
**Information technology — Automatic
identification and data capture
techniques — Effects of gloss and low
substrate opacity on reading of bar code
symbols**

*Technologies de l'information — Techniques d'identification
automatique et de capture des données — Effets de la brillance et de la
faible opacité du substrat sur la lecture des symboles de code à barres*



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard (“state of the art”, for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 19782, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

Introduction

Users of bar code systems have experienced problems with poor read rates. These read rate problems can sometimes be attributed to spectral gloss from either the substrate or the image or both.

In many bar code applications, the position and orientation of the scanner relative to the bar code symbol can be directly controlled by the operator. In these applications, the presentation of the bar code symbol to the reader will usually be manipulated by the operator to achieve optimal performance. However, in bar code applications using fixed position automated reading systems, the ability to control bar code symbol presentation to the reader and achieve optimised performance is diminished.

Due to the very high volume of bar code marked items in today's supply chain, even a small reduction in read rate can represent significant logistics problems.

Traditional gloss measurements are made at the angle that maximises specular reflection and do not provide results that can be used to predict performance at other angles. Moreover, many laser scanners use a retro-collective optical system that would correspond to a gloss meter using a zero degree angle of incidence, which is not commonly available.

Present international bar code quality standards, such as ISO/IEC 15416, do not factor the impact of gloss from either the bar code image or substrate into quality grade ratings. Thus a Grade "4" label may be high gloss or low gloss. Low gloss labels and images tend to work well in all scanning systems, while high gloss labels and images may not. In the absence of industry specifications, users have no convenient reference to use when requesting suppliers to provide labels that will work well in their systems. This Technical Report provides a method for the measurement of gloss that will permit users to judge if the bar code symbol and substrate are suitably matched for the reading system used in their application.

Low opacity of the substrate can degrade system performance because it may reduce the apparent contrast of the bar code symbol. This Technical Report therefore provides means for measuring the substrate opacity.

The test method described in this Technical Report provides a means for the production of reproducible measurements. In specific applications, it may be necessary to correlate these measurements to practical performance. For example, a substrate backed by dark liquid may exhibit lower opacity than when measured dry.

Information technology — Automatic identification and data capture techniques — Effects of gloss and low substrate opacity on reading of bar code symbols

1 Scope

This Technical Report gives guidelines to deal with the effects of substrate gloss and/or low opacity on the performance of bar code symbols when scanned by reading and verification systems.

This Technical Report defines methods of measurement for gloss and opacity; it identifies conditions and values that present a risk of reading problems and provides recommendations to users on the specification of substrates and the set-up of scanning systems to minimize these problems. It also addresses the relationship between verification results and read performance when either or both of the factors are present.

This document is intended for those who specify or implement labelling systems and those involved in the reading of bar code symbols on packages, components and other carriers of bar code symbols.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 19762-1, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 1: General terms relating to AIDC*

ISO/IEC 19762-2, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 2: Optically readable media (ORM)*

ISO/IEC 15415, *Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*

TAPPI T 425 om-01, *Opacity of paper (15/d geometry, illuminant A/2°, 89 % reflectance backing and paper backing)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762-1, ISO/IEC 19762-2 and the following apply.

3.1

coaxial

pertaining to scanning systems in which the path of illumination from the light source to the symbol and the path of collected light from the symbol are in the same axis

3.2
image
printed part of the symbol as opposed to the background (“printed” includes any method of creating a mark on the substrate)

3.3
receiver
part of the optical system that collects the reflected light, focuses it onto the photodetector and outputs an electrical signal proportional to the intensity of the light

4 Symbols and abbreviated terms

VM	Volt Meter
mW	Milliwatts
TT	Thermal Transfer
TD	Thermal Direct
λ	wavelength
CTD	Coated Thermal Direct
UNCTD	Uncoated Thermal Direct
SUB	Substrate

5 Measurement procedures

5.1 Effects of gloss and/or low opacity

5.1.1 Gloss

The performance of scanning equipment is highly dependent on the detection of adequate contrast between the image and the substrate. Performance is degraded when an image or substrate, adversely affects the Symbol Contrast due to its gloss. Note that Symbol Contrast can also be degraded by a high gloss low-opacity substrate(see 5.1.2).

In coaxial reading systems, specular reflection can cause a problem when the incident angle is close to normal with the result that the reflected light captured by the reader includes specular reflection. However, the range of angles over which significant specular reflection occurs depends on characteristics of the material, such as its gloss.

Materials with relatively high gloss will produce a higher amplitude of specular reflection over a narrower angle, compared with matte materials. Matte materials tend to produce lower amplitude of specular reflection over a wider angle.

In order for adequate contrast to be manifest, over reading angles that come close to and may even include the normal, gloss may need to be controlled on a label for both the dark and light elements of the symbol.

The intensity of specular reflection as an indicator of the effect of gloss may be measured over a range of angles and analysed as described in 5.2. There are several methods of obtaining a gloss profile. See Annex A for examples.