

Fibre optic sensors —

Part 1: Generic specification

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ICS 33.180.20

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National foreword

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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, which has the responsibility to:

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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 22, 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.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 April 1999

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ISBN 0 580 32311 0

Amendments issued since publication

Amd. No.	Date	Comments

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English version

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(IEC 61757-1:1998)

Capteurs à fibres optiques
Partie 1: Spécification générique
(CEI 61757-1:1998)

LWL-Sensoren
Teil 1: Fachgrundspezifikation
(IEC 61757-1:1998)

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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

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Foreword

The text of document 86C/222/FDIS, future edition 1 of IEC 61757-1, 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 61757-1 on 1999-01-01.

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) 1999-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-10-01

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 is informative. Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61757-1:1998 was approved by CENELEC as a European Standard without any modification.

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Introduction

This part of IEC 61757 is a generic specification and reflects the work accomplished, especially concerning general test methods and classification for fibre optic sensors. The purpose of this generic specification is to promote international trade, eliminate misunderstandings or confusion between manufacturers and buyers, and provide assistance to the purchaser in selecting consistently high quality products for his or her particular application.

This generic specification has been designed to be used as a common working and discussion tool by the vendor of components and subassemblies intended to be integrated in fibre optic sensors, as well as by designers, manufacturers and users of fibre optic sensors.

Annex A gives examples of fibre optic sensors to better illustrate the classification scheme. The examples given are illustrative only and are not limitative, nor do they constitute a recommendation or endorsement of a particular transduction principle.

1 Scope

This part of IEC 61757 is a generic specification covering optical fibres, components and sub-assemblies as they pertain specifically to sensing applications, in those aspects not already addressed by previous or concurrent standardization efforts.

A fibre optic sensor contains an optical or optically powered sensing element in which the information is created by reaction of light to a measurand. The sensing element can be the fibre itself or an optically powered element inserted along the optical path. In a fibre optic sensor, one or more light parameters are directly or indirectly modified by the measurand somewhere in the optical path, contrary to an optical data link where the information is merely transmitted from the transmitter to the receiver.

The object of this generic specification is to define, classify and provide the framework for specifying fibre optic sensors, and their specific components and subassemblies. Fibre optic sensors are devices for extracting information from the environment using fibre optic technology.

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of IEC 61757. 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 61757 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 60027-1 (all parts), *Letter symbols to be used in electrical technology*.
- IEC 60060-1, *High-voltage test techniques — Part 1: General definitions and test requirements*.
- IEC 60068-1, *Environmental testing — Part 1: General and guidance*.
- IEC 60068-2-1, *Environmental testing — Part 2: Tests — Tests A: Cold*.
- IEC 60068-2-2, *Environmental testing — Part 2: Tests — Tests B: Dry heat*.
- IEC 60068-2-3, *Environmental testing — Part 2: Tests — Test Ca: Damp heat, steady state*.
- IEC 60068-2-5, *Environmental testing — Part 2: Tests — Test Sa: Simulated solar radiation at ground level*.
- IEC 60068-2-6, *Environmental testing — Part 2: Tests — Test Fc: Vibration (sinusoidal)*.
- IEC 60068-2-9, *Environmental testing — Part 2: Tests — Guidance for solar radiation testing*.
- IEC 60068-2-10, *Environmental testing — Part 2: Tests — Test J and guidance: Mould growth*.
- IEC 60068-2-11, *Environmental testing — Part 2: Tests — Test Ka: Salt mist*.
- IEC 60068-2-13, *Environmental testing — Part 2: Tests — Test M: Low air pressure*.
- IEC 60068-2-14, *Environmental testing — Part 2: Tests — Test N: Change of temperature*.
- IEC 60068-2-27, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*.
- IEC 60068-2-29, *Environmental testing — Part 2: Tests — Test Eb and guidance: Bump*.
- IEC 60068-2-42, *Environmental testing — Part 2: Tests — Test Kc: Sulphur dioxide test for contacts and connections*.

IEC 60068-2-43, *Environmental testing — Part 2: Tests — Test Kd: Hydrogen sulphide test for contacts and connections.*

IEC 600143, *Series capacitors for power systems.*

IEC 60255-3, *Electrical relays — Part 3: Single input energizing quantity measuring relays with dependent or independent time.*

IEC 60617-1 (all parts), *Graphical symbols for diagrams.*

IEC 60695-2-2, *Fire hazard testing — Part 2: Test methods — Section 2: Needle-flame test.*

IEC 60794-1, *Optical fibre cables — Part 1: Generic specification.*

IEC 60825-1, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide.*

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

IEC 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test.*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, audio-frequency, electromagnetic field immunity test.*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test.* Basic EMC publication

IEC 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test.*

IEC QC 001001, *Basic rules of the IEC Quality Assessment System for Electronic Components (IECQ).*

IEC QC 001002, *Rules of procedure of the IEC Quality Assessment System for Electronic Components (IECQ).*

ISO 129, *Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications.*

ISO 286-1, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fit.*

ISO 370, *Toleranced dimensions — Conversion from inches into millimetres and vice versa.*

ISO 1101, *Technical drawings — Geometrical tolerancing — Tolerances of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

3 Definitions

For the purpose of this part of IEC 61757, the following definitions apply:

3.1

fibre optic sensor

sensor relying on the optical characteristics of optical fibre(s) to extract or relay environmental information for control or measurement purposes. It includes an optical or optically powered sensing element and may include one or more of the following (see Figure 1 and Figure 2):

- optical fibre lead;
- signal conditioning

3.2

intrinsic fibre optic sensor

fibre optic sensor whose sensing element consists of one or more optical fibre(s) in which one or more of the propagation, reflection or light emission characteristics depend on the measurand

3.3

extrinsic fibre optic sensor

fibre optic sensor in which the characteristics of the light are affected externally to the optical fibre(s) by the measurand

3.4

optical or optically powered sensing element

device which accepts information in the form of a physical quantity and converts it to information in the form of an optical quantity, according to a definite law

3.5**single-point fibre optic sensor**

fibre optic sensor which provides a measurement of a measurand by means of a discrete sensing element

3.6**multiple-point fibre optic sensor**

fibre optic sensor which includes a number of multiplexed single-point sensors

3.7**extended fibre optic sensor**

fibre optic sensor which provides a measurement of a measurand over an extended region by means of a continuous sensing element

3.8**distributed fibre optic sensor**

fibre optic sensor which provides a spatially resolved measurement of a measurand over an extended region by means of a continuous sensing element

3.9**optical source**

device which supplies the optical energy required to allow the interaction between the sensing element and the measurand. It contains, as a minimum, a luminous source and it may contain signal conditioning. When the optical energy is generated by the phenomenon sensed, no optical source is required

3.10**optical receiver**

device which receives the light affected by the measurand and converts it into a quantity, generally electric, according to a predetermined law. It may contain one or more photo-detectors, signal conditioners and communication interfaces

3.11**optical fibre lead(s)**

optical fibre line(s) which connect the sensing element to the optical source and to the optical receiver when present, these leads must remain unaffected by the measurand

3.12**optical interface**

arbitrary point at which the effect of the measurand on the sensing element is optically defined

3.13**signal interface**

arbitrary point at which the effect of the measurand is present in a form directly usable for control or measurement purposes. The optical interface(s) and the signal interface(s) can in some cases coincide