



Test Report: WAV Seats, Belts, Belt Anchorages and WTORS

Legislation

EC Directive 2007/46/EC as amended by Regulation 2015/166, Annex XI, Appendix 3,
Item 15A (Footnote W₃)
Item 19A (Footnote W₅)
Item 31A (Footnote W₆)
WTORS Dynamic Testing and WTORS Occupant Restraint Installation only.

Test Details

Location of Test: Unwin
Martock
TA12 6EY
Date of Test: 16/17/20/21 August 2018
VCA Representative(s): James Diwell (16th August 2018 Only)
Rob Hookway
Manufacturer's Representative(s): Paul Nieuwenhuis
Reason for Test Report: ~~New approval / Extension of approval /~~ Test report only

Manufacturer Details

Name and Address: Tripod Mobility
Collseweg 10
5674TR Nuenen
The Netherlands
Type: See Worst Case Notes
Commercial Description: See Worst Case Notes
Category: See Worst Case Notes

Conclusion

The above mentioned vehicle/components were tested in accordance with the above mentioned legislation and were found to comply in all respects. This report relates only to the items tested.

Signature:

Name: Rob Hookway
Position: Type Approval Engineer
Date: 02 November 2018

List of Annexes



Vehicle Certification Agency

VCA, 1 Eastgate Office Centre,
Eastgate Road, Bristol, BS5 6XX, United Kingdom
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Report Number: ESU437411-WAV

Issue: 1

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Annex	No of Pages	Subject
I	1	Comparison of vehicle and WTORS test geometry
II	4	T-12191
III	4	T-12198
IV	73	Info Docs
V	1	Welding Information



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Worst Case Rationale

Test 1: T-12191, Test 2: T-12198 both as described below.
In vehicle test of WTORS, to Non ISO10542 geometry.
Rear tie downs use trip-lock fittings in body shell provided by Tripod

After both tests, some deformation of rear tie-down anchorages and buckle stalk mounting locations.

Issue 1: Correction to add missing environmental test reference (UTAC report).

Note: Include information on variants and versions this report covers, as applicable. Supporting documents may be annexed to this report

Tests Required

	Yes, NA, See Report ... / Approval ... / Annex ...
Seats (Item 15a):	Not Applicable
Seatbelt Anchorages (Item 19a):	Not Applicable
Seatbelt Installation (Item 31a):	Not Applicable
WTORS Anchorages:	Yes
WTORS Components – Dynamic Test	Yes
WTORS Components– Material Tests	Not Applicable
WTORS Occupant Restraint Installation:	Yes

Vehicle/Component Specification

Vehicle Type/Variant/Version:	L2 Peugeot Rifter bodyshell.
Wheelchair Front Tie-down Details:	1 – EF3H 2 – EF3H
Wheelchair Rear Tie-down Details:	1 - BQEMH 2 - BQPH
Occupant Restraint Details:	1 – SBT-11040-A – Short Stalks 2 – SBT – 11040-A – Long Stalks

Manufacturer’s Documentation

Manufacturer’s documentation is complete and reflects the agreed specification for the components tested and covers all variants and versions agreed in the worst case rationale.

Yes

Facility and Equipment Checks

Calibration certificates checked and valid, recorded in the following table:

Equipment	Serial / Certificate No.	Calibration due*
Data Acquisition	UIG 133	20-Nov-18
Accelerometer AX	UIG 108	13-Sep-18
Accelerometer AX	UIG 125	24-Nov-18

*Specify calibrated date + (interval) or calibration due date.



