
**Road vehicles — Ergonomic aspects of
transport information and control
systems — Specifications and test
procedures for in-vehicle visual
presentation**

*Véhicules routiers — Aspects ergonomiques des systèmes
d'information et de commande du transport — Spécifications et
méthodes d'essai pour la présentation visuelle à bord du véhicule*

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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.

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 15008 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 13, *Ergonomics applicable to road vehicles*.

This second edition cancels and replaces the first edition (ISO 15008:2003), which has been technically revised.

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Introduction

Driver and vehicle form an integrated system that includes the environment, the primary vehicle controls, the instrumentation and the transport information and control systems (TICS). The task of driving, as well as human capabilities and limitations, are other important factors in the performance of this system.

TICS are intended to support drivers in their primary task, and it is therefore expected that the overall workload of the driver will not be negatively influenced by the use of TICS, while performance and comfort are increased.

The visual characteristics of display systems are only one set of factors influencing this process. They therefore need to be considered, along with human capabilities, in connection with the other elements of the driving environment.

Visual specifications fall within a wide range of environmental conditions and constitute only one necessary condition for adequate performance, comfort and workload. They refer to the relevant range of illumination conditions and to the location of the display with respect to the driver.

The following substantial changes have been made compared with the first edition of this International Standard:

- extension of the scope,
- updating of normative and bibliographic references, and terms and definitions,
- clarification of design viewing positions,
- referencing of contrast measurement methods and angles to SAE J1757/1:2007,
- changing of illumination ranges; addition of twilight condition,
- inclusion of outlined characters,
- exclusion of colour contrast,
- changing of minimum character heights,
- inclusion of Chinese and Japanese characters, and
- clarification of character dimension specifications.

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Road vehicles — Ergonomic aspects of transport information and control systems — Specifications and test procedures for in-vehicle visual presentation

1 Scope

This International Standard specifies minimum requirements for the image quality and legibility of displays containing dynamic (changeable) visual information presented to the driver of a road vehicle by on-board transport information and control systems (TICS) used while the vehicle is in motion. These requirements are intended to be independent of display technologies, while reference to test methods and measurements for assessing compliance with them have been included where necessary.

This International Standard is applicable to mainly perceptual, and some basic cognitive, components of the visual information, including character legibility and colour recognition. It is not applicable to other factors affecting performance and comfort, such as coding, format and dialogue characteristics, or to displays using

- characters presented as a part of a symbol or pictorial information,
- superimposed information on the external field (e.g. head-up displays),
- pictorial images (e.g. rear view camera),
- maps and topographic representations (e.g. those for setting navigation systems), or
- quasi-static information.

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 4513, *Road vehicles — Visibility — Method for establishment of eyellipses for driver's eye location*

CIE 17.4:1987, *International lighting vocabulary*

CIE 85:1989, *Solar spectral irradiance*

SAE J1757/1:2007, *Standard Metrology for Vehicular Displays*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CIE 17.4:1987 and the following apply.

3.1

adaptation

adjustment of the eye's sensitivity to the brightness of the observed visual field

NOTE Dark adaptation occurs at a slower rate than does light adaptation.

3.2

blink

intended periodic variation of the luminance of a light or visual information, normally from “OFF” to a given value, typically used for attracting attention

NOTE Terms and definitions related to photometric quantities (e.g. illuminance, luminance, luminance contrast and saturation) are given in CIE 17.4:1987.

3.3

brightness

subjective attribute of light sensation by which a stimulus appears to be more or less intense or to emit more or less light

3.4

critical specular line

CSL

line from the centre of the display to the centre of the eyellipse

3.5

chromatic

having hue or being coloured, appearing different in quality from a neutral grey having the same brightness

NOTE It is related to the colour properties of a visual stimulus.

3.6

contrast

C

ratio between the difference of the luminance, L_{high} , of an area in its “bright” state (e.g. the strokes of a character in the case of negative polarity) minus the luminance, L_{low} , of the same area in its “dark” state and the luminance L_{low}

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NOTE 1
$$C = \frac{L_{high} - L_{low}}{L_{low}}$$

NOTE 2 Terms and definitions related to photometric quantities (e.g. illuminance, luminance, luminance contrast and saturation) are given in CIE 17.4:1987.

