

1. GENERAL COMMENTS DOCUMENT SCOPE:

This document defines the general quality standards for products produced by the PERFEKT S.A. printing company. The document defines both the qualitative parameters, and the criteria for their acceptance.

2. BASIC DEFINITIONS

Functionality and the ability to be used as intended.

In the case of a book, the product has no functionality if:

- A book that is not complete, i.e. it does not have all of the ordered items,
- A book that cannot be used in the standard way, i.e. read/browse/leaf through,

Non-compliance – failure to comply with a requirement that does not restrict the functionality,

Fault – failure to fulfil a requirement, reducing functionality,

Proof – a print for comparison, which is designed to simulate the actual printing process in a way that most faithfully imitates the results achieved on the printing machine. It is a basic colour guideline; it is supplied by the Customer, it can also be made by a CtP Studio on behalf of the Customer,

ΔE – colour difference between the master and the sample,

OK colour sheet – a master sheet selected from production printing, with colours as much as possible consistent with the proof, signed by the Customer, the Technologist or the Machine Operator. As a comparative material obtained from the print machine, it is an actual, achievable colour master copy for the operator and is a reference for the whole system,

N – the number of allowable image or mechanical mismatches on a single page

Control fields – tonal or multi-coloured fields placed on the printing sheet for printing quality control; control fields allow you to check the printing quality both visually and by means of instruments,

Acetone test – a test performed in order to verify the correctness of fixing of the varnish, evaluation of response of the UV varnish to acetone.

3. PRINTING

3.1. COLOUR MASTER – PROCESS COLOURS

The basic colour master copy for prints made with process colours is the certified proof, made in accordance with the ISO 12647-2: 2004 standard.

Proofs should be made from files approved by the customer for printing.

Each proof must be provided with a control strip and a correct certification. Absence of certification reduces the value of such a proof as a colour pattern and makes it impossible to use it as a master copy material – in this case, the printing company prepares its own certified proof. The proof's colours are valid for 30 days from printing.

Providing a correctly prepared master copy for printing (proof) makes it possible to achieve maximum colour convergence between the print copy and the master copy.

If the Customer accepts the print copy, the master material for the machine operator is the sheet accepted and signed by the Customer. The OK colour sheet becomes the reference benchmark for the remaining print-run sheets.

Further processing of the print copy can affect the colour. The printing company is not responsible for the colour change as a result of processing operations – laminating, varnishing – outside of the printing machine.

3.1.2. COLOUR CHECKING METHODS

The basic colour checking method is the visual method.

An auxiliary colour checking method (recommended in order to verify the visual assessment) is the measurement of the control strip. Measurement of the control strip becomes the basic tool for validating the print if proof is not available.

VISUAL ASSESSMENT OF COLOUR

Visual assessment of proof compliance with the print copy must be carried out under standard lighting conditions in accordance with the ISO 3664: 2009/P1 standard.

The Colour OK sheet should be compatible in terms of colours with the proof or other colour guidelines, such as the Customer's approval.

The print run sheets should be compatible with the Colour OK sheet.

| ACCEPTABLE | UNACCEPTABLE |
|--|---|
| Colours matching or slightly deviating from the master | Colours significantly deviating from the master |

COLOURIMETRIC EVALUATION OF COLOUR

The colourimetric measurement is to be treated as an auxiliary method of colour assessment. It becomes the basic tool in the absence of a proof, or an uncertified proof.

Conditions of measurement:

- instrument – SpectroEye (GretagMacbeth),
- substrate – provided by the company,
- physical filter – polarizing,
- lighting – D50,
- angle of observation – 2°,
- density standard – ISO E

The CIELAB Lab colour coordinates for the process colour solids should match the CIELAB Lab adopted values for the substrate type in question. Deviations from the target values should fall within the tolerances described in ISO 12647-2: 2004.

The following table presents the tolerances (E) for the application of colours.

| COLOUR | BLACK | CYAN | MAGENTA | YELLOW |
|---|-------|------|---------|--------|
| Deviation of the print-run copy from the OK Colour. | 4 | 4 | 4 | 5 |

Dot gain characteristics for the OK Colour sheet and print-run copies should be consistent with the standard set by the curve B (coated paper) and curve D uncoated papers), described in the ISO 12647-2: 2004 standard.

