
Umerjanje pribora za preskušanje kromatske disperzije (IEC 61744:2023)

Calibration of fibre optic chromatic dispersion test sets (IEC 61744:2023)

Kalibrierung von Prüfaufbauten zur Bestimmung der chromatischen Dispersion (IEC 61744:2023)

Etalonnage des ensembles d'essai de la dispersion chromatique fibronique (IEC 61744:2023)

Ta slovenski standard je istoveten z: EN IEC 61744:2023**ICS:**

33.140	Posebna merilna oprema za uporabo v telekomunikacijah	Special measuring equipment for use in telecommunications
33.180.01	Sistemi z optičnimi vlakni na splošno	Fibre optic systems in general

SIST EN IEC 61744:2023**en**

EUROPEAN STANDARD

EN IEC 61744

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2023

ICS 33.180.01

Supersedes EN 61744:2005

English Version

Calibration of fibre optic chromatic dispersion test sets (IEC 61744:2023)

Étalonnage des ensembles d'essai de la dispersion
chromatique fibronique
(IEC 61744:2023)

Kalibrierung von Prüfaufbauten zur Bestimmung der
chromatischen Dispersion
(IEC 61744:2023)

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Europäisches Komitee für Elektrotechnische Normung

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

EN IEC 61744:2023 (E)**European foreword**

The text of document 86/615/FDIS, future edition 3 of IEC 61744, prepared by IEC/TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61744:2023.

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) 2024-02-09
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-05-09

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The text of the International Standard IEC 61744:2023 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 standard indicated:

ISO/IEC 17025 NOTE Approved as EN ISO/IEC 17025

IEC 60793-1-42 NOTE Approved as EN 60793-1-42

IEC 60793-2-50 NOTE Approved as EN IEC 60793-2-50

IEC 60825-1 NOTE Approved as EN 60825-1

IEC 61315 NOTE Approved as EN IEC 61315

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 60050-731	-	International Electrotechnical Vocabulary - - Chapter 731: Optical fibre communication		-
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	-
ISO/IEC Guide 98-3	-	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)		-



IEC 61744

Edition 3.0 2023-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Calibration of fibre optic chromatic dispersion test sets

Étalonnage des ensembles d'essai de la dispersion chromatique fibronique

[SIST EN IEC 61744:2023](https://standards.iteh.ai/catalog/standards/sist/aa0f51ac-dc3d-4248-a7d7-daf4ec48032b/sist-en-iec-61744-2023)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.180.01

ISBN 978-2-8322-6734-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CALIBRATION OF FIBRE OPTIC CHROMATIC
DISPERSION TEST SETS**

FOREWORD

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IEC 61744 has been prepared by IEC technical committee 86: Fibre optics. It is an International Standard.

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

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

- a) updated terms and definitions;
- b) the use of a reference fibre standard for calibration is now allowed and at the same level as the other calibration method;
- c) Annex B was split into a new Annex B (on calibration uncertainty, still normative) and a new Annex C (on uncertainty at operating conditions, informative);
- d) removed former C.3.4 on interferometric method since this method is no longer supported in IEC 60793-1-42;
- e) removed Annex D and other references in text to calibration compensation to align with other calibration documents;

- f) removed Annex E and other references in text to use of air wavelength since it is not used in the fibre domain.

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

Draft	Report on voting
86/615/FDIS	86/617/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. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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.

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0 Introduction

0.1 Chromatic dispersion in optical fibres

Chromatic dispersion is the variation with optical light wavelength of the light propagation delay time in a length of fibre. This variation can cause bandwidth limitation in the fibre when used to transmit communication signals. For a more detailed explanation, refer to Annex D and IEC 60793-1-42.

0.2 Chromatic dispersion (CD) test sets

CD test sets are used to measure the chromatic dispersion properties of optical fibres and typically comprise an optical source of known wavelength(s), a fibre light input coupling and output coupling means, optical detection means, and electronic or optical means of determining the optical delay or dispersion at the source wavelength. There are several variants each requiring slightly different calibration techniques. Refer to Annex D for further details.

In general, all CD test sets produce an output of fibre delay or dispersion versus the light wavelength, typically in graphical form.

In essence, all CD test sets operate with wavelength as a programmed (independent) variable, usually the abscissa (x-axis) and dispersion or time delay as the ordinate (y-axis) as a measured (dependent) variable. By their nature, fibre chromatic dispersion measurements require multiple wavelengths to be programmed. Even in the case of a single dispersion point obtained using the differential phase shift method, two separate wavelength values are used. It is also typical to expect a wide range of dispersion values over a range of wavelengths to be measured.

0.3 Overview of calibration procedures described in this document

The requirement to calibrate the CD test set, traceable to known standards, is essential for quality control in fibre optic production, fibre research and similar activities. This document describes the detailed procedures used to establish calibration of a CD test set.

Calibration of a CD test set is established by applying known artefacts or standards (themselves calibrated to reference standards) to the CD test set and measuring its response.

Primarily, the artefacts or standards used are as follows.

- a) Wavelength artefact(s) or traceable wavelength measuring instruments used to calibrate the light source wavelength(s) used by the CD test set. This is to establish the correct excitation wavelength for the system (the "x-axis").
- b) Delay or dispersion artefact(s) used to calibrate the delay or dispersion response of the CD test set (the "y-axis").
- c) Traceable chromatic dispersion reference fibre used to calibrate the CD test set. This method allows a simultaneous calibration of the whole CD test set, including the measurement of the delay or dispersion response of the CD test set as a function of wavelength and also the internal data processing part. A proper selection of the type of reference fibre is important, especially for an accurate calibration of the zero dispersion wavelength.

Calibration can only be carried out using these artefacts; the use of a known standard fibre (reference fibre described in c)) whose chromatic dispersion is known is recommended as the fibre forms a stable source of known dispersion and may be used as a simple dispersion artefact.

If it is found that the CD test set measurement results have changed significantly compared to the user requirements (i.e. the test set has drifted by more than the repeatability), then adjustment may be carried out depending on the need.

In this document, the reference medium for wavelength and the velocity of light is assumed to be in vacuum, and hence define the refractive index = 1,000 000 0.