

The text reproduced below has been prepared by the experts from Germany for the second meeting of the second phase of the informal group on camera-monitor-systems (IG CMS-II) to introduce provisions for camera-monitor-systems to be used as devices for indirect vision.

The document delivers justifications for the different paragraphs in the Annex 12 of the document IGCMS-II-01-02rev.1

Subclauses in the ISO-Document ISO 16505	Paragraphs providing Replacement Prov. in Annex 12		Justification
6.1	2.1	Documentation	tbd
6.2.2	2.2	Adj. def. view	It may be possible to change the CMS view (field of view, magnification) without failing the requirements of the ECE-R 46 (e.g. in a system with very high resolution and viewing angle). In this case, the default view, as selected by the manufacturer may not be optimal for the driver. The adjusted default view is a means for the driver to select and restore his optimal view.
6.2.3	2.3	Mod. View	In certain situations it is helpful to temporarily change the CMS view (field of view, magnification) to help the driver in his task, even if this fails the field of view and/or magnification and/or resolution requirements. The wording used in the proposal makes sure, that the driver is aware of the modification and the former view will be automatically restored. Example: While parking it is helpful to zoom out to the full field of view. In some systems, this might reduce the magnification to a level that does not comply with the ECE-R 46. However, while parking the magnification is not critical, since the relevant objects are all close by compared to the highway situation where the magnification requirement is much more relevant.
6.2.3.1	2.3.1	Changed FoV	This subclause is merely an example/rationale for a specific temporary modified view describing the change of only the field of view. It was proposed to omit this example in the ECE-R 46.

6.2.3.2	2.3.2	Chang. Magn. Fact.	This subclause is merely an example/rationale for a specific temporary modified view describing the change of only the magnification factor. It was proposed to omit this example in the ECE-R 46.
6.2.5	2.4	Overlays	With respect to the given requirements on obstructions in ECE-R46 (paragraph 15.2.4.9.), it is necessary to define the size of the overlays and its transparency. The values were discussed during meetings with display/optic experts and car manufacturers in 2013. It was latest discussed during the telephone conference 17.03.2014 with members of ISO/TC 022/SC 17/WG 2 (responsible for ISO/FDIS 16505).
6.3	2.5	Operat. readin.	tbd
6.7	2.6 ff	Integration	tbd
6.8.2 and new (to 7.8.1.2)	2.7	Luminance/contrast	<p>a) ISO 15008:2009 is a valid international standard and it is a normative reference in ISO/FDIS 16505.</p> <p>The minimum luminance contrast of 5:1 for night condition in ISO/FDIS 16505 is derived from ISO 15008:2009 subclause 4.3.2.1. ISO 15008:2009 does not address needs of older people. But ISO/FDIS 16505 address needs of older people explicitly, see subclause 6.11.1 and footnote 2) in subclause 6.8.2 in ISO/FDIS 16505.</p> <p>ISO 9241-303:2011 is a valid international standard and it is a normative reference in ISO/FDIS 16505. With increasing age of the driver this requires an increasing luminance contrast (see Annex D.4 (normative) in ISO 9241-303:2011). To take into account the needs of older drivers footnote 2) in subclause 6.8.2 in ISO/FDIS 16505 recommends a two times higher luminance contrast ratio of 5:1, resulting in a luminance contrast of 10:1.</p> <p>In order to consider the need of older drivers a luminance contrast of 10:1 is a requirement and not a recommendation.</p> <p>b) According to ISO/FDIS 16505 clause 5 the main content of the displayed image on the monitor is „Reality information“ (according to ISO 9241-307). ISO 9241-307:2008 is a valid international standard and it is a normative reference in ISO/FDIS 16505. „Reality information“ in ISO 9241-307:2008 needs in general a higher luminance contrast (see e.g. Table 70 in ISO 9241-307).</p>
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			<p>than a mirror.</p> <p>b) Based on experience gained during road tests in 2008 – 2013 with experts from the area of ergonomics as well as with users, proper grey scale rendering is of high importance for a proper perception of the scene.</p> <p>c) ISO 9241-303:2011 is a valid international standard and it is a normative reference in ISO/FDIS 16505. ISO 9241-303:2011 defines a gamma (electro-optical transfer function) and grey scale.</p>
6.8.4.1	2.9	Smear	<p>a) A mirror does not show smear, whereas CMS may show. A CMS shall not be worse than a mirror.</p> <p>b) Smear is a disturbance, it causes partial occlusion of the field of view and of the objects. A CMS designed to have minimum performance according to ISO/FDIS 16505 must have maximum immunity against disturbances.</p> <p>c) Homologated CMS show a transparent smear with less than 10% of the maximum luminance. Such system defines the state-of-the-art of science and technology. CMS have to fulfil the state-of-the-art of science and technology. 10% is an adequate value and judged during experts meetings under consideration of acceptable risk.</p>
6.8.4.3	2.10	Point light sources	<p>a) A mirror renders point light sources as point light sources, whereas CMS may not do. A CMS shall not be worse than a mirror.</p> <p>b) Based on experience gained during road tests in 2008 – 2013 with experts from the area of ergonomics as well as with users, detection of point light sources as point light sources is a very important safety aspect for judgements in traffic situations e.g. merge lane, change lane.</p>
6.8.4.4	2.11	Color noise	<p>a) A mirror does not show color noise, whereas CMS may do. A CMS shall not be worse than a mirror.</p> <p>b)</p>

