
**Road vehicles — Ergonomic aspects of
transport information and control
systems — Procedure for assessing
suitability for use while driving**

*Véhicules routiers — Aspects ergonomiques des systèmes de
commande et d'information du transport — Procédure d'évaluation de
leur adéquation pour une utilisation pendant la conduite*

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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 17287 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 13, *Ergonomics applicable to road vehicles*.

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0 Introduction

0.1 General

This International Standard arises from the increasing availability of transport information and control systems (TICS) to support the driver in the primary driving tasks and in other secondary tasks. Drivers require ease of use and high functionality and do not expect this to lead to unsafe driving situations (in use as intended by the manufacturer, or during malfunction).

0.2 Assessment of suitability of TICS

The suitability of TICS is assessed on the basis of compatibility with the primary driving task and is concerned with those aspects of usability which relate most closely to the driver's performance. In particular, suitability focuses on

- interference (with the driving task),
- controllability,
- efficiency, and
- ease of use while learning about the system.

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The first three aspects (which are not necessarily mutually exclusive) relate closely to the primary driving task. The fourth is also important, as some features of TICS may be used infrequently, or by drivers who are initially unfamiliar with the systems. Other aspects of usability, such as satisfaction, are less important in assessing the suitability of TICS for use while driving as they are more specific to individual manufacturers and their product profiles, and do not relate so closely to the driver's performance in undertaking the primary driving task.

The importance of the four identified components in an overall assessment of suitability will vary between TICS.

Suitability is a property of TICS and not of their components. It is assessed on the basis of the interaction between the driver and the TICS within the driving environment, and suitability needs to take into account driver's behavioural adaptation induced by the TICS.

This International Standard concerns the process of assessment of a specific TICS product and is intended to ensure that its suitability is considered, assessed and documented as part of the design and development process. It does not attempt to prescribe all the actions that should be taken to assess or ensure suitability. The scope and detail of an assessment is a matter for users of this document. Informative annexes provide examples of aspects of the suitability assessment process.

0.3 Application

This International Standard is intended to assist the assessment of the suitability of TICS in advance of widespread system deployment. It can be used when components from different suppliers are proposed or assembled for use in the in-vehicle environment. The trend of integration of in-vehicle systems is likely to increase the need to consider the impact of multiple and integrated in-vehicle systems and this document could also be applicable to non-TICS functions.

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This International Standard is intended for use by manufacturers or by others concerned with assessing the suitability of TICS for use while driving. It is assumed that the users will have some knowledge of automotive human factors.

This International Standard can be used by manufacturers as part of their own quality processes. The design and implementation of procedures to ensure that TICS suitability is assessed and documented will be influenced by the varying needs of an organization, its objectives, the products and services supplied and existing processes and practices employed.

It is not the purpose of this International Standard to enforce uniformity of TICS. It is independent of the type of vehicle, complexity of TICS, level of integration within a vehicle or the specific TICS application or implementation. It is applicable to all TICS, including, for example, those intended for use by drivers with special needs.

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Road vehicles — Ergonomic aspects of transport information and control systems — Procedure for assessing suitability for use while driving

1 Scope

This International Standard specifies a procedure for assessing whether specific TICS (transport information and control systems), or a combination of TICS with other in-vehicle systems, are suitable for use by drivers while driving. It addresses

- user-oriented TICS description and context of use,
- TICS task description and analysis,
- the assessment process, and
- documentation.

The TICS description and context of use includes consideration of improper use, reasonably foreseeable misuse and TICS failure. The TICS description, analysis and assessment include a process for identifying and addressing suitability issues.

This International Standard does not recommend specific variables for assessing suitability nor does it define criteria for establishing the suitability of use of a TICS table while driving.

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 15005, *Road vehicles — Ergonomic aspects of transport information and control systems — Dialogue management principles and compliance procedures*

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

3 Terms and definitions

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

3.1 Terms and definitions related to suitability

3.1.1

suitability

degree to which TICS use is appropriate in the context of the driving environment based on compatibility with the primary driving task

NOTE Suitability focuses on a subset of usability comprising

- interference (with the driving task),
- controllability,
- efficiency, and
- ease of use while learning about the TICS.

