TEST REPORT

Report Reference No. ..... :	WZEO-CE20241028023
Tested by (printed name and signature) ... :	Anna Yuan
Checked by (printed name and signature) ... :	David Choi
Approved by (printed name and signature) ... :	Kevin Zhang
Date of issue ..... :	Oct 28, 2024
Testing laboratory ..... :	AMTRE VERITAS STANDARD TECHNICAL TESTING LTD
Address ..... :	Unit G25 Waterfront Studios, 1 Dock Road, London. E16 IAH
Applicant's name ..... :	DO EYEWEAR OPTICS CO.,LIMITED
Address ..... :	UNIT 04-05, 16/F THE BROADWAYNO 54-62 LOCKHART RD WANCHAI HONG KONG
Manufacturer's name ..... :	Wenzhou Eyecare Optical Glasses Co., Ltd.
Address ..... :	Floor 3, No. 2 Rd Zhennan, Wutian Industrial District, Wenzhou, Zhejiang, China
Factory's name .....:	Wenzhou Eyecare Optical Glasses Co., Ltd.
Address ..... :	Floor 3, No. 2 Rd Zhennan, Wutian Industrial District, Wenzhou, Zhejiang, China
Test specification:	
COUNCIL DIRECTIVE..... :	2016/425/EU PPE
Standard ..... :	☒ EN ISO 12311:2013 ☒ EN ISO 12312-1:2022
Test procedure ..... :	CE
Non-standard test method.....:	N/A
Test item description ..... :	
Trade Mark..... :	N/A
Product Name:..... :	Sunglasses
Model/Type reference ..... :	DEVON, CYA1439, EVAN, ANNE, NELSON, BOWIE, FINN, HUGO, JUNE, IVA, MILO, RIVER, GRAYSON, ROCCO, ENZO, BLAKE, LEXI, SAGE, MARLO, TALIA, REINA, CELIA, BYRON, HAZEL, NOREE, GLT2008, GLT9039, GLT9166, CY22SA037, GL8864

Test case verdicts:	
Test case does not apply to the test object ...:	N/A
Test object does meet the requirement .....:	Pass (P)
Test object does not meet the requirement ..:	Fail (F)
Testing:	
Date of receipt of test item .....:	Oct 17, 2024
Date(s) of performance of test .....:	Oct 17, 2024 to Oct 28, 2024

General remarks:

The test results presented in this report relate only to the item(s) tested.

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"(see remark #)" refers to a remark appended to the report.

"(see Annex #)" refers to an annex appended to the report. "(see appended table)" refers to a table in the Test Report.

Throughout this report a comma (point) is used as the decimal separator.

Report No.: WZEO-CE20241028023

TEST REPORT

EN ISO 12311:2013

Testing laboratory : AMTRE VERITAS STANDARD TECHNICAL TESTING LTD

Address: Unit G25 Waterfront Studios, 1 Dock Road, London. E16 lAH

Testing location: Unit G25 Waterfront Studios, 1 Dock Road, London. E16 lAH

Applicant: DO EYEWEAR OPTICS CO.,LIMITED

Address: UNIT 04-05, 16/F THE BROADWAYNO 54-62 LOCKHART RD WANCHAI HONG KONG

Adopted standard: EN ISO 12311:2013 Personal protective equipment - Test methods for sunglasses and related eyewear

Test result: Compliance with EN ISO 12311:2013 Personal protective equipment - Test methods for sunglasses and related eyewear

Procedure deviation: N/A

Non-standard test method: N/A

Type of tested object: Sunglasses

Trade mark: N/A

Model/Type reference: DEVON, CYA1439, EVAN, ANNE, NELSON, BOWIE, FINN, HUGO, JUNE, IVA, MILO, RIVER, GRAYSON, ROCCO, ENZO, BLAKE, LEXI, SAGE, MARLO, TALIA, REINA, CELIA, BYRON, HAZEL, NOREE, GLT2008, GLT9039, GLT9166, CY22SA037, GL8864

Factory: Wenzhou Eyecare Optical Glasses Co., Ltd.

Address: Floor 3, No. 2 Rd Zhennan, Wutian Industrial District, Wenzhou, Zhejiang, China

Test item particulars:

Material:

Possible test case verdicts:

Test case does not apply to the object:	N/A (N)
Test object does meet the requirement:	Pass (P)
Test object does not meet the requirement	Fail (F)

Ambient temperature and humidity:20-25℃,60-66% RH.

EN ISO 12311:2013 Personal protective equipment - Test methods for sunglasses and related eyewear			
Clause	Requirement – Test	Result - Remark	Verdict
1	Scope		-
	This International Standard specifies reference test methods for determining the properties of sunglasses given in ISO 12312 (all parts]. It is applicable to all sunglasses and related eyewear. Other test methods may be used if proven to be equivalent.		P
2	Normative references		-
	The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments] applies.		P
3	Terms and definitions		-
	For the purposes of this document, the terms and definitions given in ISO 4007 apply.		P
4	Prerequisites		-
	The following parameters shall be specified prior to testing [see ISO 12312 (all parts]]: — t h e number of specimens; — specimen preparation; — a n y conditioning prior to testing; — characteristics to be assessed subjectively (inappropriate]; — pass/fail criteria.		P
5	General test requirements		-
	Unless otherwise specified, the values stated in this International Standard are expressed as nominal values. Except for temperature limits, values which are not stated as maxima or minima shall be subject to a tolerance of ± 5 %. Unless otherwise specified, the ambient temperature for testing shall be between 16 °C and 32 °C. Where other temperature limits are specified they shall be subject to an accuracy of		P

EN ISO 12311:2013 Personal protective equipment - Test methods for sunglasses and related eyewear			
Clause	Requirement – Test	Result - Remark	Verdict
	± 1 °C. Relative humidity shall be maintained at (50 ± 20] %.		
	Unless otherwise specified, the filters shall be tested at the reference points as defined in ISO 4007.		P
6	Test methods for assessing the construction and materials		-
6.1	Prior assessment of construction, marking and information		-
	Prior to applying the test methods, a visual inspection shall be carried out with normal or corrected vision, without magnification. Marking and information supplied by the manufacturer and safety data sheets (if applicable] or declaration relevant to the materials used in its construction shall also be assessed.		P
6.2	Test method for assessment of filter material and surface quality		-
6.2.1	Principle		-
	The quality of the filter material and surface is assessed by visual inspection.		P
6.2.2	Apparatus		-
	A suitable apparatus is shown in Figure 1.		P
6.2.3	Test procedure		-
	Carry out the assessment of the quality of material and surface by visual inspection with the aid of a “light box” or illuminated grid.		P
6.2.4	Verification and test report		-
	Except for a marginal area 5 mm wide at the edge of the eye protector, any significant defects likely to impair vision in use shall be recorded in the verification and test report.		P
7	Test methods for measuring spectrophotometric properties		-
7.1	Measurement of spectral transmittance		-

EN ISO 12311:2013 Personal protective equipment - Test methods for sunglasses and related eyewear			
Clause	Requirement – Test	Result - Remark	Verdict
7.1.1	Spectral transmittance		-
7.1.1.1	General		-
	Test methods shall be used which have relative uncertainties in spectral transmittance less than or equal to those given in Table 1.		P
	The general methods of evaluating the components of uncertainty are set out in ISO/IEC Guide 983. Annex A shows how uncertainty of measurement is to be applied in the reporting of results and compliance and Annex B is a guide to the sources of uncertainty in spectrophotometry, their minimization and evaluation.		P
	The location and direction of measurement of transmittance shall be as specified in ISO 12312-1. If the measurements are not made normal to the surface of the filter, then particular attention should be paid to the effects of beam displacement (see Annex B]. If the direction of measurement is not specified then it shall be measured normal to the surface of the filter when unmounted.		P
	Calculations shall be carried out at not more than 5 nm intervals ($\Delta\lambda$ = 5 nm] in the ultraviolet-visible region (280 nm to 780 nm] and not more than 10 nm in the infrared region (780 nm to 2 000 nm]. The necessary data at these intervals are provided in Annexes D. E, F, H and I.		P
7.1.1.2	Test procedure		-
	Place the filter in order to follow the location and direction of measurement of transmittance as specified in ISO 12312-1.		P
7.1.2	Calculations of luminous transmittance TV		-
	Luminous transmittance is calculated as a percentage from the spectral transmittances and with reference to a standard observer and a source or illuminant. Standard all calculations use the CIE 2° Standard Observer [ISO		P

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Clause	Requirement – Test	Result - Remark	Verdict
	D65 (ISO 11664-2]].		
7.2	Measurement of uniformity of luminous transmittance		-
7.2.1	Unmounted filters covering one eye		-
7.2.1.1	Test method		-
	Locate the defined reference point defined in ISO 4007. Determine a circular area around the reference point with diameter *d* calculated as follows (see Figure 2）:		P
a	for filters equal to or greater than 50 mm in vertical depth at the reference point, *d* = (40,0 ± 0,5] mm;		P
b	for filters less than 50 mm in vertical depth at the reference point, *d* = [vertical depth of filter (h] -10 ± 0,5] mm.		P
	A 5 mm wide portion around the edge ofthe filter shall be excluded from this circular area.		P
	Scan this circular area with a 5 mm nominal diameter light beam white light or a narrow spectral band with a maximum spectral energy at (555 ± 25] nm and measure the luminous transmittance with a detector whose spectral responsivity approximates that of the CIE 2° Standard Observer (ISO 11664-1]. The effects of displacement of the light beam by any prismatic effect of the filter (see B.3.4.1] shall be compensated for, and variations in thickness shall be corrected as in Annex L.		P
	For filters with bands or gradients of different luminous transmittance, the requirement for variations in luminous transmittance applies in this circular area but perpendicular to the gradient (see Figure 2）. Two example scans perpendicular to the gradient are shown in Figure 2.		P
	The filter and the light beam are positioned so that the incident light falls normally on the surface of the filter at the reference point or parallel to that direction at other locations on		P

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Clause	Requirement – Test	Result - Remark	Verdict
	the filter.		
	Measure and record the maximum value of luminous transmittance Tymax, and the minimum value of luminous transmittance Tvmin.		P
7.2.1.2	Calculations		-
	Calculate the value of Δρ as percentage, from the following formulae:		P
7.2.1.3	Test report		-
	Record A_F as the uniformity ofluminous transmittance.		P
7.2.2	Mounted filters and unmounted filters covering both eyes		-
7.2.2.1	Test method		-
	Locate the defined reference points defined in ISO 4007. Define two circular areas around the reference points with diameter *d,* calculated as follows:		P
	Circular areas are determined around each of these centres with diameters *d,* calculated as follows:		P
a	for filters equal to or greater than 50 mm in vertical depth at the reference point, *d* =（40,0 ± 0,5）mm;		P
b	for filters less than 50 mm in vertical depth at the reference point, *d* = [vertical depth of filter （h）-10 ± 0,5] mm.		P
	A 5 mm wide portion around the edge ofthe filter shall be excluded from this circular area.		P
	Scan this circular area with a 5 mm nominal diameter light beam white light or a narrow spectral band with a maximum spectral energy at（555 ± 25）nm and measure the luminous transmittance with a detector whose spectral responsivity approximates that of the CIE 2° Standard Observer（ISO 11664-1）. The effects		P

