Technical Report

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Ophthalmic optics — Spectacle lenses — Aspects of three-dimensional properties and reference markings

Optique ophtalmique — Verres de lunettes — Aspects des propriétés tridimensionnelles et marquages de référence

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Technical background **1**
4.1 General 1
4.2 Spectacle lenses 1
4.3 Spectacle frames 2
5 Influence of three-dimensional effects and necessity to deal with them **3**
5.1 Optical effects 3
5.2 Reference points on front surface versus back surface meeting the eye in as-worn position 7
5.3 Positioning errors from the images of markings on the back surface 10
5.3.1 General 10
5.3.2 Simulation results 12
6 Different approaches to specifying measurement positions and alignment **15**
6.1 General 15
6.2 Reference coordinate systems defined by engravings 16
6.2.1 General 16
6.2.2 Reference coordinate system for front side engravings 16
6.2.3 Reference coordinate system for back side engravings 17
6.2.4 Data Communication Standard (DCS) from the Vision Council 19
6.3 Summary 21
7 Conclusion **22**
Bibliography **24**

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Foreword

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This document was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 7, *Ophthalmic optics and instruments*.

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Introduction

In current standards, spectacle lenses are mostly treated as two-dimensional objects.

However, knowing their three-dimensional geometrical properties is helpful to fully understand their optical effects. Therefore, these are already taken into account in the industry in some instances, e.g. to increase the performance of products and the accuracy of measurements.

The aim of this document is to deliver background information on this topic, to provide helpful terminology including parameters, and to present some ways of dealing with their impacts. It is intended as a source of information to the manufacturers of spectacle lenses, measurement systems, and mounting equipment as well as to the optometric and dispensing professions.

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Ophthalmic optics — Spectacle lenses — Aspects of three-dimensional properties and reference markings

1 Scope

This document is applicable to the three-dimensional aspects of spectacle lenses and their mounting in frames. It gives possible details of how these aspects can be taken into account, particularly for lenses with their permanent reference engravings (markings) on their back surface.

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.

ISO 13666, *Ophthalmic optics — Spectacle lenses — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13666 apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Technical background

4.1 General

Changes in the method of manufacture of spectacle lenses and in the styling of some spectacle frames have generated problems of positioning lenses correctly in the frame that did not occur in the 20th century. Conversely, free form manufacture allows the benefits of individualized computer enhancement and more sophisticated lens designs but requires an improved, and available, ability to position lenses.

Many aspects related to the use of free form technology are explained in ISO/TR 18476[1], which also covers optical effects relevant to the topics discussed in this document.

4.2 Spectacle lenses

The reference points and design reference points are specified in ISO 13666 to be on the front surface of the lens. This is logical, in that the marking device on focimeters dots the front surface of the lens, in particular the optical centre for single-vision lenses. This dot is used for positioning the uncut lens correctly for edging it to shape for mounting in the frame. Although errors in prism imbalance (relative prism error) are generated if lenses are not correctly centred in the frame in front of the eyes, there is no or little effect on the binocular field of view for single-vision lenses or for the far and near fields of view with multifocal lenses. Position-specific single-vision lenses and power-variation lenses have, however, to be positioned so that their optical properties including, where applicable, the (intermediate) corridor and near portion are aligned with the eyes. The conventional construction of progressive-power and degressive-power lenses was to use a blank with the power-variation surface moulded (or sagged for glass blanks) on the front surface of the blank, then

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