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Report On

Environmental Testing of the
Enclosure Technofeet and Case Feet
for OKW Enclosures Ltd

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Document 75933773 Report 01 Issue 1

April 2016



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26 April 2016





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1 REPORT SUMMARY

1.1 INTRODUCTION

Objective	To perform compression testing and topple testing to study the robustness of the two enclosure foot designs
Equipment Under Test (EUT)	Enclosure feet
Model Number(s)	1. Enclosure with Technofeet 2. Enclosure with Case Feet
Serial Number(s)	Unserialised
Deviations from the Test Standard	No deviations to the specified tests
Number of Samples Tested	2
Test Plan/Issue/Date	Test plan based on e-mail received from Robert Cox to Craig Foster on 15 February 2016, 14:36
Test Specification/Issue/Date	1. ASTM D642 - 00 (Reapproved 2010) - Compression test 2. DEF STAN 00-35 Part 4 Issue 3 - Topple test
Incoming Release Date	Not released 26 February 2016
Disposal Reference Number Date	EUTs returned with attending customer upon test completion Packing Note: 75933773-01 1 March 2016
Order Number Date	RC1700/16 19 February 2016 (ref e-mail from Robert Cox, 09:39)
Start of Test	26 February 2016
Finish of Test	1 March 2016
Name of Engineer(s)	Stuart Dennison, Jamie Lunn, Steve Boddison
Related Document(s)	Compression test: Test methods and tolerances carried out generally in accordance with ASTM D 4169 - 09 Standard Practice for Performance Testing of Shipping Containers and Systems



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance to the customer test requirements to the two types of enclosure feet is shown below.

Report Section	Test Description	Result & Comments
2.1	Compression Test	<p>Technofeet. Three colours of this foot style were tested. EUT 1. Their yield point ranged between 30.5kgf to 40.5kgf.</p> <p>Case Feet. Three colours of this foot style were tested. Their yield point ranged between 33.0kgf to 36.4kgf.</p>
2.2	Topple Test	<p>Technofeet. Three colours of this foot style were tested. EUT 1 (5.12kg internal mass). One foot (left hand side) unclipped. No damage observed to the feet or enclosure. Test repeated with reduced internal mass. EUT 1 (3.69kg internal mass). Both feet withstood the topple test. No damage observed to the feet or enclosure. EUT 2 (3.69kg internal mass). Both feet withstood the topple test. No damage observed to the feet or enclosure. EUT 3 (3.69kg internal mass). Both feet withstood the topple test. No damage observed to the feet or enclosure.</p> <p>Case Feet. Three colours of this foot style were tested. EUT 4 (3.69kg internal mass). Both feet withstood the topple test. No damage observed to the feet or enclosure. EUT 5 (3.69kg internal mass). Both feet withstood the topple test. No damage observed to the feet or enclosure. EUT 6 (3.69kg internal mass). Both feet withstood the topple test. No damage observed to the feet or enclosure.</p>

Initial Test Inspection:

The two enclosures and the Technofeet (3 colours) and the Case Feet (3 colours) were identified by the attending customers.

The test pieces were reported to be in good condition to begin the test sequence.



Figure 1.2.1 EUT 3: Technofeet - Black colour.
Also in light grey colour (EUT 1) and anthracite colour (EUT 2)



Figure 1.2.2 EUT 4: Case feet - Light grey colour.
Also in off white colour (EUT 5) and black colour (EUT 6)



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2 TEST DETAILS

2.1 COMPRESSION TEST

2.1.1 Specification Reference

Test based on ASTM D642 - 00 (Reapproved 2010) Standard Test Method for Determining Compressive Resistance of Shipping Containers, Components and Unit Loads: Section 9. Procedure.

