

INTERNATIONAL STANDARD



**Flexible display devices –
Part 2: Essential ratings and characteristics**

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**Flexible display devices –
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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FLEXIBLE DISPLAY DEVICES –

Part 2: Essential ratings and characteristics

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IEC 62715-2 has been prepared by IEC technical committee 110: Electronic displays. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
110/1401/CDV	110/1462/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62715 series, published under the general title *Flexible display devices*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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FLEXIBLE DISPLAY DEVICES –

Part 2: Essential ratings and characteristics

1 Scope

This part of IEC 62715 specifies the essential ratings and characteristics of flexible display modules.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62715-1-1, *Flexible display devices – Part 1-1: Terminology and letter symbols*

IEC 62715-5-1, *Flexible display devices – Part 5-1: Measuring methods of optical performance*

IEC 62715-6-1, *Flexible display devices – Part 6-1: Mechanical test methods – Deformation tests*

IEC 62715-6-3, *Flexible display devices – Part 6-3: Mechanical test methods – Impact and hardness tests*

IEC 62679-3-1, *Electronic paper displays – Part 3-1: Optical measuring methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in 62715-1-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Flexible display modules

4.1 Types of flexible display modules

Based on the display technology, the flexible display modules include the following types:

- flexible OLED modules,
- flexible LCD modules,
- other flexible modules.

Based on the mechanical form, the flexible display modules include the following types:

- bending modules,
- foldable modules,

- rollable modules,
- other flexible modules.

4.2 Principles and structure

The flexible display modules consist of display panels, electronic circuits, cover glass or film and usually bezels.

4.3 Modes of operation

4.3.1 Addressing mode of operation

The addressing mode of operation consists of, for example, passive matrix, active matrix.

4.3.2 Optical mode of operation

The optical mode of operation consists of:

- illumination mode: for example top-emitting, bottom-emitting for flexible OLED, transmissive, transreflective for flexible LCD, electronic paper,
- number of colours,
- number of grey levels.

4.4 Details of outline

4.4.1 Material and mechanical description

The material and mechanical description of flexible displays is as follows:

- substrate material: for example glass, plastic
- structure material: for example plastic, metal.

4.4.2 Method of connection

Connector, flex cable or connection pins, etc.

4.4.3 Outline drawing and dimensions

The outline drawing and dimensions consist of:

- overall dimensions,
- bezel dimensions,
- active display area and display centre,
- flexible region.

4.4.4 Pin layout or assignment

Type of connectors.

4.5 Limiting values (absolute maximum rating system) over the operating temperature range, unless otherwise stated

The following limiting values should be specified in Table 1.

Table 1 – Limiting values of flexible display modules

Subclause	Characteristics	Symbol	Requirements		Unit
4.5.1	Operating temperature	T_{op}	Min.	Max.	°C
4.5.2	Operating humidity	H_{op}		Max.	%
4.5.3	Storage temperature	T_{stg}	Min.	Max.	°C
4.5.4	Storage humidity	H_{stg}		Max.	%
4.5.5	Supply voltages				V
	Supply voltage for logic drive	$V_{DD} - V_{SS}$	Min.	Max.	
	Supply voltage(s) for module	V_{MDL}	Min.	Max.	
4.5.6	Input signal voltages	V_{IN}	Min.	Max.	V

4.6 Electrical and optical characteristics

The following characteristics should be specified in Table 2.

Table 2 – Electrical and optical characteristics of flexible display modules

Subclause	Characteristics	Condition at $T_{op} = 25\text{ °C}$ unless otherwise specified	Symbol	Requirements		Unit	Reference
4.6.1	Supply voltages						
	Supply voltage for logic drive		$V_{DD} - V_{SS}$	Min.	Max.	V	
	Supply voltage(s) for module		V_{MDL}	Min.	Max.		
4.6.2	Input signal voltages		V_{IN}	Min.	Max.		
	High level input signal voltage		V_{INH}	Min.	Max.		
	Low level input signal voltage		V_{INL}	Min.	Max.	V	
	Input analogue video signals (where appropriate)		V_{VID}	Min.	Max.		
4.6.3	Operating frequency (where appropriate)		f_{op}			Hz	
	Frame frequency		f_{FRM}	Min.	Max.		
4.6.4	Supply currents	Conditions chosen to achieve maximum supply current, for example operating supply voltage, display pattern, as appropriate.	I_{tot} or I_{DD} or I_{EE}		Max.	mA	
4.6.5	High level input signal current (where appropriate)		I_{INH}		Max.	mA	
4.6.6	Low level input signal current (where appropriate)		I_{INL}		Max.	mA	
4.6.7	Dark-room contrast ratio	Specified measuring method and conditions	$DRCR$	Min.		-	IEC 62715-5-1

