



SLOVENSKI STANDARD
oSIST prEN IEC 63033-1:2021
01-julij-2021

**Multimedijski sistemi in oprema za vozila - Sistem prostorskega pogleda - 1. del:
Splošno**

Multimedia Systems and equipment for vehicle - Surround view system - Part 1: General

Systemes et équipements multimédias pour véhicules - Système de vision panoramique
- Partie 1: Généralités

STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: prEN IEC 63033-1:2021
<https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021>

ICS:

33.160.60	Večpredstavni (multimedijski) sistemi in oprema za telekonference	Multimedia systems and teleconferencing equipment
43.040.15	Avtomobilska informatika. Vgrajeni računalniški sistemi	Car informatics. On board computer systems

oSIST prEN IEC 63033-1:2021

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN IEC 63033-1:2021](https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021>



100/3584/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 63033-1 ED1	
DATE OF CIRCULATION: 2021-05-21	CLOSING DATE FOR VOTING: 2021-08-13
SUPERSEDES DOCUMENTS: 100/3512/CD, 100/3577/CC	

IEC TA 17 : MULTIMEDIA SYSTEMS AND EQUIPMENT FOR VEHICLES	
SECRETARIAT: Korea, Republic of	SECRETARY: Mr Ock-Woo Nam
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING
<p>Attention IEC-CENELEC parallel voting</p> <p>The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.</p> <p>The CENELEC members are invited to vote through the CENELEC online voting system.</p>	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Multimedia Systems and equipment for vehicle - Surround view system - Part 1: General

PROPOSED STABILITY DATE: 2024

NOTE FROM TC/SC OFFICERS:

In the voting for the maintenance of 63033-1,2,3 and 4, the 63033-1 and 4 received comments.

Copyright © 2021 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

1		
2		
3	FOREWORD.....	4
4	INTRODUCTION.....	6
5	1 Scope.....	7
6	2 Terms and definitions	7
7	3 System model.....	7
8	3.1 General.....	7
9	3.2 Number of camera and camera field of view.....	8
10	3.3 Method for projecting visual image to 3D projection surface.....	9
11	3.4 Visualizing the projection image at free eye point.....	10
12	3.5 Free eye point capability	11
13	4 Camera configuration	11
14	4.1 Camera.....	11
15	4.2 Lens distortion data	11
16	4.2.1 Distortion data of rotationally symmetric lens.....	11
17	4.2.2 Distortion data of non rotationally symmetric lens	12
18	4.3 Optical axis shift data	12
19	5 Rendering.....	13
20	5.1 General.....	13
21	5.2 Composite view data.....	13
22	5.2.1 3D projection surface data	13
23	5.2.2 Capture size	14
24	5.2.3 Conversion of eye point parameter	14
25	5.2.4 Virtual 3D image car model data	15
26	5.2.5 Guide line and bitmap data	16
27	5.2.6 Layout data and layer setting data	17
28	Annex A (informative) Camera mounting to the car	20
29	A.1 Camera mounting position	20
30	A.2 Camera mounting height	20
31	A.3 Camera mounting angle	20
32	Annex B (informative) Camera field of view.....	22
33	Annex C (informative) Camera calibration	23
34	Annex D (informative) Display.....	24
35	D.1 Display specification data	24
36	D.2 Composite view change mode.....	24
37	Annex E (informative) Time behaviour	25
38	E.1 Start up time	25
39	E.2 Frame rate	25
40	E.3 Latency.....	25
41	Bibliography.....	26
42		
43	Figure 1 – System model for Surround view system	8
44	Figure 2 – Horizontal angle of view at the camera.....	8
45	Figure 3 – Vertical angles of view at the camera	9
46	Figure 4 – 3D projection surface	10

47	Figure 5 – Projecting to 3D projection surface.....	10
48	Figure 6 – Distortion data of rotationally symmetric lens	11
49	Figure 7 – Distortion data format of rotationally symmetric lens	11
50	Figure 8 – Distortion data of non rotationally symmetric lens.....	12
51	Figure 9 – Distortion data format of non rotationally symmetric lens.....	12
52	Figure 10 – Texture normalization coordinate at each optical axis centre	13
53	Figure 11 – The format of optical shit data	13
54	Figure 12 – 3D projection surface data	14
55	Figure 13 – Capture specification data format.....	14
56	Figure 14 – Camera angle in conversion of eye point.....	15
57	Figure 15 – camera position / scaling in conversion of eye point.....	15
58	Figure 16 – Virtual 3D image car model at original dimension	16
59	Figure 17 – Virtual 3D image car model at real dimension.....	16
60	Figure 18 – Guide line and bitmap data.....	17
61	Figure 19 – Camera image coordinate system	17
62	Figure 20 – Screen coordinate system	18
63	Figure 21 – Object coordinate system	18
64	Figure 22 – Layout data and Layer setting data	19
65	Figure A.1 – Camera mounting position	20
66	Figure A.2 – Camera mounting height	20
67	Figure A.3 – Camera mounting angle.....	21
68	Figure C.1 – Camera calibration	23
69		
70		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MULTIMEDIA SYSTEMS AND EQUIPMENT FOR VEHICLES –
SURROUND VIEW SYSTEM****Part 1: General****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 63033-1 has been approved to be transformed into International Standards by technical area 17: Multimedia systems and equipment for vehicles of IEC technical committee 100: Audio, video and multimedia systems and equipment.

