



CERTOTTICA

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Rep. No. 151853

TEST REPORT

Client:	BOLLE' PROTECTION
Address:	95 rue Louis Guérin - 69 100 VILLEURBANNE FRANCE
Article:	Spectacles
Model:	SHOOTING - Clear oculars
Job no.:	C150706
Report no.:	151853
Receiving Date:	04/06/2015
Date of Test Begin:	19/06/2015
Date of Test End:	07/07/2015
Issuing Date:	07/07/2015
Standard Applied:	EN 166:2001 - Personal eye-protection - Specifications

Note 1: This test report is valid only for the tested samples and any changes can be made only with the issuance of a new test report.

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Note 3: The tests were performed on samples sent by client.

Note 4: This test report is an official document digitally signed according to the current Italian law.

Note 5: The declared uncertainty of the measure is expressed double the spread (which corresponds, in the case of a normal distribution, to a confidence level of about the 95%).

Optical Tests

Quality of material and surface

Clause 7.1.3

Requirements

Except for a marginal area 5 mm wide, oculars shall be free from any significant defects likely to impair vision in use.

Outcomes

Sample	Defects	Test
151853 4dx	—	Pass
151853 4sx	—	Pass
151853 5dx	—	Pass
151853 5sx	—	Pass
151853 6dx	—	Pass
151853 6sx	—	Pass

Diffusion of light

Clause 7.1.2.3

Requirements

The measurement of the reduced luminance factor is performed following the method stated in the EN167 Clause 4.2.1 (basic method). The reduced luminance factor shall be not superior than $1 \text{ cd m}^{-2} \text{ lx}^{-1}$ for welding filters, $0.75 \text{ cd m}^{-2} \text{ lx}^{-1}$ for oculars used in eye-protectors against high speed particles, $0.5 \text{ cd m}^{-2} \text{ lx}^{-1}$ for all other oculars.

Outcomes

Sample	l^* ($\text{cd m}^{-2} \text{ lx}^{-1}$)	Test
151853 4dx	0.11	Pass
151853 4sx	0.16	Pass
151853 5dx	0.25	Pass
151853 5sx	0.26	Pass
151853 6dx	0.23	Pass
151853 6sx	0.24	Pass

Transmittance

Clause 7.1.2.2

Oculars with filtering action (filters) and housings for oculars with filtering action

Clauses 7.1.2.2.2, 7.2.1

Requirements

The transmittance requirements for filtering oculars are specified in the EN 169 - *Welding filters*, EN 170 - *Ultraviolet filters*, EN 171 - *Infrared filters*, EN 172 - *Sunglare filters for industrial use* and EN 379, *Welding filters with switchable luminous transmittance*.

Goggles and face-shields mounting filtering oculars shall provide at least the same level of protection as given by the oculars.

Transmittance

EN170 - Clause 5

Spectral Transmittance Measurement Method

Spectral transmittance is measured in the ultraviolet and visible ranges by mean a spectrophotometer. The spectral transmittance is measured from 210 to 780 nm, with 1 nm step and with 2 nm spectral bandwidth.

Computing Methods

Transmittance computations if not differently stated are performed substituting with sums the integrals present in standard definitions. The highest values of the spectral transmittance in the ranges from 210 to 313 nm, from 315 to 365 nm and from 365 to 405 nm are computed from spectral data measured with a 1 nm step.

Luminous Transmittance

Requirements

Luminous Transmittance, T_v , shall be not inferior to 1.2 %. For each shade number minimum and maximum limits are reported in Table 1 of standard.

Outcomes

The T_v measurement values in percent and relative tests are:

Sample	T_v (%)	Test
151853 4sx	87.7	Pass
151853 4dx	87.3	Pass
151853 5sx	87.9	Pass
151853 5dx	87.2	Pass
151853 6sx	88.0	Pass
151853 6dx	87.3	Pass

Spectral Transmittance in the Ultraviolet and Visible Regions

Requirements

The maximum value of spectral transmittance from 210 to 313 nm, here indicated with T_{max210_313} , and the maximum value of spectral transmittance from 313 to 365 nm, here indicated with T_{max313_365} , must be inferior to limit specified in Table 1 of standard. The maximum value of spectral transmittance from 365 to 405 nm, here indicated with T_{max365_405} , must be inferior to T_v .