3.1.2

interference

adverse influence on the driver's ability to deal with the vehicle and the environment

NOTE In this context, interference from the TICS is the opposite of driver support provided by the TICS.

3.1.3

controllability

manner and degree to which drivers can influence TICS function and pace of interaction

NOTE Control elements include initiation, termination, repetition, overriding, resuming, regulation (e.g. of level or brightness) and adaptation.

3.1.4

efficiency

resources expended in relation to the accuracy and completeness with which drivers achieve intended objectives

NOTE 1 Efficiency relates to situational awareness, mental effort, physical effort, sensory effort and stress.

NOTE 2 Resources include physical, mental and sensory capacities.

NOTE 3 Adapted from ISO 9241-11:1998, definition 3.3.

3.1.5

learning

acquiring knowledge and developing skills

3.2 Other terms and definitions

3.2.1

assessment

judgement of the actual and potential effect of a TICS in a "prospective" way, usually before widespread deployment

3.2.2

behavioural adaptation

behaviour which may occur in response to changes to the road-vehicle–user system

3.2.3**context of use**

description of drivers, goals, tasks, equipment (hardware, software, materials) and the physical and social environments in which the TICS are used

3.2.4**criterion**

threshold or range of values of a variable to be met

3.2.5**workload**

degree of mental, physical and perceptual effort required by a driver to undertake a particular task

3.2.6**environment**

physical surroundings in which data is captured

EXAMPLE Real road, test track, simulator, laboratory.

3.2.7**failure**

system state which results in TICS non-performance or TICS impaired performance (relative to the TICS specification)

NOTE This is usually as a result of a hardware or software malfunction.

3.2.8**failure modes and effects analysis****FMEA**

formal technique for listing ways in which a system can fail and estimating the probabilities and consequences associated with each failure

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3.2.9**HMI component**

element or subsystem of a TICS with which the driver can interact while driving

EXAMPLE Visual display, control knob.

3.2.10**improper use**

use of TICS functions while driving that are not intended by the manufacturer to be used while driving

3.2.11**intended use**

TICS use while driving in accordance with specifications, instructions and information provided by the manufacturer

3.2.12**manufacturer**

organization or person designing, developing, integrating or supplying a TICS product

NOTE For original equipment supplied with a vehicle, the manufacturer is the vehicle manufacturer. For after-market products, the manufacturer is the after-market supplier.

3.2.13**method**

high-level approach to assessment, based on theory, which implies an underlying rationale in the choice of assessment techniques

EXAMPLE Behavioural analysis, workload assessment, analysis of psycho-physiological responses.

3.2.14

misuse

use of TICS functions intended by the manufacturer to be used while driving in a way or manner not intended by the manufacturer and which may lead to adverse consequences

3.2.15

mode

specified sub-set of functions or behaviour pattern of a TICS

EXAMPLE Processing, data entry.

3.2.16

performance

skill demonstrated by the driver in a driving task or TICS-related task

3.2.17

primary driving task

those activities that the driver has to undertake to maintain longitudinal and lateral vehicle control within the traffic environment

3.2.18

satisfaction

comfort and acceptability of use

3.2.19

task analysis

formal method used to describe and study the performance demands made on the human elements of a system

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3.2.20

technique

component of the method used to directly gather data

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EXAMPLE Eye movement registration, subjective assessment, heart rate monitoring.

NOTE Use of a technique will provide one or more variables.

3.2.21

transport information and control system

TICS

single function, such as route guidance, or number of functions designed to work together as a system

[ISO 15005:2002, definition 3.25]

See ISO/TR 14813-1^[1] for TICS services.

3.2.22

tool

means for obtaining one or more variables

NOTE Although a tool is often an item of equipment such as a video camera or accelerometer it can also be a questionnaire or checklist.

3.2.23

usability

concept comprising the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in a particular environment

NOTE Adapted from ISO 9241-11:1998, definition 3.1.

NOTE As well as effectiveness (see ISO 9241-11^[2]), efficiency and satisfaction, usability involves learnability, controllability, interference and adaptability.

3.2.24

variable

metric or indicator giving a quantitative measure of driver behaviour

EXAMPLE Eye glance duration, vehicle speed.

