SVENSK STANDARD
SS-EN ISO 9241-307:2008

Fastställd/Approved: 2008-12-04
Publicerad/Published: 2009-01-22
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 12.040; 13.180; 35.180

Ergonomi vid människa-systeminteraktion – Del 307: Elektroniska bildskärmar – Provningsmetoder för analys och kvalitetssäkring (ISO 9241-307:2008)

Ergonomics of human-system interaction – Part 307: Analysis and compliance test methods for electronic visual displays (ISO 9241-307:2008)

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This standard supersedes the Swedish Standard SS-EN 29241-3, edition 1; SS-EN ISO 9241-8, edition 1; SS-EN ISO 9241-7, edition 1; SS-EN 29241-3/A1, edition 1; SS-EN ISO 13406-2, edition 1.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 9241-307

November 2008

ICS 13.180; 35.180

English Version

Ergonomics of human-system interaction - Part 307: Analysis and compliance test methods for electronic visual displays (ISO 9241-307:2008)

Ergonomie de l'interaction homme-système - Partie 307: Méthodes d'essais d'analyse et de conformité pour écrans de visualisation électroniques (ISO 9241-307:2008)

Ergonomie der Mensch-System-Interaktion - Teil 307: Analyse und Konformitätsverfahren für elektronische optische Anzeigen (ISO 9241-307:2008)

This European Standard was approved by CEN on 21 March 2008.

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Foreword

This document (EN ISO 9241-307:2008) has been prepared by Technical Committee ISO/TC 159 "Ergonomics" in collaboration with Technical Committee CEN/TC 122 "Ergonomics", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2009, and conflicting national standards shall be withdrawn at the latest by May 2009.

This document supersedes EN 29241-3:1993, EN ISO 13406-2:2001, EN ISO 9241-7:1998.

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Endorsement notice

The text of ISO 9241-307:2008 has been approved by CEN as a EN ISO 9241-307:2008 without any modification.

Introduction

This part of ISO 9241 addresses different technologies for a wide range of visual display tasks and environments. Its modular structure will allow it to be readily amended, as ongoing technological development enables new forms of display interaction or new contexts become available.

Using ISO 9241-303 and ISO 9241-305, together with the compliance method specified in this part of ISO 9241, it is possible to obtain a good understanding of how to analyse an environment for which there does not exist a specific analysis and compliance method.

Ergonomics of human-system interaction —

Part 307:
Analysis and compliance test methods for electronic visual displays

1 Scope

This part of ISO 9241 establishes test methods for the analysis of a variety of visual display technologies, tasks and environments. It uses the measurement procedures of ISO 9241-305 and the generic requirements of ISO 9241-303 to define compliance routes suitable for the different technologies and intended context of use.

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 9241-300, *Ergonomics of human-system interaction — Part 300: Introduction to electronic visual display requirements*

ISO 9241-302, *Ergonomics of human-system interaction — Part 302: Terminology for electronic visual displays*

ISO 9241-303, *Ergonomics of human-system interaction — Part 303: Requirements for electronic visual displays*

ISO 9241-305, *Ergonomics of human-system interaction — Part 305: Optical laboratory test methods for electronic visual displays*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms and definitions

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

4 Guiding principles

Compliance procedures and assessment methods for human-system interaction systems require a structure that addresses the relevant aspects of the context of use in regard to the physical technology for the intended application.

This part of ISO 9241 links the ergonomic requirements given in ISO 9241-303 with the measurement methods specified in ISO 9241-304, ISO 9241-305 and ISO 9241-306.

For this purpose, the compliance routes specified in Clause 5 are separated into the following integral parts of compliance assessment:

— ISO 9241-303 requirements (attributes);

— Pass/Fail criteria based on those requirements and the intended context of use;

— measuring method references;

— assessment and reporting.

Annex C presents general information on the structure of compliance routes.

5 Compliance routes

5.1 CRT displays for indoor use — Display laboratory method

5.1.1 Intended context of use

The attributes of the user, environment, tasks and use of CRT (cathode ray tube) displays are summarized in Table 1. Attributes are derived from analysis of the intended context of use and are an essential prerequisite for the compliance assessment. Therefore, context elements different from those described in this method could influence the Pass/Fail criteria.

The supplier shall specify the intended context of use as well as the value or value range of an attribute. The values specified shall match the intended context of use. The intended context of use is part of the compliance report.

NOTE CRT displays are considered in this compliance route for typical visual display tasks for indoor use.

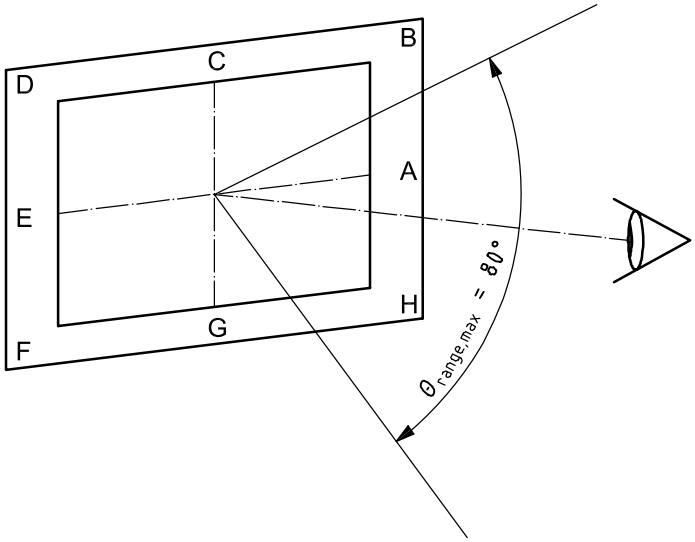
Table 1 — Intended context of use — CRT displays

