IEC 62496-4

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Optical circuit boards –
Part 4: Interface standards – General and guidance

Cartes à circuits optiques –
Partie 4: Normes d'interface – Généralités et lignes directrices

IEC 62496-4:2011

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FOREWORD

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International Standard IEC 62496-1 has been prepared by IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86/379/FDIS	86/386/RVD

Full information on the voting for the approval of 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 62496 series, under the general title *Optical circuit boards*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

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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.

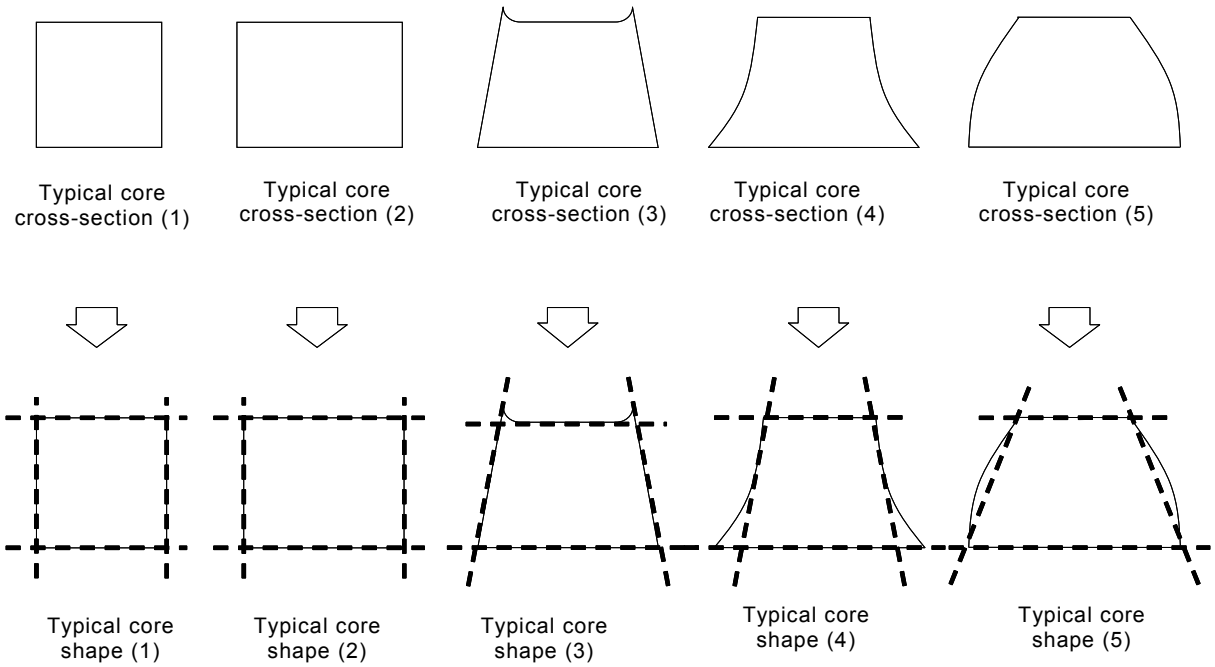

Figure 1 – Examples of shapes of square core (quasi-square made by extrapolation or interpolation)

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.

