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**Intelligent transport systems — Devices  
to aid reverse manoeuvres — Extended-  
range backing aid systems (ERBA)**

*Systèmes intelligents de transport — Dispositifs d'aide aux manoeuvres  
de marche-arrière — Système d'aide à la marche-arrière à gamme de  
distances étendue (ERBA)*

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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 22840 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

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## Introduction

Extended-range backing aids (ERBA) are detection devices with non-contact sensors that assist the driver during low- to mid-speed backing manoeuvring. These systems detect and warn the driver of objects in the pathway of the vehicle. In comparison to low-speed-only devices whose main purpose is assisting in parking manoeuvres (e.g. ISO 17386), the purpose of the ERBA is to assist in higher-speed backing manoeuvres associated with traversing longer distances.

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# Intelligent transport systems — Devices to aid reverse manoeuvres — Extended-range backing aid systems (ERBA)

## 1 Scope

This International Standard for extended-range backing aids (ERBA) addresses light-duty vehicles [e.g. passenger cars, pick-up trucks, light vans and sport utility vehicles (motorcycles excluded)] equipped with such ERBA systems. This International Standard establishes minimum functionality requirements that the driver can expect of the system, such as the detection of and information on the presence of relevant obstacles within a defined detection range. This International Standard also sets minimum requirements for failure indication as well as performance test procedures. This International Standard includes rules for the general information strategy but does not restrict the kind of information or display system.

ERBA systems are intended to provide backing aid functionality over an extended area located aft of the subject vehicle. ERBA systems are not intended for short-range detection of obstacles located immediately behind the vehicle. If a short-range detection system is needed, either in lieu of or in addition to an ERBA system, reference can be made to ISO 17386.

This International Standard does not include reversing aids and obstacle-detection devices for use on heavy commercial vehicles. Requirements for those systems are defined in ISO/TR 12155. This International Standard does not include visibility-enhancement systems, such as video-camera aids that do not have distance ranging and warning capabilities. [ISO 22840:2010](https://standards.iteh.ai/catalog/standards/sist/69b1a3cb-e625-4d81-8545-182173242616/iso-22840-2010)

ERBA systems use object-detection devices (sensors) for detection and ranging in order to provide the driver with information based on the distance to obstacles. The sensing technology is not addressed; however, technology does affect the performance test procedures defined in this International Standard. The test objects are defined based on systems using ultrasonic and radar sensors, which are the most commonly used detection technology for long-range applications at the time of publication of this International Standard.

ERBA systems are intended to supplement the interior and exterior rear view mirrors, not eliminate the requirement for such mirrors. Automatic actions (e.g. applying brakes to prevent a collision between the subject vehicle and the obstacle) are not addressed in this International Standard. Responsibility for the safe operation of the vehicle remains with the driver.

ERBA systems calculate a dynamic estimate of collision danger [e.g. perhaps using a time-to-collision, (TTC) algorithm] and warn the driver that immediate attention is required in order to avoid colliding with the detected obstacle. A dynamic warning is necessary for the higher vehicle speeds that occur in backing events where the relative closing velocities between the vehicle and the obstacle are greater as compared to low-speed situations, such as parking. The purpose of this dynamic warning is to deliver a more urgent warning to the driver in order for the driver to take timely action. Distance indications are optional, but if so included, it is recommended that reference be made to ISO 15008 for requirements.

## 2 Normative references

The following referenced documents are indispensable for the application 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 15006, *Road vehicles — Ergonomic aspects of transport information and control systems — Specifications and compliance procedures for in-vehicle auditory presentation*

ISO 15008, *Road vehicles — Ergonomic aspects of transport information and control systems — Specifications and test procedures for in-vehicle visual presentation*

## 3 Terms and definitions

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

**3.1 extended-range backing aid (ERBA) system**  
system capable of warning a driver of the presence of obstacles in an area behind the vehicle and issuing a warning to indicate immediate driver action is required

**3.2 system activation**  
process of transitioning the system's operation from a quiescent mode to an active mode

NOTE In an active mode, the system is monitoring the zone of regard. It is evaluating the objects detected and is generating the appropriate indications and/or warnings to the driver.

**3.3 audible information and warning**  
acoustical indication or signal used to convey information to the driver about obstacles in the zone of regard

NOTE For examples, see Annex A.

**3.4 visual information and warning**  
optical indication or signal used to convey information to the driver about obstacles in the zone of regard

NOTE For examples, see Annex A.

**3.5 tactile information and warning**  
physical stimulus used to convey information to the driver about obstacles in the zone of regard

NOTE For examples, see Annex A.

