

# ENVIRONMENTAL TEST REPORT

ACCORDING TO: EN 50130-5:2011 and IEC 60529:89+A1:99

FOR:

**Paradox Security Systems  
Ltd.**

EUT:

**Passive Infrared (PIR) motion  
detectors**

Models:

**NV780MX**

**NV780MR (433/868 MHz)**

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## 1 Applicant information

**Client name:** Paradox Security Systems Ltd  
**Address:** 780 INDUSTRIAL BLVD  
ST-EUSTACHE, QC, CANADA J7R 5V3  
**Telephone:** 450-491-7444  
**Fax:** 450-491-1095  
**E-mail:** nimrodh@paradox.com  
**Contact name:** Mr. Nimrod Herman

## 2 Equipment under test attributes

**Product name:** Passive Infrared (PIR) motion detectors  
**Product type:** Alarm system components  
**Models:** NV780MX NV780MR (433/868 MHz)  
**Serial numbers:** Prototype 052099  
**Hardware versions:** 462-4004-995 304-2002-996  
**Software releases:** V1.00 V1.00  
**Receipt date** 20-Dec-15

\*Note: the tested version is 433 MHz

## 3 Manufacturer information

**Manufacturer name:** Paradox Security Systems Ltd  
**Address:** 780 INDUSTRIAL BLVD  
ST-EUSTACHE, QC, CANADA J7R 5V3  
**Telephone:** 450-491-7444  
**Fax:** 450-491-1095  
**E-Mail:** nimrodh@paradox.com  
**Contact name:** Mr. Nimrod Herman

## 4 Test details

**Project ID:** 27422  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 20-Dec-15  
**Test completed:** 30-Dec-15  
**Test specifications:** EN 50130-5:2011 and IEC 60529:89+A1:99

## **5 EUT description**

### **5.1 General information**

The Equipment Under Test (EUT) are NV780MX - Passive Infrared (PIR) hardwired motion detector and NV780MR (433/868 MHz) - Passive Infrared (PIR) wireless motion detector.

The detectors are classified Security Grade 2, Environmental Class IVA, fixed equipment.

The tested version is 433 MHz (for NV780MR).

### **5.2 Acceptance criteria**

The EUT shall not sustain any physical damage or deterioration when subjected to Temperature , Humidity, Water, Sinusoidal vibration, Shock and Impact conditions expected in its application environment.

No water ingress is admitted.

Before/after each test the EUT should pass the BDT (Basic detection test per EN 50131-2-2). No any un-wanted signals and messages are accepted during operational tests. Alarm message is accepted during Impact test.

### **5.3 EUT visual inspection and functional check**

The functional check is performed to verify that the EUT operates properly or within acceptable performance degradation if any.



Before and after each test, the EUT was visually inspected by the HL engineers and a BDT was performed.

## 6 Tests summary

Test	Status
<b>EN 50130-5:2011</b>	
Cold (Operational) test	Pass
<b>EN 50130-5:2011</b>	
Dry heat (Operational) test	Pass
<b>EN 50130-5:2011</b>	
Damp heat cyclic (operational) test	Pass
<b>IEC 60529:89+A1:99</b>	
IP X4: Water splashing (Operational) test	Pass
<b>EN 50130-5:2011</b>	
Sinusoidal vibration (Operational) test	Pass
<b>EN 50130-5:2011</b>	
Shock (Operational) test	Pass
<b>EN 50130-5:2011</b>	
Impact (Operational) test	Pass

**Note:**

The tests according to EN 50130-5 Clause 9, 13, 17 and 23 were not tested for the new version of the products (NV780MR and NV780MX) based on similarity with product variants (NV780 and NVR780 ) already tested according to EN 50130-5, Clause 9, 13, 17 and 23. The similarity evaluation is done inside the EN 50131-2-2 test report.

Date	File No.	Prepared	Reviewed and approved	Amendment Description
25-Feb-16	PARENV_27422_Rev1	Miss. Anna Gorovoy, Environmental Certification Engineer  	Mr. Mihaeli Feldmann, Environmental Group Manager  	A note was added on page 5.
04-Jan-16	PARENV_27422	Miss. Anna Gorovoy, Environmental Certification Engineer	Mr. Mihaeli Feldmann, Environmental Group Manager	Original report



<b>Test specification:</b>		<b>Cold (Operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 3 ENVIRONMENTAL CLASS IVA TEST METHOD: IEC 60068-2-1 Test Ad: Cold heat-dissipating specimen with gradual change of temperature	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		25-Dec-15 - 26-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1020 hPa
<b>Remarks:</b>		<b>Verdict:</b>	<b>PASS</b>
		<b>Relative Humidity:</b> 52 %	

## 6.1 Cold (Operational) test procedure and results

### 6.1.1 Test purpose

The test was performed to demonstrate the EUT ability to function correctly at low ambient temperatures appropriate to the anticipated service environment.

