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Intelligent transport systems — Lane departure warning systems — Performance requirements and test procedures

Systèmes intelligents de transport — Systèmes d'avertissement de départ de ruelle — Exigences de performance et méthodes d'essai

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword

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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 17361 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Introduction

Lane departure warning systems (LDWSs) are based on fundamental traffic rules. The main focus of an LDWS is to help the driver keep the vehicle in the lane on highways and highway-like roads. Accordingly, a warning is issued to alert the driver in case of lane departure caused by, for example, inattention. LDWSs are not intended to issue warnings with respect to collisions with other vehicles or to control vehicle motions.

Intelligent transport systems — Lane departure warning systems — Performance requirements and test procedures

1 Scope

This International Standard specifies the definition of the system, classification, functions, human–machine interface (HMI) and test methods for lane departure warning systems. These are in-vehicle systems that can warn the driver of a lane departure on highways and highway-like roads. The subject system, which may utilize optical, electromagnetic, GPS or other sensor technologies, issues a warning consistent with the visible lane markings. The issuance of warnings at roadway sections having temporary or irregular lane markings (such as roadwork zones) is not within the scope of this International Standard. This International Standard applies to passenger cars, commercial vehicles and buses. The system will not take any automatic action to prevent possible lane departures. Responsibility for the safe operation of the vehicle remains with the driver.

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 15037-1, *Road vehicles — Vehicle dynamics test methods — Part 1: General conditions for passenger cars*

ISO 15037-2, *Road vehicles — Vehicle dynamics test methods — Part 2: General conditions for heavy vehicles and buses*

3 Terms and definitions

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

3.1
lane
area of roadway that a vehicle would be expected to travel along in the absence of any obstruction without the driver's desire to change the path of travel

3.2
visible lane marking
delineators intentionally placed on the borderline of the lane that are directly visible by the driver while driving (i.e. not covered by snow, etc.)

NOTE Annex A gives country-specific visible lane-marking definitions.

3.3
incidental visible road feature
visible patterns on the road surface that were not explicitly intended to delineate the boundaries of the lane but which are indicative of the position of the lane

NOTE These include such features as pavement seams or edges, kerbs, and tracks or ruts left by previous vehicles.

3.4
lane boundary
borderline of the lane, situated at the centre of a visible lane marking or, in the absence of a visible lane marking, determined by incidental visible road features or other means such as GPS, magnetic nails, etc.

3.5
default lane width
predetermined width given to a lane when a visible lane marking exists only on one side of the lane and no other lane boundaries are detected by the system

3.6
departure
situation in which the outside of one of the front wheels of a vehicle or of the leading part of an articulated vehicle – or, in the case of a three-wheeled vehicle, the outside of one of the wheels on the axle with the widest track – is crossing a specified line

3.7
lane departure
point of departure across the lane boundary

3.8
rate of departure, V
subject vehicle's approach velocity at a right angle to the lane boundary at the warning issue point

3.9
time to line crossing
TTLC
calculated time to lane departure

EXAMPLE The simplest method of calculating TTLC is to divide the lateral distance, D, between the predetermined part of the vehicle and the lane boundary by the rate of departure, V, of the vehicle relative to the lane.

3.10
warning issue point
measured location and time at which a warning starts to be issued

3.11
warning threshold
location where the warning is issued on the road, which corresponds to a warning trigger point set in the system

NOTE 1 In the case of TTLC, the warning threshold shifts depending on the rate of departure.

NOTE 2 The warning threshold is placed within the warning threshold placement zone (see Figure 1).

3.12
warning threshold placement zone
zone between the earliest and the latest warning lines within which the warning threshold is placed

NOTE There is one warning threshold placement zone around the left lane boundary and one around the right lane boundary (see Figure 1).

3.13
warning condition
condition in which departure across the warning threshold occurs

NOTE See Figure 2.

3.14
repeatability
ability of a certain percentage of warnings issued by the system to consistently fall within a given range

3.15
false alarm
alarm that is issued when the warning conditions have not been fulfilled

3.16
earliest warning line
innermost limit of the warning threshold

3.17
latest warning line
outermost limit of the warning threshold

3.18
no warning zone
zone between the two earliest warning lines

3.19
suppression request
driver request or system feature intended to prevent a lane departure warning if an intended lane departure is detected

3.20
lane departure warning
warning given to the driver in accordance with the lane departure warning condition in the absence of suppression requests

3.21
system incapable
state of the system in which it is unable to warn the driver of a lane departure due to temporary conditions

