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FOR THE ATTENTION OF: Joshua Jeon

DC 16603

SAMPLING: done by the Applicant

SAMPLES RECEIVED: 10/02/2023

TEST PERIOD: 02-29/03/2023

SAMPLES: Inflatable vest for the protection of workers in the event of falls from heights, to be used in conjunction with fall arrest harness;
model: **SMART AIRBAG**;
fall detection: by means of (to be specified);
one size;
available in three colour variants: fluo yellow, fluo orange, dark gray.

See the complete description on the next page

REQUEST: Preliminary laboratory tests and assessments
(Regulation (EU)2016/425)

Reference methods: EN 1621-4:2013, EN ISO 13688:2013, Ricotest me-int 104-00

NOTE:
The airbags are equipped with 71g CO₂ cartridges.

OUTCOME:  **FAIL** (the negative results are shown in **bold**)

Notes:

All results refer exclusively to the tested materials as received.

Partial reproduction or publication not admitted without written authorization by RCT.

Positive results of a test report do not imply that the tested product is "certified" or "approved" by RCT.

Comments and interpretations are of subjective nature and not part of the Test Report.

Test carried out by qualified partner lab ISO 17025.

* Test not accredited by Accredia

Conformity assessment criterion: the result is considered compliant until the value falls within or coincides with the specification limit.

Unless otherwise indicated, the test conditions correspond to the reference standard.

M22 rev08 del 01/01/2023



Description:

article: "SMART AIRBAG";

garment type: vest;

outer material:

- fluorescent yellow, or fluorescent orange or dark gray fabric;
- reflective inserts on shoulders, head protector and lower back;
- pocket made of black elasticated jersey;

lining:

- fluorescent yellow, or fluorescent orange or dark gray fabric;

airbag expansion zone fabric:

- orange fabric for all color variants;

shoulder area padding:

- thermoformed and shaped expanded material, lined with black elastic jersey;

hemming:

- webbing made of black Cordura type fabric;

chest closure system:

- on black webbing: double snap buckle closure made of black polymeric material;
- on red tape: double snap buckle closure made of black polymeric material which contains the electronic mechanism for activating the airbag equipped with a LED interface for the user;

hip adjustment system:

- black tape with buckles to adjust the adherence to the bust;

airbag opening:

- easy opening zippers to allow expansion of the airbag bag;
- head/neck protection: kneecap made of fluorescent yellow fabric closed with easy-opening zipper and fixed with black Velcro-type tape on the upper part of the back;

lower back protection: internal pocket closed by means of a zipper with easy opening, edged with black Cordura-type fabric;

activation mechanism / device detection and power supply unit:

the airbag is equipped with two inflating systems with activation mechanisms with simultaneous action identifiable in the positioning by means of a label and red pressure buttons:

- one front on the right shoulder strap;
- one behind on the center of the left side;
- there is a pocket to hold the charging cable in the area of the right shoulder blade, identifiable by a pictogram and equipped with a waterproof zipper;
- The battery has a capacity of 3.7V, 1800mAh 6.66 Wh and is contained in a protective case which also contains the airbag electronics;
- the fall sensor is placed on the center of the back between the shoulder blades;

size: one.



Pictures of the device:



Fluorescent Yellow - Front



Fluorescent yellow - Back



Fluorescent orange - Front



Dark Gray - Front



Triggering system



Details



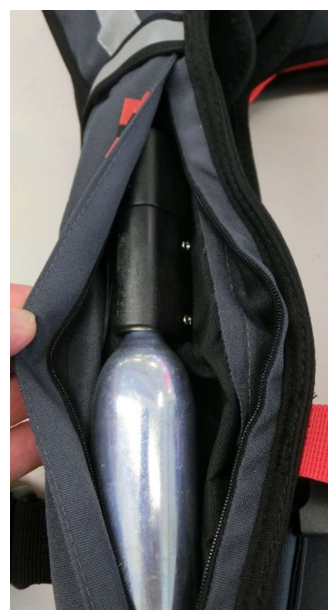
Charging cable



NTG JG 50 Cartridges MADE IN JAPAN (721 g declared)



Pocket of the chartridge and triggering system



Pocket of the chartridge and triggering system



Component materials:

Material 1: fluo yellow fabric (external material of the vest);
Material 2: fluo orange fabric (external material of the vest);
Material 3: grey fabric (external material of the vest);
Material 4: fluo orange fabric (airbag expansion pockets material);
Material 5: retro-reflective bands on shoulders and back;
Material 6: left vamp pocket made of black elastic knitting;
Material 7: edging made of Cordura-like fabric;
Material 8: Velcro, buttonhole and hook fastening bags;
Material 9: black straps with different lengths;
Material 10: red strap;
Material 11: black knitting as lining for shoulder padding;
Material 12: internal label.



