

Safety of machinery — Ergonomics requirements for the design of displays and control actuators

Part 2: Displays

ICS 13.110; 13.180

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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.

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This British Standard, having been prepared under the direction of the Health and Environment Sector Board, was published under the authority of the Standards Board and comes into effect on 15 July 1997

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ISBN 978 0 580 62354 7

Amendments/corrigenda issued since publication

Date	Comments
31 October 2009	Implementation of CEN amendment A1:2008

ICS 13.110; 13.180

English Version

Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays

Sécurité des machines - Spécifications ergonomiques pour la conception des dispositifs de signalisation et des organes de service - Partie 2: Dispositifs de signalisation

Sicherheit von Maschinen - Ergonomische Anforderungen an die Gestaltung von Anzeigen und Stellteilen - Teil 2: Anzeigen

This European Standard was approved by CEN on 3 January 1997 and includes Amendment 1 approved by CEN on 14 August 2008.

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Foreword

This document (EN 894-2:1997+A1:2008) has been prepared by 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of an identical text or by endorsement, at the latest by April 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-08-14.

This document supersedes EN 894-2:1997.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

A1 For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. **A1**

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This standard has been prepared to be a harmonised standard in the sense of the Machinery Directive and associated EFTA regulations.

1 Scope

This European Standard gives guidance on the selection, design and location of displays to avoid potential ergonomic hazards associated with their use. It specifies ergonomics requirements and covers visual, audible and tactile displays.

It applies to displays used in machinery (e.g. devices and installations, control panels, operating and monitoring consoles) for occupational and private use. Specific ergonomics requirements for visual display terminals (VDTs) used for office tasks are given in the standard EN ISO 9241.

2 Normative references

This European standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references subsequent amendments to, or revisions of, any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology.*

EN 292-2, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications.*

EN 457, *Safety of machinery – Auditory danger signals – General requirements, design and testing (ISO 7731).*

EN 614-1, *Safety of machinery – Ergonomics design principles – Part 1: Terminology and general principles.*

EN ISO 9241, *Ergonomics requirements for office work with visual display terminals (VDTs).*

EN 61310-1, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, auditory and tactile signals (IEC 1310-1).*

EN 61310-2, *Safety of machinery – Indication, marking and actuation – Part 2: Requirements for marking (IEC 1310-2).*

3 Definitions

For the purposes of this European Standard, the following definitions apply:

3.1 operator

the person or persons given the task of installing, operating, adjusting, maintaining, cleaning, repairing or transporting machinery [EN 292-1]

3.2

work task

an activity or activities required to achieve an intended outcome of the work system [EN 614-1]

3.3

work equipment

machinery, tools, vehicles, devices, furniture, installations and other components used in the work system [EN 614-1]

3.4

signal

stimulus related to the status, or change in status, of work equipment which has a potential effect on the senses of an operator. This European Standard describes signals which may be detected by the eyes (from visual displays), the ears (from auditory displays), or from the skin (tactile displays)

3.5

display

device for presenting information that can change with the aim of making things visible, audible or discriminable by touch (tactile)

3.6

digital display

display in which the information is shown in numerical code

3.7

alphanumeric display

display in which the information is shown as a combination of digits and letters.

3.8

analogue display

display in which the status information is shown as a function of length, angle or other dimension. In the case of visual displays, the information may be shown as a function of pointer deflection, length of a bar graph, or similar visual quantity. In the case of auditory displays, information may be transmitted as a function of pitch or loudness. In the case of tactile displays, the information may be transmitted as a function of the display's vibration (frequency or amplitude), or of the display's displacement.

3.9

symbols

letters, digits, pictorial representations, or combinations of these, used for labelling a display's graduations, or as a means of identifying the display itself.

3.10

perception

psychophysiological process occurring in the central nervous system, the product of which is knowledge about the environment. Perception is a dynamic process and is not determined merely by the parameters of the signals which initiated it. As a consequence, it is possible that the information obtained may be incomplete, uncertain, or incorrect.

