Formblatt FB-K2-34-02

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Test report application engineering

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Report number: **VO 913815-01**
Purchase order: **KA -**

Date: 1 August 2023

Subject: **Protective clothing tests**

Confidential: ☐
Internal: ☑
External: ☐

Requested by: **Thor UHP Armour AB**

Contact name:	Mr. Christian Lagerlöf
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E-mail:	christian@thoruhp.com

Sales internal: Mr. V. Adams
Phone: 02522 / 76 417

Test location:	Technologie Center, room 1						
Test time envelope:							
01 August 2023	9:30 h	to	10:30 h	total	1:00 h	diff.	
		to		total	0:00 h	diff.	
Set-up-, take-down time	1:00 h						
Test duration:					**1:00 h**		

Persons present: **Hammelmann** **Customer**
Test Engineer: Mr. S. Lückemeier Mr. C. Lagerlöf
Assisted by: Mr. I. Schulenberg

Test aims and methods:

Tests are to be made on protective clothing material following the standard CE 2016/425. For this the material is to be secured in the existing jig (case) and tested at pressures from 2000 bar (single round jet nozzle) up to 3000 bar (rotor jet). The stand-off distance from the single nozzle and rotor jet to the surface of the material has to be a constant 75 mm and the feed rate should be 0,5 m/s.

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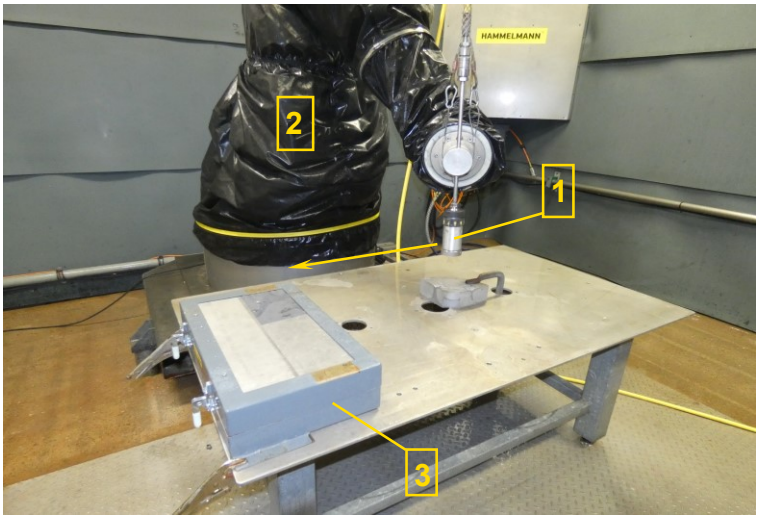
Report number:	**VO**	**913815-01**					
Purchase order:	**KA**	**-**					
Subject:	**Protective clothing tests**						
Material:	Protective clothing material						
Pump:	HDP:	144	V̇ [l/min]:	19	p [bar]:	3000	
Accessories:	Single round jet nozzle, rotor jet						

Test set up:

Pos. 1: Tool
Pos. 2: Robot
Pos. 3: Jig
Arrow: Feed direction



Test procedures:

In the tests the tool (pos.1) was guided by a robot (pos.2) in a straight line across the surface of the test material. The material was secured in a jig (pos.3). The underside was supported by several sheets of foam rubber and a black layer thus simulating the consistency of a human body.

Test sequence:

Run n°1: single round jet nozzle type “A”, pressure 2000 bar

Run n°2: rotor jet with two round jet nozzles type “P”, pressure 3000 bar

Comments to the test:

In every run the layers of protective clothing material protect the black layer and the sheets of foam rubber.

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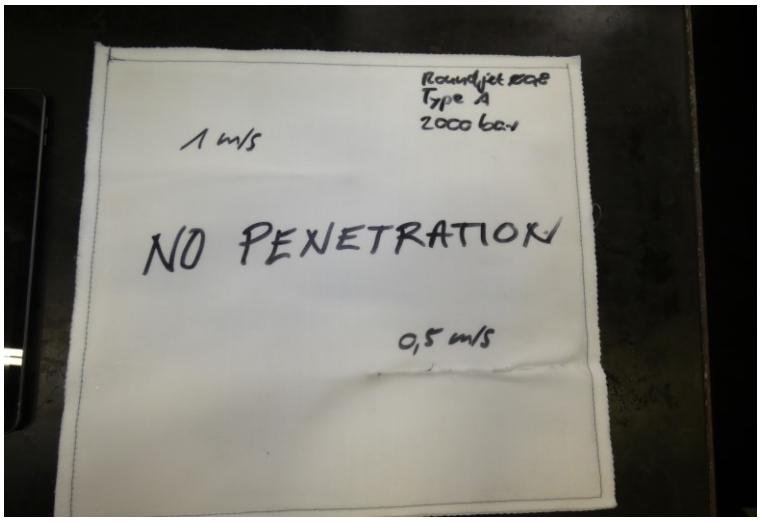
Top side of the test material after run n°1



