ISO 9241-303:2011-11 (E)

Ergonomics of human-system interaction - Part 303: Requirements for electronic visual displays

Contents

Page

Foreword v

Introduction viii

1 Scope 1

2 Normative references 1

3 Terms and definitions 1

4 Guiding principles 1

5 Ergonomic requirements and recommendations 2
5.1 Viewing conditions 2
5.1.1 General 2
5.1.2 Design viewing distance 2
5.1.3 Design viewing direction 3
5.1.4 Gaze and head tilt angles 4
5.1.5 Displays for virtual images 4
5.2 Luminance 4
5.2.1 General 4
5.2.2 Illuminance 4
5.2.3 Display luminance 4
5.2.4 Luminance balance and glare 5
5.2.5 Luminance adjustment 5
5.3 Special physical environments 5
5.3.1 General 5
5.3.2 Vibration 5
5.3.3 Wind and rain 6
5.3.4 Excessive temperatures 6
5.4 Visual artefacts 6
5.4.1 General 6
5.4.2 Luminance non-uniformity 6
5.4.3 Colour non-uniformity 6
5.4.4 Contrast uniformity 7
5.4.5 Geometric distortions 8
5.4.6 Screen and faceplate defects 8
5.4.7 Temporal instability (flicker) 8
5.4.8 Spatial instability (jitter) 9
5.4.9 Moiré effects 9
5.4.10 Other instabilities 10
5.4.11 Unwanted reflections 10
5.4.12 Unintended depths effects 10
5.5 Legibility and readability 11
5.5.1 General 11
5.5.2 Luminance contrast 11
5.5.3 Image polarity 11
5.5.4 Character height 11
5.5.5 Text size constancy 12
5.5.6 Character stroke width 13
5.5.7 Character width-to-height ratio 13

5.5.8 Character format 13
5.5.9 Between-character spacing 13
5.5.10 Between-word spacing 13
5.5.11 Between-line spacing 13
5.6 Legibility of information coding 14
5.6.1 General 14
5.6.2 Luminance coding 14
5.6.3 Blink coding 14
5.6.4 Colour coding 14
5.6.5 Geometrical coding 14
5.7 Legibility of graphics 14
5.7.1 General 14
5.7.2 Monochrome and multicolour object size 14
5.7.3 Contrast for object legibility 15
5.7.4 Colour considerations for graphics 15
5.7.5 Background and surrounding image effects 16
5.7.6 Number of colours 16
5.8 Fidelity 17
5.8.1 General 17
5.8.2 Colour gamut and reference white 17
5.8.3 Gamma and grey scale 17
5.8.4 Rendering of moving images 18
5.8.5 Image formation time (IFT) 19
5.8.6 Spatial resolution 19
5.8.7 Raster modulation or fill factor 19
5.8.8 Pixel density 20

6 Conformance 20

Annex B (informative) Attractivity, or subject visual quality 22

Annex C (informative) Usability aspects of installation 23

Annex D (normative) Basic concepts of visual perception for contrast and luminance of electronic displays 25

Annex E (informative) Virtual display -- Performance objectives 33

Annex F (informative) Electronic visual display accessibility -- Selected bibliography 40

Bibliography 42