### 6.1.2 Test procedure

6.1.2.1 After BDT, the operational EUTs were placed in the testing chamber, as presented in Photograph 6.1.1.

6.1.2.2 The chamber temperature was adjusted to +25°C.

6.1.2.3 The temperature in the testing chamber was lowered to -40°C at a 1°C/min cooling rate.

6.1.2.4 The EUTs were subjected to a temperature of -40°C for 16 hours.

6.1.2.5 At the end of exposure period, the chamber temperature was raised to +25°C at a 1°C/min heating rate.

6.1.2.6 The air chamber temperature monitoring is presented in Plot 6.1.1.

6.1.2.7 A BDT and a visual inspection were performed.

### 6.1.3 Test results

**Table 6.1.1 Test results**

Observation	Verdict
No structural or mechanical damages were registered during the visual inspection. BDT passed. No change in system status (armed). The EUT passed the cold (operational) test.	<b>Pass</b>

#### Reference numbers of test equipment used:

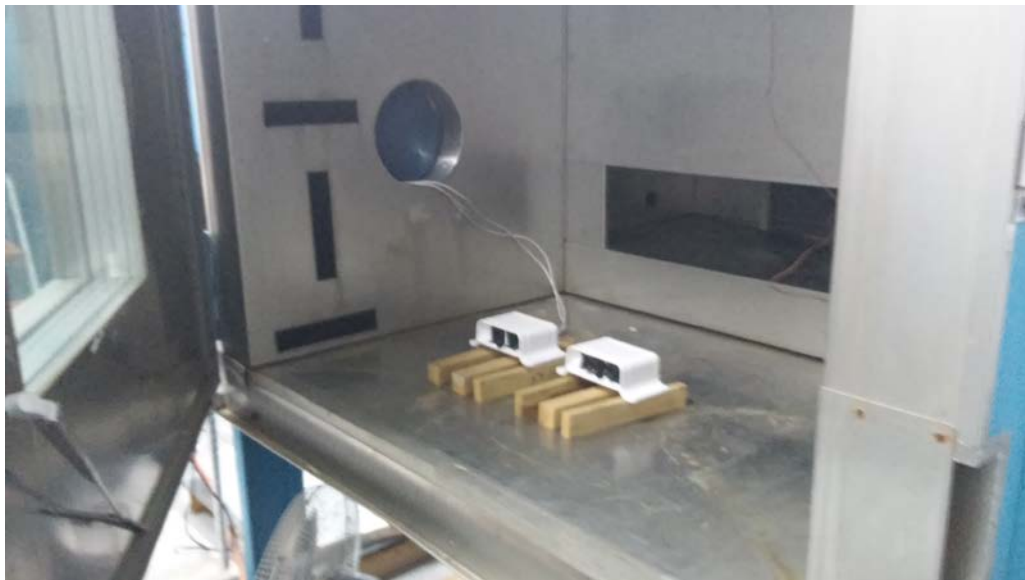
HL 3990	HL 4019
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Full description is given in Appendix A.



<b>Test specification:</b>	<b>Cold (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 3 ENVIRONMENTAL CLASS IVA TEST METHOD: IEC 60068-2-1 Test Ad: Cold heat-dissipating specimen with gradual change of temperature		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	25-Dec-15 - 26-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1020 hPa	<b>Relative Humidity:</b> 52 %
<b>Remarks:</b>			

