Safety Film

Technical Data Sheet (TDS)
8 Mil Clear Safety Film

Product Description
8 Mil Clear Safety Film is a high-impact-resistant, micro-layered polyester film engineered to provide enhanced safety and protection for glass surfaces. Once installed, it strengthens glass, reduces glare, and prevents shattering on impact.

Key Applications:

- Automobile windows
- Glass doors and partitions
- Bathroom mirrors
- Elevator finishes
- Other vulnerable glass or hard surfaces

Testing Standards: ASHRAE, ASTM, BSEN 410 & AIMCAL

Features & Benefits

- **High-Impact Resistance:** Prevents glass from splintering on impact.
- **UV Protection:** Blocks >99% of harmful UV rays.
- **Glare Reduction:** Reduces glare by 2% while maintaining high transparency.
- **Durable Adhesion:** Strong bond to glass ensures long-lasting protection.
- **Versatile Application:** Suitable for vehicles, residential, and commercial buildings.

Mechanical Properties

Property	Unit	Nominal Value
Tensile Strength at Break (MD)	Kg/cm^2	3600
Tensile Strength at Break (MD)	PSI	51,200
Break Load (MD)	Kg/cm	38
Elongation at Break (MD)	%	260
Peel Strength (After Curing)	Grams/inch	5000
Abrasion Resistance (100 cycles haze addition)	%	<10%

PRODUCT DETAILS								
8 MIL CLEAR SAFETY FILM	SINGLE PANE CLEAR		SINGLE PANE TINTED		DUAL PANE CLEAR		DUAL PANE TINTED	
	1/4 " CLEAR	8 MIL	1/4 " TINTED	8 MIL	DUAL 1/4 " CLEAR	8 MIL	DUAL 1/4 " TINTED	8 MIL
Solar Heat Gain Coefficient	0.82	0.82	0.67	0.63	0.70	0.73	0.55	0.64
Visible light Transmitted	88	87	55	54	79	77	49	47
Visible light Reflected interior	8	9	7	7	15	14	11	12
Visible light Reflected exterior	8	9	6	8	15	14	8	8
U Value	1.03	1.08	1.03	1.03	0.47	0.47	0.47	0.47
UV Blocking	43	>99	NA	>99	NA	>99	NA	>99
Total Solar Energy Rejected	18	18	33	37	30	27	45	36
Glare reduction	NA	1	NA	4	NA	3	NA	8

Test Report – Products
Testrapport - Producten

Test report no.: *Testrapport nr.:*	**89224672-21**	**Order No.:** *Opdracht nr.:*	89224672 24.A160	
Client Reference No.: *Klantreferentie nr.:*	-	**Order date:** *Opdrachtdatum:*	2024-07-22	
Client: *Klant:*	Garware Hi Tech Films Limited Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India.			
Test item: *Testvoorwerp:*	4mm Glass + 8mil Safety Film			
Identification/ Type No.: *Benaming / Type nr.:*	4mm Glass + 8mil Safety Film			
Order content: *Inhoud opdracht:*	Samples for testing against EN 12600, as given in the standard			
Test specification: *Testomschrijving:*	EN 12600:2002[a] Impact test method and classification for flat glass *Laminated safety glass*			

Date of sample receipt: *Ontvangstdatum monster:*	2024-08-01
Test sample No: *Testproefstuk nr.:*	89224672-01/04
Testing period: *Testperiode:*	2024-11-26 - 2024-11-26
Place of testing: *Testlocatie:*	Arnhem, the Netherlands
Testing laboratory: *Testlaboratorium:*	TÜV Rheinland Nederland B.V. (NoBo 0336)
Test result*: *Testresultaat*:*	Pass



tested by: *getest door:*	X Ondertekend door: Salah El Bardai	**authorized by:** *geautoriseerd door:*	X Signed by: Sef Hovens
Date: 2025-01-21 *Datum:*		**Issue Date:** 2025-01-21 *Datum uitgave:*	
Position / *functie*:	Expert	**Position** / *functie*:	Expert

Others /
Andere:

Condition of the test item at delivery:
Toestand van het test voorwerp bij ontvangst: 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*

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.
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.
V05

Test report no.: 89224672-21
Testrapport nr.:

Remarks
Opmerkingen

1	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. *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*
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. *Zoals contractueel overeengekomen is dit document enkel digitaal ondertekend. TÜV Rheinland heeft niet geverifieerd en kan niet verifiëren welke wettelijke of andere vereisten van toepassing zijn op dit document. Een dergelijke verificatie valt onder de verantwoordelijkheid van de gebruiker van het document. Op verzoek van de opdrachtgever kan TÜV Rheinland de geldigheid van de digitale handtekening bevestigen door een apart document. Een dergelijk verzoek moet worden gericht aan onze verkoopafdeling. Voor een dergelijke extra service zal een milieutoeslag in rekening worden gebracht.*
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Tests clauses marked with [a] 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. This report is only to be read is a whole. No opinions or interpretation are included in this report. This test report consists of multiple pages and is only to be read is 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. *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 [a] 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. Het rapport dient als geheel te worden gelezen. Er zijn geen opinies en interpretaties opgenomen binnen het rapport. Dit rapport bestaat uit meerdere pagina's en dient al 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.*
4	All rights reserved. No part of this report may be reproduced, provided to and/or examined by third parties, and/or published by print, photoprint, microfilm, in electronic form or any other means without the explicit previous written consent of TÜV Rheinland Nederland B.V. In case this report was drafted within the context of an assignment to TÜV Rheinland Nederland B.V., the rights and obligations of contracting parties are subject to the General Terms & Conditions for Advisory, Research and Certification assignments to TÜV Rheinland Nederland B.V. and/or the relevant agreement concluded between the contracting parties. © 2010 TÜV Rheinland Nederland. *Alle rechten voorbehouden. Niets uit dit rapport mag worden verveelvoudigd, aan derden ter beschikking gesteld en/of door derden onderzocht en/of openbaar gemaakt door middel van druk, fotokopie, microfilm, in elektronische vorm of op welke andere wijze dan ook, zonder uitdrukkelijke voorafgaande schriftelijke toestemming van TÜV Rheinland Nederland B.V.* *Indien dit rapport is opgesteld in het kader van een opdracht aan TÜV Rheinland Nederland B.V., zijn de rechten en verplichtingen van contractpartijen onderworpen aan de Algemene Voorwaarden voor Advies-, Onderzoeks- en Certificeringsopdrachten aan TÜV Rheinland Nederland B.V. en/of de betreffende overeenkomst tussen de contractpartijen. © 2010 TÜV Rheinland Nederland*

