

<b>Test report no.:</b> <i>Testrapport nr.:</i>	<b>89220726-02</b>	<b>Order No.:</b> <i>Opdracht nr.:</i>	89220726 EN12543	Page 1 of 8 <i>Pagina 1 van 8</i>
<b>Client Reference No.:</b> <i>Klantreferentie nr.:</i>	2398286	<b>Order date:</b> <i>Opdrachtdatum:</i>	2022-06-24	
<b>Client:</b> <i>Klant:</i>	Sunexx GmbH Zollernring 32, D-72186 Empfingen, Germany			
<b>Test item:</b> <i>Testvoorwerp:</i>	Laminated - safety - glass			
<b>Identification/ Type No.:</b> <i>Benaming / Type nr.:</i>	Sunexx			
<b>Order content:</b> <i>Inhoud opdracht:</i>	Samples for testing against EN 12543-2: HH and HT			
<b>Test specification:</b> <i>Testomschrijving:</i>	EN ISO 12543-2:2021 <sup>a</sup> , Laminated safety glass & EN ISO 12543-4:2021 <sup>a</sup> , Test methods for durability Glass in Building - Laminated glass and laminated safety glass <i>Laminated glas</i>			
<b>Date of sample receipt:</b> <i>Ontvangstdatum monster:</i>	2022-10-17			
<b>Test sample No.:</b> <i>Testproefstuk nr.:</i>	89220726-1/3-HT/HH			
<b>Testing period:</b> <i>Testperiode:</i>	2022-11-08 - 2022-11-24			
<b>Place of testing:</b> <i>Testlocatie:</i>	The Netherlands, Arnhem			
<b>Testing laboratory:</b> <i>Testlaboratorium:</i>	TÜV Rheinland Nederland (NoBo 0336)			
<b>Test result*:</b> <i>Testresultaat*:</i>	Pass			
<b>tested by:</b> <i>getest door:</i>	X			
<b>Date:</b> 2022-11-28 <i>Datum:</i>	Ondertekend door: Salah El Bardai	<b>Issue Date:</b> 2022-11-28 <i>Datum uitgave:</i>	Ondertekend door: Tim Zandvliet	
<b>Position / functie:</b>	Expert	<b>Position / functie:</b>	Expert	
<b>Others /</b> <i>Andere:</i>	Test samples are representative of standard production			
<b>Condition of the test item at delivery:</b> <i>Toestand van het test voorwerp bij ontvangst:</i>	Test item complete and undamaged			
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
* Legenda:	P(ass) = voldoet aan test omschrijving	F(ail) = voldoet niet aan test omschrijving	N/A = niet van toepassing	N/T = niet getest
<p><b>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</b></p> <p><i>Dit testrapport heeft alleen betrekking op het voorgenoemde test voorwerp. Zonder toestemming van het testcentrum mag dit testrapport niet in delen worden vermenigvuldigd. Dit keuringsrapport geeft geen recht op het dragen van enig keurmerk.</i></p>				

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**Remarks**  
*Opmerkingen*

1	<p>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request. For the influence of the measuring uncertainties on the results, reference is made to the validation of the respective methods.</p> <p><i>De apparatuur welke tijdens de gespecificeerde testperiode is gebruikt, is gekalibreerd volgens ons kalibratieprogramma. De apparatuur voldoet aan de eisen welke zijn opgenomen in de relevante normen. De traceerbaarheid van de gebruikte testapparatuurs is gewaarborgd door naleving van de voorschriften in ons kwaliteitsmanagementsysteem. Gedetailleerde informatie over testomstandigheden, apparatuur en meetonzekerheid is beschikbaar in het testlaboratorium en kan op verzoek worden verstrekt. Voor de invloed van de meetonzekerheden op de resultaten wordt verwezen naar de validatie van de respectievelijke methode c.q. verrichting</i></p>
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3	<p>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report. Tests clauses marked with <sup>a</sup> are performed under ISO 17025 accreditation. Deviations of testing specification(s), test locations or customer requirements are listed in specific test clause in the report. No opinions or interpretation are included in this report. This test report consists of multiple pages and is only to be read as a whole. The number of pages can be seen in the header on the top right of each page, the report ends when the last page is reached. TÜV Rheinland Nederland B.V. is solely responsible for the content.</p> <p><i>Test onderdelen welke met * zijn gemarkeerd zijn uitbesteed aan gekwalificeerde onderaannemers en zijn beschreven in het respectievelijke test onderdeel van dit rapport. Test onderdelen welke met <sup>a</sup> zijn gemarkeerd zijn onder ISO 17025 accreditatie uitgevoerd. Afwijkingen van testspecificatie(s), testlocaties of klant eisen zijn vermeld in het van toepassing zijnde onderdeel in het rapport. Er zijn geen opinies en interpretaties opgenomen binnen het rapport. Dit rapport bestaat uit meerdere pagina's en dient als geheel gelezen te worden. Het aantal pagina's is rechtsboven in de koptekst van dit rapport vermeld en eindigt wanneer de laatste pagina is bereikt. TÜV Rheinland Nederland is als enige verantwoordelijk voor de inhoud van het rapport.</i></p>
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**Product description**  
*Product omschrijving*