126 The text of this International Standard is based on the following documents:

FDIS	Report on voting
100/XX/FDIS	100/XX/RVD

127
128 Full information on the voting for the approval of this International Standard can be found in
129 the report on voting indicated in the above table.

130 This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

131 A list of all parts in the IEC 63033 series, published under the general title *Multimedia*
132 *systems and equipment for vehicles – Surround view system*, can be found on the IEC
133 website.

134 The committee has decided that the contents of this document will remain unchanged until the
135 stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to
136 the specific document. At this date, the document will be

- 137 • reconfirmed,
- 138 • withdrawn,
- 139 • replaced by a revised edition, or
- 140 • amended.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

142 The National Committees are requested to note that for this document the stability date
143 is

[https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-
f5458a204348/osist-pren-iec-63033-1-2021](https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021)

144 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE
145 DELETED AT THE PUBLICATION STAGE.

146

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

147

148

149

INTRODUCTION

150 The purpose of this document is to specify the model for generating the surrounding visual
151 image of the drive monitor system which provides car users with its visual image. The
152 surround view system is specified by the function of the audiovisual monitoring and recording
153 as car multimedia systems and equipment.

154 To ensure car position, the rear-view monitor for parking assistance, the blind corner monitor
155 for displaying views of the blind spots at the bad crossing of the prospect, and the bird's-eye
156 view monitor are used. But each surround view system provides a different view to the eye
157 point of car driver. It's a heavy burden for a car driver to switch between these systems and
158 quickly recognize the multiple fields of view. And the fields of view are limited to these camera
159 systems and they cannot freely change the eye point depending on the driving situation. Thus,
160 the usage range of these systems is limited to such as parking assistance. Furthermore, on
161 commercial vehicles such as trucks and buses, and special vehicles such as construction
162 machinery and agricultural machinery, the usage range of these systems is even more limited.
163 Nobody can assist the car driver in ensuring the car's correct position.

164 In order to solve these problems, this document specifies the model for generating the
165 surrounding visual image of the surround view system, which provides car users with its visual
166 image. With this surround view system, it is possible to quickly ensure the car's good
167 positioning in various driving situations. And not only for passenger cars, but good positioning
168 can also be quickly ensured for commercial vehicles and special vehicles.

169 Part 1 specifies the model for generating the surrounding visual image of the surround view
170 system. Part 2 specifies the information sets that are provided by the surround view system,
171 and recording methods for that information and visual images. Part 3 specifies the
172 measurement methods of surrounding visual images for the surround view system.

[oSIST prEN IEC 63033-1:2021](https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021)

173 [https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-
f5458a204348/osist-pren-iec-63033-1-2021](https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021)

MULTIMEDIA SYSTEMS AND EQUIPMENT FOR VEHICLES – SURROUND VIEW SYSTEM

Part 1: General

174
175
176
177
178
179
180

181 **1 Scope**

182 This part of IEC 63033 specifies the model for generating the surrounding visual image of the
183 surround view system.

184 **2 Normative references**

185 There are no normative references in this document.

186 **3 Terms, definitions and abbreviated terms**

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

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

- 190 • IEC Electropedia: available at <http://www.electropedia.org/>
- 191 • ISO Online browsing platform: available at <http://www.iso.org/obp>
<https://standards.iteh.ai/catalog/standards/sist/708b58aa-41b1-4564-ae97-f5458a204348/osist-pren-iec-63033-1-2021>

