

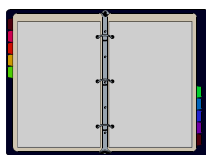


Electronic Reporting

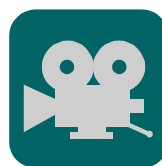
BS EN 12767: 2007 Impact Test

TRL089

(Opinions and interpretations do not form part of this report.)



[Test Report](#)



[Video Footage](#)

BS EN 12767: 2007

Customer:
Ritherdon & Co Ltd.

Test Date:
15 January 2013

Test Number:
TRL089

Test speed:
100km/h

Author:
A.Burton


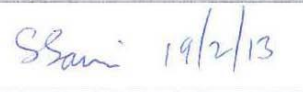
Report Issue Date:
12 February 2013

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Technical Referee	S J Savin	

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BS EN 12767: 2007 Test

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1 SUMMARY

This report describes a dynamic impact test for Ritherdon & Co Ltd, to BS EN12767: 2007, Passive Safety of Support Structures (Clause 3.8), at nominal speed of 100km/h (High speed test, at an angle of 20° to the test item. The testing took place on 15 January 2013.

The test item was an electrical/ control cabinet designation 'RB800 Passive Cabinet' measuring 1200mm x 800mm x 380mm (Height x width x depth), the cabinet was supplied and installed by Ritherdon engineers. The cabinet was loaded to a total weight of 80kg, to replicate the likely weight of equipment when in service.

The test vehicle was a Nissan Micra which satisfied the specifications of the test vehicle and calibration test in BS EN 12767: 2007 Section 6.2.2.

Impact conditions were as specified for test BS EN 12767: 2007, Passive safety of support Structures. The impact test speed and impact angle were within the test tolerance.

The vehicle speed was not significantly reduced by the impact with the cabinet.

The cabinet is assessed as a Non Energy absorbing structure, based on this and the associated 35kph speed class test, TRL test number TRL085B.

The Theoretical Head Impact Velocity did not exceed the maximum stated in BS EN 12767 and therefore attained an occupant safety level of 100NE3.

Note: The associated Speed Class 35km/h test is reported as Test no. TRL085B.

Note: after this impact test the cabinet came to rest 54.1m from its original position, as with all breakaway systems the final position of the test piece may vary, and (dependant on direction and distance of travel) the possibility exists for the test piece to interact with pedestrians or other road users.

2 TEST LABORATORY

Name	TRL Limited
Address	Crowthorne House Nine Mile Ride Wokingham Berkshire RG40 3GA
Telephone Number	+44 (0)1344 773131
Facsimile	+44 (0)1344 770356
Test Site Location	Impact Test Facility
Contact	A Burton
Contact Telephone Number	+44 (0)1344 770853

3 TEST REFERENCE NUMBERS

Test Number	TRL089
Quote Number	11109622

4 CLIENT

Name	Ritherdon & Co Ltd.
Address	Lorne Street, Darwen, Lancashire, BB3 1QW
Telephone Number	01254 819100
Contact	Ben Ritherdon

5 TEST ITEM

Date Received	15 January 2013
Date Installed	15 January 2013
Date Tested	15 January 2013
Name of Test Item	RB800 Passive cabinet.

The test item was supplied and installed by Ritherdon engineers, and the concrete footing was installed by Airtay Limited.

6 TEST PROCEDURE

BS EN 12767:2007	
Target Impact Speed	100km/h (High speed test)
Target Impact Angle	20degree
Target Vehicle Gross Static Mass	900kg

6.1 Test Track

The tests were carried out at the Impact Test Facility at TRL.

The test area was swept and dry.

Two timing devices were positioned on the track to measure the vehicle's speed immediately before the impact point, and two devices were positioned as to measure the vehicle's exit speed immediately after impact.

6.2 Test Item Installation

Test Item: RB800 Passive cabinet
Installed by: Ritherdon & Co Ltd.

