
**Road vehicles — Ergonomic
requirements for the driver's workplace in
line-service buses —**

**Part 2:
Visibility**

*Véhicules routiers — Exigences ergonomiques du poste de conduite
dans les bus de ville —*

Partie 2: Visibilité



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Contents

Page

Foreword	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Visibility	2
4.1 Forward blind spot	2
4.2 Lateral visibility	2
4.3 View upwards.....	2
4.4 View to passenger compartment	2
4.5 Reflections	3
Bibliography	6

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 16121-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 13, *Ergonomics applicable to road vehicles*.

This second edition cancels and replaces the first edition (ISO 16121-2:2005), which has been editorially revised.

ISO 16121 consists of the following parts, under the general title *Road vehicles — Ergonomic requirements for the driver's workplace in line-service buses*:

- *Part 1: General description, basic requirements*
- *Part 2: Visibility*
- *Part 3: Information devices and controls*
- *Part 4: Cabin environment*

Introduction

Poor ergonomics in the driver's workplace in buses designed to provide scheduled urban and interurban services increase the already high physical and mental strains on the driver.

It is the aim of this part of ISO 16121 to supply the designer of line-service buses with information about how to develop an overall ergonomic concept for the driver's workplace. The recommended requirements on the driver's workplace for line-service buses made in this part of ISO 16121 are based on the scientific conclusions of the research project "driver's workplace in the line-service bus". This was conducted in Germany and summarized in the VDV 234^[1] recommendation. Further comprehensive ergonomic studies related to the design of an enhanced driver workplace conducted in the United States, Canada, the Netherlands, Sweden and the United Kingdom ^{[2][3][4][5][6]} have been considered and found to provide recommendations covering similar areas.

This part of ISO 16121 sets out to consider the practical implications for all ranges of drivers but particularly those with statures from 1,55 m (small female) to 2,0 m (large male). These statures include shoes (~30 mm).

It is also essential that the designer refers to the specifications and requirements of all parts of ISO 16121 (1 to 4) before completing the design of a driver's workplace.

It should be noted that where there is also national legislation covering any of the subjects contained herein, then both should be complied with. However, if a contradiction between the two should arise in any specific area, then the legislation shall prevail for that specific point only.

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Road vehicles — Ergonomic requirements for the driver's workplace in line-service buses —

Part 2: Visibility

1 Scope

This part of ISO 16121 specifies the requirements for the driver's field of view to the area in front of the vehicle, to the entrance opposite the driver's seat and the interior compartment.

It applies to the driver's workplace in low-floor line-service buses designed for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum weight exceeding five metric tonnes and an overall width exceeding 2,30 m.

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 16121-1, *Road vehicles — Ergonomic requirements for the driver's workplace in line-service buses — Part 1: General description, basic requirements*

3 Terms and definitions

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

3.1

low-floor

vehicle in which at least 35 % of the area available for standing passengers (or of its forward section in the case of an articulated vehicle) forms a single area without steps, reached through at least one service door by a single step from the ground

3.2

vision point V1

point 635 mm vertically above the H-point (as defined in ISO 16121-1) with the seat in its rearmost highest position within the required seat H-point adjustment range specified in ISO 16121-1

NOTE The V1 and V2 vision points, as defined in ISO 16121-2, can differ from V1 and V2 vision points defined in national and international regulations.

3.3

vision point V2

point 635 mm vertically above the H-point (as defined in ISO 16121-1) with the seat in its foremost lowest position within the required seat H-point adjustment range specified in ISO 16121-1

NOTE The V1 and V2 vision points, as defined in ISO 16121-2, can differ from V1 and V2 vision points defined in national and international regulations.

4 Visibility

4.1 Forward blind spot

4.1.1 Requirement

In order to reduce the blind spot immediately in front of the vehicle, the following requirement shall be met.

A bar, having a length equal to the width of the vehicle, placed in front of the bus at a height of 1 100 mm above the ground and 300 mm in front of the foremost surface (normally front face of the bumpers) shall be visible, either by direct or indirect view, from both positions V1 and V2 for a minimum of 95 % of its length (see Figure 1).

When checking the requirement of this subclause, any obstruction caused by the steering wheel shall not be taken into account.

If the above requirement cannot be met by direct vision either from V1 or V2, then an alternative device shall be provided to achieve this, such as a mirror or video system.

