



Vehicle Certification
Agency Europe

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Report Number: ESA564413/
XLA003008



ISP N° 0178 E
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Mutual Recognition Agreements

Issue: 0

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written approval of the technical service.

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

Legislation

Regulation (EU) 2018/858 Consolidated to Commission Delegated Regulation (EU) 2021/1445,
Annex II, Part III, Appendix 3
Item 15A (Footnote W3)
Item 19A (Footnote W5)
Item 31A (Footnote W6)

Inspection/Test Details

Location of Inspection/Test:	Braunability UK, the Horseshoe, Martock, TA12 6EY
Date(s) of Inspection/Test:	06-09 June 2022
VCA Representative(s):	Fraser Coulter
Inspectors Home Office Location:	VCA HQ
Manufacturer's Representative(s):	Paul Nieuwenhuis
Reason for Report:	New Approval

Manufacturer Details

Name and Address:	Tripod Mobility B.V. Collseweg 10 5674 TR Nuenen / The Netherlands
Type:	XFKT
Commercial Description:	Kangoo / Townstar / Citan Tripod
Category:	M1 SH (Special Purpose Vehicle, Wheelchair Accessible)

Conclusion

The above-mentioned vehicle / engine / component was tested in accordance with the above mentioned legislation and was found to comply in all respects listed in this report. This report relates only to the items tested.

Witness Engineer
Signature:

Name:	Fraser Coulter
Position:	Senior Type Approval Engineer
Date:	9 June 2022

Name:	Kevin Bridges
Position:	Technical Manager
Date:	28 October 2022



Issue: 0

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List of Annexes

Annex	No of Pages	Subject
I	1	Comparison of vehicle and WTORS test geometry
II	14	Test Reports
III	54	Info Doc

Issue Record

Issue 0 is original report

Note: Include reason for reissue, date of reissue, who has reissued.

Worst Case Rationale

Test report to Tripod Mobility's stage 2 conversion of the Renault Kangoo/Mercedes-Benz Citan/ Nissan Townstar.

There is one wheelchair position within the vehicle with 2 sets of rear restraints covered. One set rated for an 85kg SWC the other heavy duty are rated to 160kg.

2x dynamic tests requested in a full representative BiW.

No seatbelt/wheelchair occupant installation checks were conducted as part of this report

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

Significant Interpretations, Alternative Test Methods, New Technologies

Inspection/Tests Required

Yes, NA, See Report ... / Approval ... / Annex ...

Seats, their anchorages and any head restraints (Item 15A):
 Safety-belt anchorages, Isofix anchorages systems and Isofix top tether anchorages (Item 19A):
 Safety-belts, restraint systems, child restraint systems and Isofix child restraint systems (Item 31A):
 WTORS Anchorages:
 WTORS Components – Dynamic Test
 WTORS Components– Material Tests

Not Applicable
Not Applicable
Not Applicable
Yes
Yes
Yes



Issue: 0

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Vehicle/Component Specification

Vehicle Type/Variant/Version:	Renault Kangoo, Mercedes-Benz Citan, Nissan Townstar
Wheelchair Front Tie-down Details:	EF3CJ
Wheelchair Rear Tie-down Details:	BQEPJ, BQE16MK
Occupant Restraint Details:	SBT-11040-A

Manufacturer's Documentation

Manufacturer's documentation is complete and reflects the agreed specification for the vehicle component tested and covers all variants and versions agreed in the worst case rationale.	Yes
Information document uploaded to job folder and identified by job number.	Yes

Facility and Equipment Checks

Facility Appraisal reference and date: <i>Reference and date if formal; state if ad-hoc appraisal).</i>	Mandatory FA not applicable
Calibration certificates are traceable to national or international standards of measurement, where available:	Yes
Calibration certificates checked and valid, recorded in the following table:	Yes

Equipment

Description	Make	Model	Serial number	Calibration due date
Data Acquisition	DTS	SLICE	UIG133	09/07/2022
Accelerometer	Endevco	2262A-200	UIG108	16/08/2022
	Strainsense	GCS-D1S-250-L5M	UIG276	
	Endevco	2262A-200	UIG125	13/08/2022
	Strainsense	GCS-D1S-250-L5M	UIG275	
Tape Measure	Stanley	5m	BE048	06/09/2022
Pressure Gauge	Kennedy	12 Bar	UIG289	20/01/2023

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

Software used in Testing

Description	Make	Version
Sliceware	DTS	1.08.0868
Trackimage	Genuine Intel	3.6.3



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Inspection/Test Requirements

**Complies
Yes / NA**

Seats (Item 15A)

See page 2

Seatbelt Anchorages (Item 19A)

See page 2

Seatbelt Installation (Item 31A)

(Ordinary Seats)

See page 2

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.	Yes

Dynamic Testing

2018/858, Ann II, Part III, App 3, 4.1.	The full assembly of the WTORS system is tested by an in-vehicle dynamic test in accordance with the specified paragraphs and Annex of ISO 10542-1:2012, testing all components/anchorages simultaneously, using a vehicle body-in-white or representative structure.	Yes
2018/858, Ann II, Part III, App 3, 4.2.	The component parts of the WTORS meet the relevant requirements of ISO 10542- 1:2012 and paragraphs 5.1, 5.3 and 5.4. These requirements are deemed to have been met in respect of the occupant restraint if it is approved in accordance with UN Regulation No 16.06.	Yes

Static Testing

Not Applicable

Geometric Requirements

2018/858, Ann II, Part III, App 3, 1.2.	The wheelchair occupant's lower belt anchorages are located in accordance with UNECE Regulation 14-07, paragraph 5.4.2.2, relative to Point P on the SWC when placed in the travelling position	Yes
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designated by the manufacturer (between 30 and 80degrees from the horizontal).

2018/858, Ann II,
Part III, App 3,
1.2.

The 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.

WTORS Components – Dynamic Test

Dynamic Test Set-up

ISO10542, Ann A,
4.2.(a)

Wheelchair design meets characteristics specified in Annex E.

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 1g.

2018/858, Ann II,
Part III, App 3,
3.3.1.

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*~~

*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.

VCA

In the case of out-of-vehicle tests, comparison of anchorage positions is attached to the report as an Annex.

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.

ISO10542, Ann A,
5.8.

Tie-downs installed and tensioned, as per manufacturer's instructions.

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.

ISO10542, Ann A,
5.14.-5.18.

Occupant restraint installed, as per manufacturer's instructions.

ISO10542, Ann E,
E.2.I

Tyre pressures set to 320 ⁺³⁰/₋₀ kPa.