The footing for the cabinet was installed on the 19th December and consisted of a concrete base (300mm x 800mm x 380mm), a plastic conduit through which electrical supply and control cables can be routed, and a rebated steel bracket. The base of the cabinet (a 100mm tall cassette) was then bolted to the rebated bracket (after the concrete footing is sufficiently cured), and the cabinet (1100mm tall) is then bolted on top of the cassette. The total height of the cabinet and cassette was then recorded as 1200mm above ground level.

The cabinet was loaded to a total weight of 80kg, to replicate the likely weight of equipment in the cabinet, when in service. This weight consisted of the cabinet itself and two modified (weighted) shelves. Each shelf weighed 13.1kg and consisted of a piece of square steel bar welded to the shelf.

Power cables were installed through the conduit so that the cabinet could be live for test, and a portable generator was employed to provide the required voltage. For safety sake a circuit breaker was included.

6.3 Test Configuration

The cabinet under test was installed so that it was impacted at 20°.

6.4 Test Vehicle Details

Make		Nissan	
Model		Micra	
Body Style		3 door hatchback	
Year		1999	
VIN		SJNEBAK11U3070535	
Condition		Fair	
Vehicle Mass (including ballast)		865kg	Compliance Yes
Ballast Mass		77.5kg	Compliance Yes
Description of ballast		See below for list of removed and added items.	
Dummy Mass		75kg	Compliance Yes
Dummy Type		Hybrid III 50 th percentile	
Dummy Position		Front right hand seat	
Total Test Mass		940kg	Compliance Yes
Track Width	Front	1364 mm	Compliance Yes
	Rear	1328 mm	Compliance Yes
Centre of Mass	Aft of front axle	925 mm	Compliance Yes
	Lateral from centre line	-10mm	Compliance Yes
	Above ground	522 mm	Compliance Yes
Drive (LHD/RHD)		RHD	
Drive (FWD/RWD)		FWD	
Transmission (Manual/Automatic)		Manual	
Engine size		1.3l	
Tyre Size		165/60/R14	
Tyre Pressure	Front	33psi	
	Rear	29psi	
Ride Height	Front	LHS	609 mm
		RHS	608 mm
	Rear	LHS	598 mm
		RHS	593 mm
Wheelbase	LHS	2358 mm	
	RHS	2354 mm	
Maximum Width		1570 mm	
Front Overhang (from drive shaft)		711 mm	
Overall Vehicle Length		3712 mm	
Overall Vehicle Height		1410 mm	

Spare wheel, parcel shelf, boot liner, tools, jack, centre console, floor mats, handbrake, hub caps, rear seats, rear seat belts, exhaust, engine oil, coolant & rear wheel arch carpets were removed to achieve the required test mass.

The dummy was not in the vehicle when the centres of mass measurements were taken.

