

The following sample(s) was/were submitted and identified on behalf of the client as:

Sample Description : (A)Knitted garment (MICROPOLAR HI-VIS CLASS 3)
(B)Knitted fabric (shell fabric for A)

Sample Color : (A)fluorescent yellow;(B)fluorescent yellow

Composition : (A)100% polyester;(B)100% polyester

Sample Dimension/Size : S

Style No. : 03269

Factory :

Buyer : TEXORA S.A. AVDA. PRESIDENTE EDUARDO FREI MONTALVA 9931,
QUILICURA, CHILE

Country of Origin : China

Country of Destination : Chile

Proposed Care Instruction :



Test Performed : Selected test(s) as requested by applicant

Sample Receiving Date : Jan 11, 2024

Testing Period : Jan 15, 2024 - Jan 25, 2024

Test Result(s) : Unless otherwise stated the results shown in this test report refer only to the sample(s) tested, for further details, please refer to the following page(s).

Signed for and on behalf of
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd

Sara Guo (Account Executive)

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High-visibility clothing - Test methods and requirements (EN ISO 20471:2013+A1:2016)

Conclusion	A	B	Remark
Clause 4 Design	Class 3	-	
Clause 5.1 Colour Performance Requirements of New Material	PASS	-	
Clause 5.1 Colour Performance Requirements of Material after Domestic Washing	PASS	-	
Clause 5.2 Colour Performance Requirements of Materials after Xenon Test	-	PASS	
Clause 5.3.1 Colour Fastness To Rubbing	PASS	-	
Clause 5.3.2 Colour Fastness To Perspiration	PASS	-	
Clause 5.3.3 Colour Fastness To Washing	PASS	-	
Clause 5.4 Dimensional Change after Domestic Washing	PASS	-	
Clause 5.5.2 Bursting Strength	-	FAIL	
Clause 5.6 Physiological performance - Water vapour and thermal resistance	-	PASS	
Clause 6.1 Retroreflection for Retroreflective Material	PASS	-	
Clause 6.2 Retroreflection after Abrasion	PASS	-	
Clause 6.2 Retroreflection after Flexing	PASS	-	
Clause 6.2 Retroreflection After Folding At Cold Temperatures	PASS	-	
Clause 6.2 Retroreflection After Temperature Variation	PASS	-	
Clause 6.2 Retroreflection Under The Influence Of Rainfall	PASS	-	
Clause 6.2 Retroreflection After Washing	PASS	-	

Remark(s) : FAIL=Below General Requirement
PASS=Meet General Requirement



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Test Result

High-visibility clothing - Test methods and requirements

EN ISO 20471:2013+A1:2016

Clause 4 Design

(EN ISO 20471:2013+A1: 2016 Clause 4.1 & 4.2)

Sample: A

Garment size: S

Types and Classes	Minimum required areas of visible material (m ²)			Result	Recommended Classification
	Class 3	Class 2	Class 1		
Background material(m ²)	0.80	0.50	0.14	0.88	Class 3
Retroreflective material(m ²)	0.20	0.13	0.10	0.27	
Combined performance material(m ²)	N/A	N/A	0.20	/	
At least (50+/-10)% of the minimum area of visible background material shall be on the front part of garment.				Front (%):54	

Remarks:

- (1) The area shall be measured on the smallest garment size available with all fasteners adjusted to the smallest configuration possible.
- (2) The minimum visible area requirements to achieve a garment classification in Table 1 are not to be reduced or compromised due to the presence of any logos, lettering, labels etc.
- (3) Only those area of retroreflective materials that comply with the design requirements of clause 4.2 shall be used in the assessment of the minimum required area of retroreflective areas.
- (4) When using two or more background materials, the total area usable regardless of colour shall be measured.
- (5) A higher performance class can be obtained if the assembly meets the minimum requirement of higher class achieved by actually visible area when wearing the garment.

Note:

- (1) The garment shall be made up of high visibility material on all sides. To ensure visibility from all sides(360° visibility), it is important that horizontal retroreflective bands and fluorescent materials encircle torso, trouser legs and sleeves.
- (2) Regardless of the area of materials used, a class 3 garment shall cover the torso and shall have as a minimum either sleeves with retroreflective bands or full length trouser legs with retroreflective bands, if not both.



