

LABORATÓRIOS - V.N.FAMALICÃO



COMPANY

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Request Nr.: 8368/2017

Date of Reception : 2017/08/21

Observations

Samples reference - Your reference

13874/2017 - Ref: Aramid D1 210

Tests required

Tests according EN ISO 11612

2/1 Twill 93% M- Aramid 5% P-Aramid 2% Carbon Ref. Aramid D1 210 210 g/m²

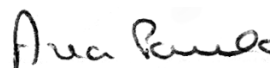
COMMENTS

See last page

- The tests were performed between the following dates: 2017/08/21 and 2017/08/30.

V.N.FAMALICÃO, 31th August 2017

LABORATORY
COORDINATOR



(Eng^a Ana Paula Fonte)

NOTES:

- These results were obtained according to the proceedings referred in the Quality Manual of CITEVE and concern only the samples submitted to testing (above mentioned).
- Any part of this report cannot be reproduced without the prior permission of CITEVE.
- The tests signalled by * are not included in the scope of accreditation of this laboratory
- q.l - quantification limit d.l. - detection limit n.d. - not detected
- Samples are stored for 6 months after the date of entry, except for chemical products that are stored for a month.

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| | | | | |
|--------------------|---|--------------------|---|---------------------------|
| Sample Ref. | - | Your ref. | - | Sample description |
| 13874 /2017 | | Ref: Aramid D1 210 | | 1 Sample of 1/2 twill |

Test/Standard: *TEAR STRENGTH / EN ISO 13937-2:2000*

Results

| | After wash (see washing) |
|------------------------------|-----------------------------|
| Warp - Individual values (N) | 50 57 52 55 50 |
| Warp - Mean value (N) | 53 |
| Uncertainty (N) | ±6,6 |
| Weft - Individual values (N) | 49 52 52 48 49 |
| Weft - Mean value (N) | 50 |
| Uncertainty (N) | ±7,5 |
| Number of tests rejected - | 0 |
| Reasons for tests rejected - | Not applicable |

Test Conditions

Mean values calculated by electronic device

Number of the specimens - 10

Type of clamps - flats, 25 mm x 75 mm

Test/Standard: *TENSILE STRENGTH (STRIP METHOD) / ISO 13934-1:2013*

Results

| | After wash (see washing) |
|------------------------------|--------------------------------------|
| MAXIMUM FORCE | |
| Warp - Individual values (N) | 1600 1600 1700 1600 1600 |

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| | |
|------------------------------------|--------------------------------------|
| Warp - Mean value (N) | 1600 |
| Uncertainty (N) | ±1,9x10 ² |
| Weft - Individual values (N) | 1000 1000 1100 1000 1100 |
| Warp - Mean value (N) | 1000 |
| Uncertainty (N) | ±1,3x10 ² |
| ELONGATION AT MAXIMUM FORCE | |
| Warp - Individual values (%) | 35 36 36 34 35 |
| Warp - Mean value (%) | 35 |
| Uncertainty (%) | ±4,2 |
| Weft - Individual values (%) | 24 25 25 25 25 |
| Warp - Mean value (%) | 25 |
| Uncertainty (%) | 2,7 |

Test Conditions

Number of specimens tested - 10 (total)

Width of specimens - 50 mm

Gauge length - 200 mm

Pretension (N) - 5

State of specimens - conditioned

Rate of extension - 100 mm/min

Conditioned Atmosphere:

20+/-2°C and 65+/-4% R.H.

Test/Standard: DIMENSIONAL STABILITY TO DOMESTIC WASHING AND DRYING / EN ISO 6330:2012

Results

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| Specimen: | 1st | 2nd | 3rd |
|-------------------------------------|-------|------|------|
| Wales/length/warp (mean value %) - | -0,6 | -0,7 | -0,3 |
| Courses/width/weft (mean value %) - | -0,2 | -0,3 | -0,2 |
| Uncertainty | | | |
| Wales/length/warp (%) - | ±0,48 | | |
| Courses/width/weft (%) - | ±0,46 | | |

Test Conditions

| | |
|---|----------------|
| Washing machine: Type A | |
| Washing programme (ISO 6330:2012): | 6N (60°C) |
| Total load (kg): 2 | |
| Type of load used: | 100% polyester |
| Detergent used: Ref.6 (IEC) | |
| Sodium perborate+TAED | |
| Drying method: | Tumble dry |
| Number of washing and drying cycles: 5 | |
| Number of specimens tested: 3 | |
| Note: the signal + means extension and the signal - means shrinkage. | |

