

Test Report No. 7191089791-EEC14-LWB
dated 18 JUL 2014



PSB Singapore

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Note: This report is issued subject to the Testing and Certification Regulations of the TÜV SÜD Group and the General Terms and Conditions of Business of TÜV SÜD PSB Pte Ltd. In addition, this report is governed by the terms set out within this report.

SUBJECT:

Batch test of full body harness incorporated with energy-absorbing lanyard sampled by TÜV SÜD PSB officer on 28 May 2014 at PDS International Pte Ltd.

TESTED FOR:

PDS International Pte Ltd
#05-03/04 (Lobby LL2)
10 Pandan Crescent
UETech Park
Singapore 128466

DATE OF TEST:

09 Jun 2014 to 27 Jun 2014

METHOD OF TEST:

SS 528: Part 1: 2006 - Specification for personal fall-arrest systems - Part 1: Full-body harnesses

SS 528: Part 2: 2006 - Specification for personal fall-arrest systems – Part 2: Lanyards and energy absorbers

SS 528: Part 5: 2006 - Specification for personal fall-arrest systems – Part 5: Connectors with self-closing and self-locking gates

SS 528: Part 6: 2006 - Specification for personal fall-arrest systems – Part 6: System performance test

SAMPLE DESCRIPTION:

Full body harness with 3 points buckle

30 pieces of full body harness were randomly sampled from a consignment of 2,995 pcs.

Brand / model: WORKGard / WGF501
Classification: Class A (back "D" ring for fall arrest purposes)
Primary strap: 44 mm width

Full body harness with 3 points buckle

5 pieces of full body harness were randomly sampled from a consignment of 496 pcs.

Brand / model: WORKGard / WGF502
Classification: Class AE (back "D" ring for fall arrest & two front attachments for confined-space access purposes)
Primary strap: 44 mm width



TÜV SÜD PSB

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3 Science Park Drive, #04-01/05
The Franklin, Singapore 118223
TUV®



Single lanyard with a energy absorber (14 mm diameter fibre rope-based lanyard)

8 pieces of energy absorbing lanyard were randomly sampled from a consignment of 796 pcs.

Brand / model: WORKGard / WGF601
Type: 2 (used in PFAS where the potential freefall distance limited to a maximum of 4 m)
Energy absorber: WORKGard / WGF610
Rope lanyard: WORKGard / ---
Steel karabiner: WORKGard / WGF702 (20 mm Gate opening)
Steel snap hook: WORKGard / WGF701 (58 mm Gate opening)

Twin lanyards with a energy absorber (14 mm diameter fibre rope-based lanyard)

22 pieces of energy absorbing lanyard were randomly sampled from a consignment of 2,195 pcs.

Brand / model: WORKGard / WGF602
Type: 2 (used in PFAS where the potential freefall distance limited to a maximum of 4 m)
Energy absorber: WORKGard / WGF610
Rope lanyard: WORKGard / ---
Steel karabiner: WORKGard / WGF702 (20 mm Gate opening)
Steel snap hook: WORKGard / WGF701 (58 mm Gate opening)

Configuration of Personal Fall Arrest System (PFAS): A + EAL + FBH



RESULTS:

Table 1(i): SS 528: Part 1: 2006 - Full body Harnesses

Test Description	Results (WGF501)					SS 528: Part 1: 2006 Requirements
	FBH 1	FBH 2	FBH 3	FBH 4	FBH 5	
<p>Clause 5.7 Dynamic performance tests</p> <p>Feet first test (Front D-ring) – The full body harness fitted to the 100 kg torso test mass is allowed to fall freely over a distance of 1.0 m.</p>	Complied	Complied	Complied	Complied	Complied	<p>Clause 4.7 The full body harness shall retain the torso test mass clear of the ground and in an upright position when tested at each fall-arrest attachment element.</p> <p>In addition, there shall be:</p> <ul style="list-style-type: none"> a. no tearing of webbing material b. no tearing of any primary strap sewn joint c. no partial or complete fracture of any buckle d. no inadvertent opening of any fastening buckle <p>At the conclusion of the test the angle formed between the back of the torso test mass and the test lanyard shall not exceed 45°.</p> <p>The full body harness shall be capable of retaining the torso test mass in post-dynamic test suspension for a period of at least 10 min.</p>
<p>Test Description</p> <p>Clause 5.7 Dynamic performance tests</p> <p>Head first test (Front D-ring) – The full body harness fitted to the 100 kg torso test mass is allowed to fall freely over a distance of 1.0 m.</p>	Complied	Complied	Complied	Complied	Complied	

