

ISO 16505:2019-07 (E)

Road vehicles - Ergonomic and performance aspects of Camera Monitor Systems - Requirements and test procedures

Contents	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
3.1 Vehicle related terms and definitions	1
3.2 Mirror related terms and definitions	2
3.3 Camera related terms and definitions	12
3.4 Monitor related terms and definitions	15
3.5 Camera Monitor System based terms and definitions	23
4 Symbols and abbreviated terms	33
5 General information and use case definitions	36
6 Requirements	40
6.1 System documentation	40
6.2 Intended use	41
6.2.1 Default view	41
6.2.2 Adjusted default view	41
6.2.3 Temporary modified view	41
6.2.4 Luminance and contrast adjustment	42
6.2.5 Overlays	42
6.3 Operating readiness (system availability)	42
6.4 Field of view	43
6.5 Magnification and resolution	43
6.5.1 Average magnification factor	43
6.5.2 Minimum magnification factor	43
6.5.3 Resolution (MTF)	44
6.6 Magnification aspect ratio	45
6.7 Monitor integration inside the vehicle	45
6.8 Image quality	46
6.8.1 Monitor isotropy	46
6.8.2 Luminance and contrast rendering	47
6.8.3 Colour rendering	47
6.8.4 Artefacts	48
6.8.5 Sharpness and depth of field	49
6.8.6 Geometric distortion	49
6.8.7 Further image quality requirements	50
6.9 Time behaviour	50
6.9.1 Frame rate	50
6.9.2 Image formation time	50
6.9.3 System latency	50
6.10 Failure behaviour	50
6.11 Quality and further ergonomic requirements	50
6.11.1 Needs of older persons	51
6.12 Influences from weather and environment	51

7	Test methods	51
7.1	System documentation	51
7.2	Intended use	51
7.2.1	Default view	51
7.2.2	Adjusted default view	51
7.2.3	Temporary modified view	52
7.2.4	Luminance and contrast adjustment	52
7.2.5	Overlays	52
7.3	Operating readiness (system availability)	52
7.4	Field of view	54
7.5	Magnification and resolution	54
7.5.1	Average magnification factor	54
7.5.2	Minimum magnification factor	55
7.5.3	Resolution (MTF)	57
7.6	Magnification aspect ratio	60
7.7	Monitor integration inside the vehicle	60
7.8	Image quality	61
7.8.1	Monitor isotropy	61
7.8.2	Luminance and contrast rendering	63
7.8.3	Colour rendering	71
7.8.4	Artefacts	74
7.8.5	Sharpness, resolution, and depth of field	75
7.8.6	Geometric distortion	77
7.8.7	Further Image quality requirements	77
7.9	Time behaviour	77
7.9.1	Frame rate	77
7.9.2	Image formation time	77
7.9.3	System latency	77
7.10	Failure behaviour	78
7.11	Quality and further ergonomic requirements	79
7.11.1	Needs of older persons	79
7.12	Influences from weather and environment	79
8	Functional safety	79
Annex A (normative)	Standard application on UN Regulation No. 46 class II and IV mirrors in commercial vehicles	80
Annex B (informative)	Formula applications, explanations, and guidelines	85
Annex C (informative)	Calculation of the dimensional magnification and of a correction factor to obtain the angular magnification	120
Annex D (informative)	Complementary information for resolution measurement	125
Annex E (informative)	Correlation between Resolution (MTF) and spatial frequency measured using SFR method for depth of field evaluation or sharpness evaluation	134
Annex F (informative)	Complementary charts and method for long distance measurements	139
Annex G (informative)	Distortion measurement	142
Bibliography		149