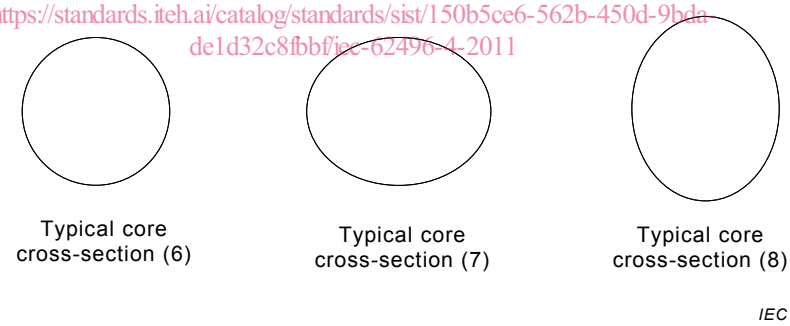

Figure 2 – Examples of shapes of circular core

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

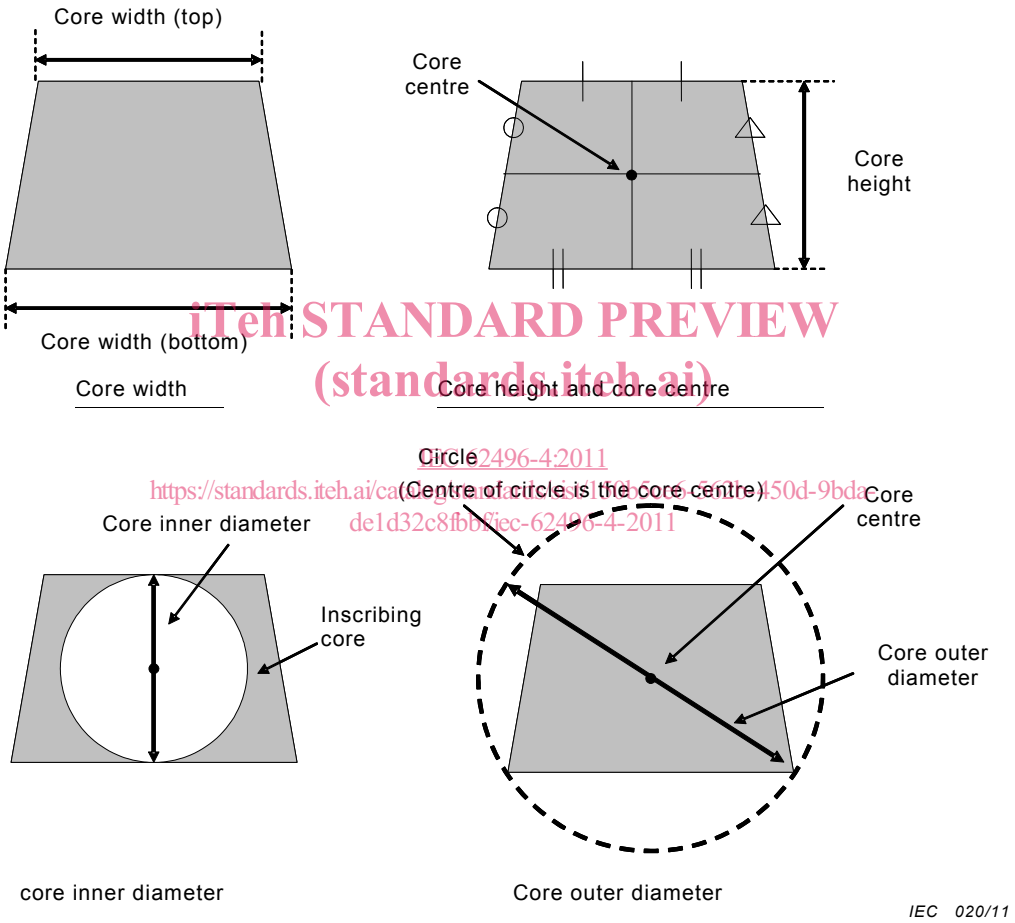

Figure 3 – Six structural parameters of square core shape of waveguide OCB

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.

