



Customer: Den Erhvervsdrivende
Fond Museumstjenesten
Vinkelvej 11
8620 Kjellerup
Danmark

Your Contact:
Dr Philipp Stolper
[Dipl.-Chem.]
Tel. +49 89 431 82 - 354
stolper@fogra.org

13.01.2021

Date of order: 14.09.2020
Allan Risbo

Task: partial Testing of a paper according to ISO
16245:2012 – Type A

Material submitted: - Sheets of outer cover (grey) of a corrugated
cardboard
- blank corrugated board; B-flute; all layers
170 g/m² archive board; colours: outer cover
grey, flute and inner cover white

Processors: Dr Philipp Stolper
Simone Grander

Documents enclosed: -

Fogra
Forschungsinstitut für
Medientechnologien e.V.

Einsteinring 1a
85609 Aschheim b. München
Deutschland

Tel. +49 89. 431 82 - 0
Fax +49 89. 431 82 - 100

www.fogra.org
info@fogra.org

Sitz des Vereins:
Aschheim b. München

Registergericht München
Vereinsregisternr. 4909
Steuernr. 143/215/00707
VAT-Nr. DE 129 514 828

Geschäftsführer:
Dr. Eduard Neufeld

The publication of the report and its use in court is subject to prior approval by FOGRA.
Customer's records will be destroyed after 3 months unless the customer explicitly reclaims them.

Commerzbank München
Leopoldstraße 230
80807 München, Deutschland
BIC DRES DE FF 700
IBAN DE31 7008 0000 0308 5661 00

Description of task

Fogra received unprinted samples of the outer cover of corrugated cardboard as well as unprinted samples of the complete cardboard. The compliance of the material with DIN ISO 16245:2012 Type A should be determined.

The following test should be carried out on the complete corrugated cardboard:

- Determination of the Cobb₆₀ value according to ISO 535
- Bleeding behaviour of the paper

The following tests should be carried out on the outer cover:

- Determination of the alkali reserve according to ISO 10716
- Determination of the Kappa number according to ISO 302
- Determination of the pH value after aqueous extraction using cold water according to ISO 6588-1.

All examinations were carried out according to ISO 16245:2012 in the period from 11th December to 12th January 2020. Tests were performed as multiple determinations and the mean values were taken for the evaluation.

The determination of the alkali reserve, the Kappa number and the pH value of the inner cover and the inner layer of the board have been determined in report 33713. These results will be stated in the conclusion.

Determination of the Cobb₆₀ value according to ISO 535

The covers of a corrugated cardboard must not exceed a Cobb₆₀ value of 25 g/m². The determination of the Cobb₆₀ value for the outer cover was performed using the complete corrugated cardboard as fivefold determination of the outer side.

The Cobb₆₀ value of the outer (grey) side was determined to be 24.89 g/m² ± 0.62 g/m².

The Cobb₆₀ value of the inner side was determined to be 22.56 g/m² ± 0.53 g/m². (report 33713).

Thus, this part of the requirements of DIN ISO 16245 is fulfilled.

Determination of the alkali reserve according to ISO 10716

The alkali reserve of every single layer of a corrugated cardboard has to equal at least 0.4 mol acid per kg. The determination was done in duplicate using the outer cover.

The alkali reserve of the outer (grey) cover equals 1.08 mol acid per kg.

The alkali reserve of the inner cover equals 1.56 mol acid per kg (report 33713).

The alkali reserve of the inner layer equals 1.51 *mol acid per kg* (report 33713).

Thus, this part of the requirements of DIN ISO 16245 is fulfilled.

Determination of the Kappa number according to ISO 302

The dimensionless Kappa number of the paper, which represents the content of residual lignin in the paper, must be less than 5.0. The test was carried out in conformity with the standard as a double determination using the outer cover sent by the customer.

The Kappa number of the outer (grey) cover is 1.1.

The Kappa number of the inner cover is 0.8 (report 33713).

The Kappa number of the inner layer is 0.7 (report 33713).

Thus, this part of the requirements of DIN ISO 16245 is fulfilled.

Determination of the pH value after aqueous extraction with cold water according to ISO 6588-1

The pH value of a cold water extract must be in the range of 7.5 to 10. The test was carried out in accordance with the standard using the outer cover sent by the customer. The pH value of the cold water extract corresponds to the mean value from a double determination.

The pH value of the outer (grey) cover is 8.7.

The pH value of the inner cover 9.5 (report 33713).

The pH value of the inner layer is 9.8 (report 33713).

Thus, this part of the requirements of DIN ISO 16245 is fulfilled.

Determination of the bleeding behaviour according to DIN ISO 16245:2012

The test was performed in conformity with DIN ISO 16245:2009. No bleeding of brighteners or coloured components must be detectable.

