

Australian/New Zealand Standard™

Eye and face protection—Sunglasses and fashion spectacles

Part 1: Requirements



AS/NZS 1067.1:2016

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee CS-053, Sunglasses. It was approved on behalf of the Council of Standards Australia on 8 September 2016 and by the New Zealand Standards Approval Board on 6 September 2016.

This Standard was published on 30 September 2016.

The following are represented on Committee CS-053:

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Australian Radiation Protection and Nuclear Safety Agency
Cancer Society of New Zealand
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New Zealand Association of Optometrists
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Australian/New Zealand Standard™

Eye and face protection—Sunglasses and fashion spectacles

Part 1: Requirements

Originated in Australia as part of AS 1067—1971.
Previous and first New Zealand edition part of AS/NZS 1067:2003.
Revised in part and redesignated as AS/NZS 1067.1:2016.

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Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, PO Box 1473, Wellington 6011.

ISBN 978 1 76035 570 8

PREFACE

This Standard was prepared by Standards Australia/Standards New Zealand Committee CS-053, Sunglasses, to supersede, in part, AS/NZS 1067:2003, *Sunglasses and fashion spectacles*.

The objective of this Standard is to specify minimum requirements for sunglasses, fashion spectacles and replacement filters that are nominally afocal (plano power)—excluding prescription filters—providing protection against solar radiation for general use including road use and driving.

This revision aligns its requirements closely to those of ISO 12312-1:2013, *Eye and face protection—Sunglasses and related eyewear*, Part 1: *Sunglasses for general use*. Test methods referred to in this Standard are now located in AS/NZS 1067.2, *Eye and face protection—Sunglasses and fashion spectacles*, Part 2: *Test methods*, which is an identical adoption of ISO 12311:2013, *Personal protective equipment—Test methods for sunglasses and related eyewear*.

This Standard specifies some requirements different from ISO 12312-1 in order to avoid lowering the standards set by its previous editions [including AS 1067, Parts 1 and 2 (1990)] and thereby reducing the level of protection provided. This recognizes the special circumstances of this region, especially the severity of its climatic conditions.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendices to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Eye and face protection—Sunglasses and fashion spectacles

Part 1: Requirements

1 SCOPE

This Standard specifies minimum requirements for sunglasses, fashion spectacles and replacement filters that are nominally afocal (plano power) providing protection against solar radiation for general use including road use and driving.

NOTE: Information on the use of sunglass filters is provided in Appendix A.

This Standard applies to the following:

- (a) Spectacles comprising nominally afocal (plano power) filters mounted in a spectacle frame.
- (b) Individual nominally afocal (plano power) filters intended for use in sunglasses.
- (c) Rimless sunshields and one-piece visors.
- (d) Clip-on and slip-on type sunglasses.
- (e) Children's sunglasses.
- (f) Fashion spectacles/light tint sunglasses.

Where the word 'sunglasses' is used in this Standard, this is taken to mean 'sunglasses and fashion spectacles'.

This Standard does not apply to the following:

- (i) Prescription and readymade spectacles.
NOTE: AS/NZS ISO 21987 applies to prescription lenses and AS/NZS ISO 16034 applies to ready-made reading spectacles.
- (ii) Safety glasses and safety goggles intended to provide protection against optical radiation other than from the sun.
NOTE: AS/NZS 1337.1, AS/NZS 1337.4, AS/NZS 1337.5, AS/NZS 1338.1, AS/NZS 1338.2 and AS/NZS 1338.3 apply to safety glasses and safety goggles.
- (iii) Eyewear for protection against radiation in solaria.
NOTE: AS/NZS 2635 applies to these filters.
- (iv) Eye protectors for sport that comply with the applicable sports eye protection Standard.
NOTE: AS/NZS 4066 applies to eye protection for racquet sports.
- (v) Sunglasses for use as toys that are clearly and legibly labelled as toys.