6.5 Test Vehicle Calibration Details

The test vehicle was calibrated according to BS EN 12767:2007 Section 6.2.2

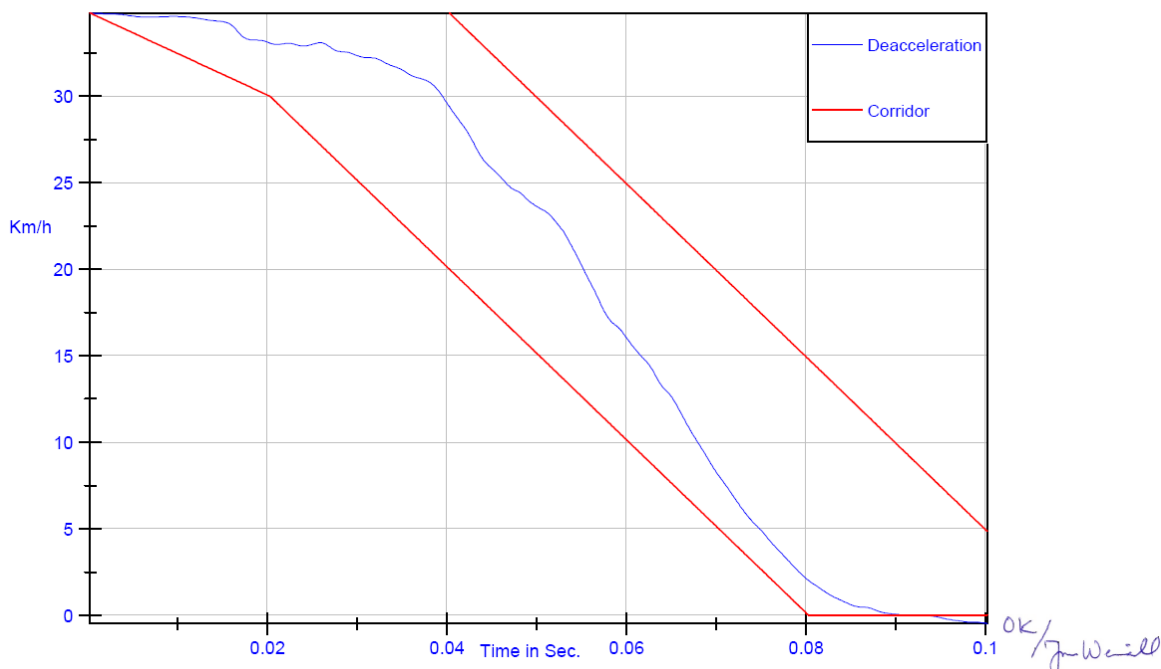
VTI Reference: R80520-1, 20 May 2008.

Make	Nissan	Drive (LHD/RHD)	LHD
Model	Micra	Drive (FWD/RWD)	FWD
Body Style	3 door hatchback	VIN	EBAK11U0562150
Year	1997	Engine size	1.3l
Inertial Test Mass	Total	890kg	
Gross Static Mass	Total	890kg	
Centre of Mass			
Longitudinal position behind front axle (m)		0.93	
Lateral position from vehicle centre line (m)		0.09	
Vertical position above ground (m)		0.48	

Note: the test vehicle was within +/- 3 years of the calibration vehicle age, as required by Clause 6.2.2.



Deacceleration in calibration pole test EN 12767:2007



6.6 Vehicle Instrumentation

Accelerometers were mounted on the rate sensor housing to measure acceleration in the X, Y, and Z directions. A second set of accelerometers measuring acceleration in the X, Y, and Z directions was mounted on the tunnel of the vehicle.

6.7 Position of Instrumentation

Transducer Position	Direction		
	X	Y	Z
Vehicle Acceleration	√	√	√
Vehicle Backup Acceleration	√	√	√
Roll Rate	√		
Pitch Rate		√	
Yaw Rate			√

6.8 Details of Instrumentation

Channel Description	Transducers				Position relative to C of G (+ forwards - rearwards)	
	ID	CAC	Units	Calibration date	X plane	Y Plane
Vehicle X	B58684	250	g	1/11/12	0	0
Vehicle Y	B63512	250	g	04/04/12	0	0
Vehicle Z	B58672	250	g	29/08/12	0	0
Vehicle X Back	B63523	500	g	04/04/12	0	-35mm
Vehicle Y Back	B63507	500	g	04/04/12	0	-35mm
Vehicle Z Back	B63522	500	g	16/05/12	0	-35mm
Vehicle Roll	ARS4076	4000	deg/s	01/08/12	0	+35mm
Vehicle Pitch	ARS4078	4000	deg/s	01/08/12	0	+35mm
Vehicle Yaw	ARS4077	4000	deg/s	01/08/12	0	+35mm

Note: Instrumentation is calibrated at least annually.

6.9 Photography

Digital photographs were taken before the test.

Description	Photograph
General view of test item (front)	TRL089-026
General view of test item (side)	TRL089-025
General view of test item (rear)	TRL089-023
View of ground fixing	TRL089-030
Vehicle at impact point (front view)	TRL089-012
Vehicle at impact point (side view)	TRL089-015
Vehicle at impact point (rear view)	TRL089-017
Vehicle DAU and brake unit	TRL089-010
Vehicle instrumentation	TRL089-011

High speed digital cameras were positioned, to provide a continuous coverage of the vehicles trajectory 6 m before and 12 m after the impact point.

