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Intelligent transport systems — Road boundary departure prevention systems (RBDPS) — Performance requirements and test procedures

Systèmes intelligents de transport — Systèmes de prévention de sortie de route (RBDPS) — Exigences de performance et modes opératoires 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 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 of 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Road boundary departure means a vehicle goes off the road unintentionally (not done intentionally by the driver). Such a departure can cause a crash by colliding with an oncoming vehicle, surrounding structures, or roll-over and the mortality rate in case of such accidents is high. To address this situation, systems which are effective in lane keeping assistance have been developed. Some representative systems are lane departure warning systems (LDWS) (presented in ISO 17361) and lane keeping assistance systems (LKAS) (presented in ISO 11270). LDWS informs the driver of danger by a warning in case of a departure but doesn't have a function to control said departure. On the other hand, the main functionality of LKAS is to support driver operations to keep the vehicle within the lane while the vehicle is in the normal driving operation, not to avoid such accidents by actively preventing road departure. This document specifies road boundary departure prevention systems (RBDPS) which aim to prevent accidents caused by road departure.

RBDPS is a driving safety support system aimed at both the prevention of road departure accidents by causes such as driver negligence and the mitigation of damages when accidents actually occur. RBDPS detects or predicts road departure and activates the actuator(s) to prevent such a departure. The actuator(s) controls yaw moment and deceleration of a vehicle such that the vehicle is effectively controlled so as to remain within the road boundaries. By this mechanism, RBDPS effectively assists in the prevention of accidents and mitigates damages when accidents actually occur. This system allows driver operations to take priority over RBDPS when RBDPS is controlling the vehicle. Also, the driver is adequately informed of the operational state of RBDPS support.

In this document, a road boundary is defined as a boundary of vehicle driving lanes delimited by solid lane markers. Therefore, a dashed line, which a vehicle can cross in order to change lanes, is not a road boundary. Also, this document does not define the means used to detect road boundaries.

Intelligent transport systems — Road boundary departure prevention systems (RBDPS) — Performance requirements and test procedures

1 Scope

This document contains the basic control strategy, minimum functionality requirements, basic driver interface elements, minimum requirements for diagnostics and reaction to failure, and performance test procedures for road boundary departure prevention systems (RBDPS). RBDPS is a driving safety support system which acts on vehicles to prevent road departures. RBDPS is designed to reduce damage and accidents arising from road boundary departures.

This document is intended to be applied to systems that predict road boundary departures and maintain the vehicle within the road boundaries by both lateral acceleration control and longitudinal deceleration control. RBDPS is intended to operate on roads (well-developed and standardized freeways or highways) having solid lane markers. Roadwork zones or roads without visible road boundary markers are not within the scope of this document. RBDPS is intended for light duty passenger vehicles and heavy vehicles. RBDPS is not designed to operate continuously, but to operate automatically only when possible road boundary departures are detected or predicted. However, the driver's decision and operation takes priority at all times.

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 1176, *Road vehicles — Masses — Vocabulary and codes*

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 https://www.electropedia.org/

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

3.1
control threshold
control trigger point set in the system where RBDPS control is issued

Note 1 to entry: In the case of *TTLC* (3.20) the control threshold shifts depending on the rate of departure.

Note 2 to entry: The control threshold is placed within the control threshold placement zone (see Figure 3).

3.2
control threshold placement zone
zone between the control threshold line and the latest control lines within which the control threshold is placed

Note 1 to entry: There is one control threshold placement zone at the inner side of the lane marking and one at the outer side of the lane marking (see Figure 3).

3.3
failure
inability of a system or system component to perform a required function within specified limits, which is caused by mechanical or electronic malfunction

Note 1 to entry: Temporary performance reductions, for example, due to bad weather conditions, bad lane markings, or temporary sensor blindness, are not considered a failure.

