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Road vehicles — Ergonomic aspects of transportation and control systems — Dialogue management principles and compliance procedures

Véhicules routiers — Aspects ergonomiques du transport et des systèmes de commande — Principes de gestion du dialogue et procédures de conformité

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 39, *Ergonomics*.

This second edition cancels and replaces the third edition (ISO 15005:2002), which has been technically revised. The main changes compared to the previous edition are as follows:

— improvements were made to the clarity of the text and references were updated; and

— a section related to "learnability" was added as 5.4.

Introduction

This document deals with the ergonomic design of transport information and control systems (TICS) and provides general ergonomic principles for their dialogues, independent of any specific dialogue techniques.

The utmost care needs to be taken in the design and installation of TICS equipment in order to ensure that it does not impair the driver's safe control of the vehicle. This is in recognition of the fact that the driving environment has variable conditions, such as road surface, visibility, weather, ambient lighting and traffic conditions.

Dialogue management principles for TICSs are characterized by the need to take into account the following:

— TICSs are intended for use in a moving vehicle.

— TICSs help functions are appropriate to a moving vehicle.

— TICS dialogues take place in a constantly changing vehicle environment.

— TICS technologies are suited to that environment.

— TICS dialogues include the driver's vehicle-control actions in response to the TICS.

The driver of a vehicle equipped with a TICS device is responsible for the safety of the vehicle, its occupants and other road users. A dialogue therefore takes into account the driver workload as a whole, including the cognitive, perceptual and physical tasks associated with driving, so that there will be no impairment of the safe and effective operation of the vehicle. An important objective is to ensure effective and efficient TICS operation while respecting the in-vehicle environment and recognizing the paramount importance of the primary driving task.

In addition to the recommendations and requirements related to the principles it presents, this document also gives the conditions for compliance. As the manner in which each dialogue principle is applied will depend on the particular characteristics of the TICS function and the specific dialogue technique used, application examples have been provided.

The ultimate beneficiary of this document will be the TICS end-user: the driver of the road vehicle. It is the needs of the driver that have determined the ergonomic requirements included by the developers of this document.

Road vehicles — Ergonomic aspects of transportation and control systems — Dialogue management principles and compliance procedures

1 Scope

This document specifies ergonomic principles for the design of the dialogues that take place between the driver of a road vehicle and the vehicle's transport information and control systems (TICS) while the vehicle is in motion. It also specifies compliance verification conditions for the requirements related to these principles.

This document is applicable to TICS consisting of either single or multiple devices, which can be either independent or interconnected. It is not applicable to TICS without dialogues, TICS failures or malfunctions, or controls or displays used for non-TICS functions.

The requirements and recommendations of this document can be reconsidered for drivers with special needs.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3958, *Passenger cars — Driver hand-control reach*

ISO 15006, *Road vehicles — Ergonomic aspects of transport information and control systems — Specifications for in-vehicle auditory presentation*

ISO 15008, *Road vehicles — Ergonomic aspects of transport information and control systems — Specifications and test procedures for in-vehicle visual presentation*

ISO/TS 16951, *Road vehicles — Ergonomic aspects of transport information and control systems (TICS) — Procedures for determining priority of on-board messages presented to drivers*

SAE J1050[1)], *Describing and Measuring the Driver's Field of View*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
communication
exchange or transfer of information

1) SAE International.

3.2
control
part of an item of equipment used by a human operator to bring about a change in the performance of the equipment

3.2.1
primary control
device used by a *driver* (3.11) to control longitudinal and/or lateral motion of a vehicle

EXAMPLE Steering wheel, brake pedal, accelerator, gear selector or clutch.

3.2.2
secondary control
non-primary device used by the *driver* (3.11) to control mandatory *functions* (3.13)

EXAMPLE Parking brake, horn, light switches, turn indicator control, washer and wiper controls, hazard flasher control or demister control.

3.3
control action
configuration or adjustment of a system input device that causes a specific response from the system

3.4
data entry
act of providing the information that the selected *function* (3.13) requires to be able to perform in a desired way

3.5
dialogue
exchange of information between a *driver* (3.11) and a system, instigated by either one, to achieve a particular goal, consisting of a related sequence of *control actions* (3.3) that can involve more than one modality

3.6
dialogue effectiveness
successful exchange of the required information between the system and the user

3.7
dialogue efficiency
effective exchange of information performed with little demand on the user in terms of information gathering (e.g. reading, listening), or information processing and information input (e.g. control actions)

3.8
dialogue management
control of the exchange of dynamic information between a *driver* (3.11) and a *TICS* (3.25), organized and displayed through any type of *interface* (3.15)

3.9
display
device that allows the presentation of visual, auditory or tactile dynamic information to a *driver* (3.11)

3.10
distraction
diversion of attention away from activities critical for safe driving toward a competing activity, which can result in insufficient or no attention to activities critical for safe driving

[SOURCE: Regan, Hallett, & Gordon, 2011, pp. 1776]

3.11
driver
vehicle occupant in control of the vehicle

3.12
dwell time
sum of consecutive individual fixation and saccade times to a target in a single glance

[SOURCE: ISO 15007-1:2002, 3.5]

3.13
function
transformation of incoming information into outgoing results

3.14
H-point
pivot centre of the torso and thigh of the three-dimensional H-point machine which simulates the pivot centre of the human torso and thigh and is used for actual H-point determination

Note 1 to entry: It is located on the centreplane of the device, which is midway between the H-point sight buttons on either side of the H-point machine.