3.7

contrast ratio

R_C

ratio between the luminance L_{high} and the luminance L_{low}

NOTE 1
$$R_C = \frac{L_{high}}{L_{low}}$$

NOTE 2 Terms and definitions related to photometric quantities (e.g. illuminance, luminance, luminance contrast and saturation) are given in CIE 17.4:1987.

3.8

cyclopean eyellipse

elliptical volume combining the left and the right eyellipse of the driver into one single volume located in the centre between them

3.9

day condition

condition with diffuse ambient light

3.10**direct sunlight condition**

condition under which the viewing conditions are mainly influenced by direct light from the sun on the display surface

3.11**dynamic information**

information that has more than two stages of change

3.12**eyellipse**

elliptical shape of the driver eye range, as defined in ISO 4513

NOTE 1 See definition of 95th percentile eyellipse in ISO 4513.

NOTE 2 It is the contraction of the words "eye" and "ellipse".

3.13**flicker**

unintended perceived temporal variation of the brightness of a visual stimulus, usually generated by refresh process of the display content or by variation of the luminance of the backlight

NOTE Terms and definitions related to photometric quantities (e.g. illuminance, luminance, luminance contrast and saturation) are given in CIE 17.4:1987.

3.14**disability glare**

dazzling or disabling effect produced by a bright light

NOTE This is a retinal effect, primarily caused by light scatter in the eye, which produces a luminous veil over the retinal image and thus reduces contrast.

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3.15**discomfort glare**

distracting or disrupting effect of bright point sources in the field of view

NOTE This is a perceptual effect, interfering with visual attention and selection.

3.16**jitter**

unintended periodic movement of an image or parts of it

3.17**legibility**

visual properties of a character or graphics representation that determine the ease with which it can be recognized

3.18**map**

representation on plane surface of the features of a connected part of the earth surface (especially of the road and traffic environment), shown in their representative forms, sizes and relationship in accordance with some convention of representation

3.19**night condition**

condition of low ambient illumination under which the adaptation level of the driver is mainly influenced by the portion of the road ahead covered by the vehicle's own headlights and surrounding street lights, and display and instrument brightness

NOTE Low ambient illumination is less than 50 lx.

3.20

pixel

smallest selectively addressable element of the display surface capable of reproducing the full range of luminance and colours

NOTE 1 "Pixel" is an abbreviation for "picture element".

NOTE 2 Terms and definitions related to photometric quantities (e.g. illuminance, luminance, luminance contrast and saturation) are given in CIE 17.4:1987.

3.21

quasi static information

<reconfigurable displays> information that has a limited number of states, where one or other state is always displayed and does not change frequently

EXAMPLE AM/PM, km/miles, kPa/PSI, On/Off information.

3.22

redundantly presented information

information which is presented in parallel by different means or at different positions

EXAMPLE 1 Speed can be displayed in both analogue and digital format.

EXAMPLE 2 Turn-by-turn navigation can be displayed on a central display and in parallel in the instrument cluster.

3.23

segment

pre-defined geometric form that can be used to create a character or symbol in whole or in part

EXAMPLE Stroke.

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3.24

twilight condition

condition between night condition and day condition

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NOTE In twilight condition, the setting of the display illumination might be in day or night setting.

4 Requirements and measurement methods

4.1 General

The following requirements shall be complied with to ensure that images on the visual displays used in on-board TICS equipment are legible.

Conformity of the presented images to the requirements specified in this International Standard shall be tested at a temperature within the range of 18 °C to 28 °C. The test shall not start until the illumination has reached a stable state. The requirements are accompanied by standard measurement conditions in terms of ambient illuminance and observer positions. Methods for measurement of contrast shall be in accordance with SAE J1757/1:2007.