3.4
heavy vehicle
any single vehicle or combination of vehicles defined as Category M3, M2, N3, N2 in the United Nations Economic and Social Council World Forum for Harmonization of Vehicle Regulations (WP.29) ECE/TRANS/WP.29/78/Rev.2

3.5
lane
area of roadway delimited by visible lane markers between which, in the absence of any obstruction or intention on the part of the driver to change direction, a vehicle would be expected to travel

3.6
lane departure warning
warning given to the driver in accordance with the lane departure warning condition in the absence of suppression requests

3.7
latest control line
outermost limit of the control threshold

3.8
light duty passenger vehicle
vehicle defined as category M1 and N1 in the United Nations Economic and Social Council World Forum for Harmonization of Vehicle Regulations (WP.29) ECE/TRANS/WP.29/78/Rev.2

3.9
rate of departure
subject vehicle's lateral component of the approach velocity to the road boundary at the control issue point

3.10
RBDPS action
action which the system performs to influence the lateral movement of the subject vehicle with the intention of assisting the driver to prevent departing the road boundaries

3.11
road
area for vehicular travel delineated by road boundaries

3.12
road boundary
innermost edge of visible, solid, markers between which a vehicle shall travel

Note 1 to entry: Refer to Table A.1 for a detailed definition.

3.13
road departure
situation in which the outermost edge of one of the front wheels with tyres 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 road boundary

Note 1 to entry: See Figure 3.

3.14
straight road
segment of road for which the curve radius is larger than 5 000 [m]

3.15
subject vehicle
vehicle equipped with RBDPS as defined herein

3.16
system states
one of several stages or phases of system operation

Note 1 to entry: See Figure 2.

3.17.1
RBDPS off state
state in which the system is switched off

3.17.2
RBDPS on state
state in which the system is switched on

3.17.3
RBDPS stand-by state
state in which the system is switched on but the activation criteria to issue intervention are not all met

3.17.4
RBDPS active state
state in which the system is switched on and the activation criteria to issue intervention are met

3.18
threshold for start timing of system support
maximum time threshold which may be set by the user for the start time of RBDPS support after the road boundary departure has started

3.19
threshold for support level of the system
maximum level of system support which may be set by the user

3.20
time to line crossing
TTLC
calculated time to the crossing of the solid line, leading to road departure

Note 1 to entry: For example, the most simple calculation method of this time (TTLC) is to divide lateral distance (D) between the predetermined part of the vehicle and the road boundary by rate of departure (*Vdepart*) of the vehicle relative to the lane (TTLC = D/*Vdepart*).

3.21
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

4 Symbols

Table 1 — Symbols and definitions

Symbol	Definition
RBDPS_Lat_Accel_min [m/s^2]	minimum lateral acceleration which RBDPS shall be capable to achieve
RBDPS_Lat_Accel_max [m/s^2]	maximum lateral acceleration which shall be induced by a RBDPS action
RBDPS_Long_Decel_min [m/s^2]	minimum longitudinal deceleration which RBDPS shall be capable to achieve
RBDPS_Long_Decel_max [m/s^2]	maximum longitudinal deceleration which shall be induced by RBDPS action
RBDPS_Offset_max [m]	maximum allowable road departure
RBDPS_Curvature_rate_max [1/m^2]	maximum rate of change of curvature which is allowed for the curve test track
RBDPS_Lat_Jerk_max [m/s^3]	maximum lateral jerk which shall be induced by a RBDPS action
RBDPS_Active_Duration_max [s]	maximum time duration of RBDPS control
Vdepart [m/s]	rate of departure
Vmax [m/s]	maximum velocity for RBDPS operation
Vmin [m/s]	minimum velocity for RBDPS operation
SV_speed [m/s]	speed of subject vehicle

5 Specifications and requirements

5.1 System function

RBDPS shall be designed taking into consideration the functional elements shown in Figure 1. However, as regards the control methods, a manufacturer is allowed to decide which control methods are used.

As examples of the control methods, generation of vehicle yaw moment for RBDPS functionality is achieved through the use of steering or four-wheel brake distribution, and reduction of vehicle velocity is achieved through braking or braking by engine.

