TEST LABORATORY

The test laboratory is accredited in compliance with DIN EN ISO/IEC 17025 by the Deutsche Akkreditierungsstelle GmbH. The accreditation is also valid for products of Regulation EU 2016/425. Test methods not included in the scope of accreditation are marked by a *.

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SÄCHSISCHES TEXTIL FORSCHUNGS INSTITUT e.V.

TEST REPORT

Order No. STFI:	**2020 2586.1**
Order No applicant:	PA 1040-20
Date of Test-Report:	29 March 2021
Testing officer:	Beyer

Digitally signed by Cernolev Andrei
Date: 2025.02.19 08:21:39 EET
Reason: MoldSign Signature
Location: Moldova
MOLDOVA EUROPEANĂ

Applicant:

Theodolf Fritsche GmbH & Co.
Herr Andreas Will
Ottengrüner Straße 86
95233 Helmbrechts
GERMANY

Testing application:

as of	23 November 2020
order receipt on	24 November 2020
sample receipt on	24 November 2020, 12 February 2021

Chairman of the Board
Prof. Dr.-Ing. Hilmar Fuchs

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Test specimen: woven fabric as outer layer for protective clothing for firefighters according to HuPF part 1/ part 4 and EN 469

Marking by applicant	**Marking for testing**
195F fabric article 44 115 195 ..., 75% meta-aramid / 23% para-aramid / 2% antistatic fibre, approx. 195 g/m², twill 2/1, water and oil repellent finish, dope-dyed,	
colour navy	sample 01
colour gold	sample 02
197F fabric article 44 115 197 ..., 75% meta-aramid / 23% para-aramid / 2% antistatic fibre, approx. 195 g/m², twill 2/1 ripstop, water and oil repellent finish, dope-dyed,	
colour navy	sample 03
colour gold	sample 04

The sampling happened by the applicant. There is no information about the sampling method.

Testing method / testing conditions:

Selected material tests according to HuPF ("Herstellungs- und Prüfungsbeschreibung für eine universelle Feuerwehrschutzkleidung"), state: 08/99 including completion 09/06 (outer material) of 2020 and as outer material according to EN 469:2020 as well as EN ISO 11612:2015.

Pre-treatment:

5 cycles washing 60°C:
- EN ISO 6330:2012, method 6N+F, drying after each washing cycle, after last washing cycle re-impregnation with Kreussler Hydrob-FC
- EN ISO 6330:2012, method 6N+F, drying after each washing cycle, without re-impregnation *(for chemical resistance)*

5 dry cleaning cycles:
- EN ISO 3175-2:2020, method 9.2; after last cleaning cycle re-impregnation with Kreussler Hydrob-FC

Property – Fabric	**Test method** [1)]
<u>according to HuPF part 1 and part 4:</u> Tensile strength new condition	EN ISO 13934-1:2013
Tear strength new condition	EN ISO 13937-2:2000, *article 44 115 197 ...tested according to annex D*
Abrasion resistance up to 30 000 cycles new condition	EN 530:1994, procedure 1, Martindale, pressure: 9 kPa, standard wool fabric
Dimensional change after 5 washing cycles after 5 dry cleaning cycles	EN ISO 5077:2008/ EN ISO 3759:2008

Property – Fabric	**Test method** [1)]
Electrostatic dissipative behaviour after 5 washing cycles	EN 1149-3:2004, method 2 Test condition: relative humidity (25 ± 5)% temperature (23 ± 1)°C
Surface wetting new condition after washing with 1x FC after dry cleaning with 1x FC	EN 24 920:2012
Oil repellency new condition after washing with 1x FC after dry cleaning with 1x FC	EN ISO 14419:1999
Colour fastness to artificial light	EN ISO 105-B02:2014
Colour fastness to perspiration (alkaline / acid)	EN ISO 105-E04:2009
Colour fastness to rubbing (dry and wet)	EN ISO 105-X12:2016
Colour fastness to laundry 60°C	EN ISO 105-C06:2010, method C2S
Colour fastness to dry cleaning	EN ISO 105-D01:2010
Colour fastness to hot pressing	EN ISO 105-X11:1996
<u>according to EN 469:</u> Limited flame spread new condition after washing with 1x FC after dry cleaning with 1x FC	EN ISO 15025:2016, method A surface ignition, flaming time 10 s
Residual strength after washing and radiant heat	EN ISO 13934-1:1999 EN ISO 6942:2002/ q0=10 kW/m²
Heat resistance / shrinkage new condition	ISO 17493:2016, 5 minutes, (180 ± 5) °C
Tensile strength after 5 washing cycles	EN ISO 13934-1:2013
Tear strength after 5 washing cycles	EN ISO 13937-2:2000 *tested according to annex D*
Dimensional change after 5 washing cycles after 5 dry cleaning cycles	EN ISO 5077:2008/ EN ISO 3759:2008
Resistance against penetration by liquids chemicals after 5 washing cycles without re-impregnation	EN ISO 6530:2005 chemicals: H_2SO_4 30% o-xylen undiluted
<u>according to EN ISO 11612</u>: Contact heat - code F after 5 washing cycles	ISO 12127:1996, *withdrawn but included in the standard,* Contact temperature T_C = 250°C

1) if available, the actual valid standard edition in German, identical to the international ones, is used for testing

Test results:

Test results partly adopted from the following Test Report:
Test Report STFI No. 2017 2595.1 of 7 December 2017.

