
**Graphic technology — Process control
for the production of half-tone colour
separations, proof and production
prints —**

**Part 8:
Validation print processes working
directly from digital data**

*Technologie graphique — Contrôle des processus de confection de
sélections couleurs tramées, d'épreuves et de tirages —*

*Partie 8: Processus d'impression de maquette couleur produite à
partir de données numériques*



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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This second edition cancels and replaces the first edition (ISO 12647-8:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

- CIE 1976 ΔE^*_{ab} has been replaced with modern ΔE_{00} colour difference formulae;
- a better metric for uniformity assessment, namely the measurement of 1D distortions of macroscopic uniformity utilizing scanning spectrophotometers, has been added;
- a more content oriented control wedge has been added;
- a new [Annex A](#) has been added to align the content with ISO 12647-7, with respect to substrate categorisation and conformance assessment;
- informative metrics that proved to be not practical, such as tonality, have been deleted.

A list of all parts in the ISO 12647 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document specifies the properties, and associated test methods, required for digital prints and printing processes to meet the criteria established for “validation prints”.

In most printing workflows, there is a requirement for a visual representation of the expected appearance of the document being printed that can be used as part of the agreement between customer and printer. Where this visual representation is produced such that its characteristics (colour fidelity, tone reproduction, registration, size, etc.) simulate those of the expected printing within tight tolerances, it is usually referred to as a “contract proof”. As the name implies, contract proofs are used as part of the contractual relationship between customer and printer and are used as a visual aim for the press operator during printing as well as the absolute reference against which the finished production is compared. Not unexpectedly, systems that can produce contract proofs are usually expensive and require careful operation and maintenance. ISO 12647-7 specifies the requirements for contract proofs and systems used to produce contract proofs directly from digital data.

Recently, other visualizations of the final printed product have found a place in the printing/proofing workflow because designers and print buyers prefer not to go to the expense of using an ISO 12647-7 compliant contract proof any earlier in the process than necessary. In many situations, participants in the workflow require a hardcopy visual reference of lesser quality than a contract proof. In the past, those prints varied widely in quality and were often referred to as design proofs, concept proofs, layout prints, etc. That quality level is here being referred to as a “validation print”.

Because data are exchanged electronically, and visualizations of those data are produced at multiple sites, there is a requirement for defined requirements for validation prints to allow a degree of consistency throughout the workflow. One of the goals of having less stringent requirements, particularly on colour fidelity, is to allow the production of validation prints on less elaborate and less costly devices than are required for contract proofs. The requirements for validation prints and the systems used to produce validation prints are given in this document.

Validation prints are not intended to replace “contract proofs” for predicting colour on production printing devices. It is expected that the modifications of the requirements for validation prints, along with the requirements for contract proofs, will continue in the future as industry requirements and imaging technologies develop.

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Graphic technology — Process control for the production of half-tone colour separations, proof and production prints —

Part 8: Validation print processes working directly from digital data

IMPORTANT — This document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This document specifies requirements that can be used for determining the conformance of systems that produce a hard-copy validation print, directly from digital data, which is intended to simulate the expected appearance of material printed in accordance with a characterized printing condition.

It is not intended for use in determining the conformance of production printing systems (digital or conventional) since many aspects of production printing are not covered in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

ISO 3664, *Graphic technology and photography — Viewing conditions*

ISO 8254-1, *Paper and board — Measurement of specular gloss — Part 1: 75 degree gloss with a converging beam, TAPPI method*

ISO 12040, *Graphic technology — Prints and printing inks — Assessment of light fastness using filtered xenon arc light*

ISO 12640-1, *Graphic technology — Prepress digital data exchange — Part 1: CMYK standard colour image data (CMYK/SCID)*

ISO 12642-2, *Graphic technology — Input data for characterization of 4-colour process printing — Part 2: Expanded data set*

ISO 12647-1, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 1: Parameters and measurement methods*

ISO 13655:2016, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

ISO 15397:2014, *Graphic technology — Communication of graphic paper properties*

ISO 15930-1, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*

ISO 15930-4, *Graphic technology — Prepress digital data exchange using PDF — Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)*

ISO 15930-6, *Graphic technology — Prepress digital data exchange using PDF — Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)*

ISO 15930-7, *Graphic technology — Prepress digital data exchange using PDF — Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6*

ISO 15930-8, *Graphic technology — Prepress digital data exchange using PDF — Part 8: Partial exchange of printing data using PDF 1.6 (PDF/X-5)*

ISO 15930-9, *Graphic technology — Prepress digital data exchange using PDF — Part 9: Complete exchange of printing data (PDF/X-6) and partial exchange of printing data with external profile reference (PDF/X-6p and PDF/X-6n) using PDF 2.0*

ISO/TS 18621-21, *Graphic technology — Image quality evaluation methods for printed matter — Part 21: Measurement of 1D distortions of macroscopic uniformity utilizing scanning spectrophotometers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12647-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 validation print substrate
substrate used for validation print processes, usually characterized by its light fastness or permanence properties, with only essential requirements dictated by the printing process

3.2 print stabilization period
time after which the print is chemically and physically stable

Note 1 to entry: It is necessary that this property of the validation print system be specified by the manufacturer. It is most important that the print is stable with respect to colour changes.

