

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

**Fibre optic interconnecting devices and passive components – Fibre optic connector optical interfaces –
Part 3-30: End face geometry – Angled PC end face PPS rectangular ferrule multimode A1b fibres**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING
DEVICES AND PASSIVE COMPONENTS –
FIBRE OPTIC CONNECTOR OPTICAL INTERFACES –**

**Part 3-30: End face geometry – Angled PC end
face PPS rectangular ferrule multimode A1b fibres**

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IEC PAS 63267-3-30 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
86B/4432/DPAS	86B/4457/RVDPAS

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC CONNECTOR OPTICAL INTERFACES –

Part 3-30: End face geometry – Angled PC end face PPS rectangular ferrule multimode A1b fibres

1 Scope

This part of IEC 63267 defines certain dimensional limits of an 16F MM angled PC rectangular polyphenylene sulphide (PPS) ferrule optical interface in order to meet specific longitudinal offset requirements for fibre-to-fibre interconnection. Ferrules made from the material specified in this document are suitable for use in categories C, OP, OP+, I and E as defined in IEC 61753-1.

Ferrule interface dimensions and features are contained in IEC 61754 (all parts), which deals with fibre optic connector interfaces.

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 61300-3-30, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-30: Examinations and measurements – Endface geometry of rectangular ferrule*

3 Terms and definitions

No terms and definitions are listed in this document.

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 Description

The performance of a multimode angled PC rectangular ferrule optical interface is determined by the accuracy with which the optical datum targets of two mating ferrules are aligned with each other. There are three conditions affecting the alignment of the optical datum targets: lateral offset, angular offset, and longitudinal offset.

Parameters influencing the lateral and angular offset of the optical fibre axes include the following:

- fibre hole deviation from designated location;
- fibre cladding diameter relative to fibre hole clearance;

- fibre hole angular misalignment;
- fibre core concentricity relative to the cladding diameter;
- alignment pin diameter relative to the guide hole clearance.

Parameters influencing the longitudinal offset of the optical fibre axes include the following:

- fibre protrusion;
- fibre array minus coplanarity;
- adjacent fibre height differential;
- end face angle in the x-axis;
- end face angle in the y-axis;
- end face radius in the x-axis;
- end face radius in the y-axis;
- fibre tip spherical radii;
- axial force on ferrule end face;
- ferrule and fibre material constants;
- frictional force of alignment pins in ferrule guide holes;
- core dip.

5 Interface parameters

This document defines the dimensional limits of angled PC rectangular ferrules with a single row of 16 fibres. The fibre centres are spaced with a nominal alignment pitch of 0,25 mm. Interface variant, which identify nominal ferrule cross-section, is given in Table 1. The fibre numbering conventions are illustrated in Figure 1.

Table 1 – Optical interface variant information

Variant number ^{b, c}	Nominal ferrule cross section ^a (mm × mm)	Number of fibres
1116	2,45 × 6,4	16
^a Refer to the applicable IEC 61754 series fibre optic connector interface standard for dimensional requirements. ^b The four digit variant code describes a combination of material type, nominal ferrule cross-section, and number of fibres. The first digit defines 1 for PPS ferrule materials; the second digit represents 2,45 mm × 4,4 mm with 0 and 2,45 mm × 6,4 mm with 1; and the last two digits designates the number of fibres. ^c All ferrule materials for rectangular type ferrules are intended to be intermateable, in the lowest specified performance category as described within IEC 61755-1, provided that the last three digits of the variant number are the same.		

