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**Optični senzorji - 3-2. del: Akustično zaznavanje in merjenje vibracij - Razpršeno zaznavanje (IEC 61757-3-2:2022)**

Fibre optic sensors - Part 3-2: Acoustic sensing and vibration measurement - Distributed sensing (IEC 61757-3-2:2022)

Lichtwellenleitersensoren - Teil 3-2: Akustische Sensorik und Schwingungsmessung - Verteilte Sensorik (IEC 61757-3-2:2022)

Capteurs fibroniques – Partie 3-2: Détection acoustique et mesure des vibrations - Détections réparties (IEC 61757-3-2:2022)

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EN IEC 61757-3-2

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May 2022

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## Fibre optic sensors - Part 3-2: Acoustic sensing and vibration measurement - Distributed sensing (IEC 61757-3-2:2022)

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

**EN IEC 61757-3-2:2022 (E)****European foreword**

The text of document 86C/1700/CDV, future edition 1 of IEC 61757-3-2, 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 IEC 61757-3-2:2022.

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) 2023-02-03
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 IEC 60869-1 NOTE Harmonized as EN IEC 60869-1

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

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IEC 61757-2-2	2016	Fibre optic sensors - Part 2-2: Temperature measurement - Distributed sensing	EN 61757-2-2	2017

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# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



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Part 3-2: Acoustic sensing and vibration measurement – Distributed sensing

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## FIBRE OPTIC SENSORS –

**Part 3-2: Acoustic sensing and vibration measurement –  
Distributed sensing**

## FOREWORD

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IEC 61757-3-2 has been prepared by subcommittee SC 86C: Fibre optic systems and active devices, of IEC technical committee TC 86: Fibre optics. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
86C/1700/CDV	86C/1719/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all parts in the IEC 61757 series, published under the general title *Fibre optic sensors*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

This document is based on SEAFOM Measuring Sensor Performance Document – 02 (SEAFOM MSP-02) [1]<sup>1</sup>. Within the framework of a type C liaison, SEAFOM proposed this document as a new work item, which was approved by the participating members of IEC SC 86C.

NOTE Except for Figure 1, Figure C.1, Figure C.2, and Figure C.3, all figures in this document were adopted from SEAFOM MSP-02 either in original or in modified form with permission from SEAFOM.

The IEC 61757 series is published with the following logic: the sub-parts are numbered as IEC 61757-M-T, where M denotes the measure and T, the technology.

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<sup>1</sup> Numbers in square brackets refer to the Bibliography.

## FIBRE OPTIC SENSORS –

### Part 3-2: Acoustic sensing and vibration measurement – Distributed sensing

#### 1 Scope

This part of IEC 61757 specifies the terminology, characteristic performance parameters, related test and calculation methods, as well as specific test equipment for interrogation units used in distributed fibre optic acoustic sensing and vibration measurement systems. This document refers to the Rayleigh backscatter and phase detection method by phase-sensitive coherent optical time-domain reflectometry ( $\phi$ -OTDR) only. Quasi-static and low frequency operation modes are not covered by this document.

Generic specifications for fibre optic sensors are defined in IEC 61757.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 61757:2018, *Fibre optic sensors – Generic specification*

IEC 61757-2-2:2016, *Fibre optic sensors – Part 2-2: Temperature measurement – Distributed sensing*

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#### 3 Terms, definitions, abbreviated terms and symbols

##### 3.1 Terms and definitions

For the purposes of this document, terms and definitions given in IEC 61757, IEC 61757-2-2:2016 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

##### 3.1.1

##### **distributed fibre optic sensor**

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

[SOURCE: IEC 61757:2018, 3.5]