Test report no.: 89224672-21
Testrapport nr.:

Product description
Product omschrijving

1	**Product details:** *Product details:*	Name of the manufacturer : Garware Hi Tech Films Limited Address of the manufacturer : Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India. Production plant of the samples : - Line ID where the samples are made : - Production date : - Sampling date : - The product was marked as : 4 mm Glass + 8mil Safety Film Kind of glass : Clear float glass Nominal thickness : 4.1 mm Composition : 4 mm float + 8mil Safety Film Intermediate layer, name, type : 8 mil Safety Film
2	**Other:** *Andere:*	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
3	**Test sample obtaining:** *Selectie van het proefstuk:*	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:

Product description
Product omschrijving

Picture 1. Sample 2 After impact	Picture 2. Sample 3 After impact
	

Test method
Test methode

EN 12600:2002[a]	**Impact test method and classification for flat glass**	
Scope:	EN 12600 specifies a pendulum impact test method for single flat glass for use in buildings. The test is intended to classify flat glass products in three principal classes by performance under impact and by mode of breakage. The standard does not specify requirements for applications, nor does it specify requirements for durability.	
Test requirements of clause 4 :	When tested by the method given in clause 5 of the standard, each test piece shall either not break or shall break as defined in one of the following ways : a) Numerous cracks appear, but no shear or opening is allowed within the test piece through which a 76mm diameter sphere can pass when a maximum force of 25 N is applied. Additionally, if particles are detached from the test piece up to 3 minutes after impact, they shall - in total – weigh no more than a mass equivalent to 10.000 mm² of the original test piece. The largest single particle shall weigh less than the mass equivalent to 4.400 mm² of the original test piece; b) Disintegration occurs and the 10 largest crack-free particles collected within 3 minutes after impact and weighed, all together, within 5 minutes of impact shall weigh no more than the mass equivalent to 6.500 mm² of the original test piece. The particles shall be selected only from the portion of the original test piece exposed in the test frame. Only the exposed area of any particle retained in the test frame shall be taken into account in determining the mass equivalent.	Applicable clause : (a) ☒ (b) ☐
Test method:	The test temperature shall be (20 ± 5) °C. **Clause 5.** Each test piece shall comprise a single pane of glass product and be representative of the normal production of the type of product submitted for test. Results obtained with test pieces of dimensions (876 ± 2) x (1938 ± 2) mm are valid for classification purposes of the glass product, whatever the service dimensions. The test shall be carried out at each drop height on four pieces of identical structure and the same nominal thickness. In case of symmetrical samples, the classification obtained can be used for both sides of the product. For asymmetrical samples, the classification obtained, are intended solely for installation in situations where the risk of impact is from one side only. Inspect the test piece after impact and note whether ; - It remains unbroken; or - It broke in accordance with either the requirements a) or b) of clause 4; or - It broke and failed to conform to the requirements of clause 4. If any of the initial four test pieces fails to conform to the requirements of clause 4, the procedure is terminated. If all four test pieces either do not break or else break according to the criteria given in clause 4, and it is required to test the material to a higher impact level, increase the drop height to the next impact level. Repeat the test on four more samples of the same material (If the material remained unbroken, the same sample(s) may be used.)	

Test method
Test methode

	Impact levels	
	Classification	Drop height (mm)
	3	190
	2	450
	1	1200
Measuring uncertainty:	Caused by the destructive nature of the test and pass/fail result no measurement uncertainty can be determined. Based on the validation of the test procedure, measurement set-up and the associated parts (test frame / drop height, etc.) there is a presumption of conformity established which is approved with ISO 17025 accreditation.	
Sphere penetration test :	The probe assembly shall consist of a sphere of diameter (76 ± 1) mm connected to an arm with a device for measuring when a maximum force of 25 N has been applied. The probe assembly shall be held horizontal. It shall then be pushed in any opening formed in the test piece. The weakest point of resistance shall be selected. A horizontal force shall be applied until : - A maximum force of 25 N has been achieved without penetration by the sphere. The test piece shall be deemed to have passed the test; or - The maximum diameter of the sphere has passed through the plan of the test piece without a force of 25 N being achieved. The test piece shall be deemed to have failed the test.	
Classification :	**General** Glazing conforming to this European standard is classified as follows : - Its performance under the impact test; - The drop height at which breakage occurred; - The drop height at which the product passed in accordance with a) of clause 4; - The drop height at which the product passed in accordance with b) of clause 4; - The mode of breakage of the material if it remains unbroken after the impact test.	
	Drop height class Glazing shall be classified as follows : - Class 3: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm; - Class 2: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm and 450 mm; - Class 1: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm 450 mm and 1200 mm.	

Test method
Test methode

Mode of breakage

If all test pieces remain unbroken at the drop height appropriate to its intended drop height class, the mode of breakage shall be determined as per Annex C of this standard. The mode of breakage shall be described as follows :

- Type A : numerous cracks appear forming separate fragments with sharp edges, some of which are large (typical of annealed glass);
- Type B : numerous cracks appear, but the fragments hold together and do not separate (typical of laminated glass);
- Type C : disintegration occurs, leading to a large number of small particles that are relatively harmless (typical of toughened glass).

Performance classification

The performance classification of a glass product shall be given as follows :

α (β) ϕ , where

- α : is the highest drop height class at which the product either did not break or broke in accordance with a) or b) of clause 4;
- β : is the mode of breakage;
- ϕ : is the highest drop height class at which the product either did not break or when broke, broke in accordance with a) clause.

When a glass product breaks at a drop height of 190 mm and the breakage is not in accordance with a) of clause 4 then the value of ϕ quoted shall be zero.

