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INTERNATIONAL STANDARD

colour inside

Fibre optic active components and devices – Test and measurement procedures –
Part 3: Optical power variation induced by mechanical disturbance in optical receptacles and transceiver interfaces

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – TEST AND MEASUREMENT PROCEDURES –

Part 3: Optical power variation induced by mechanical disturbance in optical receptacles and transceiver interfaces

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International Standard IEC 62150-3 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2012 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

– extension of application field to SC connector interface transceivers in addition to LC connector interface transceivers specified in the first edition as both transceiver interfaces are very important in the industry;
– addition of a new Annex E dealing with load value difference for connector type in Method A.

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

FDIS	Report on voting
86C/1311/FDIS	86C/1330/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 parts in the IEC 62150 series, published under the general title *Fibre optic active components and devices – Test and measurement procedures*, 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

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – TEST AND MEASUREMENT PROCEDURES –

Part 3: Optical power variation induced by mechanical disturbance in optical receptacles and transceiver interfaces

1 Scope

It has been found that some optical transceivers and receptacles are susceptible to fibre optic cable induced stress when side forces are applied to the mated cable-connector assembly, resulting in variations in the transmitted optical power. The purpose of this part of IEC 62150 is to define physical stress tests to ensure that such optical connections (cable and receptacle) can continue to function within specifications.

This standard specifies the test requirements and procedures for qualifying optical devices for sensitivity to coupled power variations induced by mechanical disturbance at the optical ports of the device.

This standard applies to active devices with optical receptacle interfaces.

This standard describes the testing of transceivers for use with single-mode connectors having either 2,5 mm or 1,25 mm ferrules.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61753 (all parts), *Fibre optic interconnecting devices and passive components performance standard*

IEC 61753-021-6, *Fibre optic interconnecting devices and passive components performance standard – Part 021-6: Grade B/2 single-mode fibre optic connectors for category O – Uncontrolled environment*

IEC 61754 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1
wiggle
mechanical disturbances that induce coupled optical power variation in the optical receptacle and transceiver interface

3.1.2
wiggle loss
variation in coupled output power (with respect to a no-load, non-rotated measurement) induced in an optical module or receptacle when the mated connector is laterally stressed

3.2 Abbreviations

DUT device under test

LOS loss of signal

Rx receiver

Tx transmitter

4 Measurement consideration

4.1 Multiple test methods

Since the wiggle loss mechanisms are categorized into two different cases, Case A and B, this standard defines two measurement methods, Method A and B, as shown in Table 1. Method A and B are applicable to the tests for the mechanical endurance of transceivers under wiggle Case A and B, respectively.

Table 1 – Multiple test methods

Test methods	Applicable to	Example of parameters to be included
Method A	Wiggle Case A: test for optical transceivers use with patchcord terminated to connectors which meet interface standards (IEC 61754 series)	Test procedure, test fixture, test jumper, test load
Method B	Wiggle Case B: test for optical transceivers use with patchcord terminated to connectors which meet both interface standards (IEC 61754 series) and performance standards (IEC 61753 series)	Test procedure, test fixture, test jumper, test load

4.2 Two wiggle loss mechanisms

4.2.1 Rationale for two different wiggle loss test methods

Some optical transceivers and receptacles are susceptible to fibre optic cable induced stress when forces are applied to the mated cable-connector assembly. Depending on the structure of fibre-optic connectors, two different points of action for the receptacle cause two different types of wiggle loss.

The intention of Method A is to help ensure that the transceiver port design is robust enough to work with a variety of cables that meet interface standards available in the field. The intention of Method B is to ensure port designs are robust enough to endure potential side loads during operation and installation with cables of known performance.

To guarantee the mechanical robustness of optical transceivers both Methods A and B or either Method A or B shall be chosen as appropriate.

4.2.2 Case A: Point of action for the ferrule

When the ferrule floating tolerance is insufficient (see Annex D), external side forces applied to the patchcord can cause deformation of the sleeve of the receptacle caused by the ferrule bending moment. This causes variations in the transmitted optical power of transceivers. In this case, the mechanical robustness of transceivers depends on the sleeve, receptacle port, and optical sub-assembly design. There are also some patchcords which have insufficient ferrule floating tolerance, as this is not specified in interface standards.

4.2.3 Case B: Point of action for the plug housing

When the ferrule floating tolerance is sufficient, external forces applied to the patchcord cause deformation of the receptacle housing caused by the plug bending moment. This causes variations in the transmitted optical power of transceivers. In this case, the mechanical endurance of transceivers depends on the design of the receptacle housings. Sufficient ferrule floating tolerance can be guaranteed by patchcord performance standards as specified in Annex C, Method B.

5 Test Method A

5.1 Apparatus

5.1.1 General

An example of the test apparatus is shown in Figure 1. Details of the elements are given in the following subclauses. Measurement wavelength is in accordance with the wavelength of transceiver specifications, and the test data is obtained at room temperature.

The exact details of the test fixture will depend on the type of DUT. For example, if an optical transceiver is being evaluated, a test board capable of securing and powering up the transceiver may be used. In this case, it is centre-mounted to the spindle of a rotation mechanism so that it can be rotated symmetrically over 360°.

5.1.2 Test cord

In order to simulate the wiggle loss mechanism of Case A, specially designed test patchcords called simulated wiggle test cords are used in Method A. Detail specifications of the simulated wiggle test cord are defined in Annex C.

In Figure 1, the test cord is connected to the transceiver under test. The test jumper has a weight applied to the end of the test cord to stress the connection to the DUT. The test cord is connected to a power meter at the other end to record the transmitted power variations.

5.1.3 Power meter

The power meter is used to measure variations in the coupled power from the DUT. It is set-up to record the maximum peak-to-peak excursions in power level normalized around the initial no-load measurement. In the case of Test Method A, the following measurement set-up is recommended. Both the rotation mechanism (e.g. stepper motor) and power meter are interfaced to a computer for control and data logging purposes. Ideally, the controller software can manipulate the direction of rotation, speed and step increments of the stepper motor. During the 360° continuous rotation, the instrumentation should be capable of collecting at least one data point for every 2,5 degrees of rotation, which equates to a response time of better than 100 ms for the measuring instrumentation.

5.1.4 Test load

The test load or weight should be applied to the end of the test cord. The test load is defined in Annex A.