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Test Requirements		Complies Yes / NA
Seats (Item 15A)		
Seatbelt Anchorages (Item 19A)		
Seatbelt Installation (Item 31A) (Ordinary Seats)		
WTORS Anchorages (Anchorage strength may be tested using either the dynamic or static options below.)		
General Requirements		
Footnote W3	Longitudinal plane of the intended wheelchair-travelling position is parallel to the longitudinal plane of the vehicle.	Yes
Footnote W3	Appropriate information is made available to the vehicle owner that, in order to be capable of withstanding the forces transmitted by the tie-down mechanism during the various driving conditions, a wheelchair with a structure meeting the relevant part of ISO 7176-19:2008 is recommended.	Not Applicable
Dynamic Testing		
2007/46, Ann XI, App 3, 0.1.	Anchorage strength requirements are considered to be met if the dynamic WTORS component test is carried out in a representative body structure.	Yes
Static Testing		
2007/46, Ann XI, App 3, 0.1.	SWC load is applied by means of a surrogate wheelchair, as defined in ISO 10542:2012.	Not Applicable
2007/46, Ann XI, App 3, 2.1.1.	Occupant restraint load and the traction device used to apply it are as specified in ECE R14.	Not Applicable
2007/46, Ann XI, App 3, 2.2.	Loads are applied simultaneously at an angle of $10^\circ \pm 5^\circ$ above the horizontal plane. The SWC load is applied at a height of between 200 mm and 400 mm, measured vertically from the surface on which the SWC rests.	Not Applicable
2007/46, Ann XI, App 3, 2.2.	All forces are maintained for a period of not less than 0.2 seconds.	Not Applicable
Forward Pull¹		



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2007/46, Ann XI,
App 3, 2.2.2

Belt position	Time to load (sec)	Time required load held (sec)	Required load (daN)	
Lap			1350 ²	
Torso			1350 ²	
Seat inertia [#]				
SWC			2450	

¹ Amend in accordance with paragraph 2.2.3, as appropriate for rear-facing wheelchairs.

² Where the occupant belt loads are transferred to the vehicle structure through a seat or structure similar to a seat, an inertia load should be added in accordance with R14 paragraph 6.4.4.

Rearward Pull¹

2007/46, Ann XI,
App 3, 2.2.2

Belt position	Time to load (sec)	Time required load held (sec)	Required load (daN)	
SWC			820 ²	

¹ Amend in accordance with paragraph 2.2.3, as appropriate for rear-facing wheelchairs.

² Note 1225 daN rearward load is required for UK NSSTA approval

VCA

No part of the system failed, or became detached during the test.

Not Applicable

Remarks (give details of damage/deformation):

Not Applicable

Geometric Requirements

2007/46, Ann XI,
App 3, 1.2.
R14.07, 5.4.2.2.

Side-view projected angles of the lines between the SWC P-point and the lower occupant anchorages are between 30 and 80 degrees from the horizontal.

Yes

2007/46, Ann XI,
App 3, 1.2.

Upper actual anchorage(s) are located at least 1,100 mm above the horizontal plane, passing through the points of contact between the rear tyres of the SWC and the vehicle floor. This condition is still satisfied after the static/dynamic strength test.

Yes

WTORS Components – Dynamic Test

Dynamic Test Set-up

ISO10542, Ann A,
4.2.(a)

Wheelchair design meets characteristics specified in Annex E.

Yes

ISO10542, Ann A,
4.2.(b)

Hybrid III dummy used with mass of 77.7 kg. Close-fitting cotton clothes worn and static resistance of all joints set to 1 g.

Yes



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2007/46, Ann XI, App 3, 2.3.1.	<p>Test carried out in representative vehicle body structure* OR All anchorages on sled set up are within an absolute linear distance of 50 mm from those on the vehicle*</p> <p><i>*Strikethrough, as appropriate. Note: There is no tolerance on the SWC P-point with respect to the declared travelling position of the wheelchair and so measurements of anchorage positions should be normalised to give the P-point as the origin in both sets of measurements.</i></p>	Yes				
VCA	In the case of out-of-vehicle tests, comparison of anchorage positions is attached to the report as an Annex.	Not Applicable				
ISO10542, Ann A, 5.7. VCA	Wheelchair reference plane parallel to vehicle longitudinal plane (+/- 3°). Where the wheelchair does not rest on a horizontal surface, this attitude is replicated on the sled, wherever possible.	Yes				
ISO10542, Ann A, 5.8.	Tie-downs installed and tensioned, as per manufacturer's instructions.	Yes				
ISO10542, Ann A, 5.12.	ATD is positioned upright in the SWC and symmetrical about its centreline with the pelvis as far back on the seat as possible and hands resting on thighs.	Yes				
ISO10542, Ann A, 5.14.-5.18.	Occupant restraint installed, as per manufacturer's instructions.	Yes				
ISO10542, Ann E, E.2.1	Tyre pressures set to 320 ⁺³⁰ / ₋₀ kPa.	Yes				
Dynamic Test Results						
ISO10542, Ann A, 4.1.(c)	<p>Sled velocity change:</p> <table border="1" data-bbox="890 1429 1169 1496"> <tr> <td>1)</td> <td>48.05</td> </tr> <tr> <td>2)</td> <td>48.63</td> </tr> </table> <p>Requirement: 48 ₋₀⁺² km/h</p>	1)	48.05	2)	48.63	Yes
1)	48.05					
2)	48.63					
ISO10542, Ann A, 4.1.(d)	<p>Acceleration pulse conforms to ISO 10542 requirements.</p> <p>Requirement: > 0g for 75 ms; > 15 g for 40 ms; > 20 g for 15 ms</p>	Yes				
ISO10542, 5.2.3.(a)	ATD retained in seat of SWC.	Yes				
ISO10542, 5.2.3.(b)	SWC is in an upright position on the impact sled.	Yes				
ISO10542, 5.2.3.(c)	No WTORS component became detached or separated.	Yes				
ISO10542, 5.2.3.(d)	Tools not required for release of SWC from tie-down system.	Yes				
ISO10542, 5.2.3.(e)	Tools not required for release of ATD from restraint system.	Yes				



