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

Part 6: Flexographic printing

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

Partie 6: Processus flexographique

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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 third edition cancels and replaces the second edition (ISO 12647-6:2012), which has been technically revised. It also incorporates the Amendment ISO 12647-6:2012/Amd 1:2015.

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

— the intent of the document has been changed from a process control definition to a specification of the way to exchange the information necessary to define the printing characteristics of the desired product. To do this, it has built on colour management technology and the exchange of colour characterization data.

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

Historically, the ISO 12647 series of International Standards established the process control parameters and their aim values and tolerances for the most important professional printing processes of the graphic arts industry. The initial concept was that the groundwork for the series was laid down in ISO 12647-1. This document differs from that concept because flexographic printing has changed significantly since the ISO 12647 series was initially conceived.

This current edition differs from the earlier edition by not defining specific printing condition aims, but instead requiring that a specific reference printing condition (characterization data set) be specified. Flexographic printing differs from other printing procedures by using a variety of printing machine architectures, ink sequence, ink types, anilox rollers, substrate types, etc. Each of these involve different printing condition and process control aims. This document requires that the colour of the printed product match a characterization data set or a printing condition agreed upon by the provider and the receiver. It specifies minimum requirements and tolerances to be communicated and produced.

The purpose of a proof is to simulate the visual characteristics of the finished printed product as closely as possible, which often becomes a contractual agreement between the provider and the receiver. ISO 12647-7 defines a process where colour characterization data are used to produce a contract proof.

Defined output intent should be a smooth data set, it is recommended to use an industry accepted Reference characterization data set. The use of a data set from an old flexographic press results in a lumpy characterization data, and consequently problematic transforms. The goal for most packaging is to render all print to a similar appearance, typically the same aim reference characterization data set is used for flexographic, offset, gravure, and digital printing.

This market also uses colour proofing on electronic displays. The International Standards for colour proofing on electronic displays are ISO 14861 and ISO 12646.

Spot colour management is defined in this document to utilize spectral data in an XML schema defined by ISO 17972-4. ISO 17972-4 includes exchange specifications for spot colour characterization data to facilitate the communication of spot colour data.

There are many cases in this document where the provider and the receiver communicate. Modern flexography has the capability to align with most other printing aims, however there are some conditions based on substrate, applications, printing forme technology where aligning to providers aims cannot be met. Table 5 list all attributes that should be discussed for these exceptions.

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

Part 6: Flexographic printing

1 Scope

This document specifies the requirements for the exchange of data and information necessary for the definition of the aims for four-colour flexographic printing of packaging and publication materials, including newsprint. It is based on the use of colour characterization data to define the colourimetric printing aims and includes appropriate assignment of responsibility for and recommended tolerances on critical parameters of the flexographic printing process.

This document is directly applicable to:

— publication flexographic printing including magazines, catalogues and commercial materials and packaging flexographic printing including labels, boxes, and flexible packages;

— half-tone and continuous tone proofing processes that predict the colourimetric results of flexographic printing.

Guidance is also provided concerning the definition of spot colours used in flexographic printing.

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 5-3, *Photography and graphic technology — Density measurements — Part 3: Spectral conditions*

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

ISO/TS 10128, *Graphic technology — Methods of adjustment of the colour reproduction of a printing system to match a set of characterization data*

ISO 12647-7, *Graphic technology — Process control for the production of halftone colour separations, proof and production prints — Part 7: Proofing processes working directly from digital data*

ISO 13468-1, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument*

ISO 13468-2, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 2: Double-beam instrument*

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

ISO 14782, *Plastics — Determination of haze for transparent materials*

ISO 17223, *Plastics — Determination of yellowness index and change in yellowness index*

ISO 17972-1, *Graphic technology — Colour data exchange format — Part 1: Relationship to CxF3 (CxF/X)*

ISO 17972-4, *Graphic technology — Colour data exchange format (CxF/X) — Part 4: Spot colour characterisation data (CxF/X-4)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
fringe width
size of fuzzy area to the outside of an imaged halftone dot

3.2
printing forme
cylinder or sleeve covered with a relief type rubber or photopolymer plate for application of printing ink to print substrate

[SOURCE: ISO 2834-2:2007, 3.3, modified — The original term was "printing forme for flexography".]

