
Optični senzorji - 5-1. del: Meritve nagiba - Nagibni senzorji na podlagi optovlakenskih Braggovih rešetk (IEC 61757-5-1:2021)

Fibre optic sensors - Part 5-1: Tilt measurement - Tilt sensors based on fibre Bragg gratings (IEC 61757-5-1:2021)

Lichtwellenleitersensoren – Teil 5-1: Neigungsmessung - Neigungssensoren auf Basis von Faser-Bragg-Gittern (IEC 61757-5-1:2021)

Capteurs fibroniques - Partie 5-1: Mesure d'inclinaison - Capteurs d'inclinaison basés sur des réseaux de Bragg à fibres (IEC 61757-5-1:2021)

[SIST EN IEC 61757-5-1:2021](https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-0ad5526ee558/sist-en-iec-61757-5-1-2021)

[https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-](https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-0ad5526ee558/sist-en-iec-61757-5-1-2021)

Ta slovenski standard je istoveten z: EN IEC 61757-5-1:2021

ICS:

33.180.99	Druga oprema za optična vlakna	Other fibre optic equipment
-----------	--------------------------------	-----------------------------

SIST EN IEC 61757-5-1:2021**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 61757-5-1:2021](https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 61757-5-1

August 2021

ICS 33.180.99

English Version

**Fibre optic sensors - Part 5-1: Tilt measurement - Tilt sensors
based on fibre Bragg gratings
(IEC 61757-5-1:2021)**

Capteurs fibroniques - Partie 5-1: Mesure d'inclinaison -
Capteurs d'inclinaison basés sur des réseaux de Bragg à
fibres
(IEC 61757-5-1:2021)

Lichtwellenleitersensoren - Teil 5-1: Neigungsmessung -
Neigungssensoren auf Basis von Faser-Bragg-Gittern
(IEC 61757-5-1:2021)

This European Standard was approved by CENELEC on 2021-08-11. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

SIST EN IEC 61757-5-1:2021

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

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

EN IEC 61757-5-1:2021 (E)**European foreword**

The text of document 86C/1699/CDV, future edition 1 of IEC 61757-5-1, 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 IEC 61757-5-1:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-05-11 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-08-11 document have to be withdrawn

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61757-5-1:2021 was approved by CENELEC as a European Standard without any modification.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN IEC 61757-5-1:2021
<https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021>

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050	series	International Electrotechnical Vocabulary- (IEV)		-
IEC 60068-2	series	Environmental testing - Part 2X: Tests	EN 60068-2	series
IEC 61300-2	series	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2X: Tests	EN 61300-2	series
IEC 61754	series	Fibre optic interconnecting devices and passive components - Fibre optic connector interfaces	EN 61754	series
IEC 61757	-	Fibre optic sensors - Generic specification	EN IEC 61757	-
IEC 61757-1-1	2020	Fibre optic sensors - Part 1-1: Strain measurement - Strain sensors based on fibre Bragg gratings	EN IEC 61757-1-1	2020
IEC 62129-1	-	Calibration of wavelength/optical frequency measurement instruments - Part 1: Optical spectrum analyzers	EN 62129-1	-
IEC 62129-2	-	Calibration of wavelength/optical frequency measurement instruments - Part 2: Michelson interferometer single wavelength meters	EN 62129-2	-
IEC 62129-3	-	Calibration of wavelength/optical frequency measurement instruments - Part 3: Optical frequency meters internally referenced to a frequency comb	EN IEC 62129-3	-
ISO/IEC Guide 98-3	-	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)		-

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 61757-5-1:2021](https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021>



IEC 61757-5-1

Edition 1.0 2021-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic sensors –
Part 5-1: Tilt measurement – Tilt sensors based on fibre Bragg gratings

Capteurs fibroniques –
Partie 5-1: Mesure d'inclinaison – Capteurs d'inclinaison basés sur des réseaux de Bragg à fibres

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.180.99

ISBN 978-2-8322-9949-4

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Symbols	8
5 Structure and characteristics	9
5.1 Fibre Bragg grating (FBG).....	9
5.2 FBG tilt sensor configuration.....	9
5.3 Reference wavelength	11
5.4 Stability behaviour	11
5.4.1 Drift and creep.....	11
5.4.2 Hysteresis	12
5.5 Test specimen	12
5.6 Indication of the measured values.....	12
5.7 Zero point related measurement	12
5.8 Non-zero point related measurement	12
5.9 Production set.....	12
5.10 FBG tilt sensor standard type.....	13
5.11 FBG tilt sensor series	13
6 Features and characteristics to be measured.....	13
6.1 Sampling and statistical evaluation.....	13
6.1.1 Sampling	13
6.1.2 Reporting the measuring result	13
6.1.3 Sample conditioning	14
6.1.4 Ambient test conditions.....	14
6.1.5 Required type of test for individual characteristics	14
6.2 Bragg wavelength λ_B	14
6.2.1 General	14
6.2.2 Measuring procedure	15
6.2.3 Evaluation	15
6.2.4 Reporting.....	15
6.3 FBG spectral width.....	15
6.3.1 Measuring procedure	15
6.3.2 Evaluation	15
6.3.3 Reporting.....	15
6.4 FBG reflectivity	16
6.4.1 Measuring procedure	16
6.4.2 Evaluation	16
6.4.3 Reporting.....	16
6.5 Tilt measurement	16
6.5.1 Test set-up	16
6.5.2 Measuring procedure	17
6.5.3 Calibration and evaluation	18
6.6 Gauge factor κ_θ	19
6.7 Temperature and humidity ranges.....	19

6.7.1	General	19
6.7.2	Measuring procedure	19
6.7.3	Evaluation	20
6.7.4	Reporting.....	20
7	Features and characteristics to be reported	20
7.1	Construction details	20
7.2	Configuration of the FBG tilt sensor	20
7.3	Temperature and humidity range.....	20
7.4	Connecting requirement.....	20
8	Recommendations for use of FBG measuring instruments	20
Figure 1 – Examples for measuring single axis tilt changes.....		10
Figure 2 – Examples of Bragg wavelength change caused by tilt		10
Figure 3 – Example of tilt sensor using FBG (schematic diagram).....		11
Figure 4 – Schematic diagram of tilt measurement system.....		16
Figure 5 – Example of temperature dependence of the Bragg wavelengths of two FBGs		17
Figure 6 – Example of tilt dependence of the Bragg wavelengths of FBG1 and FBG2		18
Table 1 – Required type of test for individual characteristics		14

STANDARD PREVIEW
(standards.iteh.ai)

SIST EN IEC 61757-5-1:2021

<https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC SENSORS –

**Part 5-1: Tilt measurement –
Tilt sensors based on fibre Bragg gratings**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61757-5-1 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee TC86: Fibre optics. It is an International Standard.

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

Draft	Report on voting
86C/1699/CDV	86C/1718/RVC

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. The main document types developed by IEC are described in greater detail at 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 in the data related to the specific document. At this date, the document will be

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

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN IEC 61757-5-1:2021

<https://standards.iteh.ai/catalog/standards/sist/2206fe56-48f8-4228-9e8e-9ad5536ee558/sist-en-iec-61757-5-1-2021>