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Clause	Requirement – Test	Result - Remark	Verdict
	of displacement of the light beam by the any prismatic effect ofthe filter〔see B.3.4.1〕shall be compensated for_and variations in thickness shall be corrected as in Annex L.		
	For filters with bands or gradients of different luminous transmittance, assessments of variations in luminous transmittance shall be for sections parallel to the line joining the reference points.		P
	Measure and record the value of luminous transmittance TVL at the left eye reference point and the value ofluminous transmittance TVR at the right eye reference point.		P
7.2.2.2	Calculations		-
	Divide the absolute difference between the values of the luminous transmittance at the two reference points rvL and tvr by the higher value of the luminous transmittance at one of the two reference points and express this ratio, as a percentage *Ap.*		P
	EXAMPLE If one filter transmits 38,0 % and the other transmits 40,0 %, then the result is 100 χ〔2,0/40,0〕= 5,0 %.		P
7.2.2.3	Test report		-
	Record the value *Ap* as a percentage.		P
7.3	Calculation of ultraviolet transmittance		-
7.3.1	Solar UV-transmittance TSUV		-
	The calculation of rsuv (see ISO 4007] as a percentage is:		P
	The values of Es(A], 5(1] and *W(X)* are given in Annex E.		P
7.3.2	Solar UVA-transmittance Tsuva		-
	Solar UVA-transmittance is the result of the mean of the spectral transmittance between 315 nm and 380 nm and appropriate weighting functions.		P
	The calculation of rsuvA (see ISO 4007] as a		P

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Clause	Requirement – Test	Result - Remark	Verdict
	percentage is as follows:		
	The values of *Es(λ)*, 5(1) and W(1] are given in Annex E.		P
7.3.3	Solar UVB-transmittance Tsuvb		-
	Solar UVB-transmittance is the result of the mean of the spectral transmittance between 280 nm and 315 nm and appropriate weighting functions.		P
	The calculation of TSUVB (see ISO 4007] as a percentage is as follows:		P
	The values of EsP], S(A] and *W(X]* are given in Annex E.		P
7.4	Calculation of solar blue-light transmittance Tsb		-
	Solar blue-light transmittance is the result of the mean of the spectral transmittance between 380 nm and 500 nm and appropriate weighting functions. The calculation of Tsb (see ISO 4007] as a percentage is as follows:		P
7.5	Calculation of solar IR transmittance TSIR		-
	The calculation of solar IR transmittance TSIR (see ISO 4007] as a percentage is obtained by integration between the limits 780 nm and 2 000 nm as follows:		P
7.6	Measurement of absolute spectral reflectance ρ(λ)		-
	The test methods to be used shall have relative uncertainties in spectral reflectance less than or equal to those given in Table 2. The angle of incidence is to be < 17°		P
	If measurements are made without the use of an integrating sphere, care shall be taken to ensure that all the reflected light is collected since the beam reflected from a curved surface will be divergent or convergent and part of it may fall outside the detector. See Reference!![0]] for guidance.		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.7	Absolute luminous reflectance *pv*		-
	The calculation of *pv* as a percentage is obtained by the ratio of the luminous flux reflected by the filter *0r* to the incident flux Φı as follows:		P
7.8	Calculation of relative visual attenuation quotient for signal light detection Qsignal		-
7.9	Wide angle scatter		-
7.9.1	Principle		-
	A hazemeter is used to measure the amount of light which deviates from an incident beam by being scattered forward when the beam passes through a specimen, compared to the amount scattered by the test instrument and the amount transmitted by the specimen.		P
7.9.2	Apparatus		-
7.9.2.1	Incandescent light source approximating CIE Standard IlluminantA (ISO 11664-2）.		-
7.9.2.2	Hazemeter with integrating sphere, light trap, photodiode and reflectance standard (see Figure 3）as follows:		-
a	The integrating sphere shall have:		P
	1） a total port area not exceeding 4,0 % of the total internal reflecting area of the sphere;		P
	2）the entrance and exit ports separated by at least 170°;		P
	3）the exit port subtending 8° at the centre of the entrance port;		P
	4）the photodiode（90 ± 10）° from the entrance port;		P
	5）all internal surfaces（including the reflectance standard for the exit port）covered with a substance ofhigh reflectance for wavelengths between 380 nm and 780 nm.		P
b	The light trap shall have a reflectance ofless than 0,1 %.		P

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Clause	Requirement – Test	Result - Remark	Verdict
c	The photodiode shall provide proportional measurements of the radiant flux to within 1 % of the incident flux, across the range of intensity used within the test.		P
d	These components shall be arranged so that the irradiating beam shall: and		P
	1） have the axis of the beam passing through the centre of the entrance and exit ports;		P
	2） be unidirectional, with no ray of the beam deviating from the direction of the axis of the beam by greater than 3°;		P
	3）when there is no specimen obstructing the beam, have a circular cross-section at the exit port, while the diameter of the exit port shall exceed the diameter of the irradiating beam so that there is an annular zone around the beam subtending（1,3 ± 0,1）° at the entrance port;		P
	4）when a specimen covers the entrance port, not form an angle greater than 8° between the axis of the beam and the normal to the surface of that specimen; and		P
	5）when there is no specimen obstructing the beam, be completely absorbed by the light trap（if used）.		P
7.9.3	Specimen		-
	The size of the specimen can vary with the size of the entrance port and the surface curvature of the integrating sphere. The specimen shall be large enough to completely cover the entrance port but shall be small enough to be tangential to the wall ofthe integrating sphere.		P
7.9.4	Test procedure		-
	Carry out the procedure as follows.		P
a	Measure the incident light（t^）without the specimen in position, without the light trap in position and with the reflectance standard in position.		P
b	Measure the total light transmitted by the specimen（t^）with the specimen in position,		P

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Clause	Requirement – Test	Result - Remark	Verdict
	without the light trap in position and with the reflectance standard in position.		
c	Measure the light scattered by the instrument（t^）without the specimen in position, with the light trap in position, and without the reflectance standard in position.		P
d	Measure the light scattered by the instrument and specimen（*T4*）with the specimen with the light trap in position and without the reflectance standard in position.		P
e	Repeat step（b）so that four readings are obtained, rotating the specimen between readings by 90°.		P
f	Repeat step（d）so that four readings are obtained at the same positions as in step（e）.		P
7.9.5	Calculation		-
	The following shall be calculated:		P
a	The total transmittance from the formula:		P
b	The scattered light from the formula:		P
c	The wide angle scatter, expressed as a percentage, from the formula:		P
7.9.6	Test report		-
	Report the wide angle scatter value.		P
7.10	Polarizing filters		-
7.10.1	Plane of transmission		-
7.10.1.1	Apparatus		-
7.10.1.1.1	Pair of individually mounted split field polarizers cut to give planes of transmission at a + 3° and a - 3° angle about the horizontal, or the prescribed axis. The top and bottom halves of the polarizers shall be joined together and glass mounted, with the line of the join horizontal or perpendicular to the prescribed axis. The		P

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Clause	Requirement – Test	Result - Remark	Verdict
	polarizers shall be capable of being rotated by means of a lever carrying a corresponding pointer. The pointer transverses a scale calibrated in degrees left or right of zero. The split fields shall be illuminated from behind by a diffused light source (see Figure 3）.		
7.10.1.2	Test procedure		-
	Mount the sunglass on the apparatus (see Figure 4], with the front towards the split fields on a horizontal register bar and ensure that the split field appears in the centre ofthe filter by means of vertical adjusters and that the pantoscopic angle and the face form angle are ⁽as worn'		P
	For the left filter, move the lever from side to side until the top and bottom halves of the illuminated split field appear of equal luminance when viewed through the filter.		P
	Read off the pointer position to give the deviation in degrees (plus or minus] of the plane of transmission of the filter from the horizontal or the prescribed orientation. Repeat the procedures for the right filter.		P
7.10.2	Polarizing efficiency		-
7.10.2.1	Principle		-
	The luminous transmittance for visible light is measured with plane polarized light with the plane of oscillation set to provide the maximum and the minimum transmittance of the lens. This can be done by a spectrophotometric method and calculation method (the reference method）or, in a broadband method using a detector with the sensitivity of the human eye (peak at 555 nm）and a source equivalent to CIE Standard Illuminant D65.		P
7.10.2.2	Test procedure for the spectrophotometric method		-
	Carry out the procedure as follows.		P

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Clause	Requirement – Test	Result - Remark	Verdict
a	Mount the linear polarizers with their planes of transmission parallel in the reference and sample beams of the spectrophotometer. The linear polarizers shall have a polarization at least one order of magnitude better than the requirement being tested against [e.g. if the requirement for the filter is a polarizing efficiency of 80 % (9:1）then the linear polarizers shall have an efficiency of at least 97.5%(90:1).		P
b	Mount the polarizing filter in the spectrophotometer.		P
c	With the spectrophotometer wavelength set to （550 ± 5）nm, rotate the filter to the point of maximum transmittance.		P
d	At this orientation, measure the spectral transmittances, Tpmax(A) in the range 380 nm to 780 nm at 5 nm intervals.		P
e	Rotate the filter 90° and measure the spectral transmittances, $Tp_{m}in(A)$, in the same way.		P
f	Calculate the luminous transmittances for providing two values ofluminous transmittance, Tpmax and Tpmin.		P
g	Calculate the polarizing efficiency P asa percentage as given in ISO 4007.		P
7.10.2.3	Test procedure for the broadband method		-
	A light source and filter combination to give a correlated colour temperature of（6 500 ± 1 000）K（approximating CIE Standard Illuminant D65 in the visible region, see ISO 11664-2）is used to produce a collimated beam of diameter （5 ± 2）mm to illuminate the filter under test at the reference point defined in ISO 12312-1. The light is polarized using the same specification linear polarizer as in 7.10.2.2 a）. The light is incident on a detector with approximately the spectral sensitivity of the CIE 2° Standard Observer（ISO 11664-1）. The responsivity of the detector shall be linear to within ± 0,5 % in the range of illuminance measured.		P
	The filter or the linear polarizer is rotated to the point of maximum transmittance. At this		P

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Clause	Requirement – Test	Result - Remark	Verdict
	orientation, the luminous transmittance, Tpmax, is recorded. The filter or linear polarizer is then rotated 90° and the luminous transmittance, Tpmin, is recorded.		
7.11	Photochromic filters		-
7.11.1	Light source(s) to approximate the spectral distribution of solar radiation for air mass *m* = 2 for testing		-
	Testing shall be done with a Xenon high pressure lamp with filters chosen so that the specified illuminance of (50 000 ± 5 000] lx and the irradiance values (with permitted tolerances] given in Table 3 are reached.		P
7.11.1.1	Radiation source using one lamp		-
	Use an ozone free high pressure xenon arc lamp, a heat absorbing filter and a cut-on filter as specified in Figure 5.		P
	This transmittance curve can be achieved using, for example, a clear white crown glass, e.g. B 270 with a thickness of 5 mm and a heat absorbing filter e.g. a Schott KG 2 with a thickness of 3 mm or a Pittsburg 2043 of2 mm thickness[1])·		P
7.11.1.2	Radiation source using two lamps		-
	This is done in order to approximate as closely as possible the spectral distribution of solar radiation for air mass *m-2,* and may be more closely approximated with the use of two ozone free high pressure xenon arc lamps. The radiation of the two lamps is superimposed by means of a semi-transparent mirror. If different filtering is used in front of the two lamps, the solar spectrum can be approximated more closely than with one lamp.		P
	The principle may be expanded by the use of more than two lamps in order to even better approximate the solar spectrum in the relevant		P

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Clause	Requirement – Test	Result - Remark	Verdict
	spectral ranges.		
7.11.2	Conditioning for luminous transmittance in the faded state		-
	Unless the manufacturer specifies a different procedure to reach the faded state in the information supplied with the product, photochromic filters shall be conditioned by the following procedure.		P
	Schott KG 2 and B270 are trade names of products supplied by SCHOTT AG and Pittsburg 2043 is the trade name of a product supplied by Corning INC. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.		P
7.11.3	Measurement		-
7.11.3.1	Principle		-
	Most photochromic materials respond to normal room lighting and all measurements should therefore be made in absence of extraneous light. Care should be taken to ensure that the radiation used for the measurements does not cause darkening or bleaching of the sample.		P
	The surface temperature of the filter shall be maintained within ± 1 °C of the nominated temperature (see Table 4).		P
	Measurements may be carried out in a water bath. However, immersion of the specimen in water reduces the refractive index change and, therefore, the reflectance at the filter surface, thereby increasing the measured transmittance relative to the transmittance values that would be measured in air. The transmittance values determined using water immersion shall be corrected to provide the equivalent air values. Calibration of the equipment can be checked		P