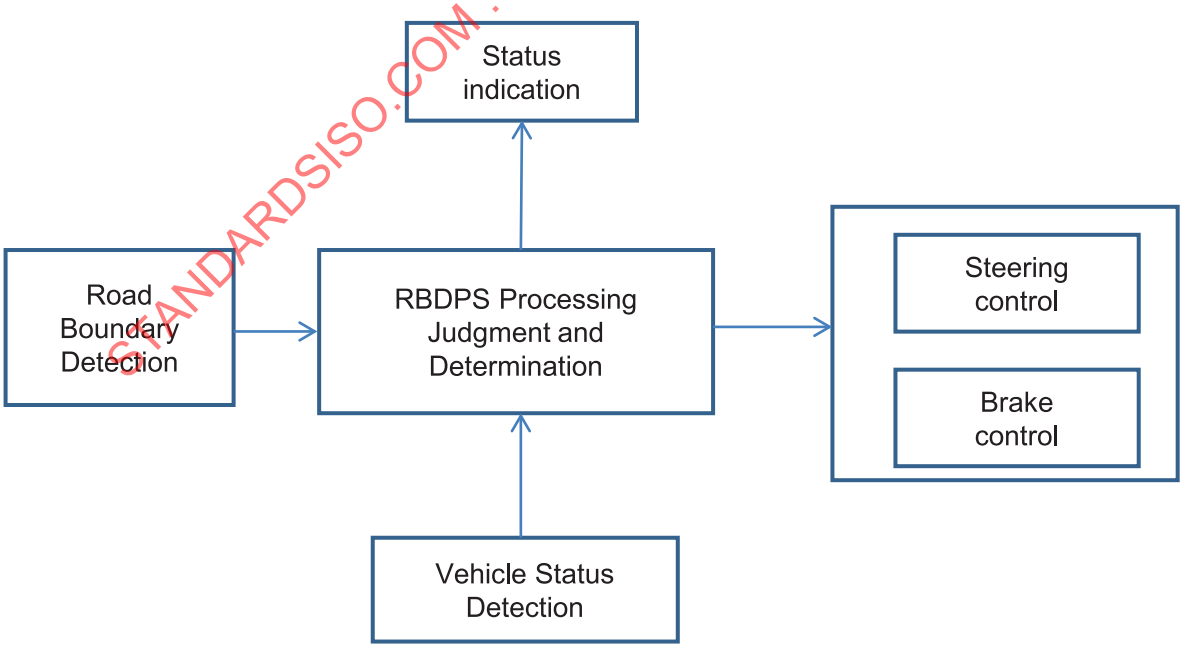


Figure 1 — RBDPS functional elements

The relationship with ISO 11270 (lane keeping assistance systems) and ISO 17361 (lane departure warning systems) is described in Annexes C and D.

5.2 Requirements

5.2.1 Functionality

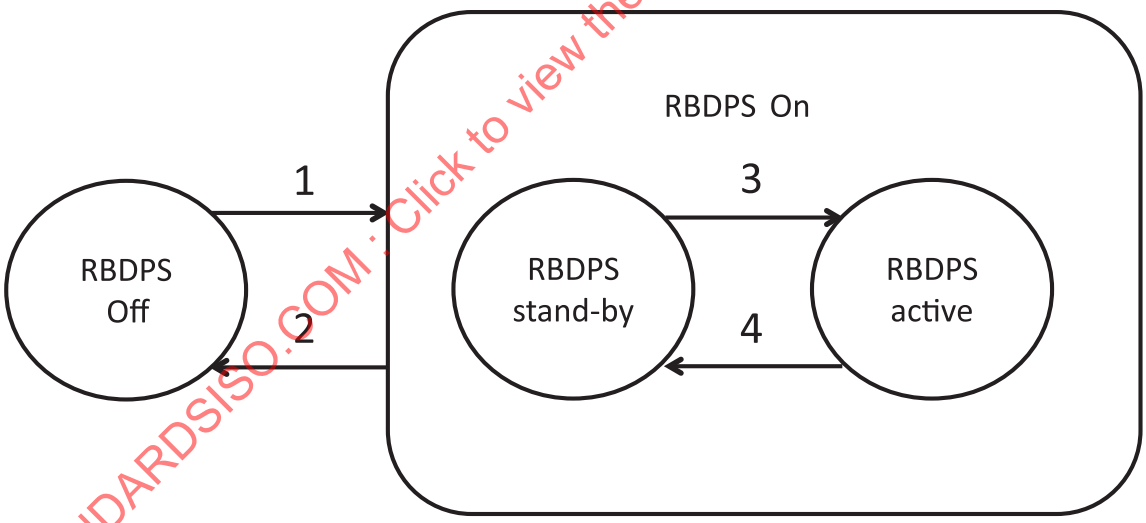
RBDPS is intended to attempt to prevent road departure crashes and minimize crash damages. The system provides driving support for prevention of road departure and does not perform automatic driving to support drivers. RBDPS shall, as a minimum, provide the following operations and state transitions. The following constitutes the fundamental behaviour of RBDPS.