Photograph 6.1.1 The EUTs in the low temperature chamber

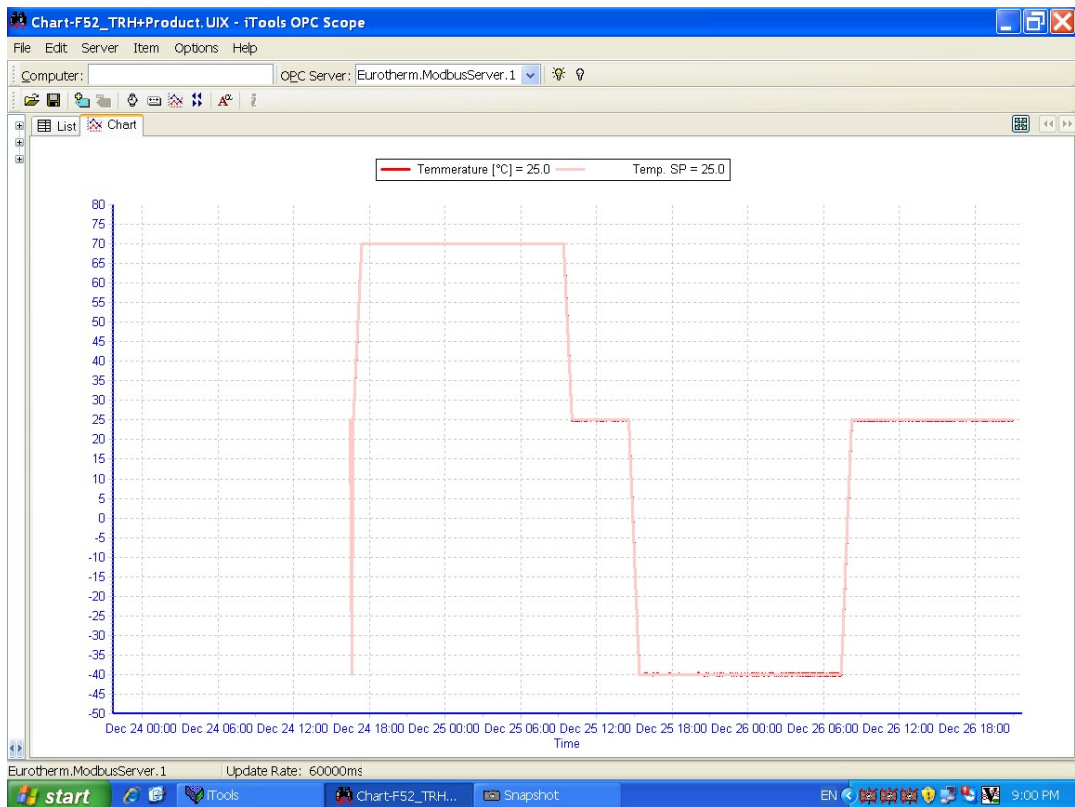






<b>Test specification:</b>	<b>Cold (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 3 ENVIRONMENTAL CLASS IVA TEST METHOD: IEC 60068-2-1 Test Ad: Cold heat-dissipating specimen with gradual change of temperature		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	25-Dec-15 - 26-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1020 hPa	<b>Relative Humidity:</b> 52 %
<b>Remarks:</b>			

Plot 6.1.1 Temperature monitoring during the cold (operational) test (2nd part of the plot)





<b>Test specification:</b>		<b>Dry heat (Operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 1 ENVIRONMENTAL CLASS IVA TEST METHOD: IEC 60068-2-2 Test Bd: Dry heat for heat-dissipating specimens with gradual change of temperature	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		24-Dec-15 - 25-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1022 hPa
<b>Remarks:</b>		<b>Verdict:</b>	<b>PASS</b>
<b>Relative Humidity:</b> 52 %			

## 6.2 Dry heat (Operational) test procedure and results

### 6.2.1 Test purpose

The test was performed to demonstrate the EUT ability to function correctly at high ambient temperatures, which may occur for short periods in the anticipated service environment.

### 6.2.2 Test procedure

6.2.2.1 After BDT, the operational EUTs were placed in the testing chamber, as presented in Photograph 6.2.1.

6.2.2.2 The chamber temperature was adjusted to +25°C.

6.2.2.3 The temperature in the testing chamber was raised to +70°C at a 1°C/min heating rate.

6.2.2.4 The EUTs were subjected to a temperature of +70°C for 16 hours.

6.2.2.5 At the end of exposure period, the chamber temperature was lowered to +25°C at a 1°C/min cooling rate.

6.2.2.6 The air chamber temperature monitoring is presented in Plot 6.2.1.

6.2.2.7 BDT and a visual inspection were performed.

### 6.2.3 Test results

Table 6.2.1 Test results

Observation	Verdict
No structural or mechanical damages were registered during the visual inspection. BDT passed. No change in system status (armed). The EUT passed the dry heat (operational) test.	<b>Pass</b>

### Reference numbers of test equipment used:

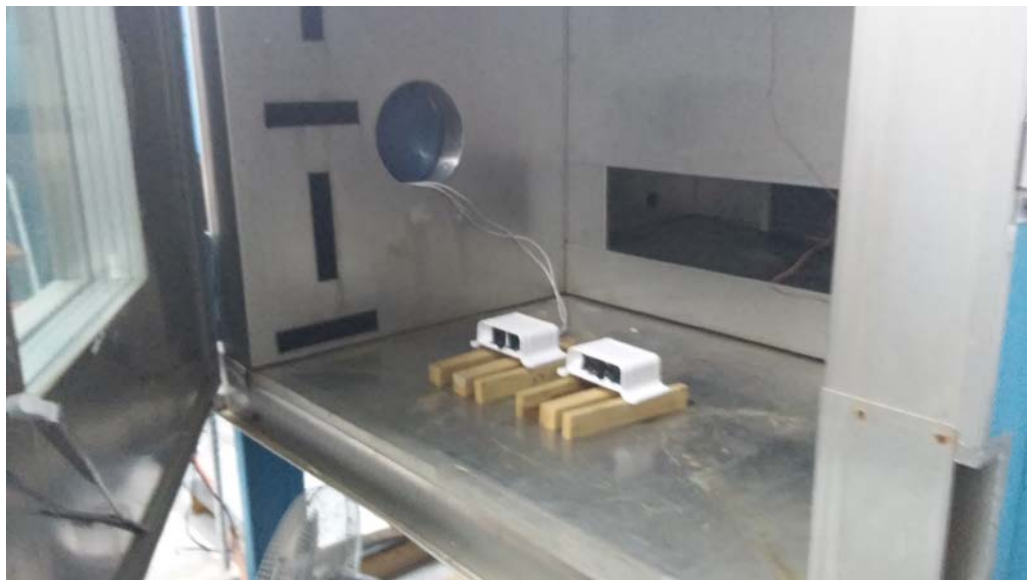
HL 3990	HL 4019
---------	---------

Full description is given in Appendix A.



