BS EN 62496-4:2011

BSI Standards Publication

Optical circuit boards

Part 4: Interface standards — General and guidance

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National foreword

This British Standard is the UK implementation of EN 62496-4:2011. It is identical to IEC 62496-4:2011.

The UK participation in its preparation was entrusted to Technical Committee GEL/86, Fibre optics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Optical circuit boards - Part 4: Interface standards - General and guidance
(IEC 62496-4:2011)

Cartes à circuits optiques -
Partie 4: Normes d'interface -
Généralités et lignes directrices
(CEI 62496-4:2011)

Optische Leiterplatten -
Teil 4: Schnittstellennormen -
Allgemeines und Leitfaden
(IEC 62496-4:2011)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 86/379/FDIS, future edition 1 of IEC 62496-4, prepared by IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62496-4 on 2011-03-02.

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The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2011-12-02
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-03-02

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62496-4:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60027 series	NOTE	Harmonized in EN 60027 series (not modified).
IEC 60695-11-5	NOTE	Harmonized as EN 60695-11-5.
IEC 60825-1	NOTE	Harmonized as EN 60825-1.
IEC 60825-2	NOTE	Harmonized as EN 60825-2.
IEC 61300 series	NOTE	Harmonized in EN 61300 series (not modified).
ISO 286-1	NOTE	Harmonized as EN ISO 286-1.
ISO 1101	NOTE	Harmonized as EN ISO 1101.
ISO 7083	NOTE	Harmonized as EN ISO 7083.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60793-1-45 (mod)	-	Optical fibres - Part 1-45: Measurement methods and test procedures - Mode field diameter	EN 60793-1-45	-

CONTENTS

OPTICAL CIRCUIT BOARDS –

Part 4: Interface standards – General and guidance

1 Scope

This part of IEC 62496 covers general information on the subject of Optical Circuit Board (OCB) interfaces. It includes normative references, definitions and rules for creating and interpreting the standard drawings.

2 Normative references

The following referenced documents are indispensable for the application 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 60793-1-45, *Optical fibres – Part 1-45: Measurement methods and test procedures – Mode field diameter*

3 Terms and definitions

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

3.1 General definitions

3.1.1
OCB interface
sizes and relative locations for the features comprising the OCB. It also includes the location of the coordinates of the alignment mark

3.1.2
OCB body
portion of an OCB where optical fibres/waveguides are fixed/fabricated to form an optical routing pattern. The typical shape of an OCB body is rectangular

3.1.3
shape of the OCB body
outline of the OCB body which consists of a straight line and a curved line

NOTE The straight line is defined by coordinates of start point and end point, and the curved line is defined by the coordinates of the start and the end points of the curve and by radius of curvature.

3.1.4
OCB tail
(OCB leg)
projection from the OCB body for interconnection with optical fibre cables and/or optical components

3.1.5
length of the OCB tail
distance between the edge of an OCB body and the end of the OCB tail protruding from the edge of the OCB body

NOTE If the OCB tail has a mark in the vicinity of its end, the OCB tail length is the distance between the mark and the end of the OCB body.

3.1.6
OCB port
position on the edge of the OCB body where OCB tails protrude from the OCB body

NOTE Relative positional accuracy between the OCB port and alignment mark or origin point is important for connection with other boards or devices. The OCB port is defined only for the fibre flexible OCB.

3.1.7
position of the OCB port
coordinates at the intersectional point of the central axis of the optical fibre and the edge of the OCB body

NOTE The coordinates of the OCB port consisting of closely arrayed fibres shall be defined by the coordinates of the OCB port closest to the origin point.

EXAMPLE In a case where the OCB body of the fibre flexible OCB is put in the first quadrant and an outline or an angle of the OCB is in contact with the X-axis or the Y-axis, as shown in Figure B.2 of Annex B, the coordinates of origin are defined as the origin point of the fibre flexible OCB. It is recommended to set one side of the OCB body parallel to the X-axis or the Y-axis. In another case where the alignment mark for assembly of optical components on the OCB is located near the I/O ports, the centre of the alignment mark is defined as the origin point of the OCB.

3.1.8
I/O port
window in the OCB through which optical energy enters and/or exits

NOTE The I/O port is located at the end of the OCB tail, at the edge of the OCB body or at the surface of the OCB where the OCB is connected to optical fibre cables and/or optical components.

3.1.9
alignment mark for assembly of OCB
mark on the OCB body, typically a through hole in the OCB body, for assembly of the OCB to another board and/or equipment

NOTE The coordinates of the alignment mark are defined by the coordinates at the centre of the mark. The alignment mark is used instead of a datum target in Annex A.

3.2 Core shape definitions

There are two types of core shape, square or circular, for waveguide OCBs

EXAMPLE 1 Square shape consists of four corners formed by extrapolating or interpolating an arbitrary shape by four straight lines, as shown in Figure 1.

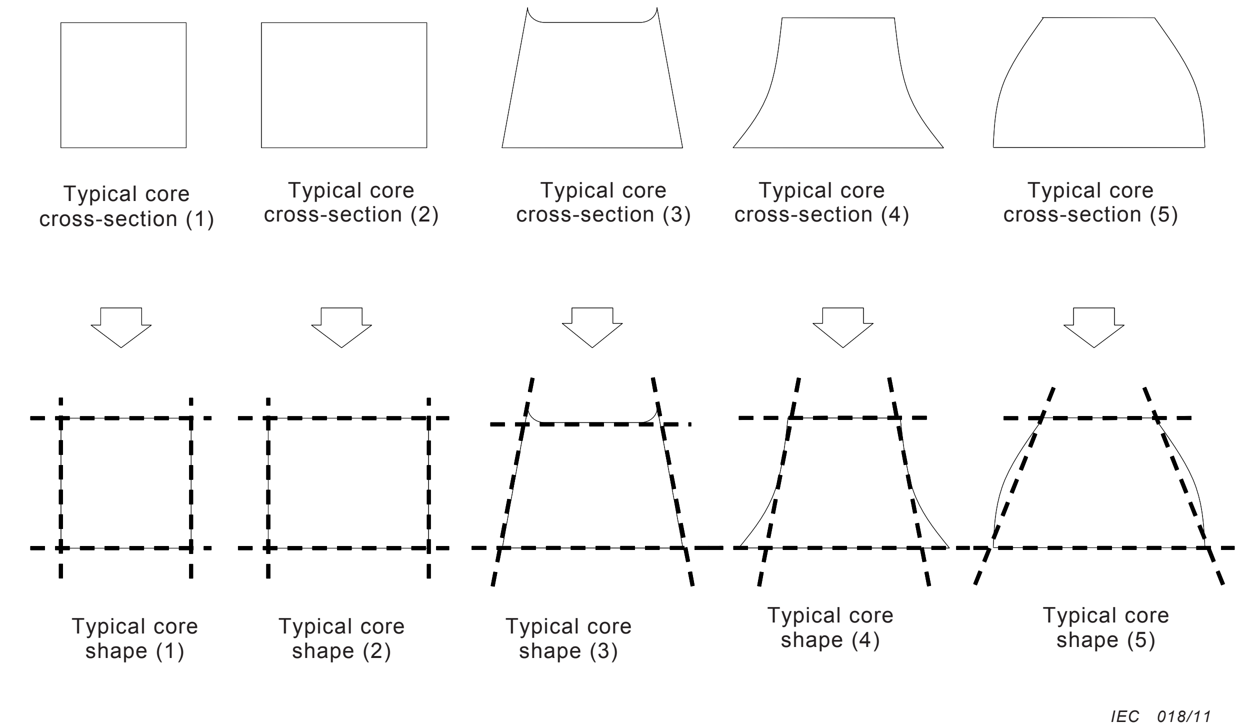


Figure 1 – Examples of shapes of square core (quasi-square made by extrapolation or interpolation)

EXAMPLE 2 Circular shape has round boundaries. It is not necessarily perfectly circular and includes elliptical shapes or any round shapes. Examples of circular shapes are shown in Figure 2.

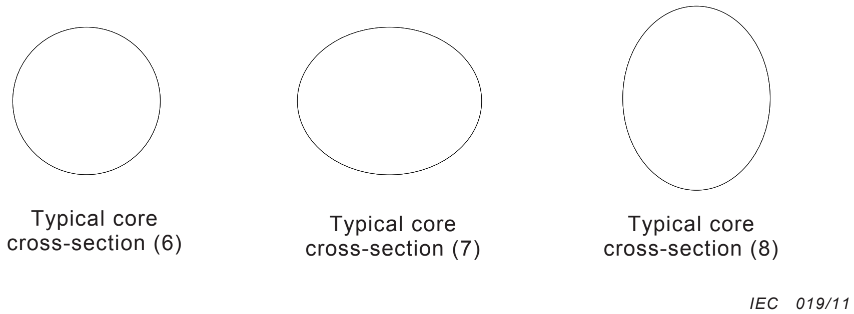


Figure 2 – Examples of shapes of circular core

The six structural parameters for the square core shape are shown in Figure 3. Structural parameters for the circle core shape are defined by NFP (near field pattern) observation of a cross section (see IEC 60793-1-45).

3.2.1
core width (top)
upper horizontal component of the core shape

3.2.2
core width (bottom)
lower horizontal component of the core shape

3.2.3
core height
distance between the lower and upper horizontal lines

3.2.4
core centre
intersection point of two diagonal lines of a quadrangle consisting of four midpoints of four lines of the core shape, as illustrated in Figure 3

NOTE This intersection point corresponds to the centre of gravity in a system of material points.

