Ni10b

* p or d nickel may be substituted for b nickel for each application grade.

TABLE 2 – Coatings on zinc alloy

All these coatings should be applied over an undercoat of copper or brass (at least 50 % copper) having a minimum thickness of 8 μm, but for articles of complex shape the minimum thickness on the significant surface may need to be increased to 10 or 12 μm in order to achieve adequate coverage. The method for determining the thickness of the undercoat is given in Annex B.

Application grade	Classification number
High*	Zn/Cu Ni25b
Medium*	Zn/Cu Ni15b
Low*	Zn/Cu Ni8b

* p or d nickel may be substituted for b nickel for each application grade.

* It will usually be possible to identify the type of nickel by microscopical examination of a polished and etched section of an article prepared according to Annex B.

** The sulphur contents are specified in order to indicate the type of nickel plating solution that is to be used. No simple method exists for determining the sulphur content of a nickel deposit on a coated article. An accurate determination is possible on a specially prepared test specimen.

TABLE 3 – Coatings on copper or copper alloy

Application grade	Classification number
High*	Cu/Ni20b
Medium*	Cu/Ni10b
Low*	Cu/Ni5b

* p or d nickel may be substituted for b nickel for each application grade.

6.4 Adhesion

Adhesion of the coating should be tested by one of the methods given in Annexes C and D. The coating should continue to adhere to the basis metal when subjected to the test selected.