The following table shows the target values, permissible deviations on fields of varying tonal values for coated and uncoated papers.

| | coated paper (B) | | | uncoated paper (D) | | |
|---|------------------|----|----|--------------------|----|----|
| control field tonal value in % | 20 | 40 | 80 | 20 | 40 | 80 |
| target gain value in % | 10 | 16 | 12 | 15 | 22 | 13 |
| permissible deviation for the OK colour in % | ±4 | ±4 | ±3 | ±4 | ±4 | ±3 |
| permissible deviation of the print copy from the OK Colour in % | ±4 | ±4 | ±3 | ±4 | ±4 | ±3 |

3.2. COLOUR MASTER – SPECIAL COLOURS

The basic colour mater for special colour prints, metallic and fluorescent colours is the standard, up to date paper-based Pantone guide.

It is acceptable to use other special colour guides after agreement between the Printing Department and the Customer Service Department.

The Colour OK sheet is signed on the basis of a visual assessment of conformity of the print with the Pantone guide. After the signing of the Colour OK sheet it becomes the basic colour guide for the print copies.

The colour OK sheet and the print sheets should conform with the colour master supplied.

| ACCEPTABLE | UNACCEPTABLE |
|--|---|
| Colours matching or slightly deviating from the master | Colours significantly deviating from the master |

In the case of custom printing using special inks such as:

- printing CMYK process colours over a special colour,
- special colour separation,

The printing company shall agree with the Customer the reproduction rules to ensure the effect in accordance with the Customer's expectation

Further processing of the print copy can affect the special colour. The printing company is not responsible for the colour change as a result of processing operations - laminating, varnishing, outside of the printing machine.

ADDITIONAL COMMENTS

Metallic pigments in contact with the moisturizing solution of the print machine can "lose lustre" which can give the effect of a "dulled" colour.

Unprotected metallic paint layer is not resistant to abrasion and scratches.

Metallic inks are only in a small extent suitable for printing screen surfaces and smaller line elements.

UV varnish coating can adversely change the impression of "metallicity"; There is also the possibility of spalling of the varnish layer due to the lower adhesion of the varnish-metallic paint system. Higher volume of varnish fed can result in the "orange peel" effect.

Fluorescent paints are characterized by low light resistance, are not resistant to alcohol, solvent varnishes and alkali. The printer is not responsible for the resulting ink discolouration under the effect of light, reaction with dispersion varnish and UV fixed varnish and after film lamination. These inks are to a lesser extent suitable for printing

screen surfaces and fine line elements. To achieve the desired optical effect a higher volume of ink may be required, which in turn can cause blurring of the screen areas.

3.3. IMAGE REGISTER

Colour images should overlap each other. Shifting of colour images relative to each other (loss of register) should not exceed the acceptable tolerance range.

| ACCEPTABLE | UNACCEPTABLE |
|-----------------------------|--------------------------|
| Register loss ≤ 0.2 mm | Register loss > 0.2 mm |

3.4. IMAGE INCOMPATIBILITIES AND MECHANICAL INCOMPATIBILITIES

The sheet should be free from image incompatibilities reducing functionality, such as: MOIRE/ BLURRING/ DOUBLING /IMAGE PICKING IMAGE SHIFTS / TONING/ WASHOUT/WATERY INK / CRACKS/ PLATE SCRATCHES / RUNS / HOLES / STAINS / IMPS / SMUDGES / LITTER.

The sheet should be free from mechanical incompatibilities reducing functionality, such as: JERKED EDGES / CRACKS / DOG EARS / "RUNNERS" / CREASES / OVERLAPS / FOLDS / SCRATCHES / SOILING / IMPRESSIONS

3.5. SURFACE FINISH

Varnish/film should be applied evenly over the entire surface of the sheet. The surface of the sheet should be even and smooth, without a perceptible roughness. Sticking of sheets together and ink picking is unacceptable.