References	Tests	Measuring unit	Requirements	Results
EN ISO 13688:2013 +A1:2021	Protective clothing - general requirements			
4.2*	Innocuousness		Materials shall not adversely affect the health or hygiene of the user, nor release toxic or otherwise harmful substances.	
4.2/c ISO 4045:2018 ISO 3071:2020	pH - leather - other materials extracting solution: KCl	- -	3,5 < pH < 9,5	test not performed
ISO 14362-1:2017# textile	Azo colorants content:	mg/kg	absent (<30 mg/kg)	test not performed
4.3 4.3.1 - 4.3.2 - 4.3.3*	Design		The design should facilitate its correct positioning on the user and should ensure that it remains in place during the course of work, ensuring that no parts of the body get uncovered by expected movements by the wearer. When two or more items are worn together, they should be compatible.	pass



References	Tests	Measuring unit	Requirements	Results
4.4 4.4.1 – 4.4.2 Annex C*	Comfort		pass	pass
4.4 4.4.1 – 4.4.2 Annex C*	Clothing: - should provide a level of comfort consistent with the level of protection against hazard which is provided; - should not have rough, sharp or hard surfaces that irritate or injure the user; - should not be so tight, loose and/or heavy so that it restricts normal movements; - should not be so tight that blood flow and deep breathing are restricted; - allows the following movements: standing, sitting, walking, stair climbing, raising both hands above the head, bending over; - should not be so loose that it flaps about or moves independently and inconveniently; - should not be points at which unexpected and unintended gaps open up between or within components of the clothing; - should not cause any unreasonable restriction of movement at any joint; - putting on and removing other items of PPE should be possible without difficulty.		pass pass pass pass pass pass pass pass	pass pass pass pass pass pass pass



References	Tests	Measuring unit	Requirements	Results
4.4 4.4.1 – 4.4.2 Annex C*	- armholes, crotch and other elements of clothing design are appropriately proportioned and positioned; - the range of adjustment available is adequate; - arms and legs of the clothing should not be so long that they interfere with hand and foot movements.		pass pass pass	pass pass pass
5	Ageing			
5.3*	Dimensional changing due to cleaning		(..... washing cycles at°C/ dry cleaning)	information not provided
ISO 5077:2007 ISO 6330:2021*	Domestic washing - length - width - length - width	% %	woven materials: ≥-3 and ≤+3 knitted material and nonwovens: ≥-5 - ≤+5	test not performed
# ISO 5077:2007 ISO 15797:2017	Industrial washing - length - width - length - width	% %	woven materials: ≥-3 and ≤+3 knitted material and nonwovens: ≥-5 - ≤+5	test not performed
# ISO 3175-1:2017 ISO 3175-2-3-4-5-6	Dry cleaning - length - width - length - width	% %	woven materials: ≥-3 and ≤+3 knitted material and nonwovens: ≥-5 - ≤+5	test not performed
7.1*	After cleaning washing marking shall be legible	-	pass	test not performed



date: 29/03/2023

References	Tests	Measuring unit	Requirements	Results
6 ISO 8559-1:2017 ISO 8559-2:2017*	Sizing Declared size Declared dimensions - height - chest girth - waist girth Measured dimensions - height - chest girth - waist girth	 cm cm cm cm cm cm		 one size x x x x x x
EN 1621-4:2013	Motorcyclists' inflatable protectors			
4.2.1 6.2.1 (EN ISO 11642:2012 or EN ISO 105-E01:2013)*	Dye fastness to water Discharge multi-fiber fabric 1) acetate 2) cotton 3) polyamide 4) polyester 5) polyacrylic 6) wool	 Gray Scale 5=good, 1=bad.	 ≥ 4 ≥ 4 ≥ 4 ≥ 4 ≥ 4 ≥ 4	 test not performed
4.2.2 6.2.2 (EN1621-1:2012)	Hard components - No sharp edge shall be present in the protector ; - A layer of impact attenuation material shall be present between any hard components present in the inflation or actuation systems and the body of the user; - The protection shall be the same size of the component or its projected area plus a minimum border of 1 cm. Impact attenuation protecting the user from hard components Status: not inflated - transmitted force	 - - - kN		 pass pass pass see me-int 104
4.2.3 6.2.3*	Temperature exposure evaluation (for hot gas generators) (with touchless IR thermometer) - average temperature from 0 to 15 seconds - highest single value between 0 and 15 seconds	 °C °C	 ≤ 48 ≤ 55	 N/A



