

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Organic light emitting diode displays –  
Part 1-2: Terminology and letter symbols**

**Afficheurs à diodes électroluminescentes organiques –  
Partie 1-2: Terminologie et symboles littéraux**

<https://standards.iteh.ai/standards/iec/475/256fb-20e3-4a94-88ce-f07dfec3bb22/iec-62341-1-2-2007>

<https://standards.iteh.ai/standards/iec/475/256fb-20e3-4a94-88ce-f07dfec3bb22/iec-62341-1-2-2007>



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00

### A propos de la CEI

La Commission Electrotechnique internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: [www.iec.ch/searchpub/cur\\_fut-f.htm](http://www.iec.ch/searchpub/cur_fut-f.htm)

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: [www.iec.ch/webstore/custserv/custserv\\_entry-f.htm](http://www.iec.ch/webstore/custserv/custserv_entry-f.htm)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tél.: +41 22 919 02 11  
Fax: +41 22 919 03 00

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Organic light emitting diode displays –  
Part 1-2: Terminology and letter symbols**

**Afficheurs à diodes électroluminescentes organiques –  
Partie 1-2: Terminologie et symboles littéraux**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

U

## CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Terms and definitions .....	5
2.1 Classification of terms .....	5
2.2 Fundamental terms.....	5
2.3 Terms related to physical properties .....	8
2.4 Terms related to constructive elements .....	11
2.5 Terms related to performances and specifications .....	15
2.6 Terms related to production process.....	23
3 Letter symbols (Quantity symbols / Unit symbols).....	24
3.1 Classification.....	24
3.2 Letter symbols.....	24
Annex A (normative) Supplement of term.....	26
Bibliography.....	28
Figure A.1 – Pixel Pitch .....	26
Figure A.2 – Viewing Direction .....	27
Table 1 – Fundamental symbols.....	24
Table 2 – Symbols related to physical properties .....	25
Table 3 – Symbol related to constructive elements .....	25
Table 4 – Symbols related to performances and specifications .....	25

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ORGANIC LIGHT EMITTING DIODE DISPLAYS –****Part 1-2: Terminology and letter symbols**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62341-1-2 has been prepared by IEC technical committee 110: Flat panel display devices.

The text of this standard is based on the following documents:

FDIS	Report on voting
110/125/FDIS	110/132/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 62341 series, under the general title *Organic light emitting diode displays*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

Withdawn

iTech Standards  
(<https://standards.iteh.ai>)  
Document Preview

[IEC 62341-1-2:2007](https://standards.iteh.ai/standards/iec/47e256fb-20e3-4a94-88ce-f07dfec3bb22/iec-62341-1-2-2007)

<https://standards.iteh.ai/standards/iec/47e256fb-20e3-4a94-88ce-f07dfec3bb22/iec-62341-1-2-2007>

# ORGANIC LIGHT EMITTING DIODE DISPLAYS –

## Part 1-2: Terminology and letter symbols

### 1 Scope

This part of IEC 62341 gives preferred terms, their definitions and symbols for organic light emitting diode (OLED) displays; with the object of using the same terminology when publications are prepared in different countries.

### 2 Terms and definitions

For purposes of this document, the following terms and definitions apply.

#### 2.1 Classification of terms

Terms for organic light emitting diode (OLED) displays are classified as follows.

- a) Fundamental terms
- b) Terms related to physical properties
- c) Terms related to constructive elements
- d) Terms related to performances and specifications
- e) Terms related to production process

#### 2.2 Fundamental terms

##### 2.2.1

##### **active matrix (addressed) driving**

matrix driving method in which each pixel or subpixel has at least one active switching (e.g. diode or transistor) and storage element

##### 2.2.2

##### **addressing method**

method of selecting each pixel or subpixel for activation

##### 2.2.3

##### **alphanumeric display**

display that is able to show a limited set of characters comprising at least letters and Arabic numerals

##### 2.2.4

##### **area-colour display**

display in which the display panel is partitioned into several parts, each one shows a colour different from each other

##### 2.2.5

##### **bottom emission**

device structure, in which almost all light emitted passes through a substrate on which organic electroluminescent layers are made

**2.2.6**

**bottom emission display**

display using bottom emission structure

**2.2.7**

**constant-current driving**

driving method where a constant current is applied to each pixel or subpixel

**2.2.8**

**constant-voltage driving**

driving method where a constant voltage is applied to each pixel or subpixel

**2.2.9**

**display with a bright background**

display showing dark images on a bright background

**2.2.10**

**display with a dark background**

display showing bright images on a dark background

**2.2.11**

**doping method**

method of adding a small quantity of different material to host material

NOTE This method is used in order to improve device characteristics or to change the emission spectrum.

