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Intelligent transport systems — Lane change decision aid systems (LCDAS) — Performance requirements and test procedures

Systèmes de transport intelligents — Systèmes d'aide à la décision de changement de voie (LCDAS) — Exigences de performances et méthodes d'essai

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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 document 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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This document was prepared by Technical CommitteeISO/TC 204, *Intelligent transport systems*.

This second edition cancels and replaces the first edition (ISO 17387:2008), which has been technically revised.

The main changes are as follows:

— the target vehicle closing speed classification and target vehicle closing speed classification for road curvature have been modified;

— the test procedure for closing vehicle warning function has been modified;

— the blind spot warning test for target vehicle moving laterally has been modified;

— the definition of the reference point for driver’s eye position has been simplified.

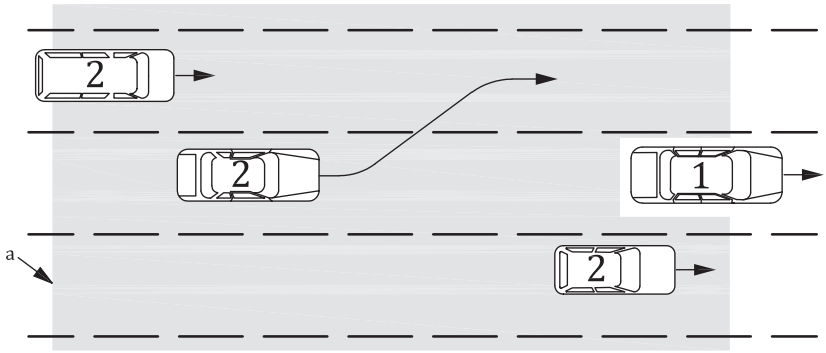
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Introduction

Lane change decision aid systems (LCDAS) warn the driver against collisions that can occur due to a lane change manoeuvre. LCDAS are intended to supplement the vehicle's interior and exterior rear-view mirrors; they are not intended to eliminate the need for such mirrors. LCDAS are intended to detect vehicles in the adjacent lanes to the rear and sides of the subject vehicle (see Figure 1). When the subject vehicle driver indicates the desire to make a lane change, the system evaluates the situation and warns the driver if a lane change is not recommended. The absence of a warning does not guarantee that the driver can safely make a lane change manoeuvre. The system will not take any automatic action to prevent possible collisions. Responsibility for the safe operation of the vehicle remains with the driver.

NOTE Many figures in this document show vehicles on roadways with lane markings. This is not intended to imply that lane marking recognition or lane detection is required for an LCDAS. The lane markings are drawn for reference only.



Key

1 subject vehicle

2 target vehicles

[a] The shaded area illustrates the concept of one possible system. The actual requirements are given in Clause 5.

Figure 1 — LCDAS concept

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Intelligent transport systems — Lane change decision aid systems (LCDAS) — Performance requirements and test procedures

1 Scope

This document specifies system requirements and test methods for lane change decision aid systems (LCDAS). LCDAS are intended to warn the driver of the subject vehicle against potential collisions with vehicles either to the side or to the rear in the adjacent lanes of the subject vehicle and moving in the same direction as the subject vehicle for lane change manoeuvres. This document addresses LCDAS for use on forward-moving cars, vans and straight trucks.

This document does not address LCDAS for use on motorcycles or articulated vehicles such as tractor/trailer combinations and articulated buses.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1
subject vehicle
vehicle equipped with the system in question and related to the topic of discussion

3.2
target vehicle
<lane change decision aid systems> any vehicle that is closing in on the subject vehicle from behind, or any vehicle that is located in one of the adjacent zones

3.3
coverage zone
entire area to be monitored by the lane change decision aid system (LCDAS), consisting of a specific subset of the following zones: left adjacent zone, right adjacent zone, left rear zone and right rear zone

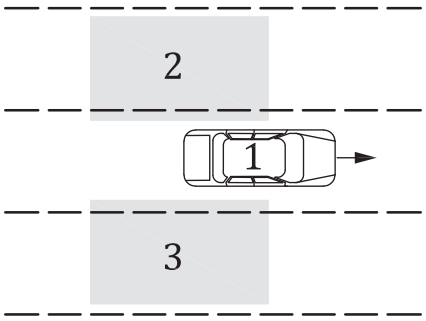
Note 1 to entry: A target vehicle located within the coverage zone will thus be detected by the system.

3.4
adjacent zone
zone to the left and right of the subject vehicle

Note 1 to entry: See Figure 2. This figure shows the zone concept only. Actual requirements are given in 5.2.

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Note 2 to entry: The adjacent zones are intended to cover the lanes adjacent to the subject vehicle. However, the position and size of the adjacent zones are defined with respect to the subject vehicle and are independent of any lane markings.



Key

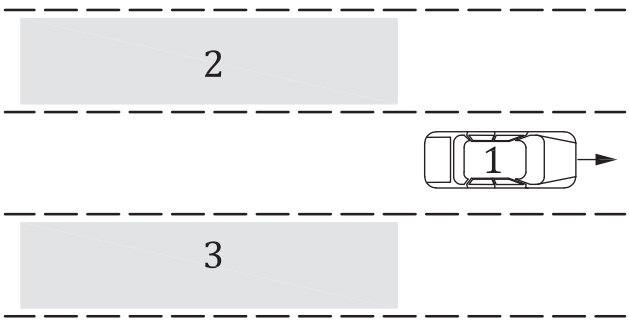
1	subject vehicle
2	left adjacent zone
3	right adjacent zone

Figure 2 — Adjacent zones

3.5
rear zone
zone that is behind and to the sides of the subject vehicle

Note 1 to entry: See Figure 3. This figure shows the zone concept only. Actual requirements are given in 5.2.

