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CGATS.4-1993  
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# AMERICAN NATIONAL STANDARD

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

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SECRETARIAT  
NPES THE ASSOCIATION FOR SUPPLIERS OF PRINTING AND PUBLISHING TECHNOLOGIES

APPROVED APRIL 22, 1993  
AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

*PRINTED AS A PUBLIC SERVICE BY*

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Printed in the United States of America  
93/6/1000

## FOREWORD

(This foreword is not a part of American National Standard CGATS.4-1993,  
Graphic technology — Graphic arts reflection densitometry measurements – Terms, equations, image elements and procedures.)

This standard defines terms, equations, image elements and procedures for measurement and communication of data when using reflection 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 standard developers. CGATS writes standards only where need exists and no other committee is undertaking the writing.

CGATS recommends the voluntary implementation and use of this standard by the prepress segment of the graphic arts industry at its earliest convenience.

Suggestions for improving this standard are welcome. They should be sent to Secretariat, NPES The Association for the Suppliers of Printing and Publishing Technologies, 1899 Preston White Drive, Reston, VA 22091-4367.

This standard was prepared by CGATS Working Group 3 and was processed and approved for submittal to ANSI by Accredited Standards Committee CGATS. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time this standard was approved the leadership of CGATS was as follows:

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**Graphic technology – Graphic arts reflection densitometry measurements –  
Terms, equations, image elements and procedures**

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

### **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 reflection densitometer instrumentation and measurements in the graphic arts field. 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 densitometers, as with other measuring systems (such as spectrophotometers and colorimeters), is to measure reflectance factor. This reflectance factor is a function of the various components, including filters, of the optical system and its geometry.

One important difference between densitometers and other reflectance measuring instruments is the densitometer's immediate calculation and reporting of density (-log of reflectance factor) rather than the reflectance factor. This practice has yielded some confusion about what the unit "measures" and what it "reports," but it differentiates densitometers from other instruments.

A significant difference between densitometers and colorimeters is the spectral response. A colorimeter is designed to take into account the human visual response as defined by the CIE Standard Observer. Densitometers 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.

In keeping with historical practice and to avoid possible confusion with colorimetric terms, density will be used as the primary "reporting" characteristic of densitometers in this document.

A document similar to this one is currently being developed to address transmission densitometry. That document is CGATS.9, "Graphic technology — Graphic arts transmission densitometry measurements — Terminology, equations, image elements and procedures."

## 1 Scope and field of application

This standard defines terms, equations, image elements and procedures for measurement and communication of data when using reflection densitometer instrumentation for graphic arts. This standard provides practical information for quantifying image characteristics of graphic arts processes. 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.

This standard also applies to limited volume images such as those produced with photographic, ink jet, thermal transfer, diffusion, electrophotographic, mechanical transfer or toner technology (e.g. off-press proofs) when used for graphic arts applications.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

- ANSI/ISO 5/1-1984, "Photography — Terms, Symbols and Notations — Density Measurements"
- ANSI/ISO 5/3-1984, "Photography (Sensitometry) — Density Measurements — Spectral Conditions"
- ANSI/ISO 5/4-1983, "Photography — Density Measurements — Geometric Conditions for Reflection Density"
- CIE 17.4-1987, "International Lighting Vocabulary (fourth edition)"
- ANSI/ASQC A1-1987, "Definitions, Symbols, Formulas and Tables for Control Charts"

## 3 Definitions

For the purposes of this standard, the following terms and definitions apply:

**3.1 absorption (light):** the process by which light (radiant energy) is captured by a material and converted into another form of energy, usually heat. Light which is neither transmitted nor reflected is absorbed.

**3.2 aperture, illumination:** the area of the sample illuminated by the instrument's light source.

**3.3 aperture, mechanical:** the aperture created by an opaque mask used to position the densitometer on the specimen.

**3.4 aperture, sampling (reading aperture):** the area actually measured by the instrument.