2.1.2 Equipment Under Test

Technofeet attached to enclosure:
 EUT 1. Type 1: RAL 7035 - Light grey
 EUT 2. Type 2: RAL 7016 - Anthracite
 EUT 3. Type 3: RAL 9005 - Black

Case feet attached to enclosure:
 EUT 4. Type 1: RAL 7035 - Light grey
 EUT 5. Type 2: RAL 9002 - Off white
 EUT 6. Type 3: RAL 9005 - Black

2.1.3 Date of Test

26 February 2016

2.1.4 Test Equipment Used

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
30000lbf Comp. Machine	MTS	842	3588	12	16-Jun-2016
Power Supply	Weir	4000	3425	N/A	TU

TU - Traceability Unscheduled

2.1.5 Test Method

The following test was required by the customer test plan:

Cant the two front feet and locate the enclosure under the fixed platen of the MTS 842 compression machine:

- Centre the EUT under the platen (small fixed platen: load test)
- Apply a load at 100lb/min until yield point is reached
- Repeat for each of the six test samples

Inspections:

Visual inspection to be performed at the following test stage by the attending customer:

- At yield point



Figure 2.1.1 Enclosure with Technofeet under compression machine platen

2.1.6 Test Results

The compression tests were completed satisfactorily to their yield point and the following was observed:

EUT	Foot Kit Name	Yield Point (kgf)
1	Technofeet: Type 1: RAL 7035 - Light grey	40.5kgf (397N). Both feet popped off.
2	Technofeet: Type 2: RAL 7016 - Anthracite	36.5kgf (358N). Both feet snapped off.
3	Technofeet: Type 3: RAL 9005 - Black	39.3kgf (385N). Both feet snapped off.
4	Case feet: Type 1: RAL 7035 - Light grey	36.4kgf (357N). Both feet popped off.
5	Case feet: Type 2: RAL 9002 - Off white	33.0kgf (323N). Both feet popped off and cracked.
6	Case feet: Type 3: RAL 9005 - Black	33.6kgf (329N). Both feet popped off.

