

TEST REPORT

2021EP2048

DATE OF RECEPTION

28/06/2021

DATE TESTS

Starting: 28/06/2021

Ending: 23/09/2021

APPLICANT

TESAMED SAĞLIK HİZMETLERİ SAN TİC A.Ş.
ALTINTEPE MAH. İSTASYON YOLU SOK NO:3
MALTEPE
TR-34000 GAZİOSMANPAŞA

Att. SOMER TAHINCIOĞLU

IDENTIFICATION AND DESCRIPTION OF SAMPLES

REFERENCES

Tesafire Fighter Suit 0025

TESTS CARRIED OUT

- PHOTOGRAPHY.
- PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING.
- RESISTANCE OF MATERIALS TO PENETRATION BY LIQUID / STANDARD.
- WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE.
- LIMITED FLAME SPREAD / STANDARD.
- ERGONOMICS.
- HEAT RESISTANCE.
- DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE.

Rev.1 This revision cancels and replaces the previous
Error by omission and/or duplication of results

AITEX - Plaza Emilio Sala, 1 - E-03801 ALCOY (Alicante) SPAIN Tel.:+34 96 554 22 00 www.aitex.es info@aitex.es

Tests marked with * are not included within the scope of the ENAC accreditation

1 / 85



RESULTS

PHOTOGRAPHY



Reference

Tesafire Fighter Suit 0025

_____///



RESULTS

PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING

Standard

ISO 6330:2012

Standard deviation

Reference

Sample1 Tesafire Fighter Suit 0025

Units

1

2

Equipment

Wascator 13470E05 Wascator 13471E05

Dryer machine

JAMES HEAL JAMES HEAL
13472E05 13473E05

Washing procedure 6N **Washing cycles** 5

Drying procedure

F (tumble dryer)

Washing powder

ECE detergent 98 + sodium perborate + TAED

Units	Dry mass of the samples	Counterweight mass	Equipment
1	1.66 Kg	0,30 Kg of Polyester	Wascator 13470E05
2	2.07 Kg	---	Wascator 13471E05

Start and finish date

05/07/2021 - 06/07/2021

///



RESULTS

RESISTANCE OF MATERIALS TO PENETRATION BY LIQUID

Standard

EN ISO 6530:2005

Atmosphere for conditioning and testing

Temperatura
Temperature (20±2) °C

Humedad Relativa (HR)
Relative Humidity (RH) (65±5) %

Flow

10 ml in 10 s

Mass per unit area approximate of the sample tested

Does not provided by the customer

Pre-treatment

5 washing cycles at 60°C, according to standard ISO 6330:2012, method 6N; and F drying

Reference

Tesafire Fighter Suit 0025

Measurement uncertainty

Test liquid	Penetration index (%) ¹	Repellency index (%) ¹
Sulphuric Acid 30%	±0.3	±0.3
O-Xylene	±5.0	±7.8

¹ On the measured value

Material tested

Assembly Woven fabric, navy blue colour + laminated non-woven fabric + non-woven fabric sewn to woven fabric, navy blue colour

Test date

30/07/2021

--->>>



RESULTS

1. Test liquid Sulphuric acid 30%
Trade name SCHARLAU (Ref: AC20791000)
Boiling point 336.85 °C
Evaporative losses prevision None

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	99.4	0.6
Weft	1	0.0	99.7	0.3

2. Líquido de ensayo o-Xileno
Test liquid o-Xylene
Nombre comercial SCHARLAU (Ref: X100252500)
Trade name
Punto ebullición 139 °C
Boiling point
Previsión para las pérdidas evaporativas Ninguna
Evaporative losses prevision None

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	92.7	7.3
Weft	1	0.0	95.3	4.7

REQUIREMENTS ACCORDING TO STANDARD UNE-EN 469:2020

The limits set by the Standard EN 469:2020 point (6.2.2) are: shall give no penetration to the innermost surface and a repellency rate $\geq 80\%$ in each chemical tested.

_____///



RESULTS

WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE

Standard

EN 20811:1992 (Obsolete)

Apparatus

Hydrostatic Head Tester

Conditioning date

07/07/2021

Test date

02/08/2021

Atmosphere for conditioning testing
Temperature

(20±2) °C

Relative humidity

(65±4) %

Water temperature

20 °C

Rate of increase of water pressure

 10cmH₂O/min ((980±50) Pa/min)

The test equipment applies the water pressure to the exposed surface from below.

Surface exposed

External side

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference

Tesafire Fighter Suit 0025

Specimen	Pressure (cmH ₂ O)	Pressure (Pa)	Less Pressure
1	28,9	2890,0	2890,0
2	29,2	2920,0	
3			
4			

>>>



RESULTS

Remark

The edition of the standard used, does not correspond to the latest version released.

REQUISITE ACCORDING TO STANDARD EN 343:2019

	CLASS 1	CLASS 2	CLASS 3	CLASS 4
After pre-treatment	---	---	---	≥ 20000 Pa

CLASS ---

///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date

13/07/2021 - 8/07/2021

Conditioned

24h in indoor ambient conditions at 20 ± 2 °C and 65 ± 5 % RH

Original and after pre-treatment ambient conditions test

22,6°C and 47,4% RH – 24,9°C and 38,2% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Seams.

Reference

Tesafire Fighter Suit 0025

_____>>>



RESULTS

Pre-Treatment As received

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams open	No	No	No

Pre-Treatment 5 washing cycles at 60°C, according to the standard EN ISO 6330:2012, method 6N and F drying (tumble dry).

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams open	No	No	No

Remark

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

_____>>>



RESULTS

Remark

Performance results according to EN 469:2020: The material shall achieve level 3 of EN 14116:2015 when it is tested after washing and drying pre-treatment. Seams shall not open.

PERFORMANCE LEVEL ACCORDING TO EN ISO 14116:2015	Index 3
---	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Seams do not open

///



RESULTS

ERGONOMICS

Standard

EN ISO 13688:2013

Reference

TESAFIRE FIGHTER SUIT 0025

Test date

28/05/2021

Remark

The ergonomics verification has been performed by physical dimensions commensurate with the size found.

According to the inspection of the garment, this fulfills ergonomics requirement.

_____///



RESULTS

SIZING

Standard

EN ISO 13688:2013 Apdo. 6

Test uncertainty

The test uncertainty is $\pm 1\%$ of the measurand's value, for a coverage value of $K=2$ (95%)

Size

XL

Reference	TESAFIRE FIGHTER SUIT 0025	
Bust girth (cm)	Arm height (cm)	Back height (cm)
132,0	64,0	82,0

Remark: The size XL corresponds to:

User height: 176-182 cm.

