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Photography — Photographic reflection prints —

Part 3: Evaluation of glossiness

Photographie — Tirages photographiques par réflexion —

Partie 3: Évaluation de la brillance

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
3.1 Terms.....	1
3.2 Abbreviations.....	2
4 Overview.....	2
5 Sample preparations.....	2
5.1 Test targets.....	2
5.2 Printing.....	3
5.3 Specimens.....	3
6 Measurement of specular gloss.....	4
6.1 General.....	4
6.2 Apparatus.....	4
6.3 Procedure.....	4
7 Measurement of image clarity.....	5
7.1 General.....	5
7.2 Apparatus.....	5
7.3 Procedure.....	6
8 Test report.....	7
Annex A (informative) Other properties regarding glossiness.....	9
Bibliography.....	11

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).

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This document was prepared by Technical Committee ISO/TC 42, *Photography*.

A list of all parts in the ISO 20791 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

Glossiness is an optical property regarding reflected light from print surfaces. Many studies have been conducted on glossiness of industrial materials, and several studies have been reported on print materials as well, see References [1] to [6]. It is especially important for photographic prints with respect to printed image quality, because it has wide variety from very high glossy to dead matte surfaces. As stated in ISO/TR 20791-1, several properties affect the gloss perception of photographic prints. Specular gloss and image clarity (distinctness of image) are the two major properties among them. The former relates to the perceived intensity of reflected light and the latter relates to the sharpness of reflected image. There is also a study that states that perceived glossiness of photographic prints is well represented by the combination of these two measurements, specular gloss and image sharpness[8].

Some measurements for properties regarding glossiness have been standardized for industrial materials such as coating, plastics and papers, see References [9] to [13]. Among them, the measurement methods for coatings are standardized with specular gloss and image clarity as important properties for the reflection characteristics. Some standards for graphic printing and office printing basically refer to them while adding methods and cautions specific to each application[14][15]. But there has been no published standard for photographic prints.

This document provides the measurement methods of two major properties to evaluate glossiness of photographic prints: specular gloss and image clarity. The methods are based on the existing documents for coatings and plastics, and specific requirements for photographic prints are defined regarding sample preparation, measurement procedure and reporting.

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Photography — Photographic reflection prints —

Part 3: Evaluation of glossiness

1 Scope

This document describes the characterization of glossiness of photographic reflection prints, which consists of specular gloss measurement and image clarity measurement. This document is applicable to any photographic printing technologies such as inkjet, thermal dye transfer, electrophotography and silver halide technologies.

NOTE The level of preferred glossiness depends on the application.

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

ISO 17221, *Plastics — Determination of image clarity (degree of sharpness of reflected or transmitted image)*

ISO 18913, *Imaging materials — Permanence — Vocabulary*

3 Terms and definitions

For the purposes of this document, the following terms and definitions given in ISO 18913 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 <https://www.electropedia.org/>

3.1 Terms

3.1.1

glossiness

visual quality related to shiny and smooth appearance

Note 1 to entry: Based on this appearance, humans perceive features such as reflection characteristics and roughness of the surface of an object.

3.1.2

specular gloss

ratio of the luminous flux, reflected by the test surface into a specified aperture at the angle of specular reflection, to that from a standard specularly reflecting surface under the same conditions

[SOURCE: ISO 4046-5:2016, 5.107, modified — Note 1 to entry was deleted.]

3.1.3

image clarity

distinctness of image

DOI

degree of sharpness of an image reflected by a specimen or transmitted through a specimen

[SOURCE: ISO 17221:2014, 3.1, modified — the synonym "distinctness of image (DOI)" was added and Note 1 to entry was deleted.]

3.2 Abbreviations

C	cyan
M	magenta
Y	yellow
R	red
G	green
B	blue

4 Overview

This document stipulates evaluation methods of glossiness, based on specular gloss and image clarity. Each measurement method is based on ISO 2813 and ISO 17221. Specific requirements for photographic prints are described in [Clause 5](#) for sample preparation, [Clause 6](#) and [7](#) for measurement and [Clause 8](#) for reporting. In addition, other properties which relate to glossiness are described in [Annex A](#).

The purpose of this document is to characterize the glossiness of photographic prints. Since the level of preferred glossiness depends on the application, this document does not discuss performance superiority or inferiority. The methods in this document are intended to be used for product design and product comparison and are not intended to be used for daily quality assurance in manufacturing.

5 Sample preparations

5.1 Test targets

At least white (D_{\min}) and black patches shall be printed for measurement. Additional colours such as cyan (C), magenta (M), yellow (Y), red (R), green (G), blue (B) and grey are recommended to evaluate the effects of colour or density on measured properties. The sRGB encoded patch values described in ISO 18944 can be applied to test targets for digital printers. Patch size for measurements shall be not less than 25 mm x 25 mm. Examples of test targets are shown in [Figure 1](#). [Figure 1 a](#)) can be used for both colour and monochrome prints.

