Prüfbericht-Nr.: *Test report no.*:	**DE25NEWI 002**	**Auftrags-Nr.:** *Order no.*:	2125 1542	Seite 1 von 15 *Page 1 of 15*
Kunden-Referenz-Nr.: *Client reference no.*:	1985281	**Auftragsdatum:** *Order date:*	2020-11-13	
Auftraggeber: *Client*:	POLYUREATEC GmbH	(for add. information see page 3)		
Prüfgegenstand: *Test item*:	Surface coating (for caravan)			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	HailGuard Pro S			
Auftrags-Inhalt: *Order content*:	Hail Impact Test			
Prüfgrundlage: *Test specification*:	following VKF - Prüfbestimmung *** *No. 11 "Kunststoffplatten" 1.04 (01/07/2015)* *No. 20 "Sandwichelemente" 1.02 (01/06/2014)s*			
Wareneingangsdatum: *Date of sample receipt*:	2021-02-19			
Prüfmuster-Nr.: *Test sample no:*	see "List of test samples"			
Prüfzeitraum: *Testing period*:	2021-03-11 – 2021-03-15			
Ort der Prüfung: *Place of testing*:	Am Grauen Stein, 51105 Köln, Cologne			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland Energy GmbH			
Prüfergebnis*: *Test result**:	Siehe Sonstiges / See Other			

geprüft von: *tested by:*	X Signiert von: Juergen Sommer	**genehmigt von:** *authorized by*:	X Signiert von: Ulrich Fritzsch
Datum: *Date:* 2025-03-26		**Ausstellungsdatum:** *Issue date:* 2025-03-26	
Stellung / Position:	Sachverständige(r)/Expert	**Stellung** / Position:	Sachverständige(r)/Expert

Sonstiges / *Other*: Only recommendation of hail withstand class
*** VKF (Vereinigung Kantonaler Feuerversicherungen)
Add. spec.: Prüfbestimmung Nr 00a – Allgemeiner Teil A & Nr 00b – Allgemeiner Teil B

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery*: Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* 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*

Prüfbericht-Nr.: DE25NEWI 002
Test report no.:

Anmerkungen
Remarks

A

Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibierungsprogramms 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.

The equipment used durinag 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.

B

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C

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.

*Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.*
Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.

D

Die Entscheidungsregel für Konformitätserklärungen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC GC8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird.

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 ILAC GC8:2019 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 and hence also not declared in the test report.

E

Wenn auf dem Bericht kein Akkreditierungshinweis aufgebracht ist, wurde der Bericht nicht im akkreditierten Bereich erstellt und ist folglich auch nicht vom EA MLA abgedeckt. Unabhängig davon wurde der Bericht auf Basis der allgemeinen Regeln der ISO/IEC 17000er Reihe erstellt. Mit "#" gekennzeichnete Prüfungen sind nicht Bestandteil der Akkreditierung D-PL-22040-01-00.

If there is no accreditation notice on the report, the report has not been produced in the accredited area and is consequently not covered by the EA MLA. Regardless of this, the report has been prepared based on the general rules of the ISO/IEC 17000 series. Tests marked with "#" are not covered by the accreditation D-PL-22040-01-00.