As a basic functionality of RBDPS, it shall operate automatically when a road departure is predicted or detected by the system, and generate yaw moment and longitudinal deceleration to keep the vehicle within the road boundaries. Road boundaries within which RBDPS shall operate are illustrated in Table A.1. RBDPS shall react to road boundaries marked with solid lines. RBDPS may also react to other road boundaries represented by dashed lines, tar/turf transition, discrete protruding lane markings, etc.

As Table A.1 shows, for the centreline of a two-way road and the solid lane markers between the lanes in the case of a multi-lane road, RBDPS may operate.

5.2.2 State transition

RBDPS state transition is described in Figure 2. Specific implementation beyond what is illustrated below is left to the manufacturer.



Key

1 ignition ON
and no system fail
and RBDPS switch on

2 system fail
or ignition off
or RBDPS switch off

3 solid lane marker is detected
and road departure is predicted
and *Vmin* ≤ *SV_speed* ≤ *Vmax*
and no driver's corrective action detected
and other criteria specified by manufacturer

4 *SV_speed* < *Vmin*
or *SV_speed* > *Vmax*
or road departure is not predicted
or solid lane marker is not detected
or turn-signal ON or driver's corrective action
or other criteria specified by manufacturer

Figure 2 — RBDPS state transition

5.2.2.1 State transition behaviour

5.2.2.1.1 Transition from off to on

The transition from RBDPS Off to RBDPS On shall be performed by turning on the ignition or by the driver.

5.2.2.1.2 Transition from on to off

The transition from RBDPS On to RBDPS Off shall be performed automatically or by the driver.

The driver shall be provided with the means to transition from RBDPS On to RBDPS Off and should be provided with the means to keep the system in the RBDPS Off state. When the system failure is detected, it shall be switched to the RBDPS Off state automatically.

5.2.2.1.3 RBDPS stand-by state

In RBDPS stand-by state the system shall evaluate the activation criteria. RBDPS shall remain in the stand-by state unless road departure is predicted. The system is moved to active state when the operational criteria are met.

One of the activation criteria shall be that the system has determined the position of the vehicle within the road relative to the visible road boundary.

And other criteria to be selected by the manufacturer may be the method of calculating an imminent road departure event (e.g. TTLC), a minimum vehicle speed, driver actions, steering angle and other vehicle conditions. This transition is automatically performed.

5.2.2.1.4 RBDPS active state

In RBDPS active state the system shall evaluate the activation criteria.

The system is switched to active-state when road departure is detected or predicted by the system. The system shall obtain the information regarding road boundaries, position relative to the road and other information defined by manufacturers. The methods of detecting boundaries and collecting other necessary information can be determined by manufacturers.

5.2.2.1.5 Transition from RBDPS stand-by to active

The transition from stand-by to active state shall be performed automatically when road departure is detected or predicted by the system and support is provided according to the defined criteria by manufacturers (e.g. maximum or minimum limit of speed, drivers operation or actions).

5.2.2.1.6 Transition from RBDPS active to stand-by

The transition from active to stand-by state is performed when the system avoids road departure or possibility of road departure and meets the defined criteria by manufacturers (e.g. maximum or minimum limit of speed, drivers operation or actions).

In addition, the system shall be switched promptly from active to stand-by when the system cannot provide support of RBDPS (e.g. lane marker cannot be detected under the various driving environments). The transition should be smooth enough to keep the vehicle stable and to give the driver sufficient time to react properly. At a minimum the automatic transition from active to stand-by shall be informed to the driver as the system status.

5.2.3 Driver interface and system reaction

The system shall provide the following controls and prevention capabilities:

5.2.3.1 System reaction

The driver shall be provided with the means to override the road departure prevention action at any time. Such means should include steering wheel operation, gas pedal (accelerator) operation, and/or brake operation.

When the system is either initiating or terminating prevention, the vehicle shall remain controllable by the driver.

5.2.3.2 Display elements

The driver shall have the possibility to obtain information about whether the RBDPS is in RBDPS on state.

The display shall indicate whether RBDPS is in RBDPS active state, except if the vehicle is equipped with a combination of systems that assist the driver to keep the vehicle inside the lane, e.g. with lane departure warning system, LKAS and RBDPS. In this case, the display shall indicate whether at least one of the systems is in an active state.

At a minimum the automatic transition of RBDPS from on-state to off-state shall be informed to the driver.

And if RBDPS is not available due to a failure, the driver shall be informed.