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ISO10542, 5.2.3.(f)	No part of the WTORS exhibits signs of tearing, fragmentation, fracture, or complete failure (unless designed to do so, e.g. load limiting webbing).	Yes									
ISO10542, 5.2.3.(g)	WTORS exhibits no dangerous roughness, sharp edges or protrusions likely to increase the risk of injury.	Yes									
ISO10542, 5.2.2.(a)	Movement of the SWC and ATD is within limits: <table border="1" data-bbox="911 719 1262 925"> <tr> <td data-bbox="373 719 906 779">- Horizontal excursion of SWC:</td> <td data-bbox="911 719 1062 779">1) 189 2) 197</td> <td data-bbox="1075 719 1262 779">mm Limit: 200</td> </tr> <tr> <td data-bbox="373 786 906 846">- Horizontal excursion of ATD knee:</td> <td data-bbox="911 786 1062 846">1) 320 2) 241</td> <td data-bbox="1075 786 1262 846">mm Limit: 375</td> </tr> <tr> <td data-bbox="373 853 906 913">- Horizontal excursion of ATD head:</td> <td data-bbox="911 853 1062 913">1) 587 2) 547</td> <td data-bbox="1075 853 1262 913">mm Limit: 650</td> </tr> </table>	- Horizontal excursion of SWC:	1) 189 2) 197	mm Limit: 200	- Horizontal excursion of ATD knee:	1) 320 2) 241	mm Limit: 375	- Horizontal excursion of ATD head:	1) 587 2) 547	mm Limit: 650	Yes
- Horizontal excursion of SWC:	1) 189 2) 197	mm Limit: 200									
- Horizontal excursion of ATD knee:	1) 320 2) 241	mm Limit: 375									
- Horizontal excursion of ATD head:	1) 587 2) 547	mm Limit: 650									
ISO10542, 5.2.2.(b)	Horizontal excursion of ATD knee is at least 1.1 times excursion of SWC.	Yes									
Remarks (condition of anchorages after test): Deformation to rear anchorages.											

WTORS Components – Material Tests

ECE Regulation 16/Environmental/Material Tests

ISO10542, 5.1.1.	ECE regulation tests as specified in the table below have been carried out and passed for all component parts of the WTORS, as applicable.	Yes
Test report details or other reference: UTAC report PV18-07711		
ISO10542, 5.1.2.	Burn rate of webbing and padding does not exceed 100 mm/min.	see report