			Color noise is an unintended spatial and temporal visual artefact and therefore a disturbance. ISO 9241-303:2011 is a valid international standard and it is a normative reference in ISO/FDIS 16505. ISO 9241-303:2011 address the minimization of unintended spatial or temporal visual artefacts. ISO 9241-307:2008 is a valid international standard and it is a normative reference in ISO/FDIS 16505. ISO 9241-307:2008 (e.g. Table 64) requires the entire image area to be free of visual artefacts to enable the user to perform the task in an effective and efficient way.
6.8.6	2.12	Geometric distortion	Depending on the class mirrors have a certain amount of distortion. A CMS shall not be worse than a mirror. Therefore a maximum distortion must be defined for CMS to avoid the risk of wrong speed and distance estimation which may lead to hazards.
6.8.7.1	2.13	Pixel faults	Pixel faults build an information that does not exist in the CMS image displayed on the monitor. Therefore pixel faults may lead to wrong information with a potential high risk of wrong decisions and distraction. According to clause 8 in ISO/FDIS 16505 CMS are considered as safety-relevant systems, therefore pixel faults must be avoided.
6.8.7.2 and 7.8.7.2	2.14	Flicker	ISO 9241-303:2011 is a valid international standard and it is a normative reference in ISO/FDIS 16505. ISO 9241-303:2011 requires in subclause 5.4.7 Temporal instability (flicker): "The entire image area shall be free of flicker to at least 90 % of the user population. ...". This is a generic requirement for any visual display task.
6.8.7.3	2.15	Visual artef.	
6.8.7.4	2.16	Gloss	a) ISO 9241-303:2011 is a valid international standard and it is a normative reference in ISO/FDIS 16505. ISO 9241-303:2011 requires in b) of subclause 5.2.4 Luminance balance and glare: "The design of the visual display screen and surrounding visible area of the product housing shall not contribute to disturbing glare by the environmental lighting. This holds especially for prolonged viewing in work environments. ..." b) According to "CEN/CENELEC Guide 6: Guidelines for standards developers to address the needs of older persons and persons with disabilities" the following factor has to be considered:

			<p style="text-align: center;">CEN/CENELEC Guide 6 Guidelines for standards developers to address the needs of older persons and persons with disabilities</p> <hr/> <p>8.4.4 Avoidance of glare</p> <p>Too high light levels and strong directional light can result in deep shadows or glare. Reflecting surfaces on information panels and glossy paper in instruction books or on packaging containing warnings should be avoided, to reduce the possibility of glare.</p> <p>c) COMMISSION RECOMMENDATION of 22 December 2006 on safe and efficient in-vehicle information and communication systems: update of the European Statement of Principles on human machine interface (2007/78/EC)</p> <p style="text-align: center;">L 32/212 EN Official Journal of the European Union 6.2.2007</p> <hr/> <p style="text-align: center;">4.3.2.5. Installation principle V</p> <p style="text-align: center;"><i>Visual displays should be designed and installed to avoid glare and reflections.</i></p> <p>d) See United States Department of Labor Homepage of OSHA Occupational Safety and Health Administration) – Computer workstations :</p> <p>"Potential Hazard:</p> <ul style="list-style-type: none"> • Direct light sources Direct light sources (for example, windows, overhead lights) that cause reflected light to show up on the monitor (Figure 3) make images more difficult to see, resulting in eye strain and fatigue. <p>..."</p>
6.9.2	2.17	Image formation time	<p>ISO 9241-303:2011 is a valid international standard and it is a normative reference in ISO/FDIS 16505.</p> <p>ISO 9241-303:2011 requires in subclause 5.8.5 Image formation time (IFT):</p>

			<p>"The IFT shall be short enough for the type of information shown. ..."</p> <p>As 55 ms is the agreed maximum image formation time in ISO/FDIS 16505, than a maximum image formation time of 55 ms has to be fulfilled.</p>
6.10	2.18	Failure behavior	tbd
7.8.2	2.19	Image quality	<p>1300 – 1500 cd/m² refer to a single daylight illumination condition with an illuminance of 5 klx (see subclause 4.2.2.4 in ISO 15008:2008).</p> <p>It is obvious that higher ambient illuminances / higher ambient luminances may hit the monitor during driving situations just without direct light from the sun itself.</p> <p>The valid international standard ISO 15469:2004 defines the spatial distribution of daylight. Absolut values of sky luminance are not given by this standard since they vary with solar elevation.</p> <p>Reference values of sky luminance can be taken from literature e.g.: Wyszecki&Stiles, Color Science, John Wiley&Sons, 2000 or R. McCluney, Introduction to Radiometry and Photometry, Artech House, 1994 or DIN 5034 Part 2.</p> <p>Values of sky luminance can be measured using a calibrated luminance meter.</p>
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