3.2.5
core inner diameter
diameter of an inscribing circle with its centre at the core centre

3.2.6
core outer diameter
twice the distance between the core centre and the farthest corner of the core shape

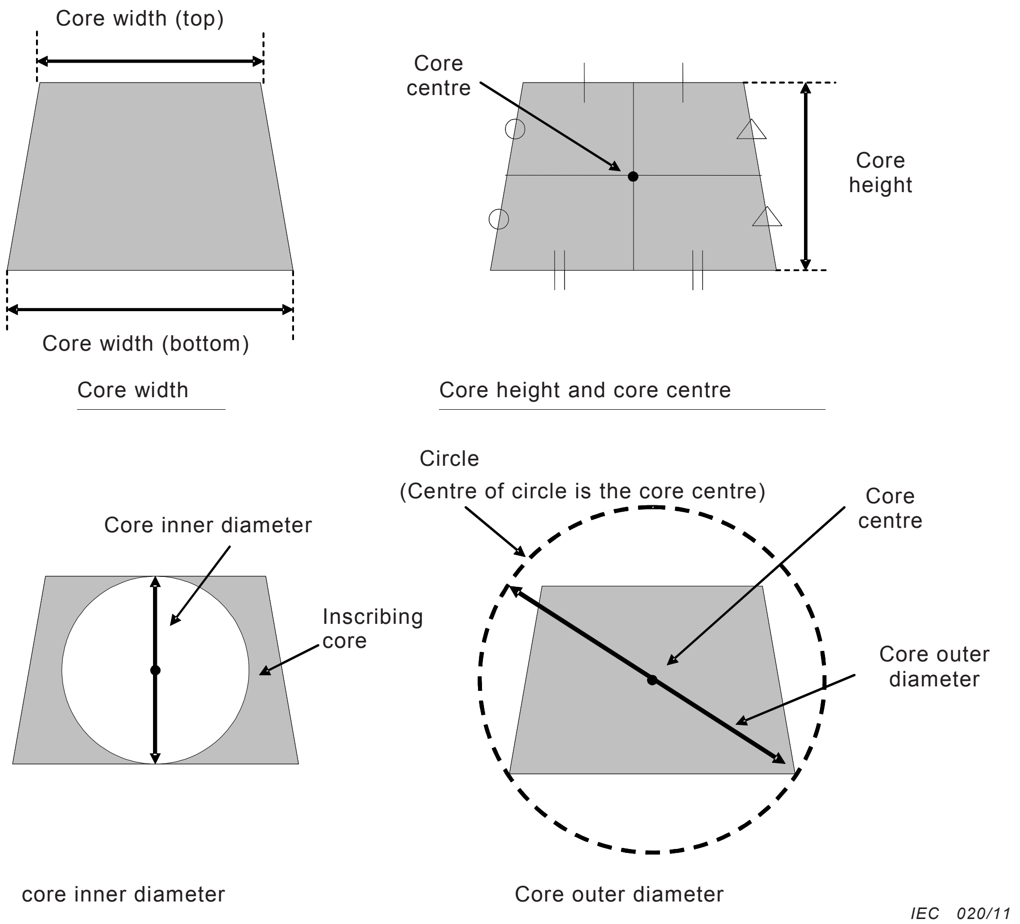


Figure 3 – Six structural parameters of square core shape of waveguide OCB

4 Coordinates of I/O ports of waveguide OCB

4.1 Structural types of waveguide OCB

OCBs are divided into two types defined by the positions and orientations of their optical I/O ports. According to one type, the input / output port is defined by the exposed cross-section of a waveguide at an edge of the board (end face I/O type), as illustrated in Figure 4, or at an edge of a hole formed inside the area of the board, as illustrated in Figure 5. According to another type, the input / output port contains an optical path converter such as a mirror to deflect optical signals out of or into the surface of the board (surface I/O type), as illustrated in Figure 6. An optical path converter can also be defined by a waveguide, which is bent towards the surface of the board, such that its cross-section is exposed on the surface of the board and thereby forms a surface I/O port, as illustrated in Figure 7. A board may contain both types of I/O port. The coordinates of an end face I/O port, as illustrated in Figure 4, are defined by the core centre as set out in 3.10.1.4. A surface I/O port is defined by the projection of an optical path converter, such as a mirror, on the surface of the board, as illustrated in Figure 6. The position of the I/O port in the axis orthogonal to the plane of the board is defined at the surface of the board on which the projection appears. The coordinates of the surface I/O port are defined by the centre of the projected area of the optical path converter on the surface or the centre of the core of a bent waveguide exposed on the surface, as set out in 3.10.1.4. Optical I/O ports on both types of OCB can be distributed in 2 dimensions across a plane shared by the I/O port cross-section, as shown in Figure 4 and Figure 6.