3.3 validation print
print produced directly from digital data early in the production chain following this document, representative of the concept for the final product

Note 1 to entry: A validation print can have reduced accuracy compared to contract proof.

3.4 production substrate
substrate to be used for production printing, including a substrate originally intended for the validation printing press under test

Note 1 to entry: A production substrate can be a paper with an ink receiving layer or a paper optimized for electrophotographic printing.

3.5

PDF/X

title of a series of ISO standards regarding the use of the Portable Document Format (PDF) for the dissemination of digital data intended for print reproduction

4 Requirements

4.1 Data requirements for validation print systems

Validation print systems shall accept digital data delivered as PDF/X data files in accordance with one of the conformance levels defined in ISO 15930-1, ISO 15930-4, ISO 15930-6, ISO 15930-7, ISO 15930-8 or ISO 15930-9. Where the digital data is delivered as PDF/X data files, the intended printing condition being simulated shall be that defined in the *OutputIntents* array of the PDF/X file. Where a profile is required for data conversion, the profile that is the value of the *DestOutputProfile* key in the PDF/X file shall be used. In case of multi primary based printing conditions (e.g. 5C, 6C, 7C or 8C), data should be delivered as PDF/X-5n. Since this is currently not industrial common, the sender and receiver shall agree on the pertinent data exchange.

NOTE There are a number of industry test suites for testing PDF/X conformance such as the Ghent PDF Output Suite 4.0 or 5.0^[21] or the Altona Test Suite^[23].

4.2 Validation print

4.2.1 Validation print substrate qualification

In an ideal situation, the validation print substrate should be the same as the production substrate. As this ideal situation is seldom possible, the following criteria apply for the validation print substrate.

- a) The gloss level of both the printing substrate and validation print substrate should be estimated as one of matte, semi-matte or gloss either by the substrate manufacturer or by measuring as described in 5.6. Matte substrates should not be used to make validation prints for gloss printing substrates and gloss substrates should not be used to make validation prints for matte printing substrates.
- b) The white point of the unprinted validation print substrate shall allow a colorimetric match of the substrate of the intended printing condition to be simulated with a colour difference of less than or equal to $3,0 \Delta E_{00}$ units when measured according to ISO 13655.

To assure a white point match, the validation print substrate should have a CIE L^* value that is higher than the substrate of the printing condition to be simulated.

- c) The validation print substrate should belong to the same fluorescence classification as the production substrate. Fluorescence classification in four levels of faint, low, moderate, and high shall be made in accordance with the testing procedures described in ISO 15397:2014, 5.12. Additional information is provided in Annex D.

4.2.2 Coloration of printed parts

4.2.2.1 Validation print system within-sheet uniformity

The variability of the coloration across the validation print format shall be verified by printing each of the three test forms described in 5.4. Each test form shall be measured at nine locations on each sheet as follows. Divide the printed area into thirds both horizontally and vertically and measure at the centre of each area. All selected locations across the printed test area for each test tint, after the stabilization period, shall have the following:

- a) standard deviation less than or equal to 1,5 for CIE L^* , a^* and b^* ;

- b) maximum ΔE_{00} colour difference less than or equal to 2 units between the average of the 9 readings and any one reading.

NOTE The requirements specified in a) and b) are not statistically consistent but have been observed to be achievable in a well-controlled digital printing system.

The uniformity shall also be measured by using the "Macro-Uniformity-Score" method defined in ISO/TS 18621-21, also known as M-Score. Three tone value combinations specified in 5.4 shall be evaluated as the uniformly tinted area. The "Macro-Uniformity-Score" shall be greater than or equal to 50 and should be greater than or equal to 60.

4.2.2.2 Colour simulation requirements for validation prints

The CIELAB colour coordinates of the patches of the ISO 12642-2 target and the validation print control strip defined in 5.2 shall agree with the aim values of the printing condition being simulated as given by the data (see 4.1) within the appropriate tolerances specified in Table 1.

NOTE 1 The colorimetric aim values for all patches are included in, or can be derived from, the colorimetric values of the reference characterization data set.

Table 1 — Tolerances for reproduction of all patches in the validation print^a by comparison to the values of the characterization data of the printing condition being simulated

Unit: 1

Patch in validation print form	Tolerance
Substrate	$\Delta E_{00} \leq 3,0$
All patches described in 5.2 (without the boundary patches)	95th percentile: $\Delta E_{00} \leq 5,0$ Average: $\Delta E_{00} \leq 2,5$
Patches described in 5.2 c	Average: $\Delta C_h \leq 2,5$ Maximum: $\Delta C_h \leq 4,0$
Selected surface gamut patches as listed in Annex C (taken from ISO 12642-2)	Average: $\Delta E_{00} \leq 3,0$
All patches described in ISO 12642-2 ^b	Average: $\Delta E_{00} \leq 2,5$ 95th percentile: $\Delta E_{00} \leq 5,0$
Spot colours (solids)	$\Delta E_{00} \leq 3,5$
^a Described in Clause 5.	
^b For multicolour reference printing conditions, only the patches in 5.2 shall be used.	

