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## AMERICAN NATIONAL STANDARD

# Graphic technology — Graphic arts transmission densitometry measurements — Terminology, equations, image elements and procedures

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**CGATS**



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## Foreword

This standard defines terms, equations, image elements and procedures for measurement and communication of data when using transmission densitometer instrumentation for graphic arts.

The Committee for Graphic Arts Technologies Standards (CGATS) was accredited by the American National Standards Institute in 1989 to serve as the coordinator of graphic arts standards activities. CGATS identifies areas in which standards are needed and desired, respecting the established activities of existing accredited standards committees and industry standards developers. CGATS writes standards only where need exists and no other committee is undertaking the writing.

This edition of CGATS.9 updates and replaces the 2005 version of this document. Changes from the 2005 version include, but are not limited to:

- removal of Annex C on sampling aperture and inclusion of a pointer to CGATS.5 for information on this topic;
- addition of information to be included when communicating data;
- removal of Annex E on instrument calibration, and revision on the procedures for measurement to include instrument standardization.

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Suggestions for improving this standard are welcomed. They should be sent to the CGATS Secretariat, NPES The Association for Suppliers of Printing, Publishing and Converting Technologies, 1899 Preston White Drive, Reston, Virginia 20191-4367, USA; Fax: 703-620-0994; E-mail: standards@npes.org.

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## Introduction

Densitometer instrumentation is widely used for quality and process control within the graphic arts industry. The intent of this standard is to define terms and establish a standard method for the use and application of transmission densitometry and measurements of graphic arts halftone images. It does not address issues of photographic process control. This document is a complement to CGATS.4, *Graphic technology — Graphic arts reflection densitometry measurements — Terminology, equations, image elements and procedures*.

Transmission densitometers for photographic materials, including graphic arts, are discussed in ISO 5-2 and ISO 5-3.

Through use of this standard, characterization of photomechanical graphic arts images and associated processes can be achieved in a more consistent manner. Furthermore, the communication of data with conformance to a measurement standard will enhance the control of image reproduction across an industry becoming global in nature.

It should be noted that the basic scheme used in transmission densitometers, as with other measuring systems (such as spectrophotometers), is to measure transmittance. This transmittance is a function of the various components, including filters, of the optical system and its geometry. One important difference between densitometers and other transmittance measuring instruments is the densitometer's immediate calculation and reporting of density (negative log of transmittance) rather than the transmittance. This practice has yielded some confusion about what the unit "measures" and what it "reports", but it differentiates densitometers from other instruments. Most densitometers also report other derived data.

A colorimeter is designed to take into account the human visual response as defined by the CIE Standard Observer. Densitometers may have a number of spectral responses, but these do not typically bear any simple linear relationship to colorimeter responses. These spectral characteristics are generally chosen to suit the process and materials being measured. For this reason it is inappropriate to use densitometers for color measurement as defined by the human visual response. Densitometric "color" characteristics should be used in a relative sense only and are useful for process control for graphic arts materials.

**NOTE** Because the printing and publishing industry uses many binary printing patterns in addition to the traditional center-weighted halftone dot, this standard uses the term tone value instead of dot area to better address this issue.

# Graphic technology — Graphic arts transmission densitometry measurements — Terminology, equations, image elements and procedures

## 1 Scope and field of application

This standard defines terminology, equations, process control elements, and procedures for measurement and communication of transmission densitometry data for graphic arts halftone images. Graphic arts includes, but is not limited to, the preparation of material for, and volume production by, production printing processes which include offset lithography, letterpress, flexography, gravure, and screen printing.

Although this standard addresses halftone applications, there are situations where non-traditional halftones and/or continuous tone materials are used for which these computations are also appropriate.

## 2 References

The following standards contain provisions that, through reference in this text, constitute provisions of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5-2, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*

ISO 5-3, *Photography — Density measurements — Part 3: Spectral conditions*

## 3 Terms and definitions

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

### 3.1

#### **absorption (light)**

process by which light (radiant energy) is captured by a material and converted into another form of energy, usually heat; light that is neither transmitted nor reflected is absorbed

### 3.2

#### **aperture, illumination**

area of the sample illuminated by the instrument's light source

### 3.3

#### **aperture, mechanical**

aperture created by an opaque mask used to position the densitometer on the specimen

### 3.4

#### **aperture, sampling reading aperture**

area actually measured by the instrument