User bust girth: 104-116 cm.

AFTER CHECKING THE SIZES, THESE ARE CONSIDERED ACCEPTABLE

Start and finish test date

31/05/2021 - 31/05/2021

_____///



RESULTS

DETERMINATION OF PH VALUE

Standard

EN ISO 3071:2020

Determination date

04/05/2021

Extractor solutionA - H₂O**pH Extractor solution**

7,00

Temperature

20.5 °C

Reference	pH	Uncertainty
TESAFIRE FIGHTER SUIT 0025 (AUTOENGAGEABLE FABRIC)	7.50	± 5 %

REQUISITE

In accordance with Standard EN ISO 13688:2013, the pH value shall be greater than 3.5, and less than 9.5.

PASS

_____///



RESULTS

DETERMINATION OF FORBIDDEN AZO COLORANTS (CANCEROGENIC ARYLAMINES)

Standard

UNE-EN 14362-1:2017

Test Methods

GC/MSD

Apparatus

Gas Chromatograph 7890A

Uncertainty

± 9 mg/Kg

Detectors

Mass Spectrometer 5975C

Reference	Results
TESAFIRE FIGHTER SUIT 0025 (AUTOENGAGEABLE FABRIC)	< 30* mg/Kg

*For all forbidden azo dyes listed below.

The textile products subject to control are according to the Standard EN ISO 13688:2013 on the use of Azo Colorants which release carcinogenic amines listed in the Standard Test

PASS

Forbidden Azo dyes

4-Aminodiphenyl, Benzidine, 4-Chlor-o-toluidine, 2-Naphthylamine, o-Aminoazotoluene, 2-Amino-4-nitrotoluene, p-Chloraniline, 2,4-Diaminoanisole, 4,4'-Diaminodiphenylmethane, 3,3'-Dichlorobenzidine, 3,3'-Dimethoxybenzidine, 3,3'-Dimethylbenzidine, 3,3'-Dimethyl-4,4'-diaminodiphenylmethane, p-Cresidine, 4,4'-Methylene-bis-2-chloraniline, 4,4'-Oxydianiline, 4,4'-Thiodianiline, o-Toluidine, 2,4-Toluylenediamine, 2,4,5-Trimethylaniline, o-Anisidine, 4-Aminoazobenzene

REQUISITE

In accordance with standard EN ISO 13688:2013, by detecting Azo colorants the limited established is not detected by standard EN 14362-1

_____///



RESULTS

SPECIFIC DESIGN REQUIREMENTS

REFERENCE

TESAFIRE FIGHTER SUIT 0025

STANDARD

EN 340:2003 and EN ISO 13688:2013

DESIGN REQUIREMENTS

The protection clothing design makes easy its correct placement and wearing staying with no movement during the use period intended.	PASS
The design of the protective clothing applies elements from other protective or equipment clothing, which are used to create a comprehensive protective outfit.	PASS
The clothing has no rough, sharp or hard surfaces or edges that could damage or irritate the user.	PASS
The clothing is not enough narrow for causing flow blood restriction.	PASS
The clothing is not enough loose and heavy for interfering the user's movement.	PASS

Remark

N/A: Not applicable

_____///



RESULTS

SPECIFIC DESIGN REQUIREMENTS

REFERENCE

TESAFIRE FIGHTER SUIT 0025

STANDARD

EN 469:2020

DESIGN REQUIREMENTS

The garment fulfils the requirements set out in the ISO 13688 guideline.	PASS
Firefighter's protective clothing shall be designed to provide protection for the firefighter's torso, neck, arms to the wrists, and legs to the ankles.	PASS
The levels of performance can be achieved by a garment assembly which may contain multilayer materials or material combinations.	PASS
If separate garment(s) (e.g. station wear, polo-shirt) are combined with turn-out gear, to meet the protection levels, they shall be tested together to meet the minimum requirements of this document. Any change, of for example the undergarment (e.g. different manufacturer or composition), invalidates the compliance with the requirements of this document including the marking.	N/A
If present the inspection access(es) shall be closed by a means that cannot be opened accidentally.	PASS
Retro-reflective, fluorescent shall give all round visibility and shall as a minimum encircle the arms, legs and torso regions of the protective clothing.	PASS
Where protection is provided by a two piece suit, it shall be determined that an overlap between the jacket and trousers shall always be retained, whilst raising both hands fully above the head and bending over from an upright position until fingertips reach the ground without bending the knees. The wrists and ankles shall remain covered, when wearing appropriate sized clothing in an upright position.	PASS
The discontinuous closure system (e.g. buttonholes or press-fasteners) shall not lead to unprotected openings in the garment. If zippers are used, the slide fastener shall be designed to lock when completely closed including when using a fast release mechanism zipper. The closure system shall not open accidentally.	PASS

>>>



RESULTS

SPECIFIC DESIGN REQUIREMENTS

DESIGN REQUIREMENTS

All external pocket flaps shall be stitched down or capable of fastening the pocket closed. They shall be 20 mm wider than the opening (10 mm on each side). Exception is possible for radio pockets and side pockets below the waist which do not extend more than 10° forward of the side seam. All pockets in the garment shall be designed in such a way to prevent entry of heat, flame, or hot material, exception for external radio pockets.	PASS
Any anti-wicking barrier used in a garment, the width of material shall not exceed 10 cm for jackets and 15 cm for trousers.	N/A
For any drain mesh material used, the width shall not exceed the 3 cm.	N/A
Hardware penetrating the outer material shall not be exposed on the innermost surface of the garment or garment assembly. Protective clothing shall be designed to ensure that the hardware shall not have sharp edges, roughness or projections which are likely to cause injury to the wearer.	PASS
Any devices that are integrated (whether permanently fixed or not), the interfaced areas or areas of interaction shall be designed so that the level of protection is maintained and shall be tested together with the garment.	N/A

Remark

N/A: Not applicable

_____///



RESULTS

PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING

Standard

ISO 6330:2012

Standard deviation

Reference

Sample1 TESAFIRE FIGHTER SUIT 0025

Units	1	2	3	4	5
Equipment	Wascator 13471E05	Wascator 13474E05	Wascator 13151E12	Wascator 13097E12	Wascator 13470E05
Dryer machine	JAMES HEAL 13473E05	JAMES HEAL 13475E05	ELECTROLUX 13426E12	ELECTROLUX 13425E12	JAMES HEAL 13472E05

Washing procedure 6N **Washing cycles** 5

Drying procedure

F (tumble dryer)