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Clause	Requirement – Test	Result - Remark	Verdict
	using a reference sample with a refractive index differing by not more than ± 0,01 from the refractive index of the filter under test.		
7.11.3.2	Faded state		-
	Measure spectral transmittance from 280 nm to 780 nm (or to 2 000 nm if IR is included) according to 7,1.		P
	For the requirements specified in ISO 12312-1, calculate the luminous transmittance in the faded state, τv0 in accordance with 71. These requirements are the solar ultraviolet transmittances (7.3.1 to 7.3.3) . the solar blue-light transmittance (see 7.4) , the relative visual attenuation quotients for signal light detection, Qred, Qyellow, Qgreen and Qblue and, if required, the solar infrared transmittance (see 7.5).		P
7.11.3.3	Darkened states		-
	The characteristic luminous transmittance values of photochromic filters are defined in ISO 4007 and, unless otherwise stated, are determined for the conditions given in Table 4.		P
	Where testing at 15 000 lx is specified, the irradiance values and the permissible tolerances of these values are those given in Table 3, but multiplied by a factor 0,3.		P
	The requirements specified in ISO 12312-1 shall be measured and calculated from the spectral transmittance values measured in the darkened state (τv1] after 15 minutes' irradiance with (50 000 ± 5 000] lx at (23 ± 1] °C. These requirements are the solar ultraviolet transmittances (see 7.3.1 to 7.3.3], the solar blue-light transmittance (see 7.4], the relative visual attenuation quotients for signal light detection, Qred, Qyellow, Qgreen and Qblue, and, if required, the solar infrared transmittance (see 7.5) .		P
8	Test methods for measuring optical properties		-

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Clause	Requirement – Test	Result - Remark	Verdict
8.1	Test method for spherical, astigmatic and prismatic refractive powers		-
8.1.1	Principle		-
	Spherical, astigmatic and prismatic refractive powers of lenses or complete sunglasses are measured by means of a telescope method (reference method]. This method requires a relatively wide measurement field. Therefore difficulties can appear in applying this method to filters which exhibit irregular distributions of optical powers across the field of measurement. In such cases the method described in 8.3 can be used for a spatially resolved determination of optical powers.		P
8.1.2	Apparatus		-
8.1.2.1	Electronic recording of visual assessment as shown in Figure 6.		-
8.1.2.2	Telescope with an aperture of nominally 20 mm and a magnification between 10χ and 30χ, fitted with an adjustable eyepiece incorporating a reticle. The focusing adjustment has a scale of refractive power capable of calibration of the telescope by using the methods as described in Annex K or by utilizing any other applicable method delivering the same precision.		P
8.1.2.3	Il luminated target, consisting of a black plate incorporating the cut-out pattern shown in Figure 7. behind which is located a light source of adjustable luminance with a condenser, if necessary, to focus the magnified image of the light source on the telescope objective.		-
	The large annulus of the target has an outer diameter of（23,0 ± 0,1） mm with an annular aperture of（0,6 ± 0,1)mm. The small annulus has an inner diameter of（11,0 ± 0,1）mm with an annular aperture of（0,6 ± 0,1）mm. The central aperture has a diameter of（0,6 ± 0,1）mm. The bars are nominally 20 mm long and 2		P

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	mm wide with a nominal 2 mm separation.		
8.1.2.4	Filter, with its maximum transmittance in the green part of the spectrum, which can be used to reduce chromatic aberration.		P
8.1.3	Calibration of the apparatus		-
	The telescope shall be calibrated to achieve an uncertainty of measurement less than or equal to 0,01 m^{-1}. This can be accomplished by using the method of variable distance（see Annex K） or by using calibration lenses, e.g. lenses that have positive and negative spherical refractive powers of 0,06 m^{-1}, 0,12 m^{-1} and 0,25 m^{-1} （tolerance ± 0,01 m^{-1}）.		P
8.1.4	Test procedure		-
8.1.4.1	General		-
	Carry out the procedure as follows.		P
	The telescope and illuminated target are placed on the same optical axis（4,60 ± 0,02） m apart. The observer shall focus the reticule and the target and align the telescope to obtain a clear image of the pattern. This setting is regarded as the zero point of the focusing scale of the telescope. The telescope shall be aligned so that the central aperture of the target is imaged on the centre of the crossline graticule. This setting is regarded as the zero point of the prism scale.		P
	The filter is positioned in front of the telescope mounted in the as-worn position as specified by the manufacturer. Measurements of spherical and astigmatic power shall be taken using the procedures specified in 8.1.4.2. If during measurement using the telescope a doubling or other aberration of the image is observed, then the filter can either be classified as defective or		P

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Clause	Requirement – Test	Result - Remark	Verdict
	subjected to further examination using the method described in 8.3.		
	For the positioning of the unmounted filter the following cases can apply.		P
8.1.4.2	Spherical power and astigmatic refractive power		-
	The target, or the filter, is rotated in order to align the principal meridians of the filter with the bars of the target. The telescope is focused firstly on one set of bars (measurement *D1*）and then on the perpendicular bars (measurement D2）.		P
8.1.4.3	Prismatic power for unmounted filters covering one eye		-
	The filter shall be placed in front of the telescope in the as-worn position and the deviation of the point of intersection of the lines of the reticule recorded. The prismatic power can be determined taking into account the following and by using linear interpolation:		P
a	if the point of intersection is on the outside edge of the large circle, the prismatic power is 0,25 prism dioptre;		P
b	if the point of intersection is on the inside edge of the small circle, the prismatic power is 0,12 prism dioptre.		P
8.1.5	Test report		-
	The measured values (spherical, astigmatic and prismatic power）shall be reported.		P
8.2	Test method for the prism imbalance of complete sunglasses or filters covering both eyes		-
8.2.1	Principle		-
	This method determines the prism imbalance (relative prism error）in the as-worn position at the two reference points of mounted filters in complete sunglasses, or at the two reference points on the filter if it is of one piece construction.		P

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Clause	Requirement – Test	Result - Remark	Verdict
8.2.2	Apparatus		-
	The arrangement of the reference method is shown in Figure 9. The uncertainty for the determination of the difference in prismatic refractive power is equal to or less than 0,05 prism dioptre. Other methods can be used, e.g. using two parallel laser sources for illumination, provided they are capable of measuring within the required uncertainty.		P
8.2.3	Test procedure		-
a	The diaphragm LB1 is illuminated by the light source La. The position of these is adjusted so that it produces a single image on the screen in plane B when the eye protector (P） is not in position.		P
b	The eye protector is placed in front of the lens L2, in the as-worn position, on the headform of a size appropriate to the specimen being tested and conforming to the description as indicated in Annex G.		P
c	Select the appropriate diaphragm LB2. The distance X^b from the centre of the diaphragm to the left and right circular opening is equal to half of the interpupillary distance. As default value an interpupillary distance of (64,0 ± 0,4） mm for adult sunglasses and (54,0 ± 0,4） mm for children's sunglasses is used. Other values for the interpupillary distance can be chosen if requested by the manufacturer.		P
d	Measure the vertical and horizontal distances between the two displaced images arising from the two filter regions of the eye protector.		P
	These distances in centimetres are divided by 2 to give the horizontal and vertical prismatic differences in prism dioptres (centimetres per metre）.		P
	If the light paths which correspond to the two eye regions cross in the horizontal direction the prism imbalance is “base in”; if the light paths do not cross, it is “base out”.		

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Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Verification and test report		-
	The measured values shall be reported.		P
8.3	Test method for local variations in refractive power		-
8.3.1	Principle		-
	This test method scans a parallel beam of light of nominal diameter 5 mm across the filter; its deflection is detected by a photodiode, and the resulting plot of deflection against point of incidence on the filter is used to measure refractive properties over smaller zones than the telescope method of 8.1. The resolution in terms of optical power is better than 10^{-3} dioptres (m^{-1}]. A sketch of this principle is given in Figure 10.		P
	If two parallel rays, 1 and 2, pass through the test filter at different points, they meet in the focal plane at a distance,/ from the test filter. Its refractive power is then 1// In the case of a test filter with different curvatures in two mutually perpendicular directions, or if light falls obliquely on a spherical surface, an astigmatic refractive power results which is equal to the difference between the refractive powers in the two main meridians.		P
	If, in addition to this, the central ray 1 is deflected by an angle *a,* the test filter has, in addition to its spherical refractive power, a prismatic refractive power 在 where:		P
8.3.2	Apparatus		-
	The apparatus for determining distance/comprises the following main elements（see Figure 11）:		P
8.3.2.1	Laser, supplying a parallel lightbeam of wavelength（600 ± 70）nm.		-
8.3.2.2	Two lenses with a diaphragm at the common focal point to expand the laser beam to a nominal diameter of 5 mm（the average size of		-

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Clause	Requirement – Test	Result - Remark	Verdict
	the eye-pupil）.		
8.3.2.3	Carriage to move the test filter continuously on a spiral path in a plane perpendicular to the direction of the laser beam. During measurement, the test filter should not turn in relation to the photodiode. The carriage runs on two guides perpendicular to each other, keeping the directions of the axes of the carriage and the test filter constant during measurement. A pivot guided by a spiral transmits the corresponding movement to the carriage. The pitch of the spiral is nominally 1,08 mm.		P
	The 5 mm diameter laser beam continuously scans the area to be tested, centred on the reference point, or scans areas that have been identified as having local variations（see 6.2 in ISO 12312-1:2013）. By appropriate markings, the position of the light beam on the filter and its deflection can be noted clearly. The entire measurement beam of 5 mm diameter shall lie within the measurement area of 20 mm diameter. A peripheral area 5 mm wide around the filter shall be excluded from the examination;		P
8.3.2.4	Position diode (see Figure 12）, to measure the deflection of the laser beam (see Figure 11). On this photodiode (for example, PIN SC 25[2] a rectangular system of coordinates is established by five electrical connections. When the centre connection, 5, is illuminated, the photocurrent of the remaining connections is equal. When the light spot moves over the sensitive surface, the photo-current of connections 1 to 4 changes according to the position of the light spot in relation to the centre.		P
	The photocurrent of connection 5 remains		P

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Clause	Requirement – Test	Result - Remark	Verdict
	constant and is directly proportional to the radiant flux.		
	The potential difference between the connections of one axis is proportional to the displacement on this axis as well as to the radiant flux. The photodiode has an active sensitive surface of 1,9 cm χ 1,9 cm (minimum dimensions）. In this apparatus, it can be positioned at distances between 50 cm and 250 cm from the test filter as required, so that, for a scanned area of 30 mm diameter, a refractive power up to a maximum of 2 m^{-1} can be measured.		P
8.3.2.5	Computer, to record the instantaneous position of the filter and corresponding position of the laser beam.		-
8.3.3	Test procedure		-
a	The filter is placed on the specimen carriage and the apparatus is started.		P
b	With a specimen having plane surfaces, the direction of the emergent light beam is independent of its position on the filter as the ray is not deflected when it passes through the filter. As a first approximation, the image on the recorder is therefore a point. With a curved afocal filter, the point can be slightly broadened because of light refraction at its surfaces. A filter with uniform refractive power (lens] has the same focal length at all points. Therefore the scanning path is reproduced either reduced or enlarged, depending on the refractive power (see Figure 13], without changing its form. The spiral scanning path is also drawn on the recorder as a spiral with constant distances between adjacent lines [see Figure 14 (a]].		P
c	Filters with astigmatic refractive power, i.e. different focal lengths in different meridians, give rise to an approximately elliptical curve, since the dimensions of the curve depend upon the refractive power which varies for the different meridians.		P

