INTERNATIONAL STANDARD

ISO 11067

First edition
2015-07-15

Intelligent transport systems — Curve speed warning systems (CSWS) — Performance requirements and test procedures

Systèmes intelligents de transport — Systèmes d'alerte de vitesse excessive en approche de virage (CSWS) — Exigences de performance et modes opératoires d'essai

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

Reference number
ISO 11067:2015(E)

© ISO 2015

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2015 – All rights reserved

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

© ISO 2015 – All rights reserved

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

 © ISO 2015 – All rights reserved

Introduction

The main function of Curve Speed Warning Systems (CSWS) is to warn the driver against the danger caused by maintaining excessive speed to negotiate an upcoming curved road. The system computes the current location of the vehicle with respect to the upcoming curved road of interest and determines a warning threshold speed, below which the vehicle can safely negotiate the upcoming curves. If the vehicle speed exceeds the warning threshold speed, the system provides a warning to the driver, prompting the driver to react and lower the subject vehicle speed to a level suitable for negotiating the curved road ahead. The CSWS scope does not include automated intervention features or means for controlling the vehicle to match a desired speed.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

© ISO 2015 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

Intelligent transport systems — Curve speed warning systems (CSWS) — Performance requirements and test procedures

1 Scope

This International Standard contains the basic warning strategy, minimum functionality requirements, basic driver interface elements, minimum requirements for diagnostics and reaction to failure, and performance test procedures for Curve Speed Warning Systems (CSWS). CSWS warns the driver against the danger caused by maintaining excessive speed to negotiate the upcoming curved roads, so that the driver may reduce the speed. The system does not include the means to control the vehicle to meet the desired speed. The responsibility for safe operation of the vehicle always remains with the driver.

This International Standard applies to vehicles with four or more wheels.

2 Terms and definitions

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2.1
subject vehicle
vehicle equipped with the CSWS and related to the topic of discussion

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62061b6d995/iso-11067-2015

2.2
subject vehicle speed
longitudinal component of the subject vehicle velocity

2.3
system states
one of several stages or phases of system operation

Note 1 to entry: See Figure 1.

2.3.1
CSWS off state
state in which CSWS is off

Note 1 to entry: This state has one of the following three causes: the driver has selected the off condition, the ignition is off, or the CSWS is in failure.

2.3.2
CSWS on state
state in which CSWS is on

Note 1 to entry: This state is either in unavailable state or in available state.

2.3.3
CSWS unavailable state
system is in on state and the system has inadequate information

Note 1 to entry: The system cannot make a decision whether the warning criteria are met or not because of fault in GNSS device, lack of map data, or other reasons.

© ISO 2015 – All rights reserved

2.3.4
CSWS available state
system is in on state and the system has sufficient information to make decisions on whether the warning criteria are fulfilled or not

2.3.5
CSWS warning state
system is in available state and the warning criteria are all met

Note 1 to entry: The CSWS starts warning(s) or is operating the warning(s). The system periodically judges whether the criteria are met in order to transition to the non-warning state.

2.3.6
CSWS non-warning state
system is in available state and the warning criteria are not all met

Note 1 to entry: The system periodically judges whether the criteria are met in order to transition to the warning state.

2.4
curved road
section where the radius of curvature is less than or equal to R_C

Note 1 to entry: R_C denotes the maximum radius of curvature to be regarded as a curvature point of interest for potential warning for CSWS (see 5.2.2).

2.5
curvature point
arbitrary points on the curved road that has associated location and value of curvature

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2.6
curvature point of interest
point of the curved road ahead where the distances from the subject vehicle to the curved roads are less than the look ahead distance, S_{LAD}

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f87f0c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

2.7
curve start point
location where the radius of curvature of the curved roadway ahead becomes less than R_C

Note 1 to entry: See 5.2.3.

2.8
curve end point
location where the radius of curvature of the curved roadway ahead becomes $\geq R_C$

Note 1 to entry: See 5.2.3.

2.9
target curvature point of interest
particular curvature point of interest on the roadway of the subject vehicle that CSWS is about to provide the warning to the driver

Note 1 to entry: CSWS selects the target curvature point of interest among the curvature points of interest and the curvature point of interest may vary depending upon the distance from the current location of the subject vehicle to the curvature point of interest and the current speed of the subject vehicle. If a section of the curved road has a constant radius of the curvature, the curve start point becomes the target point of interest. See 5.2.2.

2.10
distance to curvature point of interest
$S_{current}$
distance from the current position of the subject vehicle to the curvature point of interest

© ISO 2015 – All rights reserved

2.11
time to curvature point of interest
t_{TC}
travel time from the current position of the subject vehicle to the curvature point of interest and defined as follows

$$t_{TC} = S_{current} / V_{current}$$

where

$V_{current}$ is the current speed of the subject vehicle

2.12
warning threshold speed
V_{WT}
vehicle speed threshold that is used to determine if the CSWS warning is required

Note 1 to entry: If the vehicle speed measurement is greater than this threshold value, the CSWS provides the warning to the driver. This threshold is below the maximum speed that is defined by designed lateral acceleration to negotiate the upcoming curve.

2.13
warning end speed
V_{WT_end}
vehicle speed at which the CSWS transitions from CSWS warning state to CSWS non-warning so that the CSWS ends the warning

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2.14
warning distance
S_{warn}
distance from the location where the warning starts to the target curvature point of interest

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/9f81f0e4-2e60-4586-98e7-a62b0f866595/iso-11067-2015

2.15
driver response time
t_{resp}
reaction time of the driver which is the time from start of the speed changing event to the time that the driver starts applying brake

2.16
minimum required deceleration
a_{d_req}
deceleration that, if constant, would enable the subject vehicle to match the warning threshold speed for the target curvature point of interest

$$a_{d\_req} = \frac{V_{current}^2 - V_{WT}^2}{2 \times (S_{current} - t_{resp} \times V_{current})}$$

2.17
curve speed warning time
t_{csw}
time when the curve speed warning starts which is greater than or equal to the minimum allowed curve speed warning time

$$t_{csw} \geq t_{csw\_min}$$

Note 1 to entry: The t_{CSW}, S_{warn}, and $V_{current}$ has the following relationship:

$$t_{csw} = S_{warn} / V_{current}$$

© ISO 2015 – All rights reserved

Note 2 to entry: The value of t_{CSW} is selected by the manufacturer.

2.18
minimum allowed curve speed warning time
t_{csw_min}
lower threshold of the curve speed warning time

Note 1 to entry: The value of minimum allowed curve speed warning time is decided considering the amount of overspeed of the subject vehicle and the reaction delay of drivers.

2.19
minimum operating speed
V_{min}
minimum subject vehicle speed at which the CSWS shall operate

2.20
maximum operating speed
V_{max}
maximum subject vehicle speed at which the CSWS shall operate

2.21
look ahead distance
S_{LAD}
curve detection range of the CSWS

Note 1 to entry: For the curvature points that have radius of curvature $\leq R_C$ and the distances from the subject vehicle to the curved roads are $< S_{LAD}$, the curvature point is considered to be a curvature point of interest.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2.22
single curve
simple curved road with a constant radius of curvature separated from other curved roads

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

Note 1 to entry: The clothoid can be included.

2.23
multiple curve
curved road which is a combination of two or more closely located curved roads where the curved roads are constant radius curvatures

Note 1 to entry: The clothoid can be included.

Note 2 to entry: See Table A.1.

2.24
variable radius curve
curved road with two or more radii of curvature in the same direction

Note 1 to entry: See Table A.1.

2.25
angle of curved road
AOC
central angle between the curve start point and the curve end point

Note 1 to entry: See 5.2.3 for illustrative description.

2.26
road shape points
points that is composing roads in digital map

Note 1 to entry: Roads are composed of points and links which reflect the shape and position of the road in the digital map.