Note 2 to entry: The rear zones are intended to cover the lanes adjacent to the subject vehicle. However, the position and size of the rear zones are defined with respect to the subject vehicle and are independent of any lane markings.



Key

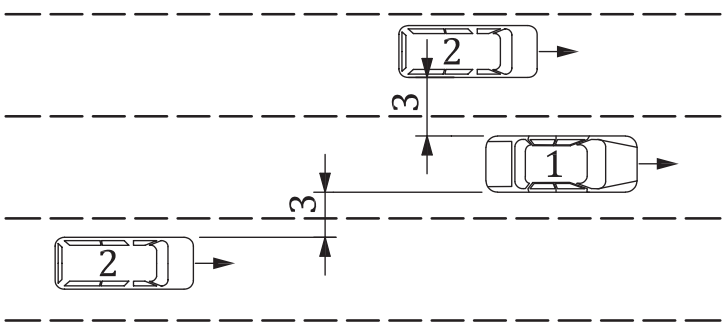
1	subject vehicle
2	left rear zone
3	right rear zone

Figure 3 — Rear zones

3.6
lateral clearance
<of a target vehicle> lateral distance between the side of the subject vehicle and the near side of a target vehicle

Note 1 to entry: See Figure 4.

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Key

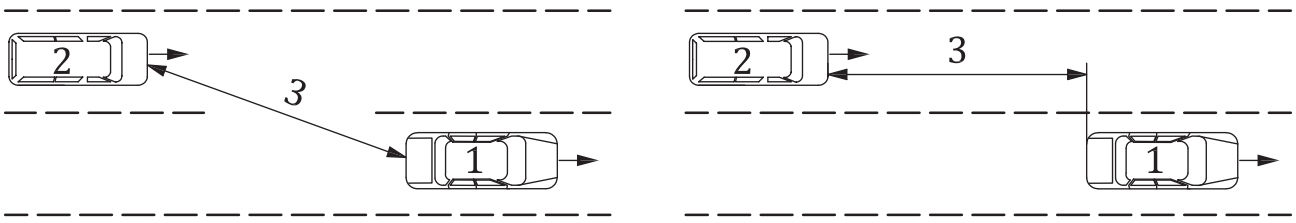
1 subject vehicle
2 target vehicle
3 lateral clearance

Figure 4 — Lateral clearance

3.7
rear clearance
<of a target vehicle> distance between the rear of the subject vehicle and the front of the target vehicle as measured along a straight line, or optionally, as estimated along the target vehicle's estimated path

Note 1 to entry: See Figure 5.

Note 2 to entry: This definition applies to target vehicles in the rear zones only.



a) On a straight road measured along a straight line

b) On a straight road estimated along target vehicle path

Key

1 subject vehicle
2 target vehicle
3 rear clearance

Figure 5 — Examples of rear clearance

3.8
closing speed
<of a target vehicle> difference between the target vehicle's speed and the subject vehicle's speed

Note 1 to entry: This definition applies to target vehicles in the rear zones only. A positive closing speed indicates that the target vehicle is closing in on the subject vehicle from the rear.

3.9
time to collision
estimated time that it would take a target vehicle to collide with the subject vehicle if the subject vehicle were in the target vehicle's path and the target vehicle's current closing speed were to remain constant

Note 1 to entry: Time to collision can be estimated by dividing a target vehicle's rear clearance by its closing speed. This definition applies to target vehicles in the rear zones only.

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3.10
overtaking speed
<of the subject vehicle> difference between the subject vehicle's speed and the target vehicle's speed when the subject vehicle is overtaking the target vehicle

Note 1 to entry: A positive overtaking speed indicates that the subject vehicle is moving faster than the target vehicle.

3.11
blind spot warning function
function that detects the presence of target vehicles in one or more of the adjacent zones and provides a warning to the subject vehicle driver

3.12
closing vehicle warning function
function that detects closing vehicles in one or more of the rear zones and provides a warning to the driver

3.13
lane change warning function
function that combines the blind spot warning function and the closing vehicle warning function

3.14
roadway radius of curvature
horizontal radius of curvature of the road on which the subject vehicle is travelling

3.15
straight road
segment of road for which the curve radius is larger than 5 000 m

3.16
reference point for driver's eye position
reference for the position of driver's eyes in longitudinal direction of the subject vehicle

Note 1 to entry: The reference point is located at the centre of the 95th percentile eyellipse on the x-axis of the subject vehicle.

4 Classification

4.1 Coverage zone classification

4.1.1 General

LCDAS are classified by the minimum required coverage as shown in Table 1. For example, a type I system shall provide coverage of at least the left and right adjacent zones.

Table 1 — Coverage zone classification

Type	Left adjacent zone coverage	Right adjacent zone coverage	Left rear zone coverage	Right rear zone coverage	Function
I	X	X			Blind spot warning
II			X	X	Closing vehicle warning
III	X	X	X	X	Lane change warning

4.1.2 Type I systems

Type I systems provide the blind spot warning function only. Type I systems are intended to warn the subject vehicle driver of target vehicles in the adjacent zones. Type I systems are not required to provide warnings

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