**3.6 zone of regard**  
specific area behind the vehicle that is monitored by the ERBA system as defined in this International Standard

**3.7 sensor**  
component that detects the obstacle(s) in the zone of regard, independent of the technology used



**3.8****test object**

standard test target used for testing a system

NOTE The test object is comprised of a specific material, geometry and surface for standardized testing of obstacles within the system's zone of regard. It is expected that the test object yield comparable results for different sensor types. See 7.1.

**3.9****warning levels**

intensity of the warnings conveyed to the driver about the threat of obstacles in the zone of regard

NOTE For examples, see Annex A.

**3.10****closing speed**

relative velocity between the subject vehicle and the detected obstacle, regardless of whether one or both is/are stationary or moving

NOTE For examples, see Annex A.

**3.11****distance indication**

provides the driver information on the specific distance between the subject vehicle and the obstacle

**3.12****presence warning**

information provided to the driver on the presence of an obstacle in the zone of regard

NOTE The purposes of this warning are to

- alert the driver of objects located in the zone of regard before releasing the brake and moving the subject vehicle;
- alert the driver of objects located in the zone of regard that have not exceeded the threshold for a dynamic warning (see 3.13).

**3.13****dynamic warning**

urgent indication to the driver of an imminent threat (collision) with an obstacle

NOTE For examples, see Annex A.

**3.14****steering angle**

angle between the straight-ahead position and the current position (heading) of the wheels relative to the longitudinal axis of the vehicle

**3.15****readiness-for-service indication**

indication presented to the driver that the ERBA system has completed its state transition from OFF (or standby) to ON and is now ready for operational use

NOTE The method of presentation of this indication may be visual or audible or any combination so desired by the system designer.

#### 4 Symbols and abbreviated terms

B<sub>edge</sub> backing area, edge

B<sub>far</sub> backing area, far

B<sub>middle</sub> backing area, middle

B<sub>near</sub> backing area, near

B<sub>out</sub> backing area, out

B<sub>side</sub> backing area, side

°C degrees Celsius

cm centimetre

dx change in *x*

dy change in *y*

e.g. *exempli gratia* (for example)

etc. *et cetera* (and the rest)

HMI human-machine interface

i.e. *id est* (that is)

m metre

max. maximum

ms millisecond

m/s metres per second

min. minimum

RCS radar cross-section

s second

∅ outside diameter

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## 5 Functional and performance requirements

**IMPORTANT** — The ERBA system as described in this International Standard is intended to detect typical objects in the reversing path of a vehicle in order to help protect it from damage. It is not intended to reliably detect pedestrians or animals. It is recommended that the vehicle operator's handbook (owner's manual) include an advisory note that clearly indicates this limitation.

### 5.1 Steering angle

As a minimum requirement, the ERBA system shall support straight backing manoeuvres. The azimuth zone-of-regard definition (3.6) in this International Standard relates to this primary-use case. See Figure 1.

ERBA systems may adapt to the steering angle for better detection of obstacles in the path of travel in curves; however, this International Standard does not include performance requirements for systems that adapt to steering angle. The requirements of this International Standard shall be fulfilled during backing events with the steering in the neutral position.

### 5.2 Detection range

ERBA systems shall detect targets located in the 1,0 m to 5,0 m range located behind the vehicle's rear bumper in a region called the zone of regard. See Figure 1.

ERBA systems may detect targets closer than 1,0 m, however, this International Standard does not include performance requirements for this range.

NOTE It is proposed that systems that can detect targets closer than 1,0 m comply with ISO 17386.