F

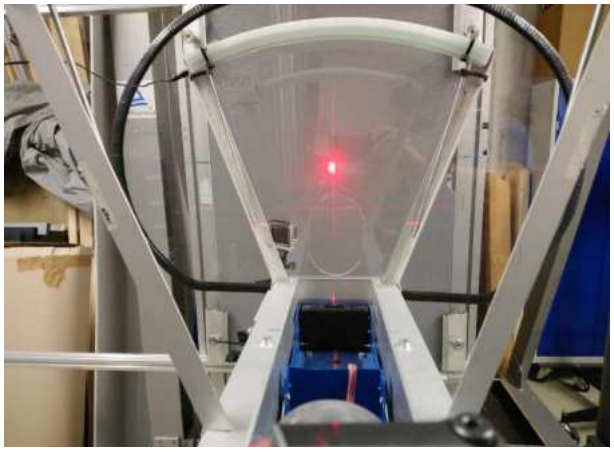
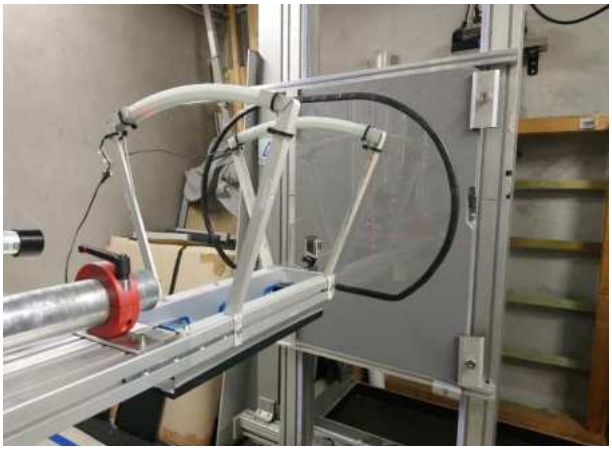
Revision History

Revision	*Date*	*Nature of changes*	*Page*
-	2021-04-12	Original issue (as 21251542.001)	
001	2025-03-07	Revised related to product name and customer	
002	2025-03-26	Correction of typewriting errors	3

Produktbeschreibung
Product description

1	**Auftraggeber** *Client*	PolyureaTec GmbH Jakob-Kaiser-Str. 8 47877 Willich Germany		
2	**Produktdetails** *Product details*	**Allgemeine Informationen ;** General Information		
		Brand name	PolyureaTec	
		Type name	HailGuard Pro S	
		Product category	(Caravan) surface coating	
		Year of production	2021	
		Coating material	Polyurea	
		Layer thickness [mm]	1.5	1.5
		Base layer material	Aluminium	Glass-fiber laminate [GFK]
		Dimensionen ; Dimension		
		Dimension (l / w / h) [mm]	910 / 605 / 41	970 / 570 / 35
		Gross area [m²]	0.55	0.55
		Thickness [mm]	41 ; incl. coating	35 ; incl. coating
3	**Technische Dokumentation** *Technical documentation*	n.n.		
4	**Hersteller** *Manufacturer*	PolyureaTec GmbH (see *Point 1*)		
5	**Distributor** *Distributor*	-		
6	**Sonstiges** *Other*	Co-report; based on Project-No. 21251542/Report-No. 21251542.001		
7	**Prüfmusterbereit-stellung**: *Test sample obtaining*	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:		

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)**
	

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen**/ *Measuring results - Remarks*	**Ergebnis** *Result*

-	**Result summary table**

Test	Date [DD Month YYYY]		Summary of main test results	—
	Start / 1st	End / 2nd		
Impact resistance (various ice ball diameter)	11 March 2021		See *Final evaluation* and *Final inspection*	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

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen/** *Measuring results - Remarks*	**Ergebnis** *Result*