References	Tests	Measuring unit	Requirements	Results
4.3*	Zones of protection The body areas claimed to get protected shall be covered by the protector when inflated. The protector shall cover at least one of the zones of protection as described in any specific part of the EN 1621series of standards. Zone covered: - Knee (K) - Leg under knee (L) - Shoulder (S) - Elbow (E) - Hip (H) - Full Back (FB) - Central Back (CB) - Lumbar			not declared
4.4 6.4*	Intervention time = activation time (6.4.2) + inflation time (6.4.3)	ms	≤ 200	
6.4.2*	Activation time (ta) - speed: 13,33 m/s - initial delay: 30 ms	ms		
6.4.3*	Inflation time determined by the use of a high speed camera (1000 fps) with visual inspection using an appropriate software for frame analysis	ms	-	0,28 0,43 0,26
4.5 6.5*	Duration time of inflated status maximum duration time declared by the manufacturer	s	≥ 5	not declared (> 5)



References	Tests	Measuring unit	Requirements	Results
4.6*	Retention of the inflatable protector The inflatable protector shall be equipped with suitable and adjustable retention devices. If the inflatable protector is fitted in a garment, the retention devices may be incorporated into it. The functions shall be assessed by ergonomic testing in accordance with 6.7. In this case if the garment can be opened (zip, buttons, press stud, etc.), the user information shall contain a warning that the safety functions will work only with the garment being closed.			pass pass pass pass
4.7 (6.6)	Impact attenuation Protective zone: Size: one size Status: inflated Test carried out after s.	kN	Level 1 level2	protective zone not declared Duration time of inflated status not declared
(6.6.5)a	<u>Airbag not rechargeable</u> - Single strikes: 1) 2) 3) - Overall Mean value - level		≤ 6 ≤ 3 $\leq 4,5$ $\leq 2,5$	- - - -
(6.6.5)b	<u>Rechargeable Airbag</u> Airbag rechargeable - Single strikes: 1) 2) 3) - Overall Mean value - level		≤ 6 ≤ 3 $\leq 4,5$ $\leq 2,5$	test not performed test not performed test not performed - -
4.8*	Sizing and size marking		The size shall be marked according to the relevant part of EN 1621	no marking present



References	Tests	Measuring unit	Requirements	Results
4.9 (6.7)*	Ergonomic tests (done with the protector in non-inflated status and then repeated with the protector in the inflated status) a) Do you confirm the protector fits you properly ? (not for inflated status) b) Can you easily get on and off a motorcycle? (To be done three times, not for inflated status). c) Can you reach and operate the controls of the motorcycle (also in inflated status)? d) Can you turn your head and torso both sides when sitting on a motorcycle? (Not for inflated status). e) Is the adjustment system free from causing intolerable discomfort, considering also breathing? f) Do you feel the retention system holds the protector securely in place? g) Can you pick up something from the floor by bending forward? (Three times, not for inflated status). h) After the ergonomic test, can you confirm that further to points a) to g) no other problems (including visual field) have appeared which could make bike riding more dangerous?		Yes Yes Yes Yes Yes Yes	pass N/A N/A N/A pass pass pass pass
4.10	Trigger system function			
4.10.1 6.8.1*	Activation force Force required by mechanical triggering system to activate the airbag Speed: 100 mm/min Peak force: 1) 2) 3) 4)	N	30 ÷ 250	N/A



References	Tests	Measuring unit	Requirements	Results
4.10.2 6.8.2*	Activation energy Energy required by the mechanical triggering system to activate the airbag: 1) 2) 3) 4)	J	< 5,0	N/A
4.10.3 6.8.3*	Connection of airbag system to motorcycle - breakage load 1) 2) 3)	N	$\geq \text{---}$ (=4x activation force) and ≥ 400	Electronic activation
8 §d)*	Sizes of inflatable protector Declared size technician wearing the airbag: Gender (M/F) height chest girth WS	- - - - -		one size GR M 185 105 46
9 § a, b, c, d,e,f*	Marking Shall be permanently and conspicuously marked and must report: - Number of the Standard - namer or registered trade mark of the manufacturer - identification of the product type, commercial name or code - size designation , as described in 4.8 - the "I" pictogram inviting to read the instruction leaflet - graphical symbol as shown in Figure 3.	pass pass pass pass pass pass		fail fail – not present fail – not present fail – not present fail – not present fail – not present