Subclause	Characteristics	Condition at $T_{op} = 25\text{ °C}$ unless otherwise specified	Symbol	Requirements		Unit	Reference
4.6.8	Ambient contrast ratio	Specified measuring method and conditions	ACR	Min.		-	IEC 62715-5-1
4.6.9	Luminance (where appropriate)	Specified measuring method and conditions	L	Min.		cd/m ²	IEC 62715-5-1
	Luminance uniformity (where appropriate)		L_{uni}	Min.		-	
	Colour uniformity (where appropriate)		$\Delta u'V'$		Max.	-	
4.6.10	Viewing angle range	Specified definition of viewing direction and specified contrast ratio	θ_V and θ_H	Min.	Max.	°	IEC 62715-5-1
4.6.11	Lifetime (for flexible OLED)	Specified measuring method and conditions	T_{50}	Min.		h	IEC 62341-5-3 [1] ¹
4.6.12	Power consumption	Specified measuring method and conditions	P		Max.	W	
4.6.13	Transmittance (where appropriate)	Specified measuring method and conditions	T	Min.		%	
4.6.14	Reflectance (where appropriate)	Specified measuring method and conditions	R		Max.	%	
4.6.15	Chromaticity of white (x, y) (where appropriate)		x_W, y_W	a	a	-	IEC 62715-5-1
	Chromaticity of red (x, y) (where appropriate)		x_R, y_R	a	a		
	Chromaticity of blue (x, y) (where appropriate)		x_B, y_B	a	a		
	Chromaticity of green (x, y) (where appropriate)		x_G, y_G	a	a		
4.6.16	Image sticking (where appropriate, for flexible OLED and electronic paper)	Specified measuring method and conditions	IS		Max.	-	IEC 62341-5-3 IEC 62679-3-1
^a Items of value (i.e., minimum, maximum, typical or average) are determined in a detail specification.							

4.7 Mechanical characteristics

The following characteristics should be specified in Table 3. If the item is not applicable to the display, it should be stated in the report that it is not applicable

¹ Numbers in square brackets refer to the Bibliography.

Table 3 – Mechanical characteristics of flexible display modules

Subclause	Characteristics	Condition at $T_{op} = 25\text{ °C}$ unless otherwise specified	Symbol	Requirements		Unit	Reference
4.7.1	Cyclic bending radius		R_{CB}	Min.		mm	IEC 62715-6-1
	Cyclic bending number		N_{CB}		Max.	-	
	Cyclic bending time		T_{CB}	Min.		s	
4.7.2	Static bending radius		R_R	Min.		mm	IEC 62715-6-1
	Static bending time		N_R		Max.	-	
4.7.3	Rolling radius		R_R	Min.		mm	IEC 62715-6-1
	Rolling number		N_R		Max.	-	
4.7.4	Torsion angle		θ_T		Max.	°	IEC 62715-6-1
	Torsion number		N_T		Max.	-	
4.7.5	Tension stress		S_T		Max.	Pa	IEC 62715-6-1
4.7.6	Ball dropping height		H		Max.	cm	IEC 62715-6-3
	Ball dropping weight		W		Max.	g	
4.7.7	Hitting force		F_H		Max.	N	IEC 62715-6-3
4.7.8	Pendulum side impact force		F_P		Max.	N	IEC 62715-6-3
4.7.9	Hardness scratch load		H		Max.	-	IEC 62715-6-3

4.8 Supplementary information

4.8.1 Timing characteristics, timing of logic voltages and data/format interface specification.

4.8.2 Supply voltages sequence condition, where appropriate.

4.8.3 Operating voltage range, if appropriate, as a function of temperature at specified contrast ratio.

4.8.4 Handling and operating information.

4.8.5 Precautions with respect to electrostatic discharges.

4.8.6 Precautions of installation: mechanical and/or electrical.

4.8.7 Safety information.

4.8.8 Characterization of diffuse and specular reflectance and transmittance.