The tested cardboard shows no bleeding:

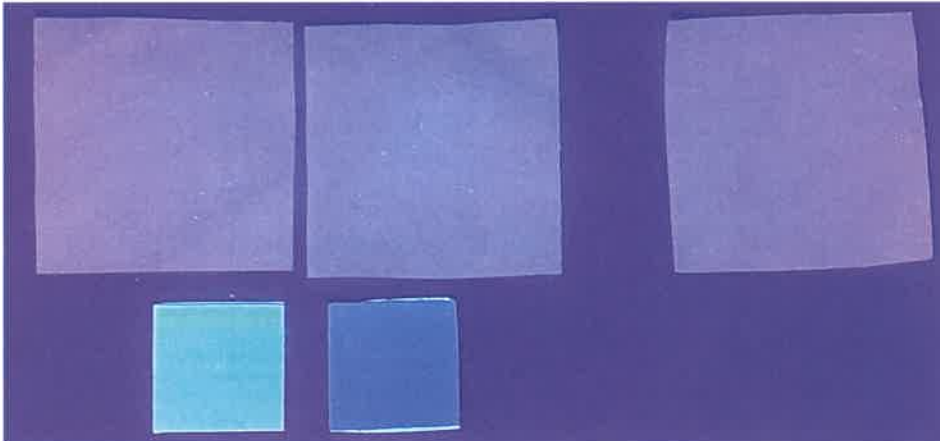


Figure 1: Test result using UV light: upper left: Filter paper of the inner (left) and the outer cover (right) after the test, upper right: Filter paper of the blank test, lower left: corrugated cardboard after test (inner and outer cover).

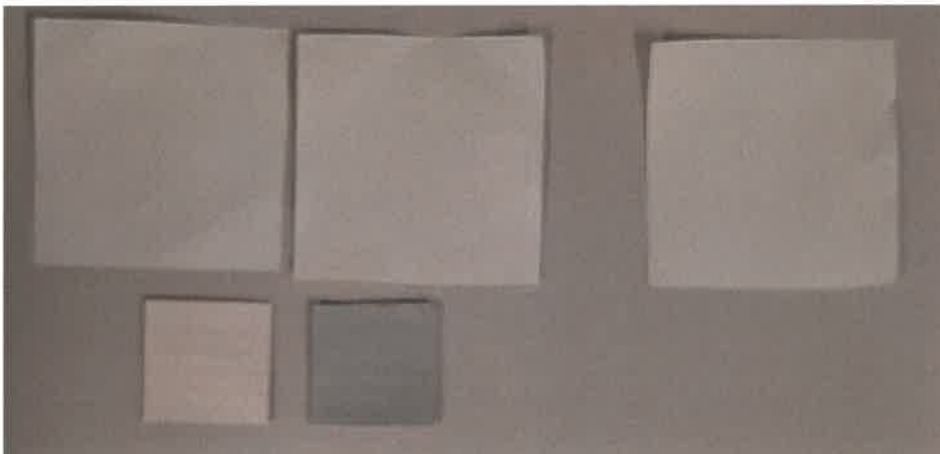


Figure 2: Test result using daylight: upper left: Filter paper of the inner (left) and the outer cover (right) after the test, upper right: Filter paper of the blank test, lower left: corrugated cardboard after test (inner and outer cover).

Thus, this part of the requirements of DIN ISO 16245 is fulfilled.

Conclusion

The tests of the corrugated cardboard sent for report 33713 (results written in *italic*) and for report 33872 (results written normal) as well as the tests on the outer cover according to DIN ISO 16245 show the following results:

Test value	Norm	Requirements DIN ISO 16245	Outer cover	Inner cover	Inner layer
Cobb ₆₀ value [g/m ²]	ISO 535	< 25	24.89 ± 0.62	22.56 ± 0.53	-
Alkali reserve [mol acid/kg]	ISO 10716	> 0.4	1.08	1.56	1.51
Kappa number	ISO 302	< 5.0	1.1	0.8	0.7
pH value after cold water extraction	ISO 6588-1	7.5 – 10	8.7	9.5	9.8
Bleeding behaviour	DIN ISO 16245	No	No	No	-

Table 1: Summary of the test results.

The values for the inner cover and the inner layer have been determined on samples of corrugated cardboard sent for report 33713. According to the customer, the only difference to the corrugated cardboard in this report 33872 is the outer cover that was exchanged.

No tests concerning the mechanical resistance and stability of the boxes were performed.

**The corrugated cardboard meets all tested requirement of
DIN ISO 16245 – Type A.**

Fogra

Forschungsinstitut für Medientechnologien e.V.



Dr Philipp Stolper



Dr Matthias Dobesch