Test results
Test resultaten

Expression of test results				
Performance under impact test	**Composition (from the attack side) : 4mm Glass + 8mil Safety Film**			
	Sample number			
	89224672 #1	89224672 #2	89224672 #3	89224672 #4
Asymmetrical yes/no	Yes			
Attack face?	Glass side			
Dimensions	876 x 1938 mm			
Nominal thickness	4.1 mm			
Tyre pressure (0,35 ± 0,02) MPa ? yes/no	yes			
In case of applied films, film clamped in frame ? yes/no	n.a.			
Behaviour at each drop height	- did the test piece broke or not - if broken, the mode of breakage - was it broken in accordance with clause 4, a) or b)			
Class 2 (drop height 450mm)	No Breakage	Breakage, A / **B** / C Clause a)	Breakage, A / **B** / C Clause a)	No Breakage

Based on EN 12600:2002 [a], Clause 6

Glazing conforming to this European Standard is classified by the performance of four consecutive samples under impact.

Trade name	**: 4mm Glass + 8mil Safety Film**	Pass ☒
Composition	**: 4mm Glass + 8mil Safety Film**	Fail ☐
Classification EN 12600	**: 2 (B) 2 Glass side**	Not applicable ☐

Remarks

The test results exclusively relate to the tested objects.

When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the glass. The decision and responsibility lies at the manufacturer.

If no reference of the product description was supplied by the manufacturer, than that document shall be added to this test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and deviations from perfection were included in the delivered test samples.

- End of report -

Test Report – Products
Testrapport - Producten

Test report no.: *Testrapport nr.:*	**89224672-22**	**Order No.:** *Opdracht nr.:*	89224672 24.A160	
Client Reference No.: *Klantreferentie nr.:*	-	**Order date:** *Opdrachtdatum:*	2024-07-22	
Client: *Klant:*	Garware Hi Tech Films Limited Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India.			
Test item: *Testvoorwerp:*	4mm Glass + 8mil Safety Film			
Identification/ Type No.: *Benaming / Type nr.:*	4mm Glass + 8mil Safety Film			
Order content: *Inhoud opdracht:*	Samples for testing against EN 12600, as given in the standard			
Test specification: *Testomschrijving:*	EN 12600:2002[a] Impact test method and classification for flat glass *Laminated safety glass*			

Date of sample receipt: *Ontvangstdatum monster:*	2024-08-01
Test sample No: *Testproefstuk nr.:*	89224672-01/04
Testing period: *Testperiode:*	2024-11-26 - 2024-11-26
Place of testing: *Testlocatie:*	Arnhem, the Netherlands
Testing laboratory: *Testlaboratorium:*	TÜV Rheinland Nederland B.V. (NoBo 0336)
Test result*: *Testresultaat*:*	Pass



tested by: *getest door:* **Date:** 2025-01-21 *Datum:*	X Ondertekend door: Salah El Bardai	**authorized by:** *geautoriseerd door:* **Issue Date:** 2025-01-21 *Datum uitgave:*	X Signed by: Sef Hovens
Position / *functie*:	Expert	**Position** / *functie*:	Expert

Others /
Andere:

Condition of the test item at delivery: *Toestand van het test voorwerp bij ontvangst:*	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*

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.
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.
V05

Test report no.: 89224672-22
Testrapport nr.:

Remarks
Opmerkingen

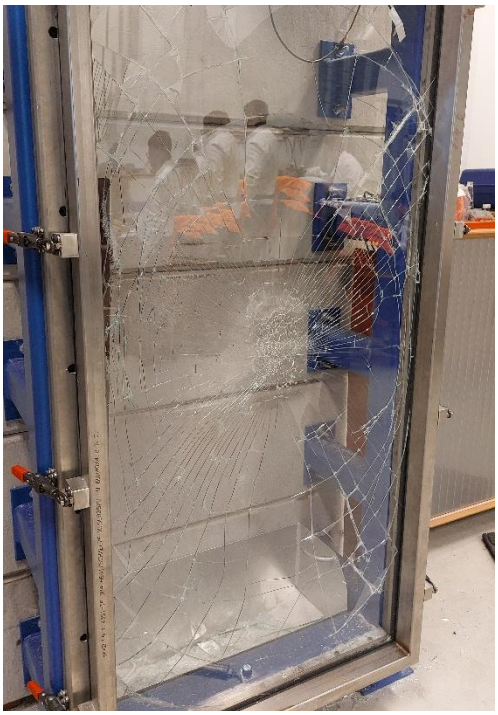
1	The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management 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. *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*
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. *Zoals contractueel overeengekomen is dit document enkel digitaal ondertekend. TÜV Rheinland heeft niet geverifieerd en kan niet verifiëren welke wettelijke of andere vereisten van toepassing zijn op dit document. Een dergelijke verificatie valt onder de verantwoordelijkheid van de gebruiker van het document. Op verzoek van de opdrachtgever kan TÜV Rheinland de geldigheid van de digitale handtekening bevestigen door een apart document. Een dergelijk verzoek moet worden gericht aan onze verkoopafdeling. Voor een dergelijke extra service zal een milieutoeslag in rekening worden gebracht.*
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Tests clauses marked with [a] 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. This report is only to be read is a whole. No opinions or interpretation are included in this report. This test report consists of multiple pages and is only to be read is 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. *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 [a] 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. Het rapport dient als geheel te worden gelezen. Er zijn geen opinies en interpretaties opgenomen binnen het rapport. Dit rapport bestaat uit meerdere pagina's en dient al 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.*
4	All rights reserved. No part of this report may be reproduced, provided to and/or examined by third parties, and/or published by print, photoprint, microfilm, in electronic form or any other means without the explicit previous written consent of TÜV Rheinland Nederland B.V. In case this report was drafted within the context of an assignment to TÜV Rheinland Nederland B.V., the rights and obligations of contracting parties are subject to the General Terms & Conditions for Advisory, Research and Certification assignments to TÜV Rheinland Nederland B.V. and/or the relevant agreement concluded between the contracting parties. © 2010 TÜV Rheinland Nederland. *Alle rechten voorbehouden. Niets uit dit rapport mag worden verveelvoudigd, aan derden ter beschikking gesteld en/of door derden onderzocht en/of openbaar gemaakt door middel van druk, fotokopie, microfilm, in elektronische vorm of op welke andere wijze dan ook, zonder uitdrukkelijke voorafgaande schriftelijke toestemming van TÜV Rheinland Nederland B.V.* *Indien dit rapport is opgesteld in het kader van een opdracht aan TÜV Rheinland Nederland B.V., zijn de rechten en verplichtingen van contractpartijen onderworpen aan de Algemene Voorwaarden voor Advies-, Onderzoeks- en Certificeringsopdrachten aan TÜV Rheinland Nederland B.V. en/of de betreffende overeenkomst tussen de contractpartijen. © 2010 TÜV Rheinland Nederland*