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Clause	Specific design requirements	Results	Pass/Fail
4.2.2	Garments covering torso and arms The background material shall encircle the torso and the sleeves and shall maintain a minimum width (height) of 50 mm. Interruptions by retroreflective stripes are not counted. Bands of retroreflective material shall be at least 50 mm wide.	Yes 50mm	Pass
	Garments covering the torso and arms shall have one or more bands of retroreflective material encircling the torso with a maximum inclination of $\pm 20^\circ$ to the horizontal and bands of retroreflective material joining the torso band from the front to the back over each shoulder. The bottom of the lowest torso band shall be at least 50 mm above the bottom edge. If more than one horizontal band is applied, the horizontal bands shall be at least 50 mm apart.	7° 87mm 105mm	Pass
	Alternatively, garments covering torso and arms shall have two or more bands of retroreflective material at least 50 mm apart and encircling the torso with a maximum inclination of $\pm 20^\circ$ to the horizontal. The bottom of the lowest torso band shall be at least 50 mm above the bottom edge.	N/A	/
	If a sleeve blocks a clear view of a horizontal torso band, then the sleeve shall be encircled by a retroreflective band. If it is a long sleeve (1/1 arm) garment, the sleeve shall be encircled by two bands of retroreflective material at least 50 mm apart.	N/A	/
	If a sleeve blocks a clear view of two horizontal torso bands, then the sleeve shall be encircled with two retroreflective bands at least 50 mm apart with the lower band at least 50 mm above the sleeve edge. Testing regarding the clear view shall be done by visual inspection while moving the arm in all positions.	90mm 137mm	Pass
	Any gap (for fastening systems and seams) in the lengthwise continuity of each band of retroreflective or combined performance material shall not be greater than 50 mm, measured parallel to the direction of the band, and the total of such gaps shall not be greater than 100 mm in any one band around the torso and 50 mm around the sleeves.	11mm 11mm 0mm	Pass



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Clause 5.1 Colour Performance Requirements of New Material

(EN ISO 20471:2013+A1:2016, Clause 7.2)

-	Unit	A
Chromaticity coordinates, x value	-	0.378
Chromaticity coordinates, y value	-	0.548
Luminance Factor, β	-	1.18

Conclusion: Pass

Remark:

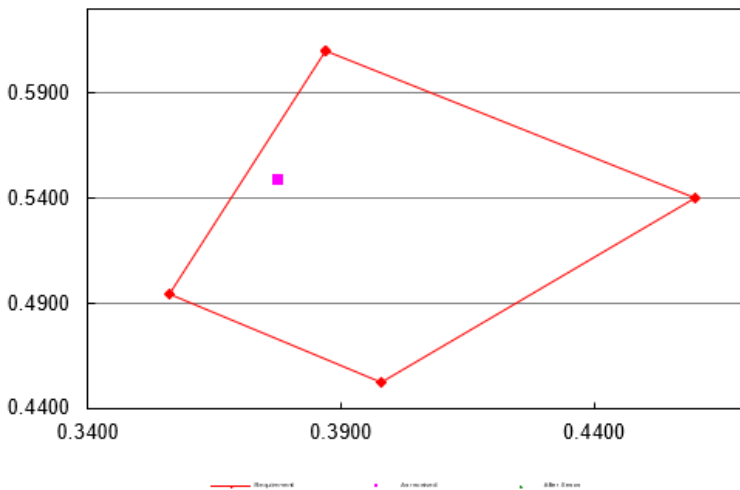
The chromaticity coordinates and the luminance factor shall comply with the requirement as below. The chromaticity shall be within one of the areas and the luminance factor shall comply with the corresponding minimum value.

Fluorescent yellow:

Chromaticity coordinates x/y: 0.387/0.610, 0.356/0.494, 0.398/0.452, 0.460/0.540.

Minimum luminance factor β_{min} : 0.70

Graphs:



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Clause 5.1 Colour Performance Requirements of Material after Domestic Washing

(EN ISO 20471:2013+A1:2016, Clause 7.2)

After 25 Washes

	Unit	A
Chromaticity coordinates, x value	-	0.375
Chromaticity coordinates, y value	-	0.550
Luminance Factor, β	-	1.06

Conclusion: Pass

Remark:

1. Pre-treatment(wash): ISO 6330:2021:Using horizontal axis, front-loading type machine; Procedure No.3N, Machine Wash At 30°C; with 2kg total dry mass (Type III (100% Polyester) Ballast+Specimen) and 20±1 g ECE reference detergent 98 without optical brightener, Line Dry