Washing powder

ECE detergent 98 + sodium perborate + TAED

Units	Dry mass of the samples	Counterweight mass	Equipment
1	2.10 Kg	---	Wascator 13471E05
2	1.98 Kg	---	Wascator 13474E05
3	1.96 Kg	0,05 Kg of Polyester	Wascator 13151E12
4	1.90 Kg	0,10 Kg of Polyester	Wascator 13097E12
5	2.00 Kg	---	Wascator 13470E05

Start and finish date

06/05/2021 - 07/05/2021

_____///



RESULTS

DETERMINATION OF DIMENSIONAL CHANGE IN DOMESTIC WASHING AND DRYING

Standard

EN ISO 5077:2008

Standard deviation

Preparation, marking and measuring of fabric specimens according to EN ISO 3759:2011
Starting test date 29/04/2021 **Ending test date** 18/05/2021

Washing procedure

 6N ($T^a = 60 \pm 3^\circ\text{C}$); Total dry load test samples and the counterweight 2 ± 0.1 Kg) according to ISO 6330:2012

Used apparatus

Wascator type A-Horizontal drum, front loading (13471E05)

Detergent

98 ECE reference detergent without optical brightener.

Counterweight

Type III - 100% polyester

Number of washing cycles

5

Dryer type

A3

Procedure F – Tumble dry(13473E05)
Uncertainty of test (% of the measured value)
 $\pm 0.5 \%$

Reference	Specimen		Direction	Dimensional change (%)
TESAFIRE FIGHTER SUIT 0025 EXTERNAL FABRIC		1	Warp	-2,0
			Weft	-1,0
TESAFIRE FIGHTER SUIT 0025 INTERNAL FABRIC		1	Warp	-2,0
			Weft	-2,0

>>>



RESULTS

REMARK

Negative dimensional change indicates shrinkage
Positive dimensional change indicates lengthening

REQUISITE

In accordance with the Standard EN ISO 13688:2013, the dimensional change shall not exceed $\pm 3\%$, both in width warp and in length weft.

PASS

REQUISITE

In accordance with the Standard EN 469:2020, the dimensional change shall not exceed $\pm 3\%$, both in width warp and in length weft.

PASS

-----///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date

11/05/2021 - 24/05/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

Original and after pre-treatment ambient conditions test

21,7°C and 33,7% RH - 20,5°C and 52,6% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Surfaces: Outer

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Pre-Treatment As received

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After-flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

—>>>



RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

- | |
|--|
| a) The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen |
| b) No specimen shall give flaming or molten debris. |
| c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection |
| d) The afterflame time is ≤ 2 s |
| e) The afterglow time is ≤ 2 s |

///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date

11/05/2021 - 24/05/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

Original and after pre-treatment ambient conditions test

21,7°C and 33,7% RH - 20,5°C and 52,6% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Surfaces: Inner

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

_____>>>



RESULTS

Pre-Treatment As received

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After-flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

—>>>



RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

- | |
|--|
| a) The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen |
| b) No specimen shall give flaming or molten debris. |
| c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection |
| d) The afterflame time is ≤ 2 s |
| e) The afterglow time is ≤ 2 s |

///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date

11/05/2021 - 13/05/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

Original and after pre-treatment ambient conditions test

21,6°C and 34,4% RH - 22,4°C and 38,1% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Surfaces: Outer seams

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Pre-Treatment As received

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After-flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

>>>



RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Seams do not separate

///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

After pre-treatment test date

08/06/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

After pre-treatment ambient conditions test

21,6°C and 57,9% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Hardware: Elastic band, plastic closure of the braces.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F (tumble dry)

Hardware	Elastic band			Plastic closure of the braces		
Flaming to top or either side edge	No	No	No	No	No	No
Post- After flame (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No
Closures can be opened	---	---	---	Yes	Yes	Yes

Performance results according to EN 469:2020. The material shall achieve level 3 to standard EN ISO 14116:2015 when it is tested after washing and drying pre-treatment.

PERFORMANCE LEVEL ACCORDING TO STANDARD EN ISO 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a) The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Hardware must continue working

_____///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

After pre-treatment test date

08/06/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

After pre-treatment ambient conditions test

21,6°C and 57,5% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Hardware: Metallic push button of the trousers, self-fastening tape of the trousers.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F (tumble dry)

Hardware	Metallic push button of the trousers			Self-fastening tape of the trousers		
Flaming to top or either side edge	No	No	No	No	No	No
Post- After flame (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No
Closures can be opened	Yes	Yes	Yes	Yes	Yes	Yes

Performance results according to EN 469:2020. The material shall achieve level 3 to standard EN ISO 14116:2015 when it is tested after washing and drying pre-treatment.

PERFORMANCE LEVEL ACCORDING TO STANDARD EN ISO 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a) The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Hardware must continue working

_____ ///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

After pre-treatment test date

08/06/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

After pre-treatment ambient conditions test

21,8°C and 55,0 RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Hardware: Metallic push button of the pocket, self-fastening tape of the pocket.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F (tumble dry)

Hardware	Metallic push button of the pocket			Self-fastening tape of the pocket		
	No	No	No	No	No	No
Flaming to top or either side edge	No	No	No	No	No	No
Post- After flame (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No
Closures can be opened	Yes	Yes	Yes	Yes	Yes	Yes

Performance results according to EN 469:2020. The material shall achieve level 3 to standard EN ISO 14116:2015 when it is tested after washing and drying pre-treatment.

PERFORMANCE LEVEL ACCORDING TO STANDARD EN ISO 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a) The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Hardware must continue working

_____///



RESULTS

CONTACT HEAT

Standard

EN ISO 12127-1:2015

Apparatus

ÖTI CONTACT HEAT PROTECTION TESTER

Conditioned

24h in indoor ambient conditions at (20 ± 2) °C and (65 ± 5) % RH

Ambient conditions test

24,0 °C and 34,4 % RH

Pre-Treatment

As received

Deviation from the Standard

Test date

07/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the contact heat test is $\pm 2\%$ of the value obtained, for a coverage factor of $K = 2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Specimen	Contact temperature (°C)	Threshold time (s)
1	250	14,30
2	250	14,22
3	250	14,41
Classification value	250	14

PERFORMANCE LEVEL ACCORDING TO EN 469:2020 LEVEL 2

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Results in accordance with Standard EN 469:2020 for the level 2

Contact temperature (°C)	Threshold time (s)
250	≥ 10,0

_____///



RESULTS

CONTACT HEAT

Standard

EN ISO 12127-1:2015

Apparatus

ÖTI CONTACT HEAT PROTECTION TESTER

Conditioned

24h in indoor ambient conditions at (20 ± 2) °C and (65 ± 5) % RH

Ambient conditions test

21,7 °C and 47,9 % RH

Pre-Treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Deviation from the Standard