Dynamic Test Results

ISO10542, Ann A,
4.1.(c)

Sled velocity change:

km/h



Issue: 0

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		Test 2:48.5	Yes				
	<i>Requirement: 48 ± 2 km/h</i>						
<i>ISO10542, Ann A, 4.1.(d)</i>	Acceleration pulse conforms to ISO 10542 requirements. <i>Requirement: > 0g for 75 ms; > 15 g for 40 ms; > 20 g for 15 ms</i>		Yes				
<i>ISO10542, 5.2.3.(a)</i>	ATD retained in seat of SWC.		Yes				
<i>ISO10542, 5.2.3.(b)</i>	SWC is in an upright position on the impact sled.		Yes				
<i>ISO10542, 5.2.3.(c)</i>	No WTORS component became detached or separated.		Yes				
<i>ISO10542, 5.2.3.(d)</i>	Tools not required for release of SWC from tie-down system.		Yes				
<i>ISO10542, 5.2.3.(e)</i>	Tools not required for release of ATD from restraint system.		Yes				
<i>ISO10542, 5.2.3.(f)</i>	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				
<i>ISO10542, 5.2.3.(g)</i>	WTORS exhibits no dangerous roughness, sharp edges or protrusions likely to increase the risk of injury.		Yes				
<i>SO10542, 5.2.2.(a)</i>	Movement of the SWC and ATD is within limits:		Yes				
	- Horizontal excursion of SWC:	<table border="1"> <tr> <td>Test 1:191</td> <td rowspan="2">mm</td> <td rowspan="2">Limit: 200</td> </tr> <tr> <td>Test 2:199</td> </tr> </table>	Test 1:191	mm	Limit: 200	Test 2:199	
Test 1:191	mm	Limit: 200					
Test 2:199							
	- Horizontal excursion of ATD knee:	<table border="1"> <tr> <td>Test 1:237</td> <td rowspan="2">mm</td> <td rowspan="2">Limit: 375</td> </tr> <tr> <td>Test 2:327</td> </tr> </table>	Test 1:237	mm	Limit: 375	Test 2:327	
Test 1:237	mm	Limit: 375					
Test 2:327							
	- Horizontal excursion of ATD head:	<table border="1"> <tr> <td>Test 1:555</td> <td rowspan="2">mm</td> <td rowspan="2">Limit: 650</td> </tr> <tr> <td>Test 2:621</td> </tr> </table>	Test 1:555	mm	Limit: 650	Test 2:621	
Test 1:555	mm	Limit: 650					
Test 2:621							
<i>ISO10542, 5.2.2.(b)</i>	Horizontal excursion of ATD knee is at least 1.1 times excursion of SWC.		Yes				

Remarks (condition of anchorages after test):

Floor that wheelchair mounted on showed substantial levels of deformation around rear tyres of SWC. Restraints showed no visible signs of damage



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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:

MBK16-0163, PARC_4064, PV18-07711_5.1, PV18-07712_5.2

ISO10542, 5.1.2. Burn rate of webbing and padding does not exceed 100 mm/min. Yes

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. NA

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. NA

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



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NA

WTORS Occupant Restraint Installation

See page 2

Remarks

Annex I – Comparison of Vehicle and WTORS Test Geometry

Measured with arbitrary datum							
	Vehicle			WTORS Test			
	X	Y	Z	X	Y	Z	
Front left	1437	-344	-185	1446	-344	-183	
Front right	1437	344	-185	1446	344	-183	
Rear left	0	-150	-314	0	-150	-314	
Rear right	0	150	-314	0	150	-314	
LB	55	-462	0	60	-462	0	
LNB	55	462	0	60	462	0	
Upper	180	419	1113	170	420	1113	
Reel	52	626	154	55	626	150	
P point	504	0	300	504	0	300	

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*	933	-344	-485	942	-344	-483	-9	0	-2	9
Front right*	933	344	-485	942	344	-483	-9	0	-2	9
Rear left	-504	-150	-614	-504	-150	-614	0	0	0	0
Rear right	-504	150	-614	-504	150	-614	0	0	0	0
LB	-449	-462	-300	-444	-462	-300	-5	0	0	5
LNB^	-449	462	-300	-444	462	-300	-5	0	0	5
Upper	-324	419	813	-334	420	813	10	-1	0	10
Reel^	-452	626	-146	-449	626	-150	-3	0	4	5
P point	0	0	0	0	0	0	0	0	0	0

Test Number:	T-13123
Test Date:	6/7/2022
Test Engineer:	Ben Cox
Test House:	UDL
Witness 1:	Jacob Downs
Witness 2:	Fraser

Customer:	Tripod
Address:	COLLSEWEG 10
	5674 TR NUENEN
	NETHERLANDS
	0
	0
	0

Test Objectives & Setup Details:	
Tripod 85KG SWC EF3CJ BQEPJ SBT-11040-A	

Equipment Used In Test:		
Component	Description	Post Test
Occupant Restraint	SBT-11040-A	Pass
Anchorage Type	BOLTED	Pass
3rd Point Restraint	SBT-11040-A	Pass
Anchorage Type	BOLTED	Pass
Front Tie-Down	EF3CJ	Pass
Anchorage Type	BOLTED	Pass
Rear Tie-Down	BQEPJ	Pass
Anchorage Type	BOLTED	Pass
Combined System	NA	N/A
Anchorage Type	NA	N/A
Wheelchair	85Kg (+- 1Kg)	Pass
ATD	50th %ile N/A	Pass

Instrumentation:			
Type	Variant	Unwin ID	Last Calibration
Data Acquisition	BR00476	UIG 133	07/09/2021
Accelerometer	Sled Accelerometer (UIG108)	UIG108	08/16/2021 15:40:21
Accelerometer	Sled Accelerometer (UIG	UIG 276	08/16/2021 10:31:31
Accelerometer	Sled Accelerometer (UIG	UIG 125	08/16/2021 15:33:23
Accelerometer	Sled Accelerometer (UIG	UIG 275	08/13/2021 15:49:41

Post Test Observations According to ISO 10542 PAS 2012

a	ATD Shall be retained in seat of the SWC	Pass
b	The SWC shall remain in an upright position on the impact sled	Pass
c	No WTORS anchorage components or securement end fittings shall be detached or separated	Pass
d	Release of the SWC from the wheelchair tie-down shall not require the use of tools	Pass
e	Release of the ATD from the occupant restraint shall not require the use of tools	Pass
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	Pass
g	The WTORS shall exhibit no dangerous roughness, sharp edges or protrusions likely to increase the risk of injury to the occupant	Pass
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	Pass

During Test Observations According to ISO 10542 PAS 2012

		Result	Complies?
a	The horizontal excursion of the test wheelchair P-Point (Xwc) shall not exceed 200mm	191 mm	Passed
b	The horizontal excursion of the ATD Knee (Xknee) shall not exceed 375mm	237 mm	Passed
c	The horizontal excursion of the ATD Head (Xhead) shall not exceed 650mm	555 mm	Passed
d	The WTORS shall prevent the wheelchair from imposing forward loads on the occupant Ratio of Xknee / XWC to be greater than or equal to 1.1	1.24	Passed
e	Inbound velocity (delta V 48kph +2 -0)	48.2 km.h-1	Passed
f	Cumulative Time to hold 20g (>15ms)	28.0 ms	Passed
h	Cumulative Time to hold 15g (>40ms)	54.9 ms	Passed

