

Appendix A

German test method TL 8135-002

Testing of Anti-Corrosive Effect of VCI Auxiliary Packaging Materials

A.1 Purpose and Area of Application

A high humidity level in the air and/or condensation can lead to corrosion even in airtight materials, thereby rendering the materials unusable. For protection against corrosion damage, VCI-based auxiliary packing materials can be used.

The testing process described below is used to determine the anti-corrosive effect of VCI-based paper and foil. The process may be used to characterize the state at the time of supply and/or for checking the state of the VCI auxiliary packing materials after storage.

A.2 Definitions of Terms

VCI auxiliary packing materials are made of smooth or crepe paper or of plastic foil provided with a relatively volatile anti-corrosive effective ingredient. The effective ingredient fills the gas space inside the packing and protects the packed goods themselves against corrosion in a humid atmosphere. Packed goods to be protected with VCI auxiliary packing materials must be packed in sealed packages (plastic/metal bags, sacks, containers), as otherwise the effective ingredient disperses into the environment.

A.3 Principle of the Test Method

A test sample with a high degree of sensitivity to corrosion through condensation water is packed together with a VCI auxiliary packing material in a vessel, which is then tightly closed. Condensation is then forced on the surface of the test sample. By means of a blank trial -- that is, a trial structure of the same type, but without VCI auxiliary packing material -- it is determined whether the conditions of the trial are sufficient to cause corrosion to appear on the unprotected test sample.

A.4 Test Equipment and Material

For each test, 4 test sets are necessary. A test set consists of the following parts (see Figure 1):

- 4.1 Erlenmeyer flask, 1 L, wide-necked, according to DIN 12385
- 4.2 Rubber stopper, 54 mm \AA , with longitudinal through hole, 15 mm \AA , and two splits in the bottom for clamping the sample.
- 4.3 Test sample of unalloyed, solid construction steel S235JRG2 DIN EN 10025 (material number 1.0038), mass according to Figure A.1.
- 4.4 10 milliliters freshly prepared glycerin/water mixture with a density of 1.076 g/cm^3 at $(23 \pm 2)^\circ\text{C}$ (glycerin/water mass ratio about 1:2; for additional instructions for preparation, see DIN 50008-1).
- 4.5 Ethanol p.a.

- 4.6 Wet sandpaper up to #320 graining.
- 4.7 Forced-air heating chamber according to DIN 50011-12.

A.5 Samples

5.1 Taking Samples

Samples will be taken according to agreement, either in the state at the time of supply or according to a composition to be determined.

5.2 Sample Dimensions

All samples will be composed of strips 25 x 150 mm in diameter.

5.3 Number of Samples

Each test will require six strips.

5.4 Sample Handling

The samples are to be taken and cut immediately before the start of the test. This is in order to prevent contact between the sample and the unprotected hand. The use of rubber gloves is recommended.

A.6 Performance of Test

6.1 Before putting together the test set, the front of the test sample is sanded with wet sandpaper up to #320 graining.

1 =	Rubber stopper, top diameter 53 mm, bottom diameter 45 mm, hole diameter 15 mm;
2 =	Test sample S235JRG2, length 12 mm, diameter 16 mm;
3 =	VCI sample 25 mm x 150 mm;
4 =	Erlenmeyer flask, 1 L, wide-necked, according to DIN 12385;
5 =	Glycerin/water mixture, $\rho = 1.076 \text{ g/cm}^3$ at 23°C;
6 =	Cuts 5 mm deep to accept the sample
Cross-section A-B	

6.2 Before putting together the four required test sets, the parts listed under Sections B.4.1 to B.4.3 are thoroughly cleaned by rinsing with distilled water and ethanol and dried with warm air.

6.3 The parts listed under Sections 4.1 to 4.3 are put together according to Figure A.1. In this process and during any additional handling, the sanded surface of the test sample must not come in contact with corrosive media (such as perspiration from human hands).

6.4 In each of three test sets, two samples are inserted in the slits provided for this purpose in the rubber stopper. The fourth test set remains without samples, for use in the blank trial.

6.5 The Erlenmeyer flasks are tightly closed with the rubber stoppers of the assembled test sets.

6.6 The test set is stored for a period of (20 ± 0.5) hours at a temperature of $(23 \pm 2)^\circ\text{C}$. At the end of the storage period, the rubber stopper is removed from the Erlenmeyer flask, the freshly prepared glycerin/water mixture is poured into the flask immediately after opening, and the flask is immediately closed again.

When closing the flask, and in any additional handling, care must be taken to observe that the samples are not immersed in the glycerin/water mixture.

6.7 After an additional 2 hours \pm 10 minutes, the test set is stored for a period of 2 hours \pm 10 minutes in the heating chamber in which the temperature was previously raised to $(40 \pm 1)^\circ\text{C}$.

6.8 On conclusion of storage in the heating chamber, the test samples are this assembled from the test set and dried with warm air.

A.7 Evaluation

The sanded surface of the test samples is visually inspected for signs of corrosion and matched with one of the stages shown in Figure A.2.

When performing the test according to the directions, significant signs of corrosion must be visible on the sanded surface of the test sample from the blank trial. Otherwise, the test must be repeated.

A.8 Test Report

The test report must cover the following points, with reference to this testing process:- Data on the sample material (manufacturer, material designation, manufacturing date, packaging, packaging date, etc.).

- Any test conditions deviating from this test procedure.
- Evaluation of the effectiveness (stage) of the sample material (see Figure A.2).
- Test date.

Note:

Any appearance of corrosion on the test samples can be documented by photographing the sanded surfaces or by the production of corrosion samples. The latter is done by pressing a piece of transparent adhesive tape onto the sanded surface, pulling it away along with the corrosion adhering thereto, and sticking it onto white paper.

Figure A-2

Stage 0: Blank sample No anti-corrosive effect

Stage 1: Blank sample Slight anti-corrosive effect

Stage 2: Blank sample -Moderate anti-corrosive effect

Stage 3: Blank sample - Good anti-corrosive effect

Referenced Documents

TL 8100-0003	Packaging of supply articles; packing stage C
TL 8100-0072	Packaging material; marking of its material content
VG 95615	Closing boxes with adhesive tape and adhesive strips
DIN 6730	Paper and cardboard; definitions

DIN 6748-1	Paper, cardboard and pasteboard rewinding tubes for paper, cardboard and pasteboard, mass, testing of mass
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