These tolerances apply only to conformance of validation prints as defined in A.1 and A.2. They can also be used for validation prints made for a particular printing condition when tested in the field using only a control wedge. They might be inappropriate as tolerances for daily use at production sites due to the increased production costs required to maintain the equipment in this optimum state.

NOTE 2 It is expected that validation printing system can also reproduce solid spot colours, provided that a clear identification by the CIELAB colour or spectral definition such as ISO 17972-4 (CxF/X-4).

NOTE 3 Only when spot colour availability is declared, the declared spot colours are evaluated.

4.2.3 Short- and long-term repeatability

Three validation prints containing at least the primary and CMY secondary colour solids, and primary colour mid-tones shall be produced. There shall be a 1 hour time difference between the production of the first and second print and a one day time difference between the first and third validation print. Recalibration before production of each print is permitted. For each print, measurements shall be made on the first print produced after the vendor-specified stabilization period. The maximum CIEDE2000

CIELAB colour difference between any two of the three samples of each colour shall not exceed the values shown in [Table 2](#).

Table 2 — Repeatability of primary and CMY secondary colour solids and primary colour mid-tones (CIEDE2000 -colour differences)

Unit: 1

Type	Solids	Mid-tones (40 % to 50 %)
Validation print	2,0	2,5

NOTE For certain print systems, the same point on a validation print can be formed from a different source on different days; strictly speaking, this is testing reproducibility not repeatability. For these systems, there is no true test of repeatability.

4.2.4 Permanence

4.2.4.1 Print stabilization period

A test should be performed and reported to verify that the print colorant has sufficient resistance to a defined mechanical abrasion after any manufacturer's defined stabilization period. One optional test method is specified in [Annex B](#). In any test, the time required for the validation print solids to reach mechanical stability should not exceed the manufacturer's defined stabilization period. In the case that there is no manufacturer's defined stabilization period, it should not exceed 30 min. This test should be performed for each separate combination of materials, driving software, colorant and printing condition that potentially can change the print stabilization time. If the validation print has been coated, this shall be reported.

4.2.4.2 Fading and light fastness testing

Fading testing shall use the solid tones of the C, M, Y, R, G, B plus K (7 patches). The measurement condition shall be in accordance with ISO 13655:2016, M1 with white backing. Colorimetric calculation shall be in accordance with ISO 13655.

The validation print stabilization period shall be specified by the manufacturer. The variability ("fading") of the C, M, Y, R, G, B plus K patches over time, in the dark, shall not exceed 1,5 ΔE_{00} colour difference units during the first 24 hours after the print stabilization period.

Four copies of a test form shall be prepared on the validation print substrate, which contain unprinted parts and patches of printed primaries and CMY secondaries both as solids and as midtones. Combinations of all of the process colours used by the validation printing system shall be included in this set, which may include more than four colorants.

Three copies of the test form shall be stored for a print stabilisation period of at least 24 h in the dark under standard atmosphere according to ISO 187 (at 23 °C \pm 1 °C and a relative humidity of 50 % \pm 2 % RH).

The CIELAB colour values of the validation printing substrate and the printed patches shall be measured according to ISO 13655 M0, M1 or M2 on white backing.

Each of the three copies of the test form shall be subjected to one of the following storage conditions.

- 24 h at 25 °C \pm 1 °C and at a relative humidity of 25 % \pm 2 % in the dark.
- 24 h at 40 °C \pm 1 °C and at a relative humidity of 80 % \pm 2 % in the dark.
- One week at 40 °C \pm 1 °C and at a relative humidity of 10 % \pm 2 % in the dark.

For each of these treatments, for the substrate and for all patches of the test form the maximum colour difference between colour values of the patches before and after the treatment shall not exceed 4,5 ΔE_{00} units.

In cases where validation prints are expected to be used for a longer period of time, light fastness exposure shall be performed using a window glass filtered xenon lamp. It shall meet a light fastness rating of 3 or greater using the blue wool test as described in ISO 12040. This corresponds to a dose of 43 000 kJ/m² and a colour difference of $\Delta E_{00} < 4,5$.

NOTE 1 Production printing substrates with OBAs are usually less stable than typical inkjet-based validation printing substrates. However, in this case, it is expected that the validation print is stable over time and does not reflect this specific behaviour. It is expected that a typical validation print is not used longer than 3 months, hence a lightfastness test is only informative.

NOTE 2 It is anticipated that window glass application as described in ISO 105-B02^[1], such as optical filters, be fitted to minimize short-wavelength light (less than 310 nm).

NOTE 3 For further information or alternative methods on light fastness testing, see ISO 18937^[15] and ISO 21139-1^[16]. These International Standards have been recently published and are subject for future use in this document.

4.2.5 Ink set gloss

The gloss of solid tone colours should be similar to that of the production print to be simulated. The ink set gloss may be specified if deemed necessary; see 5.6 for one method.

NOTE 1 If the gloss of the final validation print is substantially different from the expected production print, a surface-finishing step (e.g. surface laminate) to raise or lower the gloss can improve the situation.