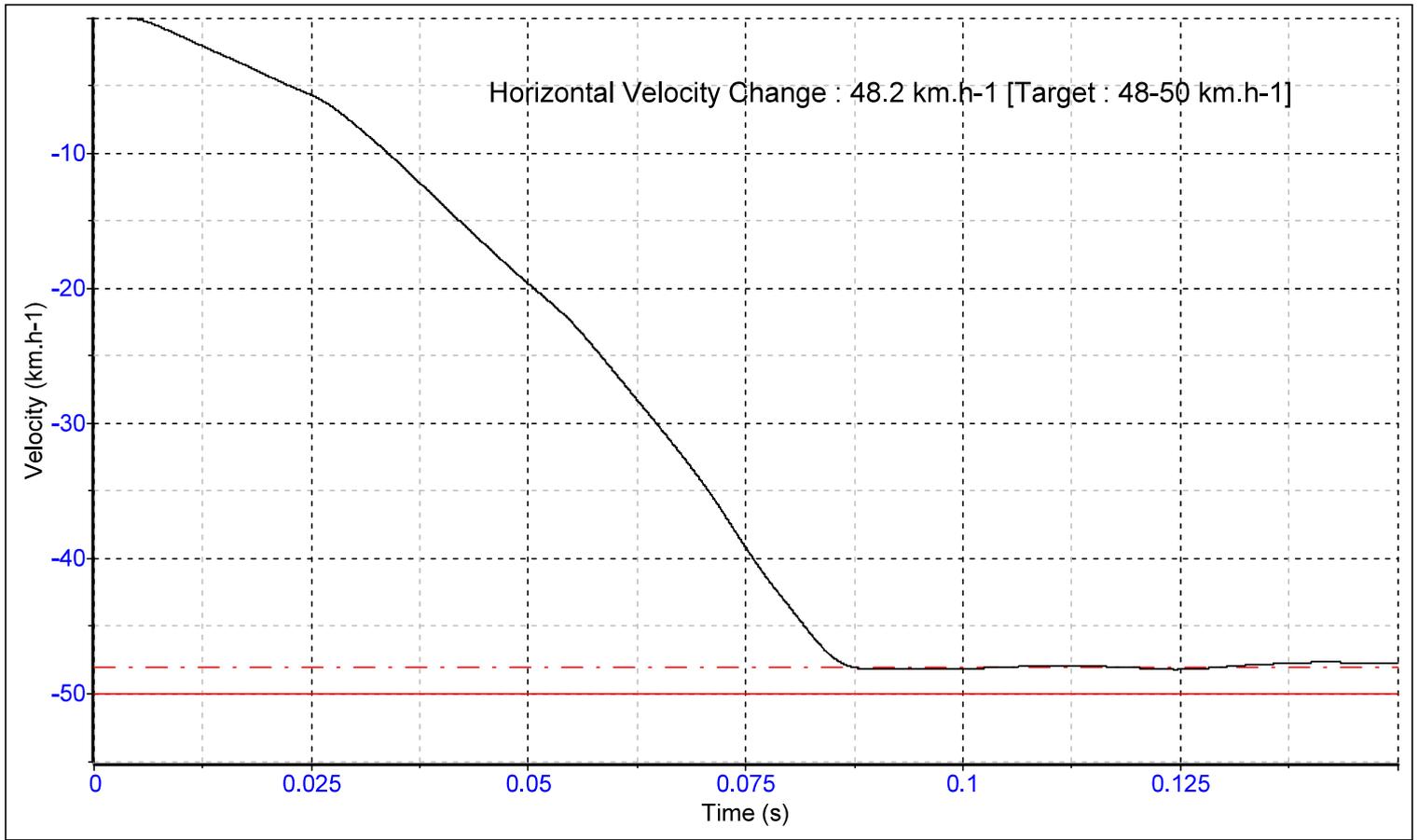
Test Pass or Fail Overall

Pass

Notes

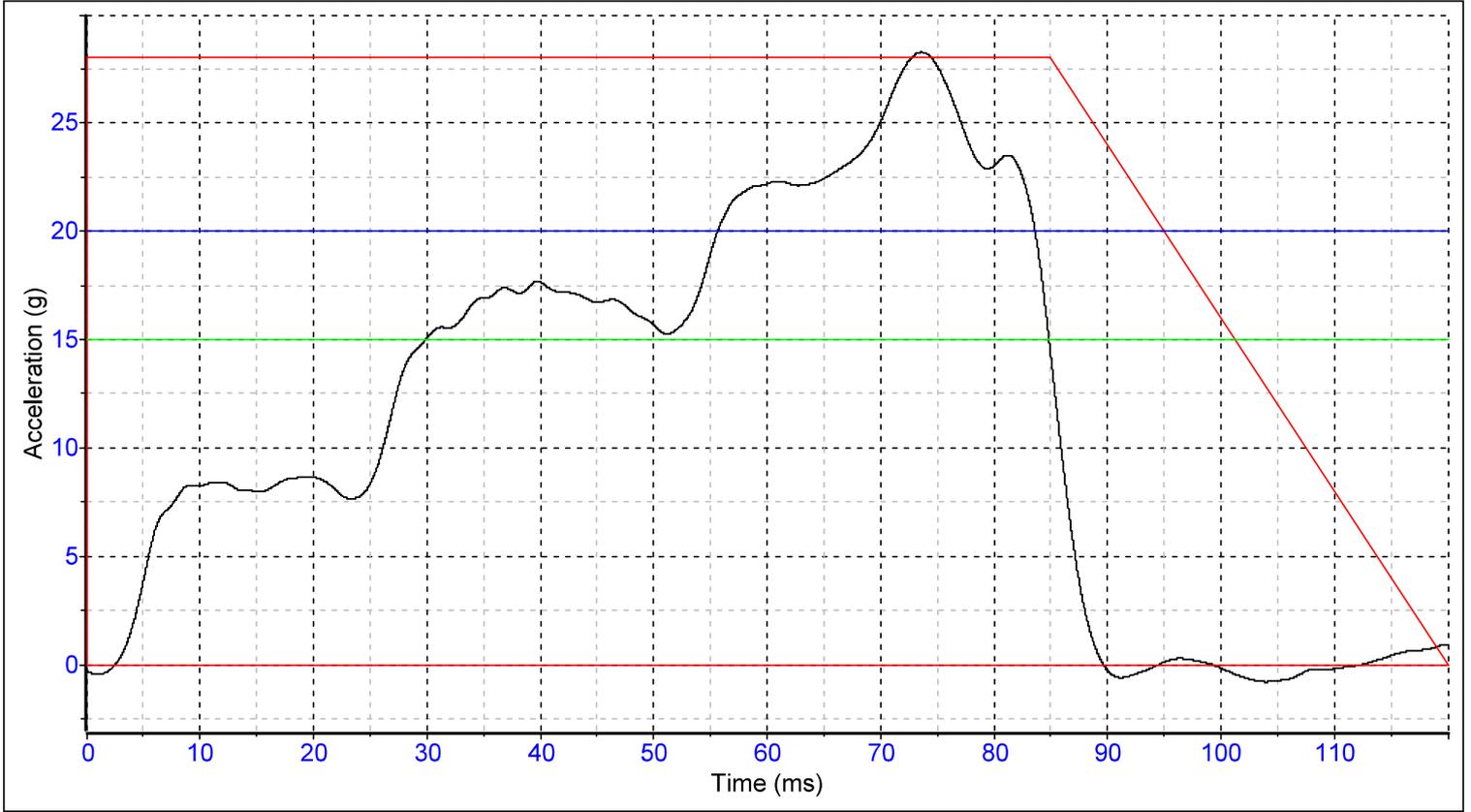
Pulse and excursions were good test passed without problem