Test date

18/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the contact heat test is $\pm 2\%$ of the value obtained, for a coverage factor of $K = 2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Specimen	Contact temperature (°C)	Threshold time (s)
1	250	16,02
2	250	15,52
3	250	15,67
Classification value	250	16

PERFORMANCE LEVEL ACCORDING TO EN 469:2020 LEVEL 2

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Results in accordance with Standard EN 469:2020 for the level 2

Contact temperature (°C)	Threshold time (s)
250	≥ 10,0

_____///



RESULTS

METHOD OF DETERMINING HEAT TRANSMISSION ON EXPOSURE TO FLAME

Standard

ISO 9151:2016

Apparatus

Convective heat

Heat flux density

80,02 kW/m²

Pre-Treatment

As received

Conditioned

24h in indoor ambient conditions at (20 ± 2) °C and (65 ± 5) % RH

Ambient conditions test

23,7 °C and 44,6 % RH

Deviation from the Standard

Test date

04/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

----->>>



RESULTS

Reference	Specimen	HTI ₁₂ (s)	HTI ₂₄ (s)	HTI ₂₄ - HTI ₁₂ (s)
TESAFIRE FIGHTER SUIT 0025	1	11,1	15,7	4,6
	2	10,8	15,3	4,5
	3	11,3	15,9	4,5
	Result	11	15	4

Remark

The uncertainty of the assay of Convective heat is $\pm 4\%$ of the value measured, for a coverage factor of K=2 (95%).

Remark

Result obtained of the lowest individual value according to EN 469:2020

PERFORMANCE LEVEL ACCORDING TO STANDARD EN 469:2020	LEVEL 2
--	----------------

Results in according with standard EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
HTI ₂₄	$\geq 9,0$	$\geq 13,0$
HTI ₂₄ - HTI ₁₂	$\geq 3,0$	$\geq 4,0$

Results have been obtained according a test method with pretenders only the classification of the materials, and are not necessary the application of the conditions.

_____///



RESULTS

METHOD OF DETERMINING HEAT TRANSMISSION ON EXPOSURE TO FLAME

Standard

ISO 9151:2016

Apparatus

Convective heat

Heat flux density

79,03 kW/m²

Pre-Treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Conditioned

24h in indoor ambient conditions at (20 ± 2) °C and (65 ± 5) % RH

Ambient conditions test

25,7 °C and 41,9 % RH

Deviation from the Standard

Test date

17/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

----->>>



RESULTS

Reference	Specimen	HTI ₁₂ (s)	HTI ₂₄ (s)	HTI ₂₄ - HTI ₁₂ (s)
TESAFIRE FIGHTER SUIT 0025	1	11,5	16,1	4,6
	2	11,7	16,4	4,7
	3	11,3	16,1	4,8
	Result	11	16	5

Remark

The uncertainty of the assay of Convective heat is $\pm 4\%$ of the value measured, for a coverage factor of K=2 (95%).

Remark

Result obtained of the lowest individual value according to EN 469:2020

PERFORMANCE LEVEL ACCORDING TO STANDARD EN 469:2020	LEVEL 2
---	---------

Results in according with standard EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
HTI ₂₄	$\geq 9,0$	$\geq 13,0$
HTI ₂₄ - HTI ₁₂	$\geq 3,0$	$\geq 4,0$

Results have been obtained according a test method with pretenders only the classification of the materials, and are not necessary the application of the conditions.

_____///



RESULTS

RADIANT HEAT

Standard

EN ISO 6942:2002, method B

Apparatus

Equipment for the determination of radiant heat

Heat flux density

40,05 kW/m²

Pre-Treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Conditioned

24h in indoor ambient conditions at (20 ± 2) °C and (65 ± 5) % RH

Ambient conditions test

25,7 °C and 41,9 % RH

Deviation from the Standard

Test date

17/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

----->>>



RESULTS

Reference	TESAFIRE FIGHTER SUIT 0025			
Specimen	TF	RHTI 12 (s)	RHTI 24 (s)	(RHTI 24 - RHTI 12) (s)
1	32,4	10,0	15,1	5,1
2	31,2	10,6	15,9	5,3
3	31,8	10,2	15,4	5,2
Result	32	10	15	5

Remark

The uncertainty of the assay of Radiant heat is $\pm 3,5\%$ of the value measured, for a coverage factor of $K=2$ (95%).

PERFORMANCE LEVEL ACCORDING TO EN 469:2020 | LEVEL 1

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Requirements to meet according to EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
RHTI 24	$\geq 10,0$	$\geq 18,0$
RHTI 24 - RHTI 12	$\geq 3,0$	$\geq 4,0$

-----///



RESULTS

RADIANT HEAT

Standard

EN ISO 6942:2002, method B

Apparatus

Equipment for the determination of radiant heat

Heat flux density

39,98 kW/m²

Pre-Treatment

As received.

Conditioned

24h in indoor ambient conditions at (20 ± 2) °C and (65 ± 5) % RH

Ambient conditions test

23,7 °C and 44,6 % RH

Deviation from the Standard

Test date

04/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

----->>>



RESULTS

Reference	TESAFIRE FIGHTER SUIT 0025			
Specimen	TF	RHTI 12 (s)	RHTI 24 (s)	(RHTI 24 - RHTI 12) (s)
1	34,9	9,7	14,7	5,0
2	35,2	9,2	13,9	4,7
3	33,1	9,9	14,9	5,0
Result	35	9	14	5

Remark

The uncertainty of the assay of Radiant heat is $\pm 3,5\%$ of the value measured, for a coverage factor of $K=2$ (95%).

PERFORMANCE LEVEL ACCORDING TO EN 469:2020 | LEVEL 1

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Requirements to meet according to EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
RHTI 24	$\geq 10,0$	$\geq 18,0$
RHTI 24 - RHTI 12	$\geq 3,0$	$\geq 4,0$

_____ ///



RESULTS

PRE-TREATMENT

Reference

TESAFIRE FIGHTER SUIT 0025

Type of specimen

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Number of specimens

6

Conditioned

24h in indoor ambient conditions at 20 ± 2 °C and 65 ± 5 % HR

Deviation from the Standard

Used apparatus

Equipment for determination of radiant heat

Pretreatments	Test standard	Test data	Method	Test time
Radiant heat	EN ISO 6942:2002	17/05/2021	A	180

///



RESULTS

DETERMINATION OF BREAKING STRENGTH AND ELONGATION

Standard

EN ISO 13934-1:2013

Apparatus

INSTRON Dynamometer

Conditioning date

18/05/2021

Test date

26/05/2021

Atmosphere for conditioning testing
Temperature (20±2) °C

Relative humidity

(65±5) %

Nº of specimens
Tested

3 for each direction

Rejected

0

Gauge length

200 mm

Test velocity

100 mm/min

Pretension
Warp

5 N

Weft

5 N

State of the specimens

Conditioned

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry), exposed to the Radiant heat according to method A, EN ISO 6942:2002

Reference

TESAFIRE FIGHTER SUIT 0025

Direction	Maximum average load (N)	C.V. (%)	Average elongation (%)	C.V. (%)
Warp	1100	1.0	17.5	4.4
	1100 1100		17.5 18.0	
	1100		19.0	
Weft	1100	2.0	12.5	1.6
	1000 1000		12.0 12.5	
	1000		12.5	

>>>



RESULTS

Remark

The relative expanded uncertainty of Tensile strength resistance is $\pm 5\%$ assay value of the measured, for a probability of coverage of 95%.