Outcomes

Measurement values and relative test are:

Sample	T_{max210_313} (%)	Test	T_{max313_365} (%)	Test	T_{max365_405} (T_v)	Test
151853 4sx	0.0001	Pass	0.0004	Pass	0.01	Pass
151853 4dx	0.0001	Pass	0.0004	Pass	0.01	Pass
151853 5sx	0.0001	Pass	0.0004	Pass	0.01	Pass
151853 5dx	0.0001	Pass	0.0004	Pass	0.01	Pass
151853 6sx	0.0001	Pass	0.0004	Pass	0.01	Pass
151853 6dx	0.0001	Pass	0.0004	Pass	0.01	Pass

Q-factors**Requirements**

Note: This clause is optional and apply to filters “with semaphoric signals recognition superior ability”.

The value of the Q-factor of red, yellow, green and blue signals shall not be lower than 0.8 for filters declared appropriate for driving and use on the road. Quotients according to various signals are here identified as: Qred, Qyellow, Qgreen and Qblue.

Outcomes

The measurement values of Qred, Qyellow, Qgreen, Qblue and the results of the relative tests are:

Sample	Qred	Test	Qyellow	Test	Qgreen	Test	Qblue	Test
151853 4sx	1.01	Pass	1.00	Pass	1.00	Pass	1.00	Pass
151853 4dx	1.01	Pass	1.00	Pass	1.00	Pass	1.00	Pass
151853 5sx	1.01	Pass	1.00	Pass	1.00	Pass	1.00	Pass
151853 5dx	1.01	Pass	1.00	Pass	1.00	Pass	1.00	Pass
151853 6sx	1.01	Pass	1.00	Pass	1.00	Pass	1.00	Pass
151853 6dx	1.01	Pass	1.00	Pass	1.00	Pass	1.00	Pass

Spectral Transmittance from 500 to 650 nm**Requirements**

Note: This clause is optional and apply to filters “with semaphoric signals recognition superior ability”.

The minimum value of the spectral transmission factor in the wavelength interval from 500 to 650 nm, here named Tmin500_650, shall not be inferior to 0.2 Tv for filters declared appropriate for driving and use on the road.

Outcomes

The minimum value measured of the spectral transmittance from 500 to 650 nm, is:

Sample	Tmin500_650 (Tv)	Test
151853 4sx	0.99	Pass
151853 4dx	0.99	Pass
151853 5sx	0.99	Pass
151853 5dx	0.99	Pass
151853 6sx	0.99	Pass
151853 6dx	0.99	Pass

Scale Number*EN166 Clause 5***Requirements**

The scale numbers are defined by Table 1 of the EN166.

Outcomes

The filter scale number determined is:

Sample	Scale Number
151853 4sx	2C - 1,2
151853 4dx	2C - 1,2
151853 5sx	2C - 1,2
151853 5dx	2C - 1,2
151853 6sx	2C - 1,2
151853 6dx	2C - 1,2

Variations in transmittance (Oculars without filtering action are exempt from this requirement)

Clause 7.1.2.2.3

Oculars without corrective effect

Clause 7.1.2.2.3.1

Requirements

The relative variation of the luminous transmittance around the visual centre(s) P_1 (and P_2) shall not exceed the values stated in Table 4 of the standard.

The relative difference in luminous transmittance, P_3 , between left and right oculars shall not exceed the values stated in Table 4 of the standard or 20% whichever is greater.

Outcomes

Sample	P_1 (%)	Test	P_2 (%)	Test	P_3 (%)	Test
151853 4	0	Pass	0	Pass	0	Pass
151853 5	0	Pass	0	Pass	1	Pass
151853 6	0	Pass	0	Pass	1	Pass

Resistance to ultraviolet radiation (oculars only)

Clause 7.1.5.2

Requirements

The external surface of the filters is exposed to radiation of a 450W Xenon lamp. The exposure time is 50 hours, the distance between filter and lamp is 300 mm, and the test equipment operate at environment temperature of 23 ± 5 Celsius degrees.

The absolute value of the relative variation of T_v after radiation shall not be greater than the values specified in Table 6 of EN166.