NOTE A larger patch size is sometimes necessary for the measurements of specular gloss especially at higher angle such as 85°. The manufacturer of each measuring instrument usually provides information about the aperture size and/or the minimum patch size.

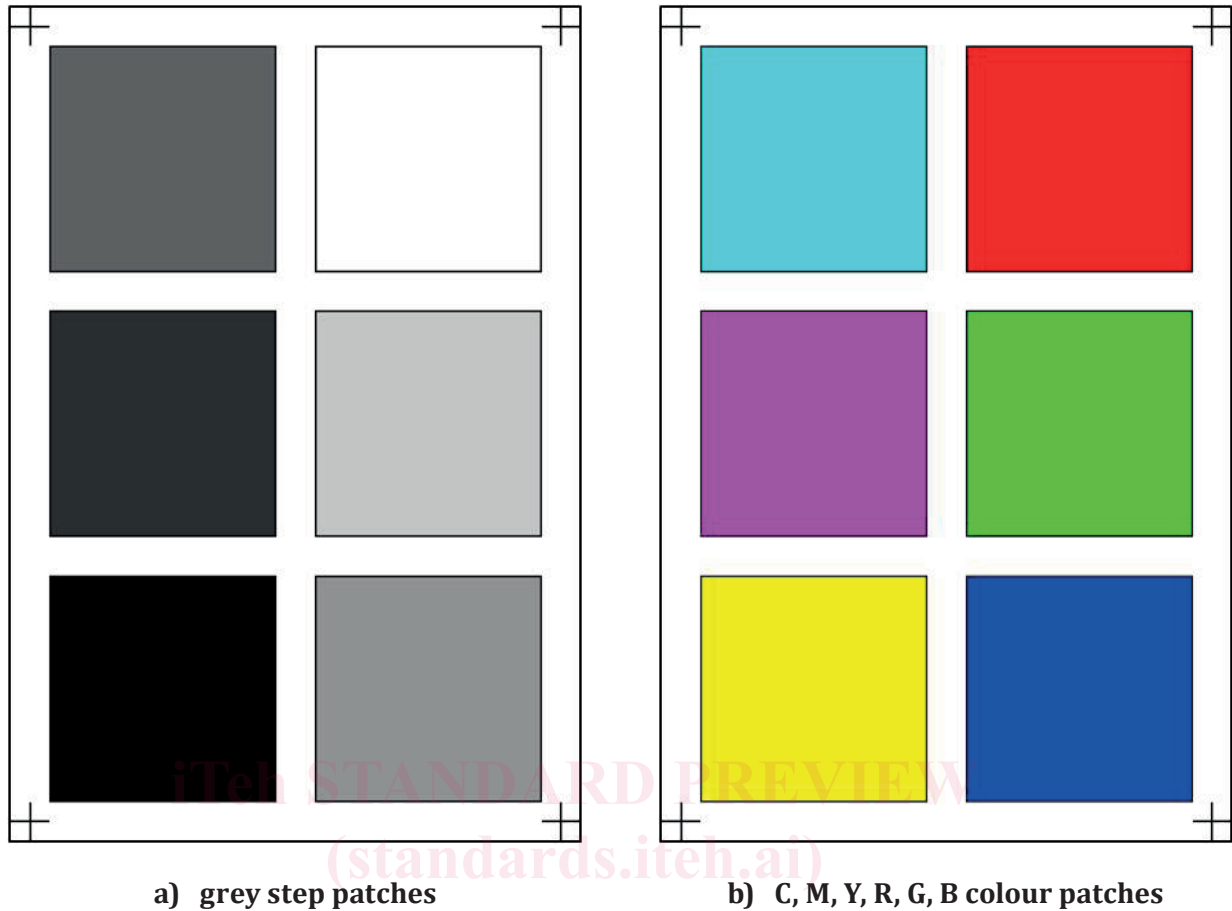


Figure 1 — Examples of test targets

5.2 Printing

The standard ambient environmental condition for printing shall be a temperature of $23\text{ °C} \pm 3\text{ °C}$, a relative humidity of $50\% \text{ RH} \pm 10\% \text{ RH}$ and an air pressure of $101\text{ kPa} \pm 20\text{ kPa}$. If it is not possible to conduct the test under the standard environmental condition, the temperature and humidity shall be reported.

Aqueous and solvent inkjet prints, and prints of any type that require curing/stabilization/dry-down shall be conditioned until the curing process is finished. If the duration of curing is unknown, prints should be conditioned for at least two weeks after printing, in an environment with a temperature of $23\text{ °C} \pm 2\text{ °C}$, with a relative humidity of $50\% \text{ RH} \pm 5\% \text{ RH}$.