Test/Standard: * **WASHING / ISO 6330:2012**

Results

Test Conditions

| | |
|---|-------------------|
| Washing machine: Type A | |
| Washing programme (ISO 6330:2012): | 6N (60°C) |
| Total load (kg): 2 | |
| Detergent used: IEC + Sodium Perborate +TAED | |
| Drying method: | Tumble dry |
| Number of washing and drying cycles: | 5 wash/dry cycles |
| Number of specimens tested: | 1 |

Test/Standard: **CONVECTIVE HEAT RESISTANCE / ISO 17493:2000**

Results

| Specimen: | After washing (see treatment) | | |
|------------------------------------|----------------------------------|------|------|
| | 1st | 2nd | 3rd |
| Variation on dimensions: | | | |
| Wales/length/warp (mean value %) - | -0,1 | -0,2 | -0,1 |

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| | | | |
|---------------------------------------|----------------|------|------|
| Courses/width/weft (mean value %) - | -0,1 | -0,4 | -0,4 |
| Uncertainty | | | |
| Wales/length/warp (%) - | ±0,48 | | |
| Courses/width/weft (%) - | ±0,46 | | |
| Ignition: | No | | |
| Melting (hole, dripping): | No | | |
| Separation (splitting, delamination): | Not applicable | | |

Test Conditions

| | |
|---|-------------|
| Temperature of exposure: | 180°C |
| Time of exposure: | 5 min. |
| Dimensions of the specimens (cm): | 38,5 X 38,5 |
| Number of specimens tested: | 3 |
| Note: the signal + means extension and the signal - means shrinkage. | |

Test/Standard: *AROMATIC AMINES DERIVED FROM AZOCOLORANTS / EN 14362-1:2012*

Results

| Results in mg/kg | |
|-------------------------------------|------------|
| 4-Aminobiphenyl | < 5 (q.l.) |
| Benzidine | < 5 (q.l.) |
| 4-Chloro-o-toluidine | < 5 (q.l.) |
| 2-Naphthylamine | < 5 (q.l.) |
| ^a o-Aminoazotoluene | < 5 (q.l.) |
| ^a 5-Nitro-o-toluidine | < 5 (q.l.) |
| 4-Chloroaniline | < 5 (q.l.) |
| 2,4-Diaminoanisole | < 5 (q.l.) |
| 4,4'-Diaminodiphenylmethane | < 5 (q.l.) |
| 3,3'-Dichlorobenzidine | < 5 (q.l.) |
| 3,3'-Dimethoxybenzidine | < 5 (q.l.) |
| 3,3'-Dimethylbenzidine | < 5 (q.l.) |
| 4,4'-Methylene-di-o-toluidine | < 5 (q.l.) |
| p-Cresidine | < 5 (q.l.) |
| 4,4'-Methylene-bis-(2-chloraniline) | < 5 (q.l.) |
| 4,4'-Oxydianiline | < 5 (q.l.) |
| 4,4'-Thiodianiline | < 5 (q.l.) |
| o-Toluidine | < 5 (q.l.) |
| 2,4-Diaminotoluene | < 5 (q.l.) |
| 2,4,5-Trimethylaniline | < 5 (q.l.) |
| o-Anisidine | < 5 (q.l.) |

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| | |
|---------------------|------------|
| 2,4-Xylidine | < 5 (q.l.) |
| 2,6-Xylidine | < 5 (q.l.) |
| ° 4-Aminoazobenzene | < 5 (q.l.) |

^aThese amines are reduced to o-toluidine and 2,4-Diaminotoluene.

^oThis amine is reduced to aniline and/or 1,4-phenylenediamine. If detected an additional test must be performed.

Quantification method: GC-MS
All positive result is confirmed by an additional method.

Test Conditions

Procedure: 9.2

Test/Standard: pH OF AQUEOUS EXTRACT / ISO 3071:2005

Results

| | |
|-----------------|-----|
| Mean pH-value - | 6,0 |
|-----------------|-----|

Test Conditions

| | |
|--|-------|
| Type of solution used - | KCl |
| pH of the extracting solution - | 6,1 |
| Temperature of the extracting solution - | 22 °C |

Test/Standard: CONTACT HEAT TRANSMISSION / EN ISO 12127-1: 2015

Results

| | |
|--|-------------------|
| Threshold time, tt | |
| Individual values (s) : | 6,3 6,4 6,1 |
| Mean value (s) : | 6,3 |
| Standard deviation (s) : | 0,12 |
| Uncertainty of measurement (s) : | ± 0,22 |
| Observed changes in the test specimens : | No changes |

