SLOVENSKI STANDARD
SIST EN 62129-2:2011

01-september-2011

Kalibriranje valovno-dolžinskih/optično-frekvenčnih merilnih instrumentov - 2. del: Merilniki ene valovne dolžine z Michelsonovim interferometrom (IEC 62129-2:2011)

Calibration of wavelength/optical frequency measurement insturments - Part 2: Michelson interferometer single wavelength meters (IEC 62129-2:2011)

Kalibrierung von Messgeräten für die Wellenlänge/optische Frequenz - Teil 2: Michelson-Interferometer-Einzelwellenlängen-Messgerät (IEC 62129-2:2011)

Etalonnage des appareils de mesure de longueur d'onde/appareil de mesure de la fréquence optique - Partie 2: Appareils de mesure de longueur d'onde unique à interféromètre de Michelson (CEI 62129-2:2011)

Ta slovenski standard je istoveten z: **EN 62129-2:2011**

ICS:

33.180.01	Sistemi z optičnimi vlakni na splošno	Fibre optic systems in general

SIST EN 62129-2:2011 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 62129-2

July 2011

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English version

Calibration of wavelength/optical frequency measurement instruments - Part 2: Michelson interferometer single wavelength meters
(IEC 62129-2:2011)

Etalonnage des appareils de mesure de longueur d'onde/appareil de mesure de la fréquence optique -
Partie 2: Appareils de mesure de longueur d'onde unique à interféromètre de Michelson
(CEI 62129-2:2011)

Kalibrierung von Messgeräten für die Wellenlänge/optische Frequenz -
Teil 2: Michelson-Interferometer-Einzelwellenlängen-Messgeräte
(IEC 62129-2:2011)

This European Standard was approved by CENELEC on 2011-06-30. 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.

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 62129-2:2011 E

Foreword

The text of document 86/395/FDIS, future edition 1 of IEC 62129-2, prepared by IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62129-2 on 2011-06-30.

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

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)	2012-03-30
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-06-30

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62129-2:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60793-1-1	NOTE	Harmonized as EN 60793-1-1.
IEC 60825-1	NOTE	Harmonized as EN 60825-1.
IEC 60825-2	NOTE	Harmonized as EN 60825-2.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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 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 60050-300	2001	International Electrotechnical Vocabulary - Electrical and electronic measurements and measuring instruments - Part 311: General terms relating to measurements - Part 312: General terms relating to electrical measurements - Part 313: Types of electrical measuring instruments - Part 314: Specific terms according to the type of instrument	-	-
IEC 61315	2005	Calibration of fibre-optic power meters	EN 61315	2006
IEC/TR 61931	1998	Fibre optic - Terminology	-	-
ISO/IEC 17025	2005	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005
ISO/IEC Guide 99	2007	International vocabulary of metrology - Basic and general concepts and associated terms (VIM)	-	-
ISO/IEC Guide 98-3	2008	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-

IEC 62129-2

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Calibration of wavelength/optical frequency measurement instruments – Part 2: Michelson interferometer single wavelength meters

Étalonnage des appareils de mesure de longueur d'onde/appareil de mesure de la fréquence optique – Partie 2: Appareils de mesure de longueur d'onde unique à interféromètre de Michelson

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CALIBRATION OF WAVELENGTH/OPTICAL FREQUENCY MEASUREMENT INSTRUMENTS –

Part 2: Michelson interferometer single wavelength meters

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.
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International Standard IEC 62129-2 has been prepared by IEC technical committee 86: Fibre optics.

The text of this standard is based on the following documents:

FDIS	Report on voting
86/395/FDIS	86/399/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all parts in the IEC 62129 series, published under the general title, *Calibration of wavelength/optical frequency – Measurement instruments*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Wavelength meters, often based on the Michelson interferometer, are designed to measure the wavelength of an optical source as accurately as possible. Although the wavelength meters contain an internal absolute reference, typically a Helium-Neon laser, calibration is required to achieve the highest accuracies. The instrument is typically used to measure wavelengths other than that of the internal reference. Corrections are made within the instrument for the refractive index of the surrounding air. A precise description of the calibration conditions must therefore be an integral part of the calibration.

This international standard defines all of the steps involved in the calibration process: establishing the calibration conditions, carrying out the calibration, calculating the uncertainty, and reporting the uncertainty, the calibration conditions and the traceability.

The calibration procedure describes how to determine the ratio between the value of the input reference wavelength (or the optical frequency) and the wavelength meter's result. This ratio is called *correction factor*. The measurement uncertainty of the correction factor is combined following Annex A from uncertainty contributions from the reference meter, the test meter, the setup and the procedure.

The calculations go through detailed characterization of individual uncertainties. It is important to know that:

a) estimations of the individual uncertainties are acceptable;

b) a detailed uncertainty analysis is only necessary once for each wavelength meter type under test, and that all subsequent calibrations can be based on this one-time analysis;

c) some of the individual uncertainties can simply be considered to be part of a checklist, with an actual value which can be neglected.