Pulse Graph for Velocity T-13123



Camera Frame Rate = 1000 Fps

Pulse Graph for Deceleration T-13123



Time at 20g (Single Peak) : 28.0 ms [t1 : 55.6 ms, t2 : 83.6 ms] (Cumulative) : 28.0 ms

Time at 15g (Single Peak) : 54.9 ms [t1 : 29.9 ms, t2 : 84.8 ms] (Cumulative) : 54.9 ms



Camera Frame Rate = 1000 Fps

Test Photos T-13123

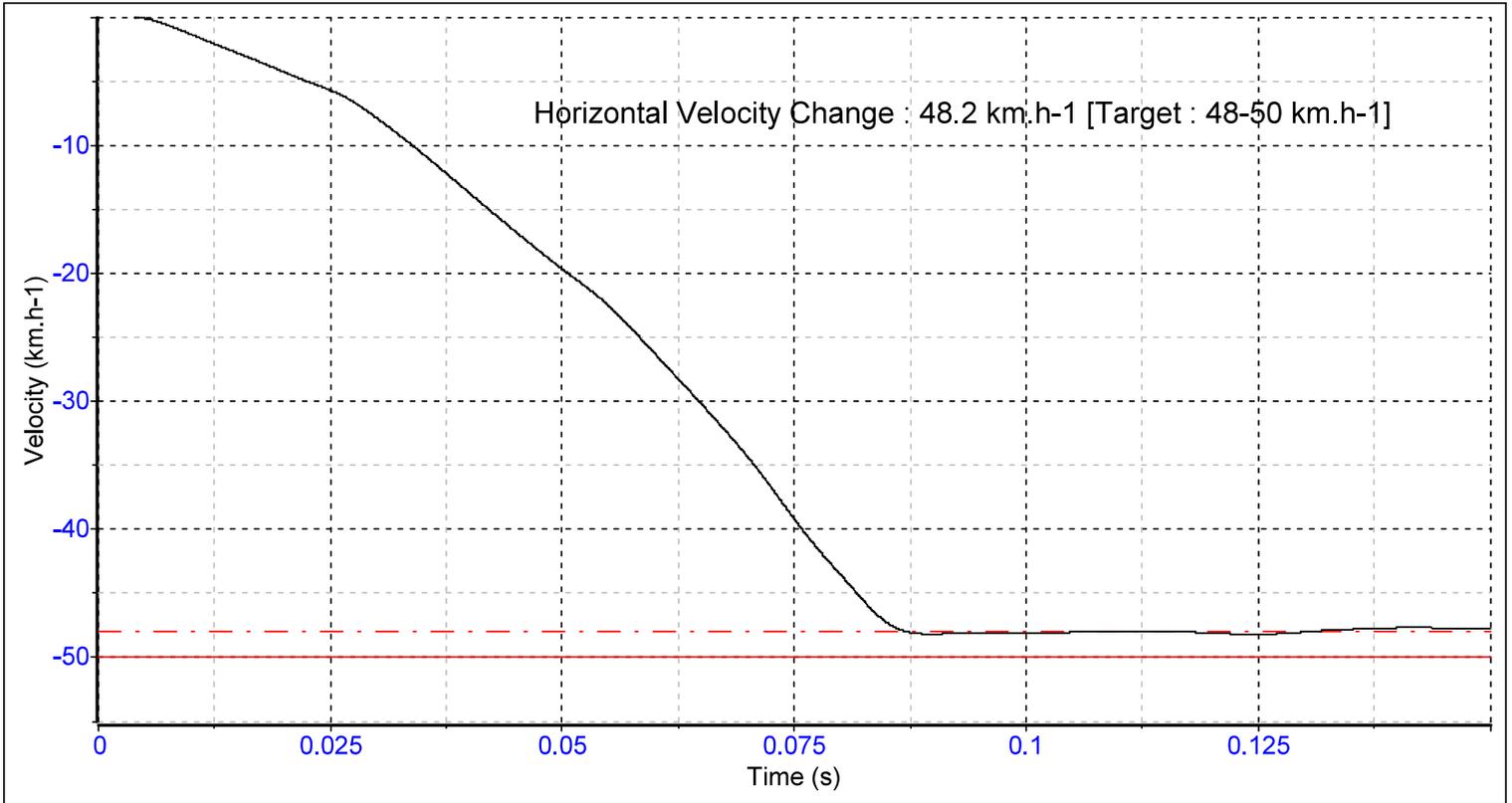


Pre Test

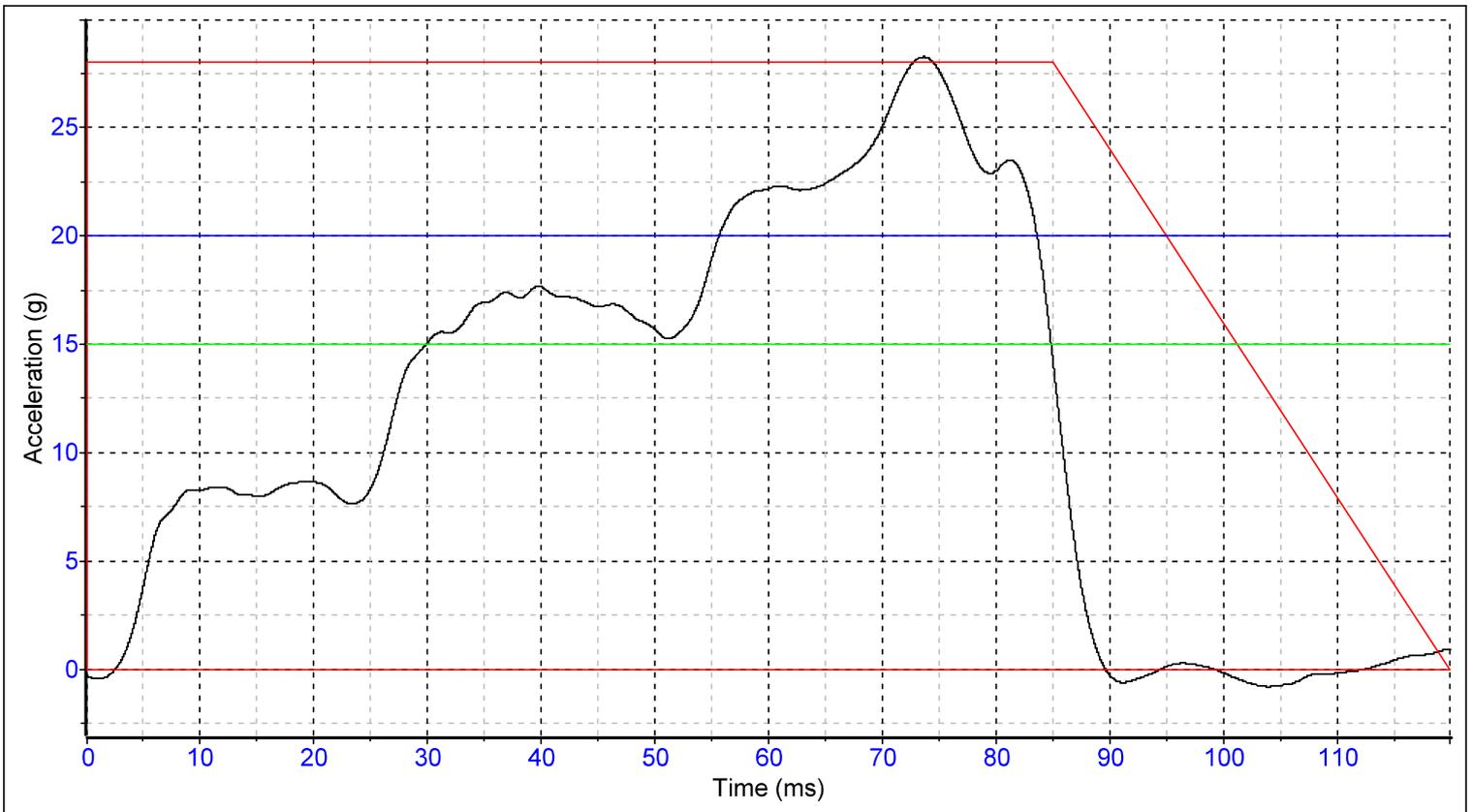


Post Test

Pulse Graph for Velocity T-13123



Pulse Graph for Deceleration T-13123



