

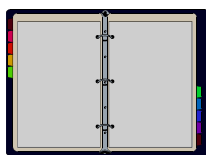


# Electronic Reporting

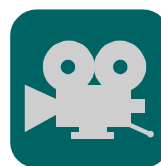
## BS EN 12767: 2007 Impact Test

### TRL085B

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



[Test Report](#)



[Video Footage](#)

# BS EN 12767: 2007

Customer:  
**Ritherdon & Co Ltd.**

Test Date:  
**19 December 2012**

Test Number:  
**TRL085B**

Test speed:  
**35km/h**

Author:  
**A.Burton**


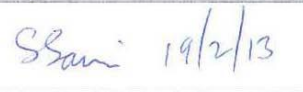
Report Issue Date:  
**11 February 2013**

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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 35 Km/h (low speed test) and at an angle of 20° to the test item. The testing took place on 20 December 2012.

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 the associated 100kph speed class test, TRL test number TRL089.

The Theoretical Head Impact Velocity could not be calculated following the test due to a failed 'yaw rate' data channel. However, post impact analysis of the test video has shown that the vehicle experiences only a slight amount of yaw following the impact. As a result it is accepted that the yaw rate will not significantly influence the calculation of the THIV value. The OIV value of 7km/h (comparable to THIV and calculated without the yaw rate component) did not exceed the maximum THIV value stated in BS EN 12767. When the OIV calculation is used in place of the THIV calculation, the product attains an occupant safety level of 100NE3.

*Note: The associated Speed Class 100km/h test is reported as Test no. TRL089.*

## 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	TRL085B
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	18 December 2012
Date Installed	18 December 2012
Date Tested	19 December 2012
Name of Test Item	RB800 Passive cabinet.

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

## 6 TEST PROCEDURE

<b>BS EN 12767:2007</b>	
Target Impact Speed	35km/h (Low 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 damp.

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 19<sup>th</sup> December and consisted on 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 is sufficiently cured), and the cabinet (1100mm tall) is then bolted to the 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 when in service.

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		SJNEBAK11U3155622	
Condition		Good	
Vehicle Mass (including ballast)		864kg	Compliance Yes
Ballast Mass		28kg	Compliance Yes
Description of ballast		See below for list of removed and added items.	
Dummy Mass		75.5kg	Compliance Yes
Dummy Type		Hybrid III 50 <sup>th</sup> percentile	
Dummy Position		Front right hand seat	
Total Test Mass		939.5kg	Compliance Yes
Track Width	Front	1373 mm	Compliance Yes
	Rear	1326 mm	Compliance Yes
Centre of Mass	Aft of front axle	922 mm	Compliance Yes
	Lateral from centre line	-4mm	Compliance Yes
	Above ground	540 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	30psi	
	Rear	30psi	
Ride Height	Front	LHS	606 mm
		RHS	610 mm
	Rear	LHS	603 mm
		RHS	598 mm
Wheelbase	LHS	2359 mm	
	RHS	2355 mm	
Maximum Width		1575 mm	
Front Overhang (from drive shaft)		694 mm	
Overall Vehicle Length		2966 mm	
Overall Vehicle Height		1430 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