5.2.3.3 State symbols

If the system is used to identify RBDPS function or malfunction, standardized symbols in accordance with ISO 2575 are recommended to be employed.

The symbol of RBDPS may be identical to the symbol for LDWS.

5.2.3.4 Manuals

Drivers shall be informed of the conditions that result in RBDPS activation and deactivation by the vehicle owner's manual. And this owner's manual shall inform the driver that RBDPS operation is not guaranteed to be the same on a dry, flat road as it is under low traction conditions, on roads with cross slopes, extreme elevation, adverse weather conditions, etc.

5.2.3.5 User-adjustable function

In order to enhance effectiveness of the system functions, users may selectively change thresholds for system support, for example, the threshold for start timing of system support, or the threshold for the support level of the system.

5.2.4 Minimum functionality

5.2.4.1 Velocity for RBDPS operation

RBDPS, at a minimum, shall become active when *SV_speed* is within the range of *Vmin* to *Vmax*.

Light duty passenger vehicles

Vmin = 20 [m/s]

Vmax = 30 [m/s] or the maximum possible vehicle speed, if smaller than 30 [m/s]. Lower or higher operational speed ranges are allowed.

Heavy vehicles

Vmin = 17 [m/s]

Vmax = More than 22 [m/s] or allowed operational speed limit in each country.

5.2.4.2 Lateral acceleration performance and longitudinal deceleration performance for RBDPS operation

RBDPS should be designed to prevent road departure. Therefore, minimum functional requirements are set to guarantee proper functionality. As the minimum functional requirement, RBDPS shall be capable of achieving the values for lateral acceleration and longitudinal deceleration defined as *RBDPS_Lat_Accel_min* and *RBDPS_Long_Decel_min* in Table 2. Minimum functional requirements defined here mean the minimum assist performance which the system shall have. These minimum values shall be verified during the performance evaluation test.

Table 2 — Minimum performance of RBDPS

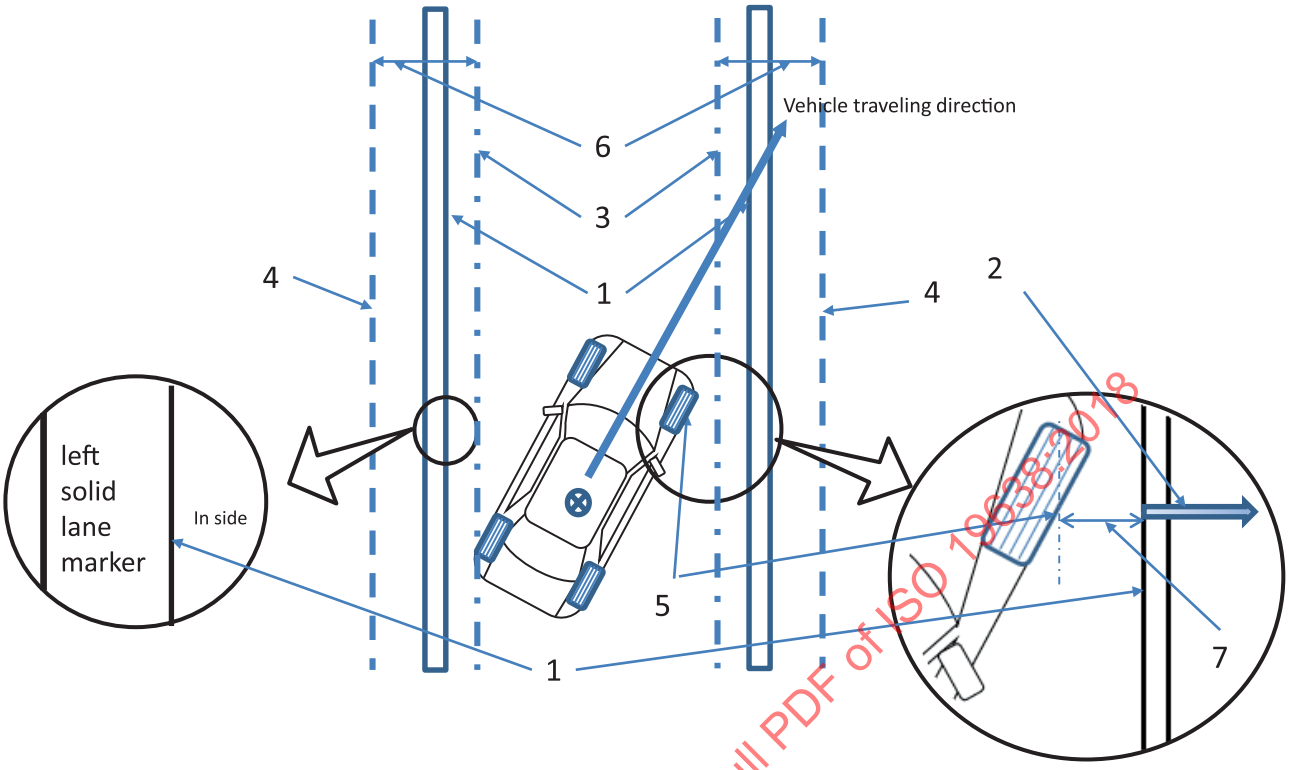
Requirement symbols	Light duty passenger vehicles	Heavy vehicles
RBDPS_Lat_Accel_min [m/s^2]	≥1,0	≥0,5
RBDPS_Long_Decel_min [m/s^2]	≥0,5	≥0,3