<b>Test specification:</b>	<b>Dry heat (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 1 ENVIRONMENTAL CLASS IVA TEST METHOD: IEC 60068-2-2 Test Bd: Dry heat for heat-dissipating specimens with gradual change of temperature		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	24-Dec-15 - 25-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1022 hPa	<b>Relative Humidity:</b> 52 %
<b>Remarks:</b>			

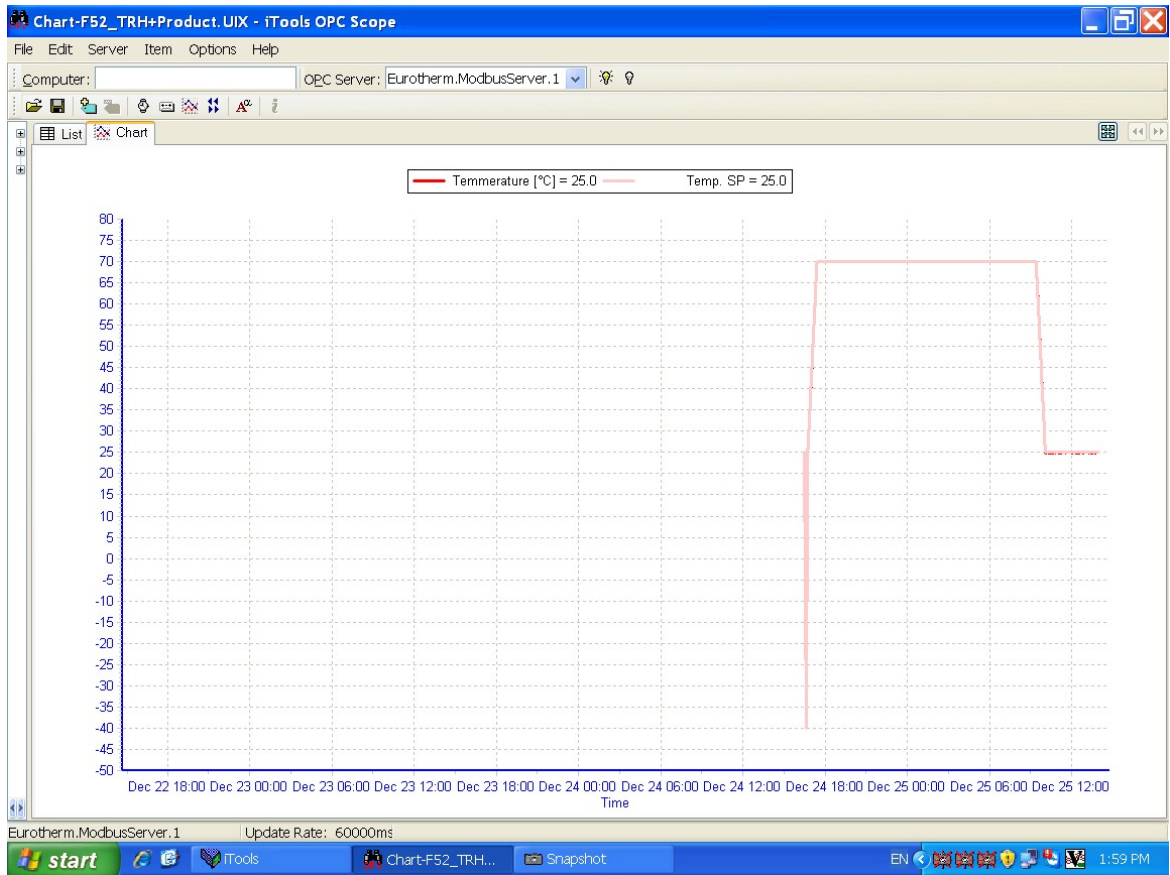
Photograph 6.2.1 The EUTs in the high temperature chamber





<b>Test specification:</b>	<b>Dry heat (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 1 ENVIRONMENTAL CLASS IVA TEST METHOD: IEC 60068-2-2 Test Bd: Dry heat for heat-dissipating specimens with gradual change of temperature		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	24-Dec-15 - 25-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1022 hPa	<b>Relative Humidity:</b> 52 %
<b>Remarks:</b>			

Plot 6.2.1 Temperature monitoring during the dry heat (operational) test





<b>Test specification:</b>		<b>Damp heat cyclic (operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 7 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-30 Test Db and guidance: Damp heat cyclic (12+12 hour cycle)	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		21-Dec-15 - 23-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1025 hPa
<b>Remarks:</b>		<b>Verdict:</b>	<b>PASS</b>
		<b>Relative Humidity:</b> 45 %	

### 6.3 Damp heat, cyclic (operational) test procedure and results

#### 6.3.1 Test purpose

The test was performed to demonstrate the EUT immunity to an environment with high relative humidity, where condensation occurs on the equipment.