3.3
provider
organization that prepares the data for printing, distributor of a digital data file, designer, consumer products company or trade shop

3.4
receiver
organization that receives the file, or to whom a digital data file is delivered,

Note 1 to entry: In the context of this document, usually a prepress company, printer or converter.

3.5
replacement colour
spot colour (3.7) used, with altered separations, in place of a process colour

3.6
screen ruling
number of image elements, such as dots or lines, per unit of length in the direction which produces the highest value

3.7
spot colour
non-process colour that is used in addition to, or in place of, a process colour and is normally applied with a single impression

Note 1 to entry: When associated with a corporate product identity, a spot colour is also known as brand colour.

4 Requirements

4.1 General

In all cases, digital data files, colour separation film sets or printing formes delivered for printing shall be accompanied by a contract proof or a soft proof unless there is an agreement between all parties concerned that soft proof may be used or that no proof is required. If delivered, the contract proof shall

simulate the intended printing condition including finishing and shall conform to ISO 12647-7, using a defined control bar per ISO 12647-7. This fact shall be verifiable by measuring a well-specified control strip or a similar control target suitable for measured verification that is printed on the proof print along with the subject.

NOTE Where intermediate proofs are needed to simulate the printed product without finishing applied, these are typically prepared by the printer.

4.2 Material input requirements

4.2.1 General

Input for flexographic printing may be either film, digital data or printing formes. It should be noted that the use of film or printing formes as the interchange format between the provider and the receiver should include additional details (such as image distortion) not covered in detail in this document.

4.2.2 Distortion correction

There is currently no agreement as to a single formula for image distortion. Therefore, the computation to be used shall be agreed upon between the provider and the receiver.

4.2.3 Proof requirements

All input for flexographic printing (film, digital data or printing formes) shall be accompanied by a proof prepared in accordance with ISO 12647-7 unless there is prior agreement that a proof is not required, or that an agreed upon soft proof will be used.

4.2.4 Digital data files

Data delivered for printing shall be in the colour formats of CMYK, CMYK plus spot colours, or CMYK with spot colour as replacement for CMYK colours. The actual data delivered may be either final format data or three-component colour data sets with associated colour profiles to allow the data to be converted to the final data format. The intended printing condition shall be defined with sufficient data to allow at least one of the three methods described in ISO/TS 10128 to be applied for establishing the printing aims. Where the intended printing condition is included in the registry of characterizations maintained by the ICC, and the digital data are CMYK, the name used in the ICC registry may be used for identification in lieu of including an ICC output profile. If the intended printing condition is not included in said registry, an ICC output profile shall be included.

If the process colorants are other than CMYK, the data shall be defined colourimetrically using an ICC destination profile that shall be referenced, along with spectral data defined in ISO 17972-4; the rendering intent to be used with the output profile shall be communicated.

The colour gamut of the aim reference printing conditions should be aligned to the intended press gamut. Where the aim data set cannot be achieved by the printing system, it is the receiver's responsibility to communicate and agree on resolution with the provider of the file.

The file format used for data exchange shall be PDF/X and should be in accordance with ISO 15930-7. The ISO 15930 series provides many versions of PDF, for global continuity PDF/X-4 for blind transfer delivers files containing fonts, images, and colour requirements and should be used.

Spot colours measurement data (for example Brand colours) shall be communicated between the provider and the receiver and should be communicated as CxF/X-4, CxF X-4a or CxF X-4b as defined ISO 17972-4 or ISO 17972-1 with spectral reflectance data. It may be embedded in the PDF/X document output intents as mixing hints as specified in ISO 32000-2, by prior agreement between the provider and the receiver.

The ICC profile should include tables that provide smooth transforms. One method to inspect the smoothness of a profile is to use a test image with colour vignettes for primary and secondary colours, as well as images with smooth contours.

