BS EN 1965-2:2011

BSI Standards Publication

Structural adhesives — Corrosion

Part 2: Determination and classification of corrosion to a brass substrate

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National foreword

This British Standard is the UK implementation of EN 1965-2:2011. It supersedes BS EN 1965-2:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/52, Adhesives.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Strukturklebstoffe - Korrosion - Teil 2: Bestimmung und Klassifikation der Korrosion eines Messingmaterials

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Foreword

This document (EN 1965-2:2011) has been prepared by Technical Committee CEN/TC 193 “Adhesives”, the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2011, and conflicting national standards shall be withdrawn at the latest by November 2011.

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1 Scope

This European Standard describes a method to determine the ability of an adhesive to corrode a brass substrate under the influence of an applied voltage and high humidity. The temperature, humidity, ageing period and applied voltage are chosen to ensure the maximum differentiation between the corrosivity of different adhesives and are not intended to represent any particular service condition.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 923:2005+A1:2008, *Adhesives — Terms and definitions*

EN ISO 291, *Plastics — Standard atmospheres for conditioning and testing (ISO 291:2008)*

EN ISO 8044:1999, *Corrosion of metals and alloys — Basic terms and definitions (ISO 8044:1999)*

ISO 426 (all parts), *Wrought copper-zinc alloys — Chemical composition and forms of wrought products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 923:2005+A1:2008 and the following apply.

3.1
corrosion
destructive attack on metals which can be chemical or electrochemical in nature

NOTE The described method measures essentially an electrochemical attack.

4 Principle

Two brass electrodes are held in contact with a flat sample of the cured adhesive. The assembly is placed in an environment with a relative humidity of 92 % at 42 °C and a direct current voltage of 100 V is applied across the electrodes for four days. Following this the brass surface is examined and the extent of the tarnishing and/or corrosion decided on the basis of discolouration.

5 Products, materials and apparatus

5.1 Solvents.

Alcohol pure: for example propan-2-ol or ethanol.

5.2 Brass electrode, consisting of 0,1 mm thick brass, Ms63F45 or Ms63F55 of width 10 mm.

The length of the foil shall be adapted to the test equipment in accordance with ISO 426 (all parts).

5.3 Etching solution, consisting of 73 % concentrated sulfuric acid (98 %), 26 % concentrated nitric acid (63 %), 0,5 % sodium chloride, 0,5 % carbon black.

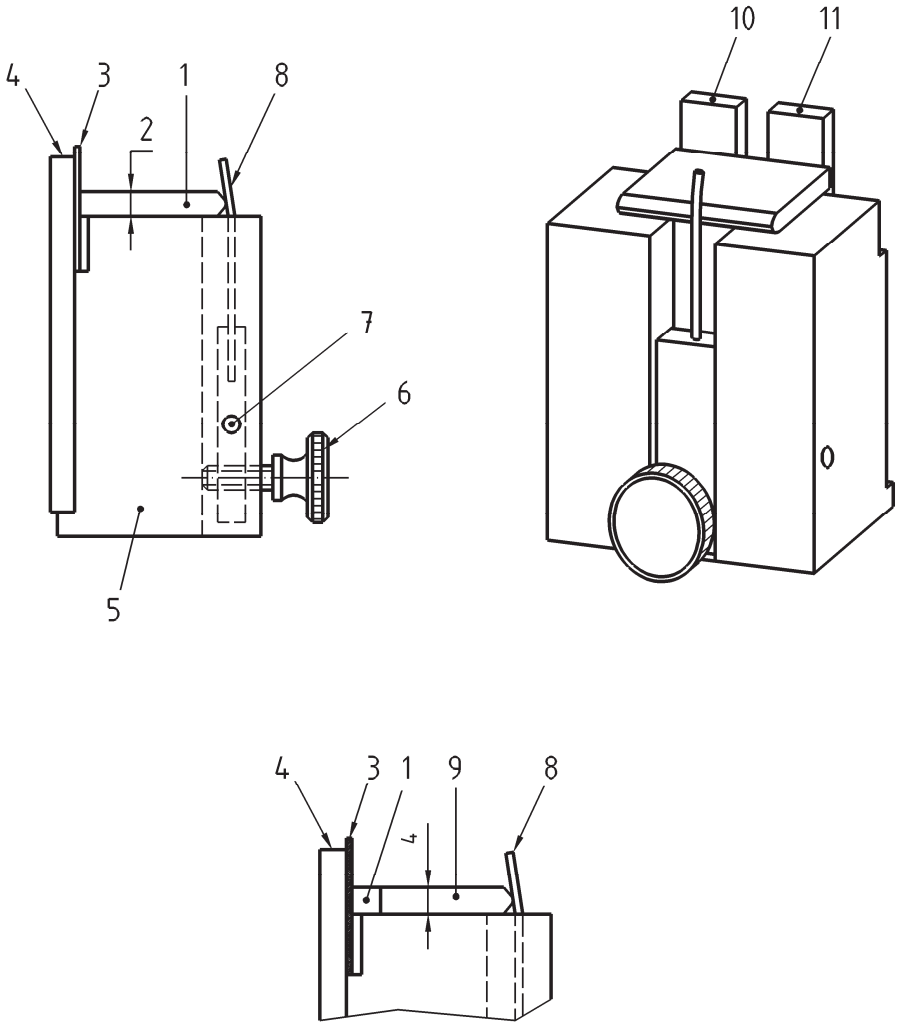
5.4 Conditioning chamber, capable of maintaining a hot/humid climate in accordance with EN ISO 291.