5.3 Specimens

The size of specimen shall not be less than $30\text{ mm} \times 30\text{ mm}$ to cover the minimum size of $25\text{ mm} \times 25\text{ mm}$ for a single test patch.

In the case of large size prints, they are cut to fit in the above size before measurement.

NOTE The upper and lower limits of the size, where the sample is stably held, can vary depending on thickness of the sample and structure of the sample holder. The specification of the instrument can be referred.

It is recommended that prints be backed to keep the surface of prints flat during the measurement. Paper boards, plastic plate and metal plates can be used as backing materials. Black coloured boards are preferable to minimize the effects on the measurements. Backing materials shall be reported if they are applied for measurements.

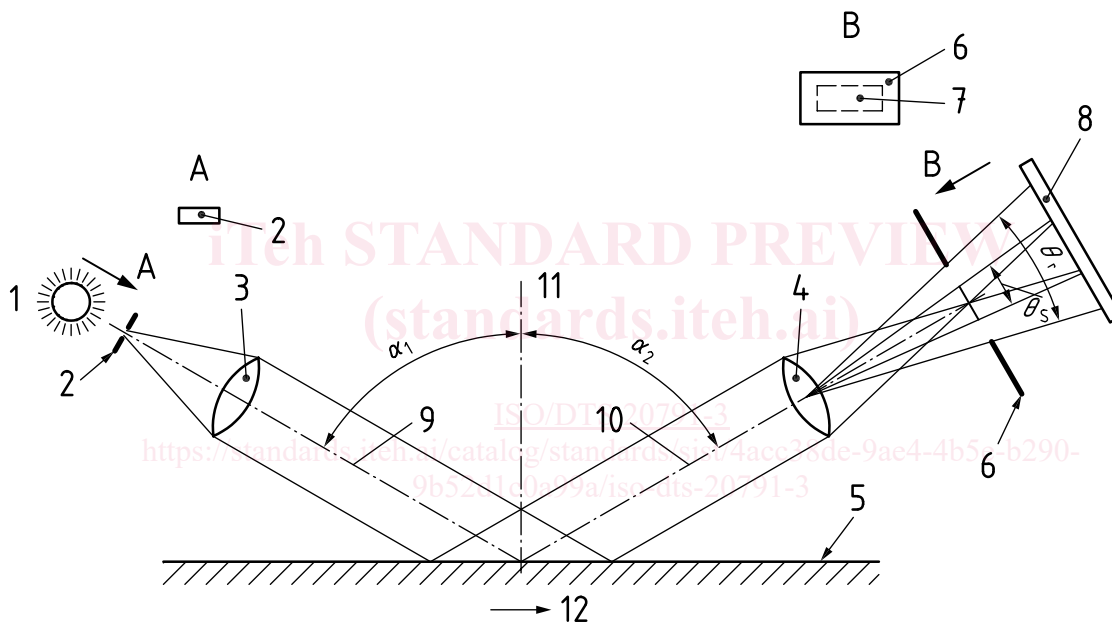
6 Measurement of specular gloss

6.1 General

Specular gloss is relating to the luminous flux reflected from a specimen in specular direction for a specified reflection angle. It is expressed as a ratio of a specimen and a reference glass surface and the ratio multiplied by 100 is treated as a measured value. A glass surface with a refractive index of 1,567 at a wavelength of 587,6 nm is assumed to be the reference for the measurement. The methods in ISO 2813 are applied.

6.2 Apparatus

A glossmeter, as stipulated in ISO 2813, shall be used. It consists of a light source unit, a sample stage and a receptor unit, and has an instrument to adjust the incident angle and the receptor angle. The course of beam of the glossmeter is illustrated in [Figure 2](#). The apparatus shall have the geometry characteristics and structure specified in ISO 2813.



Key

- | | | | |
|---|---|------------|-------------------------------------|
| 1 | light source (source) | 9 | optical axis of the incident beam |
| 2 | source image aperture | 10 | optical axis of the receptor beam |
| 3 | source lens | 11 | surface normal of the test specimen |
| 4 | receptor lens | 12 | direction of measurement |
| 5 | test surface | α_1 | angle between 9 and 11 |
| 6 | receptor field stop | α_2 | angle between 10 and 11 |
| 7 | image of the source aperture in the receptor field stop | θ_r | receptor aperture angle |
| 8 | photo detector (receptor) | θ_s | source image aperture angle |

Figure 2 — Course of beam of the glossmeter (see ISO 2813)

6.3 Procedure

The procedure shall comply with the requirements of ISO 2813. Calibration and adjustment are performed using a reference standard to ensure correct measuring values.