References	Tests	Measuring unit	Requirements	Results
me-int 114-00	AIRBAG for workers (Not for motorbike use)			
	Declared protection: "To absorb impacts in case of fall"			FAIL It must be specified which kind of fall, in which circumstances
	Protective area: - declared - verified	-	-	- back+chest (no EN 1621-2/3)
Analogue method 1621-4:2013 4.7 (6.6) (6.6.5)b	Impact attenuation anvil: hemispherical, r=100 mm impactor: flat Ø=100 mm impact energy: 26J Protective zone: Back-Chest Size: single Status: inflated Test carried out after <u>Rechargeable Airbag</u> - single impacts: 1) 2) 3) - Overall Mean value - level	s kN	> 5 Level 1 level2 ≤6 ≤3 ≤4,5 ≤2,5 -	test not performed Back Chest test not performed test not performed test not performed - -



References	Tests	Measuring unit	Requirements	Results
Analogue method 4.2.2 EN 1621-1:2012	Hard components - No sharp edge shall be present in the protector ; - A layer of impact attenuation material shall be present between any hard components present in the inflation or actuation systems and the body of the user; - The protection shall be the same size of the component or its projected area plus a minimum border of 1 cm.	- - -		pass pass pass
Analogue method 6.2.2 (EN1621-1:2012)	Impact attenuation protecting the user from hard components Status: not inflated transmitted force - gas cartridge - triggering system - pyrotechnical activator	kN kN kN	≤ 35 ≤ 35 ≤ 35	28,0 11,9 10,0
				yellow orange gray
EN 1621-4:2013 4.4 6.4*	Intervention time = activation time (6.4.2) + inflation time (6.4.3)	ms	≤ 400	940 1301 1290
analogue method EN 1621-4:2013 6.4.2*	Activation time (ta) free fall of standing mannequin	ms	-	660 870 1030
EN 1621-4:2013 6.4.3*	Inflation time determined by the use of a high speed camera (1000 fps) with visual inspection using an appropriate software for frame analysis	ms	-	280 431 260
EN 1621-4:2013 4.5 6.5*	Duration time of inflated status maximum duration time declared by the manufacturer	s	≥ 5	not declared (> 5)



References	Tests	Measuring unit	Requirements	Results
analogue method 4.9* (6.7)	Ergonomic tests (done with the protector in non-inflated status and then repeated with the protector in the inflated status) a) Do you confirm the protector fits you properly ? b) Can you turn your head and torso both sides? c) Is the adjustment system free from causing intolerable discomfort, considering also breathing? d) Do you feel the retention system holds the protector securely in place? e) Can you pick up something from the floor by bending forward? (Three times, not for inflated status).		 yes yes no yes yes	 pass pass pass pass pass

- End of the Test Report -

NOTE:

- Different behaviors have been detected using the three different devices provided;
- The Information note/user manual is incomplete, you shall insert the pictogram "not washable, no bleaching, no dryer";
- You shall add the label on the garment with the same pictograms of the previous point, adding pictogram "I";
- Remove from the user manual the references to the use of the harness as no longer recipient of coupled Certification, no compatibility checks have been performed;
- We need to know in more details the electronic activation mechanism, the activation is given by a delta of height of 70 cm from the vertical position of the user? or from a delta of height combined with an inclination? sharp acceleration with inclination? Is the device equipped with accelerometer, altimeter and gyroscope?
- In our tests, the dummy standing on a plane at a height of 90 cm with a sensor with a total height of 235 cm (90 cm + 145 cm) showed that the airbag was activated at about 55 cm from the ground. The delta height for activation is >> of the 0.7 meters declared with about a fall of 180 cm;
- We were unable to perform the preliminary impacts due to lack of sufficient triggers;
- Is the use of cans of 71 grams confirmed? we still have 4 cans of 71 grams unused;
- If the airbag is declared reusable, there must be a chapter in the user manual that explains step by step how to fold the dedicated parts to unfold and expand. Currently there is only a part dedicated to closing the hinges to the paragraph "Reclosing the Zipper".