



DRAFT INTERNATIONAL STANDARD ISO/DIS 9241-391

ISO/TC 159/SC 4

Secretariat: BSI

Voting begins on
2012-12-06

Voting terminates on
2013-05-06

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Ergonomics of Human System Interaction —

Part 391:

Requirements, analysis and compliance test methods for the reduction of photosensitive seizures

Ergonomie de l'interaction homme-système —

Partie 391: Exigences, analyses et méthodes d'essai de conformité pour la réduction des saisies photosensibles

ICS 13.180; 40.180

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

ITeH STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/de3e00da-3271-4577-abdf-baccd7239245/iso-9241-391-2016>

Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

Contents

Page

Foreword	iv
Introduction.....	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Image factors of photosensitive seizures.....	2
5 Ergonomic requirements and recommendations	3
5.1 General	3
5.2 Flashes	3
5.2.1 Potentially harmful flashes.....	3
5.2.2 Rapid changes of image sequences	4
5.2.3 Potentially harmful red flashes	4
5.2.4 Cumulative risk.....	4
5.2.5 Prior warning	4
5.3 Patterns	4
5.3.1 Potentially harmful regular patterns.....	4
6 Conformance	5
6.1 General	5
6.2 Test methods	5
6.3 Conformance	6
Annex A (informative) Overview of the ISO 9241 series	7
Annex B (informative) Clinical aspects of photosensitivity	8
Annex C (informative) Potentially harmful flashes with larger maximum luminance.....	9
Annex D (informative) Saturated Red	10
Annex E (informative) Viewing environments.....	11
Annex F (informative) Sample procedure for assessing applicability and conformance	12
Bibliography.....	14

Foreword

- Part 1: General introduction
- Part 2: Guidance on task requirements
- Part 3: Visual display requirements
- Part 4: Keyboard requirements
- Part 5: Workstation layout and postural requirements
- Part 6: Guidance on the work environment
- Part 9: Requirements for non-keyboard input devices
- Part 11: Guidance on usability
- Part 12: Presentation of information
- Part 13: User guidance
- Part 14: Menu dialogues
- Part 15: Command dialogues
- Part 16: Direct- manipulation dialogues
- Part 17: Form filling dialogues

ISO 9241 also consists of the following parts, under the general title *Ergonomics of human-system interaction*:

- Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services
- Part 110: Dialogue principles
- Part 129: Guidance on software individualization
- Part 143: Form-based dialogues
- Part 151: Software ergonomics for Guidance on World Wide Web user interfaces
- Part 154: Interactive voice response (IVR) applications
- Part 171: Guidance on software accessibility
- Part 210: Human-centred design for interactive systems
- Part 300: Introduction to electronic visual display requirements
- Part 302: Terminology for electronic visual displays

- *Part 303: Requirements for electronic visual displays*
- *Part 304: User performance test methods for electronic visual displays*
- *Part 305: Optical laboratory test methods for electronic visual displays*
- *Part 306: Field assessment methods for electronic visual displays*
- *Part 307: Analysis and compliance test methods for electronic visual displays*
- *Part 308: Surface-conduction electron-emitter displays (SED) [Technical Report]*
- *Part 309: Organic light-emitting diode (OLED) displays [Technical Report]*
- *Part 310: Pixel defects — Visibility, aesthetics and ergonomics [Technical Report]*
- *Part 331: Optical characteristics of autostereoscopic displays [Technical Report]*
- *Part 400: Principles and requirements for physical input devices*
- *Part 410: Design criteria for physical input devices*
- *Part 420: Selection procedures for physical input devices*
- *Part 910: Framework for tactile and haptic interaction*
- *Part 920: Guidance on tactile and haptic interactions*

For the other parts under preparation, see Annex A.

Introduction

Recent progress of technology enables us to watch high-definition images, some of which can be stereoscopic. When those images are projected onto the retina of both eyes and processed as visual information, undesirable biomedical effects, such as photosensitive seizures, visually induced motion sickness, and visual fatigue from stereoscopic images, can be induced. These undesirable biomedical effects need to be reduced, **where feasible**. The prevention of these undesirable biomedical effects on human health has been referred to as “image safety.”