5.2.4.3 Location for RBDPS operation

The following operational condition requirements apply.

a) The system shall become active when the prevention conditions according to Figure 2 are fulfilled.

b) RBDPS shall become active when the outermost edge of one of the front tyres enters the control threshold placement zone in Figure 3. It is recommended that RBDPS becomes active by the time the outermost edge of one of the front tyres crosses a road boundary. Refer to Figure 3 for the definitions of the location for RBDPS operation.



Key

1	road boundary	5	outermost edge of a front tire
2	road departure	6	control threshold placement zone
3	control threshold	7	distance from road boundary
4	latest control line		

Figure 3 — Location for RBDPS operation

The RBDPS shall pass the test procedure defined in Clause 6 to cover the main purpose of assisting the driver to keep the vehicle within the road boundaries.

5.2.4.4 Operational limits

The RBDPS should be designed in a way that it acts safely. Therefore, the vehicle actions which are induced by the road boundary departure prevention actions shall be limited and shall not lead to vehicle instability or unintended driver reactions.

5.2.4.4.1 Operational limits of lateral acceleration and lateral jerk

The magnitude of the lateral acceleration induced by the RBDPS action shall not exceed *RBDPS_Lat_Accel_max*. The moving average over half a second of the lateral jerk should be limited to *RBDPS_Lat_Jerk_max* (see the limit value in Table 3).

5.2.4.4.2 Operational limits of active duration time

The RBDPS action is not an automated driving function. Therefore, RBDPS intervention duration is limited. When there is no driver's driving operation (for example, no steering operation signal, steering hold signal) for a longer time duration than the manufacturer-specified time duration, the system shall stop assisting. The maximum value for the RBDPS intervention duration is *RBDPS_active_duration_max* and the assist function shall not be performed after this maximum time exceeded (see limit value in Table 3).

5.2.4.4.3 Operational limits of longitudinal deceleration

The RBDPS longitudinal deceleration action shall not exceed *RBDPS_Long_Decel_max* at any time (see limit value in Table 3).

Table 3 — Operational limits

Requirement symbols	Limit value
RBDPS_Lat_Acel_max [m/s^2]	3,0
RBDPS_Lat_Jerk_max [m/s^3]	5,0
RBDPS_active_duration_max [s]	30,0
RBDPS_Long_Decel_max [m/s^2]	5,0

5.2.5 Failure reactions

Failures in the RBDPS components shall result in immediate notification to the driver and RBDPS shall transition to the RBDPS off state. The notification shall remain active until the system is switched off.

The reactivation of the RBDPS shall be prohibited until a successful self-test, initiated by either ignition off/on or RBDPS-off/on, is accomplished.

6 Performance evaluation test methods

6.1 General

For RBDPS, testing shall be performed according to the test procedures specified in this document.

6.2 Environmental conditions

— The test location shall be on a flat, dry and clean asphalt or concrete surface.

— The temperature range shall be between −20 °C and +40 °C.

— The wind speed shall be less than 3 m/s.

— The horizontal visibility range shall be greater than 1 km.

— Visible solid lane markings at the test location shall be in good condition in accordance with nationally defined visible solid lane markings. Also, they shall be marked in accordance with applicable standards for solid lane marking design and materials.

6.3 Test course conditions

The course shall be of sufficient length to maintain the minimum vehicle speed required by a specific test while allowing the vehicle to drift out of the lane at a low rate of departure.