View	Nominal Speed	File
Front View	500fps	TRL089 front
Overhead direct	500fps	TRL089 overhead direct
Overhead Downstream	500fps	TRL089 overhead downstream
90 degree view	500fps	TRL089 90deg
90 degree offset (12m)	500fps	TRL089 90deg offset
Panned real time video	Real time	TRL089 real-time pan

7 RESULTS

Test Number	TRL089
Date	15 January 2013
Weather Conditions	Clear and Cold
Track Surface	Dry
Temperature (nominal)	3.7°C

7.1 Test Sequence

The vehicle was towed and guided to the impact area by means of two wire ropes; one rope was attached to a continuous loop of steel cable driven by a computer controlled hydraulic propulsion system. Immediately before impact, the towing cable and guidance cable, were detached and the vehicle free-wheeled, at the specified speed, into the cabinet.

Upon contact the front of the vehicle started to deform around the cabinet, causing the cabinet to flex and become detached from the base. On the high speed imagery, the cabinet can be seen rotating around the bonnet, lifting and becoming airborne while being projected in the direction of travel of the vehicle. Due to the 20° angle of impact, the left hand side of the grille makes contact with the cabinet before the right, and the majority of the damage can likewise be seen on the left hand side of the front of the vehicle. The paths of the cabinet and the vehicle diverge, and at approximately 1.7 seconds after impact the cabinet makes contact with the ground.

The vehicle is then braked to a stop and comes to rest 99.5m beyond the datum line at the rear of the product.

The cabinet comes to rest 54.1m beyond the datum line, as with all breakaway systems the final position of the test piece may vary, and (dependant on direction and distance of travel) the possibility exists for the test piece to interact with pedestrians or other road users.

During the test sequence the vehicle remained upright with no significant deviation from its original approach path. There was no damage to or penetration of the vehicle passenger compartment.

7.2 Damage to the vehicle

The following damage to the vehicle was recorded:

- The LHS of bumper shows some vertical linear damage (constant with leading corner of cabinet).
- The bumper remained in place, with the LHS and RHS corners detached.
- The bonnet was bent upward and rearward (bonnet remained latched).
- LHS and RHS headlight clusters are shattered.
- The grille was shattered and displaced from the vehicle.

All four tyres were undamaged and remained inflated. The steering mechanism remained functional. There was no damage to or penetration of the passenger compartment. There was no damage to the windscreen or roof panel.

7.3 Damage to the test item

The cabinet was buckled and deformed on the impacted face, leading corner, and towards the bottom (where it had previously been attached to the base). The deformation was at its greatest along the long side of the cabinet, the metal being bent outward. The steel at the base of the cabinet was separated at all four corners. There was some tearing of the steel at the impacted corner. There was some general deformation of the sheet steel.

The cabinet base (the cassette on to which the cabinet was affixed) remained largely undamaged, with the exception of the edge furthest from the impact point, which showed some localised deformation, and lifting of the steel and rubber seal.

The connectors in the power cables detached as anticipated, and no damage was recorded to any of the cables.

The concrete footing remained undamaged.

7.4 Post-test Photographs

Description	Photograph
General view (front)	TRL089-052
General view (overhead)	TRL089-036
General view (side)	TRL089-050
View of impact point – vehicle removed	TRL089-043
Ground fixing	TRL089-042
Vehicle front	TRL089-062
Vehicle LHS	TRL089-050
Vehicle RHS	TRL089-054
Vehicle LHS footwell	TRL089-060
Vehicle RHS footwell	TRL089-057

7.5 Test TRL089B

Test Details	
Test Item	RB 800 Passive Cabinet
Predicted Behaviour	On impact, it is predicted that the cabinet will shear from the cassette (the base), and the power cables will detach at connecting point.
Supplier	Ritherdon & Co Ltd.
Installation	Cabinet - Ritherdon & Co. Concrete footing - Airtay
Test Vehicle	Nissan Micra
Pre-test condition of test vehicle	Good
Temperature	3.7°C
Weather	Clear / Cold

