
**Ergonomic requirements for the design of
displays and control actuators —**

**Part 2:
Displays**

*Spécifications ergonomiques pour la conception des dispositifs de
signalisation et des organes de service —*

Partie 2: Dispositifs de signalisation



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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.

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.

International Standard ISO 9355-2 was prepared by the European Committee for Standardization (as European Standard EN 894-2:1997) and was adopted, under a special "fast-track procedure", by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*, in parallel with its approval by the ISO member bodies.

ISO 9355 consists of the following parts, under the general title *Ergonomic requirements for the design of displays and control actuators*:

- *Part 1: Human interactions with displays and control actuators*
- *Part 2: Displays*
- *Part 3: Control actuators*
- *Part 4: Location and arrangement of displays and control actuators*

Annex A of this part of ISO 9355 is for information only.

Ergonomic requirements for the design of displays and control actuators —

Part 2: Displays

1 Scope

This part of ISO 9355 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 ISO 9241.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9355. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 9355 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 7731, *Danger signals for work places — Auditory danger signals*.

IEC 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals*.

IEC 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking*.

3 Definitions

For the purposes of this part of ISO 9355, 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 the skin (from 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.

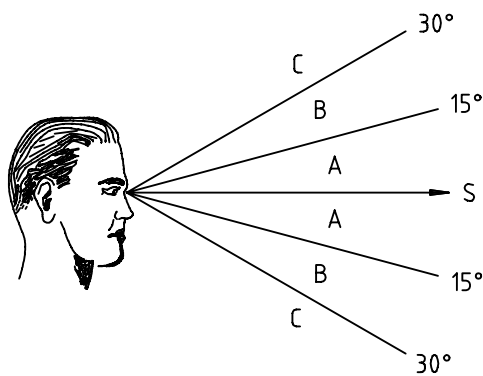
Two different types of visual task are distinguished: detection tasks and monitoring tasks. Detection tasks are those where the operator has to be alerted by the system, monitoring tasks are those in which the operator actively seeks information.

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.

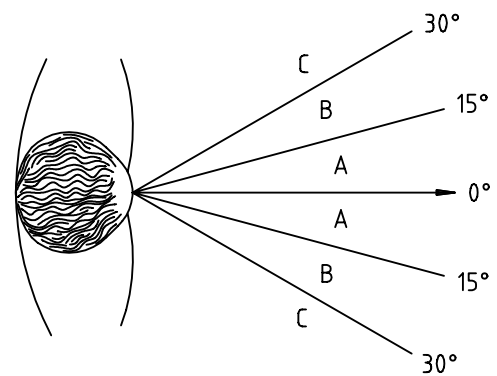
The angles presented in these figures are general ergonomic recommendations; it is assumed that the operator has normal vision, and is able to maintain a relaxed and stable (preferably seated) position, close to the displays.

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



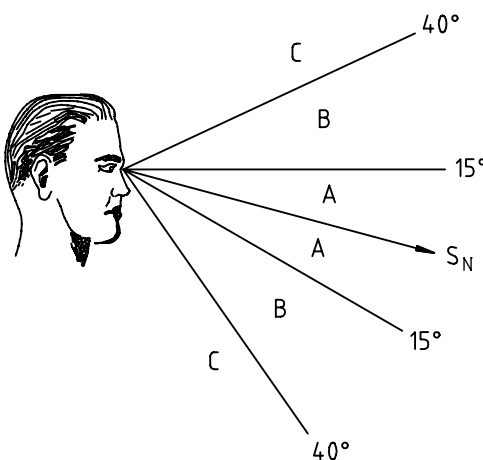
Vertical field of vision for detection



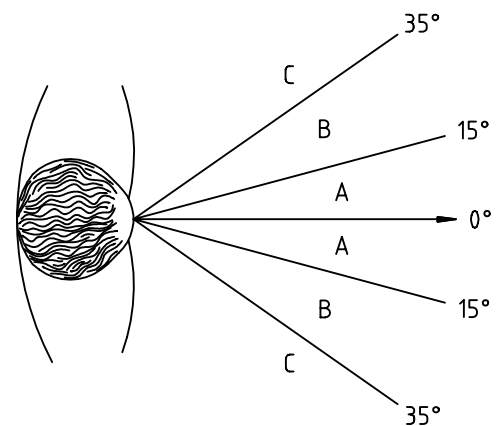
Horizontal field of vision for detection

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

Figure 1 — Detection tasks



Vertical field of vision for monitoring



Horizontal field of vision for monitoring

Legend: S_N: Normal line of sight, 15° to 30° below the horizontal

Figure 2 — Monitoring tasks