NOTE Communication of spot colours as part of digital data exchange is defined by a number of International Standards. See Annex A.

The ISO 15930 series defines many versions of PDF which may be used by prior agreement between the document designer and printer.

4.2.5 Film/printing forme requirements

4.2.5.1 Colour separations

In order to permit the reproduction of at least 100 tone value steps, the resolution of the image setter or printing forme setter should be set to the appropriate resolution for the screen ruling required for the printing application.

The fringe width shall not be greater than one fortieth of the screen ruling.

4.2.5.2 Printing forme digital (laser ablative mask or thermal imaging layer)

In the case of digital plate making processes based on laser ablative mask, the mask material and plate sensitivity varies substantially from manufacturer to manufacturer. It is therefore not possible to provide a recommendation that would apply to all plate types. Users shall follow the recommendations for ablation and plate exposure specified by the manufacturer.

4.2.5.3 Film

When film is provided, the matte negative colour separation film shall have a core density of 4,0 or above. The transmission density in the centre of a clear half-tone dot shall not be higher than 0,1 above the corresponding value of a large clear area. The transmission density of the clear film shall not be higher than 0,15. Both measurements shall be made with transmission densitometer whose spectral products conform to printing density as defined in ISO 5-3.

The clear film density requirement is based on the understanding that the density range of the clear areas of all films that are to be exposed onto the same plate need to be within a printing density range of 0,10. Experience has proved that 0,05 represents the lowest commonly found value for ISO 5 Type 1 printing density. For half-tone films with clear film densities above this range, agreements between the supplier of colour separations and the recipient are required. Contacting or duplicating may also be used to bring half-tone films with dissimilar clear film densities into agreement.

As a practical guide, a core density of 4,0 above the clear film density should be achieved if the density of large solid areas is more than 4,0 above the clear film density.

NOTE 1 Other than for the clear film density requirement, the colour separation film quality can be evaluated according to Annex C.

NOTE 2 This tolerance includes image or printing forme setter repeatability and material stability.

4.2.5.4 Printing forme verification for delivery

Flexographic printing formes, whether prepared by the provider or the receiver, shall be created with both an uncompensated and a compensated set of control patches representing the tonal steps of at least the minimum dot size, and tonal values of 10 %, 30 %, 50 %, 70 %, and a solid.

For the uncompensated set of patches, the tone values measured on the printing forme shall be within the tolerances shown in Table 1. This requires that the control patches be exposed independent of the image content.

For the compensated set of patches, the data in the file associated with these patches shall be the tone values necessary to produce the indicated value when printed on the substrate. These tone patches, measured on the printing forme, shall be within tone value tolerance shown in Table 1.

There is no standard method for measuring halftone dot area on the printed forme and there should be significant differences between measurement devices. A measurement method shall be agreed between the provider and the receiver.

Table 1 — Tone value tolerances for printing forme delivery

Tone value range	Screen rulings equal to or below 48 cm^{-1}	Screen rulings above 48 cm^{-1}
Tone values below or equal to 10 %	±1	±2
Tone values above 10 %	±2	±3

NOTE 1 Because the tone value measured on the printing forme does not necessarily represent the tone value achieved on the printed sheet, a common calibration process is to expose a digital scale representing the full tonal scale and use this to calibrate the relationship between tone value measured on the printing forme and tone value achieved on the printed sheet.

NOTE 2 Because the exposed area of a flexographic printing forme is not necessarily representative of the tone value is achieved after processing of the printing forme, a common calibration process is to expose a digital scale representing the full tonal scale and use this to calibrate the relationship between exposed tone value and tone value achieved on the processed printing forme.

The minimum physical dot printable (min dot) is dependent upon, among other things, the screen ruling, printing forme technology and anilox roller being used. It requires agreement between the provider and the receiver of the printing formes.