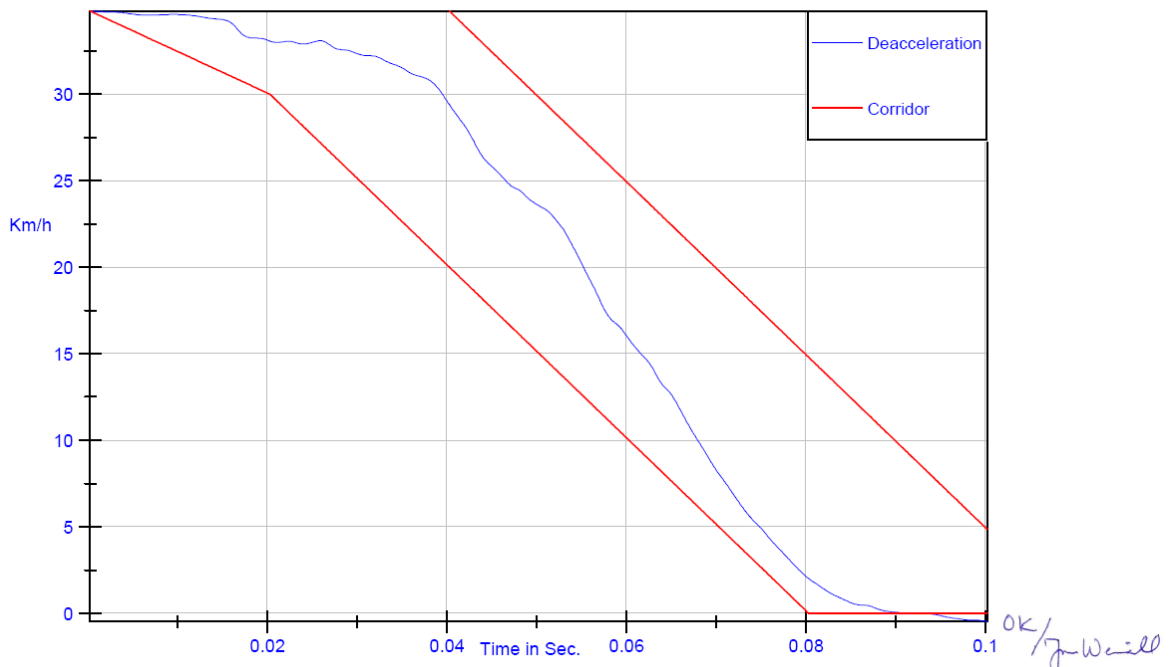
VTI Reference: R80520-1, 20 May 2008.

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	01/11/12	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	1500	deg/s	01/08/12	0	+35mm
Vehicle Pitch	ARS4078	1500	deg/s	01/08/12	0	+35mm
Vehicle Yaw	ARS4077	1500	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)	<a href="#">TRL085B-006</a>
General view of test item (side)	<a href="#">TRL085B-004</a>
General view of test item (rear)	<a href="#">TRL085B-002</a>
View of ground fixing	<a href="#">TRL085B-010</a>
Vehicle at impact point (front view)	<a href="#">TRL085B-021</a>
Vehicle at impact point (side view)	<a href="#">TRL085B-025</a>
Vehicle at impact point (rear view)	<a href="#">TRL085B-022</a>
Vehicle DAU and brake unit	<a href="#">TRL085B-016</a>
Vehicle instrumentation	<a href="#">TRL085B-018</a>

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
Overhead view	500fps	<a href="#">TRL085B overhead direct</a>
Overhead downstream view	500fps	<a href="#">TRL085B overhead downstream</a>
Front View	500fps	<a href="#">TRL085B front</a>
90 degree view	500fps	<a href="#">TRL085B 90deg</a>
Panned real time video	Real time	<a href="#">TRL085B real-time pan</a>

## 7 RESULTS

Test Number	TRL085B
Date	20 December 2012
Weather Conditions	Rain / Cloudy
Track Surface	Wet
Temperature (nominal)	9.4°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 was 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 briefly becoming airborne while being guided 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. At approximately 0.5 seconds after impact the cabinet makes contact with the ground, and subsequently the path of the cabinet and vehicle diverge. At approximately 1.8 seconds after impact the vehicle can be seen overriding the cabinet causing a notable amount of damage to the left hand side of the vehicle including the bumper, wing and headlight cluster.

The vehicle is then braked to a stop and comes to rest 41.1m beyond the datum line at the back of the product.

The cabinet came to rest 17.2m beyond the datum line.

During the entire 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:

- LHS of the bumper was damaged (shattered).
- LHS of the leading edge of the bonnet was dented.
- The bonnet was bent upward (and remained latched).
- The LHS and RHS headlight clusters were damaged (shattered).
- The RHS corner of the bumper was damaged (shattered and displaced).
- The RHS wing was partially displaced (bent outward and distorted).

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 by 108mm. The steel at the base of the cabinet was separated at two of the four corners. 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.

