BS EN 61280-1-1:2013

BSI Standards Publication

Fibre optic communication subsystem basic test procedures

Part 1–1: Test procedures for general communication subsystems — Transmitter output optical power measurement for single-mode optical fibre cable

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This British Standard is the UK implementation of EN 61280-1-1:2013. It is identical to IEC 61280-1-1:2013. It supersedes BS EN 61280-1-1:1998 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/3, Fibre optic systems and active devices.

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

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Fibre optic communication subsystem basic test procedures - Part 1-1: Test procedures for general communication subsystems - Transmitter output optical power measurement for single-mode optical fibre cable

(IEC 61280-1-1:2013)

Procédures d'essai de base des sous-systèmes de télécommunication à fibres optiques -
Partie 1-1: Procédures d'essai des sous-systèmes généraux de télécommunication - Mesure de la puissance optique des émetteurs couplés à des câbles à fibres optiques unimodales
(CEI 61280-1-1:2013)

Lichtwellenleiter-Kommunikationsuntersysteme - Grundlegende Prüfverfahren -
Teil 1-1: Prüfverfahren für allgemeine Kommunikationsuntersysteme - Messung der Senderausgangsleistung für Einmoden-LWL-Kabel
(IEC 61280-1-1:2013)

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 86C/1065/CDV, future edition 2 of IEC 61280-1-1, prepared by SC 86C "Fibre optic systems and active devices" of IEC/TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61280-1-1:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-03-25
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-06-25

This document supersedes EN 61280-1-1:1998.

EN 61280-1-1:2013 includes the following significant technical changes with respect to EN 61280-1-1:1998:

- inclusion of Annex A on how to account for uncertainties;
- editorial corrections throughout the document and updates to references.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61280-1-1:2013 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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 61300-3-35	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-35: Examinations and measurements - Fibre optic connector endface visual and automated inspection	EN 61300-3-35	-
IEC 61315	-	Calibration of fibre-optic power meters	EN 61315	-

CONTENTS

FIBRE OPTIC COMMUNICATION SUBSYSTEM BASIC TEST PROCEDURES –

Part 1-1: Test procedures for general communication subsystems – Transmitter output optical power measurement for single-mode optical fibre cable

1 Scope and object

This part of IEC 61280 applies to fibre optic general communication subsystems. The object of this part is to measure the optical power coupled from the output of a transmitter under test into single-mode optical fibre cable containing dispersion-unshifted fibre or dispersion-shifted fibre.

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 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Fibre optic connector endface visual and automated inspection*

IEC 61315, *Calibration of fibre-optic power meters*

3 Apparatus

3.1 Optical power meter

The optical power meter shall be capable of measuring the range of power at wavelengths provided by the transmitter. The optical power meter shall have a resolution of at least 0,1 dB. The meter shall have a detecting surface of sufficient size to capture all the power coming from the fibre that is put into it.

3.2 Input signal source

The input signal source is a signal generator at the appropriate signal rate of the system interface.

3.3 Test cord

A length of single-mode optical fibre cable, which is known to remove cladding modes, shall be used. The optical fibre (cable) shall be terminated at both ends with appropriate connectors. The ends for connection to the fibre optic transmitter and to the optical power meter shall be terminated with appropriate connector plugs. These plugs and any adapters necessary to produce the connections shall be such that the performance can be specified by the manufacturer of the equipment or the connectors. Values for the insertion loss repeatability shall be known.

3.4 Calibration

The optical power meter shall be configured and calibrated for the test wavelength. The optical power meters shall be calibrated in accordance with IEC 61315.

The equipment used shall have a valid calibration certificate in accordance with the applicable quality system for the period over which the testing is done.

