



CERTOTTICA

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Page 1 / 9
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TEST REPORT

| | |
|---------------------|--|
| Client: | BOLLE' PROTECTION |
| Address: | 95 rue Louis Guérin - 69 100 VILLEURBANNE FRANCE |
| Article: | Spectacle |
| Model: | RANGER smoke polarized lens |
| Job no.: | C101041 |
| Report no.: | 103994 |
| Receiving Date: | 26/10/2010 |
| Date of Test Begin: | 12/11/2010 |
| Date of Test End: | 19/11/2010 |
| Issuing Date: | 19/11/2010 |
| Standard Applied: | EN 166:2001 - Personal eye-protection - Specifications |

Note 1: This Test Report is valid exclusively for the specimens utilized for tests and any modification shall be solely performed with the issuing of a new test report.

Note 2: The partial reproduction of this Test Report is permitted against written authorization by Certottica.

Note 3: The Test Report in digital format and the relevant attached file of the digital signatures are official documents. The validity of this Test Report can be checked at <http://www.certottica.org>.

Note 4: The tests were performed on specimens that sampled the customer.

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 |
|-------------|---------|------|
| 103994 15dx | — | Pass |
| 103994 15sx | — | Pass |
| 103994 16dx | — | Pass |
| 103994 16sx | — | Pass |
| 103994 17dx | — | Pass |
| 103994 17sx | — | 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 |
|------------|--|------|
| 103994 4dx | 0.07 | Pass |
| 103994 4sx | 0.11 | Pass |
| 103994 5dx | 0.07 | Pass |
| 103994 5sx | 0.09 | Pass |
| 103994 6dx | 0.08 | Pass |
| 103994 6sx | 0.08 | 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.

Permissible transmittance and scale numbers

EN172 - Clause 4

Measurement Method of the Spectral Transmittance

The spectral transmittance is measured at least from 280 to 780 nm and at no more than from 280 to 2000 nm, always with the step of 1 nm through a spectrophotometer using a spectral band width not superior to 2 nm in the ultraviolet and in the visible and not over 20 nm in the infrared.

Sample Labeling and Measurement Point

The sample labeling and the measurement points are explained as following.

The measurement point on a filter is the standard's reference point if not otherwise specified. The reference point is the visual point or the geometric point if the first is unknown.

The spectral transmittance measurement points are labeled by mean a serie of strings.

The strings *sx* e *dx* identified the left and the right oculars reference point respectively.

The mounted gradient filters generally are measured in the reference point and in the points at the most 15 mm up and below the reference point and along the two parallels to the line through the right and the left reference points of the protective equipment.

In the case of unmounted singular filter the measurement are performed along the gradient direction.

The two measurement points apart the reference point are labeled *s* and *c*.

Photochromic filters can to be measured at different conditions of temperature, T (unit Celsius degree), and illumination, L (unit lux), and the labeling is performed with a suffix.

Luminous Transmittance

EN172 - Clause 4.1

Requirements

The superior and inferior limits of T_v relative to a filter shade number are showed in the Tables 1 and 2 of the standard.

Outcomes

The measurement values of T_v , expressed in percent, and the relative test are:

| Sample | T_v (%) | Test |
|------------|-----------|------|
| 103994 4sx | 13.9 | Pass |
| 103994 4dx | 13.6 | Pass |
| 103994 5sx | 14.4 | Pass |
| 103994 5dx | 13.4 | Pass |
| 103994 6sx | 14.2 | Pass |
| 103994 6dx | 14.0 | Pass |

Ultraviolet and Visible Spectral Transmittance

EN172 - Clause 4.1

Requirements

The superior values of the spectral transmittance , $T(\lambda)$, from 280 to 315 nm, here named T_{max280_315} , and of the transmittance , $T(\lambda)$, from 315 to 350 nm, here named T_{max315_350} , must be conform to the requirements in the Tab. 1 and 2 of the standard.

The mean value of $T(\lambda)$ from 315 to 380 nm, here named $T_{mean315_380}$, must be conform to the requirements in the Tab. 1 and 2 of the standard.

The minimum value of $T(\lambda)$ from 500 to 650 nm, here named T_{min500_600} , must be not inferior to 1/5 of the T_v .

Outcomes

Measurement values and the result of the tests are:

| Sample | Tmax280_315 (Tv) | Test | Tmax315_350 (Tv) | Test | Tmean315_380 (Tv) | Test |
|------------|------------------|------|------------------|------|-------------------|------|
| 103994 4sx | 0.00 | Pass | 0.00 | Pass | 0.00 | Pass |
| 103994 4dx | 0.00 | Pass | 0.00 | Pass | 0.00 | Pass |
| 103994 5sx | 0.00 | Pass | 0.00 | Pass | 0.00 | Pass |
| 103994 5dx | 0.00 | Pass | 0.00 | Pass | 0.00 | Pass |
| 103994 6sx | 0.00 | Pass | 0.00 | Pass | 0.00 | Pass |
| 103994 6dx | 0.00 | Pass | 0.00 | Pass | 0.00 | Pass |

Recognition of signal lights

EN172 - Clause 4.2

Requirements

Nota: these specifications are applicable to filters with shade number from 1 to 3,1.