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Subclause	Component	Subject	ECE R 16 tests referenced	Application ^a
6.2.1.1	rigid parts	sharp edges	—	OR + WTD
6.2.1.2	rigid parts	corrosion	7.2	OR + WTD
6.2.1.4	rigid parts	cold impact test	7.5.4	OR + WTD
6.2.2.1	buckles	correct use and size	—	OR
6.2.2.2	buckles	closing/releasing	7.8.2	OR
6.2.2.3	buckles	cold mating	7.5.3	OR
6.2.2.4	buckles	repeated testing	7.7	OR
6.2.3.2	adjustment devices	micro-slip	7.3	OR
6.2.3.4	belt-adjusting device	force	7.5.6	OR + WTD
6.2.5	various belt retractors	performance	7.2, 7.6.1 to 7.6.4	OR
6.2.6	preloading devices	performance	7.2, 7.9.2	OR
6.3.1	belts	general specs	7.4.3	OR
6.3.2	belts	strength	7.4.1.1, 7.4.2	OR + WTD
6.3.3	belts	strength	7.4.1, 7.4.2	OR + WTD
6.4.2	belts	strength	7.4.1.6, 7.4.2, 7.5	OR + WTD

^a OR = occupant restraint, WTD = wheelchair tiedown.

Webbing Slippage Tests

ISO10542, 5.3. Strap type adjustment mechanisms show slippage of no greater than 25 mm when tested in accordance with Annex C or ECE R16. see report

Partial Engagement Test

ISO10542, 5.4. & Ann D All parts of the WTORS with potential to be partially engaged separate from this condition, with a force of no greater than $22^{+2}/_{-0}$ N, applied for a maximum of $3^{+0.5}/_{-0}$ seconds. see report

Description of components and subjected to the above test and manner of partial engagement (with photographs, if applicable):

See report

WTORS Occupant Restraint Installation

2007/46, Ann XI, App 3, 1.3. R16.06, 8.2.2. Belt(s) are installed so that, when properly worn, they will work satisfactorily and reduce the risk of bodily injury in the event of an accident. In particular, they are installed so that the: Yes

R16.06, 8.2.2.1. Straps are not liable to assume a dangerous configuration; Yes



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R16.06, 8.2.2.2.	Danger of a correctly positioned belt slipping from the shoulder of a wearer as a result of his/her forward movement is reduced to a minimum;	Yes
R16.06, 8.2.2.3.	Risk of the strap deteriorating through contact with sharp rigid parts of the vehicle or seat structure is reduced to a minimum;	Yes
R16.06, 8.2.2.4.	Safety belt provided for each wheelchair position is such as to be readily available for use, including after a seat (or wheelchair) has been displaced/folded and then restored.	Yes
R16.06, 8.3.1.	Rigid parts do not increase the risk of injury in the event of an accident.	Yes
R16.06, 8.3.2.	Device for releasing the buckle is clearly visible to and within easy reach of the wearer, and designed so that it cannot be opened inadvertently or accidentally. It is located so that it is readily accessible to a rescuer in an emergency.	Yes
R16.06, 8.3.2.	Both when not under load and when sustaining the wearer's weight, the buckle is capable of being released by the wearer with a single simple movement of either hand in one direction.	Yes
R16.06, 8.3.2.	If the buckle is in contact with the wearer, the parts of the buckle likely to contact the body of the wearer presents a section of not less than 20 cm ² and at least 46 mm in width, measured in a plane situated at a maximal distance of 2.5 mm from the contact surface.	Not Applicable
R16.06, 8.3.3.	Belt either adjusts automatically to fit or is designed so that the manual adjusting device is readily accessible to the wearer, is convenient and easy to use, and may be tightened with one hand.	Yes
R16.06, 8.3.4.	Belts incorporating retractors are installed so that they operate correctly and stow the strap efficiently.	Yes

Remarks

Note: VCA apply measurement uncertainty to calibrated items but not test results.



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Annex I – Comparison of Vehicle and WTORS Test Geometry

Measured with arbitrary datum										
	Vehicle			WTORS Test						
	X	Y	Z	X	Y	Z				
Front left	1922	222	-10	0	225	195				
Front right	1922	-222	-10	0	-225	195				
Rear left	3572	150	-18	1660	150	200				
Rear right	3572	-150	-18	1660	-150	200				
LB	3369	480	267	1450	480	485				
LNB	3369	-480	267	1450	-480	485				
Upper	3425	-429	1398	1495	-430	1610				
Reel	3434	-480	267	1520	-480	485				
P point	3150	0	572	1238	0	785				
Corrected to make P-point the origin (0,0,0) in both cases										
	Vehicle			WTORS Test			Difference			
	X	Y	Z	X	Y	Z	X	Y	Z	Abs
Front left*	-1228	222	-582	-1238	225	-590	10	-3	8	13
Front right*	-1228	-222	-582	-1238	-225	-590	10	3	8	13
Rear left	422	150	-590	422	150	-585	0	0	-5	5
Rear right	422	-150	-590	422	-150	-585	0	0	-5	5
LB	219	480	-305	212	480	-300	7	0	-5	9
LNB^	219	-480	-305	212	-480	-300	7	0	-5	9
Upper	275	-429	826	257	-430	825	18	1	1	18
Reel^	284	-480	-305	282	-480	-300	2	0	-5	5
P point	0	0	0	0	0	0	0	0	0	0

