

issued by an Accredited Testing Laboratory

Contact person RISE Stefan Källberg Measurement Science and Technology +46 10 516 56 26 stefan.kallberg@ri.se

2020-12-21

Date

Reference 105105-2P04978-01 1 (6)

Page

Testing

Plastic Produkter AB Box 15020 SE-167 15 BROMMA Sweden

Testing of clear face shields according to EN 166:2001 – **Personal eye-protection**

(1 appendix)

Test object

Clear face shield VISOR-21 System art.no. O-9885 for protection against droplets and splashes of liquids.

Summary of results

The tested face shield, including two different frames (long and short loop) and five different ocular sizes, fulfils all mandatory requirements in EN 166:2001 Personal Eye-protection. Also, the particular requirement ^{37.2.4} – Protection against droplets and splashes of liquids is fulfilled. The requirements in §6.2 Materials, §9 Marking and §10 Information were not assessed.

Identification

Date of arrival: November, 2020

Your reference: Anders Tobiasson

Identification: Clear face shields assembled from plastic frames and oculars. All ocular versions are made of A-PET with nominal thickness 0,4 mm. Upon arrival at RISE a total of 21 face shields (18 short loop and 3 long loop) for testing were assembled from the following components supplied by the manufacturer:

- 1. Plastic frame, short loop (18 pcs, art.no. O-9885-00, O-9885-A0 and O-9885-C1)
- 2. Plastic frame, long loop (3 pcs, art.no. O-9885-00, O-9885-B0 and O-9885-C1)
- 3. Ocular O-9885-A1 (15 pcs, short loop, marked #1-15)
- 4. Ocular O-9885-A2 (1 pcs, short loop, marked #16)
- 5. Ocular O-9885-A3 (1 pcs, short loop, marked #17)
- 6. Ocular O-9885-A4 (1 pcs, short loop, marked #18)
- 7. Ocular O-9885-B1 (3 pcs, long loop, marked #1-3_LONG)
- 8. Foam pad $5 \times 23 \times 120$ mm, O-9885-04 (1 pcs, optional)

See pictures in the appendix of the different components.

Date of test

December 11-18, 2020.

RISE Research Institutes of Sweden AB

Postal address Box 857 SE-501 15 BORÅS Sweden

Office location Brinellgatan 4 SE-504 62 BORÅS

Phone / Fax / E-mail +46 10 516 50 00 +46 33 13 55 02 info@ri.se

This report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.





KI SE

Date Reference 2020-12-21 105105-2P04978-01

Page

2 (6)

Summary of assessments

EN 166:2001 Requirements	
6 Design and manufacturing requirements	
6.1 General construction	Compliant
6.2 Materials	Not assessed
6.3 Headbands	Compliant
7 Basic, particular and optional requirements	
7.1 Basic requirements	
7.1.1 Field of vision	Compliant
7.1.2 Optical requirements	
7.1.2.1 Spherical, astigmatic, and prismatic refractive powers	Optical Class 1
7.1.2.2 Transmittance	
7.1.2.2.1 Oculars without filtering action	Compliant
7.1.2.2.2 Oculars with filtering action	n/a
7.1.2.2.3 Variations in transmittance	n/a
7.1.2.3 Diffusion of light	Compliant
7.1.3 Quality of material and surface	Compliant
7.1.4 Robustness	
7.1.4.1 Minimum robustness	n/a
7.1.4.2 Increased robustness	Compliant
7.1.5 Resistance to ageing	
7.1.5.1 Stability at elevated temperatures	Compliant
7.1.5.2 Resistance to ultraviolet radiation (oculars only)	Compliant
7.1.6 Resistance to corrosion	n/a*
7.1.7 Resistance to ignition	Compliant
7.2 Particular requirements (Optional)	
7.2.4 Protection against droplets and splashes of liquids	Compliant
9 Marking	Not assessed
10 Information supplied by the manufacturer	Not assessed

* The tested face shield does not have any metal parts

Based on the outcome of this assessment, according to EN 166 §9 and with the frame and ocular forming a single unit, the following marking is suggested (X = manufactureridentification):

X 1 S -EN 166 3 S

With the frame and ocular being separate units, the following markings are suggested (X =manufacturer identification):

X1S(Ocular) X EN 166 3 S (Frame)

Measurement method

The measurements and evaluations follows, in applicable parts, RISE method MET1818 and EN 166:2001.



Measurement conditions

Unless otherwise stated, the measurements are performed in a temperature stabilized laboratory with temperature 23 °C \pm 2 °C. The samples are kept in the laboratory at least 24 h before the testing is performed.

Result details

Any paragraph referenced below are from EN 166 unless stated otherwise. Assessments against limits or tolerances are made without considering the measurement uncertainties. Also, for the short loop face shields, testing were carried out according to EN 166 Table 11 – Type examination test schedule for complete eye-protectors. Limited testing of relevant paragraphs were performed for the long loop version of the face shield.

§6 General construction and design

All specimens were assessed.

§6.1 General construction

The specimens were free from projections, sharp edges and other defects which are likely to cause discomfort or injury during use.

§6.3 Headbands

The headband is made up of the plastic frame (minimum width 15 mm) together with a rubber band (width 11 mm). The rubber band can be adjusted at the point of **Pass** attachment to the frame.

§7.1.1 Field of vision

Specimen #1 to #3 and #1 to #3_LONG were assessed.

The specimens exhibited at least the minimum field of vision as defined by the standard. Pass

§7.1.2.1 Spherical, astigmatic and prismatic refractive powers

No optical class was claimed. The specimens satisfied the requirements for optical class 1.