The width of the solid lane marking shall be in the range of 0,1 m to 0,3 m with applicable regulations for highway-like roads. The cant of the road for either a straight road or a curve shall be 3 % or less.

6.4 Test vehicle conditions

The test vehicle mass shall be between complete vehicle kerb mass according to ISO 1176 plus driver and test equipment and maximum authorised total mass. No alterations shall be made once the test procedure has begun.

6.5 Test system installation and configuration

The RBDPS shall be installed and configured in accordance with the instructions provided by the manufacturer to ensure its intended functionalities.

For tests of the RBDPS with a user-adjustable intervention threshold, each test shall be performed with the threshold which generates the maximum effect for road departure prevention. No alterations shall be made to the system once the test procedure has begun.

6.6 Parameters recoverable from data record

The following parameters are recoverable from a data record:

a) Lateral distance of road departure (departure from inside of a solid line) [m];

b) Lateral acceleration [m/s^2] or yaw-rate [rad/s or deg/s][1)];

c) Rate of departure [m/s];

d) Vehicle speed [m/s];

e) Longitudinal deceleration [m/s^2].

During all road boundary departure prevention actions by RBDPS that occur during the test, the above listed data shall be obtained. The data shall be measured by a device other than the system. The precision of the test device shall be noted in the test report.

Sampling frequency for the data shall be determined in accordance with the digital sampling theorem to ensure replication of the signals.

6.7 Test track

The curve radius is not absolutely specified and it is not necessary for the curve radius to be constant during the entire test. The test conditions are variable according to the formula in 6.8.1.1. During the entire test, the rate of change of curvature should be continuous and should not exceed *RBDPS_curvature_rate_max*.

$$RBDPS\_Curvature\_rate\_max = 4 * 10^{-5}\ [1/m^2]$$

6.8 Test procedure

There are two types of tests for the RBDPS systems that evaluate separate areas of system performance. These tests are defined below and for each test the system shall satisfy the minimum requirements or specified values defined in this document.

Test 1: Verify basic performance of RBDPS (see 6.8.1).

This test is to verify minimum performance requirements.

(*RBDPS_Lat_Accel_min*, *RBDPS_Long_Decel_min* and *RBDPS_offset_max*)

If *RBDPS_Lat_Accel_min* and *RBDPS_offset_max* are verified successfully and *RBDPS_Long_Decel_min* cannot be obtained by Test 1, Test 2 shall be performed.

Test 2: Verify deceleration performance of RBDPS (see 6.8.2).

This test is to verify deceleration performance of RBDPS.

1) If lateral acceleration cannot be measured, it may be calculated using the following formula:
Lateral acceleration [m/s^2] = *Yaw-rate* [rad/s or deg/s] × *Vehicle speed* [m/s].

6.8.1 Test 1: RBDPS basic performance test

6.8.1.1 Test conditions setup for Test 1

The test speed (*SV_speed*) shall be at least *Vmin* (see 5.2.4.1) during the entire test. Curve radius *R* (m) for the test shall be set using the relational expression $G = (SV\_speed)^2 / R$ so that the lateral acceleration *G* [m/s^2] becomes, for both light duty passenger vehicles and heavy vehicles: ≥*RBDPS_Lat_Accel_min* (see Tables B.1 and B.2 for examples of values). As long as the values satisfy the requirements described in 6.8.1.1, the *SV_speed* and curve radius *R* may be determined by the manufacturer for the party performing the test. (See Annex B for examples of values.)

For the basic calculation of curve radius *R* and *SV_speed* which satisfy *RBDPS_Lat_Accel_min*, or both *RBDPS_Lat_Accel_min* and *RBDPS_Long_Decel_min*, it is allowed to use either the average curve radius or the smallest curve radius of the curve section as a reference value for R (m). However, the range of Curve radius R used for this test shall be between 350 m and 800 m. Although, if a test course that complies to this curve radius requirement is not available, testing may also be performed on a smaller curve radius. The value of curve radius is either the value in the middle of the lane or the design value of the test course.

6.8.1.2 Test procedure for Test 1

The tests shall be conducted on a road which is either straight prior to entering a curve or a curve only. The test vehicle shall be adjusted to a position near the middle of the lane such that it moves parallel to the lane. The steering wheel shall not be operated by the driver, when the test conditions specified in 6.8.1.1 are met and performance of RBDPS is verified. The test shall be performed both on a right curve and a left curve.

