

3rd Progress Report of ISO/TC22/SC17/WG2 (ISO 16505)

“Camera monitoring systems”

Scope

The ISO 16505 international standard gives minimum safety, ergonomic and performance requirements for Camera-Monitor-Systems as an alternative to the currently mandatory inside and outside mirrors for road vehicles (e.g. Classes I to IV as defined in ECE-R 46).

It addresses Camera-Monitor Systems (CMS) that will be used in road vehicles to present the required outside information of a specific field of view inside the vehicle. These specifications are intended to be independent of different camera and display technologies unless otherwise stated explicitly.

ADAS Systems (such as parking aid) are not part of this standard.

Meetings

Several phone conferences and eight face-to-face meetings of WG2 had taken place:

- 1st meeting, 2010-11-05, London, United Kingdom (Kick-off)
- 2nd meeting, 2011-02-08 to 2011-02-09, Paris, France
- 3rd meeting, 2011-05-18 to 2011-05-20, Troy, USA
- 4th meeting, 2011-11-10 to 2011-11-11, Stockholm, Sweden
- 5th meeting, 2012-05-09 to 2012-05-11, Berlin, Germany
- 6th meeting, 2012-09-19 to 2012-09-21, Berlin, Germany
- 7th meeting, 2012-11-14 to 2012-11-16, Yokohama, Japan
- 8th meeting, 2013-02-25 to 2013-03-01, Berlin, Germany

Participants

In total, WG2 has 60 members of the following nationalities

- Germany
- France
- USA
- United Kingdom
- Japan
- Netherlands
- Sweden
- Italy
- Spain

Current status of ISO 16505

Finished tasks

- Organizational structure to edit the standard
- Edition of committee draft (CD)
- Edition of draft international standard (DIS)

Open tasks

- Edition of final ISO standard (FDIS)

General Status

With the DIS, WG2 has submitted the first entire version of the ISO 16505 standard to the ISO ballot. This document contains all relevant requirements and test methods and was agreed on in broad consensus of the participants. During the DIS ballot phase starting in May it is expected to receive a lot of comments, but the changes to be made with regards to the content should be minor compared to the changes from the CD to the DIS version of the standard.

Roadmap

The next milestones will be:

Start of DIS ballot	2013-05-15
End of DIS ballot	2013-08-15
First DIS comment review / start developing the final draft international standard (FDIS)	9 th meeting of WG 2 (2013-06-05 to 2013-06-07, Milano, Italy)
Finishing the final draft international standard (FDIS)	10 th meeting of WG2 (2013-11-11 to 2013-11-15, Yokohama, Japan)
Publish ISO 16505	Mid 2014 A delay of 6 months is possible, depending on the evaluation of the DIS comments

Contents of ISO 16505

Important changes to last report

Mirror classes

It was decided to leave out ECE-R 46 mirror class VII, as there were no experts for this class in WG2 and it was unclear whether there still are vehicles produced with mirrors of this class. Apart from that, the DIS version of the standard contains requirements and test methods for ECE-R 46 mirror classes I-IV and FMVSS 111 mirrors.

System resolution

In contrast to the CD version of the standard where the system resolution requirement was solely based on pixel resolution of the camera and monitor, the DIS version uses the concept of MTF (modular transfer function) measurement for the output of the whole system. The MTF of the system output is a measure of the ability of the CMS to resolve small details that not only takes into account the mere pixel resolution, but also all other factors that influence the resolution (e.g. lens quality, signal degradation etc.).

Comparison to requirements given in ECE-R 46 for mirrors of classes V and VI

Operating readiness (System availability)

ISO 16505 DIS, subclause 6.3:

"The CMS should be operational as soon as the driver is ready to drive. If the system is not operational, the driver shall be informed (i.e. warning indication, display information, etc.). The operator's manual should explain the information indicated to the driver.

It may be allowed to have the CMS turned off when the vehicle is temporarily stopped (e.g. at red traffic light, traffic jam, etc.), but should be reactivated in due time so that the driver can scan the surrounding."

Compared to paragraph 15.2.1.1.2. of ECE/TRANS/WP.29/GRSG/2011/23/Rev.1 *"In case a camera-monitor device is used for rendering the field(s) of vision, the relevant field(s) of vision shall be permanently visible to the driver when the ignition is on"* subclause 6.3 of the ISO 16505 DIS contains a quite weak definition. The reason for that is that the experts were unable to find a clear definition for the vehicles operating states. The term "ignition on" was refused, as this refers to combustion engine vehicles only, while e.g. electric cars do not have an ignition. Furthermore, with the introduction of start/stop systems, it should be possible to save battery power by temporarily switching off parts of the system when the vehicle is stopped, although the ignition is still on.

Field of view

Concerning the required field of view (field of vision) ISO 16505 refers to the requirements provided in paragraph 15.2.4. of ECE/TRANS/WP.29/GRSG/2011/23/Rev.1. Depending on the mounting position of the camera, the minimum field of vision that the camera system must provide in order to fulfill the requirement can be computed based on a formula given in Annex B.

Magnification and resolution

ECE/TRANS/WP.29/GRSG/2011/23/Rev.1 defines a critical object of a certain size and placement and requires a report on the *displayed object size* and *detection distance* of the CMS.

The ISO experts preferred to define requirements for magnification and resolution (MTF) of the CMS, referring to the magnification and resolution of a typical mirror system used by a human. The idea is to define minimum requirements to the CMS such, that a driver using a CMS perceives objects of arbitrary size and placement at least in the same size than in a typical mirror system (magnification requirement). Furthermore, the ability of the CMS to resolve small details (measured by the system MTF) shall be as high, as the ability of a human seeing through a typical mirror (resolution requirement). This approach takes into account the minimum allowed visual acuity of a driver, the radius of curvature of a typical mirror, and the distances of typical mirrors to the driver for defining the minimum requirements. The need to perform a Triangle Orientation Discrimination (TOD) test or equivalent using the CMS is avoided.

Nevertheless, these requirements could be easily transformed into requirements containing a critical object of arbitrary size and placement and an angular resolution requirement.

Image quality

Apart from the main requirements described above, ISO 16505 defines a set of image quality requirements including uniformity, contrast rendering, color rendering, and image artifacts.