**2.2.12**

**driving method**

specific method for activating each pixel or subpixel

**2.2.13**

**dual emission display**

display in which light is emitted from both sides (top and bottom) of a substrate on which organic electroluminescent layers are made

**2.2.14**

**emissive display**

display with pixels or subpixels that emit light

**2.2.15**

**flexible display**

display that is mechanically flexible

**2.2.16**

**full-colour display**

display capable of showing at least 3 primary colours, the colour gamut of which includes a white area (e.g. containing D50, D65, D75) and having at least 64 grey scale per primary

**2.2.17**

**matrix display**

display consisting of regularly arranged pixels and/or subpixels, e.g. arranged in rows and columns

**2.2.18**

**molecular organic light emitting diode display**

organic light emitting diode display composed of organic (small) molecules



**2.2.19****monochrome display**

display capable of reproducing only one colour

**2.2.20****multi-colour display**

display other than monochrome display and full-colour display

**2.2.21****multiplex driving**

driving method of time-share driving in which one common electrode is addressed to more than two pixels or subpixels

**2.2.22****organic electroluminescence****OEL**

emission from organic materials by recombination of negatively and positively charged carriers when forward electric bias is applied

**2.2.23****organic electroluminescent display****OEL display**

display showing visual information using organic electroluminescence

**2.2.24****organic light emitting diode****OLED**

light emitting diode in which light is emitted from organic materials

**2.2.25****organic light emitting diode display****OLED display**

display incorporating organic light emitting diodes

**2.2.26****organic light emitting diode display module**

organic light emitting diode display panel, its driving electronics and optical films if used in the device design

**2.2.27****organic light emitting diode (display) panel**

display panel of an organic light emitting diode display without external drivers

**2.2.28****passive matrix addressing**

matrix driving method in which each pixel or subpixel is addressed directly by applied signals on the addressing and data lines

**2.2.29****polymer organic light emitting diode**

light emitting diode in which light is emitted from polymeric materials

NOTE The term "polymer light emitting diode" is sometimes used.

**2.2.30****segment display**

display with symbols built-up by fixed patterns and segments

### **2.2.31**

#### **standard atmospheric condition**

standard conditions of atmosphere for tests and measurements

NOTE Generic term of "standard reference atmosphere", "standard atmospheres for referee" and "standard atmospheric conditions for measurements and tests".

### **2.2.32**

#### **standard light source**

light source that approximates a defined illuminant, such as CIE illuminant A and D65

### **2.2.33**

#### **standard reference atmosphere**

reference atmospheric conditions used for standardizing the data measured under different atmospheric conditions

### **2.2.34**

#### **standard test condition**

all of conditions of the environment for tests and measurements

### **2.2.35**

#### **static driving**

method of driving in which all pixels are activated simultaneously and constantly

### **2.2.36**

#### **top emission**

device structure, in which almost all light emitted (toward) outside from a (top) side, where OLED device is formed on, of a substrate

### **2.2.37**

#### **top emission display**

display using top emission structure

### **2.2.38**

#### **transparent display**

display in which the display area is visibly transparent

### **2.2.39**

#### **zone-colour display**

NOTE See area-colour display.

## **2.3 Terms related to physical properties**

### **2.3.1**

#### **charge carrier density**

density of mobile electrons and/or holes in a material

NOTE Expressed in  $\text{cm}^{-3}$ .

### **2.3.2**

#### **crystallization temperature**

temperature at which material changes into crystalline state when it is cooled from liquid state, molten state or solution form

NOTE In case of amorphous material, the temperature at which material changes into partly or wholly crystalline state.

### **2.3.3**

#### **electroluminescence spectrum**

spectral distribution of the light emitted by the process of electroluminescence

**2.3.4****electron affinity**

energy between the vacuum level and the bottom of the conduction band

NOTE Expressed in eV.

**2.3.5****energy level**

discrete energy state of the atom or the molecule or the exciton

**2.3.6****external quantum efficiency**

ratio of the number of the photons emitted from an organic light emitting diode divided by the number of the injected electrons or holes

NOTE An external quantum efficiency is indicated as a product of an internal quantum efficiency and an external light out-coupling efficiency.

**2.3.7****fluorescence yield (efficiency)**

ratio of the number of fluorescent photons divided by the number of photons absorbed into the material

**2.3.8****fluorescence**

emission of light from an excited singlet state of materials

**2.3.9****glass transition temperature**

temperature at which an amorphous material freezes when cooled rapidly to become a solidified supercooled liquid

NOTE This temperature depends on the cooling rate and is characterized by a change in the expansion coefficient.

**2.3.10****highest occupied molecular orbitals****HOMO**

highest molecular orbitals occupied by electrons

**2.3.11****injection barrier**

energy barrier of the carrier injection at the interface of organic layer and organic layer or at the interface of organic layer and electrode

**2.3.12****internal quantum efficiency**

ratio of the number of the photons produced from the electric charges injected from the electrode divided by the number of the injected electrons or holes

NOTE An internal quantum efficiency is indicated as a product of a recombination probability of electrons and holes, an efficiency of exciton generation through carrier recombination and an efficiency of photon generation from exciton.

**2.3.13****ionization potential**

minimum energy required to remove an electron from a specified atom or molecule to such a distance that there is no electrostatic interaction between ion and electron

NOTE Expressed in eV.