NOTE 2 The measure of gloss perception is the subject of ongoing appearance research.

4.2.6 Tone value reproduction limits

Tints intermediate between the (simulated) substrate white and solid shall transfer onto the validation print in a consistent and uniform manner over a tone value range that includes at least the tone reproduction limits of the printing condition being simulated; see the relevant parts of ISO 12647^{[5]-[9]} for this information. If the target characterization data set makes no direct reference to ISO 12647, the tone value reproduction limits shall lie between 2 % and 98 %.

NOTE It is good practice to ensure that no significant image part is reliant on tone values outside of the tone value reproduction limits of the expected production printing process.

4.2.7 Tonality assessment

The single-colour CMYK patches (ramps), between 30 % and 70 %, described in ISO 12642-2 should be measured. The absolute CIE L* difference between the measured ramps and those of the reference characterization data should be equal to or less than 2.

NOTE The usage of CIE ΔL^* has a better correlation to the perceived tonality than the differences in colorimetric tone values.

4.2.8 Reproduction of vignettes

Reproductions of the CMYK data in accordance with image S6 of ISO 12640-1 shall show no visible steps within the tone value reproduction limits (see 4.2.6) if viewed under ISO viewing condition P1 in accordance with ISO 3664.

4.2.9 Image resolving power

The resolving power of the validation print shall be such that C, M, K positive, non-serif Latin font type of 2-point size, reverse (negative) of 8-point size, and 2-point reverse line are legibly reproduced. The test objects specified in 5.3 can be used for further optional diagnostic testing.

NOTE 1 This condition usually corresponds to an output addressability of at least 100 pixels per centimetre.

NOTE 2 This condition includes the effects of colourant migration, if at all present.

4.2.10 Margin information

4.2.10.1 Every validation print shall bear a human-readable comment that includes at least the following information:

- conformance level (“validation print according to ISO 12647-8”);
- file name;
- validation printing system designation;
- substrate material type;
- printing condition being simulated;
- time and date of production;
- time and date of last calibration.

4.2.10.2 Every validation print should also include the following:

- colorant types;
- colour management profile(s) used;
- RIP name and version;
- scaling (if applied);
- type of coating;
- dedicated data preparation;
- type of paper/structure simulation, such as noise or patterning (if applied);
- document ID (if a PDF/X document); if a document ID is included, this shall be printed as two hex strings and the last 6 digits of each string should be highlighted in some way in order to assist identification.
- When light fastness assessment has not been tested or when the tolerances are exceeded a warning should be present that requests the user to store the validation print in the dark.

This information shall be printed on a sticker and applied to either the front or reverse side of the validation print or shall be printed directly in a margin of the validation print.

5 Test methods

5.1 System validation

The system being tested shall first digitally print a test form minimally consisting of the control strip described in 5.2 and all the patches in accordance with ISO 12642-2. Printing shall be targeted at a specific printing condition with a known characterization data set (see 4.1).

5.2 Validation print control strip

The control elements of the CMYK control strip, as identified in the list below, shall be included while keeping the total number of patches within reasonable limits. To provide compatibility with characterization data, as many control patches as possible should be selected from ink value combinations of ISO 12642-2. The control patch types being used are a selection of critical tertiary colours, such as flesh tones, brown, aubergine, violet (e.g. 15 patches).

A CMYK digital control strip shall be printed on every validation print. That control strip shall consist of at least the following patches:

- a) solid tones of the chromatic primaries, the CMY secondaries and black (C, M, Y, R, G, B, K = 7 patches);
- b) mid-tones of the chromatic primaries and black C, M, Y, K;
- c) a minimum 5-step near-neutral tone scale composed of the primaries C, M, Y which is approximately equally spaced in CIE L^* from substrate (or simulated substrate) to the 3-colour minimum CIE L^* and should have a CIE metric chroma (CIE C^*_{ab}) less than 2;
- d) tone step scale, composed of the primary colour K (of the target printing condition) such that the CIE L^* approximately matches the steps of the previously defined 3-color scale;
- e) simulated print substrate colour of the production printing condition (1 patch).

NOTE Grey balance patches composed of suitable CMY mixtures serve a useful purpose for quick visual checks of whether the CMY tone values have changed, for example from one print to the next.

Control elements for multi-primary printing, for example, using CMYK + 1, 2, 3 or 4 process colours (also known as 5C, 6C, 7C and 8C) should follow these principles. The patch selection (tone value grid) should reflect a "CMYK+X" printing processes behaviour. They shall also consist of the overprint of the primaries with black. A 5C and 6C control element should have approximately 70 patches and a 7C or 8C control element approximately 100 patches.

When spot colours are subject for evaluation, they shall be tested by adding an additional control element. It shall contain the solid tones. If tint values and associated $CxF/X-4$ data is present these tone values shall also be used in the control strip.

5.3 Additional test objects

The following test objects shall be used for diagnostic testing.

- a) For checks of vignettes of the primary and secondary process colours C, M, Y, K, R, G, B, and C+M+Y, vignette targets such as the test image S6 described in ISO 12640-1.
- b) For checks on the resolving power with type material positive and reverse (negative) type of a non-serif Latin font with the sizes 2, 3, 4, 5, 6, 7, 8 point and reverse lines with the sizes 2, 3, 4 point.