3.22
status indication
indication of system status

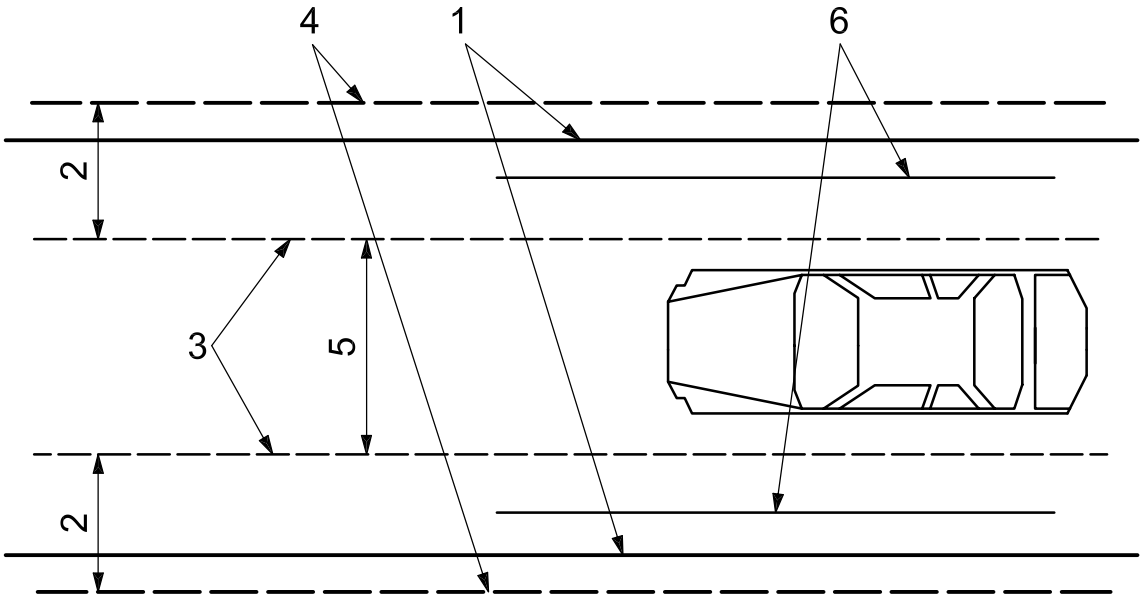
NOTE Examples of status indication are on/off, failure and incapable.

3.23
haptic warning
warning that stimulates the driver's sense of touch, vibration, force and motion

NOTE Steering wheel motion, steering wheel vibration, seat vibration and pedal vibration are examples of haptic warnings.

3.24
curve cutting
act of driving to the inner side of a curve, which can lead to an intentional lane departure

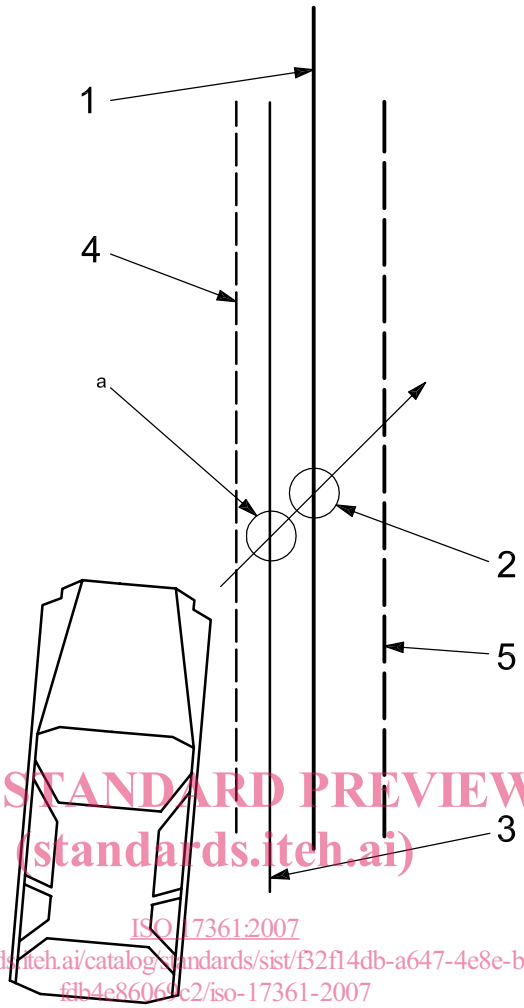
3.25
visibility
distance at which the illuminance of a non-diffusive beam of white light with a colour temperature of 2 700 K is decreased to 5 % of its original light source illuminance



Key

1 lane boundary (see 3.4)
2 warning threshold placement zone (see 3.12)
3 earliest warning line (see 3.16)
4 latest warning line (see 3.17)
5 no warning zone (see 3.18)
6 warning threshold (for reference only) (see 3.11)

Figure 1 — Concept of warning thresholds and warning threshold placement zones



Key

1 lane boundary (see 3.4)
2 lane departure (see 3.7)
3 warning threshold (see 3.11)
4 earliest warning line (see 3.16)
5 latest warning line (see 3.17)

[a] When warning condition is fulfilled here, and there is no suppression request, a lane departure warning is issued.

Figure 2 — Illustration of warning issue definitions

4 Specifications and requirements

4.1 System functions

The functional elements of a lane departure warning system shall be in accordance with Figure 3.

The suppression request, vehicle speed detection, driver preference and other additional functional elements are optional.