1	<b>Product details:</b> <i>Product details:</i>	Name of the manufacturer : Sunexx GmbH Address of the manufacturer : Zollernring 32 ,D-72186 Empfingen ,Germany Production plant of the samples : Pilkington Deutschland GmbH, Gelsenkirchen Line ID where the samples are made : - Production date : 06.10.2022 Sampling date : 06.10.2022 The product was marked as : <b>Sunexx</b> Kind of glass : Clear float glass Nominal thickness : 8.82 mm Applied Film : PET Hostaphan RNL 23 KR <b>(4 mm glass / 0,4 mm EVA / 0.023 mm PET / 0.4 mm EVA / 4 mm glass)</b>
2	<b>Maße / Gewicht</b> <i>Dimensions / Weight</i>	High Temperature test : 300x100mm High Humidity test : 300x100mm
3	<b>Bedienelemente</b> <i>Operating elements</i>	n.a.
4	<b>Ausstattung / Zubehör</b> <i>Equipment / Accessories</i>	Climate chamber high temperature test : GTEM #2789411 Climate chamber high humidity test : GTEM #2790238 UV Radiation equipment : GTEM #2789419 pyranometer : GTEM #2790438 UV-A radiometer
5	<b>Verwendete Materialien</b>	n.a.
6	<b>Sonstiges</b> <i>Other</i>	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
7	<b>Prüfmusterberei-          tigung:</b> <i>Test samnle</i>	<input checked="" type="checkbox"/> Sending by customer <input type="checkbox"/> Sampling by TÜV Rheinland Group <input type="checkbox"/> others:

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**Product description**  
Product omschrijving

89220726- HT



89220726- HH



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EN ISO 12543-2:2021<sup>a</sup>, Laminated safety glass  
 EN ISO 12543-4:2021<sup>a</sup>, Test methods for durability

<b>EN ISO 12543-4 : 2011</b>	<b>Test methods for durability</b>	
<b>Scope:</b>	This part of ISO 12543 specifies test methods in respect of: <ul style="list-style-type: none"> <li>Resistance to High Temperature</li> <li>Resistance to High Humidity</li> </ul> For laminated glass and laminated safety glass for use in building	
<b>Test method:</b>	5. High Temperature-test:  The purpose of this test is to determine whether the laminated glass and laminated safety glass are able to withstand exposure to high temperatures over an extended period of time without their properties becoming substantially altered. The changes in properties are judged by the occurrence of bubbles, delamination and cloudiness (not discoloration).  The High Temperature test may be carried out using either an oven (a) of boiling water (b). Tolerances are as follows : <ul style="list-style-type: none"> <li>(a) Oven : (100 ± 2) °C</li> <li>(b) Boiling water : (100 +0 / - 2) °C</li> </ul> 5.3.2. Procedure A : <ul style="list-style-type: none"> <li>Heat three samples to a temperature of 100 °C, and maintain this temperature – with respect of the heating-up time – for a period of 16 hours. Take the specimens out and allow to cool to room temperature while storing them vertically under natural convection and radiation.</li> <li>Assessment may be carried out when the glass surface temperature is lower than 30 °C.</li> </ul> 5.3.2. Procedure B : <ul style="list-style-type: none"> <li>Heat three samples to a temperature of 100 °C, and maintain this temperature – with respect of the heating-up time – for a period of 2 hours. Take the specimens out and allow to cool to room temperature while storing them vertically under natural convection and radiation.</li> <li>Assessment may be carried out when the glass surface temperature is lower than 30 °C.</li> </ul>	Medium used : <ul style="list-style-type: none"> <li>(a) <input checked="" type="checkbox"/></li> <li>(b) <input type="checkbox"/></li> </ul> Procedure used : <ul style="list-style-type: none"> <li>(A) <input checked="" type="checkbox"/></li> <li>(B) <input type="checkbox"/></li> </ul>