5.4 Uniformity measurement

For checks on uniformity, create three forms, each with an even tint area that fills the printable width of the printer, using the following tone value combinations from the selected characterization data set:

- a) C, 65 %; M, 50 %; Y, 50 %; K, 50 %;
- b) C, 40 %; M, 30 %; Y, 30 %; K, 30 %;
- c) C, 20 %; M, 15 %; Y, 15 %; K, 15 %.

The format to be used shall provide enough space for the placement of the mandatory margin information and control wedge.

5.5 Colour measurement

Colour measurements shall be made using a spectrophotometer that is in accordance with ISO 13655 and standardized correctly to its factory settings, and that takes accurate and repeatable measurements within the specified tolerances. Where the intended printing condition requirements are not known or measurements are being made of the substrate alone, measurement conditions shall be in accordance with M0, M1 or M2 and white backing in ISO 13655, and should be in accordance with M1 and white backing in ISO 13655. The CIEDE2000 colour differences shall be calculated in accordance with ISO 13655:2017, 5.3.

All colour measurements and computed colour differences shall be reported, accompanied by an associated total uncertainty (using the coverage factor $k = 1$). The evaluation method should be performed as outlined in ISO 15790. It should include an estimate of the inter-instrument agreement between two different measurement instruments, both believed to be conforming to ISO 13655. The value may also be extracted from the manufacturer's specification, a certificate of calibration from the manufacturer. The inter-instrument agreement uncertainty should be added in quadrature to the uncertainty determined by experimental readings, as outlined in ISO 15790. If not defined otherwise, this criterion can be considered as having been fulfilled when the tolerance limit(s) occupy no more than 50 % of the covered uncertainty. All colour measurements shall be rounded with the same precision as the defined tolerance value.

NOTE A colour difference of $\Delta E_{00} = 5,4$ is rounded to 5 if the tolerance is defined as $\Delta E_{00} \leq 5$ where the same colour difference is not in conformance when the tolerance is stipulated as $\Delta E_{00} \leq 5,0$.

5.6 Measurement of gloss

The gloss of the substrate or ink set single ink solid areas can be measured with an incidence angle of 75° as specified in ISO 8254-1 or 20°, 60°, or 85° as specified in ISO 2813 and shall be classified into categories of "matte", "semi-matte" or "gloss" as follows:

- a) 75° (ISO 8254-1): Matte: < 20 GU, Semi-matte: 20-60 GU. Gloss: > 60 GU,
- b) 60° (ISO 2813): Matte: < 5 GU, Semi-matte: 5-20 GU. Gloss: > 20 GU.

NOTE The correspondence between the categories a) and b) is based on The Measurement of Appearance^[24].

5.7 Supplementary visual control element

It is advised to also print control elements that use less boundary colour patches but more content oriented colours such as flesh tones, sky, foliage, soil or trees. Therefore, an additional control wedge should be used. ISO 12640-1, ISO 12642-1 and ISO 12642-2 provide examples of typical tone values.

Annex A (normative)

Technical requirements for validation print conformity

A.1 Conformance to validation prints

A.1.1 General

Validation prints may be considered to be “field certified” for a chosen printing condition in conformance with this document if the validation print conforms to the requirements listed in [A.1.2](#).

A.1.2 All validation prints

All validation prints shall conform to the following requirements:

- [4.2.2.2](#): colour simulation requirements for validation prints restricted to the patches of the control wedge;
- [4.2.10](#): margin information.

A.2 Conformance to validation print facilities

A.2.1 General provisions

Validation print facilities for validation prints may be considered capable of delivering validation prints for a chosen printing condition in conformance with this document if it can be reliably demonstrated that the validation prints conform to the requirements listed in [A.2.2](#).

A.2.2 All validation prints

All validation prints shall conform to the following requirements:

- [4.2.1](#): validation substrate colour and gloss; except the light fastness and 24 h colour fading tests;
- [4.2.2](#): colouration of printed parts;
- [4.2.3](#): short- and long-term repeatability restricted to the 24 h test
- [4.2.8](#): reproduction of vignettes;
- [4.2.9](#): image resolving power; and
- [4.2.10](#): margin information.

A.3 Production systems capable of delivering certified validation prints

A.3.1 General provisions

Validation printing systems for validation prints provided by vendors may be considered capable of delivering validation prints for a given printing condition in conformance with this document if it can be reliably demonstrated that the validation printing system, comprising hardware and workflow components, if tested under the environmental conditions specified by the vendor, conforms to the requirements listed in [A.3.2](#) for said printing condition. In addition, the system shall be capable of

accepting and processing data files conforming to [4.1](#). The Altona Technical Test Suite 2.0 – Technical Page 2^[23] should be printed, where all findings should be reported as defined in Reference [\[23\]](#).

Where validation printing systems are intended to support simulation of spot inks a representative set of spot colours should be included in the assessment.

A.3.2 All validation prints

All validation prints shall conform to the following requirements:

- [4.1](#): data requirements for validation print systems;
- [4.2](#): validation print, all requirements.