Reporting requirements attached:

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a breaking load in both directions ≥ 450 N.

_____///



RESULTS

HEAT RESISTANCE

Standard

ISO 17493:2016

Apparatus

Air stove

Temperature

(180 ± 5) °C

Length of the test

5 min (+0,15/-0) min

Deviation from the Standard

Pre-Treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Tested material

External (Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.)

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Fabric				
Flame	Melting	Direction	Shrink(-) / Elongation(+)	
No	No	Warp		-0,6 %
		Weft		0,0 %
No	No	Warp		-0,8 %
		Weft		-0,4 %
No	No	Warp		-0,4 %
		Weft		-0,5 %

Remark

The uncertainty of the assay of Heat Resistance is $\pm 12\%$ of the value measured, for a coverage factor of $K=2$ [95%].

PERFORMANCE LEVEL ACCORDING TO EN 469:2020

PASS

Requirements to meet according to EN 469:2020

No layer can ignite
No layer can melt
No layer shrinks more than 5%

///



RESULTS

HEAT RESISTANCE

Standard

ISO 17493:2016

Apparatus

Air stove

Temperature

$(180 \pm 5) ^\circ\text{C}$

Length of the test

5 min (+0,15/-0) min

Deviation from the Standard

Test uncertainty

The uncertainty of the assay of heat resistance is $\pm 12\%$ of the value measured, for a coverage factor of $K=2$ (95%)

Pre-Treatment

As received.

Tested material

Hardware: Main self-fastening material, main metal zipper with metallic cursor, reflective tape, cuff fabric, self-fastening material of the pocket, self-fastening material of the cuff, metallic push button, self-fastening material of the trousers, metallic push button of the trousers, elastic strap, plastic strap closure.

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Accessories				
Hardware	Flame	Melting	Separation	Hardware work correctly
Main self-fastening material	No	No	No	Yes
Main metal zipper with metallic cursor	No	No	No	Yes
Reflective tape	No	No	No	Yes
Cuff fabric	No	No	No	Yes
Self-fastening material of the pocket	No	No	No	Yes
Self-fastening material of the cuff	No	No	No	Yes
Metallic push button	No	No	No	Yes
Self-fastening material of the trousers	No	No	No	Yes
Elastic strap	No	No	No	Yes
Plastic strap closure	No	No	No	Yes
Metallic push button of the trousers	No	No	No	Yes

PERFORMANCE LEVEL ACCORDING TO EN 469:2020

PASS

Requisites to meet according to EN 469:2020

No hardware/strip/seam shall ignite or melt

Closures opens

///



RESULTS

MASS PER UNIT AREA

Standard

EN 12127:1997; pto. 8.3

Conditioning date 29/04/2021 **Test date** 30/04/2021

Atmosphere for conditioning testing

Temperature (20±2) °C **Relative humidity** (65±2) %

State of the specimens

Original

Reference	Mass per unit area (g/m ²)	CV (%)
TESAFIRE FIGHTER SUIT 0025	466	0,7

///



RESULTS

DETERMINATION OF BREAKING STRENGTH AND ELONGATION

Standard

EN ISO 13934-1:2013

Apparatus

INSTRON Dynamometer

Conditioning date		12/05/2021	Test date		26/05/2021
Atmosphere for conditioning testing					
Temperature		(20±2) °C	Relative humidity		(65±4) %
Gauge length					
Warp		200 mm.	Weft		200 mm.
Test velocity					
Warp		100 mm/min	Weft		100 mm/min
Pretension					
Warp		5 N	Weft		5 N
N° of specimens					
Tested		5 for each direction		Rejected	0
State of the specimens		Conditioned			

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025

Direction	Maximum average load (N)	C.V. (%)	Average elongation (%)	C.V. (%)
Warp	1100	2.0	16.5	1.6
	1200		16.0	
	1100 1100		17.0 16.5	
	1100		16.5	
	1100		17.0	
Weft	1000	2.0	12.0	2.6
	100		11.5	
	1000 1000		12.0 12.0	
	1000		11.5	
	980		12.5	

>>>



RESULTS

Remark

The relative expanded uncertainty of Tensile strength resistance is $\pm 5\%$ assay value of the measured, for a probability of coverage of 95%.

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a breaking load in both directions ≥ 450 N.

PASS

-----///



RESULTS

SEAM STRENGTH RESISTANCE

Standard

EN ISO 13935-2:2014

Apparatus

INSTRON Dynamometer

Conditioning date

11/05/2021

Test date

26/05/2021

Gauge length

100 mm

Atmosphere for conditioning testing

Temperature (20±2) °C

Relative humidity

(65±4) %

Number of specimens

Tested

5

Rejected

0

The break of the seam is produced for:

Torn fabric in the seam

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025 (External seam)

Average resistance (N)	C.V.(%)
706,40	4,69
729,93	
786,10 755,46	
772,60	
782,29	

Remarks

The relative expanded uncertainty of Seams resistance is ± 6% assay value of the measured, for a probability of coverage of 95%.

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a breaking load ≥ 300 N.

PASS

>>>



RESULTS

DETERMINATION OF TEAR RESISTANCE

Standard

EN ISO 13937-2:2000

Apparatus

INSTRON Dynamometer

Conditioning date

12/05/2021

Test date

26/05/2021

Atmosphere for conditioning testing
Temperature (20±2) °C

Relative humidity

(65±5) %

N° of specimens
Tested 5 for each direction

Rejected

0

The calculation of averages has been made

For electronic device

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025

Tear	Average load (N)	C.V. (%)
Lengthwise	49	4.9
	48	
	45 49	
	50	
	51	
Crosswise	49	5
	43	
	46 45	
	45	
	43	

Remark

The relative expanded uncertainty of Tear resistance is ±3.9% assay value of the measured, for a probability of coverage of 95%.

