

INTERNATIONAL STANDARD

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**Fibre optic sensors –
Part 7-3: Voltage measurement – Polarimetric method**

**Capteurs fibroniques –
Partie 7-3: Mesure de tension – Méthode polarimétrique**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC SENSORS –

Part 7-3: Voltage measurement – Polarimetric method

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

Draft	Report on voting
86C/1873/CDV	86C/1893/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/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- withdrawn, or
- revised.

INTRODUCTION

This document is part of the IEC 61757 series, which is dedicated to fibre optic sensors. Generic specifications for fibre optic sensors are defined in IEC 61757.

The individual parts of the IEC 61757 series are numbered as IEC 61757-*M-T*, where *M* denotes the measure and *T* the technology of the fibre optic sensor. The IEC 61757-7-*T* series is concerned with voltage measurements.

Voltage measuring techniques are essential for controlling and diagnosing apparatus that support industry and society. Optical voltage sensors based on electro-optic effects have been developed to serve as voltage measuring devices. These sensors enable advanced voltage measurements without encountering the issues related to conventional electrical voltage sensors. Hence, they have been applied in various fields including power systems.

Given the expected potential of this new fibre optic voltage sensing technology, several kinds of optical voltage sensors covering a wide range of applications have been developed by various manufacturers. The design of these voltage sensors depends on the specific application, which determines the target voltage to be measured, the configuration of the sensor, the signal processing method, and the installation method. When developing a new optical voltage sensor, the sensor performance and characteristics have to be specified and evaluated.

To facilitate the use of fibre optic voltage sensors, it is important to define terms that characterize the performance and functionality of these sensors. It is also important to clearly specify how these specifications can be evaluated. Clearly defined terms and evaluation procedures help to develop more efficient sensors and to smoothly transfer this new sensor technology from the suppliers to the users. This document defines a set of methods for evaluating the performance and characteristics of fibre optic voltage sensors. However, this document does not quantify any performance targets because these depend on the specific application of the sensor. It is nevertheless expected that this document helps to define specific quantitative targets for the sensor performance when a fibre optic voltage sensor is developed for a given practical application.

This document is based on the standard OITDA FS 02 [1]¹ published by the Optoelectronic Industry and Technology Development Association (OITDA). All the figures and tables in this document are identical to those in OITDA FS 02 except for the translation from Japanese to English.

¹ Numbers in square brackets refer to the Bibliography.

FIBRE OPTIC SENSORS –

Part 7-3: Voltage measurement – Polarimetric method

1 Scope

This part of IEC 61757 defines the terminology, structure, and performance characteristics of fibre optic voltage sensors using a polarimetric measurement method. The document specifies test methods and procedures for measuring key performance parameters of these sensors. It addresses only the voltage sensing element and not the additional devices that are unique to each application.

The document does not specify the required performance values of optical polarimetric fibre optic voltage sensors, because these specifications depend on the designated application of the sensor and are typically defined by the user of the sensor. The required performance values are usually defined when designing a sensor for a specific application.

2 Normative references

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.

IEC 61757, *Fibre optic sensors – Generic specification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61757 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

electro-optic effect

change in the optical characteristics of a material under the influence of an electric field

Note 1 to entry: Pockels and Kerr effects are examples of electro-optic effects.

Note 2 to entry: Electro-optic is often erroneously used as a synonym for opto-electronic.

Note 3 to entry: The most common effect results in a change in refractive index.

[SOURCE: IEC 60050-731:1991, 731-01-42]

3.2

intensity modulation method

method of converting birefringence information into light intensity by passing light through a wave plate, a Pockels cell, and a polarization separation element in this order, and creating an optical signal corresponding to the measured voltage