

DIN EN ISO 9241-303:2012-03 (E)

Ergonomics of human-system interaction - Part 303: Requirements for electronic visual displays (ISO 9241-303:2011)

Contents		Page
Foreword		4
Introduction		5
1	Scope	6
2	Normative references	6
3	Terms and definitions	6
4	Guiding principles	6
5	Ergonomic requirements and recommendations	7
5.1	Viewing conditions	7
5.1.1	General	7
5.1.2	Design viewing distance	7
5.1.3	Design viewing direction	8
5.1.4	Gaze and head tilt angles	9
5.1.5	Displays for virtual images	9
5.2	Luminance	9
5.2.1	General	9
5.2.2	Illuminance	9
5.2.3	Display luminance	9
5.2.4	Luminance balance and glare	10
5.2.5	Luminance adjustment	10
5.3	Special physical environments	10
5.3.1	General	10
5.3.2	Vibration	10
5.3.3	Wind and rain	11
5.3.4	Excessive temperatures	11
5.4	Visual artefacts	11
5.4.1	General	11
5.4.2	Luminance non-uniformity	11
5.4.3	Colour non-uniformity	11
5.4.4	Contrast uniformity	12
5.4.5	Geometric distortions	13
5.4.6	Screen and faceplate defects	13
5.4.7	Temporal instability (flicker)	13
5.4.8	Spatial instability (jitter)	14
5.4.9	Moiré effects	14
5.4.10	Other instabilities	15
5.4.11	Unwanted reflections	15
5.4.12	Unintended depths effects	15
5.5	Legibility and readability	16
5.5.1	General	16
5.5.2	Luminance contrast	16
5.5.3	Image polarity	16
5.5.4	Character height	16
5.5.5	Text size constancy	17
5.5.6	Character stroke width	18
5.5.7	Character width-to-height ratio	18

5.5.8	Character format	18
5.5.9	Between-character spacing	18
5.5.10	Between-word spacing	18
5.5.11	Between-line spacing	18
5.6	Legibility of information coding	19
5.6.1	General	19
5.6.2	Luminance coding	19
5.6.3	Blink coding	19
5.6.4	Colour coding	19
5.6.5	Geometrical coding	19
5.7	Legibility of graphics	19
5.7.1	General	19
5.7.2	Monochrome and multicolour object size	19
5.7.3	Contrast for object legibility	20
5.7.4	Colour considerations for graphics	20
5.7.5	Background and surrounding image effects	21
5.7.6	Number of colours	21
5.8	Fidelity	22
5.8.1	General	22
5.8.2	Colour gamut and reference white	22
5.8.3	Gamma and grey scale	22
5.8.4	Rendering of moving images	23
5.8.5	Image formation time (IFT)	24
5.8.6	Spatial resolution	24
5.8.7	Raster modulation or fill factor	24
5.8.8	Pixel density	25
6	Conformance	25
Annex A (informative) Overview of the ISO 9241 series		26
Annex B (informative) Attractivity, or subject visual quality		27
Annex C (informative) Usability aspects of installation		28
Annex D (normative) Basic concepts of visual perception for contrast and luminance of electronic displays		30
Annex E (informative) Virtual display -- Performance objectives		38
Annex F (informative) Electronic visual display accessibility -- Selected bibliography		45
Bibliography		47