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Annex B (informative)

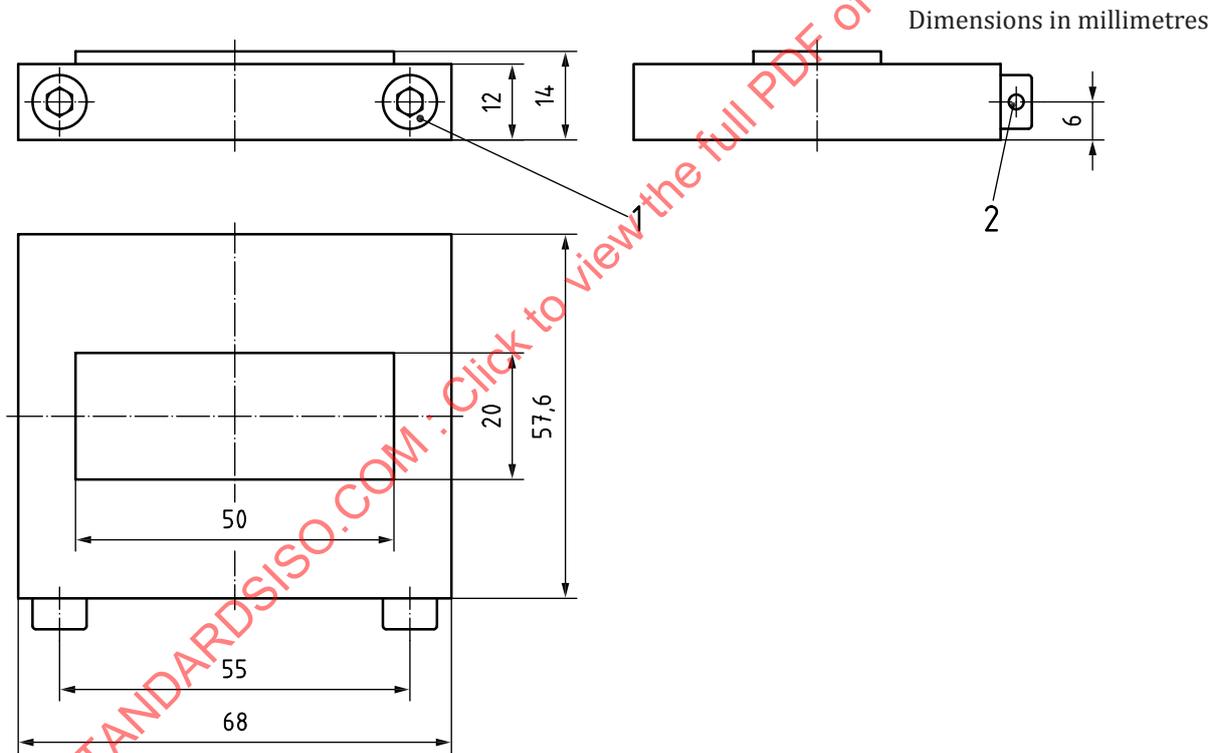
Determination of print durability after stabilization

B.1 Apparatus

B.1.1 Slab

For the procedure, a stainless steel slab is used, having dimensions in accordance with [Figure B.1](#), with a mass of approximately 400 g, a protruding wipe area of 10 cm² and, hence, a ratio of force per area of 0,4 N/cm². A pull string is attachable to the front of the slab by means of two screws whose heads have a hole; see [Figure B.1](#), key item 1.

NOTE This procedure is modelled after DIN 53131-2, method A.



Key

- 1 screw M5
- 2 hole, \varnothing 2 to 3, for fastening of the pull string

Figure B.1 — Slab

B.1.2 Rubber mat

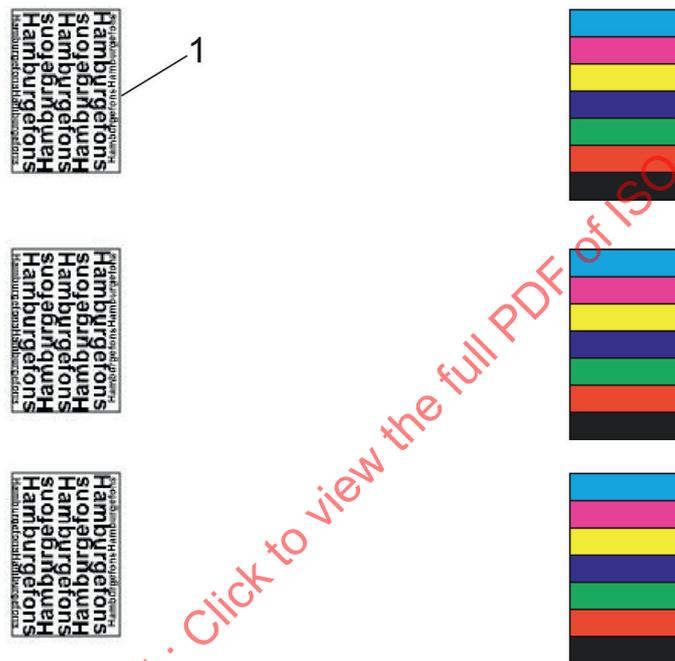
Rubber mat with the following properties: thickness, 2 mm; length, 340 mm; width, 250 mm; Shore-A hardness, 65 A; and a smooth matte surface.