4.2.5.5 Image size tolerance (film or printing forme)

For a set of colour separation films or printing formes in common environmental equilibrium, the lengths of the diagonals shall not differ by more than 0,02 %. Modern flexographic plate mounting systems do not have the capability to measure diagonals. Verification on these devices should be maintained to be within one row of dots both vertical and horizonal.

NOTE This tolerance includes image or printing forme setter repeatability and material stability.

4.3 Printing aims

4.3.1 General

The flexographic printing process as practiced today is largely based on the use of reference characterization data and colour management profiles to define the printing aims for the single and two-colour tone scales and the associated overprint colours. The printer is free to use the appropriate combination of anilox rollers, printing formes, inks, sleeves and electronic data manipulation (for example using the principles of ISO/TS 10128) to achieve final printed images that colourimetrically match the provided characterization data adjusted, if necessary to match the substrate colour as described in 4.3.3. The primary responsibility of the printer is to provide a consistent reproducible printing process.

However, there are some parameters that need to be controlled and some general aims that should be used as guidance for printing. These are addressed in the following clauses.

4.3.2 Halftoning parameters

4.3.2.1 General

The manufacturers of raster image processors generally recommend specific screen angles and output resolution for an imaging device in order to provide the smoothest screening. Agreement shall be reached between the provider and the receiver concerning the particular screening parameters to use.

4.3.2.2 Screen frequency

Agreement shall be reached between the provider and the receiver.

4.3.2.3 Screen angle

Where screen angle is critical, agreement shall be reached between the provider and the receiver.

For half-tone dots without a principal axis, the nominal difference between the screen angles for cyan, magenta and black shall be 30°, with the screen angle for yellow separated by 15° from another colour. No colour should align with engraving pattern on the anilox roller.

Typically, ceramic anilox rollers are engraved at 60° and mechanically engraved rollers are engraved at 45°. The provider needs to communicate with the receiver in order to avoid conflict with the actual anilox engraving angle.

4.3.2.4 Dot shape and its relationship to tone value

Round dots are recommended since they provide the best process consistency for a given resolution, and the best available resolution for process consistency. When delivering printing formes, agreement shall be reached between the provider and the receiver.

4.3.2.5 Tone value sum of the printing forme

The tone value sum should be equal to or less than 320 % for four colours unless there is prior agreement between the provider and the receiver.

NOTE The tone value sum requirement is intended for general guidance as a maximal limit only. The actual limitations on tone value sum are a function of, among other things, the type of ink used (solvent, water-based, UV cured, etc.), the substrate, dryer configurations, and inline converting processes. Press trials provide the appropriate tone value sum for a particular process.

4.3.2.6 Tone value reproduction limits

The receiver shall convey to the provider of films, files or printing formes the physical size of minimum stable printable dot that can be supported by the printing system to be used. The upper and lower tone value limits of half-tone dot patterns which shall transfer to the print substrate in a consistent and uniform manner shall be agreed between the provider and the receiver.

NOTE Press trials provide the appropriate minimum stable printable dot. The actual minimum stable printed dot is, among other things, a function of machine configuration, plate type, printed substrate, type of ink and speed.

4.3.3 Print substrates

Identification of the substrate to be used for printing, and its colour and gloss, shall be conveyed from the printer to the provider of films, printing formes or data. Substrate colour should typically fall within the ranges tabulated in Table 2. ISO 15397 provides guidance for communication of paper substrate colours and properties. For non-paper substrates, the following shall be consulted: ISO 13468-1, ISO 13468-2, ISO 14782, ISO 17223. The “colour” of clear or translucent films may be obtained by following the methods of ISO 13655, using a standard white backing sheet as described in ISO 13655:2017, A.3.

Table 2 — Recommended print substrate colour range

L*	a*	b*
> 85	−3 to +3	−5 to +5

Where the substrate colour falls within the range shown in Table 2, the characterization data set provided in accordance with 4.2.4 may be modified using the backing correction method outlined in ISO 13655. Where the substrate colour falls outside of the range shown in Table 2 the characterization data set provided shall be modified using the backing correction method outlined in ISO 13655. Where the substrate is transparent, the method described in ISO 13655:2017, A.4 for the correction of measurements made on transparent materials may be combined with the backing correction method to adjust the characterization data appropriately. Such adjustments shall be agreed upon by the provider and the receiver of the data file.