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	Since the dimensions of the curve depend on the refractive power, the distance from one line to the next is different for the different meridians and the spiral is therefore distorted [see Figure 14(b)].		P
	Filters with irregularly varying focal lengths produce a deformed spiral path [see Figure 14 (c)]. From this distorted spiral the refractive powers at all points on the surface of the filter can be obtained by analysis.		P
	The apparatus can be calibrated using samples of known prismatic refractive power or by lateral displacement of the detector using a micrometer.		P
8.3.4	Verification and test report		-
	The highest absolute values shall be determined of spherical and astigmatic power across the filter for a field of measurement of 20 mm in diameter, centred at the reference point of the filter. A marginal area 5 mm wide at the edge of the sunglass shall be disregarded. The measured quantities shall be given in the test report and compared with the limit values defined by ISO 12312 (all parts].		P
9	Test methods for mechanical properties		-
9.1	Test method for minimum robustness of filters		-
9.1.1	Principle		-
	A static load (100 ±2) Nis applied on the test specimen.		P
9.1.2	Apparatus		-
9.1.2.1	Loading device		-
	A steel ball of 22 mm nominal diameter is fastened to the lower end of a tube of 70 mm nominal length. This total loading mass is such that the force applied to the filter is (100 ± 2) N.		P
9.1.2.2	Specimen support		-
	The support for the filter(see Figure 15)shall be a steel cylinder with an internal diameter of		P

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Clause	Requirement – Test	Result - Remark	Verdict
	(35,0 ± 0,1)mm and an outside diameter of (41,0 ± 0,1) mm. The cylinder shall be inserted into, or be part of, a steel base.		
	The silicone gasket shall have a hardness of 40 ± 5 Shore A to IRHD per ISO 48, and shall be securely bonded to the support tube which shall be made of a rigid material.		P
	If the specimen filter is of insufficient dimensions to enable its entire periphery to be adequately supported, suitable adaptor sleeves shall be used.		P
	The pressure ring shall have a mass of (250 ± 5) g. By its weight, it presses the neoprene seating ring against the upper surface of the specimen.		P
	A sheet of carbon paper on top of a sheet of white paper is placed on the supporting steel plate at the base of the 1,5 mm deep cavity.		P
9.1.3	Test procedure		-
	Carry out the procedure as follows.		P
a	The central vertical axis of the loading tube shall be aligned with that of the specimen support.		P
b	The specimen shall be positioned on the support with the back surface downwards and the load ring shall be placed on the specimen. For curved filters with both surfaces being cylindrical or toroidal, the supporting plate may be curved to conform to the surface of the filter and the 3 mm thick seating ring may be flexed to match. The dimensions of 3,0 mm and 4,5 mm shall apply to the distance between the lowest point of the filter resting on the seating ring and the top of the supporting plate, i.e. the thickness of the seating ring, and the carbon paper respectively.		P
c	The position of the specimen shall be adjusted such that the load ring axis (9.1.2.1] passes through the boxed centre of the specimen.		P
d	The loading mass shall be lowered onto the filter		P

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Clause	Requirement – Test	Result - Remark	Verdict
	at a speed not exceeding 400 mm/min. The force of (100 ±2]Nis maintained for (10 ± 2] s.		
e	The loading mass is then removed.		P
	Record whether the filter has fractured and/or the white paper is marked by the carbon paper.		P
9.1.4	Test report		-
	Report whether filter fracture or white paper marking occurs.		P
9.2	Test method for impact resistance of filters, strength level 1		-
9.2.1	Principle		-
	A16g steel ball is dropped through (27⊥|°03) m onto a filter and the result is recorded.		P
9.2.2	Apparatus		-
9.2.2.1	Lens tube and test block (see Figure 16〕.		-
	The test block shall be made of steel and is applicable to the majority of filters. However, if a diameter of the edged filter is less than 32 mm, a substitute support can be used whose outside diameter is equal to or less than the smallest diameter of the edged lens. The wall thickness of the support is a nominal 3 mm.		P
	The neoprene gasket shall have a hardness of 40 ± 5 Shore A to IRHD, a minimum tensile strength of 8,274 kPa, and a minimum ultimate elongation of 400 %, and shall be securely bonded to the support tube which shall be made of a rigid material.		P
	The test block is to be inserted in the base plate described in Figure 17.		P
9.2.2.2	Base plate, made of steel, as shown in Figure 17.		-
9.2.2.3	Steel test ball of nominal diameter 16 mm and mass not less than 16 g.		-

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Clause	Requirement – Test	Result - Remark	Verdict
9.2.3	Test procedure		-
	Carry out the procedure as follows.		P
	— The filter shall be tested with its front surface uppermost and shall be supported by the method described in 9.2.1 to 9.2.2.		P
	—A 16 mm diameter steel ball, weighing not less than 16 g shall be dropped in free fall from a height of (27 $+^{03}_{\circ}$) ^ onto the front surface of the filter.		P
	— The ball shall strike within a 16 mm diameter circle located at the boxed centre of the lens. The ball can be guided, but not restricted, in its fall by being dropped through a tube extending to within approximately 100 mm of the filter.		P
	Record whether filter fracture occurs.		P
9.2.4	Test report		-
	Report whether filter fracture occurs.		P
9.3	Test method for impact resistance of sunglasses, strength level 1		-
9.3.1	Principle		-
	This procedure tests the ability of the sunglass, when mounted on a headform, to resist breakage or significant deformation under the impact of a 16 g steel ball dropped through (27 $+^{03}_{\circ}$) m.		P
9.3.2	Apparatus		-
9.3.2.1	Headform, of a size appropriate to the specimen being tested and conforming to the description as indicated in Annex G. The headform shall be supported such that its central vertical (crown to neck） axis is horizontal and the face is uppermost. The headform shall be capable of being rotated continuously around its crown to		P

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Clause	Requirement – Test	Result - Remark	Verdict
	neck axis, by not less than 90° either side of vertical（so that either side arm is uppermost）.		
9.3.2.2	Steel ball, of nominal diameter 16 mm and mass not less than 16 g.		-
9.3.2.3	Pressure-sensitive material, suitable for recording contact between the sunglass and the headform.		-
9.3.3	Test procedure		-
9.3.3.1	Position the headform face uppermost.		-
9.3.3.2	Apply the pressure-sensitive material to the headform to cover the area within the orbital rim of each eye.		P
9.3.3.3	Place the specimen to be tested on the headform in the as-worn position and with the tension of the headband, if fitted, adjusted according to the manufacturer's instructions.		P
9.3.3.4	Allow the steel ball to fall from（1,27 :|°03）m above the upper surface of the specimen so as to impact the specimen at the visual centre. If a guidance system is used, ensure that it does not touch the specimen or otherwise affect the results of the test.		P
9.3.3.5	Remove the specimen and note any damage as specified in ISO 12312-1.		P
9.3.3.6	Remove the pressure-sensitive material from the headform and inspect for evidence of impacts being transmitted to the eye area of the headform.		P
9.3.3.7	Repeat steps 9.3.3.2 to 9.3.3.6 for both eyes with the headform positioned appropriately.		P
9.3.4	Test report		-
	Report the extent of any damage to the specimen as specified in ISO 12312-1 and whether or not there is evidence of impacts being transmitted to the eye area of the headform. Where the lens or filter contains several elements, the report shall refer to the		P

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Clause	Requirement – Test	Result - Remark	Verdict
	rearmost element.		
9.4	Test method for impact resistance of sunglasses, strength level 2		P
9.4.1	Principle		-
	This procedure tests the ability of the sunglass, when mounted on a headform, to resist breakage or significant deformation under the impact of a 43 g steel ball dropped through (1,27 $^{+0,03}$) m.		P
9.4.2	Apparatus		-
9.4.2.1	Headform, of a size appropriate to the specimen being tested and conforming to the description given in Annex G. The headform shall be supported such that its central vertical (crown to neck) axis is horizontal and the face is uppermost. The headform shall be capable of being rotated continuously around its crown to neck axis, by not less than 90° either side of vertical (so that either side arm is uppermost).		P
9.4.2.2	Steel ball, of nominal diameter 22 mm and mass not less than 43 g.		-
9.4.2.3	Contact-indicative material, of a sufficient quantity for recording contact between the eye protector and the headform.		P
9.4.3	Test procedure		-
9.4.3.1	Position the headform face uppermost.		-
9.4.3.2	The contact-indicative material is applied to the headform to cover the area within the orbital rim of each eye.		P
9.4.3.3	Place the specimen to be tested on the headform in the as-worn position and with the tension of the headband, if fitted, adjusted according to the manufacturer's instructions.		P
9.4.3.4	Allow the steel ball to fall from (1,27 $\pm^{0,03}$) m above the upper surface of the specimen so as to impact the specimen at the visual centre. If a guidance system is used, ensure that it does not touch the specimen or otherwise affectthe results ofthe test.		P
9.4.3.5	Remove the specimen and note any damage as specified in ISO 12312-1.		-

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Clause	Requirement – Test	Result - Remark	Verdict
9.4.3.6	Inspect the sunglass for evidence ofcontact (if using contact-indicative paste） or remove and inspect the pressure-sensitive media for evidence of impacts being transmitted to the eye area of the headform.		P
9.4.3.7	Repeat steps 9.4.3.2 to 9.4.3.6 for both eyes with the headform positioned appropriately.		P
9.4.4	Test report		-
	Report the extent of any damage to the specimen as specified in ISO 12312-1 and whether or not there is evidence of impacts being transmitted to the eye area of the headform.		P
	Where the lens or filter consist of several elements, the report shall refer to the rearmost element.		P
9.5	Test method for impact resistance of sunglasses, strength level 3		-
9.5.1	Principle		-
	This procedure tests the ability of the sunglass, when mounted on a headform, to resist breakage or significant deformation under the impact of a steel ball of nominal diameter 6 mm travelling at a specified high speed.		P
9.5.2	Apparatus		-
9.5.2.1	Headform		-
	The headform shall be of a size appropriate to the specimen being tested and conform to the description given in Annex G. The headform shall be supported such that its central vertical (crown to neck） axis is both vertical and normal to the barrel of the apparatus. The headform shall be capable of being rotated continuously around its vertical axis to not less than 90° either side of the axis of the barrel. The headform shall be capable of being raised and lowered vertically such that its upper and lower extremes can be aligned with the axis of the barrel and moved sideways.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.5.2.2	Projectile propulsion		-
	The apparatus consists of a horizontal barrel, with a breech or ball-loading mechanism, and a supply of compressed gas to propel the ball. The arrangement ensures that the ball impacts the specimen at the required position and speed (5—15)m/s. The projectile shall be a steel ball of 6 mm nominal diameter and 0,86 g mass. The barrel shall be of sufficient length to ensure a reproducible exit speed of the steel ball.		P
	The end of the barrel or tube should be protected against ricochets. The area surrounding the test specimen, the headform and the exit point from the barrel should be enclosed.		P
	It is not possible to define precise requirements for the length of barrel and the bore diameter because these vary according to the design of each apparatus and the characteristics of the gas supply used for propulsion.		P
9.5.2.3	Projectile speed measurement		-
	The apparatus shall include a means of measuring the speed of the ball to within an accuracy of ± 1,0 %, typically after it exits the barrel, and certainly no further than 250 mm from the point of impact. The timer shall record in multiples of not more than 10 ps.		P
	A suitable method uses an electronic timer operated by signals from photodetectors as the ball passes by them. The distance between the photodetectors should be known accurately and not exceed 150 mm.		P
9.5.2.4	Pressure-sensitive material		-
	The pressure-sensitive material shall be of a suitable quantity for recording contact between the sunglass and the headform.		P
9.5.3	Test procedure		-