B.2 Printing system

The results of this test pertain only to the particular combination of printing system, hardware, firmware, driver setting and software, and the particular validation print substrate and colorant material used.

B.3 Printed test area

Prepare a test form with six printed rectangular test areas of approximate size 25 mm by 36 mm. Fill three rectangles with black ink type and the rest each with seven strips of C100, M100, Y100, C100+M100, C100+Y100, M100+Y100, C100+M100+Y100, with each strip parallel to the shorter side of the rectangles. See [Figure B.2](#) for an example layout.



Key

- 1 text sample area
- 2 colour sample area

Figure B.2 — Example layout for printed test objects

B.4 Mechanical stabilization period test

B.4.1 Climatic conditions

Strictly observe the temperature and relative humidity ranges specified by the vendor. Place all materials and test devices in that environment at least 24 h prior to the test.

B.4.2 Preparation of the slab

Fasten a piece of unprinted substrate of the type to be tested, 40 mm by 80 mm, to the front part of the slab such that it extends rearwards over the protruding part of the slab. Orient the normal printing side of the paper facing away from the slab so that this surface comes in contact with the printed test area.

B.4.3 Test

Attach a 40 cm pull string to the screws of the slab (see [Figure B.1](#), key item 1) so that the slab can be pulled to slide over the table surface. Place the rubber mat on a flat table. Firmly attach the validation print (with its six rectangular test objects; see [Figure B.2](#)) to the rubber mat, printed side up.

Place the prepared slab on the validation print behind a rectangular printed object, with the protruding part facing the validation print. Orient the slab such that longer sides of the protruding part of the slab and those of the printed test area are parallel. At a speed of approximately 5 cm/s, pull the slab fully across the chosen test area, in the direction perpendicular to its longer side. Do not apply vertical forces to the slab. While pulling, keep the string parallel to the table surface. Inspect the substrate attached to the bottom of the slab. If it is marked by transferred colorant, replace it with a fresh piece of validation print substrate. Repeat the rubbing pulls for the remaining five test areas.

B.4.4 Evaluation

Visually scrutinize the printed test areas and the adjacent unprinted parts for traces of the rubbing action. Visually examine the substrate that was attached to the slab for traces of transferred colorant. For the striped test areas, identify which colorant is affected most by the rubbing.

B.4.5 Mechanical stabilization period of colorant

Determine the colorant mechanical stabilization period as follows: Make a series of tests in accordance with [B.4.3](#), starting immediately after the validation print fully emerges from the print system. Repeat at least three times, at evenly spaced intervals of approximately 10 min. The time elapsed after printing until the point when no visual traces of the rubbing action can be seen is the colorant mechanical stabilization period.

B.4.6 Test report

Report the following details:

- a) a reference to this document, i.e. ISO 12647-8:2021;
- b) the validation print substrate (vendor, type, article number);
- c) the colorant (vendor, type, article number);
- d) any coating that has been applied;
- e) the validation printer (vendor, type, article number);
- f) the printer driver and setting (vendor, type, version);
- g) the application programme (vendor, type, version);
- h) the raster image processor (type and version);
- i) the operating system (vendor, type, version);
- j) the test conditions and any deviations from this document that can have influenced the results;
- k) the test results;
- l) the date and the name of the person carrying out the test.

Annex C (normative)

Surface gamut patches

[Table C.1](#) contains a selected subset of the surface gamut patches of the data set of ink value combinations defined in both ISO 12642-1 and ISO 12642-2. The column in [Table C.1](#) labelled “A” contains the ISO 12642-2 ink value combination ID number, the column labelled “B” is the ID number of ISO 12642-1. The columns labelled “C”, “M”, “Y”, and “K” are the cyan, magenta, yellow and black ink values, respectively.

Table C.1 — 226 surface gamut patches

Index	A	B	C	M	Y	K
1	1	26	0	0	0	0
2	2	50	0	10	0	0
3	3	48	0	20	0	0
4	4	46	0	30	0	0
5	5	45	0	40	0	0
6	7	42	0	70	0	0
7	9	2	0	100	0	0
8	10	37	10	0	0	0
9	11	190	10	10	0	0
10	12	191	10	20	0	0
11	14	192	10	40	0	0
12	16	193	10	70	0	0
13	18	194	10	100	0	0
14	19	35	20	0	0	0
15	20	196	20	10	0	0
16	21	15	20	20	0	0
17	23	198	20	40	0	0
18	25	199	20	70	0	0
19	27	200	20	100	0	0
20	28	33	30	0	0	0
21	37	32	40	0	0	0
22	38	202	40	10	0	0
23	39	203	40	20	0	0
24	41	11	40	40	0	0
25	43	205	40	70	0	0
26	45	79	40	100	0	0
27	55	29	70	0	0	0
28	56	208	70	10	0	0
29	57	209	70	20	0	0
30	59	210	70	40	0	0
31	61	8	70	70	0	0
32	63	212	70	100	0	0