4.2 Lateral visibility

4.2.1 Requirement

If there is a service door located at the front corner of the vehicle, a cube measuring $100 \times 100 \times 100$ mm, positioned adjacent to the door at a height of 800 mm above the ground, shall be visible either directly or indirectly.

4.2.2 Testing procedure

4.2.2.1 Position the cube indicated in 4.2.1 alongside the foremost window in the service door at the front corner, with its lowest side positioned horizontally and at a height of 800 mm above the ground (see Figure 2).

4.2.2.2 Check that at least three-fourths of one face of the cube positioned as indicated in 4.2.2.1 is visible from the points V1 and V2 (according to 4.1.1).

4.2.2.3 If the vehicle is fitted with an adjustable dashboard, the requirements of 4.1 and 4.2 shall be checked with the dashboard in its mid-position, as defined by the manufacturer.

4.3 View upwards

To ensure sufficient view of traffic lights, etc., a minimum clear angle of view above V1 shall be provided.

There shall be unobstructed view through the windscreen, measured through a horizontal plane intersecting in V1 with a 15° inclined plane (see Figure 3). When checking this requirement, any obstruction caused by rear view mirror, windscreen wiper arms, split windscreen centre bar, video screens, sun blind or visor, driver's fan and any legally required marking shall not be taken into account.

4.4 View to passenger compartment

Mirrors or other devices shall be provided for the observation of the following passenger compartment areas.

Areas to be observed shall be:

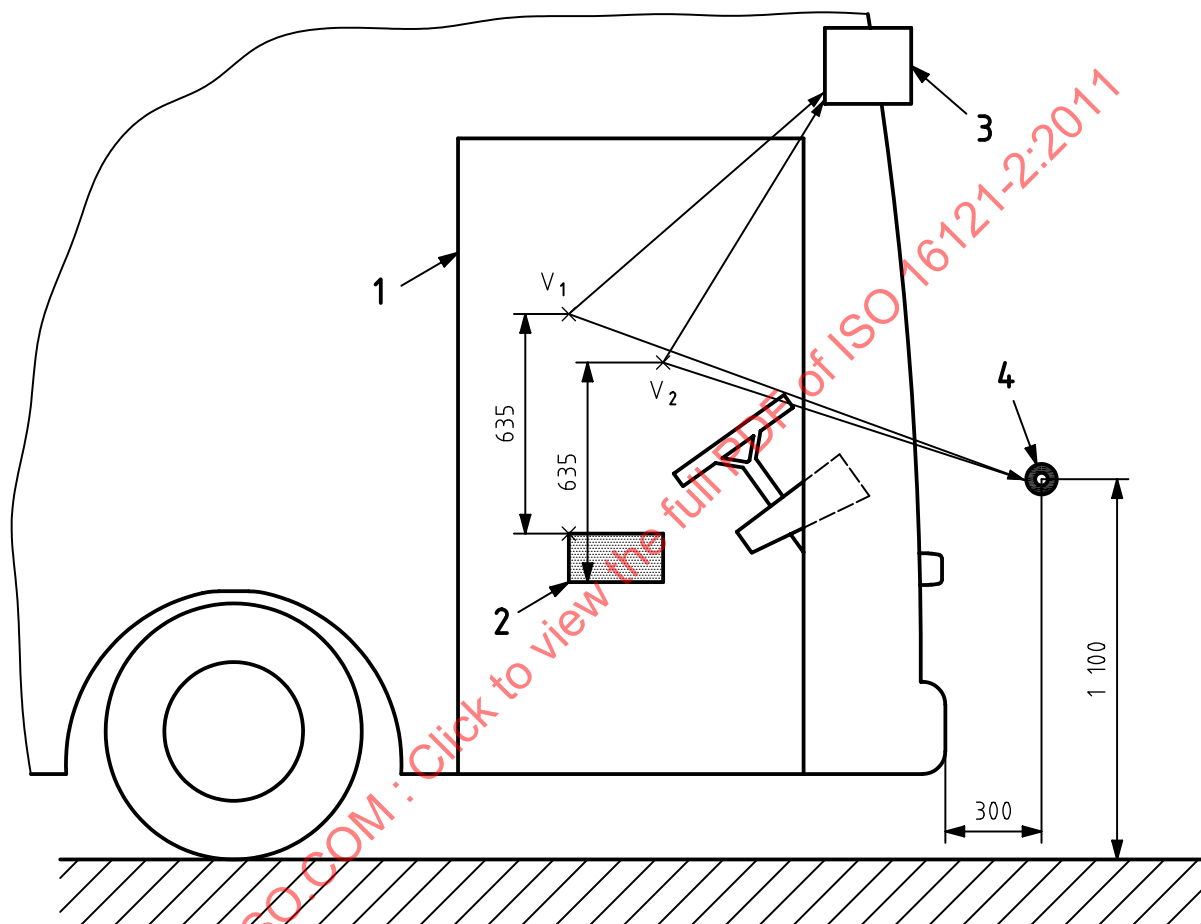
- gangways; and
- entrance/exit zones, except within the driver's direct line of sight.