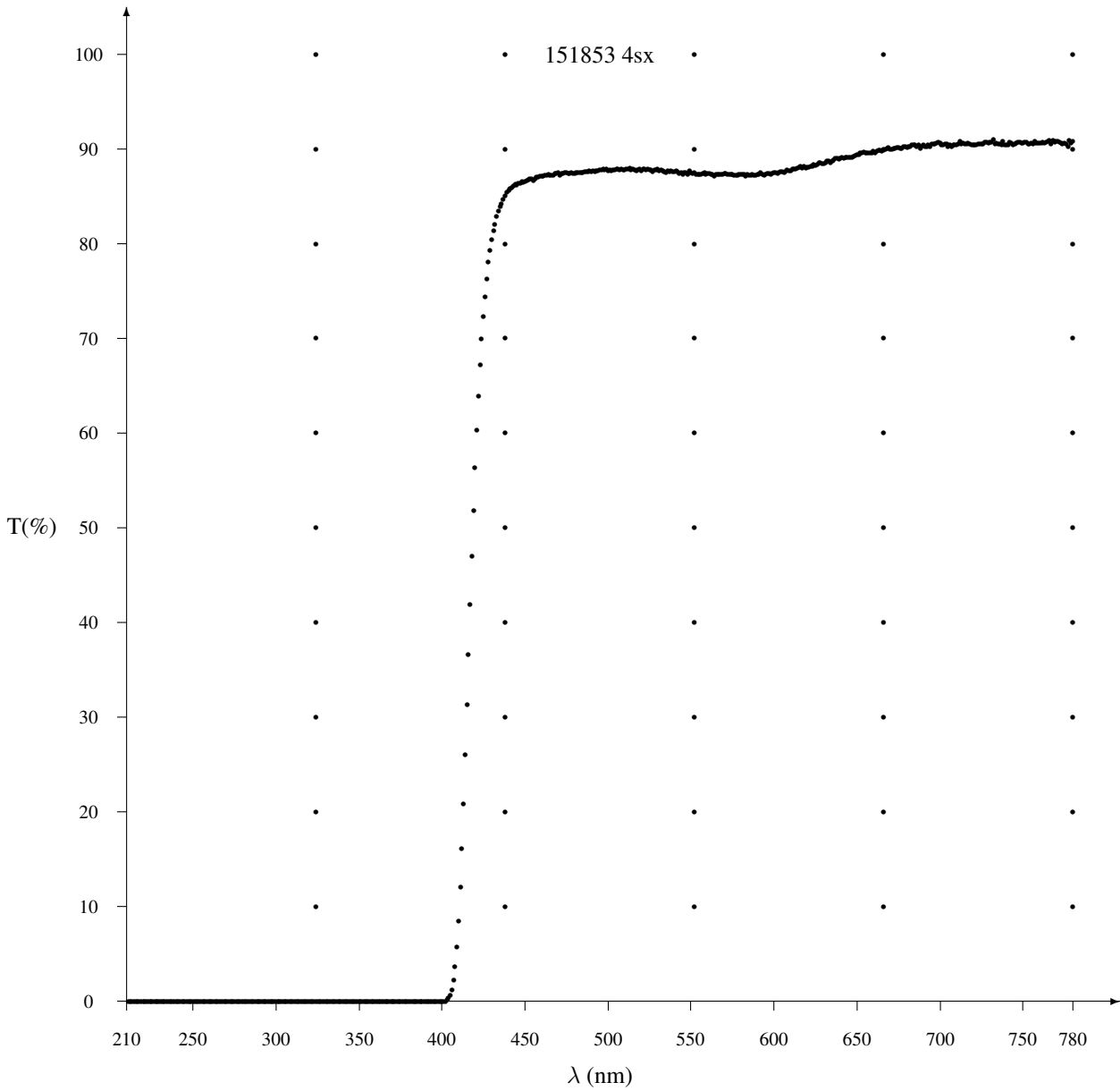
Measurement value of ℓ^* after radiation shall be not higher than 1, 0.75, $0.5 \text{ cd m}^{-2} \text{ lx}^{-1}$ respectively for welding filters, ocular for protection against high-speed particles, for all other type of oculars.

