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**Commercial vehicles — Obstacle detection  
device during reversing — Requirements  
and tests**

*Véhicules utilitaires — Dispositifs de détection d'obstacles pendant la  
marche arrière — Exigences et essais*



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ISO/TR 12155:1994(E)

## 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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 12155, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This document is being issued in the type 2 Technical Report series of publications (according to subclause G.4.2.2 of part 1 of the ISO/IEC Directives 1992) as a "prospective standard for provisional application" in the field of detection devices for reversing commercial vehicles because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

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This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this type 2 Technical Report will be carried out not later than two years after its publication with the options of: extension for another two years; conversion into an International Standard; or withdrawal.

## Introduction

When road vehicles reverse there are repeatedly accidents involving personal injury and damage to property, despite special legislative provisions. The assistant stipulated by the rules is not available in practice, as the vehicles are generally operated by one person. Drivers often reverse without adequate visibility to the rear.

Technical aids to improve vision to the rear of vehicles have therefore been developed and placed on the market in recent years. Video systems mounted high up at the rear of the vehicle have proved useful for special applications (e.g. buses, tankers, airport apron vehicles). These devices have some disadvantages, such as high purchase price, the installation of a camera on platform vehicles or folding canopy tops being difficult or impossible, high theft rate, restricted visibility in fog or darkness. A further disadvantage to the driver is the additional burden of watching the monitor.

After evaluating all currently available alternatives, experts and organizations responsible for occupational safety consider that the most effective reduction of accidents can be achieved by monitoring the area to the rear of the vehicle with ultrasonic sensors which are linked to visual/acoustic warning devices in the cab.

Requirements and tests for reversing warning devices on road vehicles have been devised by a FAKRA working group which includes equipment manufacturers, vehicle and trailer manufacturers, and organizations representing operators and responsible for occupational safety, contained in this Technical Report. Manufacturers and test houses are requested to present their experience with the requirements of this Technical Report. In this regard, the following should be observed:

- According to the information available to the members of the working group in July 1991, there is no device on the market which meets the requirements of this Technical Report.
- In the opinion of the experts in the Working Group, rearward detection devices cannot be implemented on their own. The accident-preventing function can only be tested in conjunction with the relevant vehicle model, by optimizing the monitoring range. A generally mandatory measuring plan is necessary for this. Reversing detection devices are of the same type as devices such as safety light barriers, two-hand control units and SPS control systems with safety functions.
- As with these devices, the safety questions for reversing detection devices scarcely concern prevention of electrical contact or sharp mechanical edges, etc., but rather reliability of operation (possibly including self-monitoring). Requirements should focus primarily on this.

# Commercial vehicles — Obstacle detection device during reversing — Requirements and tests

## 1 Scope

This Technical Report specifies requirements and tests for detection devices which indicate to the driver of a commercial road vehicle, when he is reversing, the presence of objects which are within the monitoring range of the device.

It applies to detection devices with non-contact sensors which can be fitted on commercial vehicles<sup>1)</sup> to improve safety during manoeuvring. They are to be regarded as an additional aid to the vehicle driver when reversing at a speed of up to 5 km/h<sup>2)</sup> (approximately walking pace), but they do not relieve the driver of his special responsibility when reversing (i.e. this is not a reversing alarm for other personnel in the area).

This Technical Report describes two basic designs:

- reversing detection devices with a pre-warning range;
- reversing detection devices without a pre-warning range (see 5.1).

NOTE 1 Detection devices having a monitoring range which extends to the full height of the vehicles are called rearward warning devices. The Technical Report currently does not include requirements for such devices.

1) As defined in ISO 3833: solo vehicles only.

2) This corresponds to the average reversing speed of commercial vehicles and is related to the monitoring range specified in this Technical Report. Higher speeds lead to longer braking distances and would therefore require larger monitoring ranges. This would cause an increased number of false warnings and would thus jeopardize acceptance of the warning device.

3) To be published.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1176:1990, *Road vehicles — Masses — Vocabulary and codes*.

ISO 3833:1977, *Road vehicles — Types — Terms and definitions*.

ISO 7637-2:1990, *Road vehicles — Electrical disturbance by conduction and coupling — Part 2: Commercial vehicles with nominal 24 V supply voltage — Electrical transient conduction along supply lines only*.

ISO 7637-3:—<sup>3)</sup>, *Road vehicles — Electrical disturbance by conduction and coupling — Part 3: Passenger cars and light commercial vehicles with nominal 12 V supply voltage and commercial vehicles with 24 V supply voltage — Electrical transient transmission by*

capacitive and inductive coupling via lines other than supply lines.

