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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

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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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.

A TICS is in compliance with this requirement if

a) the TICS has no connection to, or interaction with, either the primary or secondary driving controls or both,

b) the TICS does have such a connection or interaction, but the driver's operations always override the TICS operation, or

c) the TICS does have such a connection or interaction, but a legal requirement disallows the driver to override the TICS operation.

5.2.2.2.2 TICS dialogues shall not require removal of both hands from the steering wheel while driving.

EXAMPLE A TICS device that requires two hands for operation is not suited for use by a driver.

A TICS is in compliance with this requirement if it is possible for a driver to perform all TICS control actions while keeping at least one hand on the steering wheel.

5.2.2.2.3 TICS dialogue displays and controls shall be designed and positioned such that both the driving task and the TICS function can be accomplished in an unhindered manner.

EXAMPLE 1 A TICS display designed for use by the driver is positioned and oriented so that it is easily visible, audible or both.

EXAMPLE 2 A TICS hand control for cruise control operation, which is frequently used in conjunction with steering activities, is positioned within fingertip reach of the steering-wheel rim.

EXAMPLE 3 A TICS dialogue device in a given vehicle is located so as not to block the driver's direct or indirect view out of the vehicle.

A TICS is in compliance with this requirement if

a) all TICS controls are located in accordance with the reach requirements of ISO 3958,

b) for a TICS device stored in a holster or storage position, at least half of the grasp area is forward of the rearmost driving H-point,

c) the TICS is designed in accordance with the requirements of ISO 15006,

d) the TICS visual displays are designed in accordance with the requirements of ISO 15008, and

e) the vehicle with TICS is designed in accordance with the requirements of SAE J1050.

5.2.2.2.4 TICS functions not intended to be used by the driver while driving (as determined by regulations or by device manufacturers) shall be inaccessible for, or inoperable by, the driver, or both, when the vehicle is in motion. Otherwise, the driver shall be provided with the intended scope of the TICS use, together with suitable warnings.

EXAMPLE 1 A typewriter keyboard intended for the driver will be deactivated.

EXAMPLE 2 Dynamic images (e.g. television or video games) other than those related to driving will not be shown.

A TICS is in compliance with this requirement if

a) TICS functions considered to be inaccessible or inoperable for the driver while driving are inaccessible or inoperable even under reasonably foreseeable and probable misuse,

b) a system, subsystem or menu system is inaccessible for the driver when the means of providing data entry (including the means for switching "on" and "off ") is either unavailable, disabled, cannot be viewed or found, or has its access for use physically blocked,

c) complex information entry is preceded by advice to use the function only when the vehicle is not in motion, or

d) information is provided with the TICS defining intended use.

5.2.3 Simplicity

5.2.3.1 Explanation of principle

Driver interactions with a TICS should be as simple and few as possible, in order to avoid overloading the driver. A TICS dialogue is considered simple when it limits the amount of information and interaction to a level commensurate with conventional tasks, such as operating the vehicle's audio system.

5.2.3.2 Recommendations

5.2.3.2.1 TICS dialogues affecting vehicle dynamics through control and warning systems should be designed to maximize understanding and facilitate operation.

EXAMPLE 1 Since it is assumed that even a naive user of the TICS will have knowledge of vehicle operation, a dialogue for a given TICS uses familiar icons, symbols and text as found in other vehicles.

EXAMPLE 2 Information that implies distinctive TICS behaviour or requires distinctive driver actions is presented such that it can be readily distinguished from other (routine) information.

EXAMPLE 3 For a given vehicle, a warning display is designed to be more conspicuous than, and easily distinguished from, the status displays.

5.2.3.2.2 The design of TICS dialogues should optimize physical and mental driver effort and minimize distraction, except where the attraction of the driver's attention is required.

EXAMPLE 1 A collision avoidance system displays by exception principles, i.e. only when a critical situation is sensed by the system is a warning message be displayed to the driver.

EXAMPLE 2 A visual display is able to detect the ambient illumination and adapt its brightness accordingly.

EXAMPLE 3 Visual demands of a route guidance function are minimized by providing spoken, turn-by-turn guidance instructions.

EXAMPLE 4 A dynamic route guidance system displays information that is tailored to the immediate vicinity and driving task (e.g. a road map for the immediate vicinity, such as an intersection diagram for the next turning manoeuvre, is displayed as needed).

5.2.4 Timing/priorities

5.2.4.1 Explanation of principle

A TICS dialogue has fulfilled timing and priority requirements for driving when continuous driver attention to traffic situations is supported, or not adversely influenced.

5.2.4.2 Requirements

5.2.4.2.1 A TICS dialogue shall regulate the flow of information into sufficiently short and concise groups that can be easily perceived.

EXAMPLE 1 The amount and content of visual information provided by a TICS is limited so that the driver can assimilate the information with brief glances.

