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

(1 appendix)

### Test object

Clear face shield CARE (Series IV, VCA4-2006-00) for protection against droplets and splashes of liquids.

### Summary of results

The tested face shield fulfils all mandatory requirements in EN 166:2001 Personal Eye-protection. Also, the particular requirement §7.2.4 – 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: Oct, 2020

Your reference: Thomas Cronqvist

Identification: 18 pieces of clear face shields CARE Series IV. The specimens were supplied unmarked by the manufacturer, nominal plastic thickness 0,48 mm, foam dimensions 27×27×300 mm. Upon arrival at RISE the specimens were randomly numbered #1 – #18.

See pictures in the appendix.

### Date of test

Nov 03 – Nov 06, 2020.

### RISE Research Institutes of Sweden AB

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## Summary of assessments

<b>EN 166:2001 Requirements</b>	
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	
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 the following marking is suggested (according to EN 166 §9 and with the frame and ocular forming a single unit, X = manufacturer identification):*

*X 1 S -EN 166 3 S*

## 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  $23\text{ °C} \pm 2\text{ °C}$ . 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, testing were carried out according to EN 166 Table 11 – Type examination test schedule for complete eye-protectors.

### §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. **Pass**

#### §6.3 Headbands

The 30 mm wide plastic headband is adjustable by means of a 20 mm wide hook-and-loop fastener (Velcro band). **Pass**

#### §7.1.1 Field of vision

Specimen #1 to #3 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 refractive power (m <sup>-1</sup> )		Astigmatic refractive power (m <sup>-1</sup> )	
	Left	Right	Left	Right
#1	-0,01	0,00	0,02	0,01
#2	-0,01	-0,01	0,02	0,02
#3	-0,01	0,00	0,02	0,01
Limit	±0,06		≤0,06	

**Pass**

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

**Pass**

\* For base out

**§7.1.2.2.1 Transmittance (oculars without filtering action)**

Specimen	Luminous transmittance CIE A (%)	
	Left	Right
#4	89,0	89,0
#5	89,0	88,9
#6	88,9	88,9
Requirement	> 74,4%	

**Pass**

**7.1.2.3 Diffusion of light**

Specimen	Reduced luminance factor (cd·m <sup>-2</sup> ·lx <sup>-1</sup> )	
	Left	Right
#4	0,13	0,13
#5	0,15	0,19
#6	0,10	0,06
Limit	≤0,5	≤0,5

**Pass**

**7.1.3 Quality of material and surface**

Specimen #1 to #3 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	1 (left eye frontal)	+55
#8		
#9		-5
#10		
#11	2 (right eye frontal)	+55
#12		
#13		-5
#14		
#15	3 (left eye side)	+55
#16		-5
#17	4 (right eye side)	+55
#18		-5

**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**  
**Pass**

**7.1.5.1 Stability at elevated temperatures**

Specimen #1 to #3 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 (%)		Relative change (%)
	Before exposure	After exposure	
#4 Left	89,0	88,4	-0,7
#5 Right	88,9	88,4	-0,6
#6 Right	88,9	88,0	-1,0
Requirement			±5

**Pass**  
**Pass**  
**Pass**

Diffusion of light:

Specimen	Reduced luminance factor (cd·m <sup>-2</sup> ·lx <sup>-1</sup> )
#4 Left	0,19
#5 Right	0,22
#6 Right	0,10
Limit	≤0,5

**Pass**  
**Pass**  
**Pass**

**7.1.7 Resistance to ignition**

Specimen #10 to #12 were assessed.

Tested parts: Ocular only, ocular and foam, headband with Velcro

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 were assessed.

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

**Pass**

**Measurement uncertainty**

Spherical and astigmatic powers: ± 0,02 m<sup>-1</sup>

Luminous transmittance; ±1,0 %

Prismatic power: ±0,1 cm/m

Reduced luminance factor: ±0,10 cd·m<sup>-2</sup>·lx<sup>-1</sup>

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

## Appendix 1

## Pictures of the tested face shield



Face shield as received (with a protective plastic sheet on one side of the ocular)



Appendix 1