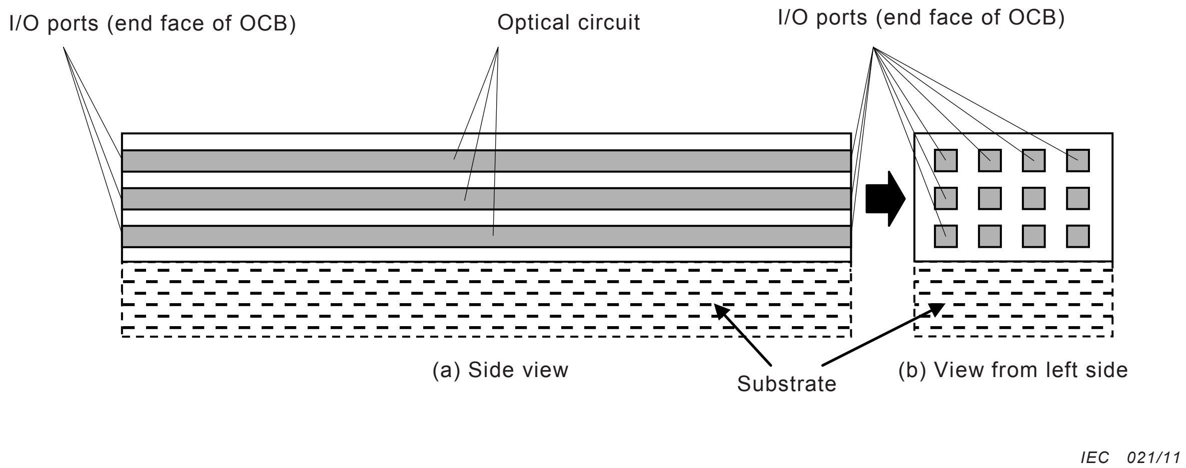


Figure 4 – Example of OCB with end face I/O ports at edge of board

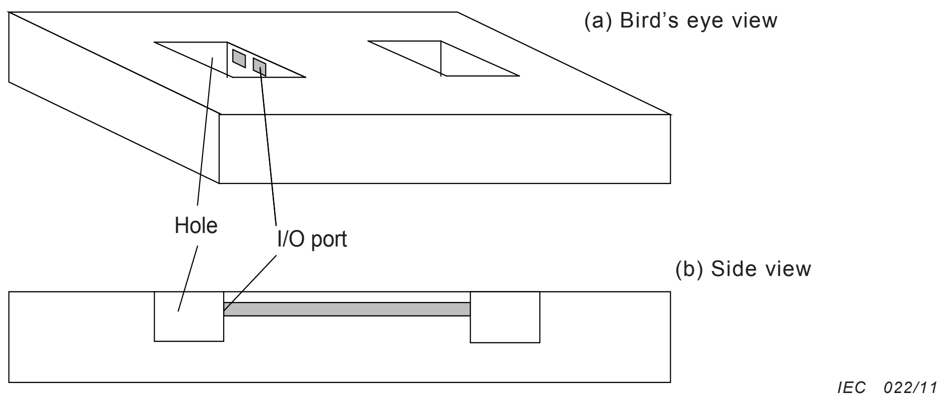


Figure 5 – Example of OCB with end face I/O type

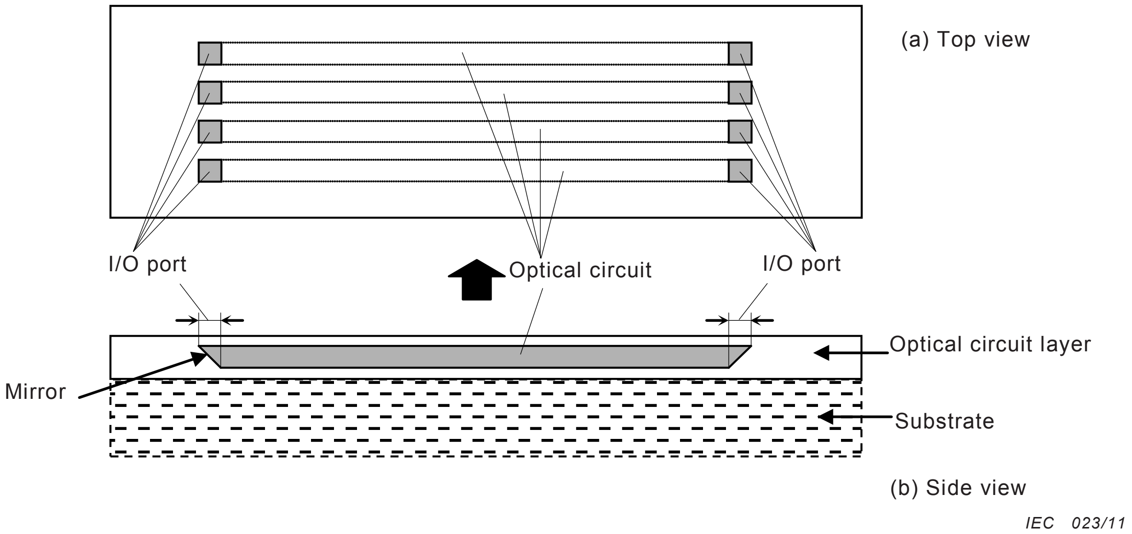


Figure 6 – Example of OCB with surface I/O ports

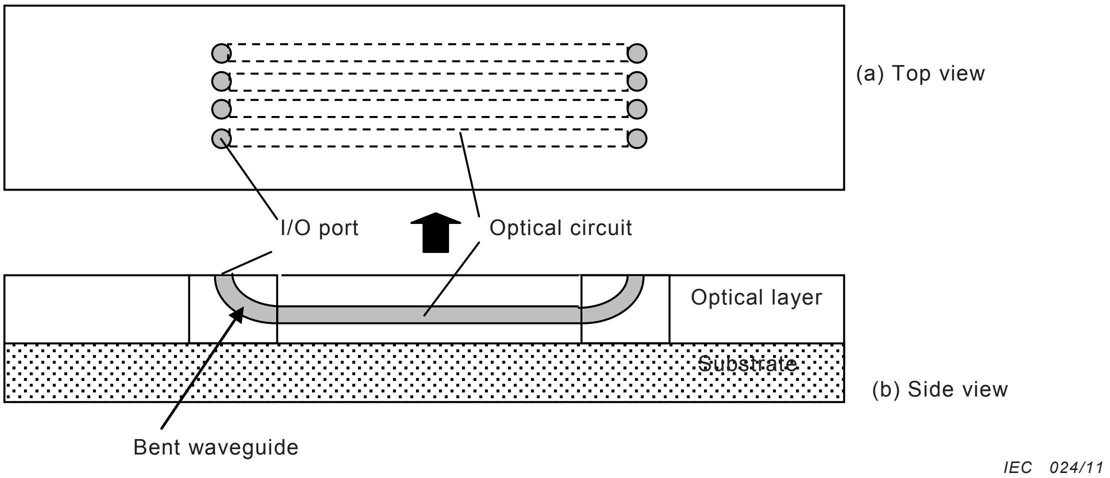


Figure 7 – Example of OCB with surface I/O ports

4.2 Origin point and coordinate axis

4.2.1 General

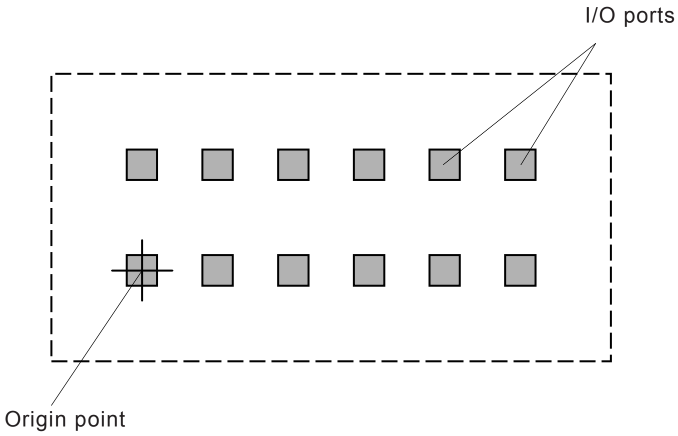
It is necessary to clearly define the origin point and coordinate axis of a port for transfer of coordinate data between optical Input/output ports. They are defined in the following way: There are two reference systems, the internal reference system and external reference system according to the definition of an origin point. The internal reference system is the system with the origin point at a specific optical input/output port, or the system with the origin point at the mid-point of two optical Input/output ports. There are cases for the external reference system, one with an origin point of a dedicated structure such as a marker and the other with an origin point of one point of an OCB such as an edge of the board. The coordinate system, origin point and coordinate axis are summarized in Table 1.

Table 1 – The coordinate system, origin point and coordinate axis

Coordinate system	Origin point	Example of Axis	Applicable to
Internal coordinate system	Specific I/O port	Aligned direction of multiple I/O ports	End face I/O port type
	A specific position on an OCB	Direction of aligned I/O ports in a specific direction	
External coordinate system	A dedicated newly formed structure	Use a dedicated newly formed structure	Surface I/O port type
	A structure existing on an OCB	Use one outer edge of an OCB	End face I/O port type
Internal coordinate system/ external Coordinate system	A specific I/O port as the origin and use an external coordinate system as the coordinate axis		Surface I/O port type

4.2.2 Origin point and coordinate axis by internal coordinate

They are defined by means of the coordinates of specific optical input/output ports for an OCB which does not have a specific structure for an origin point and coordinate axis. A definition made in this way is known as definition by internal coordinate system. Examples of the definition of origin point are 1) use of specific optical input/output ports as the origin point, as illustrated in Figure 8, and 2) to define an origin at a specific point on a board, a point where there are no optical input/output ports but which can easily be identified (see Figure 9). Figure 9 is an example of defining an origin at the mid-point between two neighbouring ports at the centre of the bottom line of ports on a board. There are two ways of defining the direction of an axis 1) the direction of a line intersecting multiple ports (Figure 10), or 2) use of the direction of a specific optical circuit (Figure 11) when the wiring is recognisable and straight. Definitions of names of axis (e. g., “x” or “y”) and sign (“-x” or “-y”) are also to be defined simultaneously. When the direction of one axis is defined, the direction of the other axis is at a right angle to the direction of the axis defined first. This coordinate system is suitable for an OCB with end face type ports (cross section), but can also be applicable to a board with surface type input/output ports.



IEC 025/11

Figure 8 – Definition of origin point 1): A specific port is used as the origin point

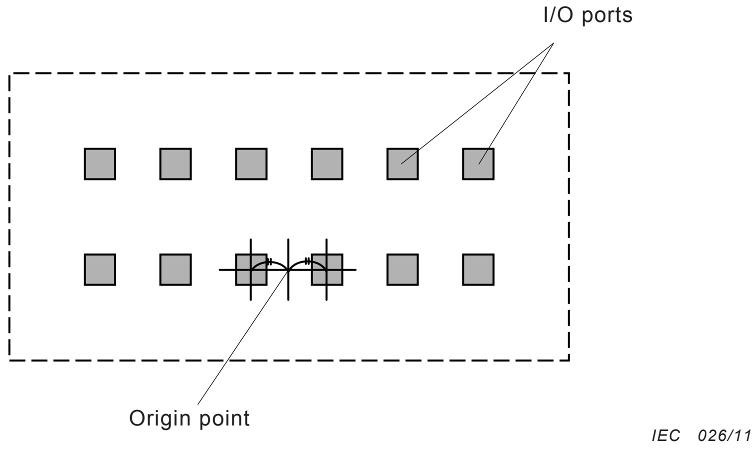


Figure 9 – Definition of origin point 2): Determination of an origin point at a place where there is no port (a mid-point of adjacent two ports at the centre of bottom line is used as the origin)

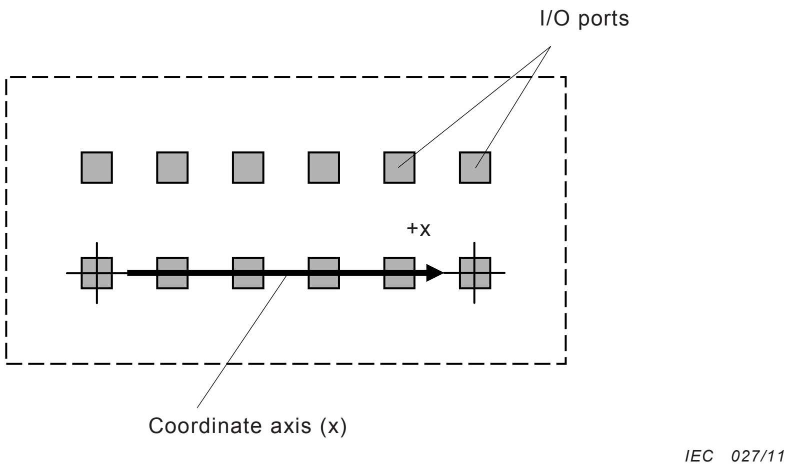


Figure 10 – Definition of the direction of coordinate axis 1): Use the direction of alignment of multiple ports

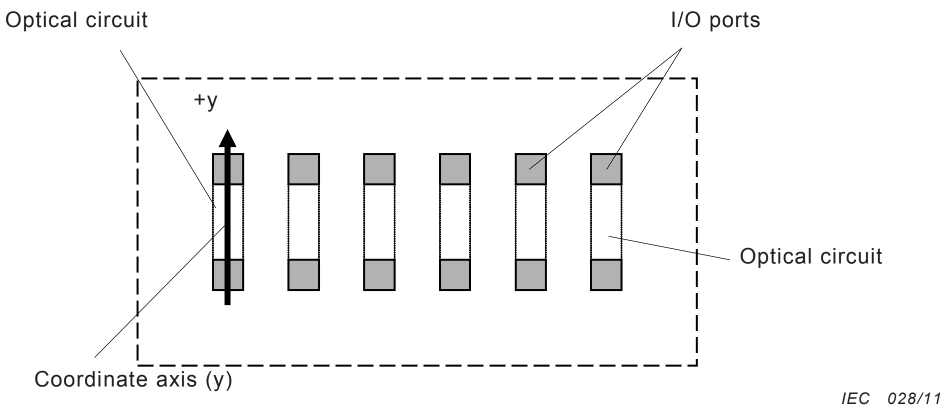


Figure 11 – Definition of direction of coordinate axis 2): Along a specific optical circuit (only if the wire is recognizable)

4.2.3 Origin point and axis by external coordinate

A way of defining the origin point and coordinate axis of an OCB using a structure formed on the board for the purpose of indicating the origin point and coordinate axis, or using a specific visible structure on the OCB is known as the definition of origin point and axis by external coordinate system. Figure 12 shows the case where a structure is formed on a board to indicate the origin point and the direction of coordinate axis, and Figure 13 shows the case where a structure already exists on a board is used for reference. Figure 13 is the case of using peripheral (edge) of a board. This method is effective especially for a board with edge-type optical input/output ports when the precision of the dimension of the edge is high enough. The OCB may be connected to an optical connector with passive alignment in reference to the outer shape of the OCB. It is possible for one of the origin points or axes to be based on an internal coordinate system while the other is based on an external coordinate system, as illustrated in Figure 14.