Test Number:	12191
Test Date:	16/08/2018
Test Engineer:	Gavin
Test House:	UDL
Witness 1	VCA
Witness 2	Tripod



Customer:	Tripod Mobility
Address:	Collseweg 10
	5674TR Nuenen
	The Netherlands

Test Objective & Setup Details:

Tripod Test 1 to include Quattro Express for rear tiedowns

Equipment Used In Test:

Component	Description	Post Test
Occupant Restraint:	SBT-11040-A	Passed
Occupant Restraint Anchorage:	Bolted	Passed
3rd Point Restraint:	As part of SBT-11040-A	Passed
3rd Point Anchorage:	Bolted	Passed
Front Restraint:	EF3H	Passed
Front Restraint Anchorage:	Bolted	Passed
Rear Restraint:	BQEMH	Passed
Rear Restraint Anchorage:	Customer Supplied Triplock	Passed

(If Concern – Use Notes)

Instrumentation:

Type	Variant	Unwin ID	Last Cal.
Data Acquisition	DTS Slice	UIG 133	20-Nov-17
Accelerometer AX	Endevco 200g	UIG 108	13-Sep-17
Accelerometer AX	Endevco 200g	UIG 125	24-Nov-17

Instrumentation Calibrated Annually.

Post Test Report



Post Test According to ISO 10542-1:2012		
a	ATD Shall be retained in seat of the SWC	Passed
b	The SWC shall remain in an upright position on the impact sled	Passed
c	No WTORS anchorage components or securement end fittings shall be detached or separated	Passed
d	Release of the SWC from the wheelchair tie-down shall not require the use of tools	Passed
e	Release of the ATD from the occupant restraint shall not require the use of tools	Passed
f	No part of the WTORS shall exhibit visible signs of tearing, fragmentation, fracture or complete failure of any load-bearing part unless such parts are intended to fail in a manner that limits the forces on the occupant	Passed
g	The WTORS shall exhibit no dangerous roughness, sharp edges or protrusions likely to increase the risk of injury to the occupant	Passed
h	The force required to open the buckle of any tie down or occupant restraint components shall not exceed 60N when tested as specified by 6.2.2.5 of ECE R16:1996, in accordance with the procedures of 7.8	Passed

During Test According to ISO 10542-1:2012			
		Result	Complies?
a	The horizontal excursion of the test wheelchair P-Point (Xwc) shall not exceed 200mm	189	Passed
b	The horizontal excursion of the ATD Knee (Xknee) shall not exceed 375mm	320	Passed
c	The horizontal excursion of the ATD Head (Xhead) shall not exceed 650mm	587	Passed
d	The WTORS shall prevent the wheelchair from imposing forward loads on the occupant (Xknee /	1.70	Passed

Required		Actual	Complies?
SWC Mass	85kg ± 1kg	85kg	Yes
ATD	50th %ile	Hybrid 3	Yes
Horizontal Velocity Change	48-50 kph	48.05	Passed
Pulse 20g	>15ms	38.2	Passed
Pulse 15g	>40ms	52.8	Passed