-	**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	-	

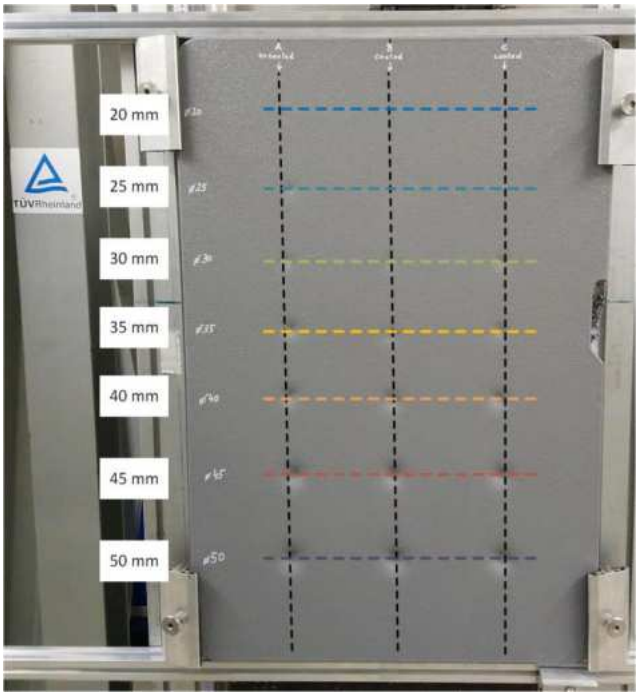
Supplementary information: -

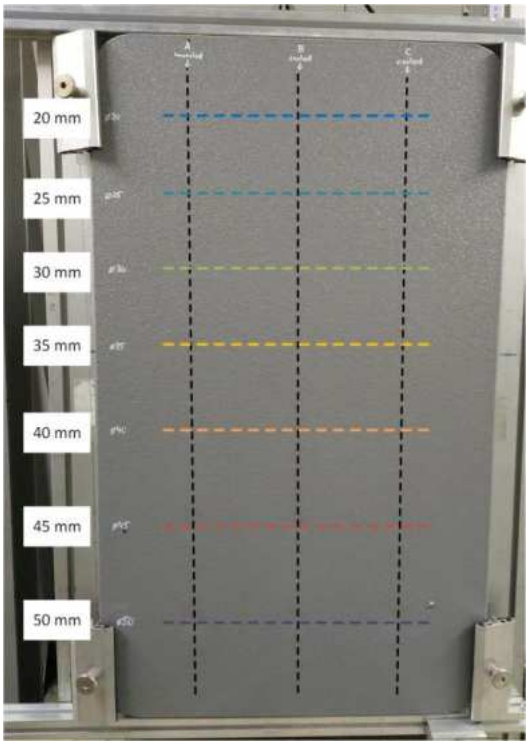
Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen/** *Measuring results - Remarks*	**Ergebnis** *Result*

-	**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

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen/** *Measuring results - Remarks*	**Ergebnis** *Result*

-	**Impact resistance test – Result table**

Sample ID	Impact information				Mass of ball [g]	Velocity of ball [m/s]	Impact energy [J]	—
	Day	No.	No. & diameter [mm]	Location description				
#Alu	Start with ice ball diameter 20mm (HW2)							—
	a	1	1	left (uncooled)	3.53	20.45	*0.74*	F*
		2	2	20 middle (cooled)	3.52	19.97	*0.70*	P*
		3	3	right (cooled)	3.53	20.14	*0.72*	P*
	Change to ice ball diameter 25 mm (HW2)							—
	a	4	4	left (uncooled)	7.58	24.14	*2.21*	F*
		5	5	25 middle (cooled)	7.48	24.05	*2.16*	P*
		6	6	right (cooled)	7.37	23.85	*2.10*	P*
	Change to ice ball diameter 30 mm (HW3)							—
	a	7	7	left (uncooled)	12.42	23.75	*3.50*	F*
		8	8	30 middle (cooled)	12.56	24.30	*3.71*	F*
		9	9	right (cooled)	12.80	24.63	*3.88*	F*
	Change to ice ball diameter 35 mm (HW3)							—
	a	10	10	left (uncooled)	20.49	28.06	*8.07*	F*
		11	11	35 middle (cooled)	20.32	27.64	*7.76*	F*
		12	12	right (cooled)	20.22	27.60	*7.70*	F*
	Change to ice ball diameter 40 mm (HW4)							—
	a	13	13	left (uncooled)	29.67	27.65	*11.34*	F*
		14	14	40 middle (cooled)	29.79	27.91	*11.60*	F*
		15	15	right (cooled)	29.55	27.59	*11.25*	F*
	Change to ice ball diameter 45 mm (HW4)							—
	b	16	16	left (uncooled)	42.43	31.85	*21.52*	F*
		17	17	45 middle (cooled)	42.47	32.01	*21.76*	F*
		18	18	right (cooled)	42.41	31.68	*21.28*	F*
	Start with ice ball diameter 50mm (HW5)							—
	a	19	19	left (uncooled)	58.36	32.08	*30.03*	F*
		20	20	50 middle (cooled)	58.32	32.33	*30.48*	F*
		21	21	right (cooled)	58.23	31.90	*29.63*	F*
End of test sequence; see "*Final inspection*" and "*Final evaluation*"								—