Test report no.: 89224672-22
Testrapport nr.:

Product description
Product omschrijving

1	**Product details:** *Product details:*	Name of the manufacturer : Garware Hi Tech Films Limited Address of the manufacturer : Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India. Production plant of the samples : - Line ID where the samples are made : - Production date : - Sampling date : - The product was marked as : 4 mm Glass + 8mil Safety Film Kind of glass : Clear float glass Nominal thickness : 4 mm Composition : 4 mm float + 8mil Safety Film Intermediate layer, name, type : 8 mil Safety Film
2	**Other:** *Andere:*	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
3	**Test sample obtaining:** *Selectie van het proefstuk:*	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:

Product description
Product omschrijving

Picture 1. Sample 1 After impact	Picture 2. Sample 2 After impact
	
Picture 1. Sample 3 After impact	**Picture 2. Sample 4 After impact**
	

Test method
Test methode

EN 12600:2002[a]	**Impact test method and classification for flat glass**	
Scope:	EN 12600 specifies a pendulum impact test method for single flat glass for use in buildings. The test is intended to classify flat glass products in three principal classes by performance under impact and by mode of breakage. The standard does not specify requirements for applications, nor does it specify requirements for durability.	
Test requirements of clause 4 :	When tested by the method given in clause 5 of the standard, each test piece shall either not break or shall break as defined in one of the following ways : a) Numerous cracks appear, but no shear or opening is allowed within the test piece through which a 76mm diameter sphere can pass when a maximum force of 25 N is applied. Additionally, if particles are detached from the test piece up to 3 minutes after impact, they shall - in total – weigh no more than a mass equivalent to 10.000 mm² of the original test piece. The largest single particle shall weigh less than the mass equivalent to 4.400 mm² of the original test piece; b) Disintegration occurs and the 10 largest crack-free particles collected within 3 minutes after impact and weighed, all together, within 5 minutes of impact shall weigh no more than the mass equivalent to 6.500 mm² of the original test piece. The particles shall be selected only from the portion of the original test piece exposed in the test frame. Only the exposed area of any particle retained in the test frame shall be taken into account in determining the mass equivalent.	Applicable clause : (a) ☒ (b) ☐
Test method:	The test temperature shall be (20 ± 5) °C. **Clause 5.** Each test piece shall comprise a single pane of glass product and be representative of the normal production of the type of product submitted for test. Results obtained with test pieces of dimensions (876 ± 2) x (1938 ± 2) mm are valid for classification purposes of the glass product, whatever the service dimensions. The test shall be carried out at each drop height on four pieces of identical structure and the same nominal thickness. In case of symmetrical samples, the classification obtained can be used for both sides of the product. For asymmetrical samples, the classification obtained, are intended solely for installation in situations where the risk of impact is from one side only. Inspect the test piece after impact and note whether ; - It remains unbroken; or - It broke in accordance with either the requirements a) or b) of clause 4; or - It broke and failed to conform to the requirements of clause 4. If any of the initial four test pieces fails to conform to the requirements of clause 4, the procedure is terminated. If all four test pieces either do not break or else break according to the criteria given in clause 4, and it is required to test the material to a higher impact level, increase the drop height to the next impact level. Repeat the test on four more samples of the same material (If the material remained unbroken, the same sample(s) may be used.)	

Test method
Test methode

	Impact levels	
	Classification	Drop height (mm)
	3	190
	2	450
	1	1200
Measuring uncertainty:	Caused by the destructive nature of the test and pass/fail result no measurement uncertainty can be determined. Based on the validation of the test procedure, measurement set-up and the associated parts (test frame / drop height, etc.) there is a presumption of conformity established which is approved with ISO 17025 accreditation.	
Sphere penetration test :	The probe assembly shall consist of a sphere of diameter (76 ± 1) mm connected to an arm with a device for measuring when a maximum force of 25 N has been applied. The probe assembly shall be held horizontal. It shall then be pushed in any opening formed in the test piece. The weakest point of resistance shall be selected. A horizontal force shall be applied until : - A maximum force of 25 N has been achieved without penetration by the sphere. The test piece shall be deemed to have passed the test; or - The maximum diameter of the sphere has passed through the plan of the test piece without a force of 25 N being achieved. The test piece shall be deemed to have failed the test.	
Classification :	**General** Glazing conforming to this European standard is classified as follows : - Its performance under the impact test; - The drop height at which breakage occurred; - The drop height at which the product passed in accordance with a) of clause 4; - The drop height at which the product passed in accordance with b) of clause 4; - The mode of breakage of the material if it remains unbroken after the impact test.	
	Drop height class Glazing shall be classified as follows : - Class 3: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm; - Class 2: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm and 450 mm; - Class 1: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm 450 mm and 1200 mm.	

Test method
Test methode

Mode of breakage

If all test pieces remain unbroken at the drop height appropriate to its intended drop height class, the mode of breakage shall be determined as per Annex C of this standard. The mode of breakage shall be described as follows :

- Type A : numerous cracks appear forming separate fragments with sharp edges, some of which are large (typical of annealed glass);
- Type B : numerous cracks appear, but the fragments hold together and do not separate (typical of laminated glass);
- Type C : disintegration occurs, leading to a large number of small particles that are relatively harmless (typical of toughened glass).

Performance classification

The performance classification of a glass product shall be given as follows :

α (β) ϕ , where

- α : is the highest drop height class at which the product either did not break or broke in accordance with a) or b) of clause 4;
- β : is the mode of breakage;
- ϕ : is the highest drop height class at which the product either did not break or when broke, broke in accordance with a) clause.

When a glass product breaks at a drop height of 190 mm and the breakage is not in accordance with a) of clause 4 then the value of ϕ quoted shall be zero.

