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Irish Standard  
I.S. EN 62129-2:2011

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

## I.S. EN 62129-2:2011

*Incorporating amendments/corrigenda issued since publication:*

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<b>NSAI</b> 1 Swift Square, Northwood, Santry Dublin 9	T +353 1 807 3800 F +353 1 807 3838 E standards@nsai.ie  W NSAI.ie	<b>Sales:</b> T +353 1 857 6730 F +353 1 857 6729 W standards.ie
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EUROPEAN STANDARD  
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**EN 62129-2**

July 2011

ICS 33.180.30

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.

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.

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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**

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**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.

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**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.

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## 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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)	-	-

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CALIBRATION OF WAVELENGTH/OPTICAL FREQUENCY  
MEASUREMENT INSTRUMENTS –****Part 2: Michelson interferometer single wavelength meters**

## FOREWORD

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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.

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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.

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