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Table 1(ii): SS 528: Part 1: 2006 - Full body Harnesses

Test Description	Results (WGF501)					SS 528: Part 1: 2006 Requirements
	FBH 6	FBH 7	FBH 8	FBH 9	FBH 10	
<p>Clause 5.7 Dynamic performance tests</p> <p>Feet first test (Back D-ring) – The full body harness fitted to the 100 kg torso test mass is allowed to fall freely over a distance of 1.0 m.</p>	Complied	Complied	Complied	Complied	Complied	<p>Clause 4.7 The full body harness shall retain the torso test mass clear of the ground and in an upright position when tested at each fall-arrest attachment element.</p> <p>In addition, there shall be:</p> <ul style="list-style-type: none"> e. no tearing of webbing material f. no tearing of any primary strap sewn joint g. no partial or complete fracture of any buckle h. no inadvertent opening of any fastening buckle <p>At the conclusion of the test the angle formed between the back of the torso test mass and the test lanyard shall not exceed 45°.</p> <p>The full body harness shall be capable of retaining the torso test mass in post-dynamic test suspension for a period of at least 10 min.</p>
<p>Test Description</p>						
	Results (WGF501)					
	FBH 16	FBH 17	FBH 18	FBH 19	FBH 20	
<p>Clause 5.7 Dynamic performance tests</p> <p>Head first test (Back D-ring) – The full body harness fitted to the 100 kg torso test mass is allowed to fall freely over a distance of 1.0 m.</p>	Complied	Complied	Complied	Complied	Complied	

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RESULTS:

Table 1(iii): SS 528: Part 1: 2006 - Full body Harnesses

Test Description	Results (WGF502) FBH 1	SS 528: Part 1: 2006 Requirements
<p>Clause 5.7 Dynamic performance tests</p> <p>Feet first test (Back D-ring) – The full body harness fitted to the 100 kg torso test mass is allowed to fall freely over a distance of 1.0 m.</p>	<p align="center">Complied</p>	<p>Clause 4.7 The full body harness shall retain the torso test mass clear of the ground and in an upright position when tested at each fall-arrest attachment element.</p> <p>In addition, there shall be:</p> <ul style="list-style-type: none"> i. no tearing of webbing material j. no tearing of any primary strap sewn joint k. no partial or complete fracture of any buckle l. no inadvertent opening of any fastening buckle <p>At the conclusion of the test the angle formed between the back of the torso test mass and the test lanyard shall not exceed 45°.</p> <p>The full body harness shall be capable of retaining the torso test mass in post-dynamic test suspension for a period of at least 10 min.</p>
<p>Test Description</p>	<p align="center">Results (WGF502) FBH 2</p>	
<p>Clause 5.7 Dynamic performance tests</p> <p>Head first test (Back D-ring) – The full body harness fitted to the 100 kg torso test mass is allowed to fall freely over a distance of 1.0 m.</p>	<p align="center">Complied</p>	

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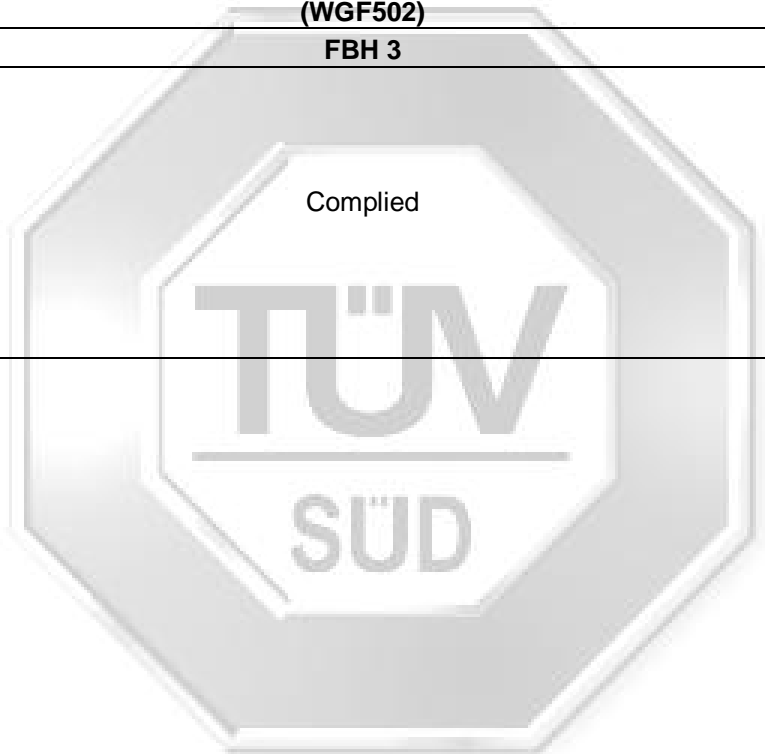