ISO 7731:1986, *Danger signals for work places — Auditory danger signals.*

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

ISO 11451-1:—<sup>3)</sup>, *Road vehicles — Electrical disturbances by narrow-band radiated electromagnetic energy — Vehicle test methods — Part 1: General and definitions.*

ISO 11452-1:—<sup>3)</sup>, *Road vehicles — Electrical disturbances by narrow-band radiated electromagnetic energy — Component test methods — Part 1: General and definitions.*

IEC 529:1989, *Degrees of protection provided by enclosures (IP Code).*

DIN-VDE 0879-3:1981, *Radio interference suppression of vehicles, vehicle equipment and internal combustion engines — Part 3: Interference suppression for on-board radio reception.*

3 Definitions

For the purposes of this Technical Report, the following definitions apply.

**3.1 reversing detection device:** Warning device which gives an acoustic and visual indication to the

vehicle driver (not an alarm to other personnel in the area), when he selects reverse gear, of whether there are objects in the monitoring range.

NOTES

2 When reverse gear is selected, the detection device is automatically activated if the device for starting or stopping the engine is in such a condition that the engine can operate.

3 The reversing detection device is a system consisting of several components which are necessary to permit operation of the system. It includes in particular the following components: sensors, signal-processing unit (evaluation device), visual and acoustic indicator, and the transmission equipment.

**3.2 sensor:** Component which detects objects in the monitoring range.

**3.3 evaluation device:** Component which evaluates the sensor signals and monitors operation.

**3.4 indication device:** Component which transmits signals to the vehicle driver in the form of visual and acoustic information.

**3.5 monitoring range:** Specific three-dimensional area behind the vehicle, which is divided into a pre-warning range, a main warning range and a collision range. (See figure 1.)

**3.6 test object:** Object with a specific geometry and surface for testing the monitoring range.

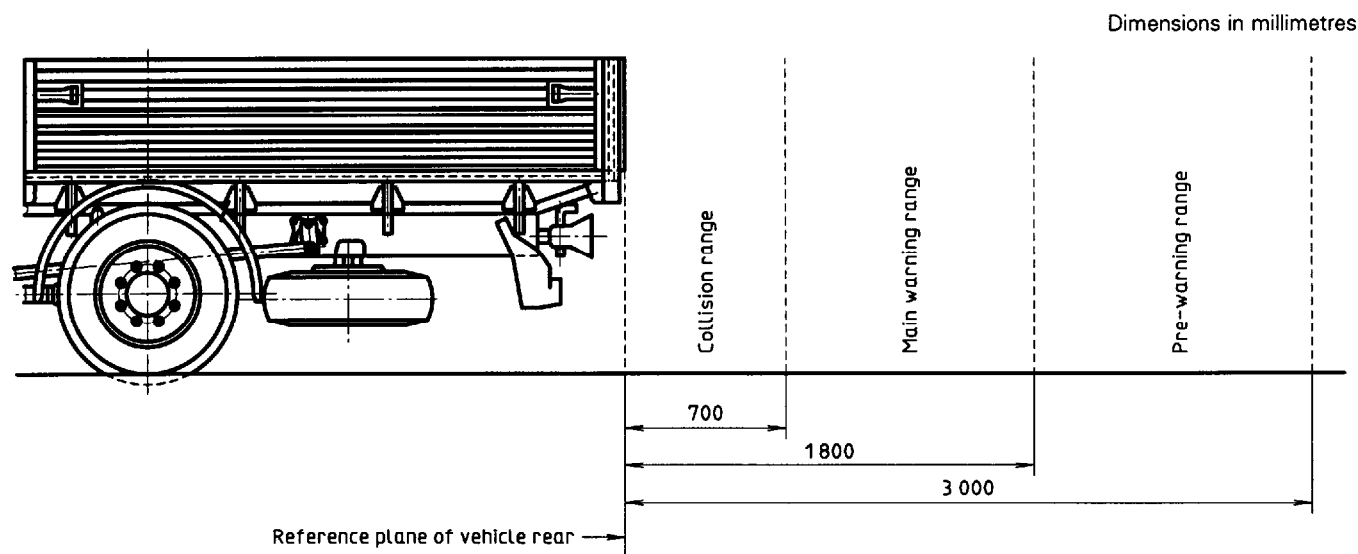


Figure 1 — Monitoring range of reversing detection device