Test results
Test resultaten

Expression of test results				
Performance under impact test	**Composition (from the attack side) : 8mil Safety + Film4mm Glass**			
	Sample number			
	89224672 #1	89224672 #2	89224672 #3	89224672 #4
Asymmetrical yes/no	Yes			
Attack face?	Foil side			
Dimensions	876 x 1938 mm			
Nominal thickness	4 mm			
Tyre pressure (0,35 ± 0,02) MPa ? yes/no	yes			
In case of applied films, film clamped in frame ? yes/no	n.a.			
Behaviour at each drop height	- did the test piece broke or not - if broken, the mode of breakage - was it broken in accordance with clause 4, a) or b)			
Class 2 (drop height 450mm)	Breakage, A / **B** / C Clause a)	Breakage, A / **B** / C Clause a)	Breakage, A / **B** / C Clause a)	Breakage, A / **B** / C Clause a)

	Based on EN 12600:2002 [a], Clause 6	
	Glazing conforming to this European Standard is classified by the performance of four consecutive samples under impact.	
	Trade name : 4mm Glass + 8mil Safety Film **Composition : 8mil Safety + Film 4mm Glass** **Classification EN 12600 : 2 (B) 2 Foil side**	Pass ☒ Fail ☐ Not applicable ☐
Remarks	**The test results exclusively relate to the tested objects.**	
	When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the glass. The decision and responsibility lies at the manufacturer.	
	If no reference of the product description was supplied by the manufacturer, than that document shall be added to this test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and deviations from perfection were included in the delivered test samples.	

- End of report -

Test Report – Products
Testrapport - Producten

Test report no.: *Testrapport nr.:*	**89224672-23**	**Order No.:** *Opdracht nr.:*	89224672 24.A160	
Client Reference No.: *Klantreferentie nr.:*	-	**Order date:** *Opdrachtdatum:*	2024-07-22	
Client: *Klant:*	Garware Hi Tech Films Limited Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India.			
Test item: *Testvoorwerp:*	4mm Glass + 8mil Solar Safety Film			
Identification/ Type No.: *Benaming / Type nr.:*	4mm Glass + 8mil Solar Safety Film			
Order content: *Inhoud opdracht:*	Samples for testing against EN 12600, as given in the standard			
Test specification: *Testomschrijving:*	EN 12600:2002[a] Impact test method and classification for flat glass *Laminated safety glass*			

Date of sample receipt: *Ontvangstdatum monster:*	2024-08-01
Test sample No: *Testproefstuk nr.:*	89224672-01/04
Testing period: *Testperiode:*	2024-11-26 - 2024-11-26
Place of testing: *Testlocatie:*	Arnhem, the Netherlands
Testing laboratory: *Testlaboratorium:*	TÜV Rheinland Nederland B.V. (NoBo 0336)
Test result*: *Testresultaat*:*	Pass



tested by: *getest door:*	X Ondertekend door: Salah El Bardai	**authorized by:** *geautoriseerd door:*	X Signed by: Sef Hovens
Date: 2025-01-21 *Datum:*		**Issue Date:** 2025-01-21 *Datum uitgave:*	
Position / *functie*:	Expert	**Position** / *functie*:	Expert

Others /
Andere:

Condition of the test item at delivery: *Toestand van het test voorwerp bij ontvangst:*	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*

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.
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.
VUS

Test report no.: 89224672-23
Testrapport nr.:

Remarks
Opmerkingen

1	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. *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*
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. *Zoals contractueel overeengekomen is dit document enkel digitaal ondertekend. TÜV Rheinland heeft niet geverifieerd en kan niet verifiëren welke wettelijke of andere vereisten van toepassing zijn op dit document. Een dergelijke verificatie valt onder de verantwoordelijkheid van de gebruiker van het document. Op verzoek van de opdrachtgever kan TÜV Rheinland de geldigheid van de digitale handtekening bevestigen door een apart document. Een dergelijk verzoek moet worden gericht aan onze verkoopafdeling. Voor een dergelijke extra service zal een milieutoeslag in rekening worden gebracht.*
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Tests clauses marked with [a] 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. This report is only to be read is a whole. No opinions or interpretation are included in this report. This test report consists of multiple pages and is only to be read is 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. *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 [a] 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. Het rapport dient als geheel te worden gelezen. Er zijn geen opinies en interpretaties opgenomen binnen het rapport. Dit rapport bestaat uit meerdere pagina's en dient al 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.*
4	All rights reserved. No part of this report may be reproduced, provided to and/or examined by third parties, and/or published by print, photoprint, microfilm, in electronic form or any other means without the explicit previous written consent of TÜV Rheinland Nederland B.V. In case this report was drafted within the context of an assignment to TÜV Rheinland Nederland B.V., the rights and obligations of contracting parties are subject to the General Terms & Conditions for Advisory, Research and Certification assignments to TÜV Rheinland Nederland B.V. and/or the relevant agreement concluded between the contracting parties. © 2010 TÜV Rheinland Nederland. *Alle rechten voorbehouden. Niets uit dit rapport mag worden verveelvoudigd, aan derden ter beschikking gesteld en/of door derden onderzocht en/of openbaar gemaakt door middel van druk, fotokopie, microfilm, in elektronische vorm of op welke andere wijze dan ook, zonder uitdrukkelijke voorafgaande schriftelijke toestemming van TÜV Rheinland Nederland B.V.* *Indien dit rapport is opgesteld in het kader van een opdracht aan TÜV Rheinland Nederland B.V., zijn de rechten en verplichtingen van contractpartijen onderworpen aan de Algemene Voorwaarden voor Advies-, Onderzoeks- en Certificeringsopdrachten aan TÜV Rheinland Nederland B.V. en/of de betreffende overeenkomst tussen de contractpartijen. © 2010 TÜV Rheinland Nederland*

Test report no.: 89224672-23
Testrapport nr.:

Product description
Product omschrijving

1	**Product details:** *Product details:*	Name of the manufacturer : Garware Hi Tech Films Limited Address of the manufacturer : Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India. Production plant of the samples : - Line ID where the samples are made : - Production date : - Sampling date : - The product was marked as : 4 mm Glass + 8mil Solar Safety Film Kind of glass : Clear float glass Nominal thickness : 4.1 mm Composition : 4 mm float + 8mil Solar Safety Film Intermediate layer, name, type : 8 mil Solar Safety Film
2	**Other:** *Andere:*	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
3	**Test sample obtaining:** *Selectie van het proefstuk:*	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:

Product description
Product omschrijving

Picture 1. Sample 1 After impact	Picture 2. Sample 2 After impact
	
Picture 3. Sample 3 After impact	**Picture 4. Sample 4 After impact**
	

Test method
Test methode

EN 12600:2002[a]	**Impact test method and classification for flat glass**	
Scope:	EN 12600 specifies a pendulum impact test method for single flat glass for use in buildings. The test is intended to classify flat glass products in three principal classes by performance under impact and by mode of breakage. The standard does not specify requirements for applications, nor does it specify requirements for durability.	
Test requirements of clause 4 :	When tested by the method given in clause 5 of the standard, each test piece shall either not break or shall break as defined in one of the following ways : a) Numerous cracks appear, but no shear or opening is allowed within the test piece through which a 76mm diameter sphere can pass when a maximum force of 25 N is applied. Additionally, if particles are detached from the test piece up to 3 minutes after impact, they shall - in total – weigh no more than a mass equivalent to 10.000 mm² of the original test piece. The largest single particle shall weigh less than the mass equivalent to 4.400 mm² of the original test piece; b) Disintegration occurs and the 10 largest crack-free particles collected within 3 minutes after impact and weighed, all together, within 5 minutes of impact shall weigh no more than the mass equivalent to 6.500 mm² of the original test piece. The particles shall be selected only from the portion of the original test piece exposed in the test frame. Only the exposed area of any particle retained in the test frame shall be taken into account in determining the mass equivalent.	Applicable clause : (a) ☒ (b) ☐
Test method:	The test temperature shall be (20 ± 5) °C. **Clause 5.** Each test piece shall comprise a single pane of glass product and be representative of the normal production of the type of product submitted for test. Results obtained with test pieces of dimensions (876 ± 2) x (1938 ± 2) mm are valid for classification purposes of the glass product, whatever the service dimensions. The test shall be carried out at each drop height on four pieces of identical structure and the same nominal thickness. In case of symmetrical samples, the classification obtained can be used for both sides of the product. For asymmetrical samples, the classification obtained, are intended solely for installation in situations where the risk of impact is from one side only. Inspect the test piece after impact and note whether ; - It remains unbroken; or - It broke in accordance with either the requirements a) or b) of clause 4; or - It broke and failed to conform to the requirements of clause 4. If any of the initial four test pieces fails to conform to the requirements of clause 4, the procedure is terminated. If all four test pieces either do not break or else break according to the criteria given in clause 4, and it is required to test the material to a higher impact level, increase the drop height to the next impact level. Repeat the test on four more samples of the same material (If the material remained unbroken, the same sample(s) may be used.)	

Test method
Test methode

	Impact levels	
	Classification	Drop height (mm)
	3	190
	2	450
	1	1200

Measuring uncertainty:	Caused by the destructive nature of the test and pass/fail result no measurement uncertainty can be determined. Based on the validation of the test procedure, measurement set-up and the associated parts (test frame / drop height, etc.) there is a presumption of conformity established which is approved with ISO 17025 accreditation.
Sphere penetration test :	The probe assembly shall consist of a sphere of diameter (76 ± 1) mm connected to an arm with a device for measuring when a maximum force of 25 N has been applied. The probe assembly shall be held horizontal. It shall then be pushed in any opening formed in the test piece. The weakest point of resistance shall be selected. A horizontal force shall be applied until : - A maximum force of 25 N has been achieved without penetration by the sphere. The test piece shall be deemed to have passed the test; or - The maximum diameter of the sphere has passed through the plan of the test piece without a force of 25 N being achieved. The test piece shall be deemed to have failed the test.
Classification :	**General** Glazing conforming to this European standard is classified as follows : - Its performance under the impact test; - The drop height at which breakage occurred; - The drop height at which the product passed in accordance with a) of clause 4; - The drop height at which the product passed in accordance with b) of clause 4; - The mode of breakage of the material if it remains unbroken after the impact test.
	Drop height class Glazing shall be classified as follows : - Class 3: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm; - Class 2: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm and 450 mm; - Class 1: material that conforms the requirements of clause 4 when tested by the method given in clause 5 at a drop height of 190 mm 450 mm and 1200 mm.

Test method
Test methode

Mode of breakage

If all test pieces remain unbroken at the drop height appropriate to its intended drop height class, the mode of breakage shall be determined as per Annex C of this standard. The mode of breakage shall be described as follows :

- Type A : numerous cracks appear forming separate fragments with sharp edges, some of which are large (typical of annealed glass);
- Type B : numerous cracks appear, but the fragments hold together and do not separate (typical of laminated glass);
- Type C : disintegration occurs, leading to a large number of small particles that are relatively harmless (typical of toughened glass).

Performance classification

The performance classification of a glass product shall be given as follows :

α (β) ϕ , where

- α : is the highest drop height class at which the product either did not break or broke in accordance with a) or b) of clause 4;
- β : is the mode of breakage;
- ϕ : is the highest drop height class at which the product either did not break or when broke, broke in accordance with a) clause.

When a glass product breaks at a drop height of 190 mm and the breakage is not in accordance with a) of clause 4 then the value of ϕ quoted shall be zero.

Test results
Test resultaten

Expression of test results				
Performance under impact test	**Composition (from the attack side) : 4mm Glass + 8mil Solar Safety Film**			
	Sample number			
	89224672 #1	89224672 #2	89224672 #3	89224672 #4
Asymmetrical yes/no	Yes			
Attack face?	Glass side			
Dimensions	876 x 1938 mm			
Nominal thickness	4.1 mm			
Tyre pressure (0,35 ± 0,02) MPa ? yes/no	yes			
In case of applied films, film clamped in frame ? yes/no	n.a.			
Behaviour at each drop height	- did the test piece broke or not - if broken, the mode of breakage - was it broken in accordance with clause 4, a) or b)			
Class 2 (drop height 450mm)	No Breakage	Breakage, A / **B** / C Clause a)	Breakage, A / **B** / C Clause a)	Breakage, A / **B** / C Clause a)

Based on EN 12600:2002 [a], Clause 6

Glazing conforming to this European Standard is classified by the performance of four consecutive samples under impact.

Trade name	**: 4mm Glass + 8mil Solar Safety Film**	Pass ☒
Composition	**: 4mm Glass + 8mil Solar Safety Film**	Fail ☐
Classification EN 12600	**: 2 (B) 2 Glass side**	Not applicable ☐

Remarks

The test results exclusively relate to the tested objects.