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Clause	Requirement – Test	Result - Remark	Verdict
9.5.3.1	The headform is positioned in front of the propulsion equipment such that the point of impact is as specified in ISO 12312-1.		P
9.5.3.2	The pressure-sensitive material is applied to the headform to cover the area within the orbital rim of each eye.		-
	Depending on the material used, it might be necessary to apply part of the material to the headform and part to the sunglass.		P
	The specimen to be tested is placed on the headform in the as-worn position and with the tension of the headband, if fitted, adjusted according to the manufacturer's instructions.		P
9.5.3.3	The steel ball is projected at the visual centre.		-
9.5.3.4	The specimen is removed and any damage as specified in ISO 12312-1 is noted.		-
9.5.3.5	Inspect the eye protector for evidence of contact (if using contact-indicative paste] or remove and inspect the pressure-sensitive media for evidence of impacts being transmitted to the eye area of the headform.		P
9.5.3.6	Repeat steps 9.5.3.2 to 9.5.3.6 for both eyes with the headform positioned accordingly.		-
9.5.4	Verification and test report		-
	The extent of any damage to the specimen, and whether or not there is evidence of impacts being transmitted to the eye area of the headform, is reported.		P
	Where the lens or filter contains several elements, the report shall refer to the rearmost element.		P
9.6	Test method for frame deformation and filter retention		-
9.6.1	Principle		-
	This procedure tests the ability of the complete sunglass to resist deformation and to retain the filters.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.6.2	Apparatus		-
9.6.2.1	Vertically operating annular clamp, capable of holding the test sample without twist or slip and having a diameter of (25 ± 2] mm, with two contact surfaces, E1 and E2, made of a firm elastic material (e.g. polyamide].		P
9.6.2.2	Downward operating pressure peg (see 5 in Figure 18], having a diameter of (10 ± 1] mm with the contact surface an approximate hemisphere.		P
	The clamping surfaces are capable of at least 10 mm separation equidistant either side of a horizontal line through the apparatus and the pressure peg is capable of travel from at least 10 mm above the horizontal line to not more than 8 mm below. To accept sunglasses with significant face form angle, the annular clamp shall also be capable of rotation about a horizontal axis so that the axis of the pressure peg remains perpendicular to the plane of the unclamped lens at its boxed centre. The distance between the clamp and pressure peg is adjustable.		P
9.6.2.3	Measuring device, having an accuracy better than 0,1 mm.		-
9.6.3	Procedure		-
	Mount the sunglass complete with its filters on the device with the sides of the test sample extended and with the front of the test sample downwards. Clamp the sample, if fitted with separate filters for each eye, within a tolerance of 2 mm at the boxed centre of one filter. For a sunglass fitted with a single filter covering both eyes, the clamping and reference points are positioned 64 mm apart, or as specified by the manufacturer (see Figure 19).		P
	Lower the pressure peg so that it rests on the		P

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Clause	Requirement – Test	Result - Remark	Verdict
	back surface of the unclamped filter within 2 mm of its boxed centre, ensuring that there is no movement of the lens. Record this as the starting position.		
	Then move the pressure peg downwards slowly and smoothly, applying an increasing force until the first of either of the following criteria is reached:		P
	a） a maximum force of 5 N; b） a distance equal to 10 % of the distance *c* between the reference points or, for single filters covering both eyes, a distance equal to 10 % of 64 mm or the distance specified by the manufacturer (see isO 4007). Retain the initial displacement for 5 s and then return the pressure peg to its starting position. After a relaxation period of 20 s, again lower the pressure peg until it just rests on the filter. Determine, in millimetres, the movement, *x,* of the pressure peg from the starting position and calculate the percentage deformation using the following formula. Check that the sunglass frame shows no fracture.		P
	Sunglass frames shall be inspected without the aid of a magnifying lens by an observer with a visual acuity of at least 1,0, when tested using optotypes conforming to ISO 8596. Any visual correction required for the observation distance shall be worn.		P
	During the examination, expose the test specimen to an illuminance of 1 000 lx to 2 000 lx and carry out the inspection against a matt black background.		P
	Confirm that neither test lens has been dislodged wholly or partially from its original location in the groove or mount.		P
9.6.4	Verification and test report		-
	Report whether the deformation of the sunglass exceeded 2 % of the distance between the reference points, whether the maximum load of 5 N achieved the distance specified in 9.6.3,		P

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Clause	Requirement – Test	Result - Remark	Verdict
	whether the frame shows any fracture or crack and whether either filter has been dislodged wholly or partially from its original location in the groove or mount.		
9.6.5	Uncertainty of measurement		-
	An estimate of the uncertainty of measurement associated with this method of test shall be established in accordance with isO/IEC Guide 98-3. The value of this estimate shall not exceed ± 10 %. See also Annex A.		P
9.7	Test method for increased endurance of sunglasses		-
9.7.1	Principle		-
	The test aims to simulate the strains on the sunglass frame, particularly the joints, when putting the sunglasses on or off. The end of one side is clamped to restrain lateral, but not rotational movement, while the end of the other is rotated through a circle of diameter 60 mm. The bridge is supported, but not clamped, by an artificial nose to restrict movement of the frame.		P
9.7.2	Apparatus		-
9.7.2.1	Two clamping devices, mounted on universal joints, which are used to restrain the sides (see Figures 21 and 22).		P
9.7.2.2	Horizontal bar, forming a bridge support. The bridge support has a triangular cross section, enclosing an angle of (30 ± 2）°, having a thickness at the top of (12 ± 1）mm with the upper edge approximately radiused (see Figure 20).		-
	The positions of the clamps and bridge support, relative to each other, are adjustable by at least 40 mm horizontally and vertically.		P
	The universal joints shall not restrict the angular movement of the sides. The clamping point, defined as the edge of the clamp nearest the dowel screw centre, shall be (55 ± 1）mm from the centre of the pivot of the universal joint.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	The apparatus is capable of continuously and smoothly imparting a cyclical motion to one of the universal joints of: — d o w n (30 ± 0,5） mm — o u t (60 ± 1,0） mm —up (30 ± 0,5） mm at a rate of 40 cycles*min^{-1}, with the other clamped side remaining fixed, except for the flexure of the universaljoint.		P
9.7.3	Procedure		-
9.7.3.1	Before mounting the test sample on the test apparatus, establish the clamping and measuring points.		P
	For curl sides, ensure that the clamping points are (3 ± 1] mm nearer to the dowel screw than the join between curl and the rigid side. Each measuring point shall be (10 ± 1] mm nearer to the dowel screw than the clamping point.		P
9.7.3.2	Before testing, open the sides of the sunglass frame to the fullest extent, without tension, and measure the distance between the sides at the pre-determined measuring points. Record this distance, *d*\. Mount the sunglass frame on the test device, and ensure:		P
a	that the rotating clamp (5] is on the same plane as fixed clamp (4] and that it is positioned at the nearest point of its rotation towards fixed clamp (4] (see Figure 22）:		P
b	that the bridge of the sunglass frame is freely supported on the bridge support (6] (see Figure 20）:		P
c	that the horizontal relationship between clamp (4], the bridge support (6] and clamp (5] are such that the sunglass frame can be mounted with sides fully open, but not under tension, and with the bridge support midway between the clamps (see Figure 22）:		P

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Clause	Requirement – Test	Result - Remark	Verdict
d	that the height of the bridge support is adjusted so as to ensure that the sides are in line with the axis of the clamps and parallel to the base of the device;		P
e	that the sides are clamped within 1 mm of the calculated clamping point;		P
f	that the lockscrew (6] is loosened to allow the fixed clamp to align with the inward angle of drop of the side, and then re-tightened (see Figure 21）:		P
g	that the revolution counter is set to zero (see Figure 22）.		P
9.7.3.3	With the test sample, complete with its filters, in position, set the apparatus in motion, subjecting the sample to the cyclical rotating movement described in 9.7.2.2 for a total of（500 0）cycles.		P
	After the 500 cycles have been completed, stop the motion and remove the sample from the apparatus. Measure the distance between the sides at the measuring point and record the distance, *d2,* in millimetres.		P
	The sunglass frames shall be inspected, without the aid of a magnifying lens, by an observer with a visual acuity of at least 1,0, when tested using optotypes conforming to ISO 8596. Any visual correction required for the observation distance shall be worn.		P
	During the examination, expose the test specimen to an illuminance of 1 000 lx to 2 000 lx and carry out the inspection against a matt black background.		P
	Record any fracture, cracks or change in side movement（see ISO 12312-1）.		P
9.7.4	Verification and test report		-
	Report on whether or not the difference between *d1* and d2 exceeds 5 mm and whether the sunglass frame shows any fracture, cracks or change in side movement.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.7.5	Uncertainty of measurement		-
	An estimate of the uncertainty of measurement associated with this method of test shall be established, as described in ISO/IEC Guide 98-3. The value of this estimate shall not exceed ± 0,5 mm（see also Annex A）.		P
9.8	Test method for resistance to solar radiation		-
9.8.1	Principle		-
	Sunglass filters are exposed to irradiation from a specified source and distance for a specified amount of time. The transmittance and wide angle scatter of these filters are measured before and after exposure to determine their resistance to fading.		P
9.8.2	Apparatus		-
9.8.2.1	Fused-silica envelope high-pressure xenon ozone free lamp with power of（450 ± 50）W. NOTE Suitable lamp references are XBO-450 OFR and CSX-450 OFR[3].		P
a	New lamps shall be burned in for at least 150 h.		P
b	The lamp shall not be used after 2 000 h of operation.		P
c	An irradiation time of（50 ± 0,1）h shall be used.		P
d	A cut-on filter shall be applied（e.g. a clear white crown glass, such as Schott B270[3]）, with a thickness of 4 mm）between the lamp and the sample. The spectral transmittance data for the cut-on filter are given in Annex J and illustrated in Figure 23. A shift of ± 5 nm is permitted as shown by the dotted and dashed lines in Figure 23.		P
e	The lamp current shall be stabilized at（25 ± 0,2）A.		P
f	The air temperature in the immediate area of the test specimen shall be（28 ± 5）°C.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.8.3	Test procedure		-
	Carry out the procedure as follows.		P
a	Measure the luminous transmittance TV according to 7.1.2 (and other transmittances to as described in 7,2 to 7.8] and wide angle scatter according to 79.		P
b	Expose the front surface of the filter to radiation from the lamp.		P
c	Ensure that the angle of incidence of the radiation on the perpendicular.		P
d	The distance from the axis of the lamp to the nearest point on the sample shall be (300 ± 10] mm.		P
e	Measure the luminous transmittance *Tv* according to 7.1.2 (and other transmittances to be checked as described in 7,2 to 7.8] and wide angle scatter according to 7.9, after exposure.		P
9.8.4	Verification and test report		-
	In accordance with solar resistance requirements (ISO 12312-1:2013, Clause 8），report relative change in luminous transmittance, new wide angle scatter value, new UV-transmittances in accordance with the initial tv, and other additional transmittance(s）claimed by the manufacturer after solar radiation exposure. For photochromic filters, reportthe new value ofthe ratio τ0/τ1.		P
9.9	Test method for resistance to ignition		-
9.9.1	Principle		-
	This procedure tests the ability of the sunglass to resist ignition.		P
9.9.2	Apparatus		-
9.9.2.1	Steel rod, (300 ± 3）mm long and 6 mm nominal diameter with end faces which are flat and perpendicular to its longitudinal axis.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.9.2.2	Heat source.		-
9.9.2.3	Thermocouple and temperature indicating device.		-
9.9.2.4	Timer, capable of measuring an elapsed time of 10 s with a resolution of ± 0,1 s.		-
9.9.3	Test procedure		-
a	Heat at least 50 mm length of one end of the steel rod to a temperature of (650 ± 20）°C.		P
b	Press the heated face of the rod (long axis vertical） against the surface of the test sample (the contact force being equal to the weight of the rod） for a period of not less than 5 s, and then remove it. Record during the test whether the specimens ignite or continue to glow.		P
c	Perform the test on all externally exposed parts of the sunglass except any elastic headband or textile edging.		P
9.9.4	Test report		-
	Report whether or not the specimens ignite or continue to glow.		P
9.9.5	Uncertainty of measurement		-
	This test method does not require a quantitative measurement to be reported. Consequently, an estimate of uncertainty of measurement is not given here.		P
9.10	Test for resistance to perspiration of the sunglass frame		-
9.10.1	Principle		-
	Complete sunglasses are exposed to an artificial sweat and then inspected for flaws.		P
9.10.2	Apparatus and reagents		-
9.10.2.1	Oven, capable of producing the test temperature of (55 ± 5）°C.		P
9.10.2.2	Container, of glass or inert plastic of minimum dimensions 200 mm across		P