Time at 20g (Single Peak) : 28.0 ms [t1 : 55.6 ms, t2 : 83.6 ms] (Cumulative) : 28.0 ms

Time at 15g (Single Peak) : 54.9 ms [t1 : 29.9 ms, t2 : 84.8 ms] (Cumulative) : 54.9 ms

Excursions T-13123



Excursion Measurements

SWC Excursion = 191.31 mm

Max Excursion = 200 mm

Knee Excursion = 237.39 mm

Max Excursion = 375 mm

Head Excursion = 555.40 mm

Max Excursion = 650 mm

Ratio Knee / SWC = 1.24

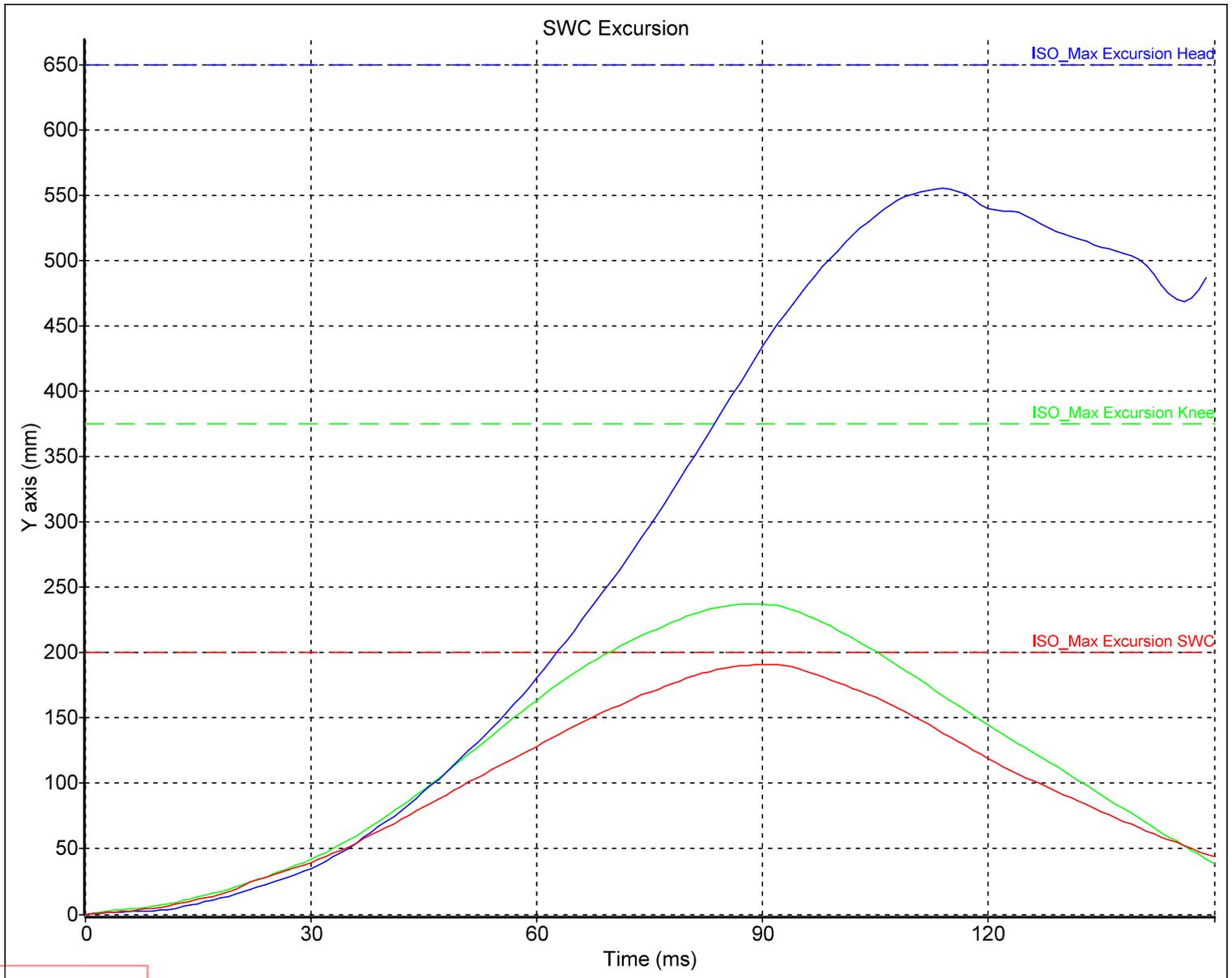
Video Depth Perception

Camera to Sled = ???