6.8.1.3 Pass criteria for Test 1

The following measurements are used to determine if the test is successfully passed:

1) Outer edges of the tyres of the vehicle do not exceed the road boundary more than *RBDPS_Offset_max* during the entire test. Table 4 shows values of RBDPS Offset max.

2) The highest lateral acceleration[2)] of the vehicle is more than or equal to *RBDPS_Lat_Accel_min and less than RBDPS_Lat_Accel_max.*

3) The highest longitudinal deceleration[2)] is more than or equal to *RBDPS_Long_Decel_min and less than RBDPS_Long_Decel max.*

Table 5 shows pass criteria for Test 1.

The test procedure is successfully passed if both tests in a right curve and a left curve are successfully done at least four times out of five.

Table 4 — Value of RBDPS Offset max

	Light duty passenger vehicles	Heavy vehicles
RBDPS_Offset_max (m)	≤0,4	≤0,6

2) The induced acceleration/deceleration is required only as an observed momentary value, and is not necessary to be continuously observed throughout the test.

Table 5 — Pass criteria for Test 1

1)	2)	3)	Result
Pass	Pass	Pass	Pass (Test 2 not required)
Pass	Pass	Fail	Pass (Shall perform Test 2)

6.8.2 Test 2: RBDPS deceleration performance test

Test 2: RBDPS deceleration performance test shall be performed only if the requested *RBDPS_Long_Decel_min* defined in 5.2.4.2 was not induced during the Test 1: RBDPS basic performance test.

6.8.2.1 Test conditions for Test 2

The test setup shall be in accordance with 6.8.1.1. However, the test conditions (curve radius *R* [m] and/or *SV_speed*) shall be changed in order to obtain expected deceleration performance values. Requirements for *SV_speed* ≥ *Vmin* [m/s] and curve radius *R* (between 350 m and 800 m) shall be satisfied. If a test course that complies to this curve radius requirement is not available, testing may also be performed on a smaller curve radius course.

6.8.2.2 Test procedure for Test 2

The test procedure for Test 1 in 6.8.1.2 shall be followed for this test.

This performance test shall be performed in a right curve and a left curve.

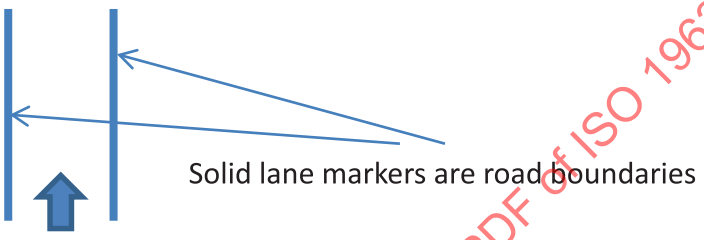
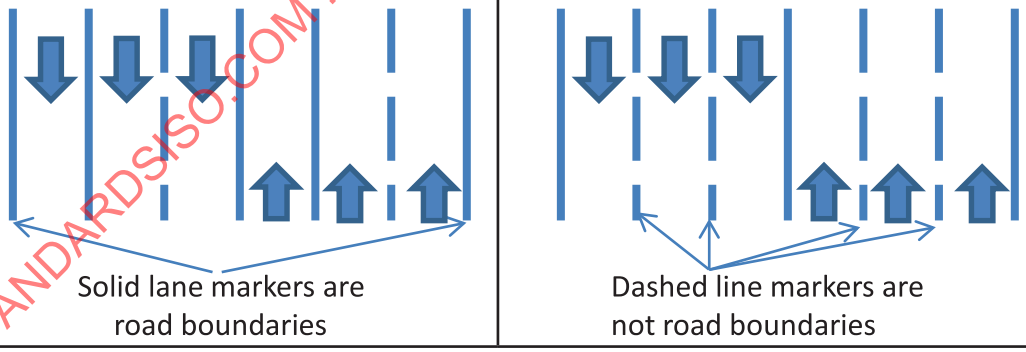
6.8.2.3 Pass criteria

The test procedure is successfully passed when *RBDPS_Long_Decel_min* is satisfied.

Annex A
(normative)

Road boundaries by road type

Table A.1 — Road boundaries for RBDPS

Road type (carriageway type)	Lane schematics
One way road	
Two-way road	
Multi-lane road	
Option Solid lane markers within road boundaries