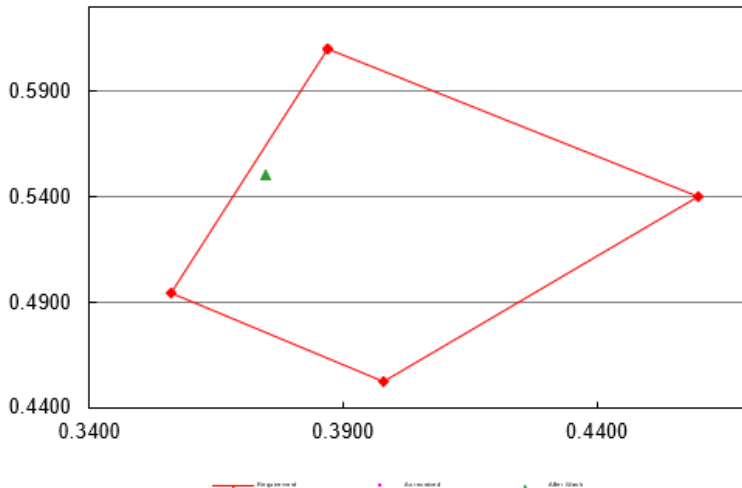
2. The chromaticity coordinates and the luminance factor shall comply with the requirement as below. The chromaticity shall be within one of the areas and the luminance factor shall comply with the corresponding minimum value.

Fluorescent yellow:

Chromaticity coordinates x/y: 0.387/0.610, 0.356/0.494, 0.398/0.452, 0.460/0.540.

Minimum luminance factor β_{min} : 0.70

Graphs:



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Clause 5.2 Colour Performance Requirements of Materials after Xenon Test

(EN ISO 20471:2013+A1:2016, Clause 7.2)

	Unit	B
Chromaticity coordinates, x value	-	0.371
Chromaticity coordinates, y value	-	0.541
Luminance Factor, β	-	1.06

Conclusion: Pass

Remark:

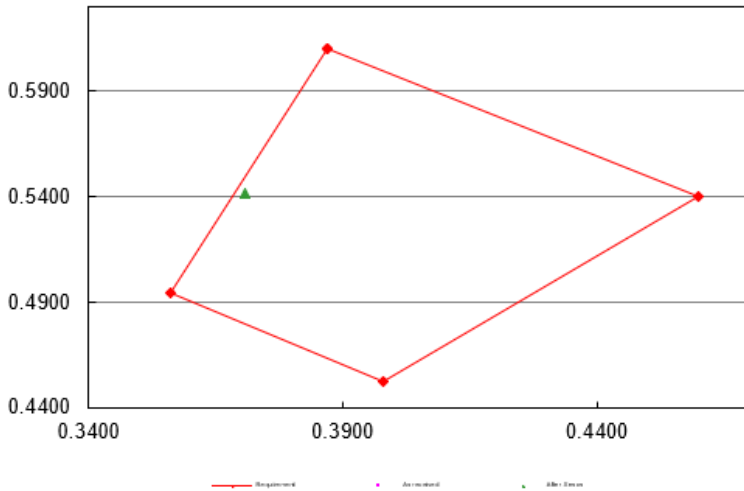
1. The chromaticity coordinates and the luminance factor shall comply with the requirement as below. The chromaticity shall be within one of the areas and the luminance factor shall comply with the corresponding minimum value.

Fluorescent yellow:

Chromaticity coordinates x/y: 0.387/0.610, 0.356/0.494, 0.398/0.452, 0.460/0.540.

Minimum luminance factor β_{min} : 0.70

Graphs:



Clause 5.3.1 Colour Fastness To Rubbing

(ISO 105-X12:2016; Size of rubbing finger: 16mm dia.)

As Received

	Unit	A-body	A-sweatband	A-elastic	Requirement
Dry Staining	Grade	4-5	4-5	4-5	Min.4

Remark: Grey Scale Rating is based on the 5-step scale of 1 to 5, where 1 is worst and 5 is best.