Sled to SWC = 548 mm

Sled to Knee = 635 mm

Sled to Head = 687.00 mm



Test Number:	T-13124
Test Date:	6/7/2022
Test Engineer:	Ben Cox
Test House:	UDL
Witness 1:	Jacob Downs
Witness 2:	Fraser Coultar

Customer:	Tripod
Address:	COLLSEWEG 10
	5674 TR NUENEN
	NETHERLANDS
	0
	0
	0

Test Objectives & Setup Details:	
Tripod 85KG SWC EF3CJ SBT-11040-A BQE16MK	

Equipment Used In Test:		
Component	Description	Post Test
Occupant Restraint	SBT-11040-A	Pass
Anchorage Type	BOLTED	Pass
3rd Point Restraint	SBT-11040-A	Pass
Anchorage Type	BOLTED	Pass
Front Tie-Down	EF3CJ	Pass
Anchorage Type	BOLTED	Pass
Rear Tie-Down	BQE16MK	Pass
Anchorage Type	BOLTED	Pass
Combined System	NA	N/A
Anchorage Type	NA	N/A
Wheelchair	85Kg (+- 1Kg)	Pass
ATD	50th %ile Hybrid 3	Pass

Instrumentation:			
Type	Variet	Unwin ID	Last Calibration
Data Aquisition	BR00476	UIG 133	07/09/2021
Accelerometer	Sled Accelerometer (UIG108)	UIG108	06/07/2022 13:27:54
Accelerometer	Sled Accelerometer (UIG	UIG 276	08/16/2021 10:31:31
Accelerometer	Sled Accelerometer (UIG	UIG 125	08/16/2021 15:33:23
Accelerometer	Sled Accelerometer (UIG	UIG 275	06/07/2022 13:28:01

Instrumentation Calibrated Annually

Post Test Observations According to ISO 10542-1:2012

a	ATD Shall be retained in seat of the SWC	Pass
b	The SWC shall remain in an upright position on the impact sled	Pass
c	No WTORS anchorage components or securement end fittings shall be detached or separated	Pass
d	Release of the SWC from the wheelchair tie-down shall not require the use of tools	Pass
e	Release of the ATD from the occupant restraint shall not require the use of tools	Pass
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	Pass
g	The WTORS shall exhibit no dangerous roughness, sharp edges or protrusions likely to increase the risk of injury to the occupant	Pass
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	Pass

During Test Observations According to ISO 10542-1:2012

		Result	Complies?
a	The horizontal excursion of the test wheelchair P-Point (Xwc) shall not exceed 200mm	199 mm	Passed
b	The horizontal excursion of the ATD Knee (Xknee) shall not exceed 375mm	327 mm	Passed
c	The horizontal excursion of the ATD Head (Xhead) shall not exceed 650mm	621 mm	Passed
d	The WTORS shall prevent the wheelchair from imposing forward loads on the occupant Ratio of Xknee / XWC to be greater than or equal to 1.1	1.64	Passed
e	Inbound velocity (delta V 48kph +2 -0)	48.5 km.h-1	Passed
f	Cumulative Time to hold 20g (>15ms)	22.4 ms	Passed
h	Cumulative Time to hold 15g (>40ms)	58.4 ms	Passed

