

INTERNATIONAL STANDARD

IEC
61300-3-30

First edition
2003-01

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –

Part 3-30: Examinations and measurements – Polish angle and fibre position on single ferrule multifibre connectors

*Dispositifs d'interconnexion et composants passifs
à fibres optiques –*

Méthodes fondamentales d'essais et de mesures –

Partie 3-30:

Examens et mesures –

*Angle de la face polie et position de la fibre sur
l'embout des connecteurs multifibres*



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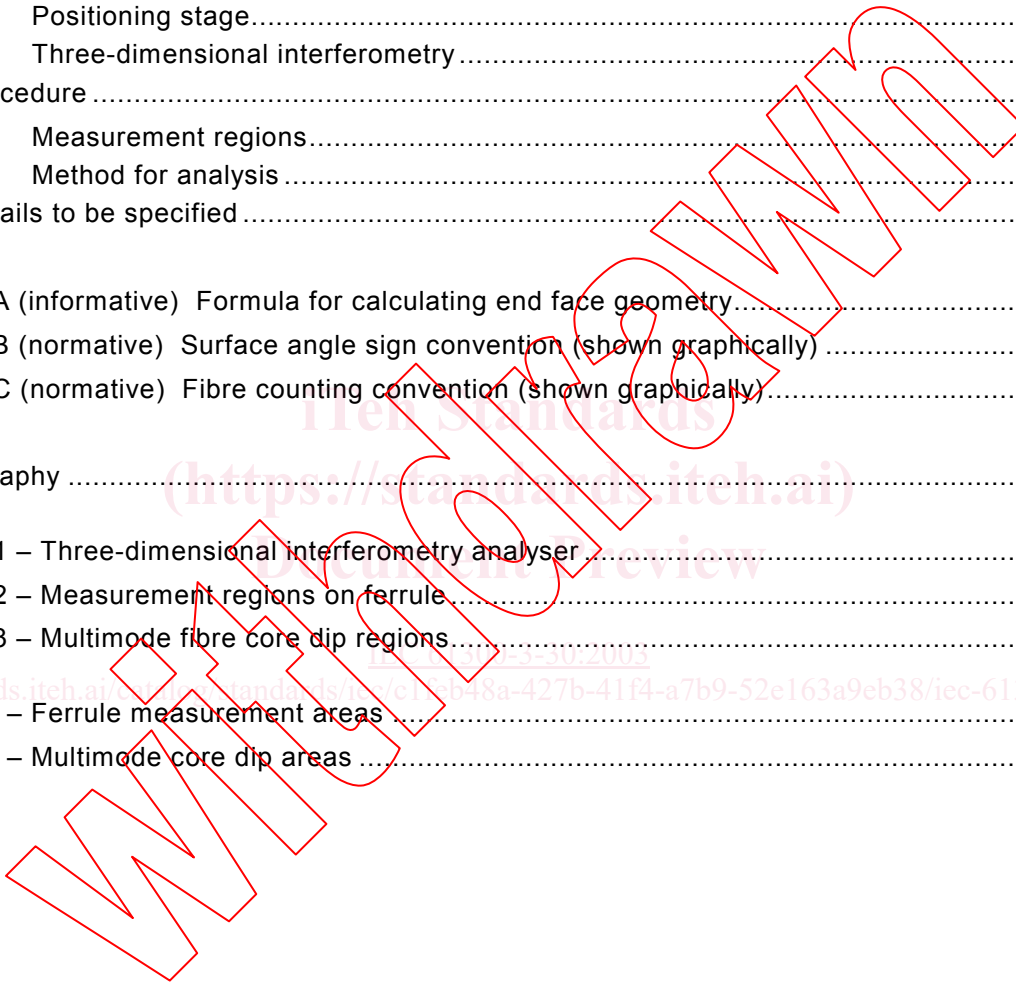
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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING DEVICES
AND PASSIVE COMPONENTS –
BASIC TEST AND MEASUREMENT PROCEDURES –**

**Part 3-30: Examinations and measurements –
Polish angle and fibre position on single ferrule
multifibre connectors**

FOREWORD

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International Standard IEC 61300-3-30 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86B/1747/FDIS	86B/1773/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 3.

IEC 61300 consists of the following parts, under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*:

- Part 1: General and guidance
- Part 2: Tests
- Part 3: Examinations and measurements

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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- withdrawn;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

Withdrawn

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 3-30: Examinations and measurements – Polish angle and fibre position on single ferrule multifibre connectors

1 Scope

This part of IEC 61300 describes a procedure to assess end face geometry in guide pin based multifibre ferrules and connectors. The primary attributes are fibre position relative to the end face, either undercut or protrusion, end face angle relative to the guide pin bores, and core dip for multimode fibres.

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.

None.