#### 6.3.2 Test procedure

6.3.2.1 After BDT, the operational EUTs were placed into the testing chamber, as presented in Photograph 6.3.1.

6.3.2.2 The EUTs were continuously operating during the entire duration of the test.

6.3.2.3 The chamber temperature was adjusted to +25°C and relative humidity was increased to 95%.

6.3.2.4 The chamber temperature was raised to +55°C within a period of 3 hours. During this period relative humidity was maintained 95%.

6.3.2.5 These conditions (+55°C and at least 93% RH) were maintained for a duration of 9 hours.

6.3.2.6 The chamber temperature was lowered to +25°C within 3 hours. During this period relative humidity was maintained at 95%.

6.3.2.7 These conditions (+25°C and 95% RH) were maintained for a duration of 9 hours.

6.3.2.8 The steps of Paragraphs 6.3.2.4 to 6.3.2.7 were repeated.

6.3.2.9 A visual inspection and BDT were performed.

6.3.2.10 The humidity and temperature measuring results are presented in Plot 6.3.1.

#### 6.3.3 Test results

Table 6.3.1 Test results

Observation	Verdict
No structural or mechanical damages were registered during the visual inspections. BDT passed. No change in system status (armed).	Pass

#### Reference numbers of test equipment used:

HL 3898	HL 4755
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Full description is given in Appendix A.



<b>Test specification:</b>	<b>Damp heat cyclic (operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 7 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-30 Test Db and guidance: Damp heat cyclic (12+12 hour cycle)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	21-Dec-15 - 23-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1025 hPa	<b>Relative Humidity:</b> 45 %
<b>Remarks:</b>			

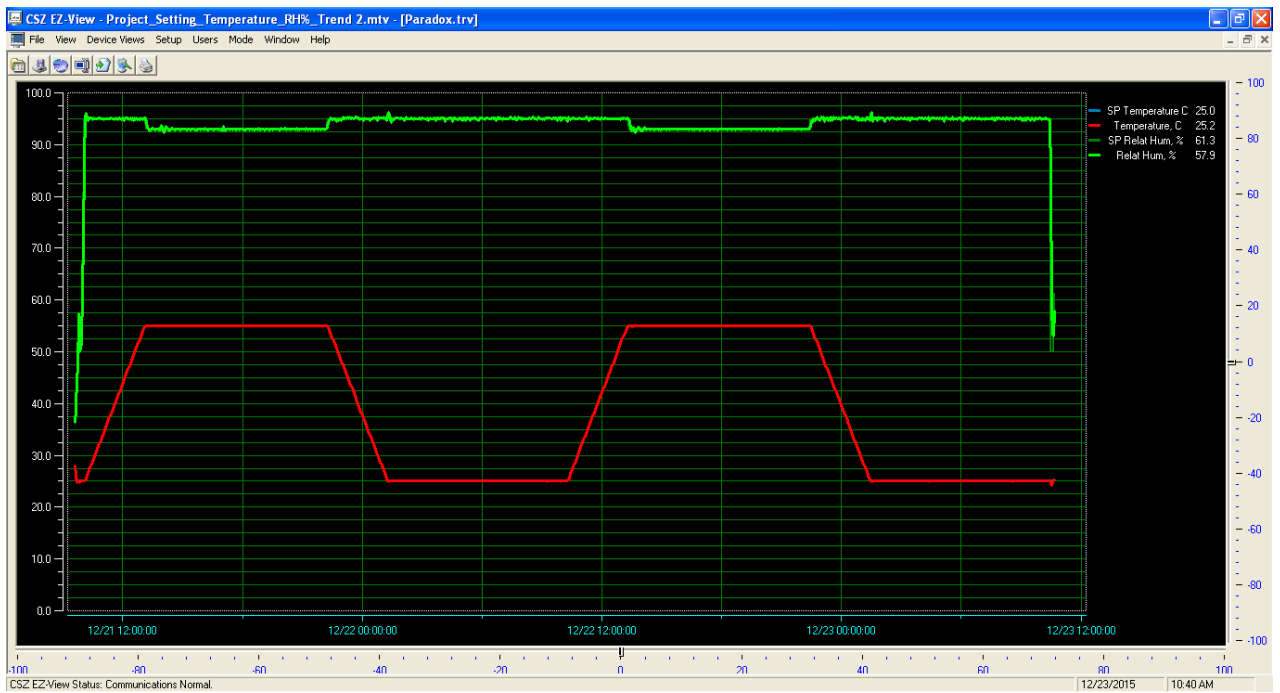
Photograph 6.3.1 The EUTs in the humidity chamber





<b>Test specification:</b>	<b>Damp heat cyclic (operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 7 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-30 Test Db and guidance: Damp heat cyclic (12+12 hour cycle)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	21-Dec-15 - 23-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1025 hPa	<b>Relative Humidity:</b> 45 %
<b>Remarks:</b>			

Plot 6.3.1 Temperature and relative humidity monitoring during the damp heat cyclic (operational) test





<b>Test specification:</b>		<b>IP X4: Water splashing (Operational) test</b>	
<b>Test procedure:</b>		STANDARD: IEC 60529 METHOD: IPX4, Water splashing Section: 14.2.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	30-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 50 %
<b>Remarks:</b>			

### 6.4 Degrees of protection against ingress of water indicated by the second characteristic numeral (IPX4 test) Operational - test procedure and results

#### 6.4.1 Test purpose

The test was performed to verify that the EUT withstands water penetration under water splashing.

