

Fibre optic communication subsystems —

Part 1: Generic specification

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National foreword

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 24, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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English version

Fibre optic communication subsystems Part 1: Generic specification

(IEC 61281-1:1999)

Sous-systèmes de télécommunications
par fibres optiques
Partie 1: Spécification générique
(CEI 61281-1:1999)

Lichtwellenleiter-
Kommunikationsuntersysteme
Teil 1: Fachgrundspezifikation
(IEC 61281-1:1999)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of document 86C/225/FDIS, future edition 1 of IEC 61281-1, 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 was approved by CENELEC as EN 61281-1 on 1999-04-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2002-01-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A and Annex B are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61281-1:1999 was approved by CENELEC as a European Standard without any modification.

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1 Scope

This part of IEC 61281 is a generic specification for fibre optic communication subsystems (FOCSs), and is structured according to the IEC Quality Assessment System (IECQ).

Subsystems are classified in families having a common sectional specification. Each sectional specification is supplemented by blank detail specifications, and detail specifications appropriate to the specific individual type or types of subsystems.

The parameters defined herein form a specifiable minimum set of specifications that are common to all fibre optic subsystems. Additional parameters may be needed depending on the particular application and technology. Those additional parameters will be specified in the relevant sectional specification and/or detail specification, as appropriate.

Each specified parameter may be measured using one of the test procedures. The use of these parameters for system design is given in design guides.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61281. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61281 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60793-2:1992, *Optical fibres — Part 2: Product specification*.

IEC 60794-2:1989, *Optical fibre cables — Part 2: Product specification*.

IEC 60874-1:1993, *Connectors for optical fibres and cables — Part 1: Generic specification*.

IEC 61291-1:1998, *Optical fibre amplifiers — Part 1: Generic specification*.

3 Definitions

For the purpose of this part of IEC 61281, the following functional and operational definitions apply. Within a definition, terms defined elsewhere are in *italics*.

3.1

active optical device

an *optical device* having gain of power

NOTE Examples include active *branching devices*, *optical amplifiers*, *optical modulators*, *optical regenerators*, and *optical repeaters*.

3.2

attenuation

the reduction of power (expressed in dB) between the end points of a *fibre optic cable plant* or of a *passive optical device*

3.3

attenuator, optical

a *passive optical device* which produces a controlled signal attenuation when inserted in the optical path

3.4

bandwidth

the difference (expressed in Hz) between the highest and lowest modulation frequencies at which the modulus of the power spectrum or of the complex transfer function is one-half of the peak value of the modulus

3.5

basic fibre optic system (BFOS)

the serial combination of a transmit terminal device, a fibre optic link, and a receive terminal device

3.6

bit-error ratio (BER)

the number of errored bits divided by the total number of bits, over some stipulated period of time

3.7**branching device (BD)**

an *optical device* which has three or more optical ports

NOTE Branching devices may be either passive (PBD) or active (ABD).

3.8**carrier-to-noise ratio (CNR)**

the ratio (expressed in dB) of carrier power to noise power in a channel of defined bandwidth, prior to any non-linear processing

3.9**centre wavelength**

the mean of the closest spaced *half-power wavelengths*, one above and one below the *peak wavelength* of an optical spectrum

NOTE Other spectral wavelengths are centroidal wavelengths, half-power wavelengths, and peak wavelengths.

3.10**centroidal wavelength**

the mean or average wavelength of an optical spectrum

NOTE Other spectral wavelengths are *centre wavelengths*, *half-power wavelengths*, and *peak wavelengths*.

3.11**chirping**

a change of the wavelength or optical frequency of an intensity-modulated *transmitter* as a function of the instantaneous intensity of the modulating signal

NOTE When chirped signals are transmitted through optical fibre, the signal waveform is distorted by *chromatic dispersion*. This process may cause a degradation in the *quality of performance*, designated as a chirping penalty.

3.12**combiner, optical**

a wavelength-independent *branching device* in which the number of input ports exceeds the number of output ports

3.13**connector, fibre optic**

a fibre optic component providing optical interconnection/disconnection of *fibre optic cable sections*, *optical devices*, and *terminal devices*

3.14**(chromatic) dispersion**

the rate of change in group delay to wavelength (usually expressed in ps/nm) between the end points of the *fibre optic cable plant*

3.15**environmental conditions**

the range of temperatures, humidity, vibration levels, etc. within which the *optical device* can be stored, or operated, or shipped and still meet all its specified parameter values

3.16**extinction ratio**

in a digital transmission system, the ratio (expressed in dB) of the average power level of logical “1” to the average power level of logical “0”

3.17**fibre optic cable plant (FOCP)**

the serial combination of *fibre optic cable sections*, *connectors*, and *splices* providing the optical path between two *terminal devices*, between two *optical devices*, or between a *terminal device* and an *optical device*

3.18**fibre optic cable section**

a single (unjointed) optical fibre cable

3.19**fibre optic communication system**

an assembly of *fibre optic subsystems* for transmitting information

3.20**fibre optic link (FOL)**

the serial combination of a *fibre optic cable plant* and *optical devices*, providing the optical path between a *transmit terminal device* and a *receive terminal device*

NOTE This is equivalent to a *basic fibre optic subsystem* minus the *transmitter* and *receiver*.

3.21**fibre optic subsystem**

an assembly of interconnected *basic fibre optic subsystems*. The assembly is specified at defined interfaces within the fibre optic system

3.22**full-width at half-maximum (FWHM)**

the positive difference of the closest spaced *half-power wavelengths*, one above and one below the *peak wavelength* of an optical spectrum

NOTE 1 Other spectral widths are *N-dB-down widths* and *root-mean-square widths*.

NOTE 2 The FWHM equals the *N-dB-down width* where $N = 3$.

3.23**half-power wavelength**

a wavelength corresponding to a half peak power value of the optical spectrum

NOTE Other spectral wavelengths are *central wavelengths*, *centroidal wavelengths*, and *peak wavelengths*.

3.24**harmonic distortion**

distortion in a system or transducer characterized by the presence at the output of spectral components which are harmonically related to the spectral components of the input signal [1]¹⁾

3.25**input power range**

for an optical fibre amplifier, the range of optical power levels such that, for any input signal power of the OFA which lies within this range, the corresponding output signal power lies in the specified output power range, where the OFA performance is ensured

3.26**input signal bandwidth, analogue**

the *bandwidth* at the electrical input to the *transmitter*

3.27**intermodulation distortion (IMD)**

distortion characterized by the appearance of spectral components with frequencies equal to the sums and differences of integral multiples of two or more component frequencies of the input signal [1]

3.28**intersymbol interference (ISI)**

the overlap of adjacent pulses as caused by the limited *bandwidth* characteristics of the *optical devices* in a *fibre optic link*

¹⁾ Figures in square brackets refer to the bibliography given in Annex B.