Property according to HuPF, part 1	**Dimension**	**Test results** article 44115195… navy	gold	**Requirements** according to HuPF part 1
Tensile strength lengthwise	N	1302		≥ 800
across	N	1133		≥ 800
Tear strength lengthwise	N	53		≥ 30
across	N	63		≥ 30
Abrasion resistance until 30 000 cycles		30 000 cycles no destruction		no destruction of more than 1 thread
Dimensional change after 5 washing cycles				
lengthwise	%	- 2,8		≤ 3 %
across	%	- 2,3		≤ 3 %
Dimensional change after 5 dry cleaning cycles				
lengthwise	%	- 2,0		≤ 3 %
across	%	- 1,6		≤ 3 %
Half decay time t_{50}	s	< 0,01		t_{50} < 4s
Shielding factor S		0,82		S > 0,2
Surface wetting	Rate/ISO			mind.
new condition		5		5
after washing with 1x FC		5		4
after dry cleaning with 1x FC		4		3
Oil repellency	Rate			min.
new condition		5		5
after washing with 1x FC		4		4
after dry cleaning with 1x FC		5		3
Colour fastness to artificial light	Rate	5	5	4 - 5 (blue)
Colour fastness to perspiration alkaline				
colour change	Rate	4-5	4-5	colour change 4
staining	Rate	4-5	4-5	staining 3-4
Colour fastness to perspiration acid				
colour change	Rate	4-5	4-5	colour change 4
staining	Rate	4-5	4-5	staining 3-4
Colour fastness to rubbing (dry)				
staining	Rate	4-5	4-5	staining 3-4
Colour fastness to rubbing (wet)				
staining	Rate	4-5	4-5	staining 3
Colour fastness to laundry				
colour change	Rate	4-5	4-5	colour change 4
staining	Rate	4-5	4-5	staining 3-4
Colour fastness to dry cleaning				
colour change	Rate	4	4	colour change 4
staining	Rate	4-5	4-5	
Colour fastness to hot pressing (200°C)				
colour change	Rate	4-5	4-5	colour change 4-5
staining	Rate	4-5	4-5	staining 4-5

Property according to EN 469	**Dimension**	**Test results** article 44115195... navy	gold	**Requirements** according to EN 469
Limited flame spread		*new condition*		*lengthwise/across*
		lengthwise	*across*	
Further flaming to top or sides		no	no	no
Hole formation		no	no	no
Flaming or melting debris	s	no	no	no
Afterflame time	s	0	0	≤ 2
Afterglow time		0	0	≤ 2
Limited flame spread		*after 5 washing cycles*		*lengthwise/across*
		lengthwise	*across*	
Further flaming to top or sides		no	no	no
Hole formation		no	no	no
Flaming or melting debris		no	no	no
Afterflame time	s	0	0	≤ 2
Afterglow time	s	0	0	≤ 2
Limited flame spread		*after 5 cycl. dry cleaning*		*lengthwise/across*
		lengthwise	*across*	
Further flaming to top or sides		no	no	no
Hole formation		no	no	no
Flaming or melting debris		no	no	no
Afterflame time	s	0	0	≤ 2
Afterglow time	s	0	0	≤ 2
Residual strength after heat radiation				
lengthwise	N	1334		≥ 450
across	N	1083		≥ 450
Heat resistance shrinkage				
shrinkage lengthwise	%	± 0,0		≤ 5 %
across	%	± 0,0		≤ 5 %
melting, dripping, ignition		no		no
Tensile strength lengthwise	N	1222		≥ 450
across	N	1026		≥ 450
Tear strength lengthwise	N	45		≥ 30
across	N	62		≥ 30
Dimensional change after 5 washing cycles lengthwise	%	- 2,8		≤ 3 %
across	%	- 2,3		≤ 3 %
Dimensional change after 5 dry cleaning cycles lengthwise	%	- 2,0		≤ 3 %
across	%	- 1,6		≤ 3 %
Resistance against penetration by liquid chemicals		*after 5 washing cycles without FC*		
Repellency R/ Penetration P		R	P	R P
- H_2SO_4 30 %	%	99,2	0,0	> 80 % 0 %
- o-Xylen undiluted	%	84,2	10,3*	> 80 % 0 %

*) Requirement "no penetration" has to be met in material combination (with moisture barrier)

