



Optics and optical instruments—Focimeters

Part 1: General purpose instruments



AS ISO 8598.1:2017

This Australian Standard® was prepared by Committee MS-024, Spectacles. It was approved on behalf of the Council of Standards Australia on 19 July 2017.

This Standard was published on 7 August 2017.

The following are represented on Committee MS-024:

Australian Dispensing Opticians Association
Optical Distributors and Manufacturers Association of Australia
Optometry Australia
Queensland University of Technology
University of New South Wales

This Standard was issued in draft form for comment as DR AS/NZS ISO 8598.1:2017.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

www.saiglobal.com (sales and distribution)

ISBN 978 1 76035 860 0

Australian Standard®

Optics and optical instruments—Focimeters

Part 1: General purpose instruments

First published as AS ISO 8598.1:2017.

COPYRIGHT

© ISO 2017 — All rights reserved
© Standards Australia Limited 2017

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth).

Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia.

Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee, MS-024 Spectacles.

The objective of this Standard is to specify requirements and test methods for general purpose focimeters designed for the measurement of vertex powers, cylinder axis, prismatic power and prism base setting within a restricted area at a specified location of a lens. This excludes instruments that can only measure the whole lens at once.

This Standard is identical with, and has been reproduced from, ISO 8598-1:2014, *Optics and optical instruments — Focimeters — Part 1: General purpose instruments*.

As this document has been reproduced from an International Standard, the following applies:

- (a) In the source text 'this part of ISO 8598' should read 'Australian Standard'.
- (b) A full point substitutes for a coma when referring to a decimal marker.

Australian Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms 'normative' and 'informative' are used in Standards to define the application of the appendices or annexes to which they apply. A 'normative' appendix or annex is an integral part of a Standard, whereas an 'informative' appendix or annex is only for information and guidance.

Contents

Preface	ii
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Technical requirements for general purpose focimeters	3
5 Metrological requirements	5
5.1 General	5
5.2 Reference wavelength	6
5.3 Performance requirement	6
5.3.1 Indication error	6
5.3.2 Axis marker for the optical centre of lens	7
5.3.3 Axis marker alignment	7
5.3.4 Adjusting rail	7
5.3.5 Capability of measuring tinted lenses	7
5.3.6 Non-symmetric errors for automated focimeters	7
5.3.7 Repeatability for the indication reading of automated focimeters	8
5.3.8 Centration error for manual focusing focimeters	8
5.3.9 Astigmatic axis repeatability for low-powered cylindrical lenses with manual focimeters	8
6 Test procedures	8
6.1 General	8
6.2 Checking the indication errors	8
6.2.1 Checking the indication errors for vertex power	8
6.2.2 Checking the indication errors for prismatic power	9
6.3 Checking the axis marker for the optical centre of lens	9
6.4 Checking the alignment of the axis marker	9
6.5 Checking the adjusting rail	9
6.6 Checking the non-symmetric error for automated focimeters	10
6.6.1 General	10
6.6.2 Checking the non-symmetric error for cylindrical power	10
6.6.3 Checking the non-symmetric error for cylinder axis	10
6.6.4 Checking the non-symmetric prism error	10
6.7 Checking the repeatability of vertex power measurement for automated focimeters	10
6.8 Checking for the centration error	10
6.9 Checking the capability of focimeters to measure tinted lenses	11
6.10 Checking the astigmatic axis repeatability for low-powered cylinder lens	11
6.11 Special procedures for eyepiece focimeters	11
6.11.1 Setting-up procedure	11
6.11.2 Checking for the absence of parallax	11
6.12 Criterion for image focusing in manual focusing focimeters	11
7 Marking	12
7.1 Reference to ISO 8598-1	12
7.2 General information to be supplied by the manufacturer	12
7.3 Additional information to be supplied by the manufacturer	12
Annex A (informative) Use of correction values when measuring spectacle lenses	13
Annex B (informative) Example for evaluation of uncertainty of measurement for automated focimeters for general use	18
Annex C (normative) Specifications of special reference lenses	24

Annex D (informative) **Information for users on the performance of general purpose
focimeters covered by this part of ISO 8598** **26**

Bibliography **27**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 7, *Ophthalmic optics and instruments*.