3 General description

Guide pin based multifibre connectors typically have a rectangular end face with a long axis and a short axis. Ideally a flat polish is desired on the end face with the fibres protruding slightly and all in the same plane to assure physical contact of the fibre cores when two connectors are intermated. In practice, the end face typically has two different curvatures across the surface along the long and short axis. Since mated ferrules are aligned by pins in the guide holes, the end face of the ferrule must be properly oriented (X and Y angle) with respect to the guide holes to achieve positive contact. The end face angle in the X-axis and the end face angle in the Y-axis are measured by finding the best fit plane based on a percentage of the highest points in a specified region of interest. The highest points typically show the greatest modulation from an interferometric standpoint. This allows for more robust measurements and greater repeatability between different interferometers.

The angle of the best fit plane is calculated by comparing it to the reference plane which is perpendicular to the axis of each guide hole. The fibre protrusion, $(+p)$, or undercut, $(-p)$, of the fibres is a planar height defined as the distance between the fibre end face and the best fit planar surface previously described. Core dip is specific to multimode fibres because the large core is softer than the edge of the fibre and tends to polish away faster. Core dip is calculated by subtracting the average height of the core area from the average height of an annular area near the edge of the fibre.

One method is described for this procedure. Analysing the endface with a three-dimensional interferometry type surface analyser.

4 Apparatus

Three-dimensional surface analysis by an interferometer system.

The apparatus shown in figure 1 consists of a suitable ferrule holder, a positioning stage and a three-dimensional interferometry analyser capable of analyzing rough surfaces and step heights.

4.1 Ferrule holder

The ferrule holder is a suitable device to hold the ferrule in a fixed position, either vertical or horizontal, or in a tilted position in the case of an angled ferrule type. Some method must be used to reference the axis of each guide hole and the average perpendicular angle to them, which shall be considered the ideal end face angle. This will typically entail the use of guide pins inserted into the guide holes or similar devices to transfer the axis of each guide hole to a measurable surface angle.

4.2 Positioning stage

The ferrule holder is fixed to the positioning stage, which shall enable the ferrule holder to be moved to the appropriate position. The stage shall have enough rigidity so as to allow measurement of the ferrule end face with the required accuracy.

4.3 Three-dimensional interferometry

The three-dimensional interferometry analyser shall have the ability to measure the fibre heights on the ferrule end face with an accuracy of better than ± 50 nm. The analyser shall consist of a microscope unit, a surface data processing unit and a monitor.

The microscope unit shall consist of an interference microscope, a phase shift actuator, an image detector and a frame grabber. The interference microscope equipped with an objective is arranged so as to view the end face of the ferrule.

The surface data processing unit shall be able to process the surface height information so as to measure the radius of curvature in the X and Y axis, the angle of the end face in the X and Y axis and the protrusion or undercut of the fibres from the best fit planar surface. A flatness deviation shall be calculated to determine if the connector has too great a curvature to consider the surface a plane.

The monitor shall display the measured and calculated surface profiles along each axis.

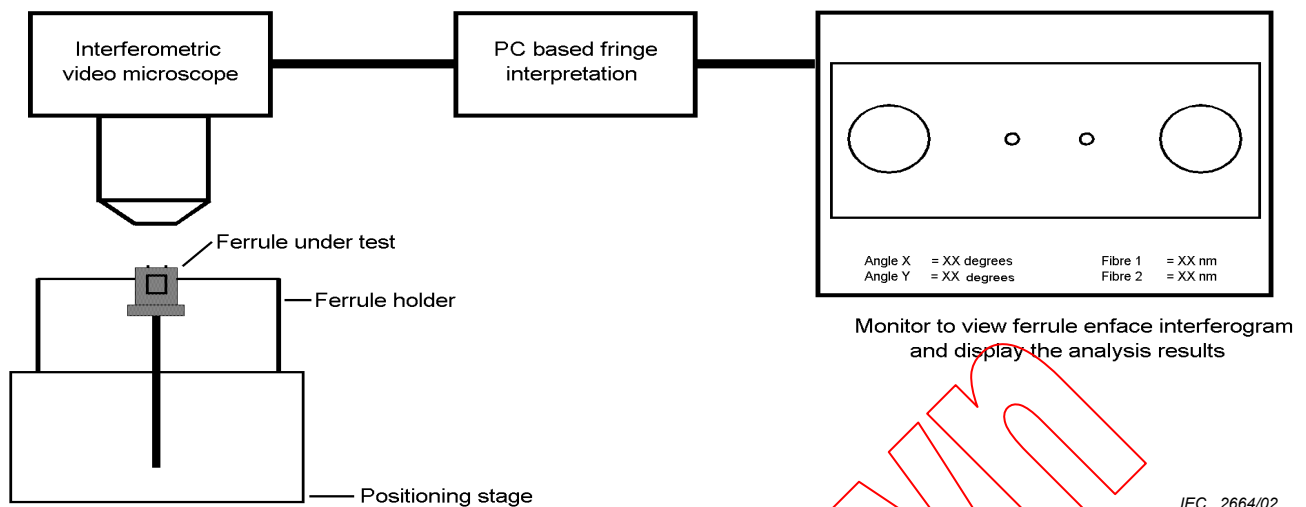


Figure 1 – Three-dimensional interferometry analyser

5 Procedure

5.1 Measurement regions

The following regions shall be defined on the ferrule end face for the measurement.