2 NORMATIVE REFERENCES

The following are the normative documents referred to in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

AS/NZS

1067 Eye and face protection—Sunglasses and fashion spectacles

1067.2 Part 2: Test methods

AS/NZS

1337 Personal eye protection

1337.0 Part 0: Eye and face protection—Vocabulary (ISO 4007:2012, MOD)

AS/NZS ISO

8980 Ophthalmic optics—Uncut finished spectacle lenses

8980-4 Part 4: Specifications and test methods for anti-reflective coatings

8980-5 Part 5: Minimum requirements for spectacle lens surfaces claimed to be abrasion-resistant

3 DEFINITIONS

For the purposes of this document, the terms and definitions given in AS/NZS 1337.0 and the following apply.

3.1 Fashion spectacles

Lightly tinted sunglasses (category 0 or 1) often worn more for reasons of fashion.

3.2 Related eyewear

Eyewear intended for protection in the same wavelength range as solar radiation but not necessarily originated by natural sunlight.

NOTE: This term is used in ISO 12312-1; it is not used in this Standard. The definition is included for the purposes of alignment with ISO 12312-1.

3.3 Trained observer

A person appropriately trained for the task concerned with a binocular visual acuity without magnification and wearing the appropriate correction for near vision of 1.0 (6/6) or better at the observation distance of the task.

3.4 Solar UVA transmittance

τ_{SUA} normalized value of the spectral transmittance averaged between 315 nm and 400 nm, weighted by the solar spectral power distribution, $E_s(\lambda)$, at sea level for air mass 2 and the relative spectral effectiveness function for UV radiation, $S(\lambda)$.

NOTES:

- 1 This is usually expressed as a percentage and is calculated from the following equation:

$$\tau_{\text{SUA}} = 100 \times \frac{\int_{315}^{400} \tau(\lambda) E_s(\lambda) S(\lambda) d\lambda}{\int_{315}^{400} E_s(\lambda) S(\lambda) d\lambda}$$

$$= 100 \times \frac{\int_{315}^{400} \tau(\lambda) W(\lambda) d\lambda}{\int_{315}^{400} W(\lambda) d\lambda}$$

where

λ is the wavelength of the UV radiation in nanometres.

- 2 The complete weighting function is the product of $E_s(\lambda)$ and $S(\lambda)$: $W(\lambda) = E_s(\lambda) S(\lambda)$. The weighting functions are given in Table A.1 of AS/NZS 1337.0 (as amended in Appendix ZZ).

3.5 Ultraviolet

Where the definitions of ultraviolet in AS/NZS 1337.0:2014 (including variations detailed in Appendix ZZ) specify the option to use 380 nm or 400 nm as the long wavelength limit of ultraviolet (UV) and ultraviolet A (UV-A), for the purposes of this Standard, the limit of 400 nm applies.

4 CONSTRUCTION AND MATERIALS

4.1 Construction

When tested in accordance with AS/NZS 1067.2, Clause 6, areas of the sunglass and frame that may come into contact with the wearer during intended use shall be smooth and without sharp projections.

4.2 Filter material and surface quality

When tested in accordance with AS/NZS 1067.2, Clause 6.2, within an area of 28 mm diameter around the reference point, excluding the marginal area of the filter 5 mm wide, sunglass filters shall have no material or machining defects that might impair vision, e.g. bubbles, scratches, inclusions, dull spots, pitting, mould marks, notches, reinforced areas, specks, beads, water specks, pocking, gas inclusions, splintering, cracks, polishing defects or undulations.

4.3 Physiological compatibility

Sunglasses shall be designed and manufactured in such a way that when used under the conditions and for the purposes intended, they will not compromise the health and safety of the wearer. The risks posed by substances leaking or leaching from the device that may come into prolonged contact with the skin shall be reduced by the manufacturer to below any regulatory limit. Special attention shall be given to substances that are allergenic, carcinogenic, mutagenic or toxic.

