

TEST REPORT No. 15-7081C

Test Specimen: Guardian Case

Client: bwh Spezialkoffer GmbH
Bevergern, Saltenwiese 54
D-48477 Hörstel

Present Persons: Björn Schindler (bwh Spezialkoffer GmbH)
Johannes Frick (PAConsult GmbH)

Purpose:

In connection with a laboratory simulation a case - type guardian - should be tested to temperature- and shock strains. The tests were given by the client and are described in the MIL 810 G standard.

Summary:

The qualification tests were performed successfully. No damages could be detected. The case opened during drop on edge 1-5. The detailed analysis of the specimen will be performed by the client.

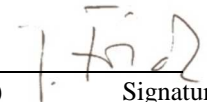
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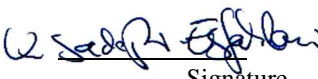
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(Laboratory Test Engineer) Signature

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3. Specimen

For the environmental tests a container was provided by the client. Table 1 describes the unit in detail. In the following designation the specimen is shortened by UUT (Unit Under Test).

Table 1: Specimen

EUT	Test Sample	Content	Dimensions [mm]			Weight [g]
			Length	Width	Height	
1	Case	Without Content	570	445	260	4490

Illustration 1 shows the specimen.



Illustration 1: UUT

4. Test and Equipment

On the basis of the conducted tests the suitability of a container - Guardian Case - was supposed to be tested with regard to temperature- and shock strains. The test specifications were given by the client and are described in the MIL STD 810 G standard.

Table 2 shows an overview of the environmental tests and the test sequences.

Table 2: Environmental Tests

Environmental Conditions and Test Procedures					
Sequence	Note	Environmental Description	Reference	Test Level	Acc. Lab.
Temperature Tests	Temperature Shock				
	1	3 Cycles Basic Hot: +63 ° C Basic Cold: -33° C	MIL-STD 810 G Method 503.5 Procedure I-C Multi-cycle shocks from constant extreme temperature.	Dwell Time: 1h per Temperature Temperature Change Rate: < 1 min	yes, paconsult
Mechanical Tests	Drop Test				
	2	<u>Faces:</u> all Faces (6) <u>Edges:</u> all Edges (12) <u>Corners:</u> all Corners (8)	MIL-STD 810 G Method 516.6 Procedure IV Transit Drop	Drop Height: 1220 mm	yes, paconsult

4.1 Test Conditions

All tests were performed, if not otherwise stated in the test report, under the following conditions (table 3).

Table 3: Environmental Conditions

Temperature	15°C-35°C
Relative Humidity	<85 %
Air Pressure	860 hPa – 1060 hPa

4.2 Equipment used for Test

The test equipment used in the laboratory of PAConsult is listed in the table stated below.

Table 4: Test Equipment

Devices	Manufacturer	Type	Serial number / Version	Date of last calibration
Climatic Cabinet 4 (ESPEC)	ESPEC	PL-4J	15000422	2014/10
Climatic Cabinet 5 (CTS)	CTS	CS 70/350-5	123074	2015/07
Data Logger 4	testo	testo 650	00276559	2015/03
Temperature Sensor 2	testo	PRT 61253	11049562	2015/03
Drop Table 2 CE	Lansmont	PDT-56ED	M15943	2014/09
Scale (Lab. 4)	Mettler Toledo	SB32000-P	2114375058	2015/05
The calibration of the laboratory test equipment is performed annually.				

4.3 Function Test

The functionality of the container was tested before and after the tests. The container was opened and closed; the lock was opened and closed.



Illustration 2: Container lock

5. Test Procedures

5.1 Temperature Tests

5.1.1 Temperature Shock [MIL STD 810G]

The following test procedures are taken from the MIL 810G standard:

Procedure I-C. Multi-cycle shocks from constant extreme temperature. (Figure 503.5-3)

Step 1. With the test item in the chamber in its appropriate logistic configuration, adjust the chamber air temperature to the high or low temperature extreme specified in the test plan (T1) at a rate not to exceed 3°C/min (5°F/min). Stabilize the temperature for a period as determined in accordance with paragraph 2.3.5.

Step 2. Transfer the test item in no more than one minute to an atmosphere at temperature (T2) that will produce the thermal shock specified in the test plan, and stabilize the temperature for a period as determined in accordance with paragraph 2.3.5.