Table C.1 (continued)

Index	A	B	C	M	Y	K
33	73	1	100	0	0	0
34	74	214	100	10	0	0
35	75	215	100	20	0	0
36	77	90	100	40	0	0
37	79	217	100	70	0	0
38	81	4	100	100	0	0
39	82	63	0	0	10	0
40	83	220	0	10	10	0
41	84	221	0	20	10	0
42	86	222	0	40	10	0
43	88	223	0	70	10	0
44	90	224	0	100	10	0
45	91	225	10	0	10	0
46	100	231	20	0	10	0
47	118	237	40	0	10	0
48	136	243	70	0	10	0
49	154	249	100	0	10	0
50	163	61	0	0	20	0
51	164	256	0	10	20	0
52	165	17	0	20	20	0
53	167	258	0	40	20	0
54	169	259	0	70	20	0
55	171	260	0	100	20	0
56	172	261	10	0	20	0
57	181	16	20	0	20	0
58	199	273	40	0	20	0
59	217	279	70	0	20	0
60	235	285	100	0	20	0
61	244	59	0	0	30	0
62	325	58	0	0	40	0
63	326	292	0	10	40	0
64	327	293	0	20	40	0
65	329	12	0	40	40	0
66	331	295	0	70	40	0
67	333	81	0	100	40	0
68	334	297	10	0	40	0
69	343	303	20	0	40	0
70	361	14	40	0	40	0
71	379	315	70	0	40	0
72	397	88	100	0	40	0
73	487	55	0	0	70	0
74	488	328	0	10	70	0
75	489	329	0	20	70	0
76	491	330	0	40	70	0

Table C.1 (continued)

Index	A	B	C	M	Y	K
77	493	10	0	70	70	0
78	495	332	0	100	70	0
79	496	333	10	0	70	0
80	505	339	20	0	70	0
81	523	345	40	0	70	0
82	541	9	70	0	70	0
83	559	357	100	0	70	0
84	649	3	0	0	100	0
85	650	364	0	10	100	0
86	651	365	0	20	100	0
87	653	83	0	40	100	0
88	655	367	0	70	100	0
89	657	6	0	100	100	0
90	658	369	10	0	100	0
91	667	375	20	0	100	0
92	685	86	40	0	100	0
93	703	387	70	0	100	0
94	721	5	100	0	100	0
95	735	160	0	100	0	20
96	741	410	10	100	0	20
97	747	416	20	100	0	20
98	753	422	40	100	0	20
99	759	428	70	100	0	20
100	760	159	100	0	0	20
101	761	430	100	10	0	20
102	762	431	100	20	0	20
103	763	432	100	40	0	20
104	764	433	100	70	0	20
105	765	162	100	100	0	20
106	771	440	0	100	10	20
107	796	465	100	0	10	20
108	807	476	0	100	20	20
109	832	501	100	0	20	20
110	843	512	0	100	40	20
111	868	537	100	0	40	20
112	879	548	0	100	70	20
113	904	573	100	0	70	20
114	910	161	0	0	100	20
115	911	580	0	10	100	20
116	912	581	0	20	100	20
117	913	582	0	40	100	20
118	914	583	0	70	100	20
119	915	164	0	100	100	20
120	916	585	10	0	100	20

Table C.1 (continued)

Index	A	B	C	M	Y	K
121	922	591	20	0	100	20
122	928	597	40	0	100	20
123	934	603	70	0	100	20
124	940	163	100	0	100	20
125	950	619	0	100	0	40
126	955	624	20	100	0	40
127	960	629	40	100	0	40
128	965	634	70	100	0	40
129	966	635	100	0	0	40
130	967	636	100	20	0	40
131	968	637	100	40	0	40
132	969	638	100	70	0	40
133	970	168	100	100	0	40
134	975	644	0	100	20	40
135	991	660	100	0	20	40
136	1 000	669	0	100	40	40
137	1 016	685	100	0	40	40
138	1 025	694	0	100	70	40
139	1 041	710	100	0	70	40
140	1 046	715	0	0	100	40
141	1 047	716	0	20	100	40
142	1 048	717	0	40	100	40
143	1 049	718	0	70	100	40
144	1 050	170	0	100	100	40
145	1 051	720	20	0	100	40
146	1 056	725	40	0	100	40
147	1 061	730	70	0	100	40
148	1 066	169	100	0	100	40
149	1 075	744	0	100	0	60
150	1 080	749	20	100	0	60
151	1 085	754	40	100	0	60
152	1 090	759	70	100	0	60
153	1 091	760	100	0	0	60
154	1 092	761	100	20	0	60
155	1 093	762	100	40	0	60
156	1 094	763	100	70	0	60
157	1 095	764	100	100	0	60
158	1 100	769	0	100	20	60
159	1 116	785	100	0	20	60
160	1 125	794	0	100	40	60
161	1 141	810	100	0	40	60
162	1 150	819	0	100	70	60
163	1 166	835	100	0	70	60
164	1 171	840	0	0	100	60