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EN ISO 12543-2:2021<sup>a</sup>, Laminated safety glass  
EN ISO 12543-4:2021<sup>a</sup>, Test methods for durability

<b>Test method:</b>	<p>6. High Humidity-test:</p> <p>The purpose of this test is to determine whether the laminated glass and laminated safety glass are able to withstand the effects of humidity in the atmosphere over an extended period of time without their properties becoming substantially altered. The changes in properties are judged by bubbles, delamination, haze or cloudiness.</p> <p>Procedures</p> <p>6.3.1. Test with condensation (A)</p> <p>Keep the three test specimens vertically over water in a closed container for 2 weeks. Maintain the temperature of the air in the container at (50 +5/-0) °C.</p> <p>6.3.2. Test without condensation (B)</p> <p>Keep the three test specimens vertically for two weeks in a climate chamber and keep the temperature of the air in the container at (50 +5/-0) °C and the relative humidity within the limits of (80 ± 5) %.</p>	Procedure used :  (A) <input checked="" type="checkbox"/>  (B) <input type="checkbox"/>
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EN ISO 12543-2:2021<sup>a</sup>, Laminated safety glass  
 EN ISO 12543-4:2021<sup>a</sup>, Test methods for durability

**Expression of test results**

<b>5. High Temperature test</b>	<b>Composition :</b> 4 mm glass / 0,4 mm EVA / 0.023 mm PET / 0.4 mm EVA / 4 mm glass		
	Sample number		
	89220726-HT #1	89220726-HT #2	89220726-HT #3
<b>Fire resistant laminated safety glass yes/no</b>	no		
<b>Indoor / outdoor use?</b>	outdoor		
<b>Dimensions</b>	300x100 mm		
<b>Nominal thickness</b>	8.82 mm		
<b>Cut or on size production</b>	Cut		
<b>Edge type</b>	Arrised edge		
<b>Edge protection</b>	n.a.		
<b>Remark :</b>	n.a.		
<b>Supported edge marked yes/no</b>	no	no	no
<b>Bubbles yes/no (number)</b>	no	no	no
<b>Size of bubbles</b>	Not applicable	Not applicable	Not applicable
<b>Delamination yes/no</b>	no	no	no
<b>Cloudiness yes/no</b>	no	no	no

1.	<b>Based on EN-ISO 12543-2, Clause 5.1.2.</b>	
	No fault (bubbles, delamination, haze or cloudiness) shall be found in three test specimens	
	<b>4 mm glass / 0,4 mm EVA / 0.023 mm PET / 0.4 mm EVA / 4 mm glass</b> <b>8.82 mm</b>	Pass <input checked="" type="checkbox"/> Fail <input type="checkbox"/> Not applicable <input type="checkbox"/>

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EN ISO 12543-2:2021<sup>a</sup>, Laminated safety glass  
 EN ISO 12543-4:2021<sup>a</sup>, Test methods for durability

**Expression of test results**

<b>6. High Humidity test</b>	<b>Composition :</b> 4 mm glass / 0,4 mm EVA / 0.023 mm PET / 0.4 mm EVA / 4 mm glass		
	Sample number		
	89220726-HH #1	89220726-HH #2	89220726-HH #3
<b>Fire resistant laminated safety glass yes/no</b>	no		
<b>Indoor / outdoor use?</b>	outdoor		
<b>Dimensions</b>	300x100 mm		
<b>Nominal thickness</b>	8.82 mm		
<b>Cut or on size production</b>	Cut		
<b>Edge type</b>	Arrised edge		
<b>Edge protection</b>	n.a.		
<b>Remark :</b>	n.a.		
<b>Supported edge marked yes/no</b>	no	no	no
<b>Bubbles yes/no (number)</b>	no	no	no
<b>Size of bubbles</b>	Not applicable	Not applicable	Not applicable
<b>Delamination yes/no</b>	no	no	no
<b>Cloudiness yes/no</b>	no	no	no

<b>2.</b>	<b>Based on EN-ISO 12543-2, Clause 5.2</b>	
	No fault (bubbles, delamination, haze or cloudiness) shall be found in three test specimens	
	<b>4 mm glass / 0,4 mm EVA / 0.023 mm PET / 0.4 mm EVA / 4 mm glass</b> <b>8.82 mm</b>	Pass <input checked="" type="checkbox"/> Fail <input type="checkbox"/> Not applicable <input type="checkbox"/>

- End of report -