NOTE 1 The ISO 13655 backing correction method has been shown to work equally well for changes in substrate as it does for changes in the backing used for measurement of a substrate. This method is now being referred to as a substrate correction method rather than as a backing correction method.

NOTE 2 If the final product is subjected to surface finishing, this step is expected to affect the print substrate colour. The aim of the proof and characterization data needs to match the final condition after surface finishing. To facilitate the printing operation, characterization data and proofs based on the appearance of the final product prior to finishing are useful data to exchange.

NOTE 3 Where printing is on the reverse side of a transparent media or over a pre-printed white background, the requirements of this clause can be modified appropriately to allow communication between the provider and the receiver.

4.3.4 Ink set colours

The hue angle aims for solid CMY of both traditional inks and extreme light-fast flexographic process inks shall be the values listed in Table 3. A metric hue angle is not specified for black because the aim for black ink is CIELAB a* = b* = 0." Additionally tolerance for CMY hue angles shall be ± 6 degrees within values listed on Table 3.

The CIELAB colour coordinates *L*, a*, b** of the process colour solid tones on the print shall be as defined in the characterization data set provided. The CIELAB colour coordinates *L*, a*, b** of the spot colour solid tones on the print shall be defined either in the characterization data or in the PDF/X data file exchange. Where accurate spot colour replication is required, spectral data shall be provided as described in Annex A.

The deviation of the process colour solids of the OK print is restricted by the condition that the colour differences between characterization data and the OK print shall not exceed 6 CIEDE2000 units and in addition shall meet the deviation tolerances specified in Table 4.

The deviation of the spot colour solids of the OK print is restricted by the condition that the colour differences between specified aims and the OK print shall not exceed a CIEDE2000 of 6 and in addition shall meet the deviation tolerances specified in Table 4.

Table 3 — CIELAB metric hue (h_{ab}) aim values for the solids of the chromatic process colours and two-colour overprints

Colour	Metric hue angle (degrees)		Max $CIEDE_{00}$
	Traditional	Extreme light-fast	
Cyan[a]	233	233	6
Magenta[a]	357	12	6
Yellow[a]	93	100	6
Red[b]	36	40	
Green[b]	160	162	
Blue[b]	290	296	

[a] Secondary colours are provided for information only.

4.3.5 Reproducibility of ink colour set

Unless there is an agreement between print buyer and the print provider the variability of solid colours is restricted by the following conditions.

— For at least 68 % of the measured production prints, the colour differences between the printed sheets and the OK sheet shall not exceed the appropriate variation tolerance specified in Table 4.

— For at least 68 % of the measured production prints, the colour differences between the printed sheets and the OK sheet should not exceed one-half of the appropriate variation tolerance specified in Table 4.

— The computation of colourimetric parameters shall be as defined in ISO 13655. Typical tolerancing from a ConsumerProducts company would be $\Delta E_{00} < 3{,}0$ or $\Delta E_{00} < 2{,}0$.

— Colour variation within a printing run is below 2 ΔE_{00}. This shall be measured as the 95th percentile of the colour variation between the OK print and a sample set of 15 prints with a colour strip containing C, M, Y, K primaries.

NOTE 1 The variation tolerance is defined as the upper limit for 68 % of the production measured samples. This is in analogy with a Gaussian distribution where 68 % are within plus or minus one standard deviation of the mean. Appropriate upper control limits can be established based on these statistical limits and the desired coverage factor.

NOTE 2 The number of samples is generally agreed between print buyer and print supplier. ISO 186 is often used as a reference for this type of sampling.