Property according to HuPF, part 1		**Dimension**	**Test results** article 44115197... navy	gold	**Requirements** according to HuPF part 1
Tensile strength	lengthwise	N	1302		≥ 800
	across	N	1133		≥ 800
Tear strength	lengthwise	N	148		≥ 30
	across	N	90		≥ 30
Abrasion resistance until 30 000 cycles			30 000 cycles no destruction		no destruction of more than 1 thread
Dimensional change after 5 washing cycles	lengthwise	%	- 2,5		≤ 3 %
	across	%	- 2,0		≤ 3 %
Dimensional change after 5 dry cleaning cycles	lengthwise	%	- 1,8		≤ 3 %
	across	%	- 1,4		≤ 3 %
Half decay time t_{50}		s	< 0,01		t_{50} < 4s
Shielding factor S			0,80		S > 0,2
Surface wetting		Rate/ISO			mind.
new condition			5		5
after washing with 1x FC			5		4
after dry cleaning with 1x FC			4		3
Oil repellency		Rate			min.
new condition			5		5
after washing with 1x FC			5		4
after dry cleaning with 1x FC			5		3
Colour fastness to artificial light		Rate	5	5	4 - 5 (blue)
Colour fastness to perspiration alkaline	colour change	Rate	4-5	4-5	colour change 4
	staining	Rate	4-5	4-5	staining 3-4
Colour fastness to perspiration acid	colour change	Rate	4-5	4-5	colour change 4
	staining	Rate	4-5	4-5	staining 3-4
Colour fastness to rubbing (dry)	staining	Rate	4-5	4-5	staining 3-4
Colour fastness to rubbing (wet)	staining	Rate	4-5	4-5	staining 3
Colour fastness to laundry	colour change	Rate	4-5	4-5	colour change 4
	staining	Rate	4-5	4-5	staining 3-4
Colour fastness to dry cleaning	colour change	Rate	4	4	colour change 4
	staining	Rate	4-5	4-5	
Colour fastness to hot pressing (200°C)	colour change	Rate	4-5	4-5	colour change 4-5
	staining	Rate	4-5	4-5	staining 4-5

Property according to EN 469	**Dimension**	**Test results** article 44115197… navy	gold	**Requirements** according to EN 469
Limited flame spread		*new condition*		*lengthwise/across*
		lengthwise	*across*	
Further flaming to top or sides		no	no	no
Hole formation		no	no	no
Flaming or melting debris		no	no	no
Afterflame time	s	0	0	≤ 2
Afterglow time	s	0	0	≤ 2
Limited flame spread		*after 5 washing cycles*		*lengthwise/across*
		lengthwise	*across*	
Further flaming to top or sides		no	no	no
Hole formation		no	no	no
Flaming or melting debris		no	no	no
Afterflame time	s	0	0	≤ 2
Afterglow time	s	0	0	≤ 2
Limited flame spread		*after 5 cycl. dry cleaning*		*lengthwise/across*
		lengthwise	*across*	
Further flaming to top or sides		no	no	no
Hole formation		no	no	no
Flaming or melting debris		no	no	no
Afterflame time	s	0	0	≤ 2
Afterglow time	s	0	0	≤ 2
Residual strength after heat radiation				
lengthwise	N	1332		≥ 450
across	N	963		≥ 450
Heat resistance shrinkage 180°C				
shrinkage: lengthwise	%	± 0,0		≤ 5 %
across	%	- 0,1		≤ 5 %
melting, dripping, ignition		no		no
Tensile strength lengthwise	N	1245		≥ 450
across	N	1003		≥ 450
Tear strength lengthwise	N	75		≥ 30
across	N	111		≥ 30
Dimensional change after 5 washing cycles lengthwise	%	- 2,5		≤ 3 %
across	%	- 2,0		≤ 3 %
Dimensional change after 5 dry cleaning cycles lengthwise	%	- 1,8		≤ 3 %
across	%	- 1,4		≤ 3 %
Resistance against penetration by liquid chemicals		*after 5 washing cycles without FC*		
Repellency R/ Penetration P		R	P	R P
- H_2SO_4 30 %	%	99,1	0,1*	> 80 % 0 %
- o-Xylen undiluted	%	86,4	10,4*	> 80 % 0 %

*) Requirement "no penetration" has to be met in material combination (with moisture barrier)

Property according to EN ISO 11612	**Dimension**	**Test results** article 44115195… navy	gold	**Requirements** according to EN 469
Contact heat – code F Threshold time t_t	s	5,5		F1 5 bis < 10 s F2 10 bis < 15 s F3 ≥ 15 s

Property according to EN ISO 11612	**Dimension**	**Test results** article 44115197… navy	gold	**Requirements** according to EN 469
Contact heat – code F Threshold time t_t	s	5,8		F1 5 bis < 10 s F2 10 bis < 15 s F3 ≥ 15 s

Test results refer to the delivered specimen. Test protocols and statistical information about test data can be viewed in the test house.
The testing period is defined as timeframe between receipt of samples and issue date of test report. Unless otherwise agreed, all materials we received within this order will be kept for a maximum time of 6 months. Materials which are not stored because of technical or safety reasons are excluded from that. This Test Report consists of 8 pages and should not be published in parts.

Dipl.-Ing. Marian Hierhammer
Head of the testing department

stfi geprüft

René Beyer
Responsible testing officer