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 Termsanddefinitions 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 Generalinformationandusecasedefinitions 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)Calculationofthedimensionalmagnificationandofacorrection factortoobaintheangularmagnification 117

Annex D (informative) Complementary information for resolution measurement 122

Annex E (informative) Correlation between Resolution (MTF) and spatial frequency measuredusingSFRmethodfordepthoffieldevaluationorsharpnessevaluation 131

Annex F (informative) Complementary charts and method for long distance measurements 136

Annex G (informative) Distortion measurement 139

Bibliography 146