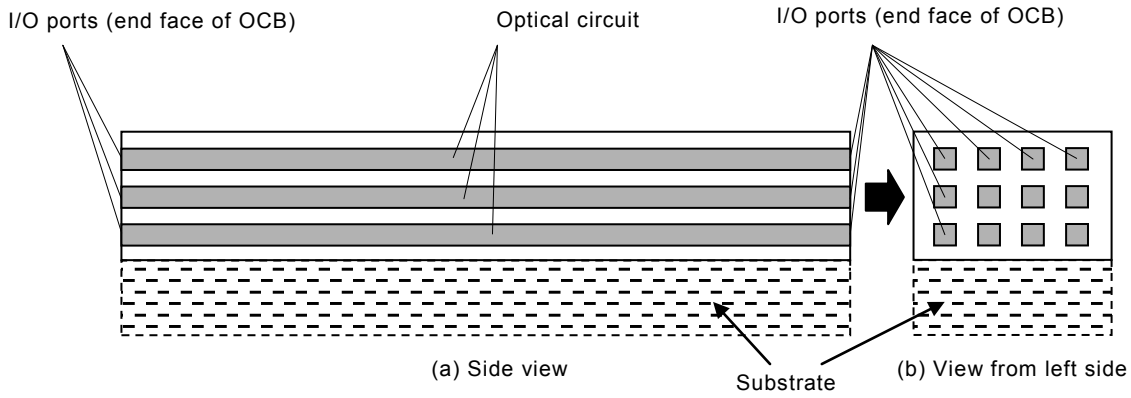

Figure 4 – Example of OCB with end face I/O ports at edge of board

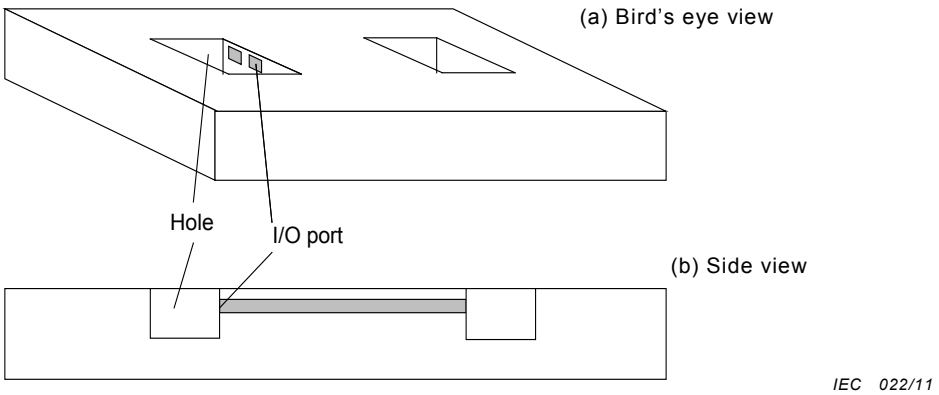

Figure 5 – Example of OCB with end face I/O type

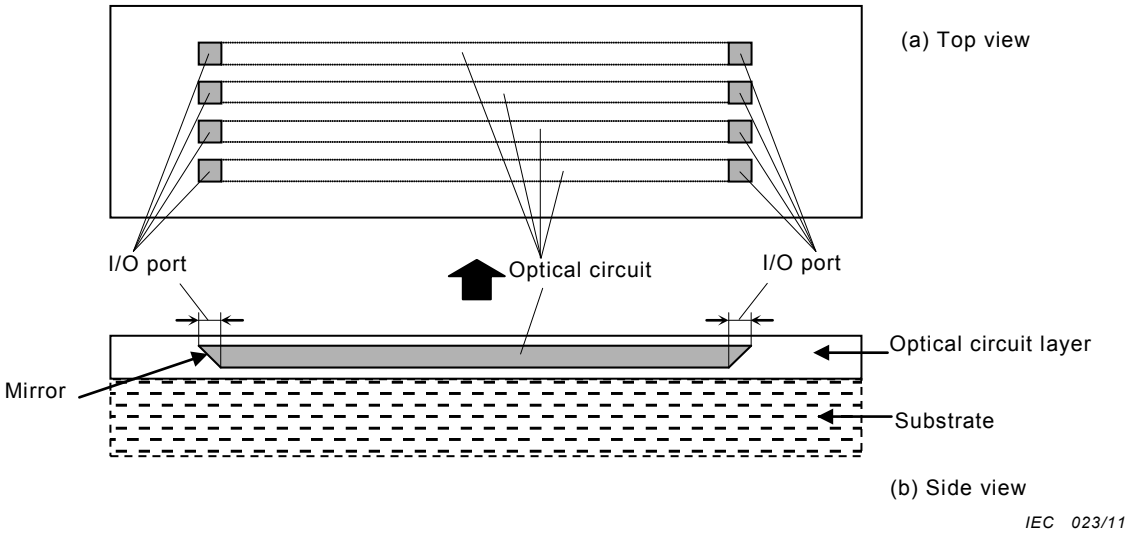

Figure 6 – Example of OCB with surface I/O ports

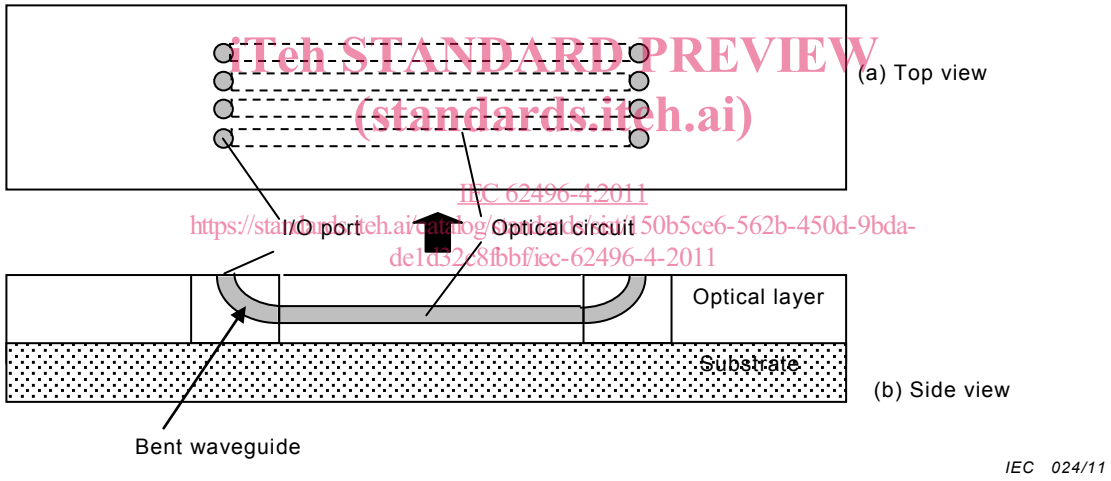

Figure 7 – Example of OCB with surface I/O ports

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.