Impact Conditions			
	Required	Test	Compliance
Impact Angle (°)	20 (± 2)	20	Yes
Impact Speed (km/h)	100 (± 5)	98.8	Yes
THIV (km/h) (corrected to CoG) EN12767:2007 Table 5 - Limit for High speed test classification	≤27	10 (CFC180) 8 (13Hz)	Yes
ASI (corrected to CoG) EN12767:2007 Table 5 - Limit for High speed test classification	≤1.0	0.5 (CFC180) 0.4 (13Hz)	Yes

Evaluation Criteria EN12767:2007 Section 5.2.		
	Test	Compliance
5.2.1 Predictable behaviour The test item shall behave in a manner predicted by the manufacturer.	The test item behaved in a manner predicted by the manufacturer.	Yes
5.2.2.1 Detached elements and penetration The test item or detached elements, fragments or other major debris from the test item shall not penetrate the occupant compartment. The windscreen may be fractured but shall not be penetrated.	There was no penetration of the occupant compartment. The windscreen was neither fractured nor penetrated. <i>Note: due to the project of the test piece, the possibility exists for the cabinet to interact with pedestrians or other road users.</i>	Yes
5.2.2.2 Vehicle Behaviour The vehicle shall remain upright for not less than 12 m beyond the impact point with a roll angle less than 45° and a pitch angle less than 45°.	The vehicle remained upright for duration of the test with a roll angle less than 45° and a pitch angle less than 45°.	Yes

8 CONCLUSION

The test item was a 1.2m x 0.8m x 0.38m electrical/control cabinet (designation RB800 Passive Cabinet), supplied and installed by Ritherdon & Co Ltd.

Impact conditions were as specified for test BS EN 12767:2007, Passive Safety of Support Structures. The impact test speed and impact angle were within the test tolerance.

The trajectory of the vehicle was not significantly affected by the impact.

The Theoretical Head Impact Velocity recorded, did not exceed the maximum stated in BS EN 12767 for a non-energy absorbing device, and therefore a safety level of 100NE3 can be attributed to the cabinet.

***Note:** after this impact test the cabinet came to rest 54.1m from its original position, as with all breakaway systems the final position of the test piece may vary, and (dependant on direction and distance of travel) the possibility exists for the test piece to interact with pedestrians or other road users.*