A number of optical frequency references can be used to provide a traceable optical frequency. These are based on absorption by gas molecules under low pressure and using excited-state opto-galvanic transitions in atoms. Annex E lists the lines.

CALIBRATION OF WAVELENGTH/OPTICAL FREQUENCY MEASUREMENT INSTRUMENTS –

Part 2: Michelson interferometer single wavelength meters

1 Scope

This part of IEC 62129 is applicable to instruments measuring the vacuum wavelength or optical frequency emitted from sources that are typical for the fibre-optic communications industry. These sources include Distributed Feedback (DFB) laser diodes, External Cavity lasers and single longitudinal mode fibre-type sources. It is assumed that the optical radiation will be coupled to the wavelength meter by a single-mode optical fibre. The standard describes the calibration of wavelength meters to be performed by calibration laboratories or by wavelength meter manufacturers. This standard is part of the IEC 62129 series on the calibration of wavelength/optical frequency measurement instruments. Refer to IEC 62129 for the calibration of optical spectrum analyzers.

2 Normative references

The following referenced documents are indispensable for the application 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 60050-300:2001, International *Electrotechnical Vocabulary – Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical instruments – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument*

IEC 61315 :2005, *Calibration of fibre-optic power meters*

IEC/TR 61931:1998, *Fibre optic – Terminology*

ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories*

ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
accredited calibration laboratory
calibration laboratory authorized by the appropriate national organization to issue calibration certificates with a minimum specified uncertainty, which demonstrate traceability to *national standards*

3.2
adjustment
set of operations carried out on an instrument in order that it provides given indications corresponding to given values of the measurand

[IEC 60050-300:2001 (311-03-16); see also ISO/IEC Guide 99:2007, 3.11, modified]

3.3
calibration
set of operations that establish, under specified conditions, the relationship between the values of quantities indicated by a measuring instrument and the corresponding values realized by standards

[ISO/IEC Guide 99:2007, 2.39, modified]

NOTE 1 The result of a calibration permits either the assignment of values of measurands to the indications or the determination of corrections with respect to indications.

NOTE 2 A calibration may also determine other metrological properties such as the effect of influence quantities.

NOTE 3 The result of a calibration may be recorded in a document, sometimes called a calibration certificate or a calibration report.

3.4
calibration conditions
conditions of measurements in which the calibration is performed

3.5
correction factor
CF
numerical factor by which the uncorrected result of a measurement is multiplied to compensate for systematic error

[ISO/IEC Guide 99:2007, 2.53, modified]

3.6
detector
the element of the wavelength meter that transduces the radiant optical power into a measurable, usually electrical quantity

[IEC/TR 61931 and ISO/IEC Guide 99:2007, 3.9, modified]

3.7
deviation
value minus its reference value

NOTE In this standard, the deviation is the difference between the indication of the test meter and the indication of the reference meter when excited under the same conditions.

3.8
excitation (fibre-)
description of the distribution of optical power between the modes in the fibre

NOTE Single mode fibres are generally assumed to be excited by only one mode (the fundamental mode).

3.9
instrument state
complete description of the state of the meter during the calibration

3.10
measuring range
set of values of measurands for which the error of a measuring instrument is intended to lie within specified limits

[ISO/IEC Guide 99:2007, 4.7, modified]

NOTE In this standard, the measuring range is the range of radiant power (part of the *operating range*), for which the uncertainty at operating conditions is specified. The term "dynamic range" should be avoided in this context.

3.11
national (measurement) standard
standard recognized by a national decision to serve, in a country, as the basis for assigning values to other standards of the quantity concerned

[ISO/IEC Guide 99:2007, 5.3, modified]

3.12
national standards laboratory
laboratory which maintains the *national standard*

3.13
natural standard
atomic or molecular transition that can be used to realise a reference standard

3.14
operating conditions
appropriate set of specified ranges of values of influence quantities usually wider than the reference conditions for which the uncertainties of a measuring instrument are specified

[ISO/IEC Guide 99:2007, 4.9, modified]

NOTE The operating conditions and uncertainty at operating conditions are usually specified by manufacturer for the convenience of the user.

3.15
operating range
specified range of values of one of a set of *operating conditions*

3.16
optical input port
physical input of the wavelength meter (or standard) to which the radiant power is to be applied or to which the optical fibre end is to be connected. An optical path (path of rays with or without optical elements like lenses, diaphragms, light guides, etc.) is assumed to connect the optical input port with the detector

3.17
reference conditions
conditions of use prescribed for testing the performance of a measuring instrument or for intercomparison of results of measurements

[ISO/IEC Guide 99:2007, 4.11, modified]

NOTE The reference conditions generally include reference values or reference ranges for the influence quantities affecting the measuring instrument.

3.18
reference wavelength meter
standard which is used as the reference to calibrate a test wavelength meter