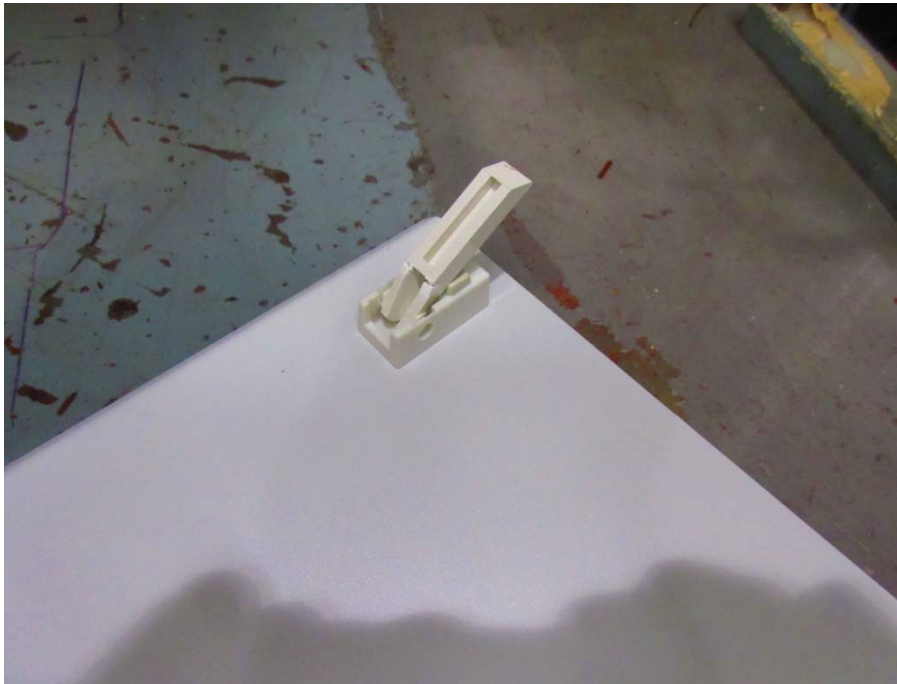


Figure 2.1.2 Post-Test Inspection. EUT 5. Case Feet - Shows the cracked foot

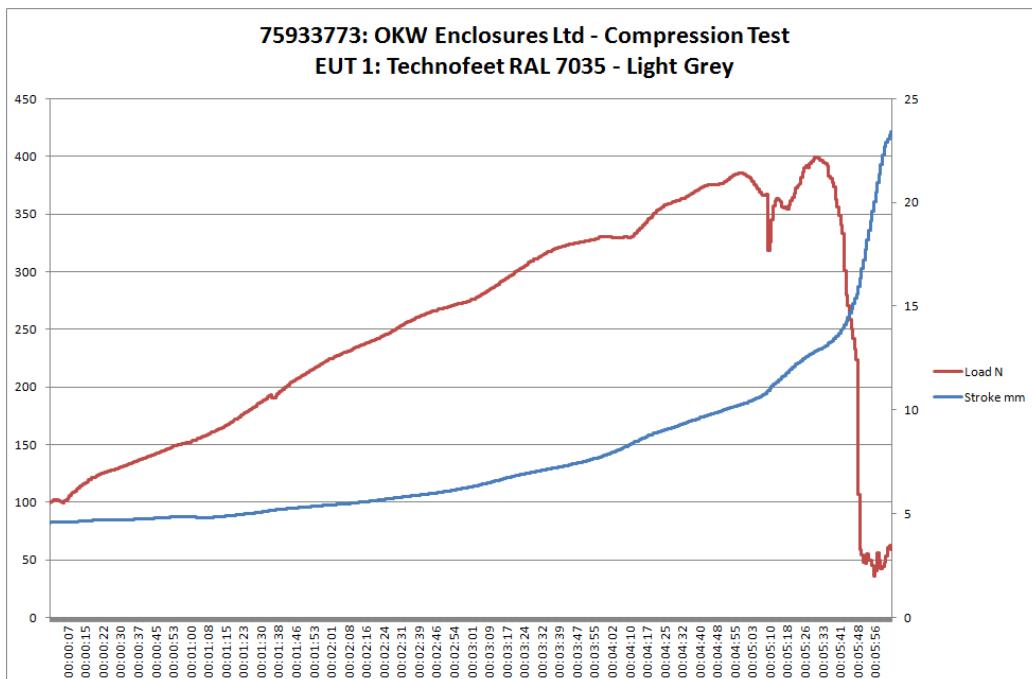


Figure 2.1.3 Compression test plot to EUT 1

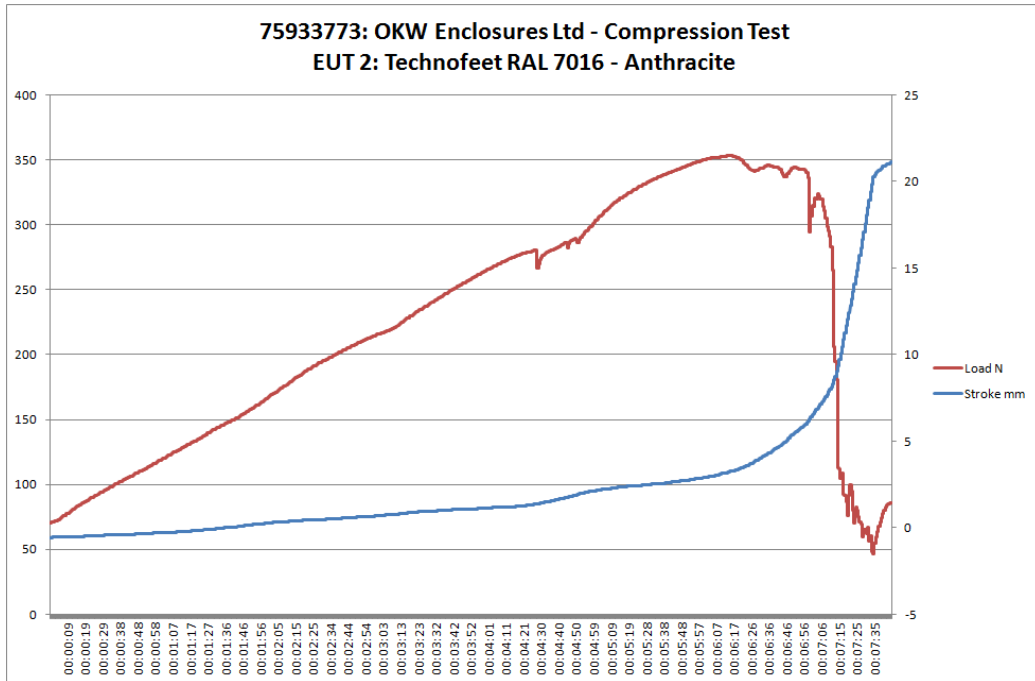


Figure 2.1.4 Compression test plot to EUT 2

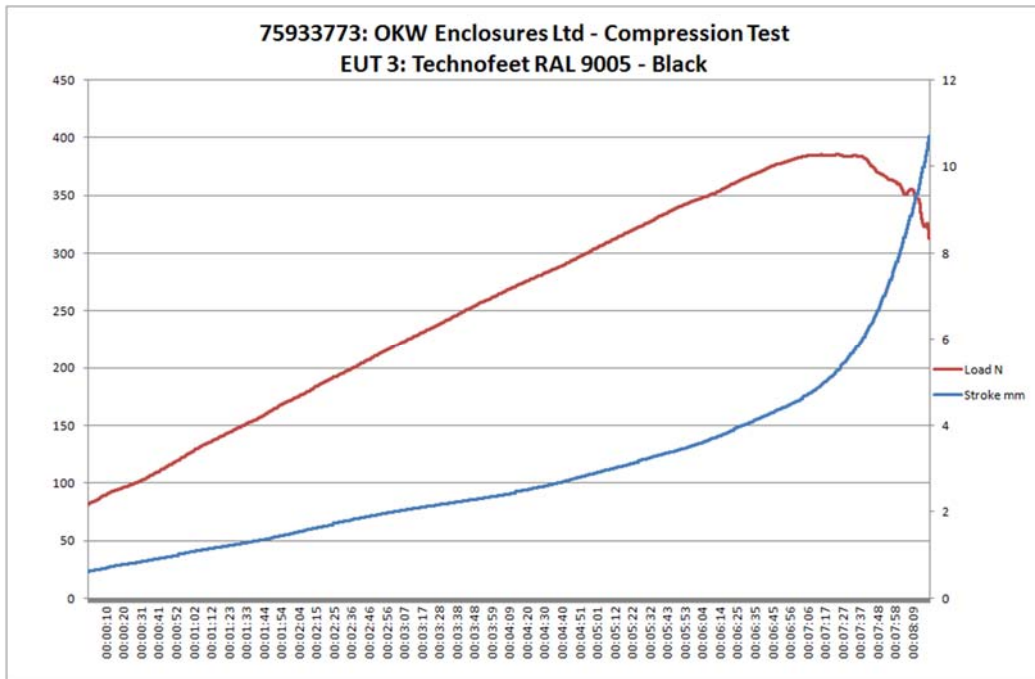


Figure 2.1.5 Compression test plot to EUT 3

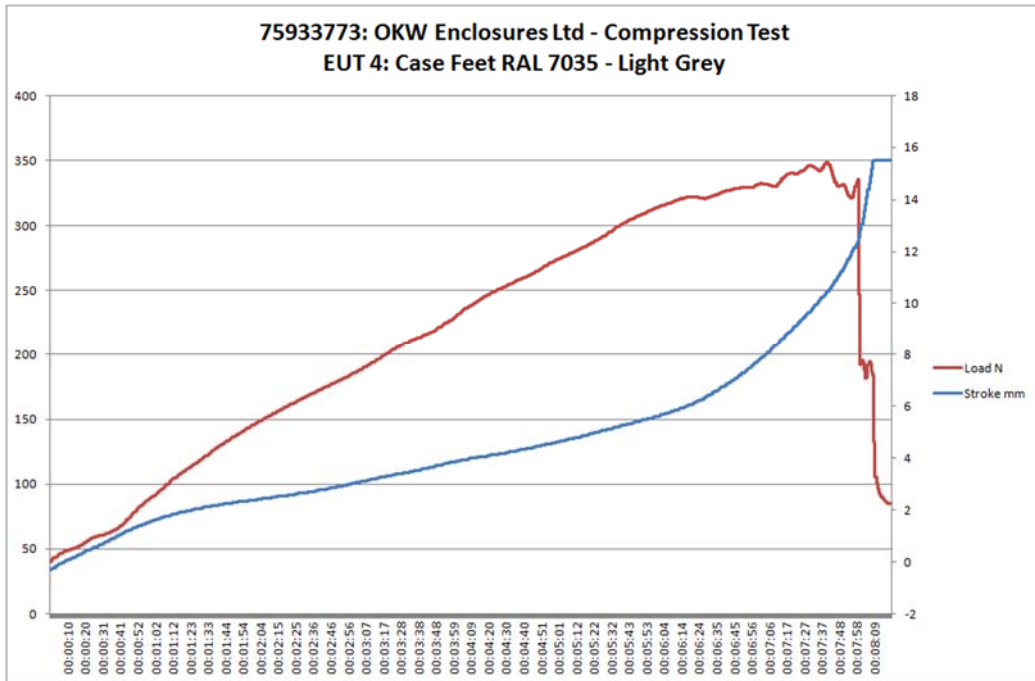


Figure 2.1.6 Compression test plot to EUT 4

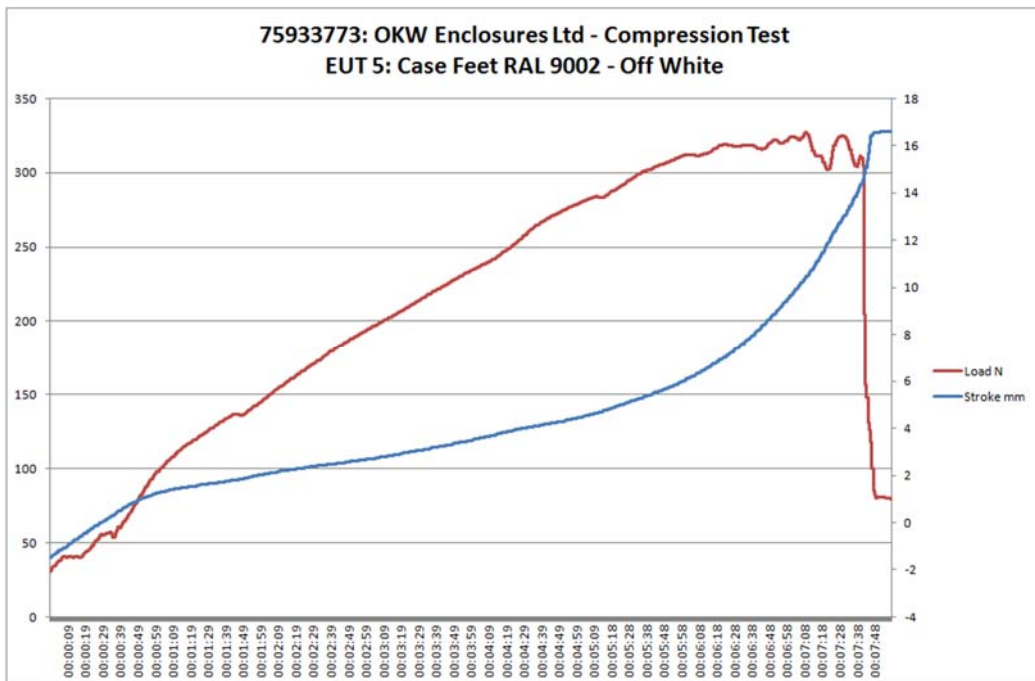


Figure 2.1.7 Compression test plot to EUT 5

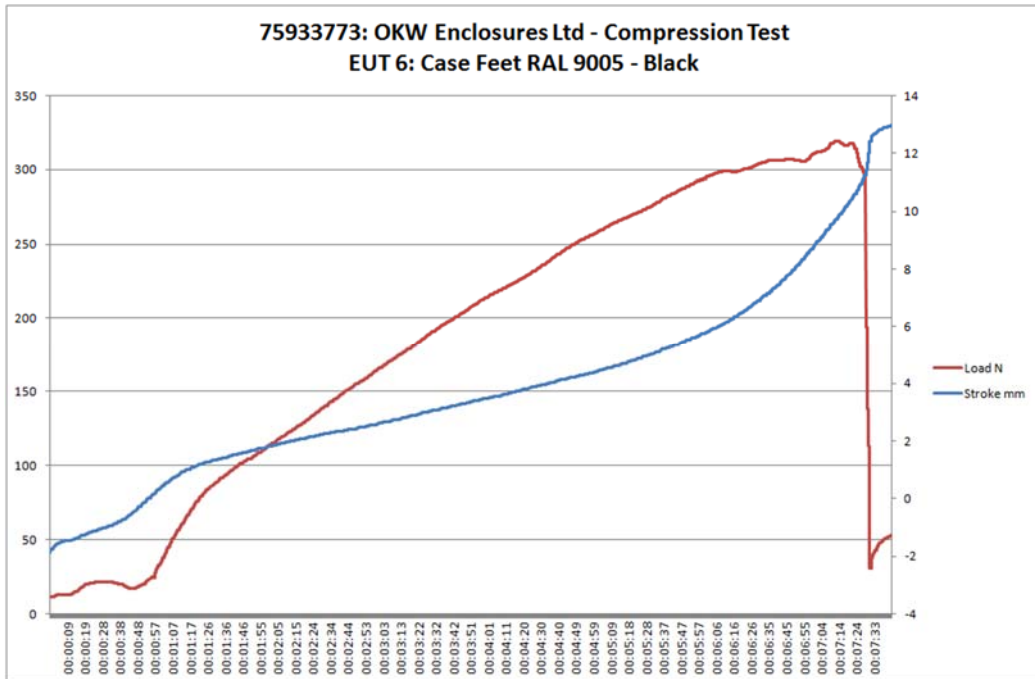