4.5 Reflections

Reflections due to light sources or other illuminated objects, and reflections by sunlight, shall affect or impede as little as possible the view of the outside or the information devices and controls.

Reflections in the windscreen originating from interior light sources shall be minimized. Reflections in the windscreen which are liable to interfere with judgement of the traffic situation shall be avoided.

Dimensions in millimetres

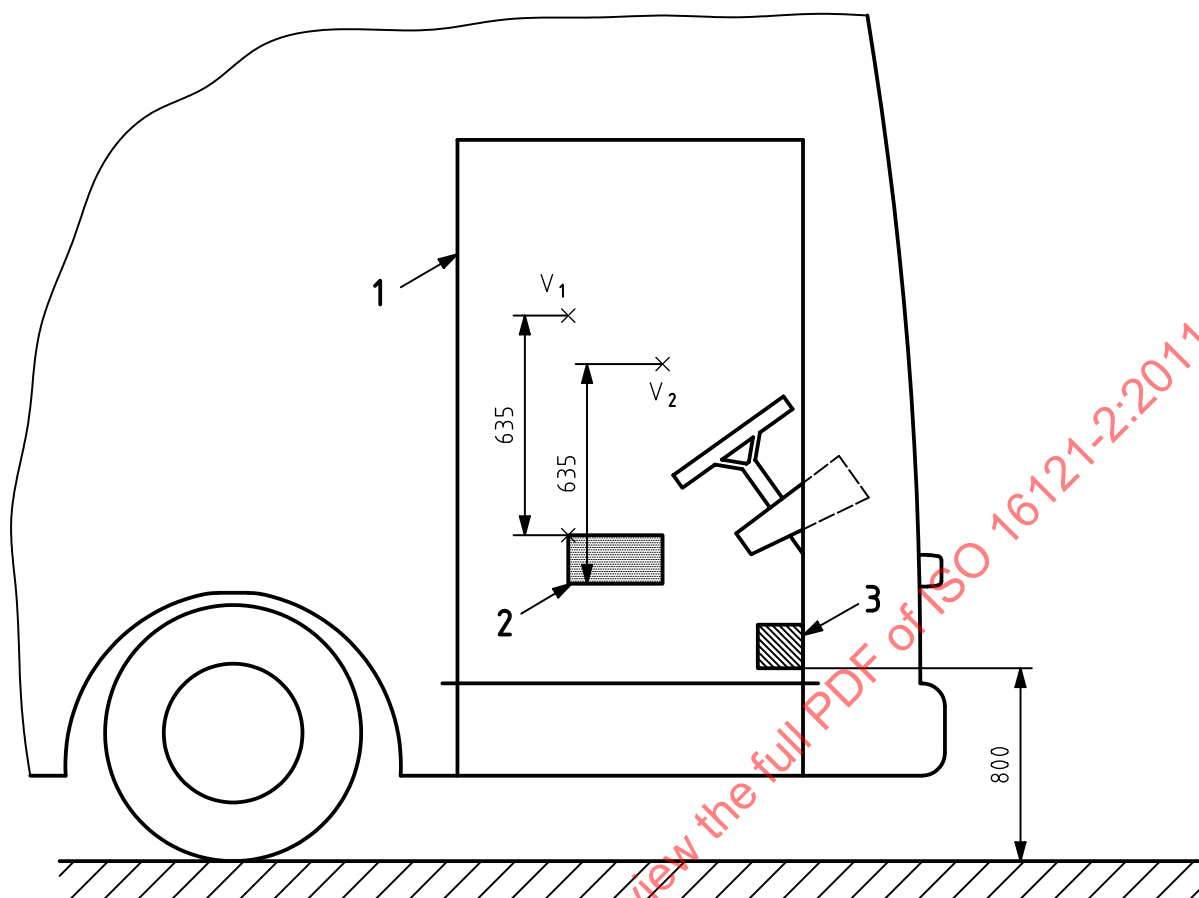


Key

- 1 service door
- 2 required seat H-point adjustment range, as specified in ISO 16121-1
- 3 alternative device, e.g. mirror, video system, etc.
- 4 bar, as defined in 4.1.1