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Clause 5.3.2 Colour Fastness To Perspiration

(ISO 105-E04:2013; Test specimen in vertical position)

Acid

-	Unit	A-body	A-elastic	A-sweatband	Requirement
Change in Shade	Grade	4-5	4-5	-	Min.4
Staining On Multi-fibre Stripe					Min.4
Acetate	Grade	4-5	4-5	4-5	
Cotton	Grade	4-5	4-5	4-5	
Polyamide	Grade	4-5	4-5	4-5	
Polyester	Grade	4-5*	4-5*	4-5*	
Acrylic	Grade	4-5	4-5	4-5	
Wool	Grade	4-5	4-5	4-5	

Alkaline

-	Unit	A-body	A-elastic	A-sweatband	Requirement
Change in Shade	Grade	4-5	4-5	-	Min.4
Staining On Multi-fibre Stripe					Min.4
Acetate	Grade	4-5	4-5	4-5	
Cotton	Grade	4-5	4-5	4-5	
Polyamide	Grade	4-5	4-5	4-5	
Polyester	Grade	4-5*	4-5*	4-5*	
Acrylic	Grade	4-5	4-5	4-5	
Wool	Grade	4-5	4-5	4-5	

Grey Scale Rating is based on the 5-step scale of 1 to 5, where 1 is bad and 5 is good.

*Select only the fibre corresponding to the fibres of the background and non-fluorescent material.

Clause 5.3.3 Colour Fastness To Washing

(ISO 105-C06:2010; Test No.: A2S, Machine wash at 40°C with 4g/L ECE (B) and 1g/L Sodium Perborate with 10 Steel Balls)

-	Unit	A-body	A-elastic	A-sweatband	Requirement
Change in Shade	Grade	4-5	4-5	-	Min.4-5
Staining On Multi-fibre Stripe					Min.4
Acetate	Grade	4-5	4-5	4-5	
Cotton	Grade	4-5	4-5	4-5	
Polyamide	Grade	4-5	4-5	4-5	
Polyester	Grade	4-5*	4-5*	4-5*	
Acrylic	Grade	4-5	4-5	4-5	
Wool	Grade	4-5	4-5	4-5	

Grey Scale Rating is based on the 5-step scale of 1 to 5, where 1 is bad and 5 is good.

*Select only the fibre corresponding to the fibres of the background and non-fluorescent material.



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Clause 5.4 Dimensional Change after Domestic Washing

(EN ISO 3759:2011/EN ISO 5077:2008/EN ISO 6330:2021; Using horizontal axis, front-loading type machine; Procedure No.3N, Machine Wash At 30°C; with 2.0±0.2kg total dry mass (Type III (100% Polyester) Ballast+ Specimen) and 20±1 g ECE reference detergent 98 without optical brightener, Line Dry)

A	Original (cm)	After 25 washes (cm)	After 25 washes Shrinkage (%)	Requirement
Front Length				
From High Point Shoulder	66.8	65.6	-1.8	+/-5%
Centre Back Length	67.5	67.0	-0.7	+/-5%
Sleeve Length	61.8	61.0	-1.3	+/-5%
Chest	115.0	112.2	-2.4	+/-5%
Hem	105.8	103.4	-2.3	+/-5%
Across Shoulder	46.6	46.1	-1.1	+/-5%
Armhole	59.6	58.6	-1.7	+/-5%
Neck Opening/ Neckline/ Collar Length	54.4	52.6	-3.3	+/-5%
Sleeve Opening	22.0	21.2	-3.6	+/-5%

Remark: (+)Means Growth; (-)Means Shrinkage

Clause 5.5.2 Bursting Strength

(ISO 13938-1:2019; Mullen Bursting Tester, Test area: 7.3cm².)

As Received

-	Unit	B	Requirement
Bursting Strength	kPa	154	Min.200kPa

Clause 5.6 Physiological performance - Water vapour and thermal resistance

(ISO 11092:2014; Fabric back side towards the measuring unit)

-	Unit	B	Requirement
Mean Water-Vapour Resistance (Ret)	m²·Pa/W	12.9	-
Mean Thermal Resistance (Rct)	m²·K/W	0.0995	-
The water-vapour permeability index (imt)	-	0.46	Min.0.15

Test conditions:

- 1) Water-vapour resistance: Air temperature and temperature of hotplate: 35.0+0.1°C, Relative humidity: 40+3%, Air speed: 1.0+0.05 m/s.
- 2) Thermal resistance: Air temperature: 20.0+0.1°C, Relative humidity: 65+3%, Air speed: 1.0+0.05 m/s, Temperature of hotplate: 35.0+0.1°C.



