REPORT

Issued by an Accredited Testing Laboratory

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Reference
O100106-1226493-2

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Testing of documents printed with coloured inks Setup Cartridge 924 K/M/Y/C in an inkjet printer in accordance with ISO 11798:1999

(1 appendix)

Summary

The testing was performed according to ISO 11798:1999 and evaluates the permanence durability of documents. The test samples consisted of documents printed with coloured inks Setup Cartridge 924 K/M/Y/C in an inkjet printer. Samples with printing in uniform colour were prepared individually in the colours black, cyan magenta and yellow. The test results presented in this report meet the requirements in ISO 11798:1999 for each of the four inks.

Accreditation

The testing was performed under accreditation according to ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*.

Place of performance

Testing was performed by the division of RISE Materials and Production at the unit for Polymeric Products and Service Life Technology, Brinellgatan 4, Borås.

RISE Research Institutes of Sweden AB
Polymers, fibers and composites - Polymeric Products and Service Life Technology

Performed by

Mathias Bark

Examined by

Mia Sjöqvist

Commission

The purpose of the commission was to test if documents printed with coloured inks in an inkjet printer meet the requirements in ISO 11798:1999 *Information and documentation – Permanence and durability of writing, printing and copying on paper – Requirements and test methods*.

Date of delivery

Test samples arrived at RISE on November 20, 2023

Date of testing

The testing was performed on November 20 – December 13, 2023

Test objects and sample preparation

The test samples consisted of documents printed with the four coloured inks designated Setup Cartridge 924 K/M/Y/C in an inkjet printer designated HP OfficeJet Pro 8135e with Serial No. TH38JBN029.

For the investigation, sample preparation was performed in accordance with SP0070 and SP0096, and instructions from the commissioner, with the inkjet printer and inks, at HP PPS Sverige in Solna, Stockholm, by an officer from RISE. Documents with printing in uniform colours of the four base colours cyan, magenta, yellow and black were printed on single sided archival papers Svenskt arkiv 80.

Performance

Testing has been performed in accordance with ISO 11798:1999. The following properties were tested:

Property	Test method/Testing equipment	Number of test samples
Appearance	ISO 11798, Clause 6.2	4
Lightfastness	ISO 11798, Clause 6.3 Ultra ScanVis spectrophotometer Atlas weathering simulator	3
Water resistance	ISO 11798, Clause 6.4 Ultra ScanVis spectrophotometer	4
Transfer of printing	ISO 11798, Clause 6.5 Weiss climate test chamber	5
Resistance to wear	ISO 11798, Clause 6.6 Taber abraser	4
Resistance to heat	ISO 11798, Clause 6.7 Ultra ScanVis spectrophotometer Weiss climate test chamber	3
Tensile energy absorption	ISO 11798, Clause 6.8.1 ISO 1924-2:2008 *Paper and board – Determination of tensile properties* Lorentzen & Wettre tensile tester Weiss climate test chamber Unstressed test length: 100 mm Rate of elongation: 10 mm/min	10

After exposure, all the presented properties were tested at 23 ±1°C and 50 ±2% RH, except for those including colour measurements.

Statements on uncertainties of measurement are given in Appendix 1. The requirement has been compared to the reported mean value.

Results

The paper substrate used was archival paper Svenskt arkiv 80 (single sided documents).

Printing in black

The following properties were obtained for test pieces prepared from documents with printing of the black ink:

Testing property	Result	Requirement
Clause 6.2 Appearance	Meets the requirements	ISO 11798:1999, Clause 4.2 Well defined recording Easily legible with even colour strength No feathering No strike-through
Clause 6.3 Lightfastness	ΔL* = -0,2 Δa* = -0,1 Δb* = -0,1	ISO 11798:1999, Clause 4.3 ΔL* = ± 8 Δa* = ± 5 Δb* = ± 5
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8
Clause 6.4 Water resistance	ΔL* = 1,0 Δa* = -0,1 Δb* = -0,7 Meets the requirements	ISO 11798:1999, Clause 4.4 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3 No discolouration of the paper No visible defects on the printing
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8
Clause 6.5 Transfer of printing	Meets the requirements	ISO 11798:1999, Clause 4.5 No transfer of printing No blocking No sticking
Clause 6.6 Resistance to wear	Visual assessment according to reference samples. Meets the requirements	ISO 11798:1999, Clause 4.6 Retention of the light absorption of the image and of the reference lines is ≥ 0,80. No flaking No partial deletions No voids
Clause 6.7 Resistance to heat	ΔL* = -0,3 Δa* = 0,1 Δb* = 0,3	ISO 11798:1999, Clause 4.7 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8

Printing in magenta

The following properties were obtained for test pieces prepared from documents with printing of ink magenta:

Testing property	Result	Requirement
Clause 6.2 Appearance	Meets the requirements	ISO 11798:1999, Clause 4.2 Well defined recording Easily legible with even colour strength No feathering No strike-through
Clause 6.3 Lightfastness	ΔL* = 1,1 Δa* = -1,2 Δb* = -1,7	ISO 11798:1999, Clause 4.3 ΔL* = ± 8 Δa* = ± 5 Δb* = ± 5
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8
Clause 6.4 Water resistance	ΔL* = -0,7 Δa* = -1,2 Δb* = -0,2 Meets the requirements	ISO 11798:1999, Clause 4.4 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3 No discolouration of the paper No visible defects on the printing
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8
Clause 6.5 Transfer of printing	Meets the requirements	ISO 11798:1999, Clause 4.5 No transfer of printing No blocking No sticking
Clause 6.6 Resistance to wear	Visual assessment according to reference samples. Meets the requirements	ISO 11798:1999, Clause 4.6 Retention of the light absorption of the image and of the reference lines is ≥ 0,80. No flaking No partial deletions No voids
Clause 6.7 Resistance to heat	ΔL* = 0,5 Δa* = -0,7 Δb* = 1,5	ISO 11798:1999, Clause 4.7 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8

Printing in colour cyan

The following properties were obtained for test pieces prepared from documents with printing of ink cyan:

Testing property	Result	Requirement
Clause 6.2 Appearance	Meets the requirements	ISO 11798:1999, Clause 4.2 Well defined recording Easily legible with even colour strength No feathering No strike-through
Clause 6.3 Lightfastness	ΔL* = 0,3 Δa* = -1,9 Δb* = -0,2	ISO 11798:1999, Clause 4.3 ΔL* = ± 8 Δa* = ± 5 Δb* = ± 5
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8
Clause 6.4 Water resistance	ΔL* = -0,4 Δa* = -0,1 Δb* = 0,9 Meets the requirements	ISO 11798:1999, Clause 4.4 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3 No discolouration of the paper No visible defects on the printing
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8
Clause 6.5 Transfer of printing	Meets the requirements	ISO 11798:1999, Clause 4.5 No transfer of printing No blocking No sticking
Clause 6.6 Resistance to wear	Visual assessment according to reference samples. Meets the requirements	ISO 11798:1999, Clause 4.6 Retention of the light absorption of the image and of the reference lines is ≥ 0,80. No flaking No partial deletions No voids
Clause 6.7 Resistance to heat	ΔL* = 0,4 Δa* = -0,8 Δb* = 1,9	ISO 11798:1999, Clause 4.7 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 8

Printing in yellow

The following properties were obtained for test pieces prepared from documents with printing of the yellow ink:

Testing property	Result	Requirement
Clause 6.2 Appearance	Meets the requirements	ISO 11798:1999, Clause 4.2 Well defined recording Easily legible with even colour strength No feathering No strike-through
Clause 6.3 Lightfastness	ΔL* = 0,5 Δa* =-0,2 Δb* = -2,4	ISO 11798:1999, Clause 4.3 ΔL* = ± 8 Δa* = ± 5 Δb* = ± 5
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 15
Clause 6.4 Water resistance	ΔL* = -1,2 Δa* = -0,1 Δb* = -1,9 Meets the requirements	ISO 11798:1999, Clause 4.4 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3 No discolouration of the paper No visible defects on the printing
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 15
Clause 6.5 Transfer of printing	Meets the requirements	ISO 11798:1999, Clause 4.5 No transfer of printing No blocking No sticking
Clause 6.6 Resistance to wear	Visual assessment according to reference samples. Meets the requirements	ISO 11798:1999, Clause 4.6 Retention of the light absorption of the image and of the reference lines is ≥ 0,80. No flaking No partial deletions No voids
Clause 6.7 Resistance to heat	ΔL* = -0,2 Δa* = 0,6 Δb* = -0,7	ISO 11798:1999, Clause 4.7 ΔL* = ± 5 Δa* = ± 3 Δb* = ± 3
		RA-FS 2006:4 ΔL* = ± 8 Δa* = ± 8 Δb* = ± 15

6.8.1 Tensile energy absorption

The test pieces in each direction consisted of at least one strip per colour.

Unaged test pieces

Test pieces were stored and measured at 23 ±1°C and 50 ±2% RH.

Material	Tensile energy absorption (J/m^2)	
	Mean value	Standard deviation
Reference*, machine direction	128	10,0
Sample, machine direction	125	9,3
Reference*, cross direction	200	11,7
Sample, cross direction	190	16,1

* Reference paper is the untreated paper from the same position on the paper reel as the paper used for the preparation of the sample.

Change (%) of tensile energy absorption (machine-direction): -2,3 %
Change (%) of tensile energy absorption (cross-direction): -5,0 %

Aged test pieces

Test pieces were aged at 90 ±1°C and 50 ±2% RH for 12 days prior to testing. Measurements were performed at 23 ±1°C and 50 ±2% RH.

Material	Tensile energy absorption (J/m^2)	
	Mean value	Standard deviation
Reference*, machine direction	113	8,6
Sample, machine direction	115	13,7
Reference*, cross direction	182	11,1
Sample, cross direction	175	14,6

Change (%) of tensile energy absorption (machine-direction): +1,8 %
Change (%) of tensile energy absorption (cross-direction): -3,8 %

Requirement in ISO 11798:1999, clause 4.8.1: The tensile energy absorption cannot be lowered by more than 10 % as compared to the reference paper (machine and cross direction).

Conclusion and evaluation

The tested documents printed with the coloured inks designated Setup Cartridge 924 K/M/Y/C meet the requirements in ISO 11798:1999.

The test results presented in this report are only related to the tested samples.

Decision rule: When stating conformity to requirement documents, the average value of the measured result is compared to the requirement level. The uncertainty is not taken into consideration unless it is a demand to the applicable requirement document. Procedure ”Simple acceptance” for handling the measurement uncertainty is applied according to document ILAC-G8:09/2019, ”Guard band 0”, shared risk <50 % probability for false acceptance.

Appendix 1 Uncertainty of measurement

Appendix 1

Uncertainty of measurement

Object	Property	Method	Uncertainty of measurement, due to test method[1]	Uncertainty of measurement [2]	Expanded uncertainty of measurement
Paper	Tensile energy absorption, machine direction	ISO 1924-2			± 3,5 %
Paper	Optical density	ISO 5-3	± 0,02	± 0,02	
Printing	Lab-values	ISO 7724-2 and -3	± 0,5		

1) Uncertainty of measurement of the method
2) Uncertainty of measurement including normally obtained standard deviation at testing

The reported uncertainty is an expanded uncertainty based on the standard uncertainty multiplied by a coverage factor of k = 2, which provides a level of confidence of approximately 95 %.

Verifikat

Transaktion 09222115557506932093

Dokument

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Huvuddokument
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