5.5 Direct current source (100 ± 5) V, e.g. a battery, or rectifying equipment with a maximum permissable electrodyne alternating current not greater than 1 %.

5.6 Magnifier, with a magnification of 2,5 ×.

5.7 Electrode and clamping, in accordance with Figure 1.

This shall be constructed from inert insulating materials which do not cause additional corrosion under the test conditions. The brass test foils shall make contact with the entire test area of the test specimen with a pressure of about 0,1 MPa.



Key

1 Test specimen
2 Thickness
3 Test foil
4 Electrode
5 Block of insulating material
6 Adjusting screw
7 Pivot
8 Spring
9 Intermediate piece of insulating material
10 Positive electrode
11 Negative electrode

Figure 1 — Test equipment for assessing the effect of electrolytic corrosion

6 Preparation of the brass substrate

Degrease strips of the foil, about 200 mm long and without any flash, with acetone solvent. Immediately afterwards immerse in the etching solution (5.3) (maintained at 15 °C to 25 °C) for 15 s. Rinse the foil under running water to remove the etching solution (5.3). Repeat this procedure as necessary until the brass foil has an even, dull lustre. Immediately afterwards immerse the brass foil in pure alcohol (5.1) dry with blotting paper and cut into pieces of suitable length.

7 Test specimens

The thickness of the test specimens shall correspond to the relevant product thickness. The test surfaces shall be machined and flat and be at right angles to the edges. The material to be tested shall protrude a few tenths of a millimetre beyond the holding plates. Remove any flash left following machining with a sharp knife. Finally clean the machined test specimens with pure alcohol.

NOTE The etching solution should be freshly made and used only once. The roughness of the brass surface has an influence on colouration and can lead to faulty assessments. An even, dull surface reveals more marked colourations than a semi-matt or glossy surface.

CAUTION — The etching solution is corrosive.

A minimum of three test specimens shall be used for each evaluation.

8 Procedure

Ensure that the surface of the electrode in contact with the brass test foils is not discoloured.

Insert the test specimens and test foils in the test equipment using tweezers. Do not handle them under any circumstances.

Preheat the test equipment with test specimens and test foils in position to 42 °C to 45 °C and place it in the warm humid environment. This is to ensure that condensation on the test specimen is avoided. This is critical as liquid water in contact with the test specimens and foils can form an electrolyte, significantly increasing the rate of electrolytic corrosion.

Place the preheated, assembled, test fixture in the warm humid environment and connect to the direct current source.

Continue ageing under these conditions for four days.

On completion of the above ageing, remove the test equipment from the humidity chamber and cool it to room temperature.

Remove the test foils and examine the face in contact with the test specimen with a magnifier (5.1).

Examine with particular attention the positive pole for signs of the green products of corrosion, red colouration (start of dezincification, see EN ISO 8044:1999 for definition) or tarnishing. Examine the negative pole for signs of discolouration.

NOTE With some materials, colourations occur during these tests which are not due to electrolytic corrosion and are recognizable as light brown to dark layers (tarnishing). These non-corrosive colourations consist of a uniform covering over the width of the test area on the brass foils and occur both at the positive and negative electrodes and result without the application of direct current. Therefore, it is possible to confirm that these colourations are not caused by electrolysis by placing the test equipment in the humidity cabinet but without applying the direct current.

9 Discolouration/corrosion

This is graded as follows, following the above described examinations:

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Plus pole grade A…. to…..B (see Annex A)

Minus pole grade 1 to 4.

10 Test report

The test report shall include the following information:

a) a reference to this European Standard, i.e. EN 1965-2;

b) type and designation of the product tested;

c) description of the substrate preparation procedure;

d) description of the type and thickness of the substrates;

e) conversion/discolouration grade ranking;

f) details of any operations not specified in this European Standard together with details of any events likely to have had an effect on the results.

Annex A
(normative)

Gradings for the appearance of plus pole and minus pole test foils at the surface of contact at the test specimen

Table A.1 — Gradings for the appearance of plus pole and minus pole test foils at the surface of contact at the test specimens

Plus pole test foil			
Description	**Figurative for test specimen thickness 4 mm**	**Figurative for test specimen thickness 1,5 mm**	**Grading**
Non changes	*	*	A
Slight tarnishing and marking	*	*	AN
Slight red colouration (start of dezincification)	*	*	A/B
Heavy red colouration (advanced dezincification). Green products of corrosion in the form of small specks. (The changes described can also occur jointly.)	*	*	B
Minus pole test foil			
Description	**Figurative for test specimen thickness 4 mm**	**Figurative for test specimen thickness 1,5 mm**	**Grading**
Non changes	*	*	1
Slight colouration, recognizable as fine dots or lines.	*	*	1.2
Progressive colouration (brown).	*	*	1.4
Colouration (black) in the form of isolated small specks, possibly also accompanied by colouration as under 1.4.	*	*	1.6
Colouration (black) in the form of a greater number of small specks, possibly also accompanied by colouration as under 1.4.	*	*	1.8
Mainly colouration (black) in the form of a greater number of small specks, possibly also accompanied by colouration as under 1.4.	*	*	2
Colouration (black), to all intents connected, over the entire area of contact of the test specimen, possibly also accompanied by lighter zones (brown).	*	*	3
Colouration (black), connected and extending considerably beyond the area of contact of the test specimen, possibly also accompanied by lighter zones (brown).	*	*	4
* The coloured representation on the test foil can be taken from EN 60426, see Bibliography.			

Bibliography

[1] EN 60426, *Electrical insulating materials — Determination of electrolytic corrosion caused by insulating materials — Test methods (IEC 60426:2007)*

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