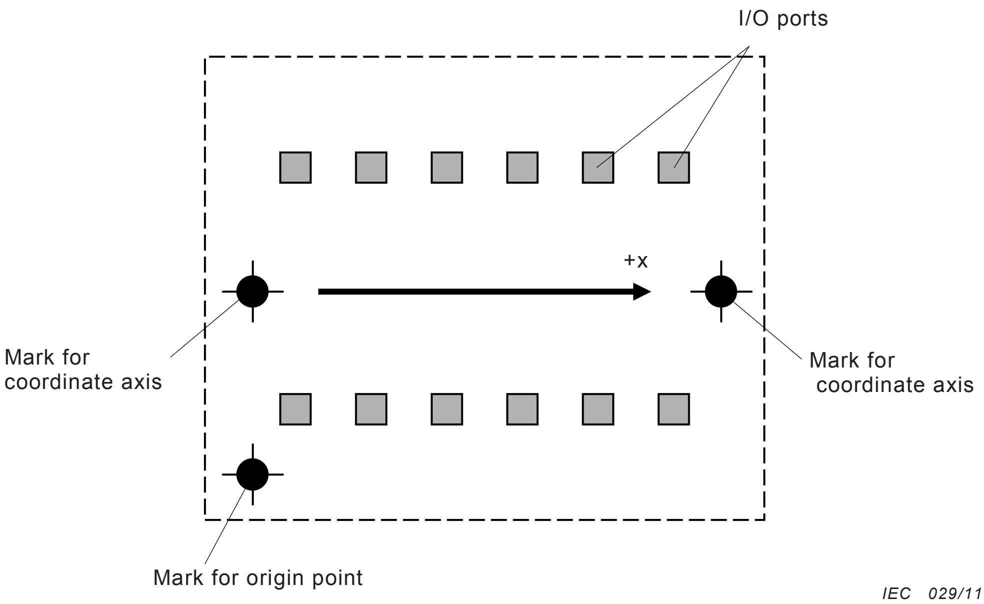


Figure 12 – Origin point and coordinate axis (1)

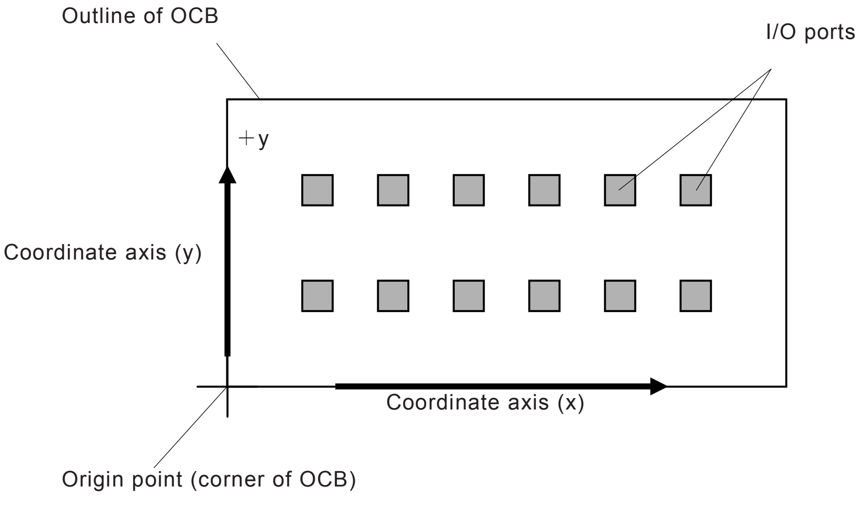


Figure 13 – Origin point and coordinate axis (2)

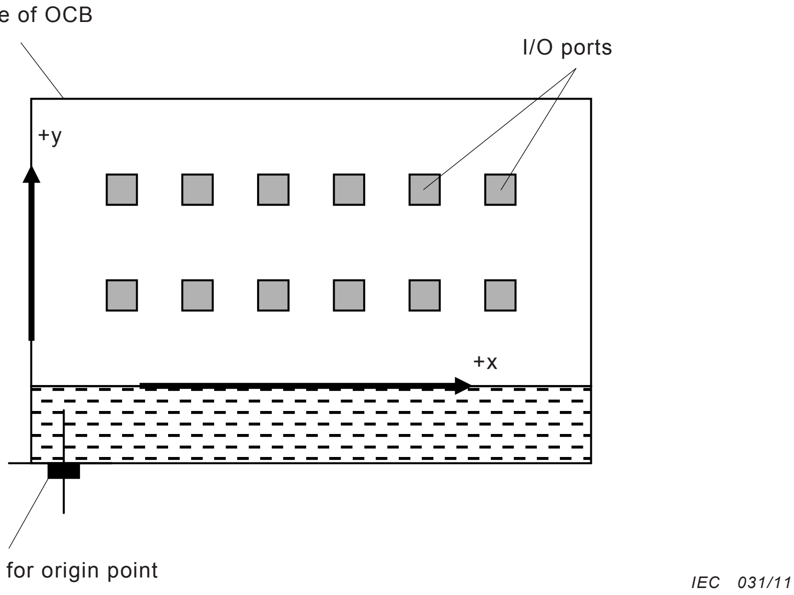


Figure 14 – Origin point and direction of coordinate axis (combination of Figure 12 and Figure 13)

4.2.4 Origin point and axis employing both internal and external coordinates

It is possible to define the origin point and coordinate axis using both of the coordinate systems. Examples are shown in Figures 15 and 16. The origin point is defined by the internal coordinate system in both examples using a specific input/out port and the direction of the axis is defined by the external coordinate system. A dedicated structure is used in Figure 15, and the peripheral of a board is used in Figure 16.

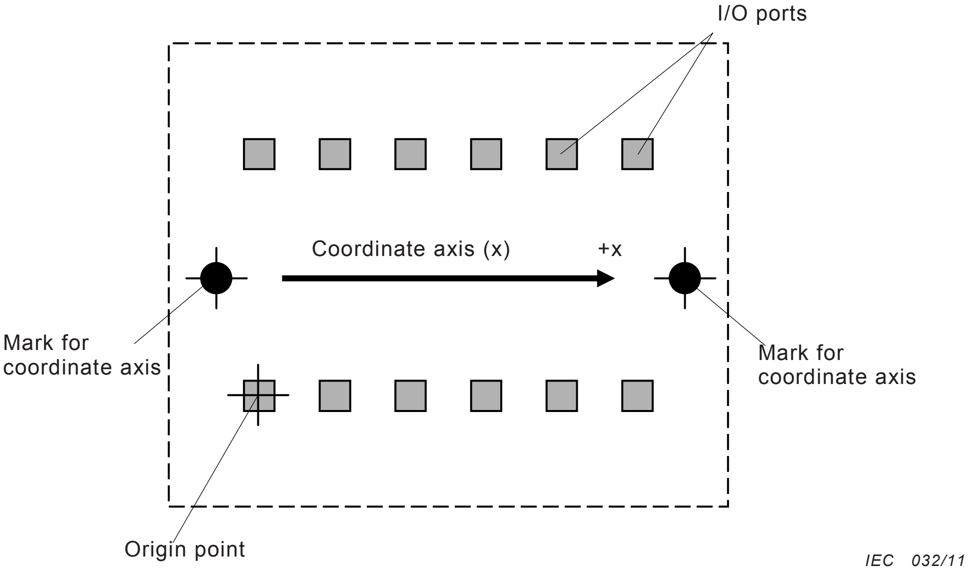


Figure 15 – Use of both internal coordinate and external coordinate systems: Internal for the origin point (a specific optical input/output port) and external for the direction of the axis (dedicated structures)