Underside of the test material and black layer after run n°1



Underside of the test material after run n°1



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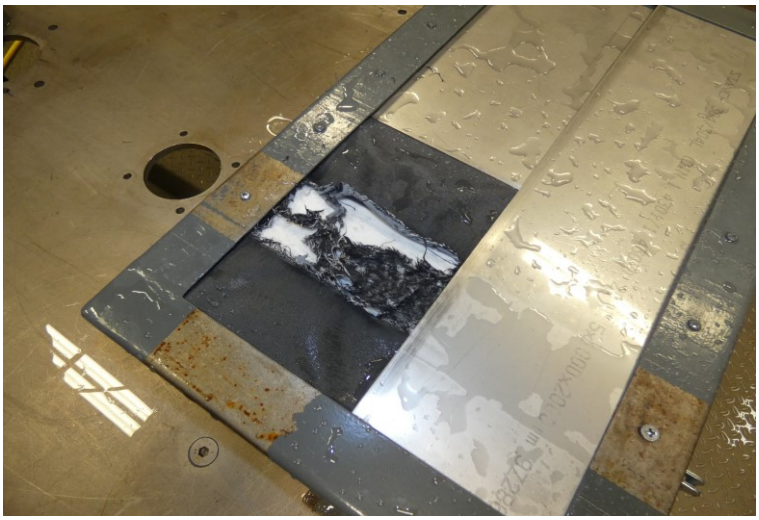
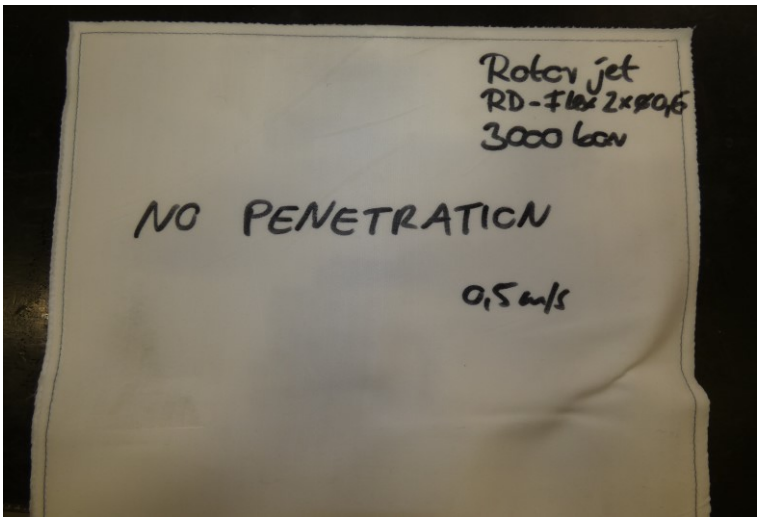
Top side of the test material after run n°2



Underside of the test material and black layer after run n°2



Underside of the test material after run n°2



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Test protocol application engineering

Requested by:	**Thor UHP Armour AB**	**Date:** 01 August 2023	**Report number:** VO 913815-01
Pump:	HDP: 144 V̇ [l/min]: 19 p [bar]: 3000	**Test location:** Technologie Center, room 1	**Purchase order:** KA -
Accessories:	Single round jet nozzle, rotor jet	**Test Engineer:** Mr. S. Lückemeier	**Assisted by:** Mr. I. Schulenberg
Material:	Protective clothing material	**Subject:** Protective clothing tests	

Run. n°	Pressure [bar]	V̇ [l/min]	Nozzle n	Nozzle Ø [mm]	Nozzle Type	Feed rate [m/s]	React. force [N]	RPM [1/min]	α [°]	Distance [mm]	Result	Comments
1	2000	17,9	1	0,8	A	0,5	187	-	90	75	No penetration of the black layer	1st layer: TechSteel 4410P3T99-90215
												2nd layer: Dyneema VNF60120344130
												3rd layer: Polyethylene J1471SL-Blanc
												4th layer: Dyneema VNF60120344130
												Single round jet nozzle type A
2	3000	19,5	2	0,6	K	0,5	249	3000	90	75	No penetration of the black layer	1st layer: TechSteel 4410P3T99-90215
												2nd layer: Dyneema VNF60120344130
												3rd layer: Polyethylene J1471SL-Blanc
												4th layer: Dyneema VNF60120344130
												Rotorjet RD-Flex