### 5.3 Minimum performance requirements

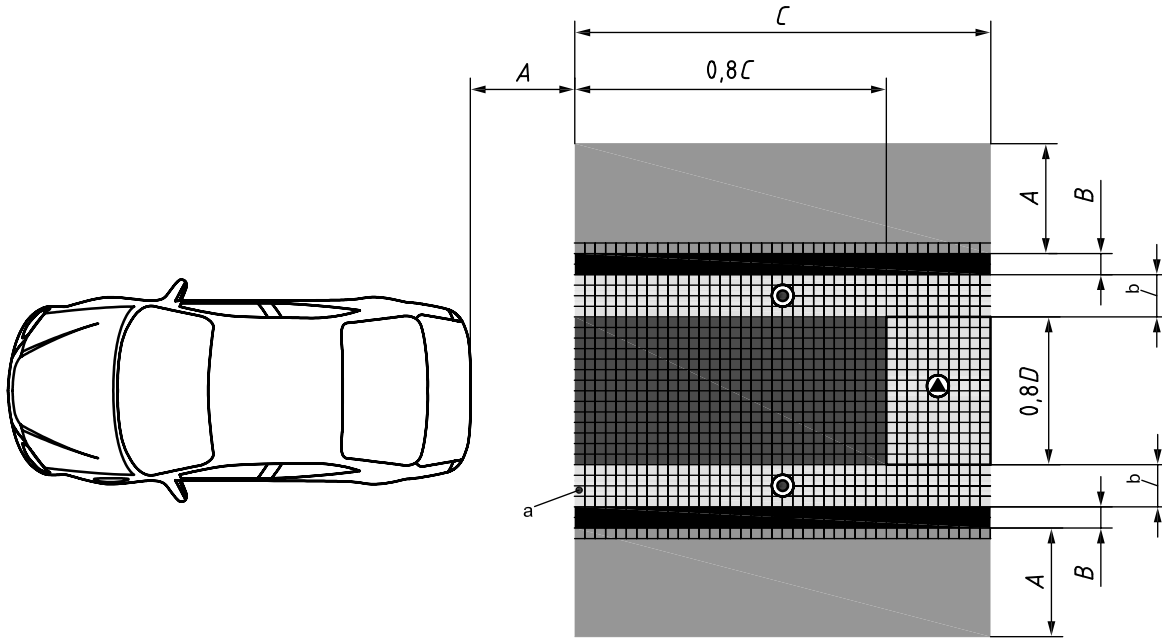
The minimum performance requirements for an ERBA system shall be in accordance with Table 1.

The column labelled "Detection range" specifies a "Near (max.);" range of 1,0 m and a "Far (min.);" range of 5,0 m. These requirements require that the ERBA system begin detecting objects at a maximum of 1,0 m from the host vehicle, and continue detecting targets to a minimum of 5,0 m from the vehicle. The vehicle's rear bumper or fascia shall be used as the reference point for this measurement; see Figure 1.

The column labelled "Closing speed" specifies the minimum range of closing speeds over which the ERBA shall detect objects. It is acceptable that the ERBA be capable of functioning at closing speeds greater than 3,0 m/s.

**Table 1 — Performance requirements**

Detection range m		Closing speed m/s	Detection latency ms		Warning type			Detection performance (using standard ISO target)				
Near max.	Far min.		Mean	Max.	Distance indication	Presence warning	Dynamic warning	B <sub>near</sub> % min.	B <sub>edge</sub> % min.	B <sub>far</sub> % min.	B <sub>side</sub> % max.	B <sub>out</sub> % max.
1,0	5,0	0,0 to 3,0	150	250	optional	optional	required	90	60	60	60	10



**Key**

Detection areas

A 1,0 m

B 0,25 m

C detection range

D bumper width

a □ 10 cm × 10 cm.

b 0,1 m to 0,25 m beyond.

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<ul style="list-style-type: none"> <li>■ min. 90 % <math>B_{near}</math></li> <li>■ min. 60 % <math>B_{edge}</math></li> <li>■ <math>B_{far}</math></li> <li>■ max. 60 % <math>B_{side}</math></li> <li>■ max. 10 % <math>B_{out}</math></li> </ul>	<ul style="list-style-type: none"> <li>●</li> <li>●</li> <li>●</li> <li>●</li> <li>●</li> </ul>
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**Figure 1 — Azimuth zone of regard**

**5.4 Detection latency**

**5.4.1 Start-up detection latency**

**5.4.1.1** Detection latency is defined as the response time of the ERBA system.

**NOTE** In case other vehicle systems (such as a navigation display) are used to display ERBA information, the appearance of the start-up screen on the display system is treated as the ERBA readiness-for-service indication.

**5.4.1.2** For systems with no visual or audible readiness-for-service indication, the response time is measured from the moment when the reverse lamps of the vehicle are lit after the ignition has been set to ON to the moment when the ERBA system issues a warning for a pre-existing object located in the zone of regard. The average response time shall not exceed 450 ms, with no single measurement value exceeding 550 ms. This time includes typical manufacturer delays for reverse-gear activation to suppress unwanted flickering of displays when the lever is shifted (e.g. from “neutral” to “park” via “reverse”, or from “park” to “drive” via “reverse”).

**5.4.1.3** For systems with only a visual readiness-for-service indication, the response time is measured from the moment when the readiness-for-service indication is presented to the moment when the ERBA system issues a warning for a pre-existing object located in the zone of regard. The average response time shall not exceed 150 ms, with no single measurement value exceeding 250 ms.