Supplementary information: *based on visual nature/optical look > 5m distance only

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen/** *Measuring results - Remarks*	**Ergebnis** *Result*

-	**Impact resistance test – Result table**

Sample ID	Impact information				Mass of ball [g]	Velocity of ball [m/s]	Impact energy [J]	—
	Day	No.	No. & diameter [mm]	Location description				
#GFK	Start with ice ball diameter 20mm (HW2)							—
	a	22	1	left (uncooled)	3.48	20.22	*0.71*	P*
		23	2	20 middle (cooled)	3.66	20.47	*0.77*	P*
		24	3	right (cooled)	3.51	20.13	*0.71*	P*
	Change to ice ball diameter 25 mm (HW2)							—
	a	25	4	left (uncooled)	7.57	24.13	*2.20*	P*
		26	5	25 middle (cooled)	7.38	23.98	*2.12*	P*
		27	6	right (cooled)	7.39	23.97	*2.12*	P*
	Change to ice ball diameter 30 mm (HW3)							—
	a	28	7	left (uncooled)	12.84	24.42	*3.83*	P*
		29	8	30 middle (cooled)	12.88	24.51	*3.87*	P*
		30	9	right (cooled)	12.56	24.28	*3.70*	P*
	Change to ice ball diameter 35 mm (HW3)							—
	a	31	10	left (uncooled)	20.43	27.51	*7.73*	F*
		32	11	35 middle (cooled)	20.47	27.49	*7.73*	F*
		33	12	right (cooled)	20.61	28.01	*8.08*	F*
	Change to ice ball diameter 40 mm (HW4)							—
	a	34	13	left (uncooled)	29.41	27.61	*11.21*	F*
		35	14	40 middle (cooled)	29.35	27.56	*11.15*	F*
		36	15	right (cooled)	29.76	28.27	*11.89*	F*
	Change to ice ball diameter 45 mm (HW4)							—
	b	37	16	left (uncooled)	45.53	31.15	*22.09*	F*
		38	17	45 middle (cooled)	45.50	31.18	*22.12*	F*
		39	18	right (cooled)	43.67	31.00	*20.98*	F*
	Start with ice ball diameter 50mm (HW5)							—
	a	40	19	left (uncooled)	58.37	31.89	*29.68*	F*
		41	20	50 middle (cooled)	58.76	32.32	*30.69*	F*
		42	21	right (cooled)	58.22	31.34	*28.59*	F*
End of test sequence; see "*Final inspection*" and "*Final evaluation*"								—

Supplementary information: *based on visual nature/optical look > 5m distance only

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen/** *Measuring results - Remarks*	**Ergebnis** *Result*

-	**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**; with 20 mm NO cracks visible under use of magnifier NO structural damages detectable	HW 3 **passed**; with 30 mm NO cracks visible under use of magnifier NO structural damages detectable	N/A*
	Additional technical remark	*Generally water tight ;* *Dents and stretching of aluminium sheet only* *(up to 50 mm)*	*Generally water tight ;* *Glass-fiber laminate broken at >35 mm* ***Water tightness given by coating only***	—
	Visual problems (distance; > 0.5 m)	HW 2 **passed**; with 25 mm NO cracks visible NO dents visible	HW 3 **passed**; with 35 mm NO cracks visible NO dents visible	N/A*
	Visual problems (near; < 0.5 m)	HW 2 **passed**; with 20 mm NO cracks visible (under use of magnifier) NO dents visible	HW 3 **passed**; with 30 mm 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 *Final evaluation* and *Annex : Additional photo documentation*			—
Supplementary information: -				