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Test Conditions

Contact temperature (Tc) : 250°C
Number of specimens: 5
State of specimens: After
washed (see washing)

Test/Standard: *BURNING BEHAVIOUR / ISO 15025:2016*

Results

| | Original | | | After washed | | |
|---|----------|----|----|--------------|----|----|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| Test / specimens: | | | | | | |
| WARP/ LENGTH for procedure A | | | | | | |
| Flaming reaches the upper edge or either vertical edge of the specimen: | No | No | No | No | No | No |
| Afterflame time (s): | 0 | 0 | 0 | 0 | 0 | 0 |
| Uncertainty of measurement (%): | ±15 | | | ±15 | | |
| Afterglow spreads beyond the flame spread area into the undamaged area: | No | No | No | No | No | No |
| Afterglow time (s): | 0 | 0 | 0 | 0 | 0 | 0 |
| Uncertainty of measurement (%): | ±15 | | | ±15 | | |
| Occurrence of melting: | No | No | No | No | No | No |
| Occurrence of debris: | No | No | No | No | No | No |
| Debris ignites the filter paper (flaming debris) or melts: | No | No | No | No | No | No |
| The seams thread remains intact: | N/A | | | N/A | | |
| Hole develops: | No | No | No | No | No | No |
| Number of holes (for multilayers): | N/A | | | N/A | | |
| Hole(s) developed in which layer(s): | N/A | | | N/A | | |
| Size of the largest hole (mm): | N/A | | | N/A | | |
| WARP/ LENGTH (procedure B) | | | | | | |
| Flaming reaches the upper edge or either vertical edge of the specimen: | No | No | No | No | No | No |
| Afterflame time (s): | 0 | 0 | 0 | 0 | 0 | 0 |
| Uncertainty of measurement (%): | ±15 | | | ±15 | | |
| Afterglow spreads beyond the flame spread area into the undamaged area: | No | No | No | No | No | No |
| Afterglow time (s): | 0 | 0 | 0 | 0 | 0 | 0 |
| Uncertainty of measurement (%): | ±15 | | | ±15 | | |
| Occurrence of melting: | No | No | No | No | No | No |
| Occurrence of debris: | No | No | No | No | No | No |
| Debris ignites the filter paper (flaming debris) or melts: | No | No | No | No | No | No |
| The seams thread remains intact: | N/A | | | N/A | | |

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| | | |
|---|----------|----------|
| Size of the largest hole (mm): | N/A | N/A |
| The layers were tested separately or together (for multilayers): | N/A | N/A |
| WEFT/ WIDTH for procedure A | | |
| Flaming reaches the upper edge or either vertical edge of the specimen: | No No No | No No No |
| Afterflame time (s): | 0 0 0 | 0 0 0 |
| Uncertainty of measurement (%): | ±15 | ±15 |
| Afterglow spreads beyond the flame spread area into the undamaged area: | No No No | No No No |
| Afterglow time (s): | 0 0 0 | 0 0 0 |
| Uncertainty of measurement (%): | ±15 | ±15 |
| Occurrence of melting: | No No No | No No No |
| Occurrence of debris: | No No No | No No No |
| Debris ignites the filter paper (flaming debris) or melts: | No No No | No No No |
| The seams thread remains intact: | N/A | N/A |
| Hole develops: | No No No | No No No |
| Number of holes (for multilayers): | N/A | N/A |
| Hole(s) developed in which layer(s): | N/A | N/A |
| Size of the largest hole (mm): | N/A | N/A |
| WEFT/ WIDTH for procedure B | | |
| Flaming reaches the upper edge or either vertical edge of the specimen: | No No No | No No No |
| Afterflame time (s): | 0 0 0 | 0 0 0 |
| Uncertainty of measurement (%): | ±15 | ±15 |
| Afterglow spreads beyond the flame spread area into the undamaged area: | No No No | No No No |
| Afterglow time (s): | 0 0 0 | 0 0 0 |
| Uncertainty of measurement (%): | ±15 | ±15 |
| Occurrence of melting: | No No No | No No No |
| Occurrence of debris: | No No No | No No No |
| Debris ignites the filter paper (flaming debris) or melts: | No No No | No No No |
| The seams thread remains intact: | N/A | N/A |
| The layers were tested separately or together (for multilayers): | N/A | N/A |

Note:

"0" means did not ignite

N/A - Not applicable

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Test Conditions

Test procedure: Surface ignition (A) and
Bottom edge ignition (B)
The surface exposed towards the flame:
Right side
Type of gas used: Propane
Flame application time: 10s
Environmental conditions of test:
23°C and 60%RH
Technique used to attach fabrics:
support on pins
Size of specimens:
Surface ignition (A): (200 X 160) mm
Bottom edge ignition (B): (200 X 80) mm
State of specimens: As received and
after washed (see washing)
Conditioning: 24h at (20±2)°C and
(65±5)% R.H.