Outcomes

Measurement values of T_v and ℓ^* after irradiation, the relative variation of T_v and the test results are:

Sample	T_v (%)	$\Delta T_v / T_v$ (%)	Test	ℓ^* ($\text{cd m}^{-2} \text{ lx}^{-1}$)	Test
151853 4sx	87.4	0	Pass	0.66	Pass
151853 5dx	87.0	0	Pass	0.57	Pass
151853 6sx	87.8	0	Pass	0.35	Pass

Note: The eye-protectors against high speed particles reduced luminance factor limit was applied.



Spherical, astigmatic and prismatic powers

Clause 7.1.2.1

Note: The refractive powers of cover plates (see Clause 7.1.2.1.3 of the standard) shall comply with the tolerances for optical class 1 given in Tables 2 and 3 of the standard. The test results in the case of the cover plates here reported are relative to the optical class 1 requirements.

Mounted oculars and unmounted oculars covering both eyes

Clause 7.1.2.1.2

Requirements

Note: The refractive powers of cover plates shall comply with the tolerances for optical class 1 given in Tables 2 and 3 of the standard.

Outcomes

Sample	Sph. Refr. Pow. (D)	Test	Ast. Refr. Pow. (D)	Test
151853 1dx	-0.02	Pass	0.02	Pass
151853 1sx	-0.02	Pass	0.02	Pass
151853 2dx	-0.02	Pass	0.02	Pass
151853 2sx	-0.02	Pass	0.02	Pass
151853 3dx	-0.02	Pass	0.02	Pass
151853 3sx	-0.02	Pass	0.02	Pass

Requirements

Note: The refractive powers of cover plates shall comply with the tolerances for optical class 1 given in Tables 2 and 3 of the standard.

Outcomes

Measurement values of the differences of the horizontal and vertical refractive prismatic powers, the base, the relative tests and the possible optical class, are:

Sample	Base	Horiz. Pris. Diff. (cm/m)	Test	Vert. Pris. Diff. (cm/m)	Test	Optical Class
151853 1	out	0.15	Pass	0.00	Pass	One
151853 2	out	0.15	Pass	0.00	Pass	One
151853 3	out	0.15	Pass	0.00	Pass	One

Stability at an elevated temperature

Clause 7.1.5.1

Requirements

The protective equipment conditioned at the temperature of 55 ± 5 Celsius degrees for 60 ± 5 minutes, after 60 minutes at the environment temperature shall show no apparent deformation.

Outcomes

The test has given the following results:

Sample	Deformations	Test
151853 1	—	Pass
151853 2	—	Pass
151853 3	—	Pass

Resistance to surface damage by fine particles*Clause 7.3.1***Requirements**

Note: This is not a resistance to abrasion test.

The ocular is fixed onto a revolving plate. Whilst the plate is rotated, 3 Kg of grain size quartz sand with between 500 and 710 μm is tickled onto the sample.

The test of the light diffusion is performed after the abrasion according to the basic method. The Reduced Luminance Factor, ℓ^* , of the sample must be less than $5 \text{ cd m}^{-2} \text{ lx}^{-1}$.

Outcomes

The measurement values of ℓ^* and the results of their related tests are:

Sample	$\ell^* (\text{cd m}^{-2} \text{ lx}^{-1})$	Test
151853 41sx	1.74	Pass
151853 42dx	1.66	Pass
151853 43sx	1.93	Pass
151853 44dx	1.91	Pass

Mechanical Tests

General construction

Clause 6.1

Requirements

Eye-protectors shall meet the general construction requirements consisting in being free from projections, sharp edges or other defects which can cause discomfort or injury during normal use.

Outcomes

Specimen	Observations	Test
151853 1	—	Pass
151853 2	—	Pass
151853 3	—	Pass

Field of vision

Clause 7.1.1

Requirements

Eye-protector shall has a field of vision including for each eye the field defined by a cone having its vertex in the pupil and such to forms an ellipse with its section on a 25 mm distant plane parallel to the two pupils and orthogonal to the horizontal sight axis. The ellipses have the following geometric features: horizontal axis 22 mm, vertical axis 20 mm. The horizontal axis shall be parallel to and 0.7 mm below the height of the line connecting the centres of the two eyes; the horizontal displacement of the ellipse's centre is 3 mm toward the external eye side.