#### 6.4.2 Test procedure

6.4.2.1 After BDT, the operational EUTs were placed on the testing table.

6.4.2.2 The enclosure was sprayed from the hand-held test device from all practicable direction, as presented in Photograph 6.4.1.

6.4.2.3 The EUTs were sprayed with water at a delivery rate of 10.5 l/min for 10 minutes. The test conditions are presented in Table 6.4.2.

6.4.2.4 After which, the EUTs were removed from the spraying place and an internal visual inspection was performed, as presented in Photograph 6.4.2.

#### 6.4.3 Test results

Table 6.4.1 Test results

Observation	Verdict
No water penetration within the enclosure was noticed. No any un-intentional signals or messages recorded. BDT test passed before and after test.	<b>Pass</b>

#### Reference numbers of test equipment used:

HL 2663	HL 2143	HL 3633
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Full description is given in Appendix A.





<b>Test specification:</b>	<b>IP X4: Water splashing (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: IEC 60529 METHOD: IPX4, Water splashing Section: 14.2.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	30-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 50 %
<b>Remarks:</b>			

Table 6.4.2 Water splashing test severity

Test means	Water pressure	Water flow rate	Distance to enclosure	Test duration
	kPa	l/min	m	min
Water splashing IPX4	100	10.5	0.3-0.5	10

Photograph 6.4.1 The EUTs under splashing water





<b>Test specification:</b>	<b>IP X4: Water splashing (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: IEC 60529 METHOD: IPX4, Water splashing Section: 14.2.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	30-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 50 %
<b>Remarks:</b>			

Photograph 6.4.2 The EUT's internal visual inspection





<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

## 6.5 Sinusoidal vibration (operational) test procedure and results

### 6.5.1 Test purpose

The test was performed to demonstrate the EUT ability to withstand the long-term effects of vibration at levels appropriate to the service environment.

### 6.5.2 Test procedure

- 6.5.2.1 After BDT the EUTs in operational mode and the control accelerometer were installed on the vibration test system, as presented in Figure 6.5.1 and Photograph 6.5.1.
- 6.5.2.2 The required vibration level was applied to the operational EUTs along the vertical axis, according to EN 50130-5 standard Class IV requirements, as presented in Table 6.5.2.
- 6.5.2.3 The Paragraphs 6.5.2.1 and 6.5.2.2 were repeated along the transverse and longitudinal axes, as presented in Figure 6.5.1, Photograph 6.5.2 and Photograph 6.5.3.
- 6.5.2.4 The control accelerometer signal was monitored and results are presented in Plots from 6.5.1 to 6.5.3.
- 6.5.2.5 A visual inspection and a BDT were performed after the sinusoidal vibration test.

### 6.5.3 Test results

**Table 6.5.1 Test results**

Observation	Verdict
No structural or mechanical damages were registered during the visual inspection. All BDT passed. No change in system status (armed). The EUT passed the sinusoidal vibration test (operational).	<b>Pass</b>

#### Reference numbers of test equipment used:

HL 2190	HL 3460	HL 4020	HL 4888	HL 3953	HL 3960
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Full description is given in Appendix A.