Step 3. If required in the test plan, evaluate the effects of the thermal shock on the test item to the extent practical.

Step 4. Transfer the test item back to the T1 environment in less than one minute. Stabilize the temperature for a period as determined in accordance with paragraph 2.3.5, and evaluate the thermal shock effects (if required).

Step 5. Repeat steps 2-4 at least twice for a minimum of three cycles.

Step 6. Return the test item to standard ambient conditions.

Step 7. Examine the test item and, if appropriate, perform an operational check. Record the results for comparison with pretest data. If the test item fails to operate as intended, see paragraph 5 for failure analysis and follow the guidance in paragraph 4.3.2 for test item failure.

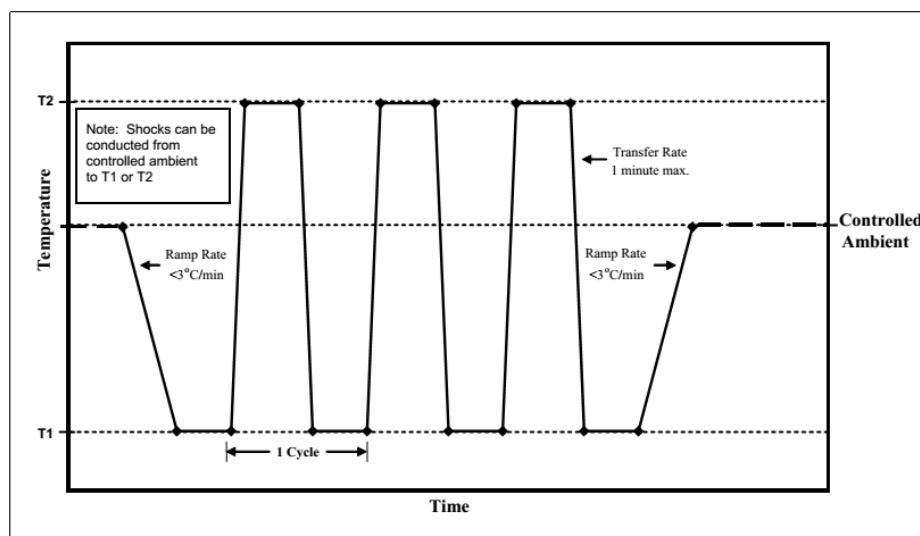


Figure 503.5-3. Multi-cycle shocks.

5.2 Mechanical Tests

5.1.1 Drop Test [MIL STD 810G]

The following test procedures are taken from the MIL 810G standard:

The intent of this test is to determine the structural and functional integrity of the materiel to a transit drop either outside or in its transit or combination case. Perform all tests with a quick release hook or drop tester. In general, there is no instrumentation calibration for the test and measurement information is minimized, however, if measurements are made, the maximax acceleration SRS and the pseudovelocity SRS will define the results of the test, along with the measurement amplitude time history.

Table 516.6-VI. Transit drop test.

Weight of Test Item & Case kg (lbs)	Largest Dimension, cm (in)	Notes	Height of Drop, h cm (in)	Number of Drops
Under 45.4 (100) Manpacked or man-portable	Under 91 (36)	<u>A/</u>	122 (48)	Drop on each face, edge and corner; total of 26 drops <u>D/</u>
	91 & over	<u>A/</u>	76 (30)	
45.4 - 90.8 (100 – 200) inclusive	Under 91	<u>A/</u>	76 (30)	Drop on each corner; total of eight drops
	91 & over	<u>A/</u>	61 (24)	
90.8-454 (200 – 1000) inclusive	Under 91	<u>A/</u>	61 (24)	
	91 – 152 (36 – 60)	<u>B/</u>	61 (24)	
	Over 152	<u>B/</u>	61 (24)	
Over 454	No limit	<u>C/</u>	46 (18)	Drop on each bottom edge. Drop on bottom face or skids; total of five drops

Acceptance criteria for all tests:

- *no cracks, splits, breaks or fissures in plastic material*
- *no functional damages (container does not close or open, lock does not close or open)*
- *no damage to the rivets*
- *no damage to the hinges*
- *no damage to the handle bar*

6. Test and Results

6.1 Temperature Tests

The temperature shock tests were performed with the parameters from table 2. Illustrations 3 and 4 show the test setup in the climatic cabinets.