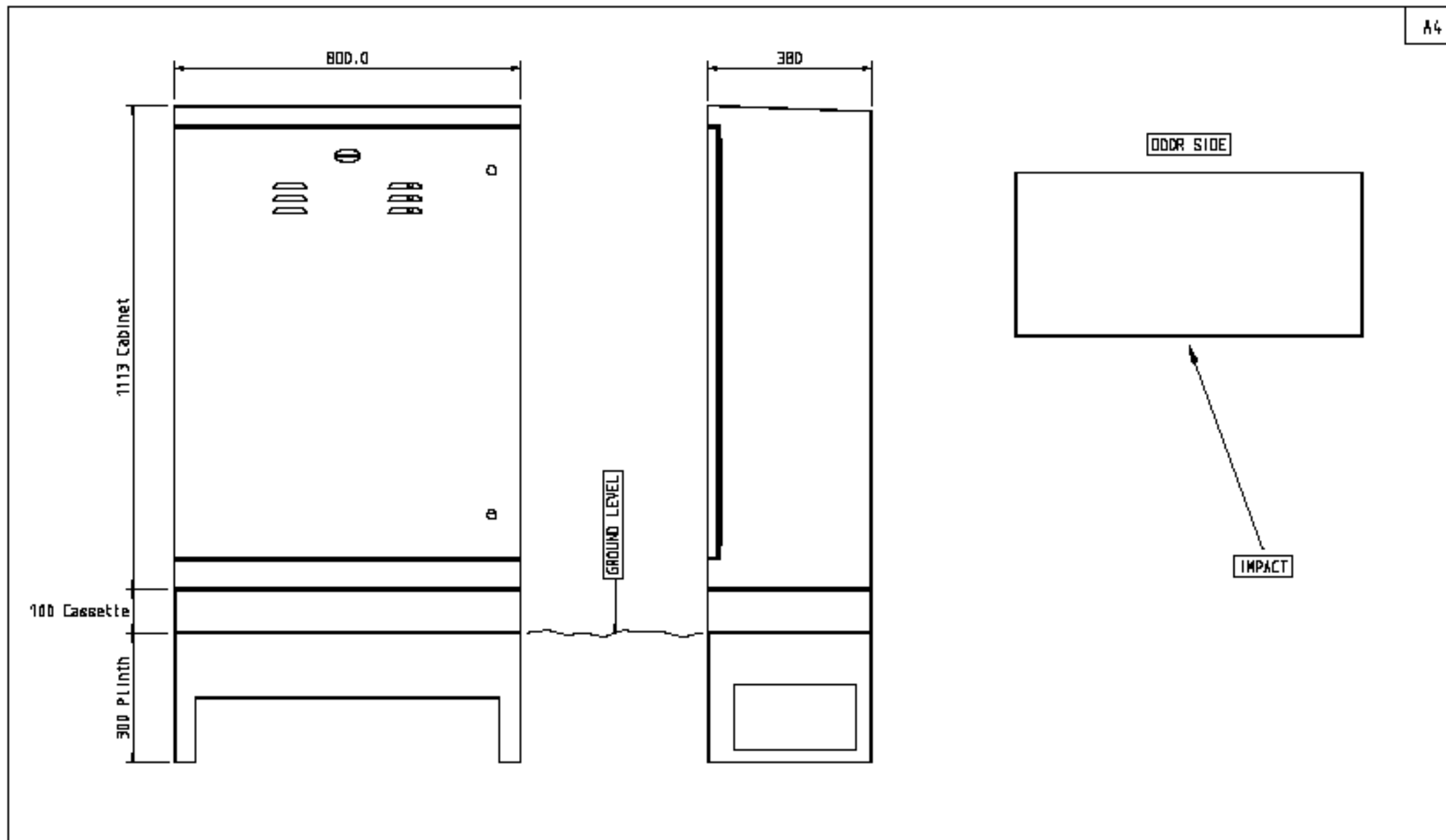
9 GENERAL STATEMENTS

The test results in this report relate only to the items as tested. Other impact conditions may give different results.

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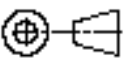
The vehicle and test preparation were carried out by staff employed by TRL.

10 DRAWINGS

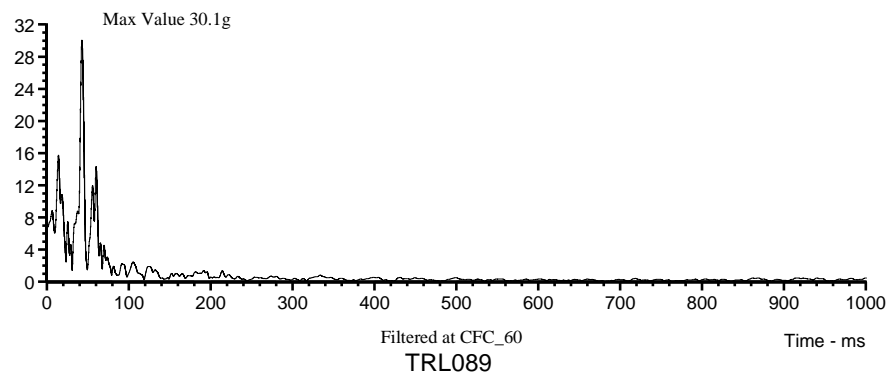
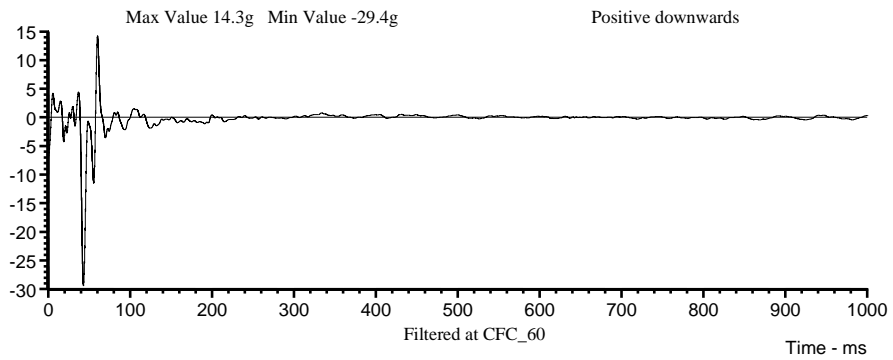
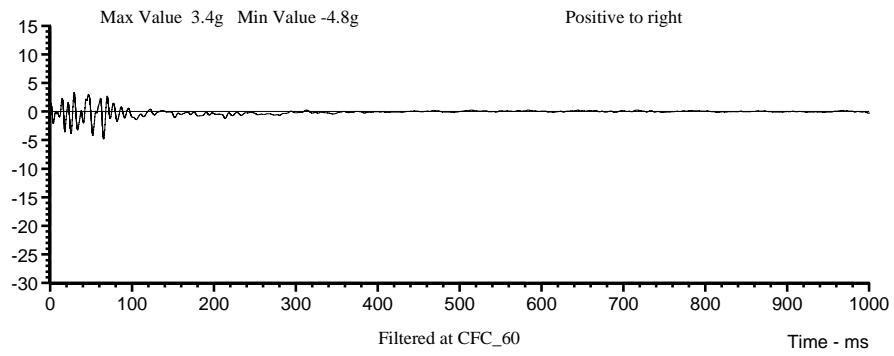
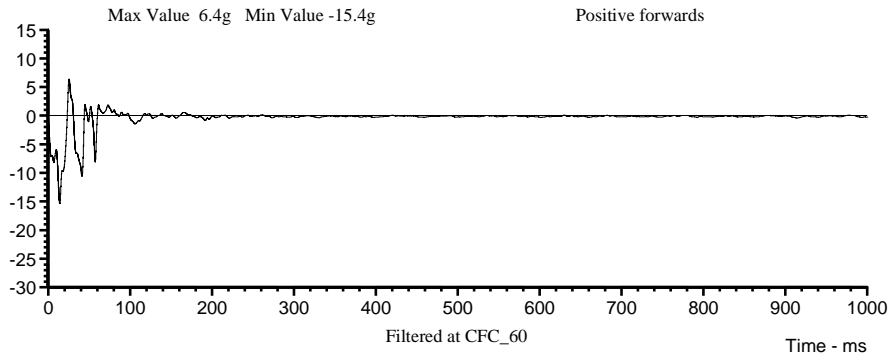


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DRAWN	Mark Bleaze	DATE	14 . 12 . 2012
CHECKED	Brian Derbyshire	DATE	14 . 12 . 2012
APPROVED	Brian Derbyshire	DATE	14 . 12 . 2012

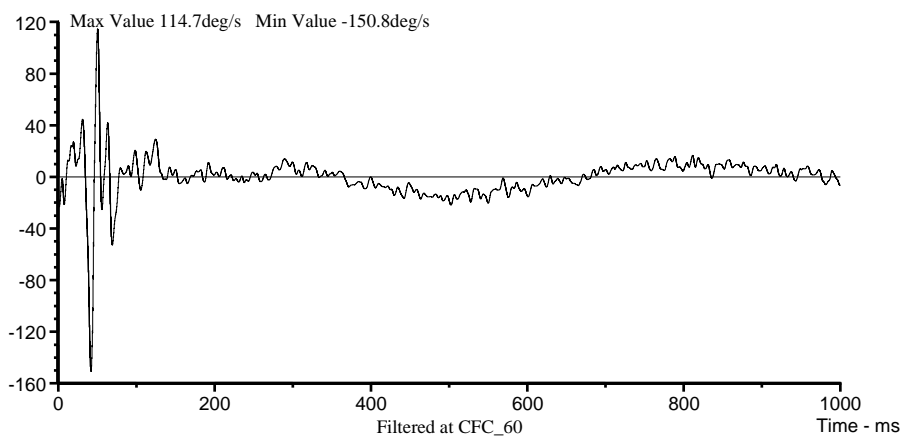
ISSUE	DATE	MOD. NO.	DRW	 RITHERDON COPYRIGHT IS STRICTLY RESERVED	TOLERANCES WHOLE NUMBERS +/- 0.5 1 DECIMAL PLACE +/- 0.2 HOLES +/- 0.15 UNLESS OTHERWISE STATED ALL DIMENSIONS IN MM		MATERIAL 1.5mm Stainless Steel Grade 304	FINISH As Customer Order	TITLE R8000 Passive Cabinet GA			
									SCALE	DRAWING NO.	(SHEET)	ISSUE
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11 VEHICLE GRAPHS



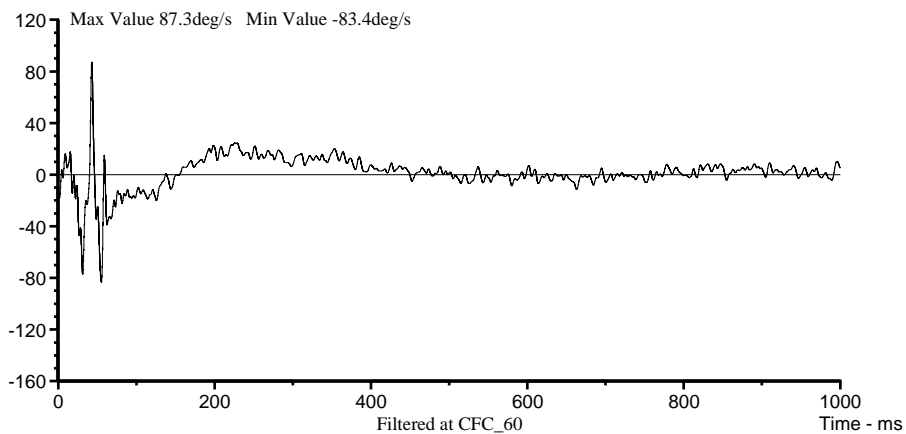
Roll Rate

Positive clockwise from rear



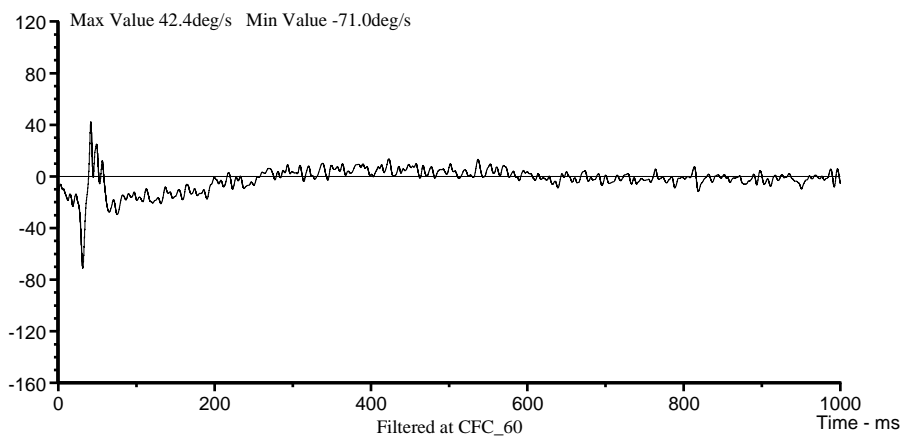
Pitch Rate

Positive clockwise from left



Yaw Rate

Positive clockwise from above



TRL089