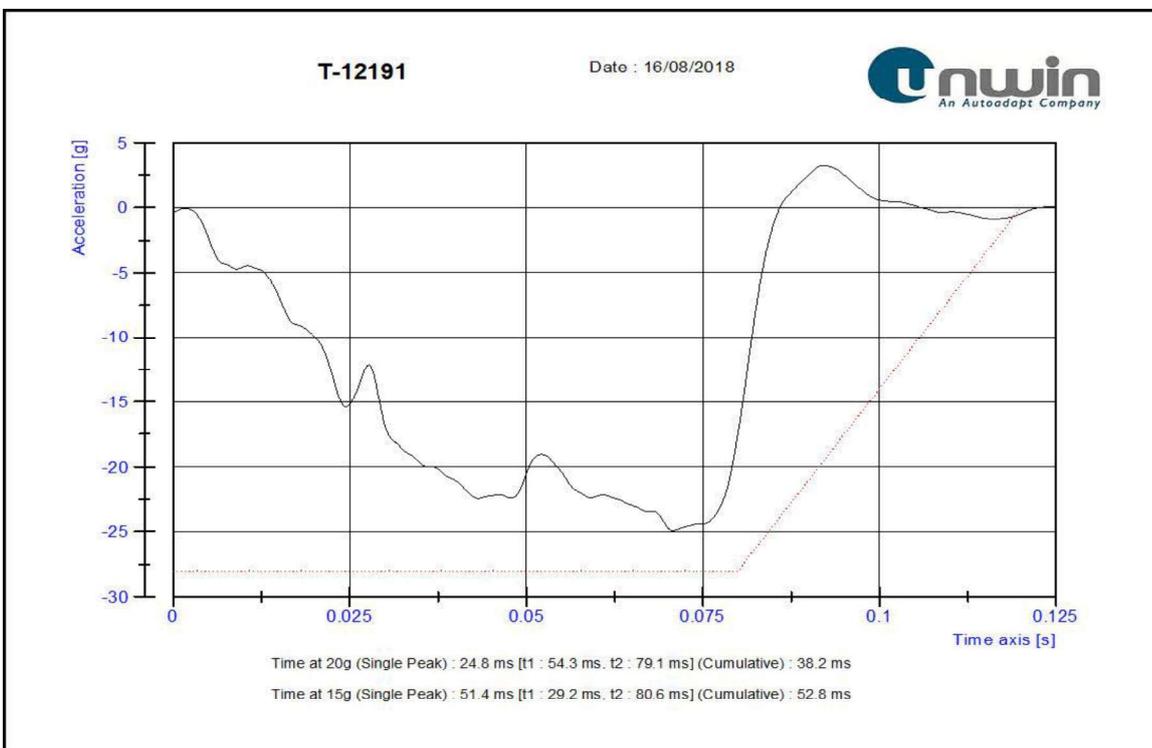
Test Pass or Fail overall	Pass
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Notes	Rear anchorages and buckle stalk bent considerably but all held ok. Excursions ok
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Pulse Graph Velocity:



Pulse Graph Deceleration:



Pre Test Photo:



Post Test Photo:



Test Number:	12198
Test Date:	21/08/2018
Test Engineer:	Jacob Downes
Test House:	UDL
Witness 1	VCA
Witness 2	Gavin pike



Customer:	Tripod Mobility
Address:	Collseweg 10
	5674TR Nuenen
	The Netherlands

Test Objective & Setup Details:

Tripod Test to include Standard Quattro for rear tiedowns

Equipment Used In Test:

Component	Description	Post Test
Occupant Restraint:	SBT-11040-A	Passed
Occupant Restraint Anchorage:	Bolted	Passed
3rd Point Restraint:	As part of SBT-11040-A	Passed
3rd Point Anchorage:	Bolted	Passed
Front Restraint:	EF3H	Passed
Front Restraint Anchorage:	Bolted	Passed
Rear Restraint:	BQPH	Passed
Rear Restraint Anchorage:	Customer supplied Triplock	Passed

(If Concern – Use Notes)

Instrumentation:

Type	Variant	Unwin ID	Last Cal.
Data Acquisition	DTS Slice	UIG 133	20-Nov-17
Accelerometer AX	Endevco 200g	UIG 108	13-Sep-17
Accelerometer AX	Endevco 200g	UIG 125	24-Nov-17

Instrumentation Calibrated Annually.