Knowledge may be based on one or more of the following levels of perception: detection, identification, and interpretation. Detection is the perceptual process by which the operator becomes aware of the mere presence of a signal. Identification is the perceptual process by which the detected signal is distinguished from other signals. Interpretation is the combination of perceptual and cognitive processes by which the contents and significance of the identified signal are recognised.

4 Visual displays

Visual displays can be used to transmit large quantities of information to the operator, in a variety of ways.

4.1 Requirements for detection of visual displays

4.1.1 Positioning the display

The physiological and functional requirements of the operator and the unobstructed lines of sight available during task performance determine the positioning of the visual display relative to the operator. The size of the operator's visual field is limited, which in turn limits the number of displays which can be attended to at any one time.

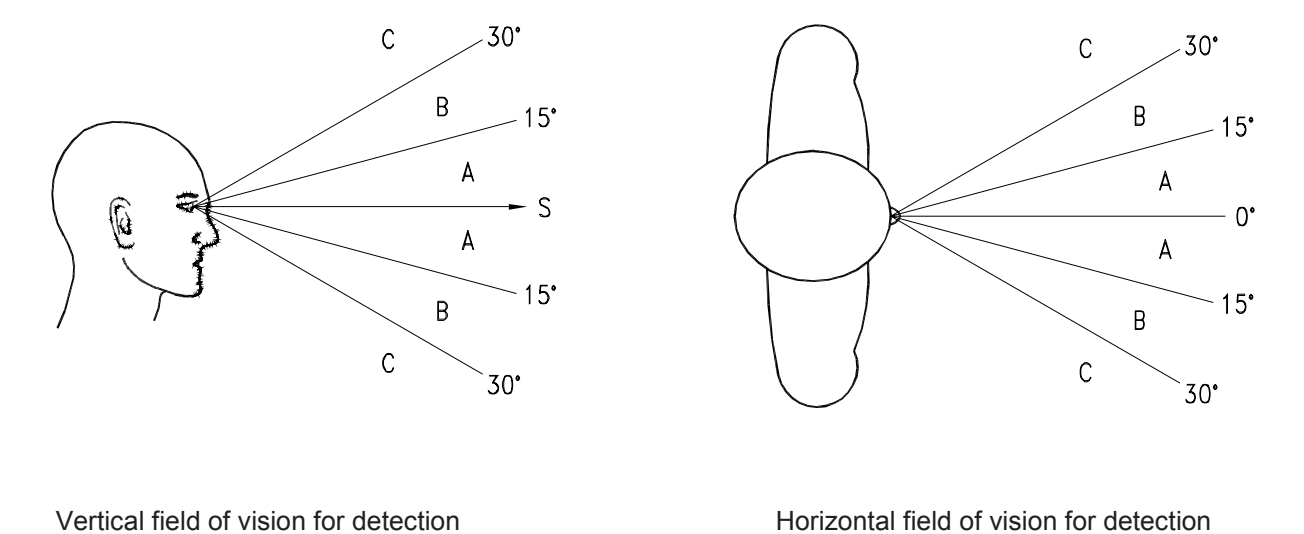
Two different types of visual task are distinguished: detection tasks and monitoring tasks. Detection tasks are those where the operator has to be alerted by the system, monitoring tasks are those in which the operator actively seeks information.

Three zones of decreasing efficiency for visual signal detection are identified for both detection and monitoring tasks as "Recommended", "Acceptable" and "Not suitable" (see Table 1). The centre-lines of the "Recommended" and "Acceptable" zones lie in the median plane and correspond with the line of sight, as shown in figures 1 and 2. In the detection task the line of sight depends on the main centre of attention. For monitoring tasks displays may be positioned around a line of sight that is at an angle below the horizontal which is known to be more comfortable for the operator.

The angles presented in these figures are general ergonomic recommendations; it is assumed that the operator has normal vision, and is able to maintain a relaxed and stable (preferably seated) position, close to the displays.

Table 1 — Levels of suitability

Level of suitability	Significance
A: Recommended	This zone shall be used wherever possible
B: Acceptable	This zone may be used if the recommended zone cannot be used
C: Not suitable	This zone should not be chosen



Legend: S: Line of sight, direction is imposed by external task requirements

Figure 1 — Detection tasks