Table 4 — Colourimetric tolerances for the solids of the process colours and spot colours

	Black	Cyan	Magenta	Yellow	Spot colours
Deviation tolerance	$\Delta L^* < 5, \Delta C^* < 3$	$\Delta h_{ab} < 6$	$\Delta h_{ab} < 6$	$\Delta h_{ab} < 6$	$\Delta h_{ab} < 6$
Variation tolerance	$\Delta E_{00} < 3$	$\Delta E_{00} < 2$	$\Delta E_{00} < 2$	$\Delta E_{00} < 2$	$\Delta E_{00} < 2$

4.3.6 Ink set gloss

If it is deemed necessary to specify the gloss of solid tone colours, the specular gloss of the ink set sample shall be requested by the provider or defined by the receiver. If setting or communicating the gloss of the ink set, it shall be measured according to ISO 2813 using either 60° angle for moderate gloss or 20° for high gloss inks.

4.3.7 Tolerance for image positioning

The maximum distance between the image centres of any two printed colours shall not be more than 2/(screen ruling) and should be not more than 1/(screen ruling).

4.3.8 Tone value increase (TVI)

The tone value increase of flexographic printing strongly depends on the particular combination of ink, anilox rolls, printing formes, printing substrate and "press" used. Therefore, no specific TVI curves are provided. The aim is to match a characterization data set (which describes the customers' expectations). An initial estimate of the aim TVI can be obtained from the characterization data itself (guidance is provided in ISO 15339).

There are situations where colour-managed systems for data input and preparation are either not available or not appropriate in a particular workflow. However, use of a consistent set of references can enable a higher degree of consistency between output from unrelated sites. Tone value curves calculated using SCTV per ISO 20654 can be used to define tone curves aims for both CMYK and Spot colours. The aim values may specify a desired tone curve or may be linear.

CMYK is out of the scope of ISO 20654, however the calculations can be used for any colour, if the printer is not capable of aligning to the data set, then SCTV may be used for all colours.

4.3.9 Reproducibility of printing

Over the press run, the difference between the measured value of the printed image of the 50 % tint of the C, M, Y and K control strip, and the values of the OK print, shall be less than ± 4 in tone value (%).

Where a control strip is not included, a single colour portion of the image having an input tone value between 30 % and 70 % may be used for this evaluation.

The minimum stable printable dot (referred in the control tonal value as min dot) of the C, M, Y and K tint of the process control strip shall not vary more than a maximum of ± 3 in tone value (%) over the press run.

5 Communication

When requested by the provider of the printing data, the receiver shall provide a summary of the values associated with the variables identified in this document requiring agreement between the provider and the receiver. This report may also include any additional printing aims and process control data deemed appropriate by the provider or receiver.

For many jobs there are no additional requirements beyond those specified in this document, in such cases the job can be fully specified by the PDF/X-4 and no additional job information is required.

In some cases, default values in this document are not always appropriate and additional job details shall be agreed by the provider and the receiver and shall be documented. Examples of job specific details are listed in Table 5.

Table 5 — List attributes where requirements should be communicated

Use cases where communications are required between the provider and the receiver
Receiver cannot match embedded data sets to aim tolerances
Receiver cannot achieve required tolerances for solids
Substrate cannot align with embedded profile
Coarse screen ruling is required to reduce noise
Receiver cannot utilize PDF/X-4 files
TAC does not comply with embedded data set
Minimum dots has more gain than embedded data sets
Ink hues cannot match embedded ICC profile or CXF/X-4 spectral data
Distortion requirements for post processing are in conflict with job requirements
NOTE TAC refers to total area coverage.

Annex B shows a tabulation of information that might be provided as part of the data exchange between the provider and the receiver.

Annex A
(normative)

Communication of spot colour data

A spot colour is a non-process colour that is used in addition to, or in place of, a process colour, where the consistent appearance of that colour produced is critical to the appearance of the finished product or the area coverage of that colour dictates the use of a single ink. It is normally applied with a single impression. When associated with a corporate product identity, a spot colour is also known as brand colour.

Where spot colours are used, they shall be defined by spectral reflectance measurement data of the spot colour ink printed over the substrate to be used for printing (or a reference substrate similar to the actual substrate to be used) and over a black area printed on this substrate. Spot colours incorporating tints shall be defined at a minimum with prints on the substrate and on the printed black area at tone values of 0 (%), 50 (%) and 100 (%).