**Test/Standard: PROTECTION AGAINST HEAT AND FIRE: SOURCE OF RADIANT HEAT / ISO
6942:2002**

Results

| | |
|---------------------------------------|-------------------|
| Transmitted heat flux - Qc | |
| Individual values (kW/m²) : | 8,5 8,6 9,1 |
| Mean value (kW/m²) : | 8,8 |
| Heat transmission factor - TF | |
| Individual values : | 0,4 0,4 0,5 |
| Mean value : | 0,4 |
| Time for a 12°C temperature raise | |
| Individual values (s) : | 8,4 8,3 8,0 |
| Radiant heat transfer index (RHTI 12) | |
| Mean value (s): | 8,2 |
| Uncertainty of measurement (s): | ± 2,1 |
| Time for a 24°C temperature raise | |

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| | |
|---------------------------------------|----------------------|
| Individual values (s) : | 16,2 16,0 15,3 |
| Radiant heat transfer index (RHTI 24) | |
| Mean value (s): | 15,8 |
| Uncertainty of measurement (s): | ± 2,0 |
| RHTI 24 - RHTI 12 | |
| Individual values (s) : | 7,8 7,7 7,3 |
| Mean value (s) : | 7,6 |
| Uncertainty of measurement (s): | ± 1,4 |

Test Conditions

Incident heat flux density (kW/m²): 20
Number of specimen tested: 3
State of specimens: After washed (see washing)
Test atmosphere: 15°C-35°C

Test/Standard: PROTETION AGAINST HEAT AND FIRE - FLAME EXPOSURE / ISO 9151:2016

Results

| | |
|----------------------------------|-------------------|
| Time for a 24°C temperature rise | |
| Individual values (s) : | 5,4 5,4 5,6 |
| Heat tranfer index HTI24 (s) : | 5,5 |
| Uncertainty of measurement (s): | ± 0,65 |
| Time for a 12°C temperature rise | |
| Individual values (s) : | 3,6 3,6 3,6 |
| Heat tranfer index HTI12 (s) : | 3,6 |
| Uncertainty of measurement (s): | 0,43 |
| HTI24 - HTI12 (s) : | 1,9 |
| Change in appearance : | Discolored |

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These results have been obtained by a test method aimed solely at ranking the materials tested and are not necessarily applicable to actual fire conditions.

Test Conditions

Incident heat flux: (80 ± 2) kW/m²
Calorimeter used: Method B
Gas used: Propane
Conditioning: 24h at (20 ± 2) °C and (65 ± 5) % R.H.
Environmental test conditions:
State of specimens: After washed (see washing) and conditioned.

COMMENTS

The sample our ref. 13874/2017 is according EN ISO 11612:2015 in tear strength (warp $50N \pm 6,6N$ and weft $48N \pm 7,5N$, minimum requirement 10N), tensile strength (warp $1600N \pm 190N$ and weft $1000N \pm 130N$, minimum requirement 300N), dimensional stability to domestic washing and drying (after 5 cycles 6N (60°C) Tumble dry: warp $-0,7\% \pm 0,48\%$ and weft $-0,3\% \pm 0,46\%$, maximum requirement $\pm 3\%$), heat resistance (180°C: warp $-0,2\% \pm 0,48$ and weft $-0,4\% \pm 0,46$, maximum shrinkage requirement 5%), burning behaviour (limited flame spread - CODE LETTER A1, requirement: no specimen shall: suffer flaming to the top or either side edge, suffer hole, give flaming or molten debris and all specimens shall have after flame time and afterglow time $\leq 2s$), protection against heat and fire: source of radiant heat (CODE LETTER C1, RHTI24 = $15,3s \pm 2,0s$, requirement code letter C1 RHTI24: $7,0s - <20,0s$), protection against heat and fire exposure (CODE LETTER B1, HTI24= $5,4s \pm 0,65s$, requirement code letter B1 HTI24: $4,0s - <10,0s$), contact heat transmission (CODE LETTER F1, threshold $6,1s \pm 0,22s$, requirement code letter F1 threshold: $5,0s - <10,0s$) and is according EN ISO 13688:2013 in aromatic amines derived from azocolorants (requirement not detectable) and pH of aqueous extract (requirement 3,5 to 9,5).



request 8368-2017 sample 13874-2017