Figure 2.1.8 Compression test plot to EUT 6



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2.2 TOPPLE TEST

2.2.1 Specification Reference

Test based on DEF STAN 00-35 Part 3 Issue 4, Chapter 2-04.
 Test M4 - Drop, Topple and Roll Test, 4. Test Procedure, 4.4 Topple Test onto a Flat Surface.

2.2.2 Equipment Under Test

Technofeet attached to enclosure:
 EUT 1. Type 1: RAL 7035 - Light grey
 EUT 2. Type 2: RAL 7016 - Anthracite
 EUT 3. Type 3: RAL 9005 - Black

Case feet attached to enclosure:
 EUT 4. Type 1: RAL 7035 - Light grey
 EUT 5. Type 2: RAL 9002 - Off white
 EUT 6. Type 3: RAL 9005 - Black

2.2.3 Date of Test

1 March 2016

2.2.4 Test Equipment Used

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Balance	Geniweigher	GM-11K	2334	12	12-Mar-2016

2.2.5 Test Method

The following test was required by the customer test plan:

Locate a suitable mass (shown in the table below) securely inside the enclosure in conjunction with the customer.

Cant the two front feet and locate the enclosure onto its back face onto the hard, rigid concrete floor, then perform the following test:

- The specimen, standing on its specified face, shall be tilted about one bottom edge until it reaches a position of instability
- It shall then be allowed to fall over freely from this position onto an adjacent face
- Inspect the feet at test completion
- Repeat for each of the six test samples

Inspections:

Visual inspection to be performed at the following test stage by the attending customer:

- At post-test



Figure 2.2.1 EUT 1. Enclosure with Technofeet canted ready for topple test



Figure 2.2.2 EUT 4. Enclosure with Case Feet canted ready for topple test



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2.2.6 Test Results

The topple tests were completed satisfactorily and the following was observed:

EUT	Foot Kit Name	Internal Mass	Result
1	Technofeet: Type 1: RAL 7035 - Light grey	5.12kg	One foot (left hand side) unclipped. No damage observed to the feet or enclosure. The mass was reduced for the next test.
1	Technofeet: Type 1: RAL 7035 - Light grey	3.69kg	Repeat test. Both feet withstood the topple test. No damage observed to the feet or enclosure.
2	Technofeet: Type 2: RAL 7016 - Anthracite	3.69kg	Both feet withstood the topple test. No damage observed to the feet or enclosure.
3	Technofeet: Type 3: RAL 9005 - Black	3.69kg	Both feet withstood the topple test. No damage observed to the feet or enclosure.
4	Case feet: Type 1: RAL 7035 - Light grey	3.69kg	Both feet withstood the topple test. No damage observed to the feet or enclosure.
5	Case feet: Type 2: RAL 9002 - Off white	3.69kg	Both feet withstood the topple test. No damage observed to the feet or enclosure.
6	Case feet: Type 3: RAL 9005 - Black	3.69kg	Both feet withstood the topple test. No damage observed to the feet or enclosure.
1	Technofeet: Type 1: RAL 7035 - Light grey	3.69kg	Both feet withstood the topple test. No damage observed to the feet or enclosure.



Figure 2.2.3 Post-Test Inspection. EUT 1. Technofeet.
One foot (left hand side) unclipped



Figure 2.2.4 Post-Retest Inspection. EUT 1. Technofeet.
No damage observed to the feet or the enclosure



Figure 2.2.5 Post-Test Inspection. EUT 2. Technofeet.
No damage observed to the feet or the enclosure

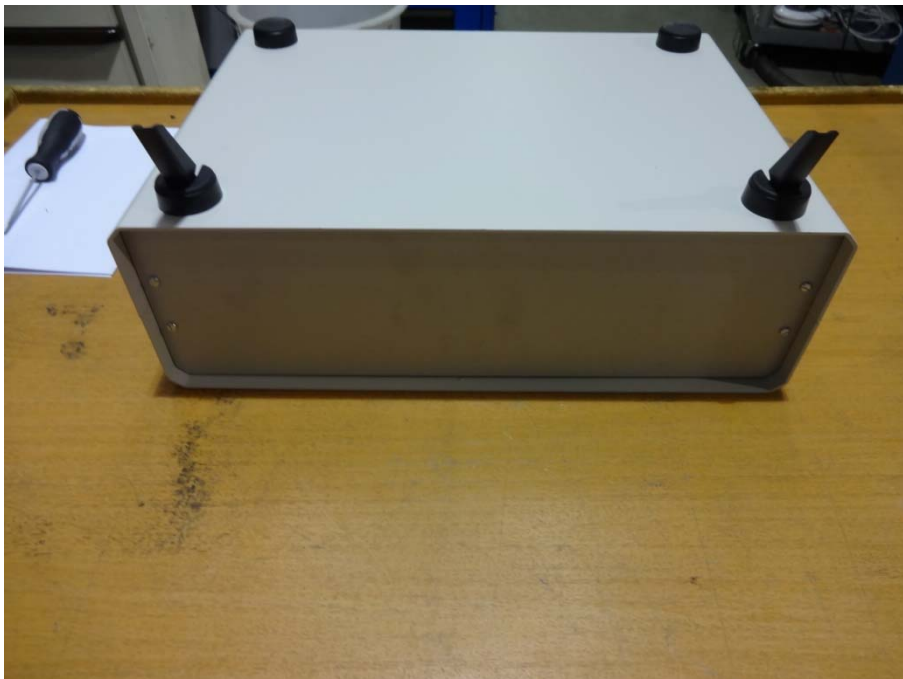


Figure 2.2.6 Post-Test Inspection. EUT 3. Technofeet.
No damage observed to the feet or the enclosure



Figure 2.2.7 Post-Test Inspection. EUT 4. Case Feet.
No damage observed to the feet or the enclosure



Figure 2.2.8 Post-Test Inspection. EUT 5. Case Feet.
No damage observed to the feet or the enclosure



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Figure 2.2.9 Post-Test Inspection. EUT 6. Case Feet.
No damage observed to the feet or the enclosure



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3 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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