**2.3.14**  
**lowest unoccupied molecular orbitals**  
**LUMO**

lowest molecular orbitals unoccupied by electrons

**2.3.15**  
**material purity**

amount of the desired substance within a material product

NOTE Expressed in wt%.

**2.3.16**  
**melting point**

temperature at which the solid state material maintains equilibrium between liquid state and solid state at a certain pressure

NOTE Usually at 1013 hPa.

**2.3.17**  
**mobility**

proportionality factor between electron (or hole) drift velocity and electric field

NOTE Expressed in  $\text{cm}^2\text{V}^{-1}\text{s}^{-1}$ .

**2.3.18**  
**optical axis**

distinguished direction in optically anisotropic materials and elements, e.g. polarizers, wave plates and retarders

**2.3.19**  
**phosphorescence yield (efficiency)**

ratio of the number of phosphorescent photons divided by the number of photons absorbed into the material

**2.3.20**  
**phosphorescence**

emission of light from an excited triplet state of materials

**2.3.21**  
**photoluminescence spectrum**

spectral distribution of the light emitted from materials excited by light of wavelengths shorter than that of the photoluminescent emission

**2.3.22**  
**polarization axis**

direction of electrical field vector of polarized light

**2.3.23**  
**quantum efficiency**

ratio of the number of generated photons divided by the number of input photons or injected electric charges

**2.3.24**  
**quantum yield**

NOTE See quantum efficiency.

**2.3.25**  
**sheet resistance**

electrical resistance of a conductive thin film with a square shape; measured from one side of the square to the opposite side

NOTE Defined as  $Rs=\rho/d$ , where  $\rho$ : resistivity coefficient,  $d$ : thickness.

### **2.3.26** **square resistance**

NOTE See sheet resistance.

### **2.3.27** **surface roughness**

degree of roughness of surface or interface

NOTE Usually, expressed in mean square deviation per  $\text{cm}^2$  of surface height measured by AFM or similar method.

### **2.3.28** **work function**

minimum energy required to remove an electron from the Fermi level of a material into the vacuum level

NOTE Expressed in eV.

## **2.4 Terms related to constructive elements**

### **2.4.1** **amorphous silicon**

solid-state silicon without distinct crystalline structure

NOTE Carrier mobility is rather low compared with polycrystalline silicon.

### **2.4.2** **anode**

electrode, which supplies holes to an organic light emitting diode display panel

### **2.4.3** **anode separator**

rib to electrically separate each anode from the adjacent anode in a passive matrix organic light emitting diode display panel

### **2.4.4** **bank**

raised elevation that is fabricated around each pixel or subpixel

NOTE Generally, it is used to prevent overflowing of coated solution.

### **2.4.5** **black matrix**

film-like structure that absorbs ambient or internally scattered light

### **2.4.6** **buffer layer**

general term used to describe a layer inserted in the device structure which may be used, for example, to improve current injection or reduce surface roughness

### **2.4.7** **cathode**

electrode, which supplies electrons to an organic light emitting diode display panel

### **2.4.8** **cathode separator**

rib to electrically separate each cathode from the adjacent cathode in a passive matrix organic light emitting diode display panel

#### 2.4.9

##### **circular polarizer**

optical component consisting of a linear polarizer and 1/4-wavelength retarder plate which transforms the component of incoming light parallel to the polarizer, into circularly polarized light

#### 2.4.10

##### **colour changing medium**

medium containing fluorescent dyes that absorb emission energy of organic electro-luminescence and re-emit photons with longer wavelength than the absorbed photons

#### 2.4.11

##### **colour filter**

material that selectively absorbs, reflects, and transmits light of specific wavelength ranges

NOTE Generally, it is used as 3-primary colour (red, green, blue) filters with white organic light emitting diode for colour image display or as a filter to improve the colour saturation of an organic light emitting diode.

#### 2.4.12

##### **common electrode**

- a) electrode connected to all segments in a segment display
- b) row- or column scanning electrode in a passive matrix display
- c) electrode connecting all pixels in a row and/or a column in an active matrix display

#### 2.4.13

##### **data electrode**

electrode driven by the data signal voltage or current synchronized with the scanning signals in a multiplexed display

#### 2.4.14

##### **dopant**

different materials added to host material in small quantity to improve device characteristics such as enhancement of luminous efficacy, spectrum change of emission, and decreasing of resistance

#### 2.4.15

##### **dot electrode**

discrete electrode for each pixel or subpixel in an active matrix display, which is separated from the signal electrode line by a switching device such as TFT

#### 2.4.16

##### **driver**

circuits that supply signal- and scanning voltages and/or currents to a display panel

NOTE There are two types of drivers, a scanning electrode (row electrode) driver and a signal electrode (column electrode) driver, in a matrix display.

#### 2.4.17

##### **electron blocking layer**

organic layer that blocks the flow of electrons in an organic light emitting diode with multilayer structure; usually an organic material with smaller electron affinity than the electron transporting layer

#### 2.4.18

##### **electron injection layer**

layer inserted between a cathode and an electron transport layer to efficiently inject electrons from the cathode into the organic layer in an organic light emitting diode