

# Calibration of fibre-optic power meters

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

|   |  |
|---|--|
| See Eesti standard EVS-EN IEC 61315:2019 sisaldab Euroopa standardi EN IEC 61315:2019 ingliskeelset teksti.         | This Estonian standard EVS-EN IEC 61315:2019 consists of the English text of the European standard EN IEC 61315:2019.              |
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English Version

**Calibration of fibre-optic power meters  
(IEC 61315:2019)**

Étalonnage de wattmètres pour dispositifs à fibres optiques  
(IEC 61315:2019)

Kalibrierung von Lichtwellenleiter-Leistungsmessgeräten  
(IEC 61315:2019)

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## European foreword

The text of document 86/533/CDV, future edition 3 of IEC 61315, prepared by IEC/TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61315:2019.

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) 2020-02-03
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-05-03

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## Endorsement notice

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

|                     |      |   |
|---------------------|------|---|
| IEC 61040:1990      | NOTE | Harmonized as EN 61040:1992 (not modified)      |
| IEC 60793-1-1       | NOTE | Harmonized as EN 60793-1-1                      |
| IEC 60793-1-43:2015 | NOTE | Harmonized as EN 60793-1-43:2015 (not modified) |
| IEC 60825-1         | NOTE | Harmonized as EN 60825-1                        |
| IEC 60825-2         | NOTE | Harmonized as EN 60825-2                        |
| IEC 61280-4-1       | NOTE | Harmonized as EN 61280-4-1                      |
| IEC 61300-3-2:2009  | NOTE | Harmonized as EN 61300-3-2:2009 (not modified)  |
| IEC 60359:2001      | NOTE | Harmonized as EN 60359:2002 (not modified)      |
| ISO/IEC 17025       | NOTE | Harmonized as EN ISO/IEC 17025                  |

## 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).

| <u>Publication</u>      | <u>Year</u> | <u>Title</u>  | <u>EN/HD</u> | <u>Year</u> |
|-------------------------|-------------|---|--------------|-------------|
| IEC 60793-2             | -           | Optical fibres - Part 2: Product specifications - General   | EN 60793-2   | -           |
| IEC/TR 61931            | 1998        | Fibre optic - Terminology   | -            | -           |
| 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 FIBRE-OPTIC POWER METERS

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International Standard IEC 61315 has been prepared by IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2005. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) update of terms and definitions;
- b) update of 5.1, including Table 1 (new type of source);
- c) update of Annex A;
- d) addition of Annex B on dB conversion.



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

| CDV        | Report on voting |
|------------|------------------|
| 86/533/CDV | 86/540A/RVC      |

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

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

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## INTRODUCTION

*Fibre-optic power meters* are designed to measure optical power from fibre-optic sources as accurately as possible. This capability depends largely on the quality of the *calibration* process. In contrast to other types of measuring equipment, the *measurement results of fibre-optic power meters* usually depend on many conditions of measurement. The conditions of measurement during the *calibration* process are called *calibration conditions*. Their precise description is therefore an integral part of the *calibration*.

This document 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 absolute power *calibration* describes how to determine the ratio between the value of the input power and the power 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 characterizations of individual uncertainties. It is important to know that

- a) some uncertainties are type B estimations, experience-based,
- b) a detailed uncertainty analysis is usually only done once for each power meter type under test, and all subsequent *calibrations* are usually based on this one-time analysis, using the appropriate type A measurement contributions evaluated at the time of the *calibration*, and
- c) some of the individual uncertainties are simply considered to be part of a checklist, with an actual value which can be neglected.

Clause 5 defines absolute power *calibration*, which is mandatory for *calibration* reports referring to this document.

Clause 6 describes the evaluation of the measurement uncertainty of a calibrated power meter operated within *reference conditions* or within *operating conditions*. It depends on the *calibration* uncertainty of the power meter as calculated in 5.4, the conditions and its dependence on the conditions. It is usually performed by manufacturers in order to establish specifications and is not mandatory for reports referring to this document. One of these dependences, the *nonlinearity*, is determined in a separate *calibration* (Clause 7).