# Scope

The ISO 16505 international standard gives minimum safety, ergonomic and performance requirements for Camera-Monitor-Systems to replace mandatory inside and outside rear-view 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.

NOTE 1 Mirror classes V and VI (as defined in UN REGULATION NO. 46) are not in scope of ISO 16505 since the requirements are already defined in UN REGULATION NO. 46.

# Meetings

Several phone conferences and ten 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 2012-03-01, Berlin, Germany
- 9th meeting, 2013-06-05 to 2013-06-07, Milano, Italy
- 10th meeting, 2013-11-11 to 2013-11-15, Los Angeles, USA

# 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 a lot of comments were received. In several phone conferences and the face to face meeting in Los Angeles, the working group managed to review and take into account all of those comments and it is expected to submit the FDIS to preparation by the ISO in March 2014, meaning the final standard will be published by the end of 2014.

# Contents of ISO 16505

## 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 standard contains requirements and test methods for ECE-R 46 mirror classes I-IV and FMVSS 111 mirrors.

## Field of view
Concerning the required field of view (field of vision) ISO 16505 refers to the requirement of the national bodies, i.e. for all ECE countries the fields of vision described in paragraph 15.2.4. of ECE/TRANS/WP.29/GRSG/2011/23/Rev.1 apply. 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 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.