

ISO 16505:2015-05 (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	2
3.2	Mirror related terms and definitions	3
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	32
5	General information and use case definitions	36
6	Requirements	40
6.1	Intended use	40
6.1.1	Default view	40
6.1.2	Adjusted default view	40
6.1.3	Temporary modified view	40
6.1.4	Luminance and contrast adjustment	41
6.1.5	Overlays	41
6.2	Operating readiness (system availability)	41
6.3	Field of view	42
6.4	Magnification and resolution	42
6.4.1	Average magnification factor	42
6.4.2	Minimum magnification factor	42
6.4.3	Resolution (MTF)	43
6.5	Magnification aspect ratio	44
6.6	Monitor integration inside the vehicle	44
6.7	Image quality	45
6.7.1	Monitor isotropy	45
6.7.2	Luminance and contrast rendering	46
6.7.3	Colour rendering	46
6.7.4	Artefacts	47
6.7.5	Sharpness and depth of field	48
6.7.6	Geometric distortion	48
6.7.7	Further image quality requirements	48
6.8	Time behaviour	49
6.8.1	Frame rate	49
6.8.2	Image formation time	49
6.8.3	System latency	49
6.9	Failure behaviour	49
6.10	Quality and further ergonomic requirements	49
6.10.1	Needs of older persons	49
6.11	Influences from weather and environment	50

7	Test methods	50
7.1	System documentation	50
7.2	Intended use	50
7.2.1	Default view	50
7.2.2	Adjusted default view	50
7.2.3	Temporary modified view	50
7.2.4	Luminance and contrast adjustment	50
7.2.5	Overlays	51
7.3	Operating readiness (system availability)	51
7.4	Field of view	52
7.5	Magnification and resolution	52
7.5.1	Average magnification factor	52
7.5.2	Minimum magnification factor	53
7.5.3	Resolution (MTF)	55
7.6	Magnification aspect ratio	57
7.7	Monitor integration inside the vehicle	57
7.8	Image quality	58
7.8.1	Monitor isotropy	58
7.8.2	Luminance and contrast rendering	60
7.8.3	Colour rendering	69
7.8.4	Artefacts	72
7.8.5	Sharpness, resolution, and depth of field	73
7.8.6	Geometric distortion	75
7.8.7	Further Image quality requirements	75
7.9	Time behaviour	75
7.9.1	Frame rate	75
7.9.2	Image formation time	75
7.9.3	System latency	75
7.10	Failure behaviour	76
7.11	Quality and further ergonomic requirements	77
7.11.1	Needs of older persons	77
7.12	Influences from weather and environment	77
8	Functional safety	77
Annex A (normative) Standard application on class II and IV mirrors in commercial vehicles		78
Annex B (informative) Formula applications, explanations, and guidelines		83
Annex C (informative) Calculation of the dimensional magnification and of a correction factor to obtain the angular magnification		117
Annex D (informative) Complementary information for resolution measurement		122
Annex E (informative) Correlation between Resolution (MTF) and spatial frequency measured using SFR method for depth of field evaluation or sharpness evaluation		131
Annex F (informative) Complementary charts and method for long distance measurements		136
Annex G (informative) Distortion measurement		139
Bibliography		146