NOTE: Reactions may be generated by excessive pressure due to a poor fit on the face, chemical irritation or allergy. Rare or idiosyncratic reactions may occur to any material and may indicate the need for the individual to avoid particular types of frames.

5 TRANSMITTANCE

5.1 Test methods

Transmittance values shall be determined in accordance with AS/NZS 1067.2, Clause 7.

5.2 Transmittance and filter categories

Sunglass filters for general use shall be assigned one of the five filter categories based on the luminous transmittance at their reference point.

The range of the luminous transmittance of these five categories is given by the values in Table 1. An overlap of the transmittance values shall be not more than $\pm 2\%$ (absolute) between the categories 0, 1, 2 and 3. There is no overlap in transmittance values between categories 3 and 4.

The maximum deviation for declared luminous transmittance value shall be $\pm 3\%$ absolute for the transmittance values falling in categories 0 to 3, and $\pm 30\%$ relative to the stated value for the transmittance values falling in category 4.

When describing the transmittance properties of photochromic filters, two categories for transmittance values are generally used. These two values correspond to the faded state and to the darkened state of the filter.

In the case of gradient filters, the transmittance value at the reference point shall be used to characterize the luminous transmittance and the category of the filter.

For gradient filters, the overlap in luminous transmittance allowed between categories shall be double that for uniformly tinted filters.

Table 1 also specifies the UV requirements for sunglass filters for general use and, when the filters are claimed by the manufacturer to protect against IR radiation, the IR requirements.

TABLE 1
TRANSMITTANCE FOR SUNGLASS FILTERS FOR GENERAL USE

Consumer label	Technical label	Requirements			
Descriptive label	Filter category	Maximum value of solar UV-B transmittance	Maximum value of mean transmittance in the range	Visible spectral range	Enhanced infrared absorption (see Note)
		τ_{SUVB} 280 nm to 315 nm	τ_{SUVA} 315 nm to 400 nm	Range of luminous transmittance τ_v 380 nm to 780 nm	Maximum value of solar IR transmittance τ_{SIR} 780 nm to 2000 nm
Light tint sunglasses	0	0.05 τ_v	τ_v	$\tau_v > 80\%$	τ_v
Fashion spectacles	1			$43\% < \tau_v \leq 80\%$	
General purpose sunglasses	2		0.5 τ_v	$18\% < \tau_v \leq 43\%$	
	3			$8\% < \tau_v \leq 18\%$	
Very dark special purpose sunglasses	4		1.0% absolute or 0.25 τ_v , whichever is greater	$3\% < \tau_v \leq 8\%$	

NOTE: Only applicable to sunglass filters recommended by the manufacturer as a protection against infrared radiation.

5.3 General transmittance requirements

5.3.1 Uniformity of luminous transmittance

The relative difference in the luminous transmittance value between any two corresponding points of the filter within a circle 28 mm in diameter around the reference point or to the edge of the filter less the marginal zone 5 mm wide, whichever is less, shall not be greater than 10% (relative to the higher value), except for category 4 where it shall not be greater than 20%. Where the reference point is not known, the geometric or boxed centre shall be used.

In the case of mounted gradient filters, this requirement shall be limited to sections parallel to the line connecting the two reference points.

For mounted filters, the relative difference between the luminous transmittance value of the filters at the reference point for the right and left eyes shall not exceed 15% (relative to the lighter filter).

Changes of luminous transmittance that are caused by thickness variations due to the design of the filter are permitted. For verification, the test method in AS/NZS 1067.2, Appendix L shall be used.

5.3.2 *Requirements for road use and driving*

5.3.2.1 *General*

Filters suitable for road use and driving shall be of categories 0, 1, 2 or 3 and shall additionally meet the requirements cited in Clauses 5.3.2.2, 5.3.2.3 and 5.3.2.4.

5.3.2.2 *Spectral transmittance*

For wavelengths between 475 nm and 650 nm, the spectral transmittance of filters suitable for road use and driving shall be not less than 0.20 τ_v .

