
INTERNATIONAL STANDARD



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**Metallic and other non-organic coatings – Corrodkote
corrosion test (CORR test)**

*Revêtements métalliques et autres revêtements non organiques – Essai de corrosion Corrodkote
(Essai CORR)*

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4541 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in November 1976.

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It has been approved by the member bodies of the following countries :

Australia	Italy	Spain
Austria	Japan	Sweden
Bulgaria	Korea, Rep. of	Switzerland
Czechoslovakia	Mexico	Turkey
France	Philippines	United Kingdom
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No member body expressed disapproval of the document.

Metallic and other non-organic coatings — Corrodkote corrosion test (CORR test)

0 INTRODUCTION

In many instances, there is no direct relation between the results of an accelerated corrosion test and the resistance to corrosion in other media, because several factors which influence the progress of corrosion, such as the formation of protective films, vary greatly with the conditions encountered. The results obtained in the test should not, therefore, be regarded as a direct guide to the corrosion resistance of the tested materials in all environments where these materials may be used. Furthermore, performance of different materials in the test cannot always be taken as a direct guide to the relative corrosion resistance of these materials in service.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the reagent, the apparatus and the procedure for assessment of the quality of metallic and related coatings by the Corrodkote procedure.

The method is primarily applicable to copper-nickel-chromium or nickel-chromium electroplated parts.

2 REFERENCES

ISO 1462, *Metallic coatings — Coatings other than those anodic to the basis metal — Accelerated corrosion tests — Method for evaluation of the results.*

ISO 3768, *Metallic coatings — Neutral salt spray test (NSS test).*

3 PRINCIPLE

Application of a slurry containing corrosive salts to test specimens, allowing the slurry to dry, and exposure of the coated specimens to a high relative humidity for a specified period of time.

4 CORRODKOTE SLURRY

Prepare the Corrodkote slurry in a glass beaker by dissolving 0,035 g of reagent grade copper(II) nitrate trihydrate $[\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}]$, 0,165 g of reagent grade iron(III) chloride hexahydrate $(\text{FeCl}_3 \cdot 6\text{H}_2\text{O})$, and 1,0 g of reagent grade ammonium chloride (NH_4Cl) in 50,0 ml of distilled

water and stirring into the solution 30,0 g of water-washed ceramic grade kaolin. Mix the slurry thoroughly with a glass stirring rod and allow it to stand for about 2 min so that the kaolin becomes saturated. Mix the slurry thoroughly with a glass stirring rod just before using.

NOTES

1 An alternative method of preparing the Corrodkote slurry is as follows: Weigh 2,50 g of copper(II) nitrate trihydrate $[\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}]$ and dilute with distilled water to the mark in a 500 ml one-mark volumetric flask. Weigh 2,50 g of iron(III) chloride hexahydrate $(\text{FeCl}_3 \cdot 6\text{H}_2\text{O})$, and dilute with distilled water to the mark in a 500 ml one-mark volumetric flask. Weigh 50,0 g of ammonium chloride (NH_4Cl) and dilute with distilled water to the mark in a 500 ml one-mark volumetric flask. Then transfer exactly 7,0 ml of the copper(II) nitrate solution, 33,0 ml of the iron(III) chloride solution and 10,0 ml of the ammonium chloride solution to a beaker and add 30,0 g of kaolin. Stir with a glass stirring rod.

2 Keep the iron(III) chloride solution in the dark in a flask fitted with a rubber or glass stopper. The iron(III) chloride solution shall not be more than 2 weeks old, since older solutions become unstable.

5 APPARATUS

5.1 The apparatus shall consist of a humidity chamber, specimen supports, provision for heating the chamber and provision for air circulation in the chamber.

5.2 The design shall be such that drops of moisture which might accumulate on the roof or walls of the chamber, or on the specimen supports, do not fall on the test specimens.

5.3 The materials of construction shall be such as not to affect the test.

6 TEST SPECIMENS

6.1 Select the type and number of test specimens to be used, as well as the criteria for evaluation of the test results, according to the specification for the coating or products being tested.

6.2 The test specimens may be solvent cleaned prior to testing, using a suitable solvent such as ethanol, diethyl ether, acetone or light petroleum. Do not use solvents that are corrosive or that deposit protective films.

6.3 Apply the Corrodkote slurry to the test specimens using a clean (paint) brush. Dip the brush in the Corrodkote slurry and, with a circular motion, completely cover the test specimen. Then smooth out the coating by brushing lightly in one direction. The wet film thickness shall be not less than 0,08 mm and not more than 0,2 mm. Allow the test specimens to dry at ambient temperature and at a relative humidity lower than 50 % for 1 h before placing them in the humidity chamber.