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Clause	Requirement – Test	Result - Remark	Verdict
	90 mm, capable ofbeing closed.		
9.10.2.3	Volumetric flask, 11, gauged to class A of ISO 1042:1998		P
9.10.2.4	Water, conforming to Grade 3 ofISO 3696:1987.		P
9.10.2.5	Artificial sweat solution, comprising:		-
a	lactic acid, *p* - 1,21 g/ml, > 85 % purity;		P
b	sodium chloride (analytical reagent purity > 99 %]. Impurities: — P b : < 0,001 0 % — F e : < 0,001 0 % — B r : < 0,020 0 % —I:<0,010 0%;		P
c	water, conforming to Grade 3 ofISO 3696:1987.		P
	Using suitable containers, weigh an amount of lactic acid solution to have (50 ± 0,1] g of lactic acid [9.10.2.5 a]] and (100 ± 0,1] g of sodium chloride [9.10.2.5 b]] and dissolve in 900 ml of water (9.10.2.4） . Using the flask (9.10.2.3], make upto1l with water.		P
9.10.2.6	Sunglasses frame supports, of glass or inert plastic, fitted in the container to enable the sample sunglasses to be held above the artificial sweat solution. The supports can be designed to hold several sample sunglasses stacked one above another, or side by side, or both, but without contact with each other.		P
9.10.3	Procedure		-
9.10.3.1	Cover the base of the container (9.10.2.2] with the artificial sweat solution (9.10.2.5] to a minimum depth of 10 mm so that the lowest part of the (lowest, if stacked] frame shall be not less		P

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Clause	Requirement – Test	Result - Remark	Verdict
	than 12 mm above the solution.		
	Place the sunglass, complete with its filters, on the supports (9.10.2.6], with the sides open to the fullest extent (for frames with sprung hinges, opened to the fullest natural extent without activating the spring mechanism], and with the bottom edges of the sides resting on the supports (see Figure 24]. Ensure that the sunglass frame does not touch other samples or the container walls.		P
	Close the container, place it in the oven (9.10.2.1] and maintain at (55 ± 5] °C.		P
9.10.3.2	After (8,0 ± 0,5] h, remove each sample and immediately wash with water (9.10.2.4] and then dry without rubbing, using a soft cloth.		-
9.10.3.3	Within 30 min, examine each test sample using the inspection conditions described in 9.10.3.6. By comparison with an identical untested sunglass frame, check for and record any spots or change in colour (excluding a loss of gloss to the surface] anywhere on the frame, excluding joints and screws].		P
9.10.3.4	Replace the test samples on the supports, close the container and maintain the test temperature of (55 ± 5]°C for a further (16,0 ± 0.5] h. After completion of this second period, remove, clean and dry the samples as described in 9.10.3.2.		P
9.10.3.5	Within 30 min, examine those areas of each sample which are liable to come into prolonged contact with the skin of the wearer, using the inspection conditions described in 9.10.3.6. By comparison with an identical untested sunglass frame, check for and record any corrosion, surface degradation or separation of any coating layer on the parts liable to come into prolonged contact with the skin during wear, i.e. the insides of the sides, bottom and lower parts of the rim and the inside of the bridge.		P

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Clause	Requirement – Test	Result - Remark	Verdict
9.10.3.6	The sunglass frames shall be inspected without the aid of a magnifying lens by an observer with a visual acuity of at least 1,0, when tested using optotypes conforming to ISO 8596. Any visual correction required for the observation distance shall be worn.		P
	During the examination, expose the test specimen to an illuminance of 1 000 lx to 2 000 lx and carry out the inspection against a matt black background.		P
9.10.4	Verification and test report		-
	Report, regarding the sunglass frame only: — a n y spots or change in colour（excluding a loss of gloss to the surface）anywhere on the frame, excludingjoints and screws, after 8 h, any corrosion, surface degradation or separation of any coating layer on the parts liable to come into prolonged contact with the skin during wear, i.e. the insides of the sides, bottom and lower parts of the rim and the inside of the bridge, after 24 h, by comparison with an untested sunglass.		P

Report No.: WZEO-CE20241028023

TEST REPORT

EN ISO 12312-1:2022

Testing laboratory : AMTRE VERITAS STANDARD TECHNICAL TESTING LTD

Address: Unit G25 Waterfront Studios, 1 Dock Road, London. E16 lAH

Testing location: Unit G25 Waterfront Studios, 1 Dock Road, London. E16 lAH

Applicant: DO EYEWEAR OPTICS CO.,LIMITED

Address: UNIT 04-05, 16/F THE BROADWAYNO 54-62 LOCKHART RD WANCHAI HONG KONG

Adopted standard: EN ISO 12312-1:2022 Eye and face protection - Sunglasses and related eyewear Part 1: Sunglasses for general use

Test result: Compliance with EN ISO 12312-1:2022 Eye and face protection - Sunglasses and related eyewear Part 1: Sunglasses for general use

Procedure deviation: N/A

Non-standard test method: N/A

Type of tested object: Sunglasses

Trade mark: N/A

Model/Type reference: DEVON, CYA1439, EVAN, ANNE, NELSON, BOWIE, FINN, HUGO, JUNE, IVA, MILO, RIVER, GRAYSON, ROCCO, ENZO, BLAKE, LEXI, SAGE, MARLO, TALIA, REINA, CELIA, BYRON, HAZEL, NOREE, GLT2008, GLT9039, GLT9166, CY22SA037, GL8864

Factory: Wenzhou Eyecare Optical Glasses Co., Ltd.

Address: Floor 3, No. 2 Rd Zhennan, Wutian Industrial District, Wenzhou, Zhejiang, China

Test item particulars:

Material:

Possible test case verdicts: Test case does not apply to the object: N/A (N) Test object does meet the requirement: Pass (P) Test object does not meet the requirement Fail (F)
Ambient temperature and humidity:20-25℃,60-66% RH.

EN ISO 12312-1:2022 Eye and face protection - Sunglasses and related eyewear Part 1: Sunglasses for general use			
Clause	Requirement – Test	Result - Remark	Verdict
1	Scope		-
	This part of ISO 12312 is applicable to all afocal (plano power) sunglasses and clip-ons for general use, including road use and driving, intended for protection against solar radiation. Information on the use of sunglass filters is given in Annex A. Requirements for unmounted filters used as replacement or alternative filters are given in Annex B. This part of ISO 12312 is not applicable to related eyewear, such as:		P
	a)eyewear for protection against radiation from artificial light sources, such as those used in solaria; b)eye protectors intended for specific sports (e.g. ski goggles or other types); c)sunglasses that have been medically prescribed for attenuating solar radiation; d)products intended for direct observation of the sun, such as for viewing a partial or annular solar eclipse; e)products intended for occupational eye protection.		P
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.		P
3	Terms and definitions		-
	For the purposes of this document, the terms and definitions given in ISO 4007 and the following apply.		P
3.1	Related eyewear		-
	Eyewear intended for protection in the same		P

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Clause	Requirement – Test	Result - Remark	Verdict
	wavelength range as solar radiation but not necessarily originated by natural sunlight		
4	Construction and materials		-
4.1	Construction		-
	When tested in accordance with ISO 12311:2013, Clause 6, areas of the sunglass, including the frame and the edges of the filters, if in a rimless or semi-rimless style, that might, during intended use, come into contact with the wearer, shall be smooth and without sharp projections.		P
4.2	Filter material and surface quality		-
	When tested in accordance with ISO 12311:2013, 6.2, except in a marginal area 5 mm wide, sunglass filters shall have no material or machining defects within an area of 30 mm diameter around the reference point 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.		P
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 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 which are allergenic, carcinogenic, mutagenic or toxic to reproduction.		P
5	Transmittance		-

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Clause	Requirement – Test	Result - Remark	Verdict
5.1	Test methods		-
	Transmittance values shall be determined in accordance with ISO 12311:2013, Clause 7.		P
5.2	Transmittance and filter categories		-
	Depending upon their luminous transmittance at their reference point, sunglass filters for general use shall be attributed to one of five filter categories. Unless Text the deleted filter is one of the following, category 0 shall.		P
	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 ± 2 % (absolute) between the categories 0, 1, 2 and 3. There is no overlap in transmittance values between categories 3 and 4.		P
	The maximum deviation for declared luminous transmittance value shall be ± 3 % absolute for the transmittance values falling in categories 0 to 3 and ± 30 % relative to the stated value for the transmittance values falling in category 4.		P
	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.		P
	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.		P
	For gradient filters, the overlap in luminous transmittance allowed between categories shall be double that for uniformly tinted filters.		P
	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.		P

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Clause	Requirement – Test	Result - Remark	Verdict
5.3	General transmittance requirements		-
5.3.1	Uniformity of luminous transmittance		-
	The relative difference in the luminous transmittance value between any two points of the filter within a circle 40 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 %.		P
	The geometric or boxed centre takes the place of the reference point if this is not known.		P
	In the case of mounted gradient filters, this requirement shall be limited to sections parallel to the line connecting the two reference points.		P
	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).		P
	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 ISO 12311:2013, Annex L shall be used.		P
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 following two requirements.		P
	a) 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 0,2 τ v.		P
	b)Detection of signal lights. The relative visual attenuation quotient Q of filters of categories 0,		P

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Clause	Requirement – Test	Result - Remark	Verdict
	1, 2 and 3 suitable for road use and driving shall be not less than 0,80 for red signal light, not less than 0,60 for yellow, green and blue signal lights. The relative spectral distribution of radiation emitted by incandescent signal lights shall apply in accordance with ISO 12311:2013, 7.8.		
5.3.2.2	Driving in twilight or at night		-
	Sunglass filters with a luminous transmittance of less than 75 % shall not be used for road use and driving in twilight or at night. In the case of photochromic sunglass filters, this requirement applies when tested in accordance with ISO 12311:2013, 7.11.”		P
5.3.3	Wide angle scattering		-
	When tested in accordance with ISO 12311:2013, 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 %.		P
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_{vo} and its luminous transmittance in its darkened state τ_{v1} achieved after 15 min irradiation according to ISO 12311:2013, 7.11. In both states, the requirements specified in 5.2 and 5.3.2 shall be met. For photochromic filters, τ_{vo}/τ_{v1} shall be $\geqslant$ 1,25.		P
5.3.4.2	Polarizing filters		-
	If the filters in the sunglasses are claimed to be polarizing, when tested in accordance with ISO 12311:2013, 7.10.1, the filters shall be fitted in the frame so that their planes of transmission do		P