_____>>>



RESULTS

Observation

The test was performed with specimens of great width (200x200) mm in crosswise direction.

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a determination of tear resistance in both directions ≥ 30 N.

PASS



RESULTS

WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE

Standard

EN ISO 811:2018

Apparatus

Hydrostatic Head Tester

Conditioning date

20/05/2021

Test date

07/06/2021

Atmosphere for conditioning testing
Temperature (20±2) °C

Relative humidity

(65±4) %

Water temperature 20 °C

Rate of increase of water pressure

 10 cmH₂O/min

The test equipment applies the water pressure to the exposed surface from below.

Surface exposed

External side

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025

Specimen	Pressure (cm/H ₂ O)	Average (cm/H ₂ O)	Pressure (KPa)	Media (KPa)
1	104	132	10,4	13,2
2	114		11,4	
3	135		13,5	
4	186		18,6	
5	119		11,9	

REQUISITE ACCORDING TO STANDARD EN 469:2020

Y1 < 20 kPa, for garments without a moisture barrier.

Y2 ≥ 20 kPa, for garments with a moisture barrier.

PERFORMANCE LEVEL ACCORDANCE WITH EN 469:2020	---
---	-----

///



RESULTS

RESISTANCE OF MATERIALS TO PENETRATION BY LIQUID

Standard

EN ISO 6530:2005

Atmosphere for conditioning and testing

Temperatura
Temperature (20±2) °C

Humedad Relativa (HR)
Relative Humidity (RH) (65±5) %

Flow

10 ml in 10 s

Mass per unit area approximate of the sample tested

Does not provided by the customer

Pre-treatment

5 washing cycles at 60°C, according to the standard ISO 6330:2012, method 6N and F drying

Reference

TESAFIRE FIGHTER SUIT 0025

Measurement uncertainty

Test liquid	Penetration index (%) ¹	Repellency index (%) ¹
Sulphuric Acid 30%	±0.3	±0.3
O-Xylene	±5.0	±7.8

¹ On the measured value

Material tested

Assembly: Outer woven fabric, navy blue colour + Intermediate laminated non-woven fabric + Inner non-woven fabric sewn to a woven fabric, grey colour

Test date

19/05/2021

—>>>



RESULTS

1. Test liquid Sulphuric acid 30%
Trade name SCHARLAU (Ref: AC20791000)
Boiling point 336.85 °C
Evaporative losses prevision None

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	99.3	0.7
	2	0.0	99.7	0.3
	3	0.0	99.2	0.8
Weft	1	0.0	99.7	0.3
	2	0.0	99.8	0.2
	3	0.0	99.7	0.3

2. Líquido de ensayo o-Xileno
Test liquid o-Xylene
Nombre comercial SCHARLAU (Ref: X100252500)
Trade name
Punto ebullición 139 °C
Boiling point
Previsión para las pérdidas evaporativas Ninguna
Evaporative losses prevision None

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	93.8	6.2
	2	0.0	95.9	4.1
	3	0.0	96.6	3.4
Weft	1	0.0	86.5	13.5
	2	0.0	96.8	3.2
	3	0.0	94.4	5.6

ACCORDING TO STANDARD EN 469:2020

PASS

REQUIREMENTS ACCORDING TO STANDARD UNE-EN 469:2020

The limits set by the Standard EN 469:2020 point (6.2.2) are: shall give no penetration to the innermost surface and a repellency rate $\geq 80\%$ in each chemical tested.

_____///



RESULTS

WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE

Standard

EN ISO 811:2018

Apparatus

Hydrostatic Head Tester

Conditioning date

11/05/2021

Test date

25/05/2021

Atmosphere for conditioning testing
Temperature (20±2) °C

Relative humidity

(65±4) %

Water temperature 20 °C

Rate of increase of water pressure

 10 cmH₂O/min

The test equipment applies the water pressure to the exposed surface from below.

Surface exposed

External side

Previous treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025 (SEAMS)

Specimen	Pressure (cm/H ₂ O)	Average (cm/H ₂ O)	Pressure (KPa)	Media (KPa)
1	124	110,7	12,4	11,07
2	140		14,0	
3	159		15,9	
4	64,3		6,43	
5	66,2		6,62	

REQUISITE ACCORDING TO STANDARD EN 469:2020

Y1 < 20 kPa, for garments without a moisture barrier.

Y2 ≥ 20 kPa, for garments with a moisture barrier.

PERFORMANCE LEVEL ACCORDANCE WITH EN 469:2020



RESULTS

WATER VAPOUR RESISTANCE

Standard

EN ISO 11092:2014

Test date

24/06/2021

Uncertainty of the measurement

± 7% of the result for a coverage factor of K=2 (95%).

Observation or deviation from the Standard

Apparatus

12060IE05

Test atmosphere

Temperature	(35.0±0.5) °C
Relative humidity	(40±3) %

Conditioning

Temperature	(35.0±0.5) °C
Relative humidity	(40±3) %
Time	24 hours

Sample description

Navy woven fabric + yellow laminated non-woven fabric + yellow non-woven fabric seamed to navy lining.

Disposition test specimens

The membrane of yellow laminated non-woven fabric is oriented to inside.

Pre-treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying.



RESULTS

Test results

Reference	Specimen	Water vapour resistance R_{et} (m^2Pa/W)
TESAFIRE FIGHTER SUIT 0025	Specimen 1	12,51
	Specimen 2	13,03
	Specimen 3	13,09
	Average	12,86

According to the requirements of EN 469:2020 standard, water vapour resistance shall be in accordance with the following table:

Z1	$45 m^2 \cdot Pa/W \geq R_{et} > 30 m^2 \cdot Pa/W$
Z2	$R_{et} \leq 30 m^2 \cdot Pa/W$

GRADE Z2



RESULTS

DETERMINATION OF THE AREAS OF VISIBLE MATERIALS

Standard

EN 469:2020

Test uncertainty
 $\pm 1,5 \cdot 10^{-4} \text{m}^2$

Reference	TESAFIRE FIGHTER SUIT 0025	
Size	Background material (m ²)	Retroreflective material (m ²)
S	0,20	0,13

ACCORDING TO EN 469: 2020 PASS

 Requirements for minimum surface of visible material in m² according to EN 469: 2020 point 6.2.6

Background material (m ²)	≥ 0,20
Retroreflective material (m ²)	≥ 0,13

_____///



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard

CIE 54.2 modified by EN ISO 20471:2013/A1:2016 section 7.3

Apparatus

Optronik rms 10 retroreflectometer 13320E06

Light lamp

CIE standard Illuminant A

Measurement distance

A=15 m

B= 16 m

To determine the retroreflection coefficient is considered

$\epsilon_1 = 0^\circ$ vertical retroreflective strips

$\epsilon_2 = 90^\circ$ Horizontal retroreflective strips.