EXAMPLE 2 Related pieces of information provided by a TICS are presented in close spatial or temporal proximity to allow the message to be shorter and more easily understood.

EXAMPLE 3 The amount of textual information provided by a TICS is limited in length and text on maps is avoided as much as possible.

EXAMPLE 4 The junction representation provided by a navigation system is stylized to represent only essential features.

A TICS is in compliance with this requirement if

a) dwell times of 1,5 s are sufficient to acquire relevant information, and

b) the auditory components of a TICS device are designed in accordance with ISO 15006.

5.2.4.2.2 A TICS device shall not require the continuous visual attention of the driver providing it with input.

EXAMPLE 1 An acoustical signal provided by a TICS informs the driver when a route calculation is completed.

EXAMPLE 2 A TICS does not require the entering of a route guidance destination to be completed within a set time period.

EXAMPLE 3 A TICS provides that scrolling or changing the scale of a displayed map is performed in discrete steps.

A TICS is in compliance with this requirement if input tasks are able to be performed in a series of one or more discrete steps, none of which requires more than a 1,5 s dwell time.

5.2.4.2.3 A TICS device shall respond to or acknowledge driver input, or do both, in a timely manner.

EXAMPLE 1 System feedback of changes in state or errors when using a TICS is perceived as instantaneous by the driver.

EXAMPLE 2 A TICS responds to a button or touchscreen press made by a driver in a moving vehicle quickly enough to prevent the system from reading “repeat presses” unintended by the driver.

EXAMPLE 3 A vehicle’s response to the deactivation of its adaptive cruise control (ACC) system is immediate and clearly perceptible.

EXAMPLE 4 A vehicle’s ACC system provides confirmation of status or change of mode quickly enough to be perceived as instantaneous by the driver.

EXAMPLE 5 A TICS dialogue changes menu when the driver requests it in a time that is perceived as instantaneous by the driver.

A TICS is in compliance with this requirement if the system responds or provides an acknowledgement to the driver’s tactile input within 250 ms.

5.2.4.2.4 Individual TICS dialogues shall be designed to guide the driver in giving a priority to the information displayed.

EXAMPLE 1 A vehicle’s collision-avoidance system rapidly attracts the driver’s attention (but without startling the driver) when a collision is imminent.

EXAMPLE 2 A vehicle only uses flashing signals for applications designed specifically to attract the driver’s attention when an immediate or imminent action is required.

EXAMPLE 3 Messages from a TICS visual display are not to be so bright that they startle the driver.

EXAMPLE 4 A TICS provides status information in a calm and unemotive way.

A TICS is in compliance with this requirement if

a) the procedure for determining the priority of TICS and other messages presented to drivers are in accordance with ISO/TS 16951, and

b) the calculated priority of information is reflected in the way the information is presented.

5.2.4.3 Recommendations

5.2.4.3.1 A TICS should not limit the amount of time within which the driver has to respond when providing inputs to the TICS.

EXAMPLE 1 Selection of route characteristics from a preference list on a visual display is driver-paced.

EXAMPLE 2 Route guidance information continues to be provided following deviation from the suggested route and the driver is able to confirm a rerouting proposal, due to, for example, changes in the traffic situation, when this is convenient.

EXAMPLE 3 There is no time limit for driver actions requested by a TICS.

5.2.4.3.2 The TICS should maintain visually displayed information for as long as needed.

EXAMPLE 1 Both warning and status remain active on a vehicle's ACC visual display while the triggering situation still exists and are automatically terminated or replaced as soon as the situation changes.

EXAMPLE 2 The position of the vehicle shown on the display of a route guidance system is updated according to real time. In the case of step-by-step instructions, the display changes once the manoeuvre is complete to reflect the new position.

EXAMPLE 3 The screen is only updated by the TICS when new information relevant to the current task is to be displayed to the driver.

EXAMPLE 4 If the system-initiated information is no longer applicable to the current task context, the information is removed from the display.

5.2.4.3.3 When multiple TICS are installed in a vehicle, the integrated designs should take account of the relative priority of their functions.

EXAMPLE A collision warning has priority over an incoming phone-call signal.

5.2.4.3.4 TICS should provide timely visual information to the driver.

EXAMPLE 1 Route guidance information is given sufficiently in advance of the manoeuvre for it to be accomplished safely.

EXAMPLE 2 Updating of the vehicle's position on a map is sufficiently frequent to avoid driver confusion.

5.3 Appropriate for the TICS task

5.3.1 Explanation of principle

A dialogue is appropriate for a TICS task when it supports the driver in the safe, efficient and effective completion of that task.

5.3.2 Consistency

5.3.2.1 Explanation of principle

TICS dialogues are consistent when they conform to rules and logic governing TICS interactions and behaviour.