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RESULTS:

Table 2: SS 528: Part 1: 2006 - Full body Harnesses

Test Description	Results (WGF502) FBH 3	SS 528: Part 1: 2006 Requirements
<p><u>Clause 5.9 Static suspension angle test for Class AE full body harness</u></p> <p>Raise the torso test mass so that it is just clear of the floor. Allow the torso test mass to remain suspended for 3 min.</p>	<p>Complied</p>	<p><u>Clause 4.9</u></p> <p>Class AE full body harness shall retain the torso test mass in an upright position when tested at each confined-space access attachment element. The angle formed between the back of the torso test mass and the test lanyard shall not exceed 10°.</p>



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RESULTS:

Table 3(i): SS 528: Part 2: 2006 - Lanyards and energy absorbers

Test Description	Results (WGF601 / WGF602)					SS 528: Part 2: 2006 Requirements
	EAL 1	EAL 2	EAL 3	EAL 4	EAL 5	
<p><u>Clause 5.2.2.1 - Static tensile test rope lanyard</u> Apply a tensile force of 22 kN to the fibre-rope-based lanyard and maintain the force for a period of 3 min.</p>	Complied	Complied	Complied	Complied	Complied	<p><u>Clause 4.2.6</u> The fibre-rope-based lanyard, including its terminations and if applicable its adjustment device, shall sustain a force of 22 kN, without tearing or rupture of any element.</p>
<p><u>Clause 5.3.1 – Initial resistance test of energy absorber</u> A tensile force of 2 kN is applied across its two terminations and maintained for a period of 2 min.</p>	Complied	Complied	Complied	Complied	Complied	<p><u>Clause 4.3.4</u> In order to avoid inadvertent deployment, an energy absorber shall not have a permanent extension greater than 40 mm.</p>
Test Description	Results (WGF601 / WGF602)					SS 528: Part 2: 2006 Requirements
	EAL 10	EAL 11	EAL 12	EAL 13	EAL 14	
<p><u>Clause 5.3.4 – Dynamic test of Type 2 energy absorbing lanyard</u> Raised a test mass (100 ± 1) kg, of steel, to the potential free fall distance of 4.0 m and released the test mass.</p>	Complied	Non-compliance	Complied	Complied	Complied	<p><u>Clause 4.3.5</u> The arrest force shall not exceed 6 kN.</p>
	Complied	Complied	Complied	Complied	Complied	<p><u>Clause 4.3.5</u> The permanent extension of the energy absorber shall not exceed 1.75 m</p>

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RESULTS:

Table 3(ii): SS 528: Part 2: 2006 - Lanyards and energy absorbers

Test Description	Results (WGF601 / WGF602)				SS 528: Part 2: 2006 Requirements
	EAL 6	EAL 7	EAL 8	EAL 9	
<p><u>Clause 5.2.2.1 - Static tensile test rope lanyard</u> Apply a tensile force of 22 kN to the fibre-rope-based lanyard and maintain the force for a period of 3 min.</p>	Complied	Complied	Complied	Complied	<p><u>Clause 4.2.6</u> The fibre-rope-based lanyard, including its terminations and if applicable its adjustment device, shall sustain a force of 22 kN, without tearing or rupture of any element.</p>
<p><u>Clause 5.3.1 – Initial resistance test of energy absorber</u> A tensile force of 2 kN is applied across its two terminations and maintained for a period of 2 min.</p>	Complied	Complied	Complied	Complied	<p><u>Clause 4.3.4</u> In order to avoid inadvertent deployment, an energy absorber shall not have a permanent extension greater than 40 mm.</p>
Test Description	Results (WGF601 / WGF602)				SS 528: Part 2: 2006 Requirements
	EAL 15	EAL 16	EAL 17	EAL 18	
<p><u>Clause 5.3.4 – Dynamic test of Type 2 energy absorbing lanyard</u> Raised a test mass (100 ± 1) kg, of steel, to the potential free fall distance of 4.0 m and released the test mass.</p>	Complied	Complied	Non-compliance	Complied	<p><u>Clause 4.3.5</u> The arrest force shall not exceed 6 kN.</p>
	Complied	Complied	Complied	Complied	<p><u>Clause 4.3.5</u> The permanent extension of the energy absorber shall not exceed 1.75 m</p>

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Table 4: SS 528: Part 5: 2006 - Connectors with self-closing and self-locking gates

Test Description		Results (WGF601 / WGF602)			SS 528: Part 5: 2006 Requirements
		EAL 1	EAL 2	EAL 3	
Clause 5.1.1 - Gate-face resistance Apply a minimum force of 1.0 kN in a perpendicular direction, towards the gate at a point as close to the latch as possible and maintained it for a period of 1 min.	Snap hook	Complied	Complied	Complied	Clause 4.2.1 The connector shall withstand a minimum force of 1.0 kN for 1 min without the gate separating from the latch by more than 3 mm. Following this test, the self-closing gate shall be so designed that when it is released from the open position, it shall automatically close, and the locking feature shall automatically engage.
	Karabiner	Complied	Complied	Complied	
Test Description		Results (WGF601 / WGF602)			SS 528: Part 5: 2006 Requirements
		EAL 4	EAL 5	EAL 6	
Clause 5.1.2 - Gate side-load resistance Apply a minimum force of 1.5 kN in a perpendicular direction, towards the gate at a point halfway between the hinge and latch. Maintained it for a period of 1 min.	Snap hook	Complied	Complied	Complied	Clause 4.2.2 The connector shall withstand a minimum force of 1.5 kN for 1 min without the gate separating from the latch by more than 3 mm. Following this test, the self-closing gate shall be so designed that when it is released from the open position, it shall automatically close, and the locking feature shall automatically engage.
	Karabiner	Complied	Complied	Complied	

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RESULTS:

Table 5: SS 528: Part 5: 2006 - Connectors with self-closing and self-locking gates

Test Description		Results (WGF601 & WGF602)			SS 528: Part 5: 2006 Requirements
		EAL 7	EAL 8	EAL 9	
<p>Clause 5.2 - Static strength test Apply a minimum force of 23 kN (declared by manufacturer) and maintained it for a period of 1 min.</p>	Snap hook	Complied	Complied	Complied	<p>Clause 4.3 The connector shall withstand a minimum force of 23 kN (declared by manufacturer) for 1 min. There shall be no partial fractures or inadvertent opening of the gate.</p>
<p>Clause 5.2 - Static strength test Apply a minimum force of 25 kN (declared by manufacturer) and maintained it for a period of 1 min.</p>	Karabiner	Complied	Complied	Complied	<p>Clause 4.3 The connector shall withstand a minimum force of 25 kN (declared by manufacturer) for 1 min. There shall be no partial fractures or inadvertent opening of the gate.</p>

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RESULTS:

Table 6(i): SS 528: Part 6: 2006 - System performance test

Test Description	Results (WGF601 / WGF602 / WGF501)					SS 528: Part 5: 2006 Requirements
	EAL 19 / FBH 21	EAL 20 / FBH 22	EAL 21 / FBH 23	EAL 22 / FBH 24	EAL 23 / FBH 25	
<p>Clause 6.2.2 - Performance test for A + EAL + FBH type PFAS (Back D-ring)</p> <p>a. 100 kg torso test mass b. 1.8 m free fall distance</p>	Complied	Complied	complied	Complied	Non-compliance	<p>Clause 5.2.2</p> <p>1) The arrest force shall not exceed 6kN. 2) The angle formed between the back of the torso test mass and the vertical plane shall not exceed 45°. 3) With the 100 kg torso test mass remaining in post drop suspension, there shall be none of the following results on a full body harness:</p> <ul style="list-style-type: none"> a. Tearing of webbing material b. Tearing of any primary strap sewn joint c. Partial or complete fracture of any fastening or adjusting buckle d. Inadvertent opening of any fastening buckle e. Straps applying pressure to the neck of the torso test mass. <p>4) With the torso test mass remaining in post drop suspension, there shall be neither of the following results on other parts of the PFAS:</p> <ul style="list-style-type: none"> a. Tearing or rupture of any component (except where such tearing was deliberately designed to contribute to energy dissipation) b. Partial fractures or inadvertent opening of connector gates.

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RESULTS:

Table 6(ii): SS 528: Part 6: 2006 - System performance test

Test Description	Results (WGF601 / WGF602 / WGF501)				SS 528: Part 5: 2006 Requirements
	EAL 24 / FBH 26	EAL 25 / FBH 27	EAL 26 / FBH 28	EAL 27 / FBH 29	
<p>Clause 6.2.2 - Performance test for A + EAL + FBH type PFAS (Front D-ring)</p> <p>c. 100 kg torso test mass d. 1.8 m free fall distance</p>	Complied	Complied	Complied	Non-compliance	<p>Clause 5.2.2</p> <p>1) The arrest force shall not exceed 6kN.</p> <p>2) The angle formed between the back of the torso test mass and the vertical plane shall not exceed 45°.</p> <p>3) With the 100 kg torso test mass remaining in post drop suspension, there shall be none of the following results on a full body harness:</p> <ul style="list-style-type: none"> f. Tearing of webbing material g. Tearing of any primary strap sewn joint h. Partial or complete fracture of any fastening or adjusting buckle i. Inadvertent opening of any fastening buckle j. Straps applying pressure to the neck of the torso test mass. <p>4) With the torso test mass remaining in post drop suspension, there shall be neither of the following results on other parts of the PFAS:</p> <ul style="list-style-type: none"> c. Tearing or rupture of any component (except where such tearing was deliberately designed to contribute to energy dissipation) d. Partial fractures or inadvertent opening of connector gates.

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RESULTS:

Table 6(iii): SS 528: Part 6: 2006 - System performance test

Test Description	Results (WGF602 / WGF502)		SS 528: Part 5: 2006 Requirements
	EAL 28 / FBH 4	EAL 29 / FBH 5	
<p>Clause 6.2.2 - Performance test for A + EAL + FBH type PFAS (Front D-ring)</p> <p>e. 100 kg torso test mass f. 1.8 m free fall distance</p>	Complied	Complied	<p>Clause 5.2.2</p> <p>1) The arrest force shall not exceed 6kN.</p> <p>2) The angle formed between the back of the torso test mass and the vertical plane shall not exceed 45°.</p> <p>3) With the 100 kg torso test mass remaining in post drop suspension, there shall be none of the following results on a full body harness:</p> <ul style="list-style-type: none"> k. Tearing of webbing material l. Tearing of any primary strap sewn joint m. Partial or complete fracture of any fastening or adjusting buckle n. Inadvertent opening of any fastening buckle o. Straps applying pressure to the neck of the torso test mass. <p>4) With the torso test mass remaining in post drop suspension, there shall be neither of the following results on other parts of the PFAS:</p> <ul style="list-style-type: none"> e. Tearing or rupture of any component (except where such tearing was deliberately designed to contribute to energy dissipation) f. Partial fractures or inadvertent opening of connector gates.

RESULTS

Table 7: SS528: Part 1 & Part 5: 2006 (Corrosion resistance)