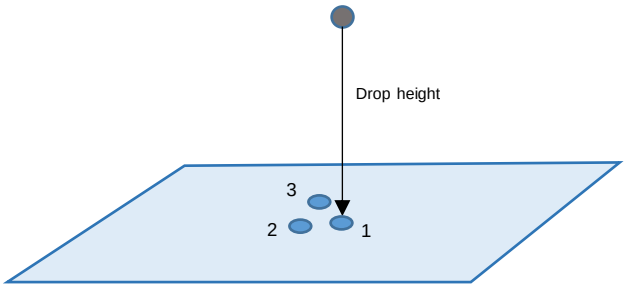
When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the glass. The decision and responsibility lies at the manufacturer.

If no reference of the product description was supplied by the manufacturer, than that document shall be added to this test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and deviations from perfection were included in the delivered test samples.

- End of report -

Test report no.: *Testrapport nr.:*	**89224672-30**	**Order No.:** *Opdracht nr.:*	89224672 24.A160	
Client Reference No.: *Klantreferentie nr.:*	-	**Order date:** *Opdrachtdatum:*	2024-07-22	
Client: *Klant:*	Garware Hi Tech Films Limited Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India.			
Test item: *Testvoorwerp:*	4mm Glass+ 8mil Solar Safety Film			
Identification/ Type No.: *Benaming / Type nr.:*	4mm Glass+ 8mil Solar Safety Film			
Order content: *Inhoud opdracht:*	Classification testing hard body impact			
Test specification: *Testomschrijving:*	EN 356:1999 Glass in building - Security glazing [a] Testing and classification of resistance against manual attack *Resistance to hard body impact*			

Date of sample receipt: *Ontvangstdatum monster:*	2024-08-01
Test sample No: *Testproefstuk nr.:*	4 pieces
Testing period: *Testperiode:*	2024-11-26 - 2024-11-26
Place of testing: *Testlocatie:*	Arnhem, the Netherlands
Testing laboratory: *Testlaboratorium:*	TÜV Rheinland Nederland NoBo 0336
Test result*: *Testresultaat*:*	Pass



tested by: *getest door:* **Date:** 2025-01-21 *Datum:*	X Ondertekend door: Salah El Bardai	**authorized by:** *geautoriseerd door:* **Issue Date:** 2025-01-21 *Datum uitgave:*	X Signed by: Sef Hovens
Position / *functie*:	Expert	**Position** / *functie*:	Expert

Others /
Andere: Category of resistance: P1A
Code designation: EN 356 P1A

Condition of the test item at delivery:
Toestand van het test voorwerp bij ontvangst: 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*

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.
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.
V05

Test report no.: 89224672-30
Testrapport nr.:

Remarks
Opmerkingen

1	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.The decision rule for statements of conformity in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance to and ILAC-G8:09/2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account. *De apparatuur die tijdens de gespecificeerde testperiode is gebruikt, is gekalibreerd volgens ons testlaboratoriumkalibratieprogramma. De apparatuur voldoet aan de eisen die zijn opgenomen in de relevante normen. De traceerbaarheid van de gebruikte testapparatuur wordt gewaarborgd door naleving van de voorschriften van ons managementsysteem. De beslisregel voor conformiteitsverklaringen in dit testrapport is gebaseerd op de "Zero Guard Band Rule" en "Simple Acceptance" in overeenstemming met en ILAC -G8:09/2019 en IEC Guide 115:2021, tenzij anders aangegeven in de toegepaste norm vermeld op pagina 1 van dit rapport of aangevraagd door de klant. Dit betekent dat er geen rekening wordt gehouden met de meetonzekerheid.*
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. *Zoals contractueel overeengekomen is dit document enkel digitaal ondertekend. TÜV Rheinland heeft niet geverifieerd en kan niet verifiëren welke wettelijke of andere vereisten van toepassing zijn op dit document. Een dergelijke verificatie valt onder de verantwoordelijkheid van de gebruiker van het document. Op verzoek van de opdrachtgever kan TÜV Rheinland de geldigheid van de digitale handtekening bevestigen door een apart document. Een dergelijk verzoek moet worden gericht aan onze verkoopafdeling. Voor een dergelijke extra service zal een milieutoeslag in rekening worden gebracht.*
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Tests clauses marked with [a] 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. This report is only to be read is a whole. No opinions or interpretation are included in this report. This test report consists of multiple pages and is only to be read is 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. *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 [a] 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. Het rapport dient als geheel te worden gelezen. Er zijn geen opinies en interpretaties opgenomen binnen het rapport. Dit rapport bestaat uit meerdere pagina's en dient al 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.*
4	All rights reserved. No part of this report may be reproduced, provided to and/or examined by third parties, and/or published by print, photoprint, microfilm, in electronic form or any other means without the explicit previous written consent of TÜV Rheinland Nederland B.V.
In case this report was drafted within the context of an assignment to TÜV Rheinland Nederland B.V., the rights and obligations of contracting parties are subject to the General Terms & Conditions for Advisory, Research and Certification assignments to TÜV Rheinland Nederland B.V. and/or the relevant agreement concluded between the contracting parties. © 2010 TÜV Rheinland Nederland. *Alle rechten voorbehouden. Niets uit dit rapport mag worden verveelvoudigd, aan derden ter beschikking gesteld en/of door derden onderzocht en/of openbaar gemaakt door middel van druk, fotokopie, microfilm, in elektronische vorm of op welke andere wijze dan ook, zonder uitdrukkelijke voorafgaande schriftelijke toestemming van TÜV Rheinland Nederland B.V. Indien dit rapport is opgesteld in het kader van een opdracht aan TÜV Rheinland Nederland B.V., zijn de rechten en verplichtingen van contractpartijen onderworpen aan de Algemene Voorwaarden voor Advies-, Onderzoeks- en Certificeringsopdrachten aan TÜV Rheinland Nederland B.V. en/of de betreffende overeenkomst tussen de contractpartijen. © 2010 TÜV Rheinland Nederland*

Clause *Deel*	**Product description** *Productomschrijving*

1	**Product details:** *Product details:*	Name of the manufacturer : Garware Hi Tech Films Limited Address of the manufacturer : Naigaon, P.O. Waluj, Aurangabad – 431 133, Maharashtra, India. Production plant of the samples : - Line ID where the samples are made : - Production date : - Sampling date : - The product was marked as : 4 mm Glass + 8mil Solar Safety Film Kind of glass : Clear float glass Nominal thickness : 4.1 mm Composition : 4 mm float + 8mil Solar Safety Film
2	**Other:** *Andere:*	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
3	**Test sample obtaining:** *Selectie van het proefstuk:*	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ Others:
4	**Number of test items** Aantal proefstukken	4
5	**Picture of sample**	

Picture 1.