Image safety was first discussed **by the ISO** in the ISO/COPOLCO with respect to the users of image products. Then, in 2004, the ISO/International Workshop on Image Safety was held, and resulted in the publication of ISO/IWA3:2005 as the international workshop agreement [1]. Following those discussions, the study group, (ISO/TC 159/SC 4/SG on Image Safety), continued to evaluate strategies of the international standardizations until 2009.

This standard will help to **promote** the production of safer images by reducing the risk of photosensitive seizures, and thereby result in the wider distribution of images that are free from constraints **on which consumers can view them**. A small proportion of the population is susceptible to seizures and other neurological effects when watching motion picture and video content with certain display features. Since these idiosyncratic reactions have been documented with programming viewed through CRT displays, there is as yet less experience with high-definition displays.

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 9241-391 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Human-system interaction*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO 9241 consists of the following parts, under the general title *Ergonomics of human-system interaction — Requirements, analysis and compliance test methods for the reduction of photosensitive seizures*:

-
- **Part [n]:**
- **Part [n+1]:**

Ergonomics of human-system interaction — Requirements, analysis and compliance test methods for the reduction of photosensitive seizures

1 Scope

This International Standard provides requirements and recommendations for reducing photosensitive seizures, (PSS), while viewing images on electronic displays.

The requirements and recommendations in this document are designed to be applied to image contents. By image contents, reference is made to the images independent of the device or environment in which they are displayed.

The requirements and recommendations in the document are for the protection of the vulnerable individuals in the viewing population who are photosensitive, and who are therefore liable to seizures triggered by flashing lights and regular patterns, including certain repetitive images.

NOTE 1 ITU considers the image safety issues in relation to broadcasting. Some of these are described in ITU-R BT.1702 [2].

NOTE 2 There are some related recommendations in ISO/IEC DIS 40500 (W3C Web Content Accessibility Guidelines (WCAG) 2.0) for web contents accessibility.

NOTE 3 Photosensitive seizures and photosensitive epilepsy, that is, chronic conditions characterized by those repeated seizures are medical conditions. Clinical aspects of photosensitivity appear in Annex B.

2 Normative references

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

ISO 9241-302, *Ergonomics of human system interaction — Ergonomic requirements and measurement techniques for electronic visual displays — Part 302: Terms and definitions*.

Recommendation ITU-R BT.500-11: *Methodology for the subjective assessment of the quality of television pictures*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9241-302 and the following apply.

3.1

flash

a pair of opposing changes in relative luminance

NOTE 1 to entry: "a pair of opposing changes" is an increase followed by a decrease, or a decrease followed by an increase

3.2
electroencephalogram
EEG

record of electrical changes, caused by neuronal activities in the brain through electrodes attached to the scalp in the EEG

3.3
photoparoxysmal response
PPR

EEG response to flash or pattern, consisting of spikes, spike-waves, or intermittent slow waves, which include spike-waves at around 3 Hz that can be detected bilaterally and simultaneously in all areas of the scalp

3.4
photosensitivity

human individual sensitivity to flashing or intermittent light stimulation and/or visual patterns, evidenced by the occurrence of a photoparoxysmal response in the EEG

NOTE 1 to entry: Visual sensitivity is a term recently sometimes used as an alternative to the term "photosensitivity"

3.5
photosensitive seizure
PSS

an epileptic seizure [3] triggered by visual stimulation as a result of photosensitivity in a human individual

3.6
photosensitive epilepsy

chronic neurological condition characterized by recurrent photosensitive seizures, either convulsive or nonconvulsive seizures, such as absence seizures

4 Image factors of photosensitive seizures

A photosensitive seizure **may be** produced **in susceptible individuals** by flashing lights or certain regular patterns[3][16]. A visual stimulus tending to provoke a seizure is bright light flashes of a certain numbers per second [4]. The light must also fill a large part of the visual field. For the light flashes, colour changes to or from saturated red, instead of luminance changes, also tend to provoke a seizure [5][12].

Another **potentially** provocative visual stimulus **for some individuals with photosensitivity** is regular patterns with a certain numbers of bright stripes per a certain area [6]. The pattern must also fill a large part of the visual field, while the provocation depends on whether the patterns are stationary or oscillating (including flashing) [7][16][17].

PSS can be reduced, to some extent, by considering factors such as those shown below [3][14]. Therefore, to control PSS, a number of different factors, shown below, need to be considered at the same time in an appropriate balance [13][15].