5.3.2.3 *Detection of signal lights*

The relative visual attenuation quotient Q of filters of categories 0, 1, 2 and 3 suitable for road use and driving shall be not less than 0.80 for red signal light, not less than 0.70 for blue signal light, not less than 0.60 for yellow and green signal lights. The relative spectral distribution of radiation emitted by incandescent signal lights shall apply in accordance with AS/NZS 1067.2, Clause 7.8.

5.3.2.4 *Driving in twilight or at night*

Sunglass filters of category 1–3 shall be labelled to warn against being used for road use and driving in twilight or at night.

In the case of photochromic sunglass filters, this requirement applies unless the lenses reach category 0 in the dark when tested in accordance with AS/NZS 1067.2, Clause 7.11.

5.3.3 *Wide angle scattering*

When tested in accordance with AS/NZS 1067.2, Clause 7.9, at the reference point, the wide angle scattering of the filters in the condition as supplied by the manufacturer shall not exceed the value of 3%.

5.3.4 *Additional transmittance requirements for specific filter types*

5.3.4.1 *Photochromic filters*

The categories of the photochromic filter shall be determined by its luminous transmittance in its faded state τ_{v0} and its luminous transmittance in its darkened state τ_{v1} achieved after 15 min irradiation according to AS/NZS 1067.2, Clause 7.11. In both states, the requirements specified in Clauses 5.2 and 5.3.2 shall be met. For photochromic filters, τ_{v0}/τ_{v1} shall be ≥ 1.25 .

5.3.4.2 *Polarizing filters*

If the filters in the sunglasses are claimed to be polarizing, when tested in accordance with AS/NZS 1067.2, Clause 7.10.1, the filters shall be fitted in the frame so that their planes of transmission do not deviate from the vertical by more than $\pm 5^\circ$. Additionally, any misalignment between the planes of transmission of the left and right filters shall not be greater than 6° .

In the case of clip-ons, the misalignment shall be tested in the position assumed to be taken when mounted on a spectacle.

When tested in accordance with AS/NZS 1067.2, Clause 7.10.2, the polarization efficiency shall be $>78\%$ for filter categories 2, 3, 4 and $>60\%$ for filter category 1. Filters of category 0 do not have any useful polarizing effect.

NOTE: These values are equivalent to ratios of the transmittance values parallel and perpendicular to the plane of transmission of approximately 8:1 and 4:1 respectively.

5.3.4.3 *Gradient filters*

5.3.4.3.1 *General*

Gradient filters shall meet the transmittance requirements anywhere within a 10 mm radius circle around the reference point.

Uniformity of transmission is subject to the requirements of Clause 5.3.1.

5.3.4.3.2 *Determination of the filter category*

The filter category of gradient filters shall be determined by the luminous transmittance value at the reference point.

The filter category determined at the reference point shall be used to define whether the filters are suitable for road use and driving according to Clause 5.3.2.

5.3.5 *Claimed transmittance properties*

5.3.5.1 *Blue-light absorption/transmittance*

5.3.5.1.1 *Blue-light absorption*

In the case where it is claimed that a filter has $x\%$ blue-light absorption, the solar blue-light transmittance, τ_{sb} , of the filter shall not exceed $100.5 - x\%$.

5.3.5.1.2 *Blue-light transmittance*

In the case where it is claimed that a filter has less than $x\%$ blue-light transmittance, the solar blue-light transmittance, τ_{sb} , of the filter shall not exceed $x + 0.5\%$.

5.3.5.2 *UV absorption/transmittance*

5.3.5.2.1 *General*

Calculations of τ_{SUV} and τ_{SUVB} shall be made with the upper wavelength limit of 400 nm.

Requirements for the transmittance of filters for sunglasses in the UV-A and UV-B shall be as given in Table 1. In cases where it is claimed that a product reaches a certain percentage of UV absorption or UV transmittance, the relevant requirement(s) of Clause 5.3.5.2 shall apply.