192 **3.1 Terms and definitions**

193 **3.1.1**

194 **car**

195 any kind of powered wheeled vehicle

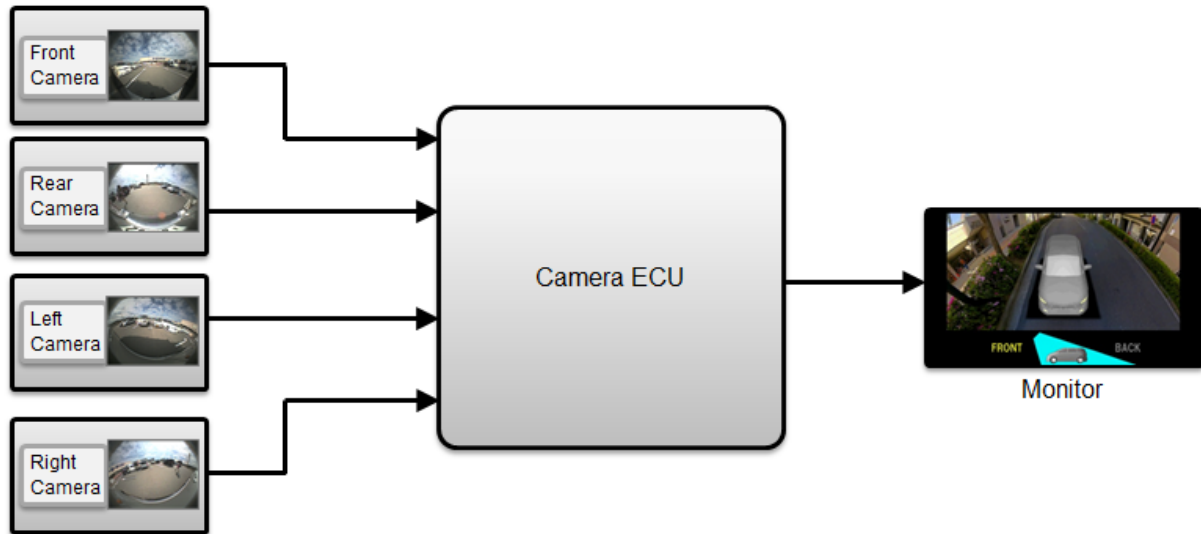
196 **3.2 Abbreviated terms**

197	3D	three dimensional
198	camera ECU	camera electronic control unit
199	CAN	controller area network
200	GUI	graphical user interface

201 **4 System model**

202 **4.1 General**

203 The system model of the drive monitor system is described in Figure 1. Cameras, which are
204 mounted on the outside of the car, capture the visual image of outside the car and these
205 visual data are projected onto a 3D projection surface. It can then be displayed as a
206 composite image. The images can be rendered from various viewpoints with the capturing
207 parameters. The number of cameras required on vehicles other than passenger cars may be
208 more than four depending on the size and shape of the car. This model defines the system
209 with four cameras as a general application. The number of cameras actually used for each
210 composite image changes depending on the viewpoint. The mounting positions and angles for
211 the four cameras should be calibrated according to the data described in 4.2 and 4.3.