With UV varnish coating the unacceptable features are:

- discolouration resulting from a 10 second reaction to acetone.

4. SHEETING

Pertains to cutting the product (most often leaflets) to the final format using auxiliary machines with high precision of cutting.

4.1. FORMAT

The cutting format is specified in the process sheet by providing the physical dimensions of the product, expressed in millimetres: length and width

Deviation of the copy format from the specified net format should be within the acceptable tolerance range.

| ACCEPTABLE | UNACCEPTABLE |
|--------------------------------|------------------------------|
| format deviation ≤ 1.0 mm | format deviations $> 1,0$ mm |

4.2. RECTANGULARITY

Cut, perpendicular edges of the product should form a 90° angle. Squareness deviation measured relative to the back should be within the acceptable tolerance range.

| ACCEPTABLE | UNACCEPTABLE |
|---|--|
| deviation ≤ 1 mm along a section of 100mm | deviation > 1 mm along a section of 100mm |

In the finished product there should be no pages that have been torn, jagged edges and burrs.

5. FOLDING

The folding method master is a dummy prepared by the authorised persons.

The break should occur on the designated folding line. Allowable horizontal and vertical offset of the break from the line should be within the tolerance range.

| ACCEPTABLE | UNACCEPTABLE |
|---------------------|------------------|
| Shift $\leq 1,0$ mm | Shift $> 1,0$ mm |

Additional not acceptable non-compliance of folding jagged edges, burrs, paper cracks, other mechanical discrepancies.

6. Die-cutting:

A mockup is used as a model for stamping.

Shift of the die-cut part relative to the designated location should not exceed the acceptable tolerance range.

| | |
|---------------------|------------------|
| ACCEPTABLE | UNACCEPTABLE |
| Shift \leq 1,0 mm | Shift $>$ 1,0 mm |

7. PERFORATION

Perforation should be carried out at the designated line of perforation. Perforation offset relative to the specified line should not exceed the permissible range of tolerance.

| | |
|---------------------|------------------|
| ACCEPTABLE | UNACCEPTABLE |
| Shift \leq 1,0 mm | Shift $>$ 1,0 mm |

Additional unacceptable non-conformities of perforation: cracking of paper outside of the perforation line outside of the perforation line, inability to tear off along the perforation line, loss of continuity of the perforation, perforation torn in places.

PARTS ARRANGEMENT

The arrangement of parts in the book must be correct, i.e. correct order, position and orientation of sections and other additional parts (glued inserts, overlays, stickers, inserts, end papers, and covers).

| | |
|------------------------------|----------------------------|
| ACCEPTABLE | UNACCEPTABLE |
| Correct arrangement of parts | Wrong arrangement of parts |

8. WIRE STITCHING

8.1. POSITION OF STAPLES

By default staples should be placed at 1/4 of ridge height, measured from the top edge to the bottom edge of books and should not move forward or backward in the book. Permissible vertical and horizontal displacement of staples should be within the tolerance range.

| | |
|-------------------------------|----------------------------|
| ACCEPTABLE | UNACCEPTABLE |
| Vertical offset \leq 5 mm | Vertical offset $>$ 5 mm |
| Horizontal offset \leq 1 mm | Horizontal offset $>$ 1 mm |

Additional unacceptable discrepancies of stapling: too strong clamp of staples, cutting through paper or too loose staples – pages fall out. The staple legs overlap or distance between the ends of the legs is more than 3 mm.

8.2. STRENGTH THE WIRE STITCHED BINDING

MANUAL EVALUATION

The strength of the stitched binding is good when the two middle sheets are torn out only after a very strong pull. Strength shall be deemed to be insufficient if the two middle sheets are not able to hold the weight of a copy when shaken with moderate force.