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Clause	Requirement – Test	Result - Remark	Verdict
	not deviate from the vertical, or from the specified direction if different from the vertical, by more than ± 5°. 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 the sunglasses.		P
	When tested in accordance with ISO 12311:2013, 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.		P
5.3.4.3	Gradient filters		-
5.3.4.3.1	General		-
	Gradient filters shall meet the transmittance requirements within a 10 mm radius circle, around the reference point.		P
	Uniformity of transmission is subject to the requirements of 5.3.1.		P
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.		P
	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 5.3.2.		P
5.3.5	Claimed transmittance properties		-
	For reference, see Annex A.		P
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		P

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Clause	Requirement – Test	Result - Remark	Verdict
	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) %.		P
5.3.5.2	UV absorption/transmittance		-
5.3.5.2.1	General		-
	Requirements for the transmittance of filters for sunglasses in 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) below shall apply.		P
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) %.		P
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) %.		P
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) %.		P
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) %.		P

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Clause	Requirement – Test	Result - Remark	Verdict
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) %.		P
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 SUVB shall not exceed (x + 0,5) %.		P
5.3.5.3	Antireflective coated sunglasses		-
	In the case where sunglasses are claimed to be antireflective coated, the luminous reflectance ρ v of the filter as measured from the eye-side of the filter shall be less than 2,5 %.		P
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.		P
6	Refractive power		-
6.1	Spherical and astigmatic power		-
	The requirements apply in the “as-worn” position and the sunglass shall be tested according to ISO 12311:2013, 8.1.		P
	The spherical power and astigmatic power shall not exceed the tolerances given in Table 2, where D1 and D2 are the powers in the two principal meridians of the sunglass filter.		P
	The difference between the spherical powers of the right and the left filters in the mounted state shall not exceed 0,18 dioptres.		P
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		P

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Clause	Requirement – Test	Result - Remark	Verdict
	reference point according to ISO 12311:2013, 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 ISO 12311:2013, 8.2.		P
	For adults’ sunglasses, use the diaphragm LB2 with Xb = (32,0 ± 0,2) mm		P
	For children’s sunglasses, use the diaphragm LB2 with Xb = (27,0 ± 0,2) mm		P
	Alternatively, a diaphragm with a different Xb may be used if specified by the manufacturer.		P
	The prismatic power difference shall not exceed the values in Table 3.		P
7	Robustness		-
7.1	Minimum robustness of filters		-
	For complete sunglasses, including the filter portion of those where the sunglass frame and filter are integral parts of each other, when tested as specified in ISO 12311:2013, 9.1, none of the following defects shall appear.		P
	a)Filter fracture. A filter is considered to have fractured when — it cracks through its entire thickness and across a complete diameter into two or more separate pieces, or — a person with a visual acuity of at least 1,0 (6/6 or 20/20) can see, when viewing without magnification but wearing the appropriate correction, if any, for near vision, either a piece of material that has become detached from the filter surface or a corresponding surface defect.		P
	b)Filter deformation. A filter is considered to have been deformed if a mark appears on the		P

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Clause	Requirement – Test	Result - Remark	Verdict
	white paper on the opposite side to that contacted by the ball. For clip-ons neither a) nor b) are applied.		
7.2	Frame deformation and retention of filters		-
	When tested in accordance with ISO 12311:2013, 9.6, the frame fitted with filters shall not:		P
	a)fracture or crack at any point; b)be permanently deformed from its original configuration by more than 2 % of the distance, c, between the boxed centres of the sunglass frame, that is the residual deformation x shall not exceed 0,02c (see Figure 18 in ISO 12311:2013); c)neither filter shall be displaced from the frame.		P
7.3	Impact resistance of the filter, strength level 1 (optional specification)		-
	When tested in accordance with ISO 12311:2013, 9.3, the filter shall not fracture. A filter is considered to have fractured when — it cracks through its entire thickness and across a complete diameter into two or more separate pieces, or — a person with a visual acuity of at least 1,0 (6/6 or 20/20) can see, when viewing without magnification but wearing the appropriate correction, if any, for near vision, either a piece of material that has become detached from the filter surface or a corresponding surface defect, or — the test ball passes through the filter.		P
	This requirement also applies to the filter portions of complete sunglasses where the frame and the filters are integral parts of each other.		P
	If this requirement is met, testing according to 7.1 (minimum robustness) is not necessary.		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.4	Increased endurance of sunglasses (optional specification)		-
	When an increased endurance is claimed, a complete sunglass is tested according to ISO 12311:2013, 9.7. The sunglass shall not:		P
	a)fracture at any point; b)be permanently deformed (the sunglass is considered to be permanently deformed if the original distance between the sides at the measuring points have changed by more than 5 mm after 500 cycles); c)except for sunglasses with frames fitted with sprung joints, require more than light finger pressure to open and close the sides; d)for sunglasses with frames that are not fitted with sprung joints, have a side that closes under its own weight at any point in the opening/closing cycle, or for sides fitted with a sprung joint, the side shall still support its weight in the open position (i.e. opened to the fullest natural extent without activating the spring mechanism).		P
7.5	Resistance to perspiration (optional specification)		-
	When the sunglass is tested in accordance with ISO 12311:2013, 9.10, there shall be:		P
	a)no spotting or colour change (excluding a loss of gloss to the surface) anywhere on the frame, excluding joints and screws, after testing for 8 h, and b)no corrosion, surface degradation or separation of any coating layer on the parts liable to come into prolonged contact with the skin during wear, i.e. the insides of the sides, bottom and lower parts of the rim and the inside of the bridge, after testing for a total of 24 h. Such defects shall be visible under the		P

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Clause	Requirement – Test	Result - Remark	Verdict
	inspection conditions described in ISO 12311:2013, 6.2.		
	If the sunglass frame is made from natural materials and the manufacturer recommends a cream or wax for its maintenance, then before testing, the frame(s) shall be prepared with this cream or wax according to the manufacturer's instructions. At the end of the test when the frame is checked for colour change or surface degradation, if the frame fails this requirement, use the cream or wax and wait for one day before checking again for colour change or surface degradation. If the frame has recovered its original appearance, the sunglass frame is considered to have passed the test while if the frame remains discoloured, the frame is considered to have failed the test.		P
7.6	Impact resistance of the filter, strength level 2 or 3 (optional specification)		-
	If an increased level of impact resistance strength is claimed, when tested as specified in ISO 12311:2013, 9.4 or 9.5, the filter shall not fracture. A filter is considered to have fractured when: — it cracks through its entire thickness and across a complete diameter into two or more separate pieces, or — a person with a visual acuity of at least 1,0 (6/6 or 20/20) can see, when viewing without magnification but wearing the appropriate correction, if any, for near vision, either a piece of material that has become detached from the filter surface or a corresponding surface defect, or — if applicable, the test ball passes through the filter (applicable to 7.3 and 7.5, but not 7.1). If this requirement is met, testing according to 7.1 (minimum robustness) is not necessary.		P

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Clause	Requirement – Test	Result - Remark	Verdict
8	Resistance to solar radiation		-
	Following irradiation as specified in ISO 12311:2013, 9.8, the relative change in the luminous transmittance of the filters referred to the initial τ v (for photochromic filters, in the faded state when according to the method described in ISO 12311:2013) shall be less than or equal to the values shown in Table 4.		P
	In addition, the following shall be met: a)the wide angle scattering shall not exceed the value of 3 %; b)for photochromic filters, τ 0/ τ 1 shall be $\geqslant$ 1,25; c)the UV requirements for the initial τ v shall continue to be satisfied; d)all claimed transmittance requirements shall be met.		P
9	Resistance to ignition		-
	When sunglasses are tested in accordance with ISO 12311:2013, 9.9, they shall not ignite or continue to glow after withdrawal of the test rod.		P
10	Resistance to abrasion (optional specification)		-
	Filters or filter surfaces that are claimed to provide a basic level of abrasion resistance shall meet the requirements of ISO 8980-5. A filter that is claimed to be abrasion resistant shall meet the requirement on both surfaces. If only one surface is claimed to be abrasion resistant, it shall be specified on the information that is supplied with the product. The surface form of the filter is restricted for testing; however, test results are applicable to claims for filters and filter surfaces with identical properties other than the surface radius.		P
11	Protective requirements		-
11.1	Coverage area		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The sunglasses shall cover two ellipses with a horizontal diameter of 40 mm and a vertical diameter of 28 mm, the centres of which are separated by 64 mm and symmetrically placed on either side of the centre of the bridge of the frame, i.e. its vertical symmetry axis.		P
	For sunglasses intended to be worn by children, the sunglasses shall cover two ellipses with a horizontal diameter of 34 mm and a vertical diameter of 24 mm, the centres of which are separated by 54 mm and symmetrically placed on either side of the centre of the bridge of the frame.		P
	A different inter-pupillary distance may be used if specified by the manufacturer.		P
11.2	Temporal protective requirements		-
	Very dark special purpose sunglasses (filter category 4) having a pupillary distance greater than 54 mm shall provide temporal shielding such that the ultraviolet transmittances of the sunglass filter, frame and side comply with the requirements for category 4 filters in Table 1 in the area PPTT shown in Figure 1, defined as follows:		P
	a)in the line of intersection of the frontal plane (tangent to the apex of the cornea) with the inner surface of the sunglass structure, to elevations of 11 mm above and below the horizontal plane through the reference point; and b)in a vertical line in the inner structure of the sunglass that is 30° back from the frontal plane and relative to the apex of the cornea, and to elevations of 6 mm above and below the horizontal plane through the reference point.		P
12	Information and labelling		-
12.1	Information to be supplied with each pair of sunglasses		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The manufacturer shall provide information for the user with each pair of sunglasses. This information shall be in the form of markings on the frame or separate information on labels, packaging, etc., that accompanies the sunglasses at the point of sale. Where pictograms are used, an explanation of the significance of these pictograms shall also be available.		P
	a)Identification of model. b)Name and address of the manufacturer. c)Reference to this part of ISO 12312. d)Type of filter, if photochromic and/or polarizing. e)Number of the filter category (in both the faded and darkened states for photochromic filters) marked preferably on the frame or on the filter. f)Description of the filter category in the form of a symbol and/or verbal description as given in Table 5. The minimum height of the symbols shall be 5 mm. g) Restrictions of use, which shall include at least the following: — not for direct observation of the sun; — not for protection against artificial light sources, e.g. solaria; — not for use as eye protection against mechanical impact hazards (for products not satisfying the requirements of 7.3 or 7.6); — any other restrictions deemed appropriate to be communicated by the manufacturer, e.g. increased or decreased transmittance of photochromic glasses due to high or low temperatures or to low light conditions.” h)When the filter does not meet the necessary requirements for driving and for filter category 4, the following warning: “Not suitable for driving and road use” in the form of the symbols shown		P

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Clause	Requirement – Test	Result - Remark	Verdict
	in Figure 2 and/or in writing. The minimum height of the symbol shall be 5 mm. i)When the filter has a luminous transmittance of less than 75 % and higher than 8 %, the following warning: “Not suitable for driving in twilight or at night” or “Not suitable for driving at night or under condition of dull light”. The same warning applies to photochromic filters for which the luminous transmittance in the faded conditions is less than 75 %. j)If relevant, instructions for care and cleaning if the wrong use of cleaning products might damage the sunglasses and a list of damaging products not suitable for cleaning.		
12.2	Additional information		-
	The following information shall be available from the manufacturer on request.		P
	a)An explanation of the trademarks that are not universally recognized or foreseen by the users of this part of ISO 12312. b)The position of the reference point when different from the one defined in this part of ISO 12312. c)The country of origin (e.g. “made in ……”). d)The nominal value of luminous transmittance. e)Transmission requirements applicable to this product. f)Polarization efficiency in cases of polarizing filters. g)The base material of filters and frame.		P
13	Selection of test samples		-
13.1	General		-
	The minimum level of conformity testing requires samples to be selected at random. These specimens shall be selected by the manufacturer or its representative, and shall be identified as reported in Table 6, and shall be		P