Element	Attribute	Quantification
User	Vision	User with normal or corrected to normal vision of any age, 7 years or older (any literate user).
Environment	Design screen illuminance, E_S	At indoor locations (see References [5], [9], [19], [25]): — up to 200 lx, e.g. (mostly) general building areas; — up to 300 lx, e.g. (mostly) general machine work, rough assembly work, (general) museum; — vertical 250 lx + 250 lx × cos(α) in offices, where α is the screen tilt angle; — up to 500 lx, e.g. medium assembly and decorative work, simple inspection, counters, libraries, (mostly) educational areas, control rooms; — up to 750 lx, e.g. fine work, technical drawing; — up to 1 000 lx, e.g. precision work, quality control, inspection, medical examination and treatment; — up to 1 500 lx, e.g. high precision work; — > 1 500 lx, e.g. special workplaces in the medical area; — controlled and/or adjustable illuminance, e.g. projection rooms, film and video studios and radio stations, theatres, concert halls, X-ray departments. The supplier shall specify the maximum design screen illuminance as well as the intended environment. The screen tilt angle is considered to be 75°, if not otherwise specified by the supplier.
	Typical components of the illumination: large aperture source (15°) and small aperture source (1°) illumination	At indoor locations (see References [13], [19]): — $L_{REF,EXT}$ = 500 cd/m^2, $L_{REF,SML}$ = not applicable; — $L_{REF,EXT}$ = 300 cd/m^2, $L_{REF,SML}$ = not applicable; — $L_{REF,EXT}$ = 200 cd/m^2, $L_{REF,SML}$ = 2 000 cd/m^2 (suitable for general office use); — $L_{REF,EXT}$ = 125 cd/m^2, $L_{REF,SML}$ = 200 cd/m^2 (requires a specially controlled luminous environment); where $L_{REF,EXT}$ is the luminance of the large aperture source (15°); $L_{REF,SML}$ is the luminance of the small aperture source (1°). The supplier shall specify the luminance of the large and small aperture source of the illumination.
	Illuminant	For this compliance route, CIE illuminants A, D65, F11 and F12 are considered [1]. The supplier may specify the intended illuminant. NOTE 1 All these illuminants exist at every illuminance level of indoors use, often in combinations. It is assumed that by verifying that the visual display complies in each of the illuminants, the visual display will also comply with any combination of illuminants. NOTE 2 The compliance assessment need only be performed once, with a spectrally broad-band laboratory illumination. The compliance calculations are then made using spectral calculations and repeated for each of the specified illumination levels and illuminants.

Table 1 (*continued*)

Element	Attribute	Quantification
Environment	Ambient temperature	For this compliance route, an ambient temperature of approximately 15 °C to 35 °C is considered, if not otherwise specified by the supplier.
Task	Content and perception	For this compliance route, the following two contexts for perception of information are considered, if not otherwise specified by the supplier [38]. **a) Artificial information** Visualization of objects and scenes that do not have originals in our world — text (i.e. alphanumeric characters), graphical signs, symbols, etc. — in monochrome (including achromatic) and/or multicolour (including full-colour) presentation. **b) Reality information** Imaging of objects and scenes that do have existing originals in our world — faces, people, landscapes, etc. — in monochrome (including achromatic) or multicolour (including full-colour) presentation. The supplier shall specify whether the visual display is designed predominantly for artificial information or reality information. If both types of information are used in a work environment, Pass/Fail criteria for both types of information are applied.
	Amount of information	Preferred screen size for sufficient amount of information with appropriate object size and resolution.
	Image type	For this compliance route, still, quasi-static or moving images are considered, if not otherwise specified by the supplier.
	Design viewing distance, $D_{design,view}$	The supplier shall specify the design viewing distance depending on the predominant information. If both types of information are used in a work environment, the design viewing distance for artificial information is selected. **a) Artificial information** The typical design viewing distance is calculated based on the optimum position for the most important visual display that is within $\pm$ 15° in the vertical and horizontal directions from the line-of-sight [11]. — If $W_{view} > H_{view}$: $D_{design,view} = W_{view}/2 \times \tan(15°) = W_{view}/0{,}536$ — If $H_{view} > W_{view}$: $D_{design,view} = H_{view}/2 \times \tan(15°) = H_{view}/0{,}536$ where H_{view} is the height of the active display area; W_{view} is the width of the active display area. **b) Reality information** Depending on the aspect ratio of the active display area, the typical design viewing distance, $D_{design,view}$, is as follows [30]. — For aspect ratio 4:3 (from ITU-R BT.500): If $H_{view} \leqslant$ 1,53 m: $D_{design,view} = 1\text{ m} + 4 \times H_{view}$ If $H_{view} >$ 1,53 m: $D_{design,view} = 4{,}7 \times H_{view}$ — For aspect ratio 16:9 (from ITU-R BT.710): $D_{design,view} = 3 \times H_{view}$

Table 1 (*continued*)

Element	Attribute	Quantification
Task	Design viewing direction (Θ_D, Φ_D)	Within a specific range of angles from the normal. For this compliance route, perpendicular viewing direction is assumed, if not otherwise specified by the supplier. Therefore, the default design viewing direction (Θ_D, Φ_D) is (0°, –).
	Design viewing direction range (angle of inclination and azimuth)	For this compliance route, a design viewing direction range of up to 80° is considered, if not otherwise specified by the supplier (see Figure 1). Therefore, the maximum angle of inclination, Θ, is 40°. The azimuth angle, Φ, is 0° to 360°.  **Figure 1 — Design viewing direction for CRT displays**
	Eye and head position	From fixed to moving.
	Number of users	Typically single or multiple.
Usage	Display handling	For this compliance route, stationary display handling is considered, if not otherwise specified by the supplier.