This first edition of ISO 8598-1 cancels and replaces ISO 8598:1996, of which it constitutes a technical revision. It also incorporates the Technical Corrigendum ISO 8598:1996/Cor.1:1998.

ISO 8598 consists of the following parts, under the general title *Optics and optical instruments — Focimeters*:

— *Part 1: General purpose instruments*

Introduction

General purpose focimeters are intended for measurement of contact lenses, single-vision, multifocal and progressive-power or degressive-power spectacle lenses, both uncut and mounted in spectacle frames, and for the orientation and marking of spectacle lenses.

Australian Standard®

Optics and optical instruments—Focimeters

Part 1: General purpose instruments

1 Scope

This part of ISO 8598 specifies requirements and test methods for general purpose focimeters designed for the measurement of vertex powers, cylinder axis, prismatic power and prism base setting within a restricted area at a specified location of a lens. This excludes instruments that can only measure the whole lens at once.

It is applicable to instruments typically intended for use by the ophthalmic community, with the capability to demonstrate conformity of lens products with the International Standards existing for these lenses.

2 Normative references

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.

ISO 7944, *Optics and optical instruments — Reference wavelengths*

ISO 8429, *Optics and optical instruments — Ophthalmology — Graduated dial scale*

ISO 9342-1, *Optics and optical instruments — Test lenses for calibration of focimeters — Part 1: Test lenses for focimeters used for measuring spectacle lenses*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 adjusting rail

movable rail or bar used as the reference axis for spectacles during measurement and which is aligned perpendicularly to the optical axis of the focimeter and parallel to the axis direction 0° to 180°

Note 1 to entry: This is also called the lens table or frame rest.

3.2 capability

ability of a system or process to achieve the required performance

3.3 general purpose focimeter

instrument that is used to measure vertex powers, cylinder axis and prismatic effects of spectacle and contact lenses, to orientate and mark uncut lenses, and to verify the correct mounting of lenses in spectacle frames

3.3.1 manual focusing focimeter

instrument that allows the operator to view images formed by rays of light passing through a lens and, by manually focusing and adjusting, to measure the vertex power and identify the principal meridians

Note 1 to entry: For lenses with cylindrical power, the cylinder axis is found using the method provided to locate the principal meridians of the lens in the area defined by the focimeter aperture. Prismatic power is measured separately for this type of focimeter.

Note 2 to entry: There are sub-classes of manual focusing focimeter. One type has an eyepiece whereas the other has a projection screen. With the eyepiece type, the measurement target is focused and viewed through an eyepiece.

3.3.2

automated focimeter

instrument that measures the vertex power of a lens, in the area defined by the focimeter aperture, in a single measurement without operator adjustment

3.3.3

continuously indicating focimeter

focimeter with a continuous scale

Note 1 to entry: For the purposes of this part of ISO 8598, this includes both automated instruments when set to 0,06 D or 0,01 D steps and conventional manual focusing instruments.

3.3.4

digitally rounding focimeter

focimeter which displays measured values rounded to the nearest 0,25 D or 0,12(5) D incremental value

3.4

centration error of the instrument

residual prismatic error of the instrument with no lens in place

3.5

indication

⟨of a focimeter⟩ quantitative value provided as the output of the focimeter

3.6

indication error

difference between the value indicated by the focimeter and the true value of the reference lens

Note 1 to entry: Here the true value of the reference lens, the back vertex power, is calculated using the four known basic lens parameters: radii of curvature of the front and back surface (r_1 and r_2), the centre thickness (t), and the refractive index (n) of the reference lens material, using the formulas listed in ISO 9342-1.

Note 2 to entry: When using a measuring instrument, the influence of the uncertainty and indication error of the device should be considered.

3.7

lens support

mechanical interface of the instrument against which the spectacle lens or the contact lens is placed for measurement

Note 1 to entry: The focimeter measures the vertex power related to the surface placed against the lens support.