Illustration 3: Test setup cold



Illustration 4: Test setup hot

6.1.1 Temperature Shock

The Multi-cycle shocks from constant extreme temperature were performed successfully. Diagram 1 documents the test proceeding. The temperature diagram shows data taken from a temperature sensor that was taken from cabinet to cabinet to show the actual temperature.

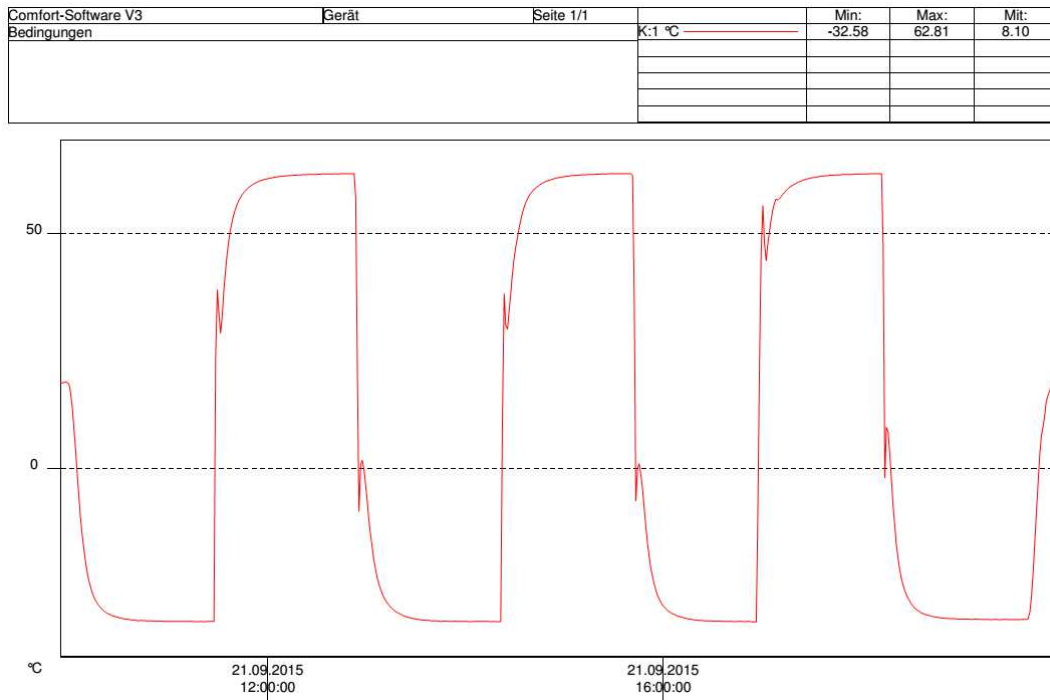


Diagram 1: Temperature proceeding during shock tests

Result:

No damage or malfunctions could be detected. See illustrations 5 to 7 for details.



Illustration 5: Frozen Container in hot chamber



Illustration 6: Frozen locks



Illustration 7: Container corner during temperature shock test

6.2 Mechanical Tests

6.2.1 Drop Test

The mechanical tests were performed with the parameters from table 2. They were performed immediately after the temperature shock tests. Illustration 8 shows the test setup.



Illustration 8: Setup drop table (corner and edge drop)

Result:

No damages could be detected. The case opened during the drop on edge 1-5.

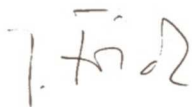
7. Evaluation

The environmental tests were performed successfully. In the following table the test results are summarized. The specified function of the container was checked and demonstrated.

Table 5: Overview Test Results

Environmental Conditions and Test Procedures - Container -			
Sequence	Environmental Description	Reference	Acceptance Criteria
Temperature Tests	Temperature Shock Tests		
	1	Multi-cycle shocks from constant extreme temperature 3 Cycles Basic Hot: +63 ° C Basic Cold: -33° C	MIL-STD 810 G Method 503.5 Procedure I-C
Mechanical Tests	Drop Tests		
	2	Transit Drop Drop height: 1.220 mm 26 Drops (all faces, edges, corners)	MIL-STD 810 G Method 516.6 Procedure IV

The analyses of the test result and the final function check is going to be performed by the client.



Dipl.-Wirt.-Ing. J. Frick
(Laboratory Test Engineer)

Note:

This test report may be passed on as a complete version and unchanged only. Extracts require permission of the test laboratory. Test results refer to the test object specified above. Test reports without signature are invalid.