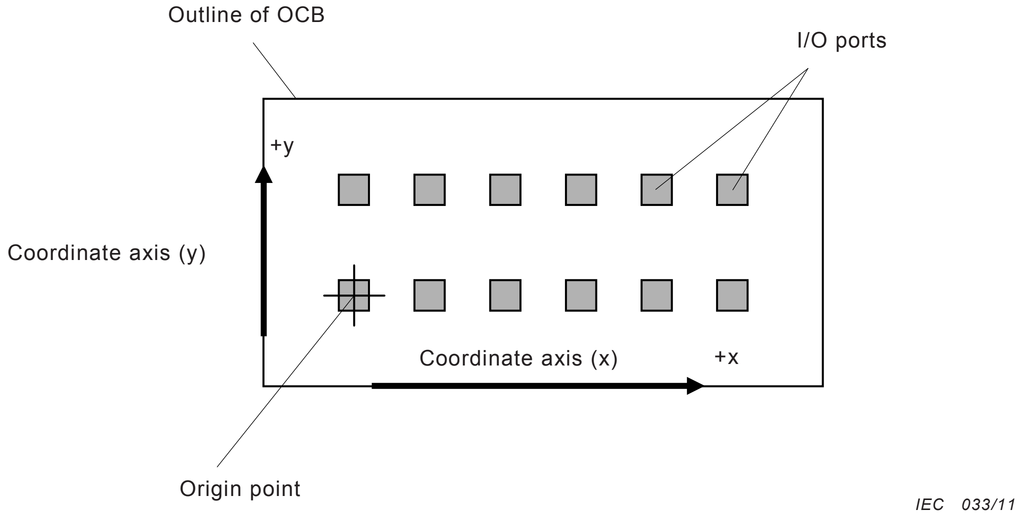


Figure 16 – Use of both internal coordinate and external coordinate systems: Internal for the origin point (coordinates of a specific optical input/output port) and external for the direction of the axis (periphery of the board)

5 Misalignment angle of I/O ports

5.1 General

Misalignment angle of I/O ports is angle between the cross section of I/O ports and the axis of the waveguide (or the surface of the board) is required to estimate the optical coupling efficiency with other I/O ports. The misalignment angle is defined by the angle between the surface of the I/O port and the perpendicular plane to the axis of the waveguide. Since tilting of a plane in three dimensions is possible toward three independent directions, it is necessary to describe the tilt angles separately for edge type and surface type I/O ports.

5.2 Misalignment angle of I/O port in edge type

For the end face I/O type, the misalignment angle θ_t is defined in Figure 17. The plane of the I/O port is the surface plane of the I/O port where reflection and refraction occur when a light passes through the I/O port. The axis of the waveguide is the axis passing through the centre of the core in a short range near the I/O port. The angle θ_t of I/O port is determined by the angle between the normal direction of the plane of the I/O port and the z direction, when the waveguide axis is aligned to the -z direction.

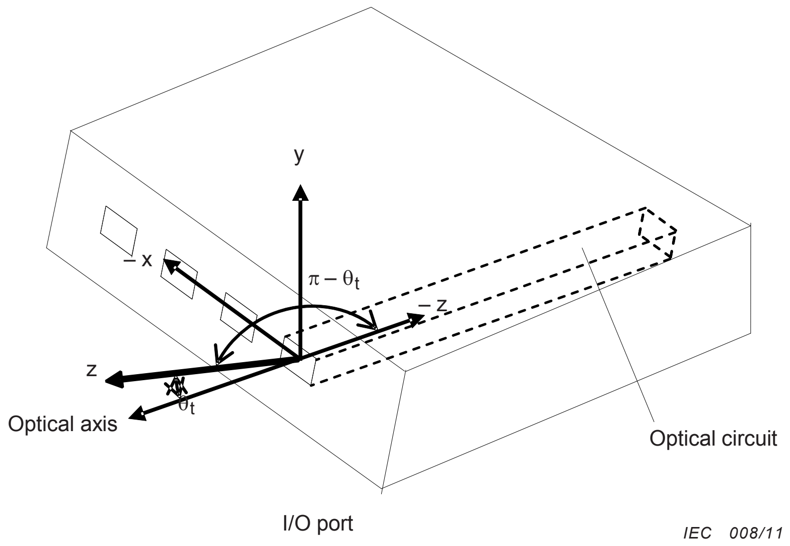
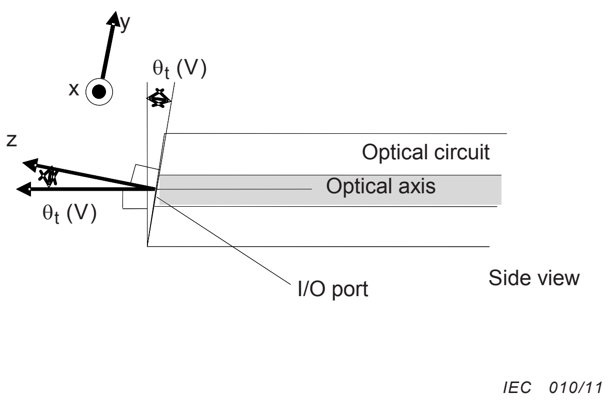


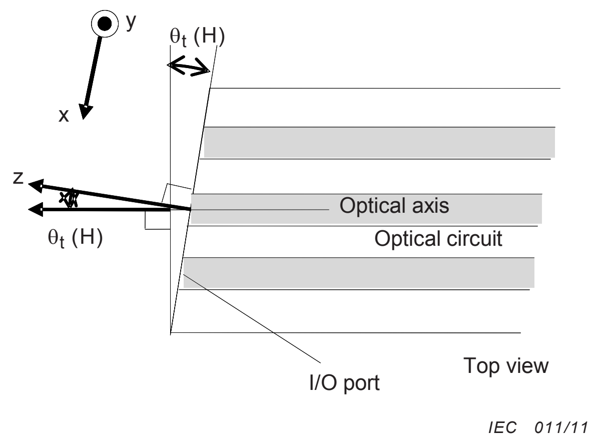
Figure 17 – Definition of misalignment angle of I/O port in edge type

When the misalignment angle is measured from a cross section of the waveguide, the angle may be represented on two orthogonal cross sections, as shown in Figure 18 (a) and (b). On a vertical cross section of OCB which is cut along the core of a waveguide, An angle of vertical rotational misalignment θ_t(V) is defined by the angle subtended by the plane of the I/O port and the vertical axis y as illustrated in Figure 17. An angle of horizontal rotational misalignment θ_t(H) is defined by the angle subtended by the plane of the I/O port and the horizontal axis x as illustrated in Figure 17. The angle θ_t defined by the normal direction of the plane of the I/O port in Figure 17 is approximated by equation 1:

$$\sin\theta_t \approx \sqrt{\sin^2\theta_t(V) + \sin^2\theta_t(H)} \qquad (1)$$

when $\theta_t(V)$ and $\theta_t(R)$ are small angles.





(a) Vertical (rotational) misalignment angle **(b) Horizontal (rotational) misalignment angle**

Figure 18 – Definition of vertical and horizontal rotational misalignment angle of I/O port in edge type

5.3 Misalignment angle in surface type I/O port

For the surface I/O type, the misalignment angle is defined in Figure 19. The axis of the waveguide and the normal direction of the plane of the I/O port are determined by the same manner as those in the end face I/O port. The angle θ_t of the I/O port is determined by the angle between the normal direction to a plane of the I/O port and the z direction of the axis of the waveguide. If the plane of the surface I/O port corresponds to the surface of the OCB, the normal direction to a plane of the I/O port becomes the perpendicular direction to the surface of the OCB.

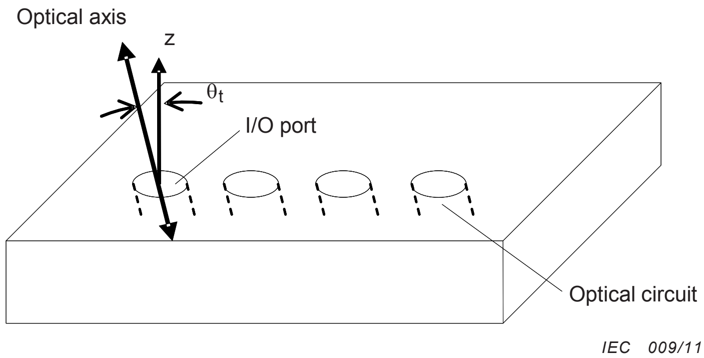
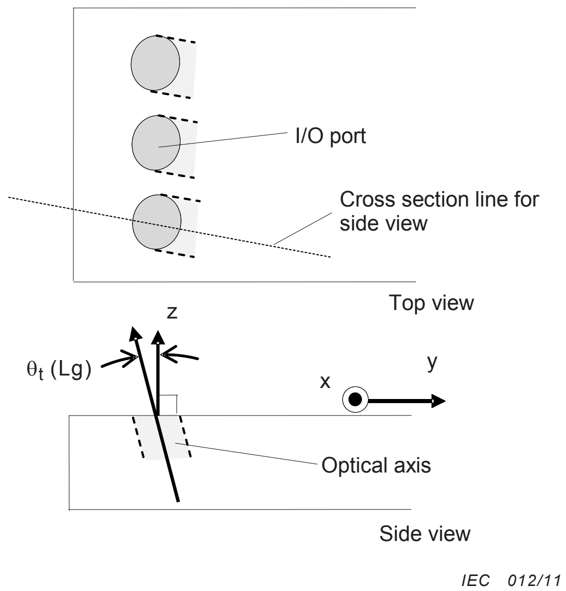


