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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 12823-1991

Replacing GB/T 12823.1-2008

**Photography and graphic technology - Density measurements -
Part 1: Geometry and functional notation
(English Translation)**

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Foreword

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This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 1 of GB/T 12823 "Photographic and Graphic Techniques - Density Measurement". GB/T 12823 has published the following...

part.

--Part 1: Geometric and Functional Notation;

--Part 2: Geometric Conditions of Transmission Density;

--Part 3: Spectral Conditions;

This document supersedes GB/T 12823.1-2008 "Photographic Density Measurement Part 1: Terminology, Symbols and Representation", and is consistent with GB/T 12823.1-Compared to 2008, aside from structural adjustments and editorial changes, the main technical changes are as follows.

- a) The scope of the document has been changed (see Chapter 1, Chapter 1 of the 2008 edition).
- b) Some terms and definitions have been added or deleted (see Chapter 3, Chapter 3 of the 2008 edition);
- c) Content related to "symbols" has been deleted (see Chapter 4 of the 2008 edition);
- d) The content related to "Formulas" has been changed (see Chapter 4, Chapter 5 in the 2008 edition);
- e) Added content and requirements related to "instrument description" (see Chapter 5);
- f) The content and requirements related to the "coordinate system" have been changed (see Chapter 6, Chapter 6 of the 2008 edition);
- g) The content and requirements related to "geometric description" have been changed (see Chapter 7, 7.2 of the 2008 edition);
- h) The content and requirements related to "function representation" have been changed

(see Chapter 8, Chapter 7 of the 2008 edition).

This document is equivalent to ISO 5-1:2009 "Photographic and graphic techniques - Density measurement - Part 1: Geometric and functional notation".

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Petroleum and Chemical Industry Federation.

This document is under the jurisdiction of the National Technical Committee on Standardization of Photosensitive Materials (SAC/TC 102).

Introduction

GB/T 12823 "Density Measurement in Photographic and Graphic Techniques" aims to establish standards applicable to density measurement in the fields of photographic and graphic techniques.

Therefore, it is proposed to consist of four parts.

--Part 1: Geometric and Functional Notation. The aim is to establish the geometric conditions involved in density measurements and the representation of related functions.

--Part 2: Geometric Conditions for Transmission Density. The purpose is to establish the geometric conditions for transmission density in density measurements.

--Part 3: Spectral Conditions. The purpose is to establish the spectral correlation conditions for density measurements.

--Part 4: Geometric Conditions for Reflection Density. The aim is to establish the geometric conditions for reflection density in density measurements.

Measuring the transmission and reflection properties of an object is crucial for photography and graphics techniques. When light or other radiant energy shines on an object...

If light passes through a substance, it will be absorbed or propagated. Propagation may involve reflection, transmission, refraction, diffraction, scattering, fluorescence, and polarization. The propagated light is distributed...

In all directions around the object. In most applications, it is not necessary to consider the light distributed in every direction, only the light leaving the object and being...

The receiver responds to light from the direction of the light, much like the human eye responds.

An object modulates the flow of radiant energy from the source to the receiver. The time rate of this radiant energy flow is called the radiant flux, or simply flux. This article...

This provides a method for describing flux modulation measurements in arbitrary systems.

To accurately define such a system, the system's geometry needs to be given.

The spectral distribution of the flux incident on the sample and the spectral responsivity of the receiver. If the reflection characteristics of the light source and receiver affect the measurement...

As in transmission measurements using the opalescent glass method, this characteristic needs to be specified.

The sample aperture defines the sample area under consideration. In some applications, if the sample has significant inhomogeneity, the sampling aperture size is increased.

The distinction is important and needs to be specified. If the measurement is to quantify the way sample modulation throughput is performed in a given practical application, such as observation or contact printing...

The phase, the spectral and geometric conditions for measurement need to simulate the conditions in actual applications.

The modulation amount is measured and expressed as a dimensionless modulation coefficient equal to the flux ratio, i.e., the propagation and confinement of the spectral range in a certain direction.

Propagation occurs through the system's flux. For some applications, modulated measurements using a logarithmic scale are more useful than those using an arithmetic scale. Typically, a base-10 scale is used.

The optical density is defined by the negative logarithm of the modulation coefficient.

Most geometric arrangements used in photographic and graphics optical systems can be represented by a uniform flux beam bounded by a right-angled cone.

To describe it fully. A point on an object is usually illuminated by this conical distribution, and the geometry of the light rays reaching the receiver is...

It is often also cone-shaped. For example, the pupil of the eye forms a cone solid angle with a point on the object; in a projection system, the projection lens and the sample point...

This forms a cone solid angle. This document defines the cone distribution using the cone's half-angle and its axis.

Obtaining transmission and reflection reference measurements typically requires prior experience in radiometric measurements. For example, in radiometric measurement practice, through...

Using appropriate baffles and moderately blackening the surface of certain samples can minimize the influence of stray light. This is because of the principle of radiometric measurements.

As practice is known and fully described in other literature [10], detailed specifications for radiation measurement procedures will not be provided in this document.

Density measurement in photography and graphics technology Part 1: Geometry and Function Symbols

1 Scope

This document specifies the terminology, symbols, functional symbols, and coordinates for describing the geometric and spectral conditions used to describe the modulation of radiative flux in a measured sample.

Standard system.

This document primarily provides a system for describing methods of measuring or specifying the transmission and reflection properties of materials used in photographic and graphic technologies.

The geometric and spectral conditions associated with such measurements are specified in ISO 5-2, ISO 5-3 and ISO 5-4.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are listed below.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

ISO 5-2 Photographic and graphic techniques - Density measurement - Part 2: Geometric conditions of transmission density technology-Density measurements-Part 2: Geometric conditions for transmittance density) Note. GB/T 12823.2-2026 Photographic and graphic techniques - Density measurement - Part 2: Geometric conditions for transmission density (ISO 5-2:2009, IDT) ISO 5-3 Photographic and graphic technology - Density measurement - Part 3: Spectral conditions Density measurements-Part 3: Spectral conditions) Note. GB/T 12823.3-2025 Photographic and graphic techniques - Density measurement - Part 3: Spectral conditions (ISO 5-3:2009, MOD) ISO 5-4 Photographic and graphic techniques - Density measurement - Part 4: Geometric conditions of reflectance density technology-Density measurements-Part 4: Geometric conditions for reflection density) Note. GB/T 12823.4-2026 Photographic and graphic techniques - Density measurement - Part 4: Geometric conditions for reflectance density (ISO 5-4:2009, IDT)