Figure 1 — Forward blind spot

Dimensions in millimetres

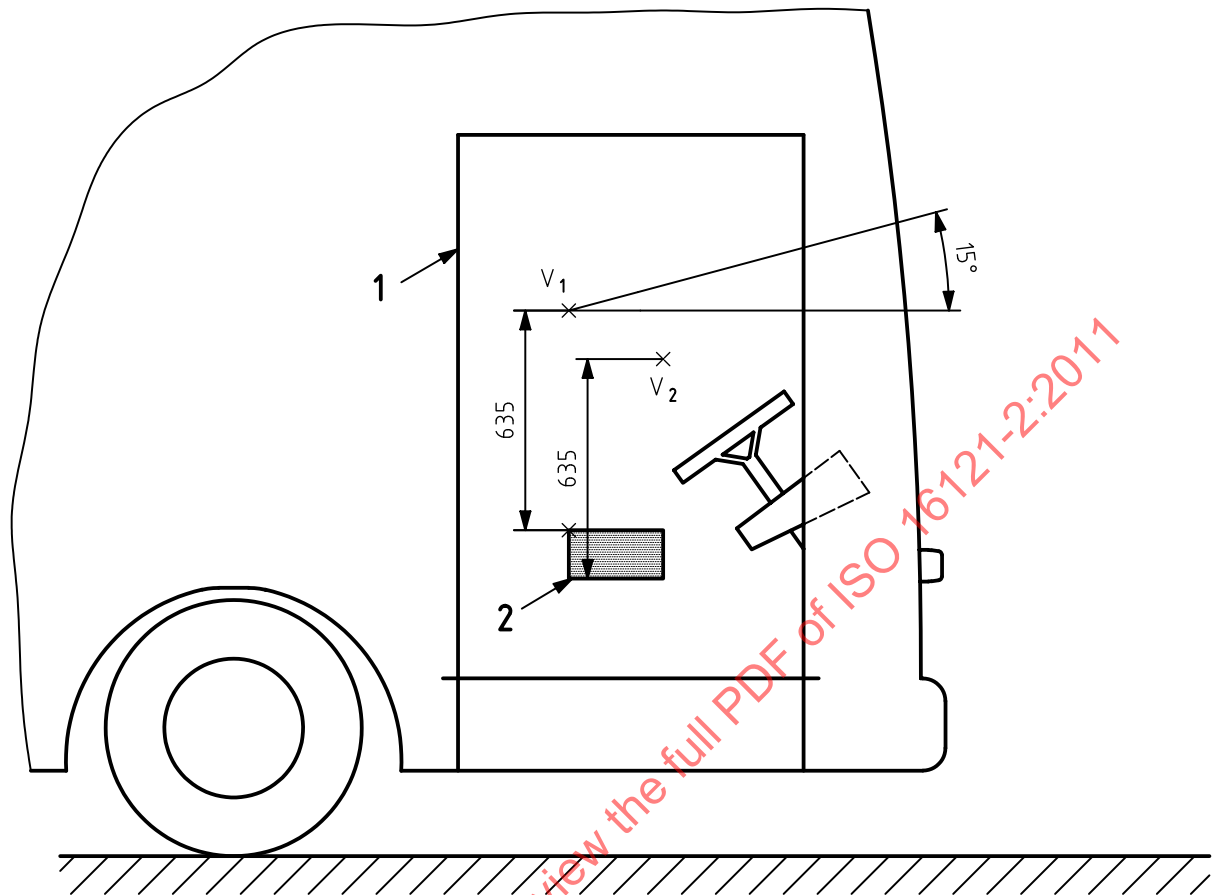


Key

- 1 service door
- 2 required seat H-point adjustment range
- 3 cube as defined in 4.2.1

Figure 2 — Lateral visibility

Dimensions in millimetres

**Key**

- 1 service door
- 2 required seat H-point adjustment range

Figure 3 — View upwards