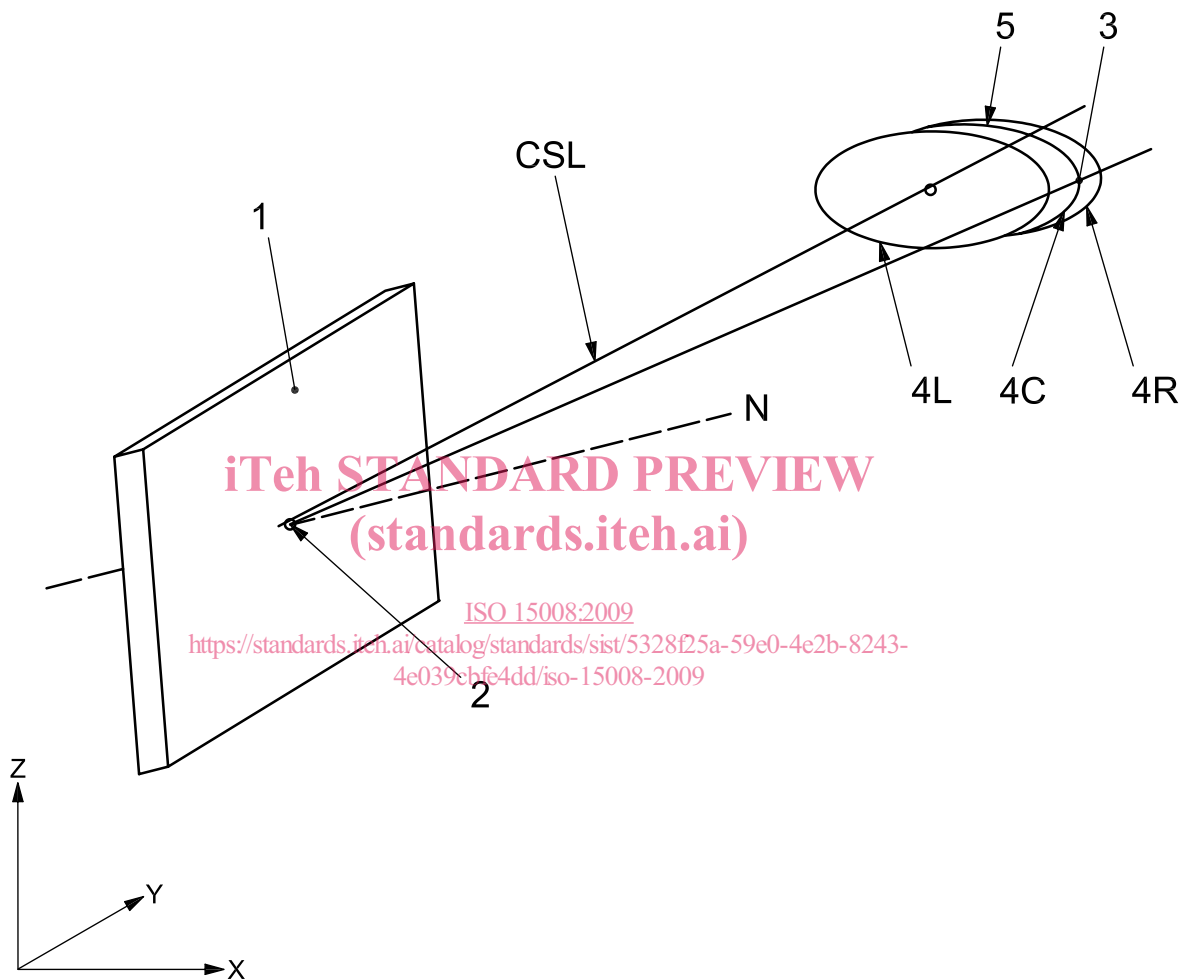
4.2 Design viewing position and illumination range

4.2.1 Design viewing position

The requirements in this subclause are applicable to displays in their installed vehicle locations, as seen from any point in the driver eyellipses according to ISO 4513 (for passenger vehicles only).

If the display is fixed to the vehicle, the relevant requirements shall be complied with from the rearmost point of the cyclopean eyellipse. If the position of the display is adjustable, the display may be adjusted so that a position can be found in which all the relevant requirements are complied with simultaneously. For direct sunlight conditions, the requirements of contrast (see 4.3.2) shall only be fulfilled in the direction of the critical specular line (CSL) (see Figure 1).

Standard default values for angles ($45^\circ/30^\circ$) as an alternative for direct sunlight measurements are acceptable (see SAE J1757/1:2007).



a) Display at right-hand side of driver

Figure 1 (continued)