Post Test Report



Post Test According to ISO 10542-1:2012		
a	ATD Shall be retained in seat of the SWC	Passed
b	The SWC shall remain in an upright position on the impact sled	Passed
c	No WTORS anchorage components or securement end fittings shall be detached or separated	Passed
d	Release of the SWC from the wheelchair tie-down shall not require the use of tools	Passed
e	Release of the ATD from the occupant restraint shall not require the use of tools	Passed
f	No part of the WTORS shall exhibit visible signs of tearing, fragmentation, fracture or complete failure of any load-bearing part unless such parts are intended to fail in a manner that limits the forces on the occupant	Passed
g	The WTORS shall exhibit no dangerous roughness, sharp edges or protrusions likely to increase the risk of injury to the occupant	Passed
h	The force required to open the buckle of any tie down or occupant restraint components shall not exceed 60N when tested as specified by 6.2.2.5 of ECE R16:1996, in accordance with the procedures of 7.8	Passed

During Test According to ISO 10542-1:2012			
		Result	Complies?
a	The horizontal excursion of the test wheelchair P-Point (Xwc) shall not exceed 200mm	197	Passed
b	The horizontal excursion of the ATD Knee (Xknee) shall not exceed 375mm	241	Passed
c	The horizontal excursion of the ATD Head (Xhead) shall not exceed 650mm	547	Passed
d	The WTORS shall prevent the wheelchair from imposing forward loads on the occupant (Xknee /	1.22	Passed

Required		Actual	Complies?
SWC Mass	85kg ± 1kg	85kg	Yes
ATD	50th %ile	Hybrid 3	Yes
Horizontal Velocity Change	48-50 kph	48.63	Passed
Pulse 20g	>15ms	34.3	Passed
Pulse 15g	>40ms	51.9	Passed

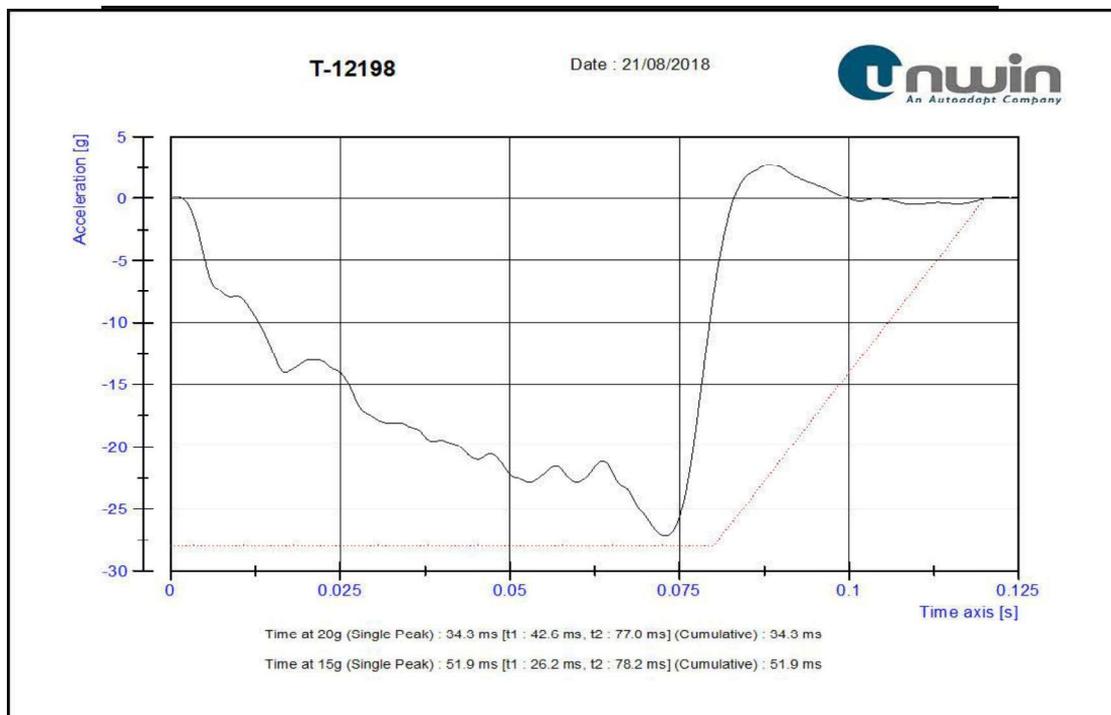
Test Pass or Fail overall	Pass
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Notes
Pulse and excursions passed.

Pulse Graph Velocity:



Pulse Graph Deceleration:



Pre Test Photo:



Post Test Photo:

