INTERNATIONAL STANDARD

ISO 19206-1

First edition
2018-12

Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions —

Part 1: Requirements for passenger vehicle rear-end targets

Véhicules routiers - Dispositifs d'essai pour véhicules cibles, usagers de la route vulnérables et autres objets, pour l'évaluation de fonctions de sécurité active —

Partie 1: Exigences pour cibles d'arrière de véhicules particuliers

Reference number
ISO 19206-1:2018(E)

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

Published in Switzerland

Contents

Page

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 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 33, *Vehicle dynamics and chassis components*.

A list of all parts in the ISO 19206 series can be found on the ISO website.

Introduction

ADAS (Advanced Driver Assistance Systems) and Active Safety systems are designed to support decision-making for the driver, extend the driver's awareness of the traffic situation with advanced warnings, improve the behaviour of the vehicle, and even take over vehicle control in an emergency situation. The goal is to completely avoid an accident or at least reduce the severity of an accident.

Testing of active safety systems requires documentation of test materials, test environment, testing procedures, and performance criteria. This document series addresses the specification of test target objects for traffic scenarios representing vehicles, vulnerable road users and other objects in the forward path of the subject vehicle.

This document addresses the specification of vehicle rear-end test targets (see Annex E for examples of existing vehicle rear-end targets). A future part of this document series is intended to address also other configurations (3D targets).

A surrogate vehicle target needs to represent a real vehicle in terms of detectability and movement. It should also provide safety for the subject vehicle and test operators in the event that contact is made between the subject vehicle and the target. Crashworthiness and durability requirements for the vehicle target require that the material and construction of the vehicle target are adapted to fit the purposes.

Test cases usually address both stationary and moving vehicle targets and, as such, the physical construction of the target accommodates a target carrier system capable of mimicking realistic motions. This document includes requirements on the target carrier system as applicable.

Targets described in this document series may be used for system development or applied in conjunction with existing standards, or standards under development, for assessment of ADAS and active safety functions of vehicles.

Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions —

Part 1: Requirements for passenger vehicle rear-end targets

1 Scope

This document specifies performance requirements for surrogate targets used to assess the system detection and activation performance of active safety systems.

This document specifies the properties of a vehicle target that will allow it to represent a passenger vehicle in terms of size, shape, reflection properties, etc. for testing purposes. The document addresses the detection requirements for a vehicle target in terms of sensing technologies commonly in use at the time of publication of this document, and where possible, anticipated future sensing technologies. It also addresses methodologies to verify the target response properties to these sensors, as well as performance requirements for the target carrier.

This document specifies the properties of the vehicle target for simulation of rear-end scenarios, with overlap greater than 50 %. The specifications of vehicle targets in this document are intended to address current and anticipated test protocols related to safety critical events in which the subject vehicle approaches a stopped, braking or slower moving (target) vehicle from behind and in the forward path of the subject vehicle.

This document does not address the test procedures in terms of speeds, positions, or timing of events. Performance criteria for the active safety system are also not addressed.

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 8855:2011, *Road vehicles — Vehicle dynamics and road-holding ability — Vocabulary*

ISO 8608, *Mechanical vibration — Road surface profiles — Reporting of measured data*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8855:2011 and the following apply.

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

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

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

3.1
subject vehicle
SV
vehicle with active safety system to be tested

3.2
vehicle target
VT
test device representing a vehicle in the forward path of the subject vehicle used to test active safety systems

Note 1 to entry: This document addresses test devices representing the rear-end of a vehicle.

3.3
target structure
physical structure used to activate sensor systems representing the body of a vehicle

3.4
target carrier
mechanical system used to move the target structure according to a test protocol

Note 1 to entry: It may be self-contained within, or supporting the target structure or external devices connected with cables, beams, or similar structures.

Note 2 to entry: Target structure fixation is included in the target carrier.

3.5
measurement equipment
equipment used to record the position and motions of the vehicle target relative to the subject vehicle to ensure that the test protocol is followed within prescribed tolerances and to record data documenting the function of the active safety system and allowing its performance to be assessed

4 Symbols and abbreviated terms

CCD	Charge-Coupled Device
FIR	Far Infrared
LIDAR	Light Detection and Ranging
NIR	Near Infrared
PMD	Photonic Mixer Device
RCS	Radar Cross Section

5 Vehicle target specifications

5.1 Vehicle classes and target applicability

The vehicle targets specified in this document refer to passenger cars and in particular the smaller and more common B and C class cars. See Annex A for more information.

The vehicle targets are intended for testing of systems designed to mitigate or avoid collisions in which the subject vehicle approaches a stopped, braking, or slower moving vehicle (target) from behind and in the forward path of the subject vehicle.

The vehicle target should withstand impacts for all rear collision overlap situations.

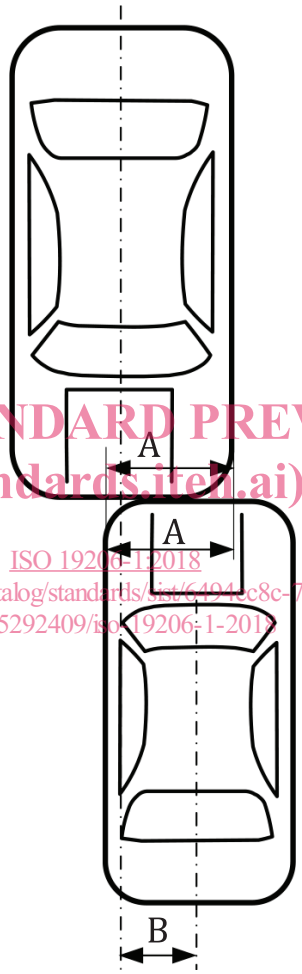
For system tests, the range of potential collision situations of interest includes those having 50 % up to 100 % vehicle target width overlap.