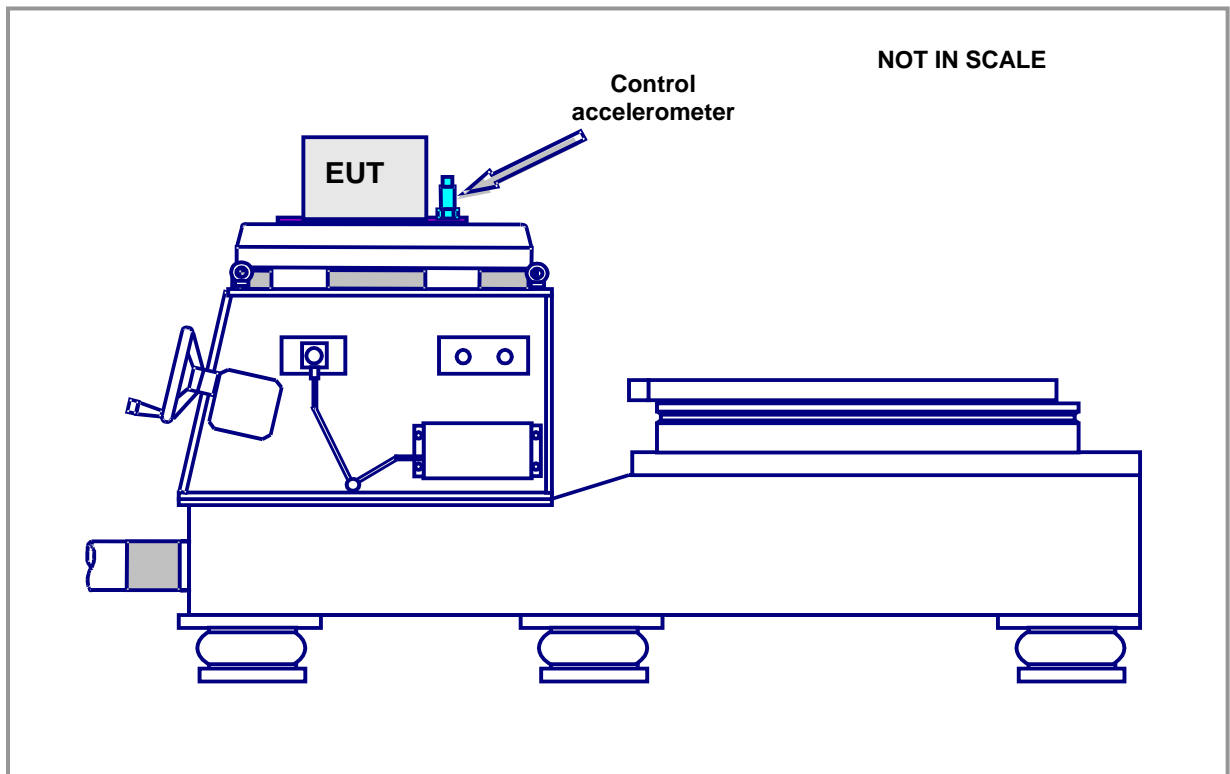
<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Table 6.5.2 Sinusoidal vibration test profile (operational)

Frequency range, Hz	Frequency, Hz	Displacement, (mm) Peak-Peak	Velocity, (m/s) Peak	Acceleration, (m/s <sup>2</sup> ) Peak	Duration (per each axis) min
10-150	10	2.533	0.080	5.000	07:50
	150	0.011	0.005	5.000	

Note: Number of sweep cycles / axis / functional mode =1 cycle (1 Octave / min).

Figure 6.5.1 Sinusoidal vibration test setup





<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

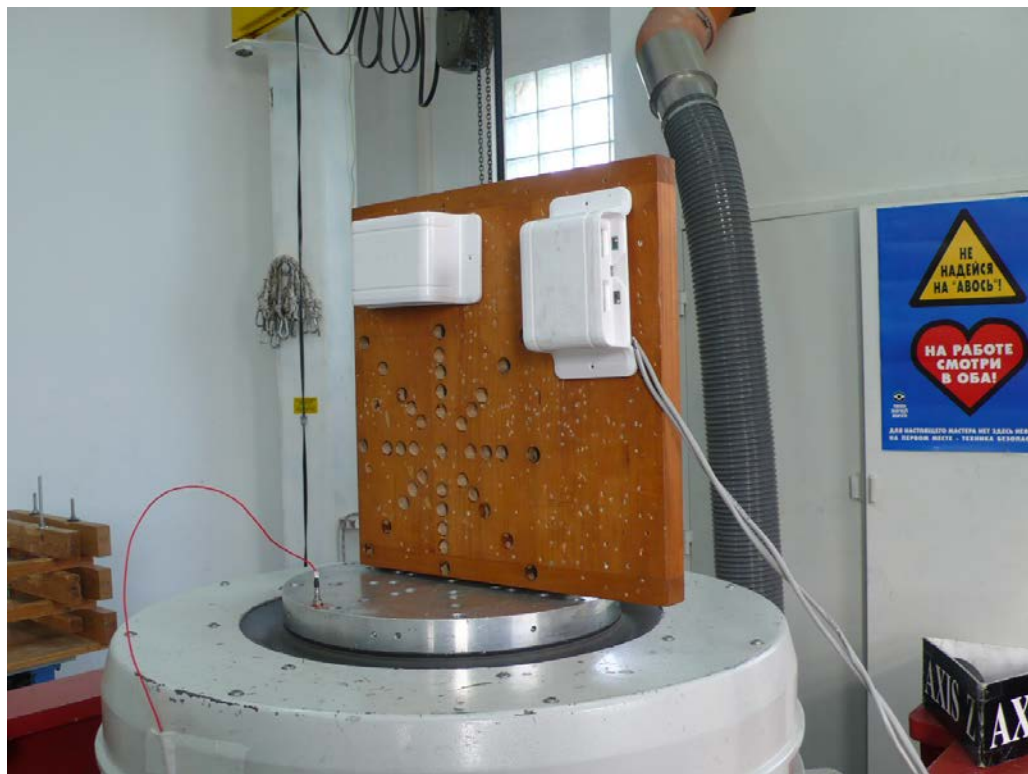
Photograph 6.5.1 Sinusoidal vibration test setup (vertical axis)