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Clause 6.1 Retroreflection for Retroreflective Material
(EN ISO 20471:2013+A1: 2016 Clause 7.3)

Sample A

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Orientation Sensitive	Minimum Requirement (cd/(lx. m ²))			Result (Pass/Fail)
		0°	90°		Orientation Sensitive		Non-Orientation Sensitive	
5°	12'	439	438	No	330	247.5	330	Pass
	20'	334	330	No	250	187.5	250	Pass
	1°	36.5	34.3	No	25	18.75	25	Pass
	1°30'	20.3	19.6	No	10	7.5	10	Pass
20°	12'	440	426	No	290	217.5	290	Pass
	20'	334	322	No	200	150	200	Pass
	1°	35.6	35.2	No	15	11.25	15	Pass
	1°30'	19.8	19.8	No	7	5.25	7	Pass
30°	12'	429	414	No	180	135	180	Pass
	20'	325	313	No	170	127.5	170	Pass
	1°	36.2	34.1	No	12	9	12	Pass
	1°30'	20.2	19.0	No	5	3.75	5	Pass
40°	12'	404	386	No	65	48.75	65	Pass
	20'	311	294	No	60	45	60	Pass
	1°	35.9	32.7	No	10	7.5	10	Pass
	1°30'	18.7	17.9	No	4	3	4	Pass

Remark:

- When measured at two rotation angles $\epsilon = 0^\circ$ and $\epsilon = 90^\circ$, materials having coefficients of retroreflection that differ by more than 15% are defined as orientation sensitive.
- Orientation-sensitive material shall comply with the minimum requirements for the coefficient of retroreflection stated in Table 4 of EN ISO 20471 at one of the two rotation angles. The coefficient of retroreflection shall be not less than 75% of the values stated in Table 4 (Minimum coefficient of retroreflection for separate performance retroreflective material) at the other rotation angle.

Table 4 – Minimum coefficient of retroreflection in cd/(lx.m²) for separate performance retroreflective material

Observation angle	Entrance angle β_1 ($\beta_2 = 0$)			
	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



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Clause 6.2 Retroreflection after Abrasion

(Clause 7.3&7.4.1, ISO 12947-2:2016, Martindale Wear & Abrasion Tester: 9kPa Pressure, 5000cycles)

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Orientation Sensitive	Minimum Requirement (cd/(lx. m ²))		Result (Pass/Fail)	
		0°	90°		Orientation Sensitive	Non-orientation Sensitive		
5°	12'	385	381	No	100	75	100	Pass

Clause 6.2 Retroreflection after Flexing

(Clause 7.3&7.4.2, ISO 7854:1995, method A, 7500cycles)

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Orientation Sensitive	Minimum Requirement (cd/(lx. m ²))		Result (Pass/Fail)	
		0°	90°		Orientation Sensitive	Non-orientation Sensitive		
5°	12'	426	402	No	100	75	100	Pass

Clause 6.2 Retroreflection after Folding at cold temperatures

(Clause 7.3&7.4.3, ISO 4675:2017, (-20±2) °C)

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Orientation Sensitive	Minimum Requirement (cd/(lx. m ²))		Result (Pass/Fail)	
		0°	90°		Orientation Sensitive	Non-orientation Sensitive		
5°	12'	420	408	No	100	75	100	Pass

Clause 6.2 Retroreflection after Temperature Variation

(EN ISO 20471:2013+A1: 2016 Clause 7.3&7.4.4)

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Orientation Sensitive	Minimum Requirement (cd/(lx. m ²))		Result (Pass/Fail)	
		0°	90°		Orientation Sensitive	Non-orientation Sensitive		
5°	12'	408	402	No	100	75	100	Pass

Clause 6.2 Retroreflection under the influence of rainfall

(EN ISO 20471:2013+A1: 2016 Clause 7.3&7.4.5&Annex C)

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Minimum Requirement (cd/(lx. m ²))	Result (Pass/Fail)
		0°	90°		
5°	12'	124	118	100	Pass



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Clause 6.2 Retroreflection after Washing

(Clause 7.3&7.5.2, ISO 6330:2021:Using horizontal axis, front-loading type machine; Procedure No.3N, Machine Wash At 30°C; with 2kg total dry mass (Type III (100% Polyester) Ballast+Specimen) and 20±1 g ECE reference detergent 98 without optical brightener, Line Dry.)

After 25 washes

Separate Performance Retroreflective Material

Entrance Angle	Observation Angle	Measured value (cd/(lx. m ²))		Orientation Sensitive	Minimum Requirement (cd/(lx. m ²))		Result (Pass/Fail)	
		0°	90°		Orientation Sensitive	Non-orientation Sensitive		
5°	12'	311	308	No	100	75	100	Pass

Sample Photo



Product information is provided by applicant without verification or authentication of the brand.

The statement of conformity in this test report is only based on measured values by the laboratory and does not take their uncertainties into consideration.

End of Report



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