6.4 If the test specimens are cut from a larger coated article, carry out the cutting in such a way that the coating is not damaged, especially in the area adjacent to the cut. Take care to avoid contamination by swarf during cutting. Unless otherwise specified, protect the cut edges adequately by coating them with a suitable medium that is stable under the conditions of the test, such as paint, varnish, wax or adhesive tape.

7 POSITION OF TEST SPECIMENS DURING TEST

The position of the test specimens in the humidity chamber during the test is not critical provided that they do not touch each other or the walls, and the supports do not touch the test areas that have been coated with the Corrodkote slurry.

8 CONDITIONS IN THE HUMIDITY CHAMBER

Maintain exposure zone of the humidity chamber at 38 ± 1 °C. Maintain relative humidity of the exposure zone of the chamber between 80 and 90 % and so that condensation is not produced on any of the test specimens. Condensation is permitted on the roof and walls of the chamber if it does not reduce the humidity in the chamber below the minimum 80 %.

NOTE — A fan or blower may be used in the chamber to maintain uniform temperature and humidity. Determine the amount of air circulation in the chamber necessary to maintain these conditions for each chamber.

9 TEST CYCLE

9.1 Unless otherwise specified for the coating or product being tested, the exposure in the humidity chamber shall be continuous for periods up to 16 h. A single test period up to 16 h shall be considered as one cycle. Continuous operation implies that the humidity chamber be closed and operated continuously except for the short interruptions necessary to place or remove test specimens. Schedule operations so that these interruptions are kept to a minimum.

9.2 If more than one test cycle of 16 h or less is specified, treat the test specimen as specified in 11.1 and 11.2 after each test cycle. Apply fresh slurry for each succeeding cycle. After the last test cycle, treat the test specimen as specified in 11.1, 11.2 and 11.3.

10 PERIOD OF TEST

The period of each test cycle, as well as the number of test cycles required, shall be as stated in the specification for the coating or product being tested.

11 TREATMENT OF TEST SPECIMENS AFTER TEST

11.1 Unless otherwise specified for the material being tested, treat the test specimen after each test cycle as specified in 11.2. After the last test cycle, and if the test specimen is to be inspected between test cycles, treat the test specimen as specified in 11.2 and 11.3.

11.2 Remove the test specimen from the humidity chamber. Examine the test specimens with the slurry intact. Clean the test specimen using fresh running water and a piece of clean cheesecloth or a suitable synthetic sponge to remove all of the slurry. A mild abrasive may be used to remove any tenacious adhering materials.

11.3 As the cleaning operation described in 11.2 removes any corrosion products, it is necessary to redevelop the points of failure. This may be done in several ways, such as exposure for 4 h in the salt spray cabinet specified in ISO 3768, exposure for 24 h in a humidity chamber operated at 38 °C and 100 % relative humidity with condensation, or some other method which causes corrosion of the basis metal without any significant damage to the coating.

NOTE 4 — Corrosion products visible on the test specimen with the slurry in place are not necessarily caused by points of failure in the coating. Particles of metal accidentally deposited on the test specimen prior to humidity exposure will also cause visible corrosion products. Take care to avoid such contamination.

12 EVALUATION OF RESULTS

Criteria for the evaluation of the results of the test will usually be given in the specification for the coating or product tested. For most applications of the test, only the following need to be considered :

- a) the appearance after test;
- b) the appearance after removing superficial corrosion products;
- c) the number and distribution of corrosion defects, i.e. pits, cracks, blisters, etc. These may conveniently be assessed by methods such as that specified in ISO 1462.

13 TEST REPORT

Unless otherwise prescribed in the specifications, the test report shall contain the following information :

- a) the specification of the basis material tested;
- b) the type of coating, with an indication of its surface finish;

- c) the number of the test specimens of each coating or product subjected to the test;
- d) the dimensions and shape of the test specimens and the nature and area of the surface tested;
- e) the preparation of the test specimens, including any cleaning treatment applied and any protection given to edges or other special areas;
- f) the method, if any, used to clean the test specimens after test with, when appropriate, an indication of the loss of mass resulting from the cleaning operation;
- g) the temperature readings within the exposure zone of the humidity chamber;
- h) the relative humidity readings within the exposure zone of the humidity chamber;
- i) the exposure period for each cycle and the number of cycles;
- j) an indication of the precautions taken to verify that all the requirements stated in this International Standard have been met;
- k) the behaviour of any reference panels placed in the test chamber at the same time as the test specimens;
- l) the results of all inspections.

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