3.8

near portion power

vertex power measured at the near design reference point, as specified by the manufacturer, of a multifocal, progressive-power or degressive-power lens

3.9

non-symmetric error for cylindrical power and cylinder axis

residual error in the indicated cylindrical power and/or the indicated cylinder axis of a spherocylindrical lens for an automated focimeter after calibration

3.10

non-symmetric prism error of a focimeter

difference in the prismatic power readings when a plano-prism is measured first with its base setting in one direction and then in the opposite direction, for example, base settings of 180° and 360°, or 90° and 270°

3.11.1

back vertex power

reciprocal of the paraxial value of the back vertex focal length measured in metres

3.11.2

front vertex power

reciprocal of the paraxial value of the front vertex focal length measured in metres

Note 1 to entry: Conventionally, the back vertex power, in dioptres, is specified as the “power” of a spectacle lens or a contact lens, although the front vertex power is required for certain purposes, for example in the measurement of some multifocal lenses or progressive-power lenses.

Note 2 to entry: The unit for expressing vertex power is the reciprocal metre (m^{-1}). The name for this unit is the “diopetre”, for which the symbol is “D”.

4 Technical requirements for general purpose focimeters

4.1 The measuring range shall include vertex powers with a range from at least -20 D to $+20\text{ D}$ and prismatic powers from $0\text{ }\Delta$ to at least $5\text{ }\Delta$.

The instrument shall be capable of measuring the axis direction (see ISO 8429) of cylindrical lenses between 0° and 180° . For prisms, it shall be possible to determine the direction of the base setting between 0° and 360° .

4.2 For manual focusing focimeters with non-digital display, the dioptric power scale shall have an interval not greater than $0,25\text{ D}$ and shall be clear enough for interpolations to be made to the nearest $0,12\text{ D}$ or less.

For axis directions (see ISO 8429) the scale interval shall not exceed 5° and shall be clear enough for interpolations to be made to the nearest degree.

For prismatic power readings, the scale interval shall not exceed $1\text{ }\Delta$ and shall be clear enough for interpolations to be made to the nearest $0,50\text{ }\Delta$.

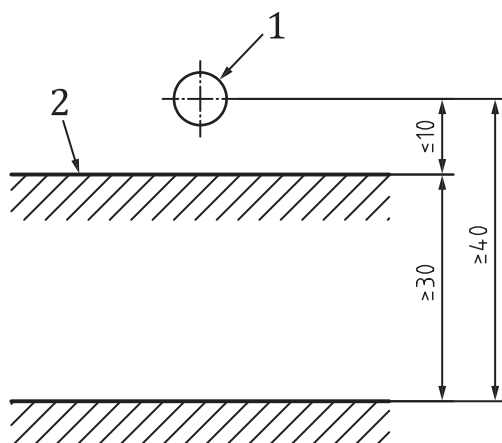
4.3 For focimeters with digital display in the range from $+20\text{ D}$ to -20 D , the minimum step of the display shall be equal to or lower than $0,06\text{ D}$. The display shall show at least two decimal digits.

For axis directions, the increment of the digital display shall be 1° .

For prismatic power readings, the minimum step of the digital display shall be equal to or lower than $0,06\text{ }\Delta$.

4.4 The instrument designed to measure spectacle lenses shall be able to measure lenses with a diameter of at least 80 mm and a thickness of at least 20 mm . Translational movements of the lenses on the lens support of not less than 30 mm in a direction perpendicular to the optical axis and to the adjusting rail shall be possible, starting from no more than 10 mm below, in front of, or behind, the optical axis of the instrument, as applicable. The adjusting rail shall also be capable of movement of not less than 30 mm in a direction perpendicular to its length and the optical axis of the instrument. See [Figure 1](#).

Dimensions in millimetres

**Key**

- 1 lens support
- 2 adjusting rail

Figure 1 — Minimum required movement of the adjusting rail

4.5 The lens support should be designed so that it does not cause any damage to the lens under test when used in the manner recommended by the manufacturer.

It shall be designed and manufactured so that it will support a lens placed against it, holding the surface that is in contact with it perpendicular to the optical axis of the focimeter.

The lens support shall not adversely affect the accuracy of measurement by introducing sagittal error.

Examples of suitable lens supports are shown in [Figure 2](#).