The rear-end target should not be used in offset scenarios where subject vehicle sensors will view the side of the vehicle target.

Figure 1 shows the ISO definition of overlap. It should be noted that the overlap is related to one of the vehicles involved.

NOTE Vehicle width overlap specifications are typically described in a test procedure.

EXAMPLE The Euro NCAP AEB test procedure specifies 100 % vehicle width overlap.



Key

A overlap

B offset

Figure 1 — Overlap and offset definition (approximately 60 % overlap frontal collision shown) (Source: ISO 6813)

5.2 Reference dimensional measurements

Reference measurements for the vehicle target should come from a representative sample of vehicles from the B/C class that were manufactured within five years prior to the publication date of this document.

General dimensions of the vehicle fleet are given in Annex A.

5.3 Safety considerations

Drivers of the subject vehicle shall not be exposed to any substantial risk of personal injury. The vehicle target and its components should not cause more than cosmetic damage to the subject vehicle when struck at a relative velocity of 60 km/h. The conditions specified by the test procedure application shall be taken into consideration.

NOTE Test procedures for specific applications typically indicate what measures are taken to reduce the risk of injury and vehicle damage. These measures can include instructions to disable subject vehicle systems such as supplementary occupant restraints, seatbelt pre-tensioners, vulnerable user protection systems, etc.

EXAMPLE The US NHTSA test procedure for crash imminent brake system performance evaluation specifies that the subject vehicle airbags be disabled. The Euro NCAP AEB test procedure specifies that if a vehicle is equipped with a deployable pedestrian/VRU protection system, this system must be deactivated before the testing commences.

5.4 Repairability

The vehicle target should be easily reassembled or repaired after minor contacts. Field repairs should be possible to perform with hand tools. After repair or reassembly, the vehicle target shall be checked according to 6.5.

5.5 Environmental conditions

The vehicle target shall fulfil all requirements in an ambient temperature range of −5 °C to +40 °C. The vehicle target shall not deteriorate under storage temperatures in the range of −40 °C to +80 °C when properly stored.

NOTE The specified temperature range recognises that there are substantial technical challenges achieving a cost-effective target fulfilling the requirements at lower temperatures than −5 °C.

6 Vehicle target response to sensing technologies

6.1 General

Requirements related to sensing technologies commonly in use at the time of publication of this document are listed in 6.2, 6.3 and 6.4. A vehicle target intended for use with a specific set of sensing technologies needs only to meet the requirements of those technologies.

6.2 Optical requirements

6.2.1 General

Sensors operating on optical principles include CCD and CMOS camera sensors, stereo camera sensors, Photonic Mixer Devices (PMD) and Light Detection and Ranging (LIDAR). These systems cover visible and near infrared (NIR) light frequency spectra. PMD and LIDAR are more reliant on infrared reflectivity of the target surface.

6.2.2 Reference measurements

When technology-specific measurements are required, information of the type of sensor used, environmental conditions during measurements, and date of measurement shall be provided with the description of the vehicle models. The version of the vehicle target and the target carrier shall be traceable to manufacturing drawings or supplier specifications.

General dimensions of the vehicle fleet are given in Annex A.

6.2.3 Stability of dimensions for optical recognition

Target surface shall not flutter or vibrate unrealistically due to aerodynamic effects for a speed up to 50 km/h and a side wind of up to 10 m/s. Local fluttering should not exceed 10 mm perpendicularly from the reference surface. Distortion of the vehicle shape should not exceed 10 mm in any direction.

6.2.4 Viewing angles

Viewing angles for which target should be valid, at a distance of 10 m:

— Horizontal ±5°;

— Vertical up to 10° from above if used with vehicles having high sensor positioning (e.g. commercial vehicles, SUVs).

6.2.5 Features related to optical requirements

For camera based systems, lighter colours of vehicle targets shall be used. Silver or grey is recommended. Contrast to background should be considered.

Features representing the rear lights, reflectors, and registration plate are required.

General requirements for the size and position of these features are available in e.g. 407/2011/EC, UN-ECE R3, UN-ECE R48, FMVSS 108.

Features necessary for the optical recognition as specified in Annex B shall be followed.

6.3 Radar requirements

6.3.1 Reference measurements of radar properties

At the time of publication of this document, automotive applications of radar are using 24 GHz and 76 GHz – 81 GHz.

6.3.2 Reference measurements

Reference measurements for the vehicle target should come from a representative sample of vehicles from the B/C class that were manufactured within five years prior to the publication date of this document.

When technology-specific measurements are required, information of the type of sensor used, environmental conditions during measurements, and date of measurement shall be provided with the description of the vehicle models. The version of the vehicle target and the target carrier shall be traceable to manufacturing drawings or supplier specifications.

6.3.3 Radar cross section, static measurements and requirements

Requirements for the measurement of radar cross section are given in Annex C, C.3.

6.3.4 Radar recognition features of vehicle target

Features necessary for radar recognition as specified in Annex B shall be followed.

6.3.5 Stability of dimensions for radar recognition

Target surface shall not flutter or vibrate due to aerodynamic effects more than a normal car for a speed up to 50 km/h and a side wind of up to 10 m/s. Local fluttering should not cause radar signature to vary, including micro-doppler effects.