Test Description		Results (WGF601 / WGF501) EAL 30 / FBH 30	SS 528: Part 1 & Part 5: 2006 Requirements
<u>5.2 Corrosion test (SS528: Part 1)</u> Salt sprayed test the metallic fittings in accordance with ISO 9227, with an initial exposure of 24 h, followed by 1 h of drying, followed by a second exposure of 24 h.	D-ring	Complied	<u>Clause 4.4 Corrosion resistance</u> All metallic fittings shall be free of red rust, as visible to the unaided eye, or other evidence of corrosion of the base metal.
	Buckle	Complied	
<u>5.3 Corrosion test (SS528: Part 5)</u> Salt sprayed test the connector in accordance with ISO 9227, with an initial exposure of 24 h, followed by 1 h of drying, followed by a second exposure of 24 h.	Snap hook	Complied	<u>Clause 4.4 Corrosion resistance</u> After tested, the connector gate shall continue to function, the self-closing gate shall be so designed that when it is released from the open position, it shall automatically close, and the locking feature shall automatically engage. There shall be no evidence of corrosion of the base metal.
	Karabiner	Complied	

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REMARKS:

1. Based on the test results, in accordance with the requirements of the following Singapore Standards, the samples taken from the consignment passed the established acceptance criteria:
 - a. SS 528: Part 1: 2006
 - b. SS 528: Part 2: 2006
 - c. SS 528: Part 5: 2006
 - d. SS 528: Part 6: 2006

2. A total of 6,417 nos. of PSB TEST BATCH INSPECTED labels, comprising TBB 384380 to TBB 390796 were issued to the above consignment of full body harness incorporated with energy-absorbing lanyard.

A handwritten signature in black ink, appearing to read 'Andy Lim Wee Boon'.

Andy Lim Wee Boon
Associate Engineer



A handwritten signature in black ink, appearing to read 'Chin Fook Onn'.

Chin Fook Onn
Product Manager
Safety Products
Product Service

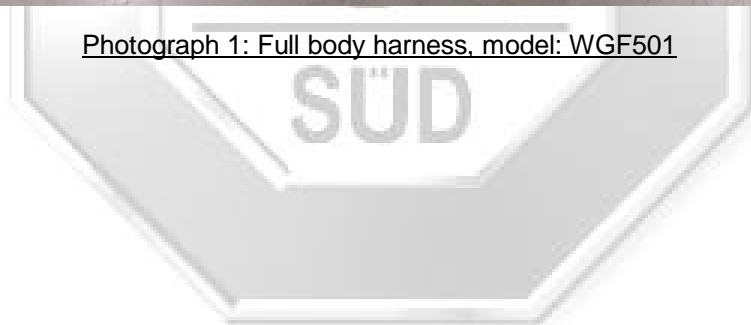
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Photograph 1: Full body harness, model: WGF501



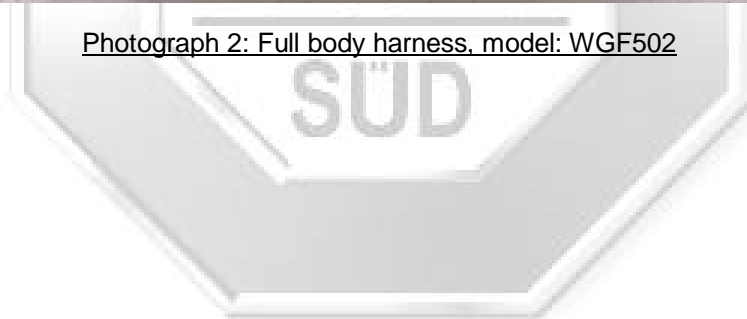
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Photograph 2: Full body harness, model: WGF502



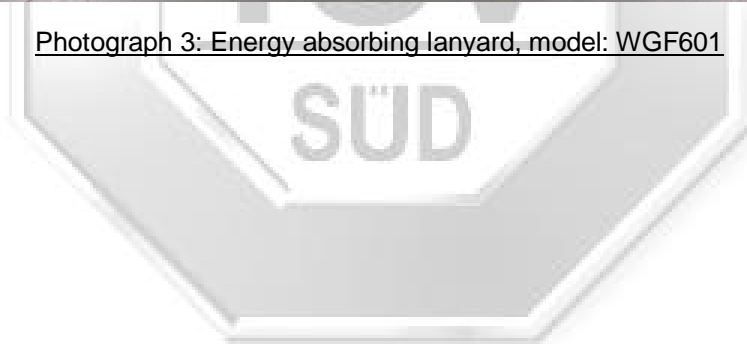
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Photograph 3: Energy absorbing lanyard, model: WGF601



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Photograph 4: Energy absorbing lanyard, model: WGF602



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1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.
2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.
3. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.
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5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011