NOTE A variable is independent of the tool used to measure it.

4 Requirements and recommendations

4.1 Summary of requirements

The assessed TICS shall be described in accordance with the following requirements (see Annex A).

- a) The intended use of the TICS and the context of use shall be defined (see 4.2.2 to 4.2.4).
- b) TICS functions that are not intended to be used while driving shall be identified (see 4.2.5.1).
- c) Steps taken to prevent the use of functions not intended to be used while driving shall be described (see 4.2.5.2).
- d) Steps taken to prevent reasonably foreseeable misuse shall be described (see 4.2.5.3).
- e) The way in which TICS failures will be apparent to the driver shall be described (see 4.2.6).
- f) Suitability assessment shall take account of the intended use and context of use of the TICS (see 4.4.2).
- g) Information concerning suitability, including assessment results, shall be recorded and documented (see 4.5).

4.2 User-oriented TICS description and context of use

4.2.1 Introduction

The intended use of the TICS and the context of use shall be defined. This subclause provides a recommended structure along with an explanation of the elements. An outline example is given in Annex A.

4.2.2 General description

Table 1 gives those elements that should be included in the general description of the TICS.

Table 1 — General TICS description

Aspect of description	Explanation
Market	A brief introductory description of the market for which the product is intended.
General function	A brief "headline" description of the function performed by the system.
Technical context	A brief <i>résumé</i> of current developments in the field including, particularly, comparisons with existing systems.
Benefits	A summary of the intended goals and benefits of system use. Where appropriate, reference should be made to the three levels of the driving task (navigating, manoeuvring and handling).

4.2.3 Identification

Table 2 gives those elements that should be included in the identification of the TICS.

Table 2 — TICS identification

Aspect of description	Explanation
Product name and version	A one line description for identification purposes.
Manufacturer	The name, address and contact points.
Subsystems	A brief description of the subsystems to an appropriate level. HMI (human-machine interface) components should receive greatest attention.
Build status	A brief description of the state of development of the TICS for reference purposes.
Documentation	A list of technical and user documentation included within the suitability assessment.

4.2.4 Context and restrictions for intended use

The context and restrictions can be regarded as “envelope of use”. Restrictions or limitations may be particularly important for certain TICS functions. In these cases, the restrictions and limitations should be given particular emphasis. A consideration of the driver’s needs, including his or her training needs, could be helpful. Table 3 presents aspects of the context that should be considered.

Table 3 — Context and restrictions for intended TICS use

Aspect of description	Explanation
Vehicle	A description of the TICS requirements of a vehicle (e.g. physical devices, sensor signals or other information). Also, any exclusions or restrictions on the vehicle within which the TICS is intended to be used.
Driver	If any restrictions or special driver skill requirements are defined by the manufacturer, these should determine the intended user group considered within assessments.
Road	A definition of the road context in which the TICS is, and is not, intended to be operated. This includes the road category and physical requirements of road markings, gradients, curvatures, widths, etc.
Traffic	A description of the traffic context within which the TICS is, and is not, intended to be operated (e.g. traffic mix and density).
Other environmental	Additional requirements or restrictions could include weather and lighting specifications.
Infrastructure	A general description of any infrastructure or information which is external to the vehicle and required for the intended TICS operation.

4.2.5 Improper use and misuse

4.2.5.1 TICS functions that are not intended to be used while driving shall be identified. According to the definition of *intended use*, this is the responsibility of the manufacturer of the TICS. The result should be a clear distinction between functions intended to be used while driving and those not intended for use while driving.

4.2.5.2 Steps taken to prevent the use of functions not intended to be used while driving shall be described. Such *improper use* occurs when a function not intended to be used while driving is used by the driver. As an example, suppose a mobile phone is not intended to be used without a hands-free car-adaptor kit. Steps taken to prevent the use of functions could include physical lock-outs or descriptions in the operating manuals of the intended scope of TICS use and suitable warnings.

4.2.5.3 Steps taken to prevent reasonably foreseeable *misuse* shall be described. Misuse occurs when a function intended to be used while driving is used by the driver in a way or manner not intended by the manufacturer and which may lead to adverse consequences. Examples are using an ACC system as a