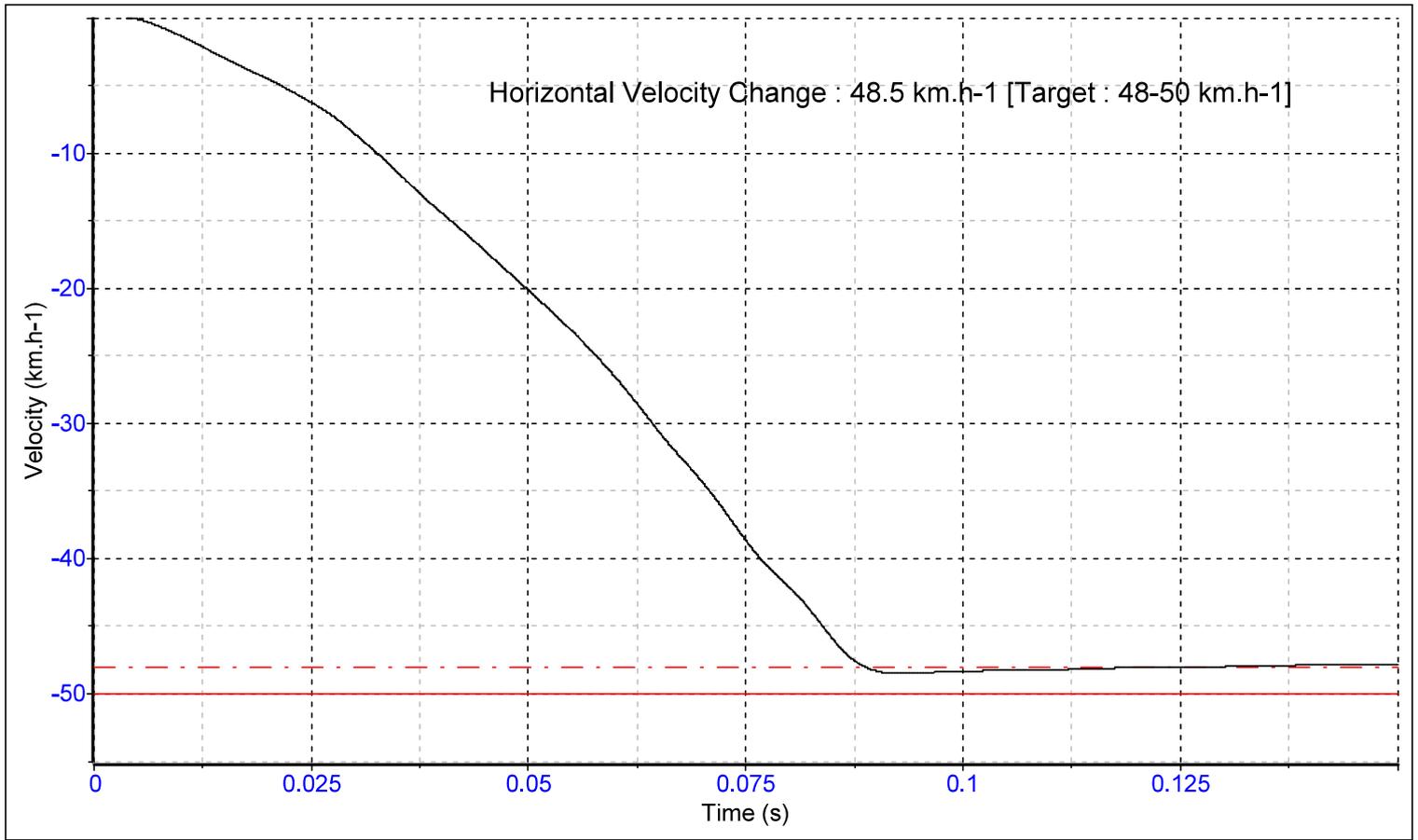
Test Pass or Fail Overall

Pass

Notes

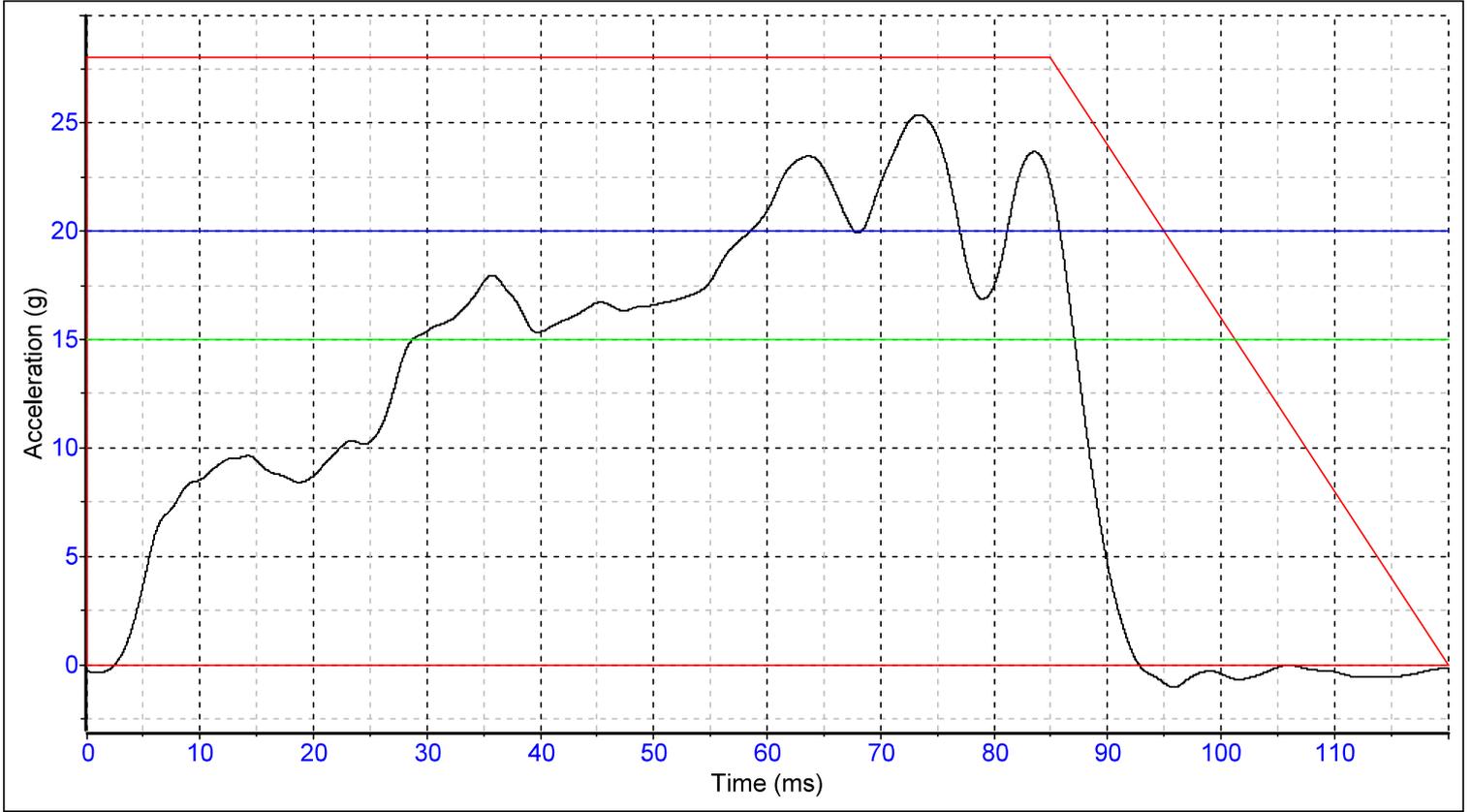
Pulse and excursions were good

Pulse Graph for Velocity T-13124



Camera Frame Rate = 1000 Fps

Pulse Graph for Deceleration T-13124



Time at 20g (Single Peak) : 9.2 ms [t1 : 81.2 ms, t2 : 85.8 ms] (Cumulative) : 22.4 ms

Time at 15g (Single Peak) : 58.4 ms [t1 : 28.7 ms, t2 : 87.1 ms] (Cumulative) : 58.4 ms