<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

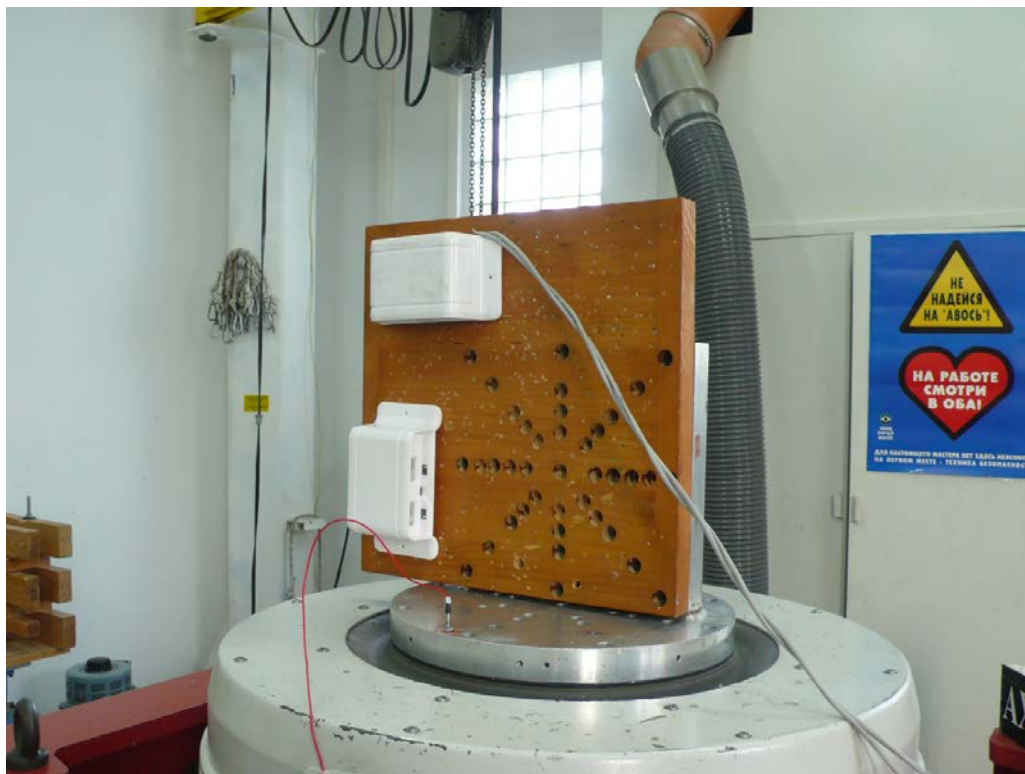
Photograph 6.5.2 Sinusoidal vibration test setup (transverse axis)





<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

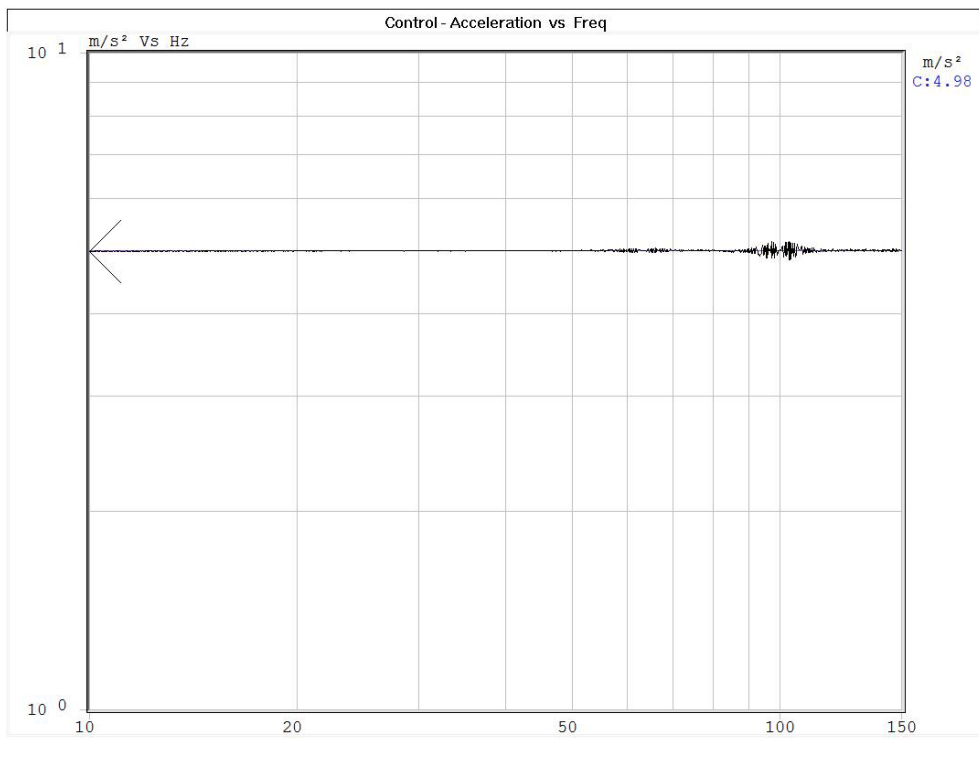
Photograph 6.5.3 Sinusoidal vibration test setup (longitudinal axis)





<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Plot 6.5.1 Sinusoidal vibration along vertical axis (operational)

