

Prüfbericht-Nr.: <i>Test report no.:</i>	21251542.001	Auftrags-Nr.: <i>Order no.:</i>	2125 1542	Seite 1 von 15 Page 1 of 15
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	1985281	Auftragsdatum: <i>Order date:</i>	2020-11-13	
Auftraggeber: <i>Client:</i>	Tecnopol Sistemas SLU (for add. information see page 3/4)			
Prüfgegenstand: <i>Test item:</i>	Surface coating (for caravan)			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	Polyurea TECNOCOAT H-2049			
Auftrags-Inhalt: <i>Order content:</i>	Hail Impact Test			
Prüfgrundlage: <i>Test specification:</i>	following VKF - Prüfbestimmung *** No. 11 "Kunststoffplatten" 1.04 (01/07/2015) No. 20 "Sandwich Elemente" 1.02 (01/06/2014)			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2021-02-19			
Prüfmuster-Nr.: <i>Test sample no.:</i>	see "List of test samples"			
Prüfzeitraum: <i>Testing period:</i>	2021-03-11 – 2021-03-15			
Ort der Prüfung: <i>Place of testing:</i>	Cologne			
Prüflaboratorium: <i>Testing laboratory:</i>	Solar Energy Assessment Center Cologne			
Prüfergebnis*: <i>Test result*:</i>	Siehe Sonstiges / See Other			
geprüft von: <i>tested by:</i>	X  Datum: 2021-04-12 Signiert von: Juergen Sommer		genehmigt von: <i>authorized by:</i> X  Ausstellungsdatum: <i>Issue date:</i> 2021-04-12 Signiert von: Ulrich Fritsch	
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position: Sachverständige(r)/Expert	
Sonstiges / Other:	Only recommendation of hail withstand class *** VKF (Vereinigung Kantonalen Feuerversicherungen) Add. spec.: Prüfbestimmung Nr 00a – Allgemeiner Teil A & Nr 00b – Allgemeiner Teil B			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * 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				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>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.</i>				

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Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>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.</i>																				
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>																				
4	<table><tr><th colspan="4">Revision History</th></tr><tr><th>Revision</th><th>Date</th><th>Nature of changes</th><th>Page</th></tr><tr><td>-</td><td>12/04/2021</td><td>Original issue</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	Revision History				Revision	Date	Nature of changes	Page	-	12/04/2021	Original issue									
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Produktbeschreibung
Product description

1	Auftraggeber <i>Client</i>	Tecnopol Sistemas SLU Finlàndia 33 08520 Les Franqueses del Vallès Spain	
2	Produktdetails <i>Product details</i>	Allgemeine Informationen ; General Information	
		Brand name	Tecnopol
		Type name	Polyurea TECNOCOAT H-2049
		Product category	(Caravan) surface coating
		Year of production	2021
		Coating material	Polyurea TECNOCOAT H-2049
		Layer thickness [mm]	1.5
		Base layer material	Aluminium
			Glass-fiber laminate [GFK]
		Dimensionen ; Dimension	
		Dimension (l / w / h) [mm]	910 / 605 / 41
		Gross area [m²]	0.55
		Thickness [mm]	41 ; incl. coating
			35 ; incl. coating
3	Technische Dokumentation <i>Technical documentation</i>	TDS - Technical Data Sheet – TECNOCOAT H-2049 <i>Version 26-07-2020</i>	
4	Hersteller <i>Manufacturer</i>	Tecnopol Sistemas SLU (see <i>Point 1</i>).	
5	Distributor <i>Distributor</i>	-	
6	Sonstiges <i>Other</i>	-	
7	Prüfmusterbereitstellung: <i>Test sample obtaining</i>	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:	

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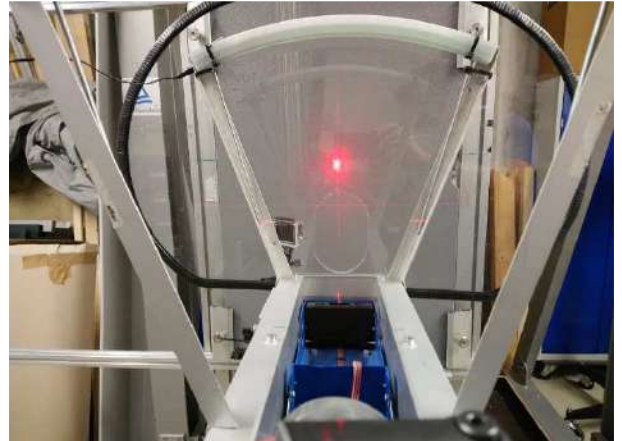
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Produktbeschreibung
Product description

Set-up and mounting situation (example)



Set-up and mounting situation (example)



Set-up and mounting situation (example)



Final inspection – external – Alu vs. GFK (example)



Example of thickness (Alu)



Example of thickness (GFK)



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Absatz Clause	Anforderungen - Prüfungen / Requirements - Tests	Messergebnisse – Bemerkungen/ Measuring results - Remarks	Ergebnis Result
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-	Result summary table			
Test	Date [DD Month YYYY]		Summary of main test results	—
	Start / 1 st	End / 2 nd		
Impact resistance (various ice ball diameter)	11 March 2021		See <i>Final evaluation</i> and <i>Final inspection</i>	N/A*
Final inspection	15 March 2021			N/A*

Supplementary information:

*because of various results no clear information could be given; see also *Final evaluation* and *Final inspection*