Camera Frame Rate = 1000 Fps

Test Photos T-13124

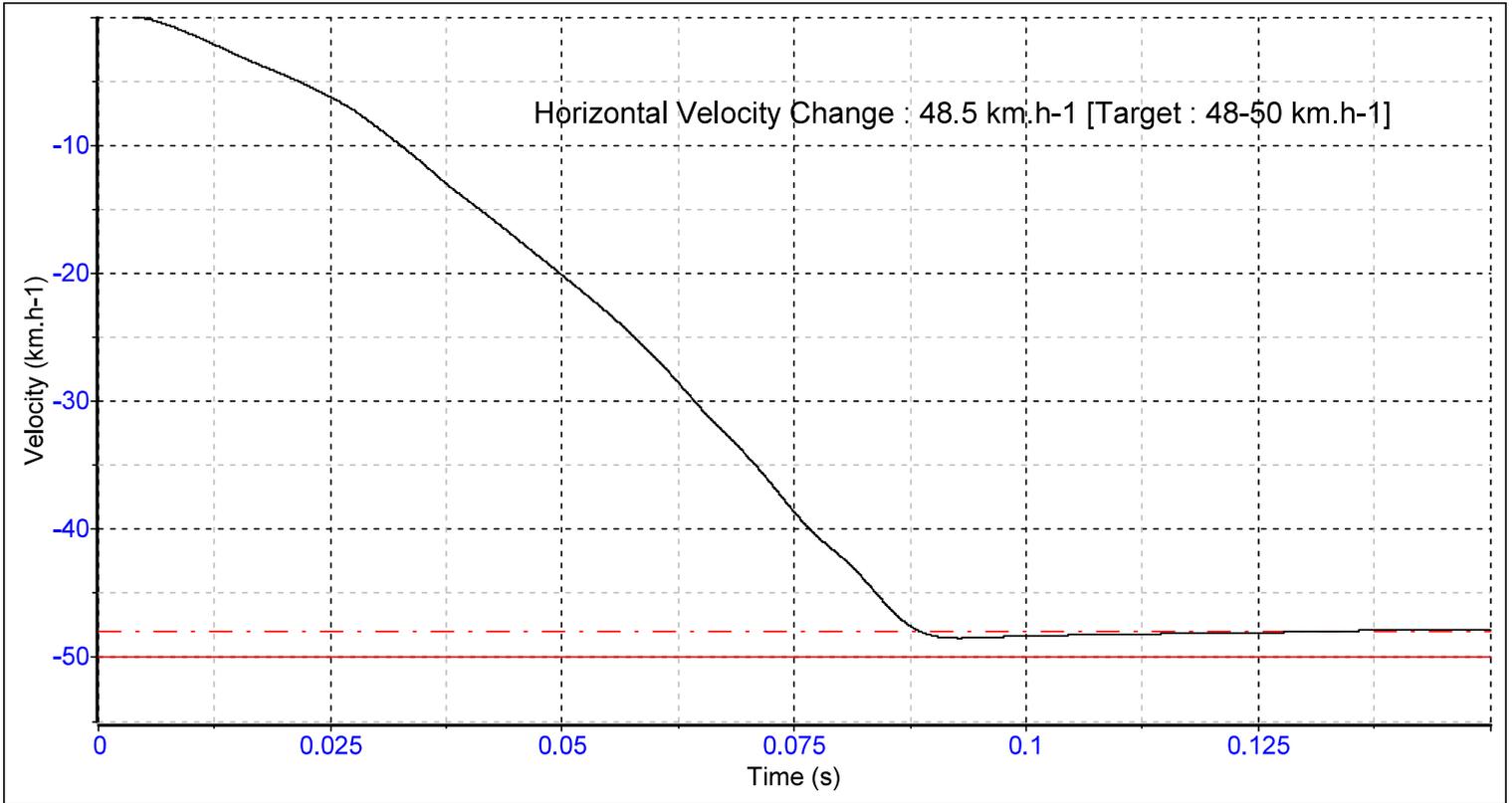


Pre Test

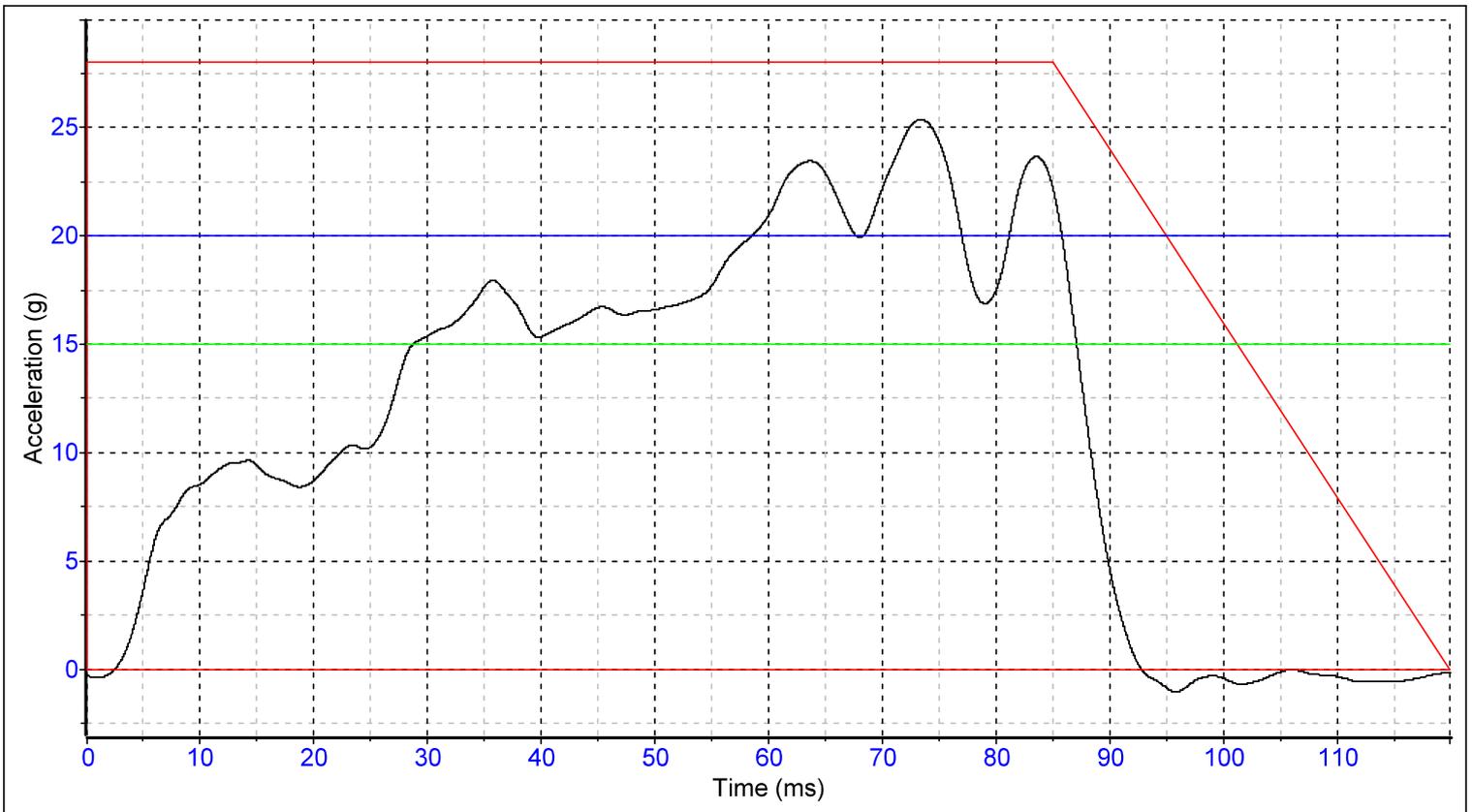


Post Test

Pulse Graph for Velocity T-13124



Pulse Graph for Deceleration T-13124



Time at 20g (Single Peak) : 9.2 ms [t1 : 81.2 ms, t2 : 85.8 ms] (Cumulative) : 22.4 ms

Time at 15g (Single Peak) : 58.4 ms [t1 : 28.7 ms, t2 : 87.1 ms] (Cumulative) : 58.4 ms

Excursions T-13124



Excursion Measurements

SWC Excursion = 199.14 mm

Max Excursion = 200 mm

Knee Excursion = 327.21 mm

Max Excursion = 375 mm

Head Excursion = 621.06 mm

Max Excursion = 650 mm

Ratio Knee / SWC = 1.64

Video Depth Perception

Camera to Sled = ???

Sled to SWC = 548 mm

Sled to Knee = 635 mm

Sled to Head = 687.00 mm