Deviation from the Standard

Test was carried out as result verification only at Observation / Entrance angles $12' / 5^\circ$

_____>>>



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference	TESAFIRE FIGHTER SUIT 0025
Pre-treatment	As received
Sample size	60 cm ²
Measurement distance	A
Date test	26/05/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m ²)
12' / 5°	ε1 = 0° vertical	343,3
12' / 5°	ε2 = 90° horizontal	348,5

Remark:

The uncertainty of the assay of retroreflective photometric performance is $\pm 2\%$ of the value measured, for a coverage factor of K=2 (95%).

Minimum coefficient of retroreflection in cd/(lx m²) for separate performance retroreflective material according to section 6.1 of standard EN ISO 20471:2013/A1.2016

Observation angle	Entrance angle			
	5°	20°	30°	40°
12'	330	290	180	65
20'	250	200	170	60
1°	25	15	12	10
1°30'	10	7	5	4

///



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard

CIE 54.2 modified by EN ISO 20471:2013/A1:2016 section 7.3

Apparatus

Optronik rms 10 retroreflectometer 13320E06

Light lamp

CIE standard Illuminant A

Measurement distance

A=15 m

B= 16 m

To determine the retroreflection coefficient $R(\text{cd/m}^2\text{luxes})$ is considered

$\epsilon_1 = 0^\circ$ vertical retroreflective strips

$\epsilon_2 = 90^\circ$ Horizontal retroreflective strips.

Deviation from the Standard

Test was carried out as result verification only at Observation / Entrance angles $12' / 5^\circ$

>>>



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference	TESAFIRE FIGHTER SUIT 0025
Pre-treatment	After heat 180
Sample size	60 cm ²
Measurement distance	A
Date test	26/05/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m ²)
12' / 5°	ε1 = 0° vertical	222,3
12' / 5°	ε2 = 90° horizontal	215,6

Remark:

The uncertainty of the assay of retroreflective photometric performance is $\pm 2\%$ of the value measured, for a coverage factor of K=2 (95%).

Minimum coefficient of retroreflection in cd/(lx m²) for separate performance retroreflective material according to section 6.2.2 of standard EN ISO 20471:2013/A1:2016

Observation angle Entrance angle	Position	Separate performance retroreflective material requirement after pre- treatment
12' / 5°	ε1 = 0° vertical	≥ 100 (cd/m ² ·lx)
12' / 5°	ε1 = 90° horizontal	

///



RESULTS

DETERMINATION OF TEMPERATURE AND ENTHALPY OF MELTING

Standard

ISO 11357-1:2016

ISO 11357-3:2018

ApparatusDifferential scanning calorimeter DSC 3+/METTLER of heat flow rate with aluminum crucible 40 μ l**Calibration**

Calibration type Simple

Procedure

Standard reference materials: Indium de 99,99999 % putity, 4,80 mg

Zinc de 99,99998% de purity, 2,80 mg

Tin de 99,99998% de purity, 6,00 mg

Test conditionsGas: N₂ Grade: 99,99% Flow rate: 50ml/min**Previous conditioning**According standard EN 20139-1993 (20 \pm 2°C y 65 \pm 4%HR)**Number of specimens:**

1

Temperaturas program

First heating cycle from 20 to 300°C at 20°C/min

Isotherm at 300°C, 5 minutes

Cooling cycle at 20°C/min until 20°C

Second heating cycle from 20 to 300°C at 20°C/min

>>>



RESULTS

DETERMINATION OF TEMPERATURE AND ENTHALPY OF MELTING

Start date test

30/04/2021

End date test

30/04/2021

Results

Reference	Heat of fusion
TESAFIRE FIGHTER SUIT 0025 (sewing threat)	NO MELT

Requisite

According UNE-EN 469:2020 6.2.1.7, two specimens of the sewing thread for structural seams shall be tested as received in accordance with the hot plate test in EN ISO 3146:2000 and shall not melt at a temperatura of $(260 \pm 5) ^\circ\text{C}$.

PASS

_____///



RESULTS

HEAT RESISTANCE

Standard

ISO 17493:2016

Apparatus

Air stove

Temperature

(180 ± 5) °C

Length of the test

5 min (+0,15/-0) min

Deviation from the Standard

Pre-Treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Tested material

Internal (Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.)

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Fabric				
Flame	Melting	Direction	Shrink(-) / Elongation(+)	
No	No	Warp		-1,6 %
		Weft		-0,1 %
No	No	Warp		-0,6 %
		Weft		-0,2 %
No	No	Warp		-1,0 %
		Weft		-0,5 %

Remark

The uncertainty of the assay of Heat Resistance is $\pm 12\%$ of the value measured, for a coverage factor of $K=2$ [95%].

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	PASS
--	------

Requirements to meet according to EN 469:2020

No layer can ignite
No layer can melt
No layer shrinks more than 5%

///



RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date

11/05/2021 - 13/05/2021

Conditioned

24h in indoor ambient conditions at $(20 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{ RH}$

Original and after pre-treatment ambient conditions test

21,6°C and 34,4% RH - 22,4°C and 38,1% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Surfaces: Inner seams

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the assay of limited flame spread is $\pm 2\%$ of the value measured, for a coverage factor of $K=2$ (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

----->>>



RESULTS

Pre-Treatment As received

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After-flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

Pre-Treatment 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After-flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

>>>



RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3
--	----------------

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

- | |
|--|
| a) The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen |
| b) No specimen shall give flaming or molten debris. |
| c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection |
| d) The afterflame time is ≤ 2 s |
| e) The afterglow time is ≤ 2 s |
| f) Seams do not separate |

///



RESULTS

HEAT RESISTANCE

Standard

ISO 17493:2016

Apparatus

Air stove

Temperature

$(180 \pm 5) ^\circ\text{C}$

Length of the test

5 min (+0,15/-0) min

Deviation from the Standard

Fabric tested after washing.

Pre-Treatment

5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Tested material

Assembly: Navy blue woven fabric, yellow non-woven sewn to grey woven fabric

Reference

Tesafire Fighter Suit 0025

----->>>



RESULTS

Fabric				
Flame	Melting	Direction	Shrink(-) / Elongation(+)	
No	No	Warp		-1,1 %
		Weft		-1,5 %
No	No	Warp		-1,4 %
		Weft		-1,8 %
No	No	Warp		-1,2 %
		Weft		-1,2 %

Remark

The uncertainty of the assay of Heat Resistance is $\pm 12\%$ of the value measured, for a coverage factor of $K=2$ [95%].