5.3.2.2 Requirements

5.3.2.2.1 Information presentation and dialogue within a TICS shall be consistent with respect to mode, location, orientation and dialogue management.

EXAMPLE 1 A vehicle's ACC information is provided for periodic reference and confirmation of status. This information is consistently available in a defined place, orientation and format.

EXAMPLE 2 A vehicle's side collision warning is always presented in or near the corresponding side rear-view mirror.

EXAMPLE 3 Error messages for a TICS always appears in a fixed position on the screen, following an incorrect entry.

EXAMPLE 4 All screens for a particular type of task are consistently designed to contain all the elements of information (e.g. route guidance, maps, etc.) needed to perform the task.

EXAMPLE 5 System dialogue and status messages always appear in the same area on the display.

EXAMPLE 6 Audible signals always use the same format for the same message.

EXAMPLE 7 A function on the menu is always selected in the same way or ways.

A TICS is in compliance with this requirement if

a) visual information is either

   — always presented in the same apparent location, orientation, size and coding, or

   — there is a stable and prescribed relationship between displayed information for every TICS state, and the temporal and spatial relationships between various TICS visual information elements are only varied to support the TICS task, and

b) auditory information elements are presented in the same sequence (or are only varied to support the TICS task).

5.3.2.2.2 State changes that require driver attention shall be displayed in a conspicuous manner. Information about current TICS states shall be displayed either continuously or on request.

EXAMPLE 1 The driver is informed clearly and visually of the headway adjustment setting, even when the system is operating at a pre-set value of headway.

EXAMPLE 2 After selecting "Resume" on an ACC system, the previously displayed values are shown.

EXAMPLE 3 When the driver switches a TICS off and then on again, the system state is indicated when it comes back on.

The TICS is in compliance with this requirement if

a) system state changes requiring driver action to avoid immediate or imminent danger to persons or very serious damage to equipment are displayed conspicuously and automatically, and

b) information for the TICS states "on", "off" and other predefined driver-relevant TICS states that can affect the vehicle and the driver's understanding of the TICS (type of route guidance, ACC set speed, etc.) is available to the driver.

5.3.2.3 Recommendation

TICS presentation should be appropriate and consistent with the content and characteristics of the information.

EXAMPLE For a TICS with a visual display, it is possible to discriminate between warning messages on the basis of their colour and message content.

5.3.3 Controllability

5.3.3.1 Explanation of principle

A TICS dialogue is controllable when the driver can direct its initiation and termination, as well as the manner and conditions in which the dialogue can occur.

5.3.3.2 Requirements

5.3.3.2.1 The driver shall be able to terminate a dialogue at any step during an interaction and return to a prescribed state, except where the dialogue is legally required or considered mandatory by the manufacturer.

EXAMPLE 1 The driver is able to cancel a telephone call when a partial telephone number has been entered.

EXAMPLE 2 The driver is able to escape from or undo a destination entry of a route guidance system to return directly and easily to a previous menu level.

The TICS is in compliance with this requirement if

a) a termination or escape procedure is available to the driver at any dialogue step or state, and

b) the termination results in a defined and consistent TICS state.

5.3.3.2.2 The TICS shall be designed so that following any system-paced interruption of driver input to the TICS, the driver is able to resume the dialogue at the point of interruption or at a logical point in the task sequence.

EXAMPLE 1 A partially entered telephone number or search for a hotel, restaurant or any other facility is retained until completed (or aborted) by the driver.

EXAMPLE 2 If an input sequence is interrupted by a traffic message, the input is resumed when the input display is reactivated.

The TICS is in compliance with this requirement if, following driver-paced or system-paced state changes unrelated to the actual task, there is no loss of relevant entered data on resumption.

5.3.3.2.3 Except for legally required messages and traffic-situation-relevant messages, the driver shall be able to control the flow of information displayed by the TICS.

EXAMPLE 1 Dynamic traffic congestion information displayed by a TICS is immediately presented to the driver.

EXAMPLE 2 In a traffic information system, the driver is able to access any stored traffic message or messages.

EXAMPLE 3 The driver is able to request a repeat of an auditory message from a route guidance system.

The TICS is in compliance with this requirement if, except for traffic-situation-relevant messages and messages that are legally required,

a) the driver cannot terminate the display of legally required messages or messages considered mandatory by the manufacturer, and

b) the driver can control when to access available information from the TICS when the TICS is active.

5.3.3.3 Recommendations

5.3.3.3.1 Except for legally required messages, the driver should be able to select the type of TICS information to be displayed from all that are available within the TICS.

EXAMPLE 1 The driver is able to switch off auditory traffic information.

EXAMPLE 2 In navigation mode, the driver is able to select visual or audible guidance information or both.

EXAMPLE 3 The driver is able to select traffic information specific only to the present route.

5.4 Appropriate for the driver

5.4.1 Explanation of principle

A TICS dialogue is appropriate for the driver when it takes account of driver expectations, characteristics and limitations.