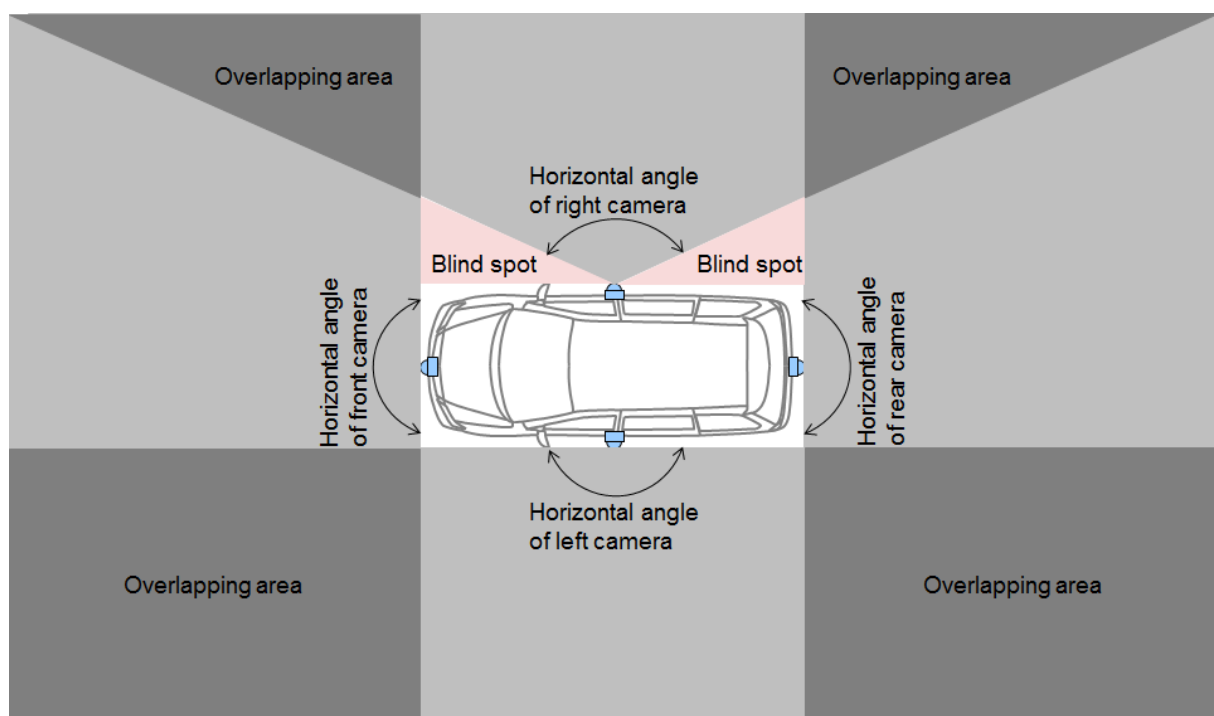
212

213

Figure 1 – System model for surround view system

214 4.2 Number of cameras and camera field of view

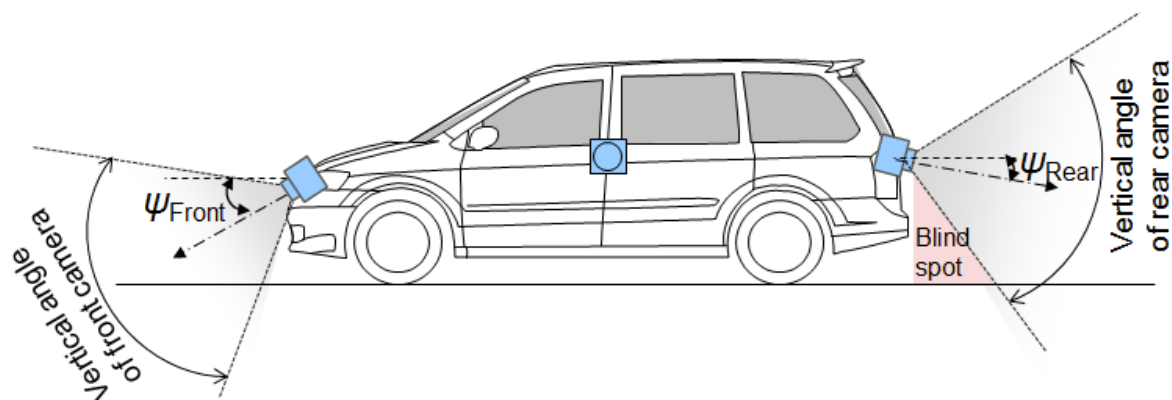
215 The horizontal angle of view of the camera is described in Figure 2. Overlapping areas and
 216 blind spots on the horizontal field of view change depending on the number of cameras and
 217 the horizontal angle of view of the camera. Overlapping areas should be wide for getting
 218 better composite views. The number of cameras and the horizontal angle of view of the
 219 camera should be determined for ensuring there are no blind spots. Vertical angle of view and
 220 tilt angle ψ_{Front} of the front camera and vertical angle of view and tilt angle ψ_{Rear} of the rear
 221 camera is described in Figure 3. The blind spot of the vertical field of view changes depending
 222 on the vertical angle of view of the camera and the tilt angle ψ . The vertical angle of view of
 223 the camera and the tilt angle ψ should be decided for ensuring that no blind spots are
 224 generated. The details are described in Annex A.



225

226

Figure 2 – Horizontal angle of view of the camera



227

228

Figure 3 – Vertical angles of view at the camera

229 4.3 Method for projecting visual image to 3D projection surface

230 Following the right-handed coordinate system, the length of the car is the Y_{car} axis, the width
 231 direction of the car is X_{car} axis and the upper part is the Z_{car} axis. The projection surface of
 232 the camera video image is $Z_V = 0$, the road surface. The 3D projection surface that should be
 233 used is described in Figure 4. Projecting to a 3D projection surface is described in Figure 5.
 234 The 3D projection surface should deal with 3D surface as the polygon model is similar to a
 235 polyhedron. P_V of the one point at 3D projection surface is converted to P_C of the coordinate
 236 value at camera coordinate system is based on the optics origin of the car's cameras. This
 237 coordinate conversion is defined as:

238

$$P_C = M_{V \rightarrow C} \times P_V$$

oSIST prEN IEC 63033-1:2021

239 $M_{V \rightarrow C}$ is the coordinate conversion matrix to the car coordinate system is fixed by the camera
 240 mounted position and the angle for the car coordinates. Incident vector V_i when the car's
 241 camera photographs the subject at position P_C is defined as:

242

$$V_i = -\frac{P_C}{|P_C|}$$

243 The coordinates of the car's camera image records the subject of incident vector V_i calculated
 244 by the internal parameter of the car's camera. Projecting the car's cameras to a 3D projection
 245 surface is realized by arranging the pixels of four cameras with the relations mentioned above.