Picture 2.



Clause Deel	**Requirements – Tests** *Vereisten - Tests*

6	**Scope**	EN 356 specifies requirements and test methods for security glazing designed to resist actions of force by delaying access of objects and/or persons to a protected space for a short period of time. The standard classifies security glazing products into categories of resistance to actions of force.			
7	**Requirement**	**Resistance to hard body impact** The security glazing product shall be classified in that particular category of resistance if all three test pieces prevent penetration by the impacting body when tested by the method described in clause 8 of the standard.			
8	**Classification**	Category of resistance	Drop height (mm)	Total number of strikes	Code designation for category of resistance
		P1A	1500 ± 50	3 in a triangle	EN 356 P1A
		P2A	3000 ± 50	3 in a triangle	EN 356 P2A
		P3A	6000 ± 50	3 in a triangle	EN 356 P3A
		P4A	9000 ± 50	3 in a triangle	EN 356 P4A
		P5A	9000 ± 50	3 times 3 in a triangle	EN 356 P5A
9	**Test method**	**Clause 8 EN356. Test method for drop test:** The test piece shall be placed horizontally into the clamping frame of the test piece support apparatus and fixed in accordance with the requirements of clause 6.1.3. of this standard. The drop height (measured from the bottom of the impactor to the surface of the test piece) shall be adjusted according to table 1 for the category of resistance tested. For categories P1A, P2A, P3A and P4A, the impactor (a steel ball of 4,11 ±0,06 kg) shall be dropped on to each test piece three times from the same height, in such a way that the impacted positions form the pattern of an equilateral triangle with a side length of (130 ± 20) mm around the geometric centre of the test piece, with one side of the triangle parallel to a short side of the specimen. The impact position opposite to this side of the triangle shall be hit first. For category P5A, the above procedure shall be repeated a total of three times on each test piece, giving nine impacts, three on each point of the triangle. Loose fragments shall be removed from the test piece after each impact. The test temperature shall be (23 ± 2) °C.			
10	**Measurement uncertainty**	Caused by the destructive nature of the test and pass/fail result no measurement uncertainty can be determined. Based on the validation of the test procedure, measurement set-up and the associated parts (steel ball / drop height, etc.) there is a presumption of conformity established which is approved with ISO 17025 accreditation.			

Clause Deel	**Requirements – Tests** *Vereisten - Tests*

11 Resistance to Hard Body Impact

Composition (from the attack side)	**4 mm Glass + 8mil Solar Safety Film**
Asymmetrical yes/no	Yes
Attack face?	As marked by the manufacturer - Glass side
Dimensions [mm]	900 x 1100
Nominal thickness [mm]	4.1
Clamping < (140 ± 20) N/mm^2 ? yes/no	Yes
Drop height [mm]	1500
Number of strikes	3 in a triangle

Test piece	Position	1	2	3
Repetition 1	1	No Breakage	Breakage, no penetration	No Breakage
	2	Breakage, no penetration	Breakage, no penetration	No Breakage
	3	Breakage, no penetration	Breakage, no penetration	Breakage, no penetration
Test result		Pass	Pass	Pass
Penetration within 5 seconds since the time of impact ? yes/no		No	No	No
Slippage of test piece > 5mm ? yes/no		No	No	No

12 Classification based on test results EN 356:1999, Clause 10.1 Drop test

The security glazing product is classified in that category of resistance corresponding to the applied drop height and number of impacts, provided that all three test pieces have resisted penetration by the impactor.

Security glazing product with (trade)name: 4 mm Glass + 8mil Solar Safety Film **Composition: 4 mm Glass + 8mil Solar Safety Film** **Category of resistance: P1A** **Code of designation: P1A**	Pass ☒ Fail ☐ Not applicable ☐

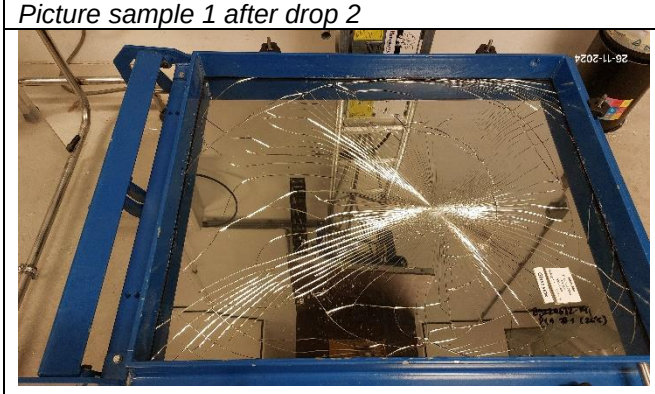
13 Remarks

When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the glass. The decision and responsibility lies at the manufacturer.

If no reference of the product description was supplied by the manufacturer, than that document shall be added to this test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and deviations from perfection were included in the delivered test samples.

Photo documentation
Foto documentatie

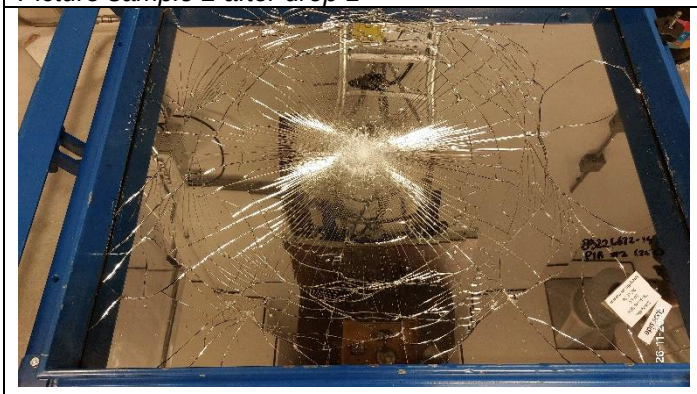
Picture sample 1 after drop 2



Picture sample 1 after drop 3



Picture sample 2 after drop 1



Picture sample 2 after drop 2



Picture sample 2 after drop 3



Picture sample 3 after drop 3