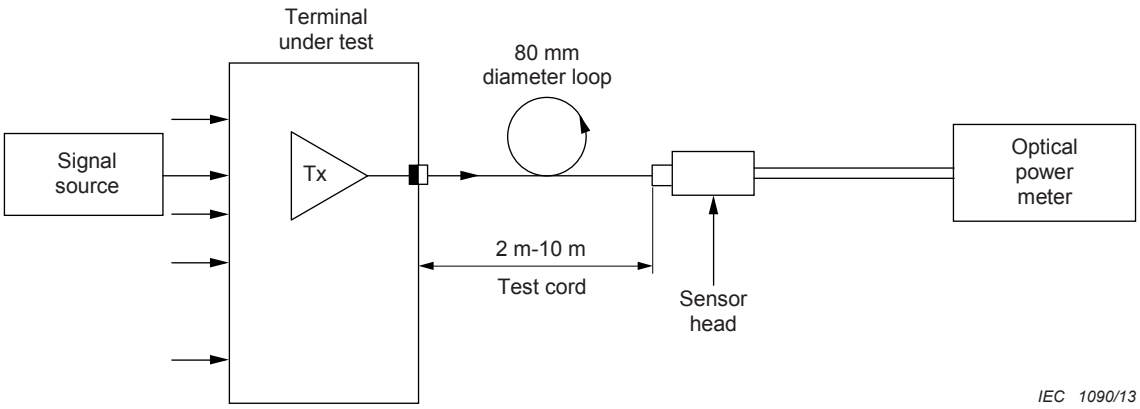

Figure 1 – Transmitter output power measurement configuration

4 Test sample

The test sample shall be a specified single-mode fibre optic transmitter, including all signal conditioning and multiplexing equipment used in the system in normal operation. The electrical inputs and outputs shall be those normally available to the user for interfacing with other transmission equipment.

5 Procedure

5.1 Unless otherwise specified, standard operating conditions apply. The ambient or reference point temperature shall be specified.

5.2 Apply appropriate terminal input voltage to the system under test. Apply standard (or extended) operating conditions. Allow sufficient time (30 min, unless otherwise specified in the detail specification) for the system under test to reach a steady-state temperature and performance condition.

5.3 Turn the optical power meter on, and allow the manufacturer's recommended warm-up and settling time to achieve the rated measurement performance level.

5.4 All connector end faces shall be inspected to verify that they are clean and essentially free of defects in accordance with IEC 61300-3-35. If necessary, connectors should be cleaned in accordance with IEC/TR 62627-01 and re-inspected to verify that the cleaning has been effective. The appropriate performance selection must be selected.

5.5 Remove higher order modes. For example, use a test cord between 2 m and 10 m long and with an 80 mm diameter loop, as shown in Figure 1.

5.6 Connect one end of the test cord to the transmitter connector and the other end to the sensor head of the optical power meter, as shown in Figure 1.

5.7 Observe the optical power reading.

If the meter reading fluctuates more than 0,4 dB, the transmitter power output power is not stable, and the reading should be disregarded. When the meter reading indication is stable, record the reading.

5.8 Disconnect the fibre test cord from the transmitter connector, clean the test cord connector again, and reconnect to the transmitter.

5.9 Repeat steps 5.7 and 5.8 until five stable readings are obtained. If it is impossible to obtain five stable readings, or five readings with a maximum deviation less than the stated repeatability for the transmitter connector, from 10 attempted measurements, then the fibre optic transmitter and the test cord shall be rejected.

6 Calculation

Calculate the average of the five readings, and record as the average effective transmitter output power.

7 Test results

7.1 Required information

– Date and title of the test
– Transmitter identifications
– Identification of test methods, specific operating conditions (standard or extended) and procedures used
– Results of the tests, including ambient or reference point temperature

7.2 Available information

– Identification of test equipment used
– Measurement uncertainty due to measurement inaccuracy and display resolution
– Details of the fibre test cord and connectors
– Insertion loss repeatability of the connectors, including the worst case random mated insertion loss
– Optical power meter uncertainties
– Names of test personnel
– Supply voltages and/or currents
– Rate and input signal characteristics
– Optical output measurement conditions: wavelength, transmitter mating connector model number
– Warm-up time applied for temperature stabilization
– Extended operating conditions, if applicable

Annex A
(informative)

Taking into account uncertainties

A.1 Using optical power meter calibration report

If the optical power has been calibrated according to IEC 61315, the calibration report should include the correction factor, *CF*, defined as the numerical factor by which the uncorrected result of a measurement is multiplied to compensate for systematic error:

$$CF = \frac{P_{\text{ref}}}{P_{\text{DUT}}} \tag{A.1}$$

It is recommended to compensate the optical power reading properly.

$$P_{\text{reported}} = CF \times P_{\text{read}} \tag{A.2}$$

A.2 Taking into account uncertainties

If the optical power measurement is used for a pass/fail test, the uncertainties of measurement and calibration should be used to set the test limits properly.

As an example, if the minimum power expected from the transmitter is 1 mW, and if the calibration uncertainties and measurement uncertainties are respectively 3 % and 2 %, the pass/fail limit should be increased by the accumulated uncertainties.

$$PassFail_{\text{L}} = P_{\text{expected}} + P_{\text{expected}} \times \sqrt{(U_{\text{cal}})^2 + (U_{\text{measure}})^2} = 1 + \sqrt{0{,}03^2 + 0{,}02^2} = 1{,}036 \text{ mW} \tag{A.3}$$

Bibliography

IEC/TR 62627-01, *Fibre optic interconnecting devices and passive components – Part 01: Fibre optic connector cleaning methods*

ISO/IEC GUIDE 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

EIA/TIA-526-2:1989, *OFSTP-2: Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable*

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