[SOURCE: ISO 6549:1999, 3.2]

3.15
interface
physical facility (or hardware) between *driver* (3.11) and system that provides the media through which they can connect and interact

3.16
manufacturer

person or organization responsible for *TICS* (3.25) operational characteristics

Note 1 to entry: The term covers the designer, component supplier and system integrator, and also system suppliers who, by putting a name, trademark or other distinguishing feature on a product, present themselves as its producer.

3.17
primary driving task
control actions (3.3) undertaken by a *driver* (3.11) in navigating and manoeuvring a vehicle on roadways

EXAMPLE Steering, braking or accelerating.

3.18
prompt
indication that the system is available to receive input

3.19
sensory mode
perceptual medium used for information transmission or reception (auditory, visual, tactile, etc.)

3.20
status
current available or active *system mode(s)* (3.23), or both, of the *TICS* (3.25)

3.21
system acknowledgement
information provided to the *driver* (3.11) by the system in response to a driver request

3.22
system initiated information
information provided to the *driver* (3.11) by the system, other than in response to a driver request

3.23
system mode
specified subset of system *functions* (3.13) or behaviour patterns

3.24
task
sequence of control operations (i.e. a specific method) leading to a goal at which the *driver* (3.11) will normally persist until the goal is reached

[SOURCE: Alliance of Automobile Manufacturers, 2006]

3.25
transport information and control system
TICS
single *function* (3.13), such as route guidance, or number of functions designed to work together as a system

Note 1 to entry: See ISO/TR 14813-1 for TICS services.

3.26
timing
temporal relationship between display presentations and *control actions* (3.3), other presentations, system changes, the road or traffic situation, and driving

3.27
traffic situation relevant information
information received via communication channels, such as broadcasting receivers and on-board sensors, where the *driver* (3.11) has no control over the time of reception

Note 1 to entry: Traffic information, route guidance information or collision warning.

3.28
vehicle in motion
vehicle whose speed relative to its supporting surface is "nonzero"

Note 1 to entry: Practical limitations on existing vehicle sensors may cause small velocities (typically ≤5 km/h) to be registered as zero.

3.29
vehicle not in motion
vehicle whose speed relative to its supporting surface is zero

Note 1 to entry: Practical limitations on existing vehicle sensors may cause small velocities (typically ≤5 km/h) to be registered as zero.

4 Application

The ergonomic principles for TICS dialogues given in Clause 5 are to be applied within the context to which they are relevant, for example, for particular TICS functions and input/output technologies. The principles take into account a range of user characteristics. Therefore, the application of this document to a specific TICS function should take into account the characteristics of the target user population.

If controls or displays, or both, are used for non-TICS functions, these functionalities are excluded from the provisions of this document.

5 Dialogue principles

5.1 General

The following principles have been identified as being important in the design and evaluation of a TICS dialogue:

a) appropriate for use while driving:

- compatibility with driving;
- simplicity;
- timing/priorities;

b) appropriate for the TICS task:

- consistency;
- controllability;

c) appropriate for the driver:

- self-descriptiveness;
- conformity with driver expectations;
- error tolerance.

These dialogue principles are explained, and the related requirements and recommendations are given, together with examples demonstrating how the principles can be applied. Wherever there are requirements, compliance verification conditions for these are also given.

5.2 Appropriate for use while driving

5.2.1 Explanation of principle

A TICS dialogue is appropriate for use while driving to the extent that it recognizes the paramount importance of the primary driving task, the driver's need to respond to stimuli from the traffic environment and, where applicable, from TICS that enhance the driving task.

5.2.2 Compatibility with driving

5.2.2.1 Explanation of principle

A TICS dialogue is compatible with driving when the use of the TICS optimizes, or at least does not adversely influence, the driver's ability to perform the primary driving task.

5.2.2.2 Requirements

5.2.2.2.1 Subject to applicable laws, whenever a TICS provides inputs to either the primary driving controls or secondary controls, or both, the vehicle's response to driver operation of these controls shall not be adversely affected.

EXAMPLE 1 The driver is able to override an ACC function by application of the service brake or accelerator.

EXAMPLE 2 The driver's braking force is modified or improved by a given braking assistance feature for collision avoidance purposes.