Figure 19 – Definition of misalignment angle of I/O port in surface type

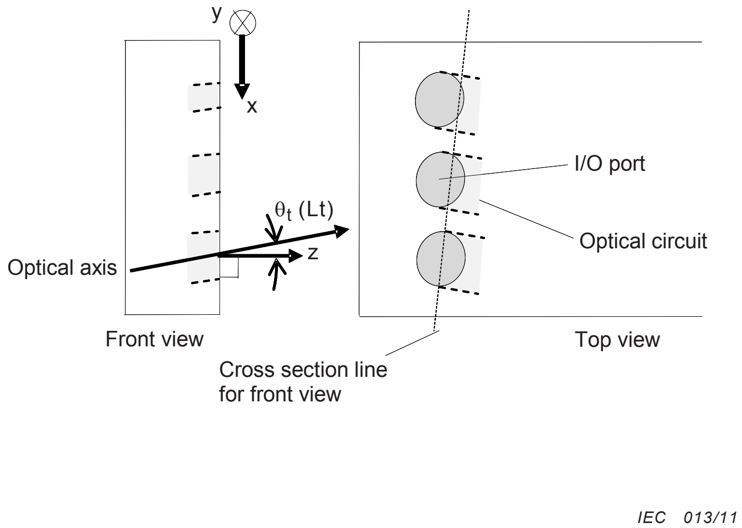
In the surface type I/O port, the misalignment angle may be also divided into two angles, according to the selection of the cross section, as illustrated in Figure 20 (a) and Figure 20 (b). On a longitudinal cross section of the OCB, along the core of a waveguide, a longitudinal angle θ_t(Lg) is revealed from the plane of the surface I/O port. On a lateral cross section of OCB across a waveguide array, which is perpendicular to the longitudinal cross section, lateral angle θ_t(Lt) is revealed from the plane of the surface I/O port. The misalignment angle θ_t defined by the normal direction of the plane of the I/O port in Figure 19 is approximated by equation 2:

$$\sin\theta_t \approx \sqrt{\sin^2 \theta_t(Lg) + \sin^2 \theta_t(Lt)} \qquad (2)$$

when $\theta_t(Lg)$ and $\theta_t(Lt)$ are small angles.



(a) Longitudinal misalignment angle of I/O port in surface type



(b) Lateral misalignment angle

Figure 20 – Definition of longitudinal and lateral misalignment angle of I/O port in surface type

6 Mirror angle

A mirror angle is defined as the angle between a mirror surface and a reference line.

(1) mirror angle 1
angle θ_1 subtended by a mirror surface and a core bottom boundary shown in Figure 21. The reference line was set on boundary edge between core and cladding. Another reference line is a tangential to the plane of the mirror at the core cladding interface.

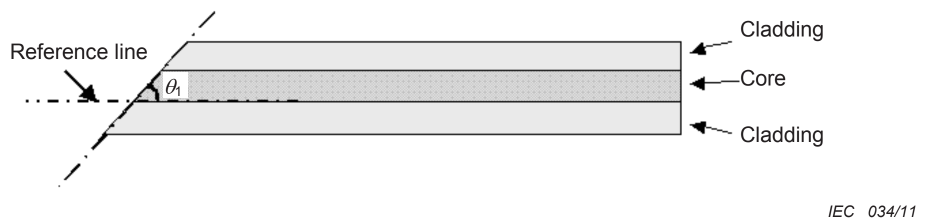


Figure 21 – Mirror angle 1

(2) mirror angle 2
angle θ_2 subtended by a mirror surface and an optical waveguide surface shown in Figure 22. The reference line was set on the surface of an optical waveguide. Another reference line is a tangential to the plane of the mirror at the waveguide surface.

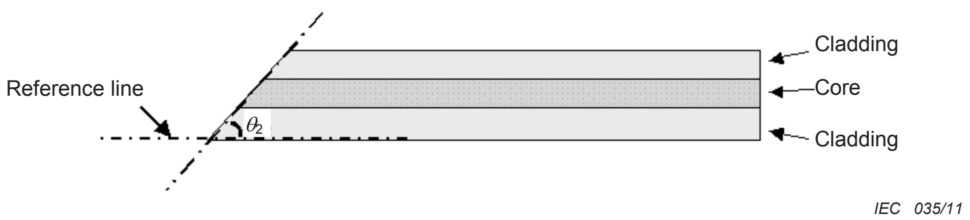


Figure 22 – Mirror angle 2

(3) mirror angle 3
angle θ_3 of subtended by a mirror surface and an OCB surface is shown in Figure 23. The reference line was set on the surface (or bottom) of an OCB. Either of the angles defined in 3.14 (1) or 3.14 (2) may be used instead of this angle if the bottom of the OCB cannot be measured. Another reference line is a tangential one at the OCB surface.

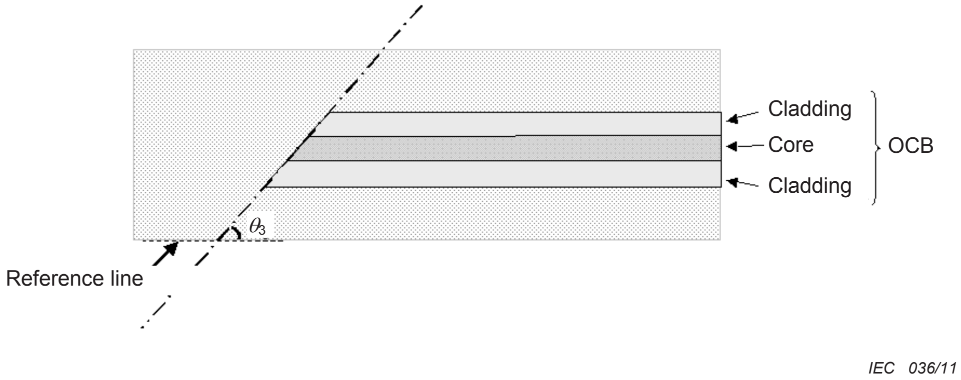


Figure 23 – Mirror angle 3

(4) angle between mirror and OCB, optical waveguide and upper surface of the core:
it is permissible to use the upper boundary edge of the board as in 3.13 (1) to 3.13 (3). The reflection angle θ_4 is the angle subtended by the upper boundary of the board and the tangent to the plane of the mirror at the upper boundary as illustrated in Figure 24.

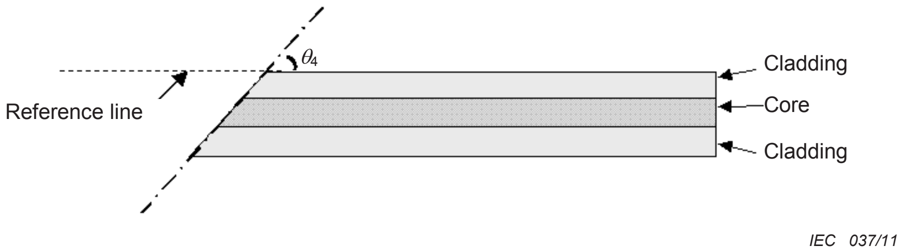


Figure 24 – Mirror angle 4

(5) mirror tilt angle
angle ϕ_t subtended by a mirror surface and the plane normal to the optical axis of the waveguide shown in Figure 25.

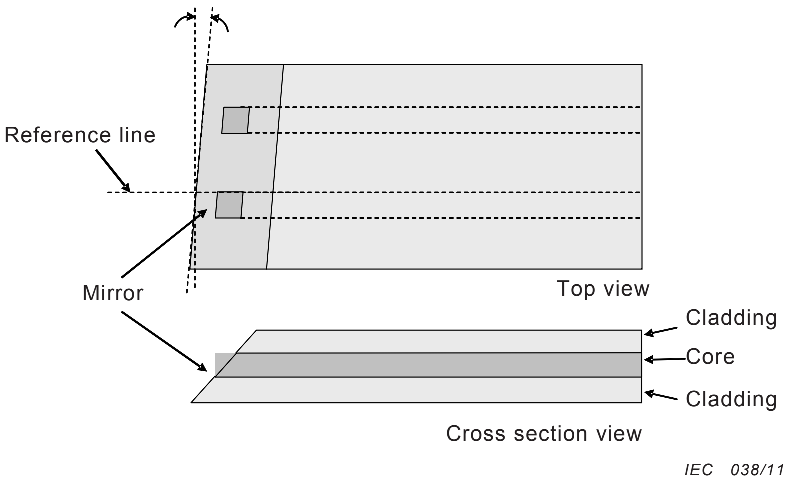


Figure 25 – Mirror tilt angle

7 Hole

A hole made on the surface of an OCB or on the edge of the board to insert a component such as an optical device is called a hole. A hole required for accurate optical alignment of the optical I/O ports between an OCB and an optical component is defined as an optical alignment hole. The optical alignment can be achieved by inserting guide pins into the alignment holes which are formed on both sides of an OCB and an optical component, as illustrated in Figure 26.