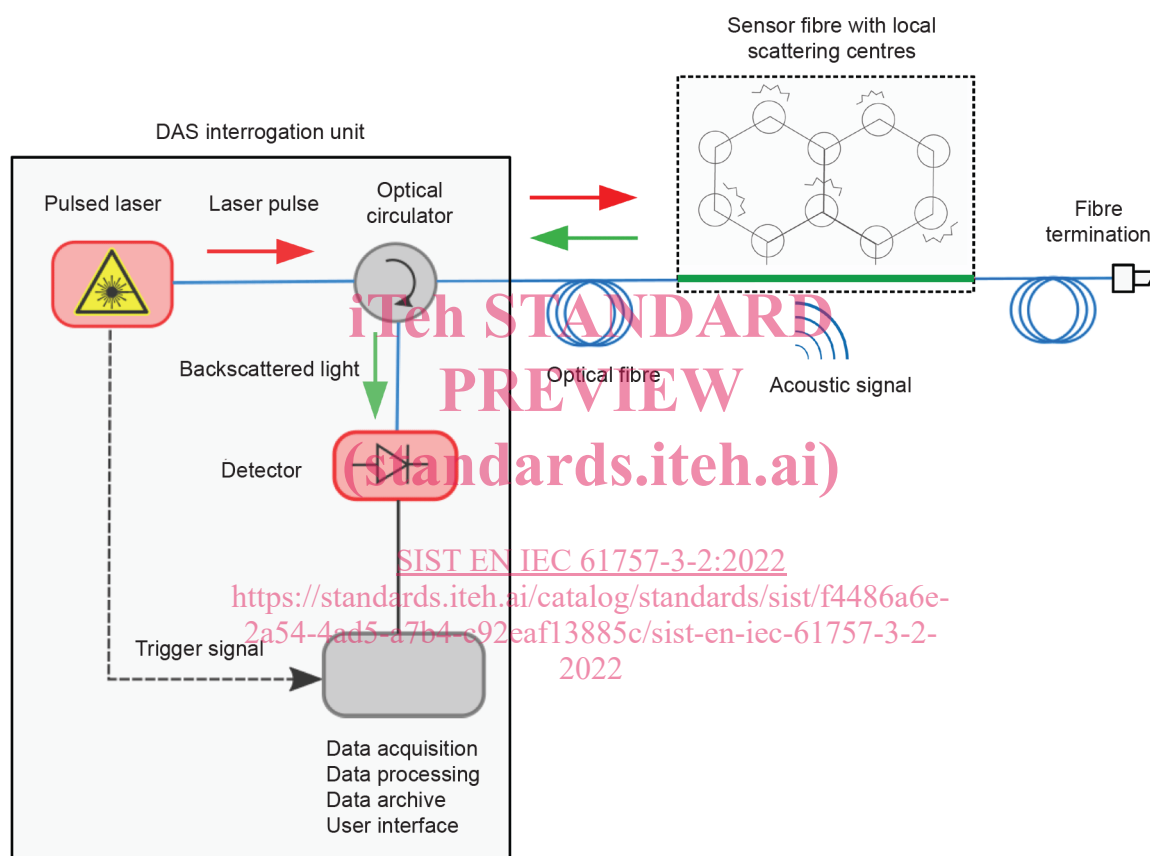
### 3.1.2 distributed fibre optic acoustic sensing system DAS

measurement set-up consisting of a distributed fibre optic sensor connected to an interrogation unit including processor, data archive, and user interface, which can locally detect acoustic or vibration induced disturbances (phase change of the backscattering centres) in the fibre

Note 1 to entry: The alternative term fibre optic distributed vibration sensing (DVS) is also used in the industry.

Note 2 to entry: See Figure 1 for a principal DAS set-up. Pulses from a coherent source are sent into the sensor fibre through an optical circulator, which also taps the coherent Rayleigh backscattering signal to a detector for subsequent digitization and fast real-time acquisition.

Note 3 to entry: Typically, a DAS detects acoustic or vibration induced disturbances at frequencies below 2 kHz.



IEC

Figure 1 – Distributed acoustic sensing system

### 3.1.3 distance measurement range

maximum distance (specified in length units) from the interrogation unit output connector along the simulated fibre sensor within which the DAS measures an acoustic signal with specified measurement performance under defined conditions

[SOURCE: IEC 61757-2-2:2016, 3.2, modified – adapted to acoustic sensing.]

### 3.1.4 fibre stretcher

device where an external stimulus causes a linearly proportional amount of fibre strain uniformly across the fibre length attached

Note 1 to entry: Normally the fibre stretcher consists of a piezoelectric cylinder with an electrical stimulus.