Outcomes

The performed tests have given the following results:

Specimen	Observations	Test
151853 1	—	Pass
151853 2	—	Pass
151853 3	—	Pass

Robustness

Clause 7.1.4

Increased robustness

Clause 7.1.4.2

Complete eye-protectors and frames

Clause 7.1.4.2.2

Requirements

The eye protector shall be submitted to an impact of a 22 mm diameter steel ball, of 43 g minimum mass at a speed of 5.1 m/s. The impact occurs in correspondence to the visual centers and the eye-sides.

As a consequence of the test, the sample shall not present any ocular fractures or deformations, ocular housing fractures, frame fractures, lateral protection failure.

Before the test, samples are pre-conditioned for at least one hour at -5 or +55 Celsius degrees.

The possible impact points are the ocular centres and the lateral protection.

A new sample shall be used for each impact point.

Outcomes

The results of the test are:

Sample	Impact Point	Temperature (° C)	Observations	Test
151853 7	right frontal	+55	—	Pass
151853 8	left frontal	+55	—	Pass
151853 9	right side	+55	—	Pass
151853 10	left side	+55	—	Pass
151853 11	right frontal	+55	—	Pass
151853 12	left frontal	+55	—	Pass
151853 13	right frontal	-5	—	Pass
151853 14	left frontal	-5	—	Pass
151853 15	right side	-5	—	Pass
151853 16	left side	-5	—	Pass
151853 17	right frontal	-5	—	Pass
151853 18	left frontal	-5	—	Pass

Resistance to ignition*Clause 7.1.7***Requirements**

The several external parts of the test sample except elastic headbands and textile edging, are put into direct contact for 5 ± 0.5 seconds with a steel bar risen to the temperature of 650 ± 20 Celsius degrees. During the test, a visual exam is performed to establish if the test sample ignite or continue to glow after the removal of the steel bar.

Outcomes

The visual exam has given the following results:

Sample	Observations	Test
151853 10	—	Pass
151853 11	—	Pass
151853 12	—	Pass

Lateral protection*Clause 7.2.8*

Requirements

The eye-protector shall give lateral protection of the ocular region. The test consists to verify that the lateral and the frontal impact point of the headform are protected by the device to test, into an area of radius 10 mm.

Outcomes

The results of the test are:

Sample	Observations	Test
151853 1	—	Pass
151853 2	—	Pass
151853 3	—	Pass

Resistance to fogging of oculars*Clause 7.3.2***Requirements**

Note: This test does not assess resistance to fogging of the complete of the complete eye-protector.

The oculars shall remain free from fogging for a minimum of 8 s when tested according to clause 16 of EN 168:2001.

Outcomes

The tested samples have given the following results:

Sample	Time (s)	Test
151853 37sx	10	Pass
151853 38dx	11	Pass
151853 39sx	> 15	Pass
151853 40dx	10	Pass

Protection against high speed particles at extremes of temperature*Clause 7.3.4***Requirements**

If an increased impact resistance is required, the complete eye-protector shall withstand the impact of a 6 mm nominal diameter steel ball of 0.86 g minimum mass striking the ocular at one of the speeds 45, 120 or 190 m/s according to the robustness declared.

The impact are carried out after the protector have been conditioned at $+55 \pm 2$ and -5 ± 2 Celsius degrees, in correspondence to the visual centre and of the lateral protection.

Outcomes

The performed tests have given the following results:

Sample	Impact point	Temperature (° C)	Speed (m/s)	Defects	Test
151853 45	right frontal	+55	45.7	—	Pass
151853 46	left frontal	+55	45.8	—	Pass
151853 47	right side	+55	45.7	—	Pass
151853 48	left side	+55	46.0	—	Pass
151853 49	right frontal	+55	45.8	—	Pass
151853 50	left frontal	+55	46.2	—	Pass
151853 51	right frontal	-5	45.7	—	Pass
151853 52	left frontal	-5	45.8	—	Pass
151853 53	right side	-5	45.2	—	Pass
151853 54	left side	-5	45.6	—	Pass
151853 55	right frontal	-5	45.8	—	Pass
151853 56	left frontal	-5	45.6	—	Pass



Figure 1: Specimen picture.

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