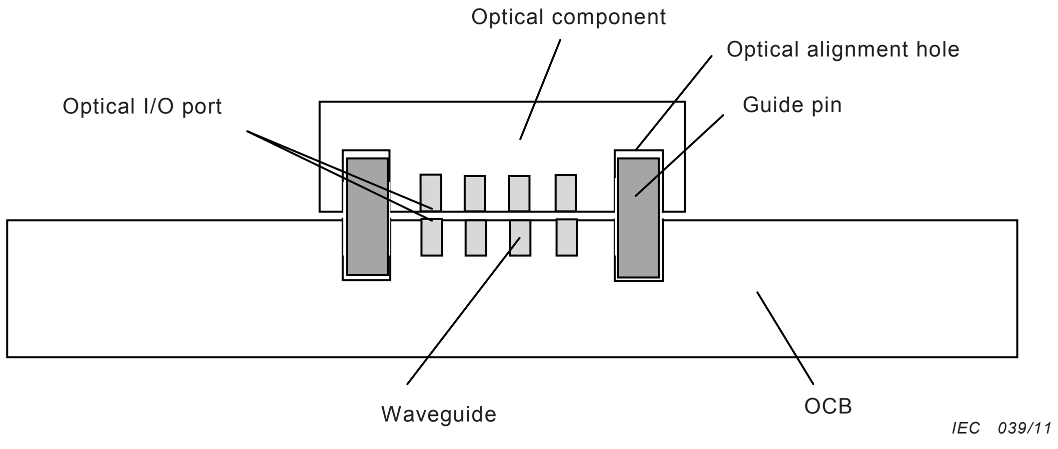


Figure 26 – Example of optical alignment hole

A typical example of the hole is shown in Figure 27. Structural parameters for hole are as follows.

(1) long diameter on the top side (V_{1t})
the longest distance across a hole when seen from above on a board is the long diameter of a hole. When a hole is a true circle or square, the long diameter and the short diameter of a hole are the same.

(2) short diameter on the top side (V_{2t})
the shortest distance across a hole on a board when seen from above is the short diameter of a hole. When a hole is a true circle or square, the long diameter and the short diameter of a hole are the same.

(3) long diameter on the bottom side (V_{1b})
the longest distance across a hole on a board when seen from below is the long diameter of a hole. When a hole is a true circle or square, the long diameter and the short diameter of a hole are the same.

(4) short diameter on the bottom side (V_{2b})
the shortest distance across a hole on a board when seen from below is the short diameter of a hole. When a hole is a true circle or square, the long diameter and the short diameter of a hole are the same.

(5) depth of a hole (V_d)
when a hole does not completely penetrate a board (i.e. a blind hole), the depth of the hole is defined as the hole depth.

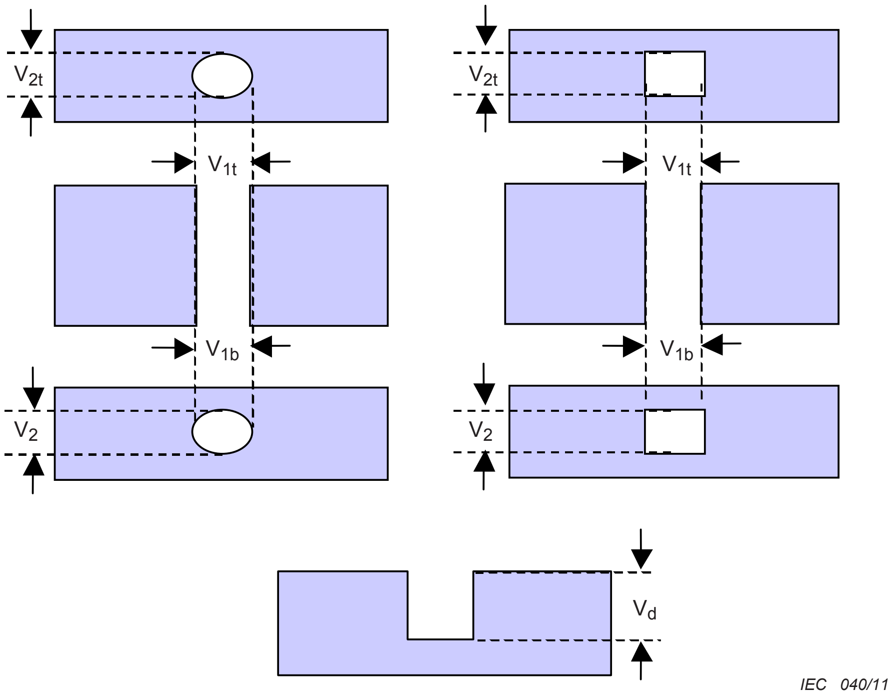


Figure 27 – Hole and objects to be measured

8 Dimensioning system

The interface dimensions listed in subsequent parts of IEC 62496-4-1 are presented and interpreted using the tolerancing methods described in Annex A.

9 Gauges

This standard is not intended as a gauging standard. It shall not be assumed that gauges that are included as a method for specifying sizes and locations of features must be designed exactly as illustrated.

10 Tolerance grade of the OCB

10.1 General

The OCB is graded by tolerance. Each grade tolerance is identified in the standard by a grade number. The grades and the grade numbers are as follows.

10.2 Shape accuracy of the OCB body of fibre flexible OCB

Classification of accuracy of shape of an OCB body of the fibre flexible OCB in comparison with design is given below.

Class A:

Less than ± 1 mm for the designated dimension less than 200 mm

Less than ± 0,5 % of the designated dimension for the dimension ranging from 200 mm to 1 000 mm

Less than ± 5 mm for the designated dimension larger than 1 000 mm

Class B:

Larger than ± 1 mm for the designated dimension less than 200 mm

Larger than ± 0,5 % of designated dimension for the dimension ranging from 200 mm to 1 000 mm

Larger than ± 5 mm for the designated dimension larger than 1 000 mm

The length of the longest diagonal line of OCB body is also used as a dimension instead of the X-axis and Y-axis dimension.

Figure 28 shows classification of shape accuracy of OCB body of fibre flexible OCB.

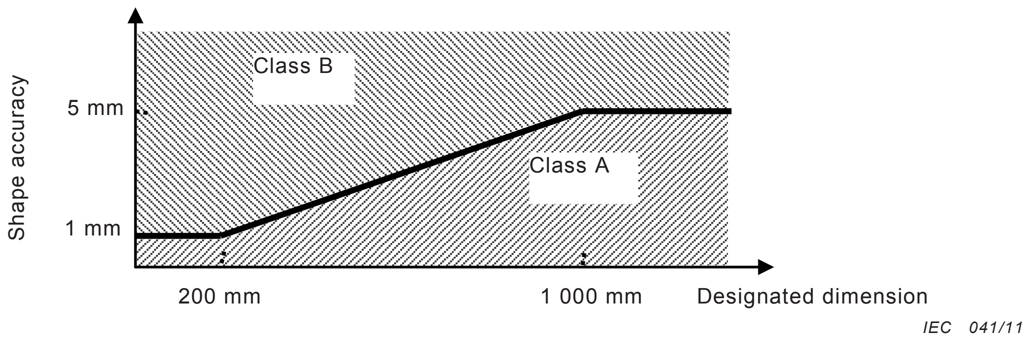


Figure 28 – Classification of shape accuracy of OCB body of fibre flexible OCB

10.3 Position accuracy of the OCB port/I/O port of fibre flexible OCB

Classification of accuracy of position of an OCB port in comparison with design is given below.

Class a:

Less than ± 1 mm for the designated dimension less than 200 mm

Less than ± 0,5 % of the designated dimension for the dimension ranging from 200 mm to 1 000 mm

Less than ± 5 mm for the designated dimension larger than 1 000 mm

Class b:

Larger than ± 1 mm for the designated dimension less than 200 mm

Larger than ± 0,5 % of designated dimension for the dimension ranging from 200 mm to 1 000 mm

Larger than ± 5mm for the designated dimension larger than 1 000 mm

10.4 Length accuracy of the OCB tails of fibre flexible OCB

Classification of OCB tail length is given below.

Class 1:

Less than ± 1mm for the designated dimension not larger than 10 mm

Less than ± 1 % of the designated dimension larger than 10 mm

Class 2:

Larger than ± 1 mm for the designated dimension not larger than 100 mm

Larger than ± 1 % of the designated dimension larger than 100 mm

Annex A
(normative)

OCB interfaces

A.1 Purpose

This annex covers the dimensioning, tolerancing and related practices to be used on the OCB interface drawings of IEC 62496-4. Uniform practices for stating and interpreting these drawings are established herein.

The annex is not intended to replace existing standards on dimensioning and tolerancing. Rather, it is intended to interpret and supplement, where necessary, the existing standards as they apply to OCB interfaces.

A.2 Units

The interface drawings shall use the International System of Units (SI).

A.3 Terms and definitions

The following definitions apply for the purposes of this annex.

A.3.1
dimension
numerical value expressed in appropriate units of measure and indicated on a drawing along with lines, symbols and notes to define the size or geometric characteristic, or both, of a part or part feature

A.3.2
tolerance
total amount by which a specific dimension is permitted to vary. The tolerance is the difference between the maximum and minimum limits

A.3.3
single limit dimension
dimension that is designated by MIN or MAX (minimum or maximum) instead of being labelled by both

NOTE Single limit dimensions may be used where the intent will be clear, and the unspecified limit can be zero or approach infinity without causing a condition that is detrimental to the design.

A.3.4
geometrical tolerances
general term applied to the category of tolerances used to control form, profile, orientation and runout

A.3.5
feature of size
one cylindrical or spherical surface, or set of two plane parallel surfaces, each of which is associated with a size dimension

A.3.6
maximum material condition
MMC
condition in which a feature of size contains the maximum amount of material within the stated limits of size

NOTE For example, minimum hole diameter or maximum shaft diameter.

A.3.7
least material condition
LMC
condition in which a feature of size contains the least amount of material within the stated limits of size

NOTE For example, maximum hole diameter or minimum shaft diameter are both least material conditions.

A.3.8
basic dimension
numerical value used to describe the theoretically exact size, profile, orientation or location of a feature or datum target

NOTE This is the basis from which permissible variations are established by tolerances on other dimensions in notes, or in feature control frames.

