

Photographic density measurements —

Part 2: Specification for geometric conditions for transmission density

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- British Association of Oral and Maxillo-Facial Surgeons
- British Dental Association
- British Kinematograph, Sound and Television Society
- British Photographic Association
- College of Radiographers
- Institute of Physics
- Ministry of Defence
- Photogrammetric Society

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National foreword

This Part of BS 1384 has been prepared under the direction of the Cinematography and Photography Standards Policy Committee. It is one of a series of Parts which together constitute a revision of BS 1384. This Part is identical with ISO 5-2:1991 *Photography — Density measurements — Part 2: Geometric conditions for transmission density* published by the International Organization for Standardization (ISO). It supersedes BS 1384-2:1986, which is withdrawn.

Cross-references

International standard	Corresponding British Standard
ISO 5-1:1984	BS 1384 <i>Photographic density measurements</i> Part 1:1985 <i>Guide for terms, symbols and notations</i> (Identical)
ISO 5-3:1984	Part 3:1985 <i>Specification for spectral conditions</i> (Identical)

The Technical Committee has reviewed the provisions of CIE Publication 15-2:1978, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. There is no corresponding British Standard to CIE 15-2.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

This part of ISO 5 is one of a series which specifies the geometric conditions for transmission densitometry, primarily but not exclusively, as practised in black-and-white and colour photography. The primary change from the first edition (1974) to the second edition (1985) was the replacement of the integrating sphere method with the “opal-glass” method as the basis for specifying ISO standard diffuse transmission density. (Although any means of diffusion which meets the specifications of this part of ISO 5 may be used, the method is often denoted simply by the words “opal-glass” to differentiate it from the integrating sphere method.) By that change it was recognized that transmission density measurements of photographic products are almost exclusively made by using diffusers. Slightly smaller density values are obtained compared to those based on the integrating sphere method because of inter-reflections between the opal-glass and the specimen. The effect is greatest at low densities and dependent on the reflectance characteristics of the opal-glass and the surface of the specimen facing the diffuser.

The changes from the second edition are as follows:

- a) The Halbertsma method for measuring diffusion coefficient has been replaced by a general method intended to describe the illumination distribution incident on the film or receiver. That distribution is influenced by the system not just by the “opal” as “illuminated by normally incident light”, which is prescribed by the Halbertsma method. In other words, a diffuser having a diffusion coefficient of 0,9, measured by the Halbertsma method, may have an entirely different distribution when placed in a system not having normally incident light.
- b) The diffusion coefficient of an entire system has been defined along with the method of measurement.
- c) The system for which the reflectance factor is to be measured has been defined and the method of measurement has been prescribed to achieve consistency of results.
- d) Since inter-reflections and surface finish play such an important role in the determination of density with this geometry, the condition that the diffusing system surface be polished was placed in the body of the text instead of in a footnote.
- e) Wording which fostered inconsistency in interpretation regarding the separation between sample and diffuser has been altered.

- f) The figure describing geometry for density measurements was clarified and made more general in order to accommodate both diffuse and projection density.

This part of ISO 5 also describes the geometric conditions for two types of projection density. The spectral conditions described are specified in ISO 5-3.

Diffuse transmission density is a measure of the modulation of light by a film that is diffusely illuminated on one side and viewed from the other, as when a film is viewed on a diffuse transparency illuminator. The geometric conditions of projection with diffuse illumination are nearly equivalent to the conditions of viewing a film on a diffuse illuminator, the projection lens taking the place of the eye. When film is on a diffuse illuminator or in contact with a print material, light is inter-reflected between the film and the nearby surface. This inter-reflection affects the density and is best taken into account in a measuring instrument by the use of an opal-glass diffuser or integrator, rather than an integrating sphere. Apart from this fundamental reason for using densitometers employing opal-glass diffusers, such instruments are preferred because they are more durable and more convenient to manufacture and use.

Projection density is a measure of the modulation of light by a film that is specularly illuminated on one side and is projected by way of a specular collection system. Equipment employing optical condensers is used to view microfilm, motion pictures, and slides, and to make projection prints. The conditions defined in this part of ISO 5 for projection density simulate the geometric conditions affecting the transmitting characteristics of a small area on a negative or transparency at the centre of the frame of a typical projection system employing condensers. The area under consideration may be defined by a small opening, known as the sampling aperture, in an otherwise opaque sheet in the frame.

The ratio of the total flux transmitted by a specimen to the total flux incident on the aperture is defined as transmittance and is of little practical use. However, the flux transmitted by the sampled area and collected by the projection lens to form the projected image is of interest. The ratio of this flux to the flux collected when there is no film in the sampling aperture is designated transmittance factor, and is used as a basis for calculating projection density.