-	Final evaluation				
In four-eyes principle; by		J. Sommer U. Fritzsche			—
Overview of single evaluation results					
Evaluation of hail withstand (only recommendation)					
Properties of component	Hail withstand class and Ice ball diameter				
Thickness of surface [mm]	1.5 ; on aluminium		1.5 ; on glass-fiber laminate		
Visual nature / look (>0.5 m)	HW2	25 mm	HW3	30 mm	
Visual nature / look (<0.5 m)	HW2	20 mm	HW3	30 mm	
Water tightness	HW5	50 mm	HW5*	50 mm*	
Mechanics / structure	HW2	20 mm	HW3	30 mm	

Supplementary information: see also *Final inspection*

*glass-fiber laminate is broken (internally), but system is still water tight by coating

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Absatz <i>Clause</i>	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	Messergebnisse – Bemerkungen/ <i>Measuring results - Remarks</i>	Ergebnis <i>Result</i>
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-	List of test samples		
Test Sample Picking (randomly)		Date [DD/MM/YYYY]	by
		-	-
Sample No.	Sample S/N	Type	Remarks /constructional characteristics
HV2021000371	-	Alu; with 1.5 mm coating	-
HV2021000372	-	GFK; with 1.5 mm coating	-
HV2021000373	-	Alu; with 1.5 mm coating	Spare

-	Visual inspection (Initial)		
Test date [DD/MM/YYYY]		11/03/2021	—
Sample No.	Nature and position of initial findings		
HV2021000371	-		
HV2021000372	Small nonuniformity in coating on a defined spot, but not relevant for testing		
HV2021000373	-		
Supplementary information: -			

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-	Impact resistance test (general)						
Test date [DD/MM/YYYY] Day code	11/03/2021 ^a						
Sample-No. ID code	HV2021000371#Alu ; HV2021000372#GFK						
Method used for impact resistance (following)	Nr. 11 "Kunststoffplatten" & Nr. 20 "Sandwichelemente"						
Surface conditioning	Cooled with ice (also referenced without cooling)						
Sample tilt angle [° from horizontal]	90						
Direction of shoot [°]	0 (horizontal)						
Impact angle [° from sample surface]	90						
Distance (sample to center of v ₀ -meas.) [mm]	500 to 700						
Ice ball production [week of the year]	5 (hermetically sealed)						
Storage temperature of ice ball [°C]	-20						
Ambient conditions (mean) [°C and % RH]	22.4 and 38.4 ;						
Diameter of ice ball [mm]	20	25	30	35	40	45	50
Weight of ice ball [g] +/- 5%	3.6	7.5	12.3	20.7	29.2	43.9	56.9
Velocity of ice ball [m/s] +/- 5%	19.5	23.0	23.9	27.3	27.5	30.7	30.8
Impact energy (at least) [J]	0.7	2.0	3.5	7.7	11.1	20.7	27.0

Description of impact location



Supplementary information: Cross-points of lines are impact locations with remarked ice diameter

[illegible]

[illegible]

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-	Final inspection (general)			
Test date [DD/MM/YYYY]		15/03/2021		—
Sample-No.	Potential problem	Evaluation		
		Alu; with 1.5 mm coating	GFK; with 1.5 mm coating	
HV2021000371 HV2021000372	Technical problems	HW 2 passed ; <u>with 20 mm</u> NO cracks visible under use of magnifier NO structural damages detectable	HW 3 passed ; <u>with 30 mm</u> NO cracks visible under use of magnifier NO structural damages detectable	N/A*
	<i>Additional technical remark</i>	<i>Generally water tight ; Dents and stretching of aluminium sheet only (up to <u>50 mm</u>)</i>	<i>Generally water tight ; Glass-fiber laminate broken at <u>>35 mm</u> Water tightness given by coating only</i>	—
	Visual problems (distance; > 0.5 m)	HW 2 passed ; <u>with 25 mm</u> NO cracks visible NO dents visible	HW 3 passed ; <u>with 35 mm</u> NO cracks visible NO dents visible	N/A*
	Visual problems (near; < 0.5 m)	HW 2 passed ; <u>with 20 mm</u> NO cracks visible (under use of magnifier) NO dents visible	HW 3 passed ; <u>with 30 mm</u> NO cracks visible (under use of magnifier) NO dents visible	N/A*
	Individual additional remarks: All results are related to the tested samples (carrier sandwich and coating) ; further, without any correlation of long term effects. * see <i>Final evaluation</i> and <i>Annex : Additional photo documentation</i>			
Supplementary information: -				

-	General remarks and supplementary information	
Measuring uncertainties		
All results only refer to the test samples that were subjected to testing.		—
The extended total measuring uncertainty is: $u(k=2) \leq \pm 2.5 \%$		

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-	Annex: Additional photo documentation		
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Final inspection - Alu



Final inspection - GFK



Final inspection - Alu



Final inspection - GFK



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-	Annex: Additional photo documentation		
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Final inspection - Alu



Final inspection - GFK



Final inspection – Alu vs. GFK



Final inspection – Alu vs. GFK



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-	Annex: Additional photo documentation		
Final inspection - Alu		Final inspection – Alu [NO cracks]	
			
Final inspection - GFK		Final inspection – GFK [NO cracks]	
			
Final inspection - GFK		Final inspection – GFK [with cracks]	
			

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-	Annex: Additional photo documentation		
Final inspection - GFK		Final inspection – GFK [with cracks]	
			
Final inspection - GFK		Final inspection – GFK [with cracks]	
			
Final inspection - GFK		Final inspection – GFK [with cracks]	
			

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End of report