- Region of interest (ROI):** the ROI is set on the ferrule surface and defined by a rectangular region having a long axis (X axis) of length, L , and a short axis (Y axis) of height, H ; The region of interest is chosen to cover the intended contact zone of the ferrule end face when the ferrules are mated. The region of interest shall be centred on the fibre array. See figure 2. Refer to table 1 for measurement areas to be used for different connectors.
- Extracting region:** the extracting region, which includes the fibre end face regions and the associated adhesive regions, are defined by circles having a diameter E , centred on each fibre;
- Fitting region:** the fitting region is the region of interest excluding the extracting regions and is the data set used in making calculations for the ferrule surface. It is assumed that the surface points on the ferrule outside the fitting region will be lower than the surface points in the fitting region.
- Averaging region:** the averaging region is set on the fibre surfaces to be used to calculate the fibre height, and is defined by a circle having a diameter F . The averaging region is different for singlemode (SM) fibres and multimode (MM) fibres.
- To assess core dip in MM fibres, two averaging regions are used. The first is the *core fitting region* with a diameter D_{core} . The second region is an *annular area* bound by a maximum annular ring of diameter D_{max} and a minimum annular ring of D_{min} . See figure 3. Refer to table 2 for measurement areas.

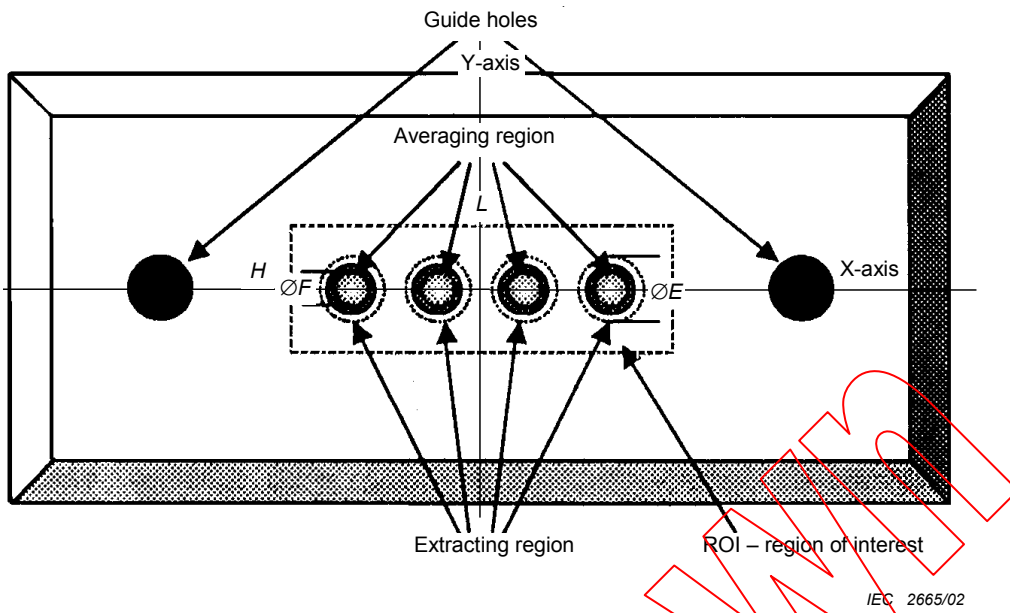


Figure 2 – Measurement regions on ferrule

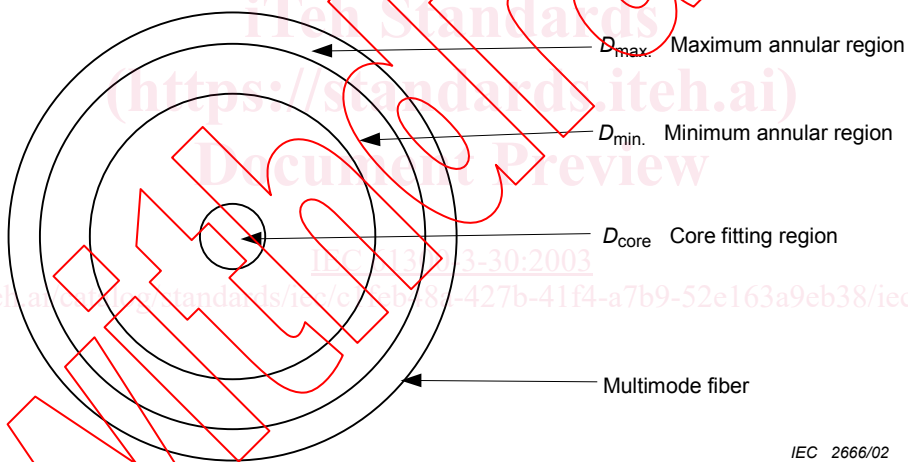


Figure 3 – Multimode fibre core dip regions