Specimen	Spherical refrac	tive power (m ⁻¹)	Astigmatic refrac	ctive power (m ⁻¹)
	Leit	Kigitt	Leit	Kigitt
#1	0,00	0,00	0,00	0,00
#2	0,00	0,00	0,00	0,01
#3	0,00	0,00	0,00	0,00
#1_LONG	0,00	0,00	0,00	0,01
#2_LONG	0,00	0,00	0,00	0,01
#3_LONG	0,00	0,00	0,01	0,00
Limit	±0.	,06	≤0,	,06

Pass



Specimen	Differenc Vertical prism	e in prismatic power Horisontal prism	(cm/m) Base
#1	0,0	0,1	Out
#2	0,0	0,2	Out
#3	0,0	0,1	Out
#1_LONG	0,0	0,2	Out
#2_LONG	0,0	0,2	Out
#3_LONG	0,0	0,2	Out
Limit	≤0,25	≤0,75*	-

Pass

Page

4 (6)

* For base out

§7.1.2.2.1 Transmittance (oculars without filtering action)

Specimen	Luminous transmittance CIE A (%)		
	Left	Right	
#4	89,8	89,8	
#5	89,7	89,8	
#6	89,8	89,9	
Requirement	> 74	,4%	

7.1.2.3 Diffusion of light

Specimen	Reduced luminance factor $(cd \cdot m^{-2} \cdot lx^{-1})$		
	Left	Right	
#4	0,17	0,15	
#5	0,13	0,08	
#6	0,10	0,09	
Limit	≤0,5	≤0,5	

Pass

Pass

7.1.3 Quality of material and surface

Specimen #1 to #3 and #1 to #3_LONG were assessed.

The specimens were free from any significant defects as specified in the standard. Pass



7.1.4.2 Increased robustness

Specimen	Impact position	Conditioning (°C)	
#7		155	Pass
#8	1 (left ave frontal)	+55	Pass
#9	I (left eye flohtal)	F	Pass
#10		-5	Pass
#11		55	Pass
#12	2 (right eye frontal)	+55	Pass
#13		-5	Pass
#14			Pass
#15	3 (left eye side)	+55	Pass
#16		-5	Pass
#17	4 (right eye side)	+55	Pass
#18		-5	Pass

Comment: This test was only performed on short loop face shields, which has the ocular significantly closer to the wearers face compared to the long loop version. Since the short and long loop versions are otherwise identical in terms of ocular mounting and materials, the risk for ocular deformation with a negative outcome in the robustness test is clearly higher for the short loop version.

7.1.5.1 Stability at elevated temperatures

Specimen #1 to #3 and #1 to #3_LONG were assessed.

The specimens were free from any apparent deformations.

Pass

7.1.5.2 Resistance to ultraviolet radiation (oculars only)

Transmittance:

Specimen	Luminous transmittance CIE A (%) Before exposure After exposure		Relative change (%)
#4 Left	89,8	88,6	-0,2
#5 Right	89,8	88,7	-0,1
#6 Right	89,9	88,9	0,0
Requirement			±5

Diffusion of light:

Specimen	Reduced luminance factor $(cd \cdot m^{-2} \cdot lx^{-1})$
#4 Left	0,18
#5 Right	0,15
#6 Right	0,11
Limit	≤0,5

Pass

Pass



7.1.7 Resistance to ignition

Specimen #10 to #12 were assessed.

Tested parts: Ocular, ocular+frame, frame only, elastic rubber band

No part of the eye-protector ignited or continued to glow after removal of the rod

Pass

7.2.4 Protection against droplets and splashes of liquids

For face shields this assessment is based on the area of coverage as specified in EN 168:2001 §10.2.

Specimen #1 to #3 and #1 to #3_LONG were assessed.

The specimens fulfils the requirements when evaluated against the coverage area ABCD as defined in Figure 11 in EN 168:2001.

Comment: This test was only performed on the short loop face shields with ocular O-9885-A1 as the other ocular versions (-A2, -A3 and -A4) have larger areas of coverage with the same ocular mounting.

Measurement uncertainty

Spherical and astigmatic powers: $\pm 0,02 \text{ m}^{-1}$

Luminous transmittance; ±1,0 %

Prismatic power: ±0,1 cm/m

Reduced luminance factor: $\pm 0,10 \text{ cd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EAL Publication EA-4/02.

Remark

The results in this test report are only valid for the tested specimens.

RISE Research Institutes of Sweden AB Measurement Science and Technology - Time and Optics

Performed by

Stefan Källberg

Appendix

Pictures of the tested face shield

RISE Research Institutes of Sweden AB



Appendix 1

Page 1 (5)

Pictures of the tested face shield

Mounted face shield (short loop, ocular O-9885-A1)



Mounted face shield (long loop, ocular O-9885-B1)





Page 2 (5)



Appendix 1

Short (left) and long (right) loop frames with optional foam pad.



Short loop ocular O-9885-A1



RI. SE

Appendix 1

Page 3 (5)

Short loop ocular O-9885-A2



Short loop ocular O-9885-A3



Page 4 (5)



Appendix 1

Short loop ocular O-9885-A4



Long loop ocular O-9885-B1



Date Reference 2020-12-21 105105-2P04978-01

Page 5 (5)



Appendix 1

Frame parts (from top to bottom: O-9885-00, O-9885-B0, O-9885-A0 and O-9885-C1)