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 (rear)	<a href="#">TRL085B-040</a>
General view (cabinet)	<a href="#">TRL085B-030</a>
General view (side)	<a href="#">TRL085B-047</a>
View of impact point – vehicle removed	<a href="#">TRL085B-032</a>
Ground fixing	<a href="#">TRL085B-034</a>
Vehicle front	<a href="#">TRL085B-048</a>
Vehicle LHS	<a href="#">TRL085B-052</a>
Vehicle RHS	<a href="#">TRL085B-050</a>
Vehicle LHS footwell	<a href="#">TRL085B-053</a>
Vehicle RHS footwell	<a href="#">TRL085B-055</a>

## 7.5 Test TRL085B

Test Details	
Test Item	RB800 Passive Cabinet
Predicted Behaviour	On impact, it was predicted that the cabinet will shear from the cassette (base), and the power cables will detach.
Supplier	Ritherdon & Co Ltd.
Installation	Cabinet - Ritherdon & Co. Concrete footing - Airtay
Test Vehicle	Nissan Micra
Pre-test condition of test vehicle	Good
Temperature	9.4°C
Weather	Rain / Cloudy

Impact Conditions			
	Required	Test	Compliance
Impact Angle (°)	20 (± 2)	20	Yes
Impact Speed (km/h)	35 (± 3)	34.2	Yes
THIV/ based on OIV (km/h) (corrected to CoG) EN12767:2007 Table 5 - Limit for low speed test classification	≤27	7 (CFC180) 7 (13Hz)	Yes
ASI (corrected to CoG) EN12767:2007 Table 5 - Limit for low speed test classification	≤1.0	0.2 (CFC180) 0.1 (13Hz)	Yes

Evaluation Criteria EN12767:2007 Section 5.2.		
	Test	Compliance
<b>5.2.1 Predictable behaviour</b> The test item shall behave in a manner predicted by the manufacturer.	The test item behaved in a manner predicted by the manufacturer.	Yes
<b>5.2.2.1 Detached elements and penetration</b> 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.	Yes
<b>5.2.2.2 Vehicle Behaviour</b> 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 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 could not be calculated following the test due to a failed 'yaw rate' data channel. However, post impact analysis of the high speed video has shown that the vehicle experiences only a slight amount of yaw following the impact. As a result it is accepted that the yaw rate will not influence the calculation of the THIV value. The OIV value of 7km/h (comparable to THIV and calculated without the yaw rate component) did not exceed the maximum THIV value stated in BS EN 12767. When the OIV calculation is used in place of the THIV calculation, the product attains an occupant safety level of 100NE3.

*Note: The OIV calculation was determined using TRL autosequence thiv\_phdq.aut (date 10/02/2010) running in DIADEM version 9.10.2036 TDM.*

## 9 GENERAL STATEMENTS

The test results in this report relate only to the item 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.