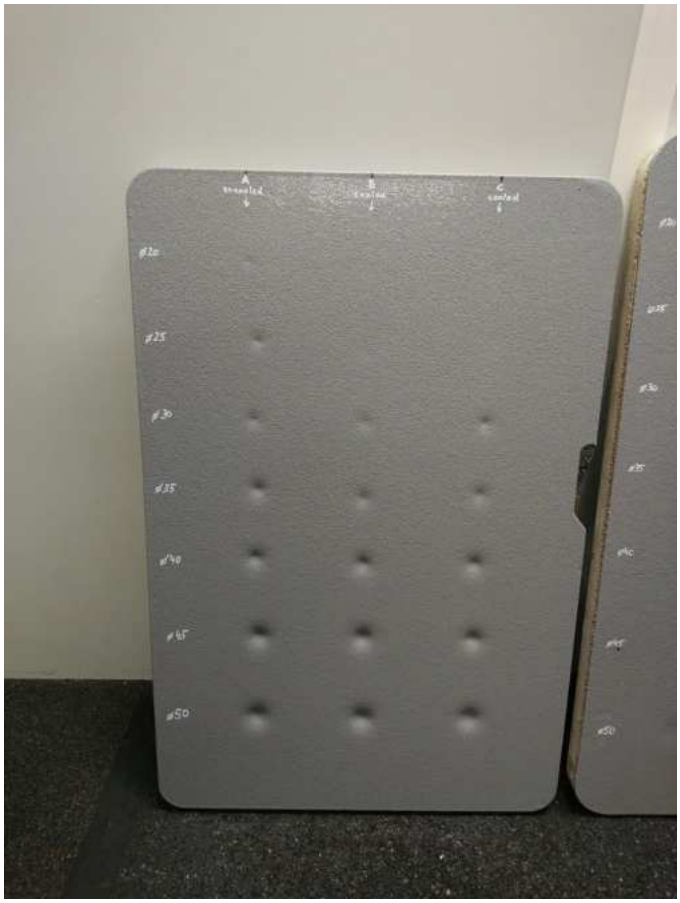
-	**General remarks and subblementary information**

Measuring uncertainties	—
All results only refer to the test samples that were subjected to testing. The extended total measuring uncertainty is: u (k=2) ≤ ± 2.5 %	

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen**/ *Measuring results - Remarks*	**Ergebnis** *Result*
-	**Annex: Additional photo documentation**		

Final inspection - Alu	Final inspection - GFK
	
Final inspection - Alu	Final inspection - GFK
	

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen**/ *Measuring results - Remarks*	**Ergebnis** *Result*
-	**Annex: Additional photo documentation**		

Final inspection - Alu	Final inspection - GFK
	
Final inspection – Alu vs. GFK	Final inspection – Alu vs. GFK
	

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen**/ *Measuring results - Remarks*	**Ergebnis** *Result*
-	**Annex: Additional photo documentation**		

Final inspection - Alu

Final inspection – Alu [NO cracks]

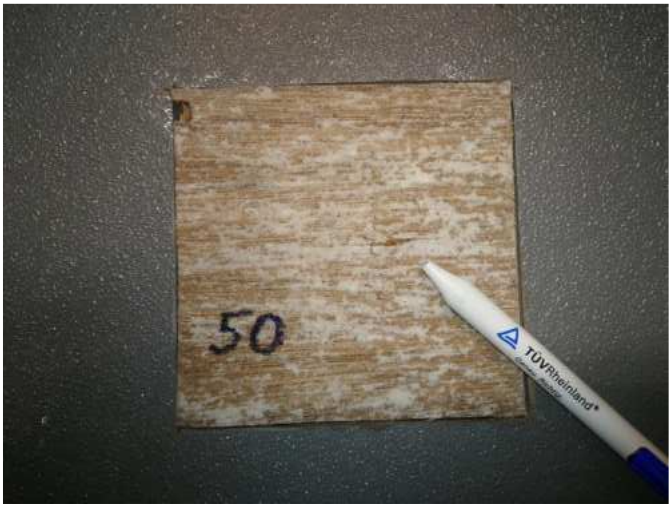
Final inspection - GFK

Final inspection – GFK [NO cracks]

Final inspection - GFK

Final inspection – GFK [with cracks]

Absatz *Clause*	**Anforderungen - Prüfungen** / *Requirements - Tests*	**Messergebnisse – Bemerkungen**/ *Measuring results - Remarks*	**Ergebnis** *Result*
-	**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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