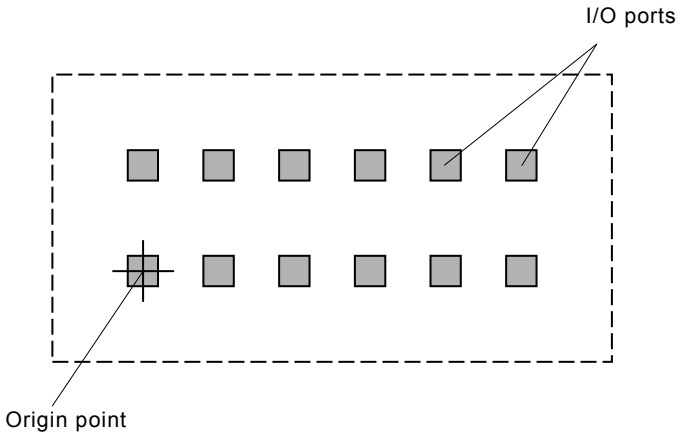

Figure 8 – Definition of origin point 1): A specific port is used as the origin point

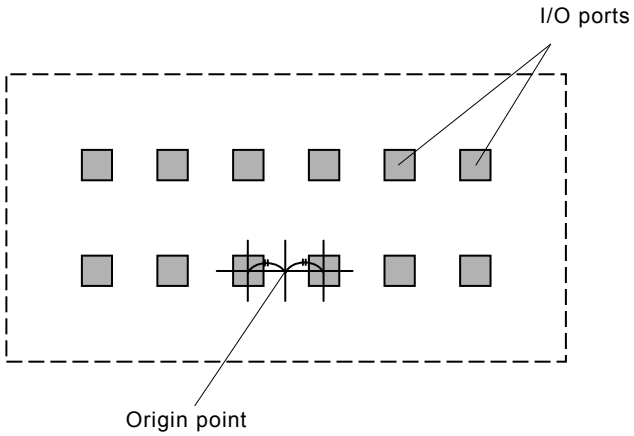

Figure 9 – Definition of origin point 2): Determination of an origin point at a place where there is no port (a mid-point of adjacent two ports at the centre of bottom line is used as the origin)

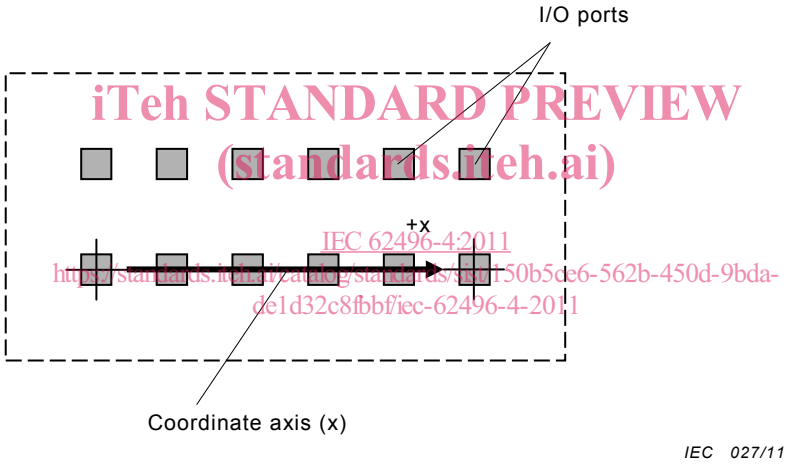

Figure 10 – Definition of the direction of coordinate axis 1): Use the direction of alignment of multiple ports

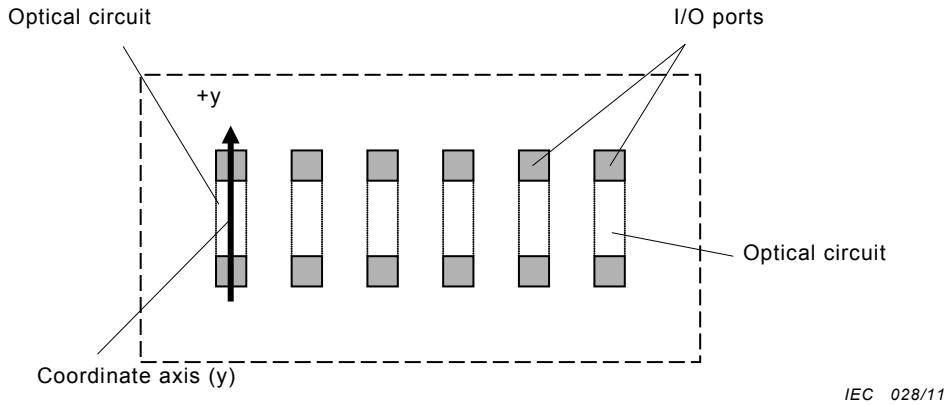

Figure 11 – Definition of direction of coordinate axis 2): Along a specific optical circuit (only if the wire is recognizable)