Printing a spot colour ink over a printed black area on the substrate may exhibit a difference in film transfer characteristics. The affinity of the ink for the unprinted surface may be different than its affinity for the surface of the black ink due to changes in the surface tension and roughness of the receiving surface, known at ink trap. This is similar to the issues observed when printing 2-colour overprints (M+Y, C+Y, M+C) which do not produce expected R, G, B colours. However, flexographic printing which utilizes dry trap does not exhibit as strong of a trapping error as wet-on-wet printing used in offset printing.

Spot colours incorporating tints are better defined with prints on the substrate and on the printed black area with at least 9 tone values that include a 0 (%), 50 (%) and 100 (%) tone value and are otherwise evenly distributed in tone value between the substrate and the solid. Unless otherwise agreed between the provider and the receiver, colour measurements are made as defined in ISO 13655, condition M1, over a white backing.

Calibration of spot colour tints should be aligned with ISO 20654.

Brand or spot colours spectral data should be communicated between the provider and the receiver and should be communicated in an XML format, as documented in ISO 17972-4 or ISO 17972-1 with spectral data.

The substrate ideally is the substrate on which the job will be printed. The black ink shall be printed at the standard L^* value ($L^* \leq 11$). A commercial “contrast card” or print substrate with a white area and a pre-printed black area can be used where the actual printing substrate is not known or available. Such “contrast cards” are available with either an uncoated, coated or sealed surface.

The measurement data file shall include the model of measurement instrument used, the printing procedure, ink identification, and substrate used.

Annex B
(informative)

Information exchange

The following tabulation includes one possible information that might be provided as part of the data exchange between the provider and the receiver of the data for flexographic printing, or agreed to as a separate communication. ISO 12647-1 can also be used as a source for reporting details.

a) Proofing requirements (required, type).

b) Exchange medium:

   1) film — type of film, density requirements, etc.;

   2) digital data — file format, reference printing condition, etc.;

   3) printing formes — type, printing forme measurement procedure, etc.

c) Characterization data.

d) Spot colour description.

e) Minimum printable dot.

f) Screening parameters.

g) Tone value sum.

h) Surface finishing requirements.

i) Ink set gloss.

j) Reporting requirements.

Metamerism Index, degree of colour mismatch, calculated in the form of a colour difference, caused by substituting a test illuminant (observer) of different relative spectral composition (responsivity) for the reference illuminant (observer)

Table B.1 shows a possible reporting format for some of the more useful data that might be reported.

Table B.1 — Possible reporting format for useful data

Parameter	Data set value	OK Print[a]	Production[a]
Cyan solid	L* = a* = b* =	Δh_{ab} = $CIEDE_{00}$ =	$CIEDE_{00}$[b] =
Magenta solid	L* = a* = b* =	Δh_{ab} = $CIEDE_{00}$ =	$CIEDE_{00}$[b] =
Yellow solid	L* = a* = b* =	Δh_{ab} = $CIEDE_{00}$ =	$CIEDE_{00}$[b] =
Black solid	L* = a* = b* =	ΔL^* = $CIEDE_{00}$ =	$CIEDE_{00}$[b] =
Cyan midtone TVI (%)	TVI =	TVI =	TVI (mean) =
Magenta midtone TVI (%)	TVI =	TVI =	TVI (mean) =
Yellow midtone TVI (%)	TVI =	TVI =	TVI (mean) =
Black midtone TVI (%)	TVI =	TVI =	TVI (mean) =
Cyan min dot TV (%)	NA	TV =	TVI (mean) =
Magenta min dot TV (%)	NA	TV =	TV (mean) =
Yellow min dot TV (%)	NA	TV =	TV (mean) =
Black min dot TV (%)	NA	TV =	TV (mean) =

[a] All differences recommended for reporting are with respect to the data set values.

[b] 68th percentile.