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## Photography and graphic technology — Density measurements —

### Part 4: Geometric conditions for reflection density

*Photographie et technologie graphique — Mesurages de la densité —  
Partie 4: Conditions géométriques pour la densité de réflexion*



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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 5-4 was prepared by ISO/TC 42, *Photography*, and ISO/TC 130, *Graphic technology*, in a Joint Working Group.

This third edition cancels and replaces the second edition (ISO 5-4:1995), which has been technically revised. This technical revision introduces the concept of ideal and practical conditions. In the course of this technical revision, all parts of ISO 5 have been reviewed together, and the terminology, nomenclature and technical requirements have been made consistent across all parts.

ISO 5 consists of the following parts, under the general title *Photography and graphic technology — Density measurements*:

- *Part 1: Geometry and functional notation*
- *Part 2: Geometric conditions for transmittance density*
- *Part 3: Spectral conditions*
- *Part 4: Geometric conditions for reflection density*

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## Introduction

This part of ISO 5 specifies the geometric conditions that are used to define ISO 5 standard reflection density and to make measurements of ISO 5 standard reflection density. These conditions correspond approximately to practical situations for viewing reflection-type photographs or graphic reproductions, which specifically requires illuminating the print at an angle of  $45^\circ$  to the normal to the surface and viewing along the normal. These conditions tend to reduce surface glare and maximize the density range of the image, which is sometimes referred to as annular  $45^\circ:0^\circ$  reflection densitometry.

The geometric conditions specified in this part of ISO 5 are intended to simulate  $45^\circ$  illumination for viewing or photographing a specimen. There might be some engineering advantages in designing a measuring instrument with normal illumination and  $45^\circ$  collection. Reversing the geometry in this way has no demonstrated effect on the measured values in most cases, so both geometric arrangements are included in this part of ISO 5. However, work by Voglesong<sup>[11]</sup> has demonstrated that there are times when measurements of the same printed sample with  $0^\circ/45^\circ$  &  $45^\circ/0^\circ$  can be significantly different. This part of ISO 5 attempts to specify unambiguously the geometric conditions that define reflection densitometry by providing what is termed "ideal requirements". The actual design and manufacture of instruments, however, require tolerances around these ideal conditions which, in this part of ISO 5, are shown as practical specifications.

This part of ISO 5 serves three primary functions:

- a) to provide the basis for unequivocal measurements that are needed for specifications, for communication between organizations, and for contractual agreements;
- b) to provide a reference to assist in resolving seemingly different measurement data between systems; and
- c) to aid in the calibration and certification of densitometers, or spectrophotometers used as densitometers, by allowing for the generation of certified reference materials (CRMs) with numerical values traceable to fundamental physical phenomena.

For graphic arts applications, guidance in the use of densitometry is provided in ISO 13656.