A.3.9
true position
theoretically exact location of a feature established by basic dimensions

A.3.10
datum
theoretically exact point, axis or plane derived from geometric counterpart of a specified datum feature. A datum is the origin from which location or geometric characteristics of features of a part are established

A.3.11
datum target
specified point, line or area on a part used to establish a datum

A.3.12
feature
general term applied to a physical portion of a part, such as a surface, hole or slot

A.4 Fundamental rules

Dimensioning and tolerancing shall clearly define the OCB interface and shall conform to the following:

a) Each dimension shall be referenced on the interface drawing using a capital letter. The dimension values shall be tabulated in a supplementary table appearing with the drawing. In general, the same reference letter should be used for the counterpart features on the various drawings;

b) Each dimension shall have a tolerance, except for those dimensions specifically identified as maximum or minimum only. The tolerance may be applied directly to the dimension, or indirectly in the case of basic dimensions;

c) Dimensioning for size, form and location of features shall be complete to the extent that there is full understanding of the characteristics of each feature;

d) A gauge definition may replace a direct dimension when direct dimensioning of a feature is impractical such as for resilient members, etc. When such dimensioning is used, a supplementary drawing of the gauge shall appear with the interface drawing and a note shall clearly state the use of the gauge;

e) Dimensions shall be selected and arranged to suit the function and shall not be subject to more than one interpretation;

f) The drawing shall define the interface without specifying manufacturing methods. Thus, only the diameter of a hole is given without indicating whether it is to be drilled, reamed or made by any other operation;

g) Dimensions should be arranged to provide required information for optimum readability. Dimensions should be shown in true profile views and refer to visible outlines;

h) A 90 ° angle is implied where centre lines and lines depicting features are shown on the drawing at right angles and no angle is specified;

i) A 90 ° BASIC angle applies where centre lines of features in a pattern or surfaces shown at right angles on an interface drawing are located or defined by basic dimensions and no angle is specified;

j) All dimensions are applicable at 20 °C unless otherwise specified. Compensation may be made for measurements made at other temperatures;

k) Where a tolerance of form is not specified, the limits of the dimensions for a feature control the form as well as the size. The combined effect of size and form variations may not exceed the envelope of perfect form at maximum material condition (MMC);

l) Where interrelated features of size (features shown with a common axis or centre plane) have no geometric tolerance of location or runout specified, the limits of the dimensions of a feature control the location tolerance as well as the size. When interrelated features are at MMC, they shall be perfectly located to each other as indicated by the interface drawing;

m) Where perpendicular features (features shown at a right angle) have no geometric tolerance of orientation or runout specified, the limits of the dimensions for a feature control the orientation tolerance as well as the size. When perpendicular features are at MMC, they shall fit perfectly orientated to each other as indicated by the interface drawing;

n) As the size of a feature departs from MMC, variations in form, location and orientation are permissible.

Annex B
(informative)

Example of the OCB

The fibre flexible OCB as an example of the OCB and coordinate of the fibre flexible OCB are shown in Figures B.1 and B.2.

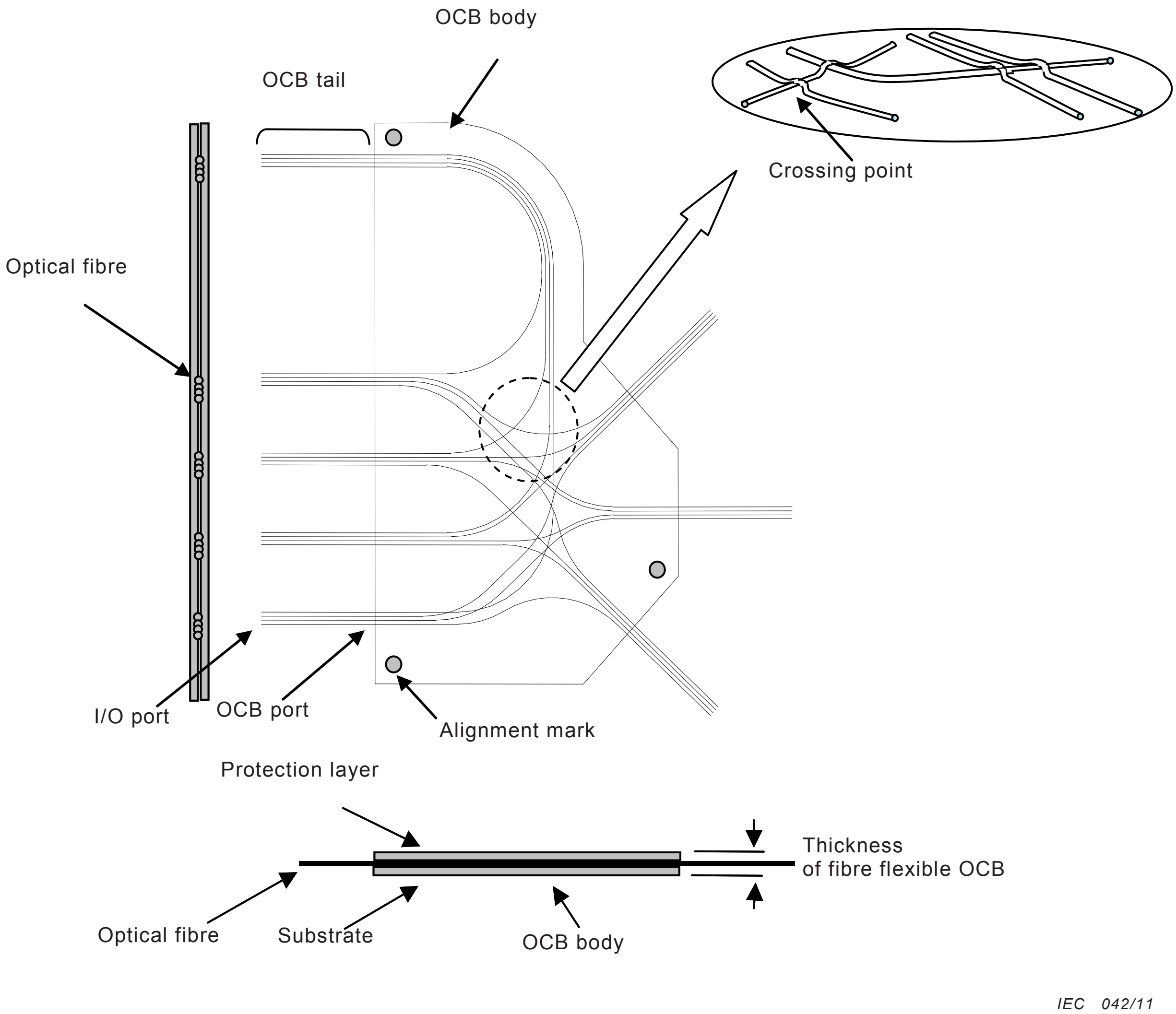


Figure B.1 – Example of the fibre flexible OCB

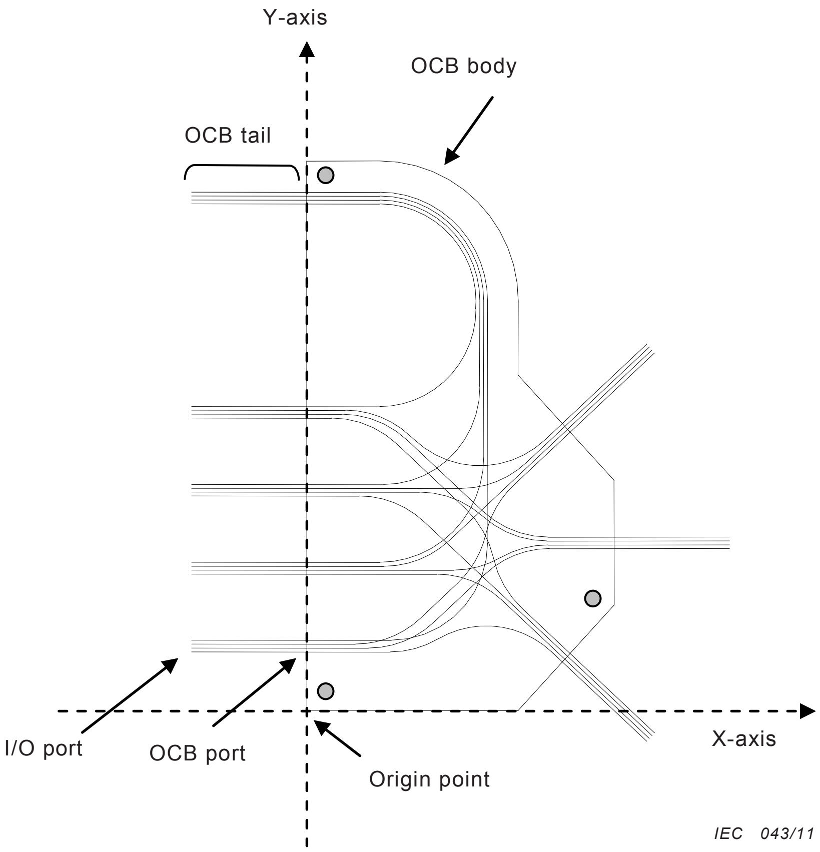


Figure B.2 – Origin point and coordinate for the fibre flexible OCB

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ISO 7083, *Technical drawings – Symbols for geometrical tolerancing – Proportions and dimensions*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

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