



BSI Standards Publication

**Unwanted reflections from the active and inactive areas of display surfaces visible during use**

**National foreword**

This Published Document is the UK implementation of ISO/TR 20278:2015.

The UK participation in its preparation was entrusted to Technical Committee PH/9, Applied ergonomics.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015. Published by BSI Standards Limited 2015

ISBN 978 0 580 91824 7

ICS 13.180; 35.180

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 December 2015.

**Amendments issued since publication**

Date	Text affected
------	---------------

---

---

---

**Unwanted reflections from the active  
and inactive areas of display surfaces  
visible during use**

*Réflexions non désirées des zones actives et inactives des surfaces de  
l'écran visibles durant l'utilisation*





**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015. Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

Page

<b>Foreword</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Terms and definitions</b> .....	<b>1</b>
<b>3 Unwanted reflections within the context of the ISO 9241-3xx series</b> .....	<b>2</b>
3.1 Glare and unwanted reflections.....	2
3.2 Direct glare in the context of the ISO 9241-3xx standards series.....	2
3.3 Glare by reflection.....	3
<b>4 Visual discomfort and glare while using computer displays</b> .....	<b>3</b>
4.1 Asthenopia.....	3
<b>5 Unwanted reflections from displays</b> .....	<b>3</b>
5.1 General.....	3
5.2 Glare and unwanted reflections on screens in the ISO 9241-3xx series.....	4
<b>6 Pertinent regulations regarding glare and unwanted reflections</b> .....	<b>4</b>
6.1 European Directive 90-270 — On the minimum safety and health requirements for work with display screen equipment.....	4
6.2 The meaning of disturbing glare within the ISO 9241-3xx series.....	4
6.2.1 General.....	4
6.2.2 CIE definitions of discomfort glare and disability glare.....	4
6.2.3 Unwanted reflections as currently specified and limited in ISO 9241-303, 9241-305 and 9241-307 for the active area of displays (screens).....	5
6.3 Interaction between specular, diffuse and glare reflection components.....	6
6.3.1 General.....	6
6.3.2 Recognition of the interaction of unwanted reflection components in the ISO 9241-3xx series.....	6
<b>7 Luminance balance</b> .....	<b>6</b>
<b>8 Glare and the ambient illumination in the office-working environment</b> .....	<b>6</b>
8.1 Ambient illuminance.....	6
8.2 Arrangement of the computer work area.....	7
8.3 Surface finishes (reflectivity).....	7
8.3.1 General.....	7
8.3.2 Conversion of specular gloss values to specular reflectance values.....	8
<b>9 Literature review of research regarding unwanted reflections from the bezel, screen housing and other inactive areas of the display visible during use</b> .....	<b>8</b>
9.1 General.....	8
9.2 Bezel gloss.....	8
9.2.1 Howarth and Hodder, 2004.....	8
9.2.2 Béland and André.....	8
9.2.3 Howarth and Hodder, 2013.....	8
9.3 Bezel reflectance.....	9
9.3.1 General.....	9
9.3.2 Hunter, et al.....	9
9.3.3 Soderston, et al.....	9
9.3.4 Béland and André.....	10
9.3.5 Howarth and Hodder.....	11
9.3.6 Conclusions from the literature regarding bezel gloss and reflectance.....	11
<b>10 A review of the literature regarding eyestrain due to vergence and accommodative demands of glare reflections</b> .....	<b>11</b>
10.1 Accommodative stress.....	11
10.2 Vergence stress.....	12
<b>11 Summary and conclusions</b> .....	<b>12</b>

**Bibliography** ..... **14**

Currently in preview, click buy full version

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 59, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

Currently in preview, click buy full version

# Unwanted reflections from the active and inactive areas of display surfaces visible during use

## 1 Scope

This Technical Report provides users a summary of the existing knowledge about ergonomics requirements for unwanted reflections on electronic displays. The document furthermore provides some guidance on specification of unwanted reflections.

NOTE ISO 9241 contains normative requirements related to unwanted reflections. It is possible that the information contained in this Technical Report will be used for a future update of ISO 9241.

## 2 Terms and definitions

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

### 2.1

#### **asthenopia**

weakness or tiring of the eyes accompanied by pain, headache and dim vision

Note 1 to entry: Symptoms include pain in or around the eyes; headache, usually aggravated by using the eyes for close work; fatigue; vertigo; and reflex symptoms such as nausea, twitching of facial muscles, or migraine.

[SOURCE: Taber's Medical Dictionary]

### 2.2

#### **disability glare**

glare that impairs the vision of objects without necessarily causing discomfort

### 2.3

#### **direct glare**

glare caused by self-luminous objects located in the visual field, especially near the line of sight

### 2.4

#### **discomfort glare**

glare that causes discomfort without necessarily impairing the vision of objects

### 2.5

#### **glare**

condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or by extreme contrasts

### 2.6

#### **glare by reflection**

glare produced by reflections, particularly when the reflected images appear in the same or nearly the same direction as the object viewed

### 2.7

#### **gloss (of a surface)**

mode of appearance by which reflected highlights of light sources or objects are perceived as superimposed on the surface due to the directionally selective properties of that surface

### 2.8

#### **glossmeter**

instrument for measuring the various photometric properties of a surface giving rise to gloss