The Q-factor of the semaphoric signals red, yellow, green and blue, here named respectively Qred, Qyellow, Qgreen e Qblue, must be not inferior to 4/5.

Outcomes

The measurements values of Qred, Qyellow, Qgreen e Qblue and the results of the tests are:

| Sample | Qred | Test | Qyellow | Test | Qgreen | Test | Qblue | Test |
|------------|------|------|---------|------|--------|------|-------|------|
| 103994 4sx | 0.96 | Pass | 0.98 | Pass | 1.02 | Pass | 1.05 | Pass |
| 103994 4dx | 0.96 | Pass | 0.98 | Pass | 1.02 | Pass | 1.05 | Pass |
| 103994 5sx | 0.97 | Pass | 0.99 | Pass | 1.02 | Pass | 1.05 | Pass |
| 103994 5dx | 0.96 | Pass | 0.98 | Pass | 1.02 | Pass | 1.06 | Pass |
| 103994 6sx | 0.96 | Pass | 0.98 | Pass | 1.02 | Pass | 1.05 | Pass |
| 103994 6dx | 0.96 | Pass | 0.98 | Pass | 1.02 | Pass | 1.05 | Pass |

Spectral transmittance

EN172 - Clause 4.2

Requirements

Note: these specifications are applicable to filters with shade number from 1 to 3,1.

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 |
|------------|------------------|------|
| 103994 4sx | 0.91 | Pass |
| 103994 4dx | 0.89 | Pass |
| 103994 5sx | 0.90 | Pass |
| 103994 5dx | 0.88 | Pass |
| 103994 6sx | 0.89 | Pass |
| 103994 6dx | 0.90 | Pass |

On road use: day Yes ; night NO .

Polarizing Quotient

Requirements

The polarizing quotient, R, between the values of luminous transmittance, Tv, along the parallel and orthogonal directions to the polarizing axis, must be greater than 20.

Outcomes

The values of R are:

| Sample | R | Test |
|------------|------|------|
| 103994 4sx | > 20 | Pass |
| 103994 4dx | > 20 | Pass |
| 103994 5sx | > 20 | Pass |
| 103994 5dx | > 20 | Pass |
| 103994 6sx | > 20 | Pass |
| 103994 6dx | > 20 | Pass |

Polarizing Axes

Requirements

The angle α between the horizon and the polarization axis of the mounted filter must be not superior to 3 degrees.

Outcomes

The measured value of α for the right (dx) and the left (sx) oculars are:

| Sample | dx (degrees) | Test | sx (degrees) | Test |
|----------|--------------|------|--------------|------|
| 103994 1 | 0 | Pass | 2in | Pass |
| 103994 2 | 0 | Pass | 0 | Pass |
| 103994 3 | 0 | Pass | 0 | 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 |
|------------|--------------|
| 103994 4sx | 5 - 3,1 |
| 103994 4dx | 5 - 3,1 |
| 103994 5sx | 5 - 3,1 |
| 103994 5dx | 5 - 3,1 |
| 103994 6sx | 5 - 3,1 |
| 103994 6dx | 5 - 3,1 |

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 |
|----------|-----------|------|-----------|------|-----------|------|
| 103994 4 | 0 | Pass | 0 | Pass | 2 | Pass |
| 103994 5 | 0 | Pass | 0 | Pass | 7 | Pass |
| 103994 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 Tv 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 Tv and ℓ^* after irradiation, the relative variation of Tv and the test results are:

| Sample | Tv (%) | $\Delta Tv/Tv$ (%) | Test | ℓ^* ($cd\ m^{-2}\ lx^{-1}$) | Test |
|------------|--------|--------------------|------|------------------------------------|------|
| 103994 4sx | 0 | 13.9 | Pass | 0.17 | Pass |
| 103994 4dx | 0 | 13.6 | Pass | 0.11 | Pass |
| 103994 5sx | -1 | 14.3 | Pass | 0.16 | Pass |
| 103994 5dx | -1 | 13.3 | Pass | 0.20 | Pass |
| 103994 6sx | 0 | 14.2 | Pass | 0.18 | Pass |
| 103994 6dx | -1 | 13.9 | Pass | 0.18 | Pass |

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 |
|------------|---------------------|------|---------------------|------|
| 103994 1dx | 0.00 | Pass | 0.01 | Pass |
| 103994 1sx | 0.00 | Pass | 0.02 | Pass |
| 103994 2dx | 0.00 | Pass | 0.02 | Pass |
| 103994 2sx | 0.01 | Pass | 0.02 | Pass |
| 103994 3dx | 0.01 | Pass | 0.02 | Pass |
| 103994 3sx | 0.01 | 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 | Ver. Pris. Diff. (cm/m) | Test | Optical Class |
|----------|------|---------------------------|------|-------------------------|------|---------------|
| 103994 1 | out | 0.40 | Pass | 0.05 | Pass | One |
| 103994 2 | out | 0.35 | Pass | 0.05 | Pass | One |
| 103994 3 | out | 0.35 | Pass | 0.05 | 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 |
|-----------|--------------|------|
| 103994 12 | — | Pass |
| 103994 13 | — | Pass |
| 103994 14 | — | Pass |

Optical laboratory manager: Renato Battistin

Laboratory Technical Manager: Giorgio Sommariva



Figure 1: Specimen picture.