PERFORMANCE LEVEL ACCORDING TO EN 469:2020

PASS

Requirements to meet according to EN 469:2020

No layer can ignite
No layer can melt
No layer shrinks more than 5%

///



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard

CIE 54.2 modified by EN ISO 20471:2013/A1:2016 section 7.3

Apparatus

Optronik rms 10 retroreflectometer 13320E06

Light lamp

CIE standard Illuminant A

Measurement distance

A=15 m

B= 16 m

To determine the retroreflection coefficient $R(\text{cd/m}^2\text{luxes})$ is considered

$\epsilon_1 = 0^\circ$ vertical retroreflective strips

$\epsilon_2 = 90^\circ$ Horizontal retroreflective strips.

>>>



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference	Tesafire Fighter Suit 0025
Pre-treatment	After 5 washing cycles at 60°C, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry) + After 5 minutes Heat Resistance according to the Standard ISO 17493:2016 at 180°C
Sample size	60 cm ²
Measurement distance	A
Date test	28/09/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m ²)
12' / 5°	ε1 = 0° vertical	222,9
12' / 5°	ε2 = 90° horizontal	219,9

PERFORMANCE LEVEL ACCORDING EN ISO 20471:2013/A1:2016

PASS

Remark:

The uncertainty of the assay of retroreflective photometric performance is $\pm 2\%$ of the value measured, for a coverage factor of K=2 (95%).

Requirements According to the Standard EN 469:2020, point 6.2.6.4. the minimum coefficient of retroreflection for materials or combined must be in accordance to section 6.1 of standard EN ISO 20471:2013.

Minimum coefficient of retroreflection in cd/(lx m²) for combined retroreflective material according to section 6.1 of standard EN ISO 20471:2013

Observation angle. Entrance angle	Position	Separate performance retroreflective material requirement after pre- treatment
12' / 5°	ε1 = 0° vertical	≥ 100 (cd/m ² ·lx)

///



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard

CIE 54.2 modified by ISO 20471:2013/A1:2016 section 7.3

Apparatus

Optronik rms 10 retroreflectometer 13320E06

Light lamp

CIE standard Illuminant A

Measurement distance

A=15 m

B= 16 m

To determine the retroreflection coefficient is considered

$\epsilon_1 = 0^\circ$ vertical retroreflective strips

$\epsilon_2 = 90^\circ$ Horizontal retroreflective strips.

Deviation from the Standard

Test was carried out as result verification only at Observation / Entrance angles $12' / 5^\circ$

_____>>>



RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference Tesafire Fighter Suit 0025

Sample size 60 cm²

Measurement distance A

Date test 28/09/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m2)
12' / 5°	ε1 = 0° vertical	343,3
12' / 5°	ε2 = 90° horizontal	348,5

PERFORMANCE LEVEL ACCORDING EN ISO 20471:2013/A1:2016 PASS

Remark:

The uncertainty of the assay of retroreflective photometric performance is $\pm 2\%$ of the value measured, for a coverage factor of K=2 (95%).

Minimum coefficient of retroreflection in cd/(lx m2) for separate performance retroreflective material according to section 6.1 of standard ISO 20471:2013/A1:2016

Observation angle	Entrance angle			
	5°	20°	30°	40°
12'	330	290	180	65
20'	250	200	170	60
1°	25	15	12	10
1°30'	10	7	5	4

///



Lucia Martinez
Head of PPE and Ballistics department

Digitally signed by LUCIA MARTINEZ
 MOLTO - NIF:21651425F
 Date: 2021.10.07 18:25:18 +02:00
 Reason: Responsable
 Location: Alcoy

LIABILITY CLAUSES

- 1.- AITEX is liable only for the results of the methods of analysis used, as expressed in the report and referring exclusively to the materials or samples indicated in the same which are in its possession, the professional and legal liability of the Centre being limited to these. Unless otherwise stated, the samples were freely chosen and sent by the applicant.
- 2.- AITEX shall not be liable in any case of misuse of the test materials nor for undue interpretation or use of this document
- 3.- The Offer and / or Order to which the applicant gives approval through signature and seal, constitutes the Legally Executable Agreement in which AITEX is responsible for safeguarding and guaranteeing the absolute confidentiality of the management of all the information obtained or created during the performance of the contracted activities.
- 4.- In the eventuality of discrepancies between reports, a check to settle the same will be carried out in the head offices of AITEX. Also, the applicants undertake to notify AITEX of any complaint received by them as a result of the report, exempting this Centre from all liability if such is not done, the periods of conservation of the samples being taken into account.
- 5.- AITEX will provide at the request of the person concerned, the treatment of complaints procedure. In the event that you want to make it, direct it to: calidad@aitex.es.
- 6.- AITEX is not responsible for the information provided by customers, which is reflected in the Report, and may affect the validity of the results.
- 7.- AITEX is not responsible for an inadequate state of the sample received that could compromise the validity of the results, expressing such circumstance, in the test reports.
- 8.- AITEX may include in its reports, analyses, results, etc., any other evaluation which it considers necessary, even when it has not been specifically requested.
- 9.- When a Declaration of Conformity is requested, if not indicated otherwise, the decision rule will be applied according to ILAC-G8 & ISO 10576-1, in case of ambiguity, or indeterminacy
- 10.- The uncertainties of tests, which are made explicit in the Results Report, have been estimated for a $k = 2$ (95% probability of coverage). If not informed, they are available to the client in AITEX.
- 11.- The original materials and rests of samples, not subject to test, will be retained in AITEX during the twelve months following the issuance of the report, so that any check or claim which, in his case, wanted to make the applicant, should be exercised within the period indicated.
- 12.- This report may only be sent or delivered by hand to the applicant or to a person duly authorised by the same.
- 13.- The results of the tests and the statement of compliance with the specification in this report refer only to the test sample as it has been analyzed / tested and not the sample / item which has taken the test sample.
- 14.- The client must attend at all times, to the dates of the realization of the tests.
- 15.- According to Resolution EA (33) 31, the test reports must include the unique identification of the sample, and any brand or label of the manufacturer may be added. It is not allowed to re-issue test reports of untested sample names (references), they can only be re-issued for error correction or inclusion of omitted data that were already available at the time of the test. The laboratory can not assume responsibility for declaring that the product with the new trade name / trademark is strictly identical to the one originally tested; This responsibility belongs to the client.
- 16.- This report may not be partially reproduced without the written approval of the issuing laboratory.