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Clause	Requirement – Test	Result - Remark	Verdict
	conditioned as described in 13.2 before testing.		
13.2	Preparation and conditioning of test samples		-
	Immediately before starting the series of tests, the test samples shall be conditioned for at least 4 h at an ambient temperature of 23 ° C ± 5 ° C, in the as-received condition from the manufacturer or supplier, without prior realignment, adjustment or lubrication.		P
	The testing schedule in Table 6 shall be applied to type testing of complete sunglasses with the same filter type. At least 4 (6 if the nickel release test was performed) samples are required for testing. If additionally testing for optical requirements has to be done, more than 8 samples may be necessary. See Table 7 for testing schedule for unmounted filters used as replacement or alternative filters and Table 8 for testing schedule for complete clip-ons.		P

TEST RESULTS

Test standard: EN ISO 12312-1:2022 Eye and Face Protection – Sunglasses and Related Eyewear Part 1: Sunglasses for General Use

Test samples: A Black Sunglasses

Section	Test	Result
4	Construction and materials	
4.1	Construction	P
4.2	Filter material and surface quality	P
4.3	Physiological compatibility	#1
5	Transmittance	
5.2	Transmittance and filter categories	P
5.3.1	Uniformity of luminous transmittance	P
5.3.2.1a	Spectral transmittance	P
5.3.2.1b	Detection of signal lights	P
5.3.2.2	Road use (including driving) in twilight or at night	#2
5.3.3	Wide-angle scatter	P
5.3.4.1	Photochromic filters	NA
5.3.4.2	Polarizing filters	NA
5.3.4.3	Gradient-tinted filters	NA
5.3.4.4	Electro-optical sunglare filter, electro-optical sunglass filter	NA
5.3.5	Claimed transmittance properties	NA (No claim)
6	Refractive power	
6.1	Spherical and astigmatic power	P
6.2	Spatial deviation	NA
6.3	Prism imbalance (relative prism error)	P
7	Robustness	
7.1	Minimum robustness of filters	P
7.2	Frame deformation and retention of filters	P
7.3	Impact resistance of sunglasses, strength level 1(optional specification)	NA (No claim)
7.4	Increased endurance of sunglasses(optional specification)	NA (No claim)
7.5	Resistance to perspiration(optional specification)	NA (No claim)
7.6	Impact resistance of sunglasses, strength level 2 or 3(optional specification)	NA (No claim)
8	Resistance to solar radiation	P
9	Resistance to ignition	P
10	Resistance to abrasion (optional specification)	NA (No claim)
11	Protective requirements	
11.1	Coverage area	P
11.2	Temporal protective requirements	NA
12	Information and labeling	
12.1	Information to be supplied with each pair of sunglasses	#3
12.2	Additional information	#4

Note: P=PASS; NA=Not applicable, M=Meet, F=Fai

TEST RESULTS

5.2: Transmittance and Filter Categories

Luminous Transmittance (τ_V) (380 nm to 780 nm), %	Left ocular	Right ocular
	13.5	14.1
Determined Filter Category	3	

Parameter	Requirement (%)		Result	
	Left ocular	Right ocular	Left ocular	Right ocular
Solar UVA Transmittance (315 nm to 380 nm) (Max.)	$\leq 0.5\tau_V$ (6.75)	$\leq 0.5\tau_V$ (7.05)	<0.10	<0.10
Solar UVB Transmittance (280 nm to 315 nm) (Max.)	1	1	<0.10	<0.10

Requirement(s) :					
Type (Claimed Filter Category, If Applicable)	0	1	2	3	4
Parameter(s)	Limit				
Luminous Transmittance (τV) (%) (380 nm to 780 nm)	> 80	> 43 and ≤ 80	> 18 and ≤ 43	> 8 and ≤ 18	> 3 and ≤ 8
Determined Filter Category	0	1	2	3	4
Maximum Solar Ultraviolet A (UVA) Transmittance (τSUVA) (%) (315 nm to 380 nm)	τV	τV	0.5 τV	0.5 τV	1 or 0.25 τV
Maximum Solar Ultraviolet B (UVB) Transmittance (τSUVB) (%) (280 nm to 315 nm)	0.05 τV	0.05 τV	1 or 0.05 τV	1	1

Lens Category: 0= Very limited reduction of sunglare, 1= Limited protection from sunglare, 2= Good protection against sunglare, 3= High protection against sunglare, 4= Very high protection against extreme sunglare, e.g. at sea, over snowfields, on high mountain, or in desert.

5.3.1: Uniformity of luminous transmittance

Parameter	Results		Requirement
Relative Difference in Luminous Transmittance within filter, %	Left Ocular	Right Ocular	≤ 15%(Category0,1,2,3) ≤ 20%(Category 4)
	0.73	1.20	≤ 15%
Relative Difference in Luminous Transmittance between filter, %	4.39		≤ 15%

5.3.2.1a: Spectral transmittance

Range	Limit (%)		Minimum transmittance (%)	
	Left ocular	Right ocular	Left ocular	Right ocular
Spectral Transmittance (%) (475-650 nm)	$\geq 0.2\tau_V$ (2.70)	$\geq 0.2\tau_V$ (2.82)	9.54	10.1

TEST RESULTS

5.3.2.1b: Detection of signal lights

Signal Light	Limit	Left ocular	Right ocular
Relative Visual Attenuation Quotient - Red, Q	≥ 0.80	1.34	1.32
Relative Visual Attenuation Quotient - Yellow, Q	≥ 0.60	1.00	1.00
Relative Visual Attenuation Quotient - Blue, Q	≥ 0.60	1.36	1.35
Relative Visual Attenuation Quotient - Green,Q	≥ 0.60	0.97	0.97

5.3.3: Wide-angle scatter

Requirement(s) :	Results	
When tested in accordance with ISO 18526-2:2020, 14.1, at the reference point, the wide-angle scatter of the filters in the condition as supplied by the manufacturer shall not exceed the value of 3 %.	Left Ocular	Right Ocular
	0.78	0.94

6.1: Spherical and Astigmatic Power

Optical Power	Right Ocular	Left Ocular	Requirement
Spherical Power	-0.03	-0.01	±0.12
Difference of spherical power between left and right filters (m^{-1})	0.02		≤ 0.18
Astigmatic Power	0.00	0.00	≤ 0.12

6.3: Prism Imbalance (Relative Prism Error)

Optical Power			Result	Requirement
Prismatic Power Difference	Horizontal	Base out cm/m	0.17	≤ 1.00
		Base in cm/m	-	≤ 0.25
	Vertical cm/m		0.03	≤ 0.25

TEST RESULTS

7.1 : Minimum robustness of filters

Evaluation	Criteria	Result
For complete sunglasses, including the filter portion of those where the sunglass frame and filter are integral parts of each other, when tested as specified in ISO 18526-3:2020, 7.2.1, none of the following defects shall appear.		M
Note: 1) Filter fracture. A filter is considered to have fractured when - it cracks through its entire thickness into two or more pieces, or - a trained observer can see, when viewing without magnification but wearing the appropriate correction, if any, for near vision, that either a piece of material that has become detached from the filter surface or a corresponding surface defect. 2) Filter deformation. A filter is considered to have been deformed if a mark appears on the contact indicating medium on the opposite side to that contacted by the ball.		

7.2 : Frame Deformation and Retention of Filters

Evaluation	Criteria	Result
Frame Deformation	shall not be permanently deformed from its original configuration by more than 2 % of the distance, c,between the boxed centres of the sunglass frame, that is the residual deformation x shall not exceed 0,02c	M Distortion: 0.11%
	It shall not be fracture or crack at any point	M
	Neither filter shall not be displaced from the frame.	M

8: Resistance to solar radiation

Parameter	Left Ocular	Right Ocular	Requirement
Wide-angle scatter %	0.86	0.97	≤ 3%
Relative Change in the Luminous Transmittance (τv), % (380-780nm)	-0.22	-0.57	± 3% (Category 0) ± 5% (Category 1) ± 8% (Category 2) ± 10% (Category 3,4)
Solar UVA transmittance, % (315 – 380nm)(Max)	<0.10	<0.10	It shall be complied with the requirement of the table in clause 5.2.
Solar UVB transmittance, % (280 – 315nm)(Max)	<0.10	<0.10	

TEST RESULTS

9: Resistance to ignition

Evaluation	Criteria	Result
Resistance to ignition	When sunglasses are tested in accordance with ISO 18526-3:2020, 6.10, they shall not ignite or continue to glow after withdrawal of the test rod.	M

11.1 : Coverage area

Requirement(s) :	Results
When viewed from the front, the sunglasses (filter plus frame) shall cover two ellipses with a horizontal diameter of (40 ± 1) mm and a vertical diameter of (28 ± 1) mm, the centres of which are separated by 64 mm (1-M headform) or as defined by the headform utilized, and symmetrically placed on each side of the centre of the bridge of the frame, i.e. its vertical symmetry axis. The vertical positioning of the sunglass is not restricted. For sunglasses intended to be worn by children, the sunglasses shall cover two ellipses with a horizontal diameter of 34 mm and a vertical diameter of 24 mm, the centres of which are separated by 52 mm (1-C6 headform) or 58 mm (1-C12 headform) and symmetrically placed on either side of the centre of the bridge of the frame.	PASS

Note:

1 = Sunglasses shall be designed, manufactured and packaged in such way that, when used under normal conditions, they will not compromise the health or safety of the wearer. The risks posed by substances leaking or evaporating from the sunglasses that can come into prolonged contact with the wearer shall be reduced by the manufacturer to within the limit of any applicable regulatory requirement. Special attention shall be given to substances that are allergenic, carcinogenic, mutagenic or toxic to reproduction.

#2 = Sunglass filters with a luminous transmittance of less than 75 % shall not be used in twilight or at night for road use (including driving).The applicant is drawn attention to include the following warning will be printed on the labels, packaging, etc that accompanies the sunglasses at the point of the sale:

- "Not suitable for driving in twilight or at night" or
- "Not suitable for driving at night or under condition of dull light"

#3 = The manufacturer shall provide information for the user with each pair of sunglasses. This information shall be in the form of markings on the frame or separate information on labels, packaging, etc., that accompanies the sunglasses at the point of sale. Where pictograms are used, an explanation of the significance of these pictograms shall also be available.

#4 = The following information shall be available from the manufacturer on request.

a) An explanation of the trademarks that are not universally recognized or foreseen by the users of this document;

b) The position of the reference point when different from the one defined in this document;

c) Transmittance requirements applicable to this product;

d) Polarizing efficiency in cases of polarizing filters;

e) The base material of filters and frame.

END

PHOTO APPENDIX



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PHOTO APPENDIX



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ARTWORK OF MARKING LABLE

Sunglasses

MODEL NO：DEVON, CYA1439, EVAN, ANNE, NELSON, BOWIE, FINN, HUGO, JUNE, IVA, MILO, RIVER, GRAYSON, ROCCO, ENZO, BLAKE, LEXI, SAGE, MARLO, TALIA, REINA, CELIA, BYRON, HAZEL, NOREE, GLT2008, GLT9039, GLT9166, CY22SA037, GL8864

STANDARD：

EN ISO 12311:2013

EN ISO 12312-1:2022

Applicant: DO EYEWEAR OPTICS CO.,LIMITED

Add.: UNIT 04-05, 16/F THE BROADWAYNO 54-62 LOCKHART RD WANCHAI HONG KONG

Manufacture: Wenzhou Eyecare Optical Glasses Co., Ltd.

Add.: Floor 3, No. 2 Rd Zhennan, Wutian Industrial District, Wenzhou, Zhejiang, China

CE

MADE IN CHINA

MANUFACTURE DATE：