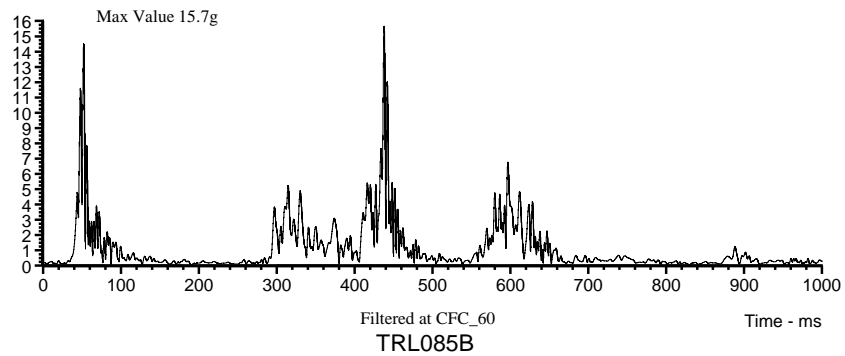
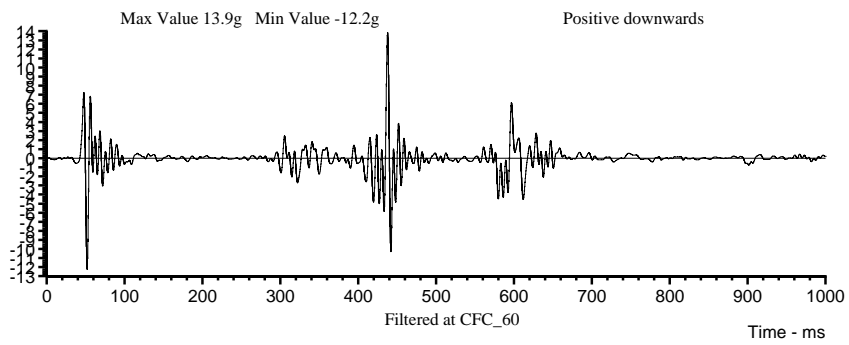
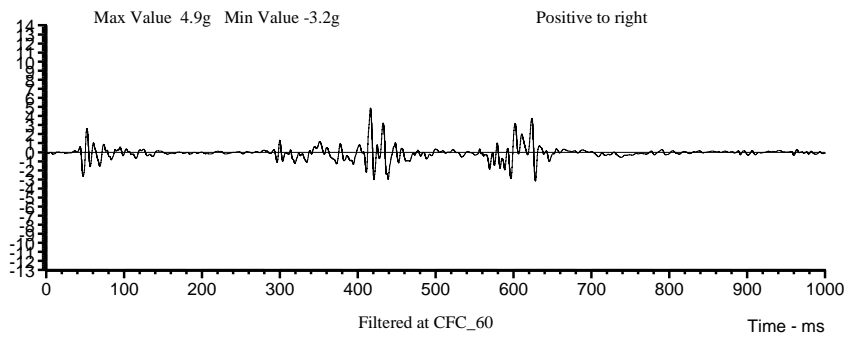
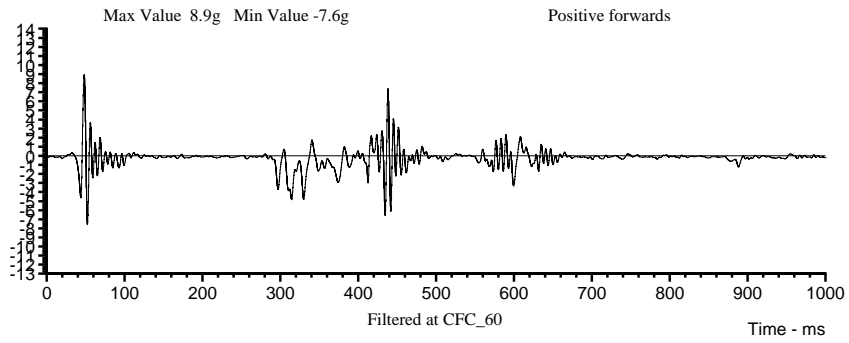
# 10 DRAWINGS

A4

				<b>RITHERDON</b>	<small> <b>TOLERANCES</b>            WHOLE NUMBERS +/- 0.5            1 DECIMAL PLACE +/- 0.2            HOLES +/- 0.15            UNLESS OTHERWISE STATED            ALL DIMENSIONS IN MM         </small>			<b>MATERIAL</b> 1.5mm Stainless Steel Grade 304	<b>FINISH</b> As Customer Order	<b>TITLE</b> R8000 Passive Cabinet GA	
<b>ISSUE</b>	<b>DATE</b>	<b>MOD. NO.</b>	<b>DRW</b>	<small>COPYRIGHT IS STRICTLY RESERVED</small>							
								<b>SCALE</b> NTS	<b>DRAWING NO.</b> S 9081	<b>(SHEET)</b> 1	<b>ISSUE</b> -

<b>DRAWN</b>	Mark Bleaze	<b>DATE</b>	14 . 12 . 2012
<b>CHECKED</b>	Brian Derbyshire	<b>DATE</b>	14 . 12 . 2012
<b>APPROVED</b>	Brian Derbyshire	<b>DATE</b>	14 . 12 . 2012

# 11 VEHICLE GRAPHS



*Note: Failure of the rate sensors (Roll, Pitch and Yaw), so the graphs have not been included in this report.*