Potentially harmful flashes:

- Luminance and contrast
- Area of visual field
- Number of flashes per unit time

Rapid changes of image sequences

Potentially harmful red flashes

- Colour
- Area of visual field
- Number of flashes per unit time

Cumulative risk

- Duration of flashing

Potentially harmful regular patterns:

- Clearly discernible stripes
- Number of stripes and area of visual field occupied
- Moving/stationary
- Luminance and contrast
- Duration of patterns

5 Ergonomic requirements and recommendations

5.1 General

To obtain the condition that will sufficiently reduce the possibility of PSS, visual content, presentation devices and characteristics of viewers need to be considered. However, in this document, characteristics of visual content, such as flashing and regular patterns, are the principal concern.

NOTE 1 The following principles in 5.2 and 5.3 are easier to apply in the case of pre-recorded content, which can be analyzed frame-by-frame. Interactive media, such as video games, may afford essentially limitless sequences through the game, depending upon user actions. In the case of video games the requirements and recommendations apply to typical sequences of play, but cannot cover every eventuality of play [8].

NOTE 2 The requirements and recommendations described in 5.2 and 5.3 may be insufficient to provide protection from larger (>60 inch, or 152 cm) and brighter(>200 cd/m²) screens.

5.2 Flashes

5.2.1 Potentially harmful flashes

Potentially harmful flashes shall be avoided.

Potentially harmful flashes are defined as those satisfying all the following conditions.

- (i) A pair of opposing changes in luminance (i.e., an increase in luminance followed by a decrease, or a decrease followed by an increase) of 20 cd/m² or more when the luminance of the darker image is below 160 cd/m².
- (ii) The combined area of flashes occurring concurrently occupies more than one quarter of the displayed screen area.
- (iii) There are more than 3 flashes and fewer than 65 flashes within any one-second period.

NOTE The above requirement is applied for the display set as maximum screen luminance of 200 cd/m² and below. For maximum screen luminance above 200 cd/m², see annex C.

5.2.2 Rapid changes of image sequences

Rapidly changing image sequences (for example, “fast cuts”, see note) shall be avoided if they result in areas of the screen that produce a potentially harmful flash.

NOTE “fast cuts” denote switching briefly and abruptly from one scene to another in movies, videos and other image products.

5.2.3 Potentially harmful red flashes

Potentially harmful red flashes shall be avoided, irrespective of luminance change.

Potentially harmful red flashes are defined as those satisfying all the following conditions.

- (i) A transition between a saturated red and a colour differing more than 0,2 in CIE 1976 UCS chromaticity diagram.
- (ii) The combined area of red flashes, satisfying (i) above, occurring concurrently, occupies more than one quarter of the displayed screen area.
- (iii) There are more than 3 red flashes and fewer than 65 red flashes, those satisfying (i) above, within any one-second period.

NOTE Saturated red can be defined in the CIE chromaticity diagram (see Annex D).

5.2.4 Cumulative risk

It should be noted that the level of any cumulative risk arising from successive sequences of ‘potentially harmful’ flashes over a prolonged period is unknown. If, as medical opinion suggests, the risk of seizures increases with the duration of flashing, it should be noted that a sequence of flashing images lasting more than 5 seconds might constitute a risk, even when it complies with 5.2.1 to 5.2.3.

5.2.5 Prior warning

A prior warning shall be given, if the image sequences may contain flashing visual stimuli that cannot be corrected and contravene the above sections on flashing.

5.3 Patterns

5.3.1 Potentially harmful regular patterns

Potentially harmful regular patterns should be avoided.

Potentially harmful regular patterns are defined as those satisfying all the following conditions. [15]

- (i) Clearly discernible stripes, which may be parallel or radial, curved or straight, in any orientation.
- (ii) If the patterns are stationary, the stripes are more than 8 light-dark pairs occupying more than 40% of the displayed screen area, or if the pattern change direction, oscillate, flash, or reverse in contrast, the stripes are more than 5 light-dark pairs occupying more than 25% of the displayed screen area.
- (iii) Luminance difference of the stripes is 20 cd/m² or more when the luminance of the darker bar is below 160 cd/m².
- (iv) Pattern persists for 0.5 s and more.