9. GLUING

9.1. SIDE GLUING

The standard width of side gluing is 5 mm, however, this value can vary depending on the parameters of the product. Whatever the value of the target parameter, the variance within a single copy should be within the acceptable range of tolerance.

| ACCEPTABLE | UNACCEPTABLE |
|-------------------------------|----------------------------|
| variation in copy ≤ 1 mm | variation in copy > 1 mm |

9.2. BACK GLUING

For glued binding the back glue thickness may differ depending on the parameters of the product. The prerequisite for considering the parameter as conforming is good strength of gluing (see item 9.3)

9.3. GLUING STRENGTH

MANUAL EVALUATION

The strength of the copy is good when the selected pages from the beginning, middle and end of copy are torn out only with a strong pull, and repeatedly turning the sheet from one side to the other does not result in a weakening of the sheet bonding.

PULLTESTER EVALUATION

| ACCEPTABLE | UNACCEPTABLE |
|--------------------------|---------------------------|
| Hot Melt from 4.5 N/cm | Hot Melt below 4.5 N/cm |
| PUR from 5,5 N/cm | PUR below 5.5 N/cm |
| Dispersion from 5.5 N/cm | Dispersion below 5.5 N/cm |

10. STITCHING WITH BINDING THREADS

10.1. QUALITY OF THREAD SEWING

By default line of thread sewing should be placed evenly over the entire height of the back of the book, and the ends of the stitch should be no closer than 10 mm from the expected cut line. The amount of stitches used depends on the height of the book.

Unacceptable discrepancies of sewing:

- too high tension of threads - the back "roundS up" to the inside,

- too loose threads - sections move relative to each other,
- dangling threads after sewing the insert - uneven back line after gluing the back,
- too large thread holes - penetration of back glue to the inside of the insert.

10.2. THREAD SEWN BINDING STRENGTH

MANUAL EVALUATION

The strength of thread sewing is considered good when the weight of the insert is maintained by one of the internal sections with additional shaking with moderate force.

11. HARDBACK BINDING QUALITY

A hardback book consists of a book unit which is subject to the same standards as a glued and thread-sewn book, and a hard cover (laminated cardboard layers), whose quality parameters are indicated below.

| ACCEPTABLE | UNACCEPTABLE |
|---|--|
| cover format deviation ≤ 1 mm | cover format deviation > 1 mm |
| deviation of unit position within cover ≤ 1 mm | deviation of unit position within cover > 1 mm |
| cardboard thickness deviation $\leq 5\%$ | cardboard thickness deviation $> 5\%$ |
| edge size deviation ≤ 1 mm | edge size deviation > 1 mm |

Additional non-conformities of a HARD COVER:

In the case of colour embossing made on structural materials local insufficient colour on the coloured surface is acceptable (depending on the cover material used). The porosity of the cover depends on the quality and the degree of smoothing of the surface of the calendared cardboard.

Due to the use of a water based glue during binding (connecting the insert with the cover), waviness of the unit and the end paper is acceptable.

12. INSERTING, INCLUDING TRAY INSERTING

Inserting guidelines pertaining to

- the location of the insert in the copy
- position and orientation on the page
- method of placement (type of glue, tape)

are provided in the process sheet.

Shifting of the insert relative to the specified place on the page shall not exceed the permissible range of tolerance.

| ACCEPTABLE | UNACCEPTABLE |
|------------------|---------------|
| shift \leq 5mm | shift $>$ 5mm |

Additional unacceptable features of inserting:

- lack of – or a greater number of inserts,
- location other than indicated.
- placement method other than indicated,
- soiling of copy pages with glue.
- damaging of inserts,
- insufficient bonding strength – insert fall out when browsing copy.

13. FILM WRAPPING

The strength of the seal shall be verified manually. The strength of the seal shall be deemed to be correct if both welded edges are able to support the weight of the entire package when shaken with moderate force.

Additional unacceptable features of film wrapping: mechanical damage of copy, jerked film, holes in the film, the lack of continuity of the seal (seal break).

14. PACKAGING AND SHIPPING

Packaging should be adapted to the type of product, so as to provide protection from potential damage during storage and transport. The product shall be marked in such a way as to allow its unambiguous identification.

Standard packing is considered to be:

- A film wrapped package by equipment of Kalfass type, weight up to 10 kg.
- euro-like pallet packed up to 700 kg and a maximum height of 140 cm,