© ISO 2015 – All rights reserved

3 Symbols

a_{d_req}	minimum required deceleration (m/s^2)
a_{d_max}	maximum braking deceleration (m/s^2)
$a_{lateral\_max}$	maximum value of the lateral acceleration threshold from which vehicles may deviate on a curved roadway (m/s^2)
d_{max}	on the section of a curved road, the maximum distance from the point on the line consisting of two neighbouring road shape points to the point on the arc of the section (m)
G	gravitational acceleration (m/s^2)
R	radius of curvature at a point along a curved roadway (m)
R_C	threshold radius of curvature to define a curvature point of interest; the curvature point of interest is reached if the radius of the curvature of the particular location is less than R_C (m)
R_{max}	upper threshold of the operational range in terms of the radius of curvature (m)
R_{min}	lower threshold of the operational range in terms of the radius of curvature (m)
$S_{current}$	distance to the curvature point of interest (m)
S_{LAD}	look ahead distance (m)
S_{warn}	warning threshold distance considering $V_{current}$ and t_{CSW} (m)
S_{warn_min}	minimum of warning threshold distance considering $V_{current}$ and t_{CSW_min} (m)
V_{add}	additional speed considering the tolerance for the test (m/s)
$V_{current}$	current speed of the subject vehicle (m/s)
V_{min}	minimum operating speed of CSWS (m/s)
V_{max}	maximum operating speed of CSWS (m/s)
V_{test}	test vehicle speed (m/s)
V_{WT}	warning threshold speed (m/s)
V_{WT_end}	warning end speed (m/s)
V_{WT_max}	upper threshold of the warning threshold speed (m/s)
t_{CSW}	curve speed warning time (s)
t_{CSW_min}	minimum allowed curve speed warning time (s)
t_{d_min}	minimum reaction delay (s)
t_{TC}	time to curvature point of interest (s)
t_{resp}	driver response time (s)
θ	angle of curved road (AOC) (deg)
θ_{min}	minimum AOC (deg)

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-ab20e8b0b595/iso-11067-2015

© ISO 2015 – All rights reserved

4 Classification

The CSWS subject to this International Standard only has a single type.

5 Requirements

5.1 Basic operation principle

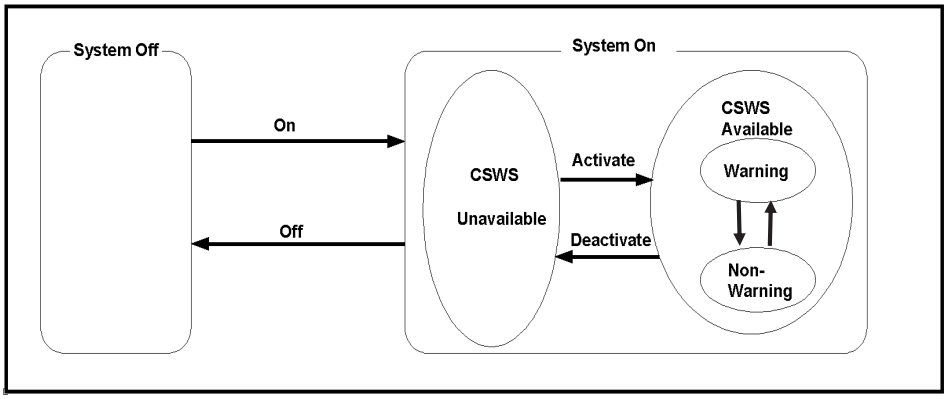

Figure 1 — CSWS states and transitions

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The pattern of the transition conditions are as follows.

— The condition that CSWS transitions from system OFF state to system ON state are as follows.

a) For CSWS ON/OFF control equipped vehicles, both the vehicle ignition and the ON/OFF control are on.

ISO 11067:2015
https://standards.iteh.ai/catalog/standards/sist/5f8110c4-2260-4586-96e7-a62b0f866595/iso-11067-2015

b) For CSWS ON/OFF control not equipped vehicles, the vehicle ignition is on.

c) The transition from CSWS OFF to CSWS ON can be performed by the driver or automatically.

— The condition that CSWS transitions from system ON state to system OFF state are as follows.

a) For CSWS ON/OFF control equipped vehicles, either the vehicle ignition or the ON/OFF control are off.

b) For CSWS ON/OFF control not equipped vehicles, the vehicle ignition is off.

c) If the system is in on state and a system failure occurs.

CSWS shall, as a minimum, provide the following operations and state transitions. The following constitutes the fundamental behaviour of CSWS. The warning criteria are described in 5.2.1.

— In CSWS available state, the system judges the warning criteria to determine whether the warning should be issued. If the system judges to warn, the CSWS starts warning(s) immediately.

— In CSWS unavailable state, the warning judgment is not made because the warning criteria such as subject vehicle position are being monitored by CSWS but not confirmed in this state.

— In CSWS non-warning state, the system shall evaluate the activation criteria. CSWS shall not perform any warning actions.

— If the activation criteria are met, the system shall transition from CSWS non-warning state to CSWS warning state. This transition shall be automatic.

 © ISO 2015 – All rights reserved