5.4.2 Self-descriptiveness

5.4.2.1 Explanation of principle

A dialogue is self-descriptive when the essential meaning of information is conveyed unambiguously and the driver is kept constantly aware of what can or must be done through the dialogue.

5.4.2.2 Recommendations

5.4.2.2.1 The particular input required to reach the intended goal should be made obvious to the driver.

EXAMPLE 1 When a menu is used, only the available options are presented for selection.

EXAMPLE 2 Guidance is given to the driver on the current phase within the system dialogue structure.

EXAMPLE 3 Prompts are displayed indicating that the system is available for input. These prompts provide information on the type of driver input that is valid, given the current system status.

5.4.2.2.2 Displays supporting dialogue should only present symbols, signals, tell-tales, graphical elements and terminology (terms, abbreviations, etc.) likely to be understood by the driver.

EXAMPLE 1 Terms used within traffic messages are the same as those from the road environment.

EXAMPLE 2 Displayed symbols or pictograms are consistent with those used on external traffic signs.

5.4.3 Conformity with driver expectations

5.4.3.1 Explanation of principle

A dialogue recognizes driver expectations when account is taken of driver characteristics, such as level of education, experience and commonly accepted conventions.

5.4.3.2 Recommendations

5.4.3.2.1 Displays and controls should be of a content and style suitable for inducing the understanding of, and appropriate reactions from, the driver.

EXAMPLE 1 The message “Prepare to turn left” is displayed by a TICS to alert the driver to the pending manoeuvre.

EXAMPLE 2 The driver is able to select the level of detail and complexity of graphics in a TICS.

EXAMPLE 3 Quickly changing values and qualitative changes are displayed in an analogue manner.

EXAMPLE 4 The functional keys and the functions on the display have a direct visual relationship.

5.4.3.2.2 A dialogue should have a consistent, simple vocabulary and syntax, based on accepted symbols, abbreviations and national population expectancies, and be in a manner likely to be understood by the intended user group.

EXAMPLE 1 Approved vehicle symbols, such as those of ISO 2575, are used.

EXAMPLE 2 Accepted vehicle abbreviations are used only for the functions for which they are intended.

EXAMPLE 3 Road sign symbols are used inside the vehicle only to convey the information with which they are associated when used outside of the vehicle.

EXAMPLE 4 Bar graphs used to convey fuel usage over time increase upwards or from left to right.

EXAMPLE 5 Knob controls for a TICS increase a variable when turned clockwise.

5.4.4 Error-tolerance

5.4.4.1 Explanation of principle

A TICS dialogue is error-tolerant if, despite evident errors in input, the intended result can be achieved with either no, or minimal, corrective action by the driver.

5.4.4.2 Recommendations

5.4.4.2.1 When a TICS is able to assess the likelihood of incorrect user input considering the present circumstances, it should request driver confirmation when there is an apparent deviation between input and circumstances.

EXAMPLE 1 A vehicle's ACC system does not permit a set speed selection beyond the performance capability of the vehicle, or which is obviously inappropriate considering the traffic situation, weather or road conditions.

EXAMPLE 2 A route guidance system does not allow a return to defaults without driver confirmation.

5.4.4.2.2 When incorrect inputs are made, a TICS should support drivers in achieving their intended goals.

EXAMPLE 1 In a route guidance system, the TICS recalculates the route if the driver does not follow guidance.

EXAMPLE 2 In a route guidance system, input of an out-of-range street number results in an error message illustrating a range of possible correct inputs.

EXAMPLE 3 In a route guidance system, incorrect spelling of a street name results in a message that presents possible correct spellings.

5.4.4.2.3 No driver input should cause undefined TICS states or TICS failures.

EXAMPLE An analysis of the dialogue system is conducted to determine and prevent occurrences of undefined dialogue states or dialogue system failures.

5.4.5 Learnability

5.4.5.1 Explanation of principle

A dialogue is easy to learn if unfamiliar users and especially novice users understand how to perform tasks on the first attempt without training or exploratory learning. Such a dialogue requires lower effort and takes less time to accomplish basic tasks during the user's first exposure to the system and helps the user increase competencies for using the system in more efficient or effective ways.

5.4.5.2 Recommendations

5.4.5.2.1 The dialogue supports relevant strategies of learning, e.g. learning-by-doing or learning-by-example during use in different situations.

5.4.5.2.2 Information on rules and models underlying the application should be displayed on demand of the user

5.4.5.2.3 Fewer functions and lower complexity mean that there is less to learn

5.4.5.2.4 Functionality should be structured into meaningful units (not only according to how frequent functions are used) which support the user to discover functionality

5.4.5.2.5 If the user interface is difficult to learn or is unfamiliar to the user, there should be available guidance to learn using the system.

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