INTERNATIONAL STANDARD

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Graphic technology — Testing of prints — Visual lustre

Technologie graphique — Examen des imprimés — Lustre visuel

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 15994 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

Introduction

There is a large number of national and International Standards covering gloss measurement. However, no existing measure of gloss provides a measure of the visual lustre as perceived by the human observer over the wide range of materials used in printing and publishing. This International Standard defines a measure of surface appearance, identified as “visual lustre”, which is not intended for process control but rather for communication amongst designer, client and the printer of products for which the visual perception of the surface lustre is important.

The visual lustre as specified in this International Standard is a measure of the specular reflection from a sample with the diffuse component of the reflection minimized, and it should therefore correlate with the lustre as perceived by an observer. The test method specified makes it possible to compare the perceived lustre of a wide range of differently coloured prints in a meaningful way. A 45:45 geometry coupled with a 45:0 geometry (preferably, but not necessarily in the same instrument) is sufficient for the entire range that spans from the ideally diffusive surface to a highly reflective glass surface. It is recognized that the the specular component of the total reflectance can also be determined using an instrument with spherical geometry, which can measure total (specular included) and diffuse (specular excluded) reflectance. However, the present 45/0:45/45 method is preferred because it is close to the geometry used for densitometers and colorimeters in graphic technology.

Comparative studies of the lustre of various printed and unprinted samples (see CIE Publ. 17.4) showed that the visual lustre defined in this International Standard correlates well with the lustre as perceived by an observer group, whereas the specular gloss (measured in accordance with ISO 2813 and ISO 8254-1 shows a much smaller correlation coefficient. An important prerequisite for such a comparison is that the geometric conditions for illuminating and observing the samples are identical to those realized in the measuring instrument.

Graphic technology — Testing of prints — Visual lustre

1 Scope

This International Standard defines a measure of the apparent lustre of printed materials, termed “visual lustre”, which is intended for communication amongst designer, client and the printer of products for which the visual perception of the surface lustre is important.

This International Standard is not intended for process control in the printing industry, or in the papermaking and boardmaking industry, nor is it intended for the measurement of fluorescent materials or those which show metallic or pearlescent effects.

2 Normative references

The following referenced documents are indispensable for the application 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 186, *Paper and board — Sampling to determine average quality*

ISO 2813:1994, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20 degrees, 60 degrees and 85 degrees*

ISO 8254-1:1999, *Paper and board — Measurement of specular gloss — Part 1: 75 degree gloss with a converging beam, TAPPI method*

ISO/CIE 10527, *CIE standard colorimetric observers*

CIE Publ. 15.3:2004, *Colorimetry*

CIE Publ. 17.4:1987, *International Lighting Vocabulary*

CIE Publ. 38.5:1977, *Radiometric and Photometric Characteristics of Materials and their Measurement*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
visual lustre
L
quantity characterizing the visually perceived lustre as defined in this International Standard and having a unit of 1

3.2
reflectometer scale
scale defined in relation to the specular reflection of a polished, flat, black glass with a refractive index of 1,567 at a wavelength of 546,1 nm which has a reflectometer value of 100 under the geometrical conditions (45/45) of measurement defined by this International Standard

3.3
reflectometer value
R
value on the defined reflectometer scale

3.4
photopic vision
vision by the normal eye when it is adapted to a level of luminance of at least several candelas per square metre

[CIE Publ. 17.4]

3.5
measurement beam plane
plane defined by the influx and efflux light beams

3.6
area under test
part of the sample surface determined by the angular field of sensitivity of the receiver

3.7
diffuse reflection
d
reflection in which the incident flux is reflected in many directions by diffusion at or below the surface of the material

3.8
specular reflection
s
reflection of light from the surface of a material according to the laws of optics, excluding diffuse reflection

3.9
total reflection
r
reflection of light from the surface of a material, including both the specular and diffuse components of reflection, as used in this International Standard

NOTE Total reflection is approximately equivalent to the sum of the specularly reflected flux and the diffusely reflected flux relative to the flux from the perfect reflecting diffuser.

4 Principle

A test piece is illuminated at an angle of 45° to the normal and measurements of the reflected light are made under standardized conditions at the angle of specular reflection, 45°, to obtain the total reflection (the sum of specular and diffuse reflection) and at an angle of 0° (diffuse reflection only). The result of the latter measurement is subtracted from that of the former to yield a value of the specular reflection. The logarithmic value of this specular reflection is calculated in order to obtain a quantity which correlates with the visual perception of lustre.

5 Apparatus

5.1 Instrument or instrument combination, in conformance with the requirements of Annex A.

5.2 Black glass reference standard, polished, optically flat, black-coloured idealized glass with a refractive index of 1,567 at 546,1 nm, which is assigned a reflectometer value 1,0.

NOTE 1 Such glasses are not commercially available. A practical working standard is a polished, optically flat, black-coloured glass whose specular reflectance has been characterized relative to the ideal standard.

NOTE 2 The black glass serves as a standard for specular reflectance.

5.3 White reference standard, matte, non-glossy surface produced by pressing calibrated $BaSO_4$ powder or substitute of sufficient purity as referred to in CIE Publ. 15.3.

NOTE In the application of this method it is assumed that the reference white is a perfectly diffusing and perfectly reflecting surface. Other commercial materials such as Spectralon[1)] manufactured by Labsphere may be appropriate for use instead of $BaSO_4$ powder.

5.4 Black cavity, hollow body with a highly absorbing inner surface and an orifice so that it can be positioned in the measuring instrument in a reproducible way. The diffuse reflectance of this cavity shall be less than 1 %.

6 Determination of instrumental constants

6.1 General

Two instrumental constants, k and N, shall be determined.

Constant k is a measure of the imbalance of the two signal channels, which may be caused by differing responsivities/emissivities and/or unequal beam apertures.

Constant N is the difference between the intensity signals detected with the 45:45 and the 45:0 measurements on black glass, after the 45/0 signal has been corrected for channel imbalance by multiplication by the constant k.

6.2 Zero adjustment

The black cavity (5.4) serves as a substitute for the perfectly absorbing surface, it is used for zeroing the intensity signals. Measure the black cavity and set the intensity signals of the 45:45 and the 45:0 measurements to zero.

1) Spectralon is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.