5.3.5.2.2 *Solar UV absorption*

In the case where it is claimed that a filter has $x\%$ UV absorption, the solar UV transmittance of the filter τ_{SUV} shall not exceed $100.5 - x\%$.

5.3.5.2.3 *Solar UV transmittance*

In the case where it is claimed that a filter has less than $x\%$ UV transmittance, the solar UV transmittance of the filter τ_{SUV} shall not exceed $x + 0.5\%$.

5.3.5.2.4 *Solar UV-A absorption*

In the case where it is claimed that a filter has $x\%$ UV-A absorption, the solar UV-A transmittance of the filter τ_{SUVA} shall not exceed $100.5 - x\%$.

5.3.5.2.5 *Solar UV-A transmittance*

In the case where it is claimed that a filter has less than $x\%$ UV-A transmittance, the solar UV-A transmittance of the filter τ_{SUVA} shall not exceed $x + 0.5\%$.

5.3.5.2.6 *Solar UV-B absorption*

In the case where it is claimed that a filter has $x\%$ UV-B absorption, the solar UV-B transmittance of the filter τ_{SUVB} shall not exceed $100.5 - x\%$.

5.3.5.2.7 Solar UV-B transmittance

In the case where it is claimed that a filter has less than $x\%$ UV-B transmittance, the solar UV-B transmittance of the filter τ_{SUB} shall not exceed $x + 0.5\%$.

5.3.5.2.8 UV400 (or other nominated wavelength)

In the case where it is claimed that a filter is UV400 (or other nominated wavelength less than 400 nm), the spectral transmittance at 400 nm (or at the nominated wavelength) and all shorter wavelengths shall be no more than 5.0% for wavelengths in the range 190 nm to ≤ 400 nm (or other nominated wavelength ≤ 400 nm).

Claims using the 'UV' prefix, for example UV450, implying that filters have cut off wavelengths greater than 400 nm, shall not be made.

5.3.5.3 Antireflective coated sunglasses

In the case where sunglasses are claimed to be antireflective coated, when tested in accordance with ISO 8980-4, the luminous reflectance ρ_v of the filter as measured from the eye-side of the filter shall be less than 2.5%.

5.3.5.4 Enhanced infrared absorption

Sunglass filters for which enhanced infrared absorption is claimed shall meet the requirements as given in column 6 of Table 1.

6 REFRACTIVE POWER

6.1 Spherical and astigmatic power

The requirements apply in the 'as-worn' position and the sunglasses shall be tested according to AS/NZS 1067.2, Clause 8.1.

The spherical power and astigmatic power shall not exceed the tolerances given in Table 2, where D_1 and D_2 are the powers in the two principal meridians of the filter.

TABLE 2
SPHERICAL AND ASTIGMATIC POWER

Spherical power	Astigmatic power
Mean value of the optical power values (D_1 , D_2) in the two principal meridians	Absolute difference between the optical power values (D_1 , D_2) in the two principal meridians
$(D_1 + D_2)/2$ dioptres	$ D_1 - D_2 $ dioptres
± 0.12	± 0.09

The difference between the spherical powers of the right and the left filters in the mounted state shall not exceed 0.18 dioptres.

6.2 Local variations in refractive power

If during the measurements using the telescope a doubling or other aberration of the image is observed then the filters shall be tested at the reference point according to AS/NZS 1067.2, Clause 8.3. The local values shall comply with the limit listed in Table 2. The measurement shall be made with a 5 mm aperture within a 20 mm circle centred on the reference point.

6.3 Prism imbalance (relative prism error)

The complete sunglass shall be tested in the 'as-worn' position according to AS/NZS 1067.2, Clause 8.2. For adults' sunglasses, use the diaphragm LB₂ with $X^b = 32.0 \pm 0.2$ mm.