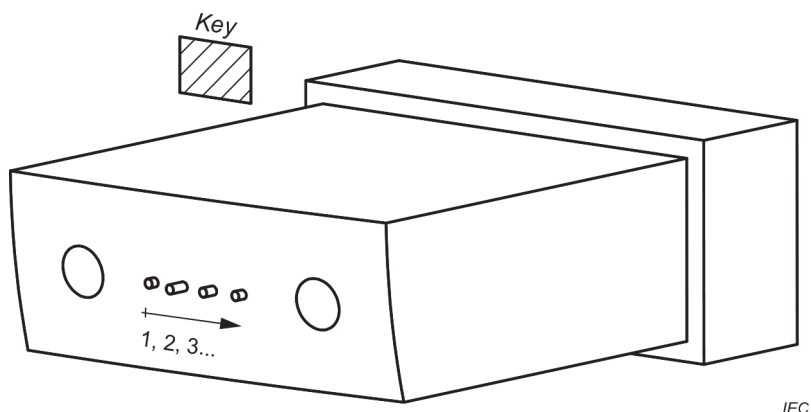


Figure 1 – Fibre numbering conventions

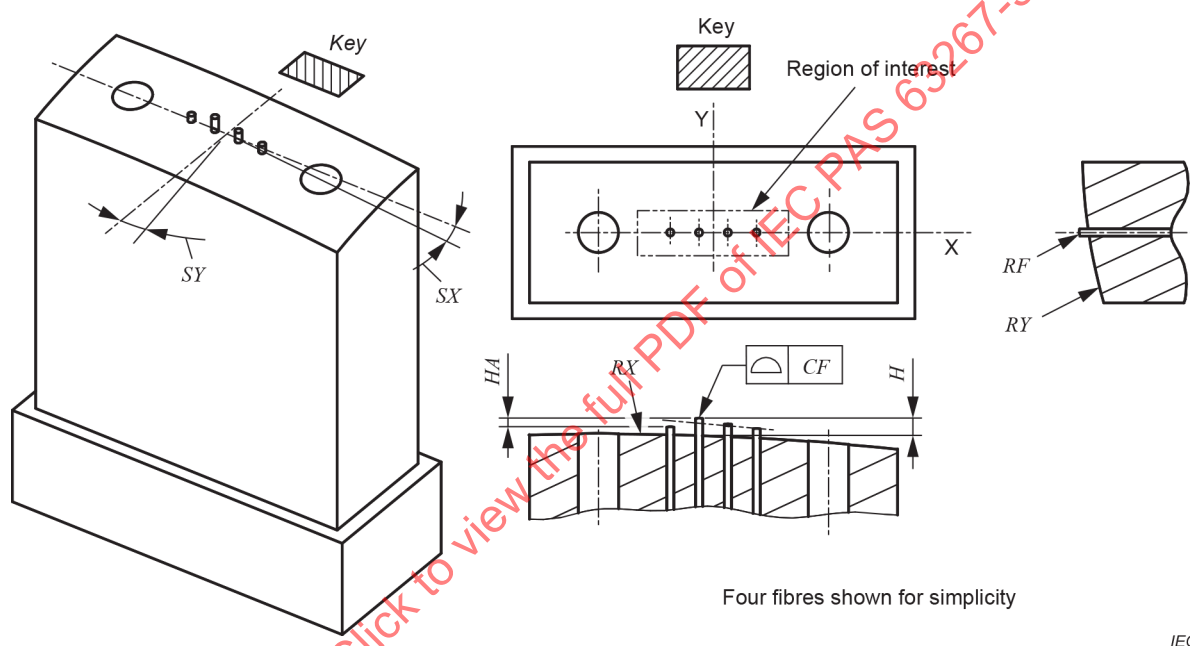


Figure 2 – Interface dimensions related to longitudinal offset

The optical interface coordinate system is established with an x-axis, which passes through the guide hole centres, a perpendicular y-axis that passes through the midpoint of the line connecting the guide hole centres, and an orthogonal z-axis pointing away from the ferrule. All parameters are illustrated as positive values with respect to the defined coordinate system. End face geometry limits associated with longitudinal offset when < 50 % of the fibres have core dip are specified in Table 2. End face geometry limits associated with longitudinal offset when > 50 % of the fibres have core dip are specified in Table 3. In this case, the maximum minus coplanarity is reduced.

**Table 2 – Physical contact end face geometry dimensions having
< 50 % fibres with core dip for optical interface variant 1116**

Ref.	Parameter values		Units	Remarks
	Minimum	Maximum		
<i>CF</i>	-	0,25	μm	Minus side coplanarity ^a
<i>SX</i>	-0,15	0,15	°	Ferrule surface x-angle ^b
<i>SY</i>	7,8	8,2	°	Ferrule surface y-angle ^c
<i>H</i>	1	3,5	μm	Fibre height ^d
<i>HA</i>	0	0,3	μm	Adjacent fibre height differential
<i>RF</i>	1	-	mm	Fibre tip spherical radius ^e
<i>RX</i>	2 000 (convex) -10 000 (concave)	-	mm	Ferrule surface x-radius
<i>RY</i>	5	-	mm	Ferrule surface y-radius
<i>CD</i>		120	nm	Core dip

The end face geometry shall be measured in accordance with IEC 61300-3-30.

The values in Table 2 shall be specified in the central surface region surrounding fibres of 2,900 mm wide and 0,675 mm high. Furthermore, the outside surface region is lower than the central surface region of interest.

NOTE 1 Refer to Figure 2 for dimensional references.

NOTE 2 The values in Table 2 apply for polyphenylene sulphide (PPS) ferrules with a Young's modulus of 15 GPa to 20 GPa. Ferrule compression force: 20 N nominal.

^a Refer to Annex A for a description of minus side coplanarity.

^b X-angle represents the slope of the ferrule surface as defined by a bi-parabolic fit in accordance with IEC 61300-3-30.

^c Y-angle represents the slope of the ferrule surface as defined by a bi-parabolic fit in accordance with IEC 61300-3-30.

^d A positive value indicates a fibre protrusion.

^e Fibre tip spherical radii fitting region is defined within IEC 61300-3-30.

**Table 3 – Physical contact end face geometry dimensions having
≥ 50 % fibres with core dip for optical interface variant 1116**

Ref.	Parameter values		Units	Remarks
	Minimum	Maximum		
<i>CF</i>	-	0,15	μm	Minus coplanarity ^a
<i>SX</i>	-0,15	0,15	°	Ferrule surface x-angle ^b
<i>SY</i>	7,8	8,2	°	Ferrule surface y-angle ^c
<i>H</i>	1	3,5	μm	Fibre height ^d
<i>HA</i>	0	0,3	μm	Adjacent fibre height differential
<i>RF</i>	1	-	mm	Fibre tip spherical radius ^e
<i>RX</i>	2 000 (convex) -10 000 (concave)	-	mm	Ferrule surface x-radius
<i>RY</i>	5	-	mm	Ferrule surface y-radius
<i>CD</i>		120	nm	Core dip

End face geometry shall be measured in accordance with IEC 61300-3-30.

The values in Table 3 shall be specified in the central surface region surrounding fibres of 2,900 mm wide and 0,675 mm high. Furthermore, the outside surface region is lower than the central surface region of interest.

NOTE 1 Refer to Figure 2 for dimensional references.

NOTE 2 The values in Table 3 apply for polyphenylene sulphide (PPS) ferrules with a Young's modulus of 15 GPa to 20 GPa. Ferrule compression force: 20 N nominal.

^a Refer to Annex A for a description of minus coplanarity.

^b X-angle represents the slope of the ferrule surface as defined by a bi-parabolic fit in accordance with IEC 61300-3-30.

^c Y-angle represents the slope of the ferrule surface as defined by a bi-parabolic fit in accordance with IEC 61300-3-30.

^d A positive value indicates a fibre protrusion.

^e Fibre tip spherical radii fitting region is defined within IEC 61300-3-30.

Annex A (normative)

Minus coplanarity

The fibre protrusion distribution for rectangular ferrules is characterized by a parameter referred to as minus coplanarity. This metric represents the unilateral distance from a least squares fit line through the array of protrusions, known as the fibre line, to the minimum height fibre as illustrated in Figure A.1.

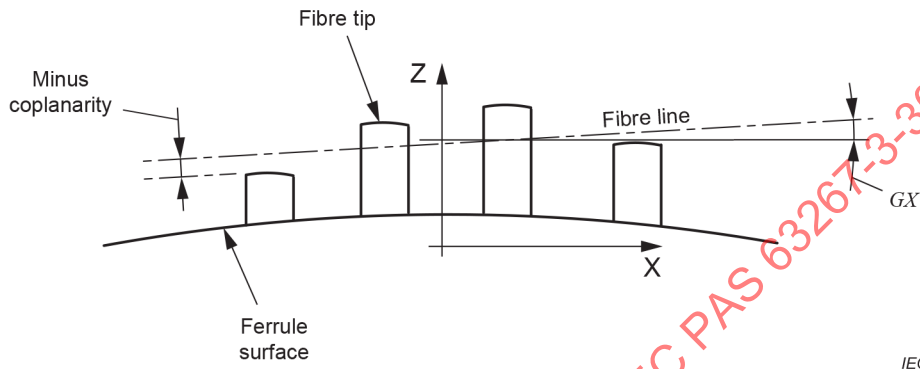


Figure A.1 – Illustration of fibre line and minus coplanarity parameters

The fibre line, which provides a single characterization of the height distribution, takes the form:

$$z(x) = \tan(GX) \cdot x + \beta \quad (\text{A.1})$$

The angle of the array, GX , denotes the x-slope angle. A measure of the average fibre height at the x-origin of the coordinate system is given by the intercept of the fit, β .

Minus coplanarity, CF , can be defined as:

$$CF = \max(z_i(x) - Z_i) \quad (\text{A.2})$$

where

$z_i(x) - Z_i$ represents the deviation of each fibre tip, i , from the fibre line.

The physical significance of minus coplanarity is that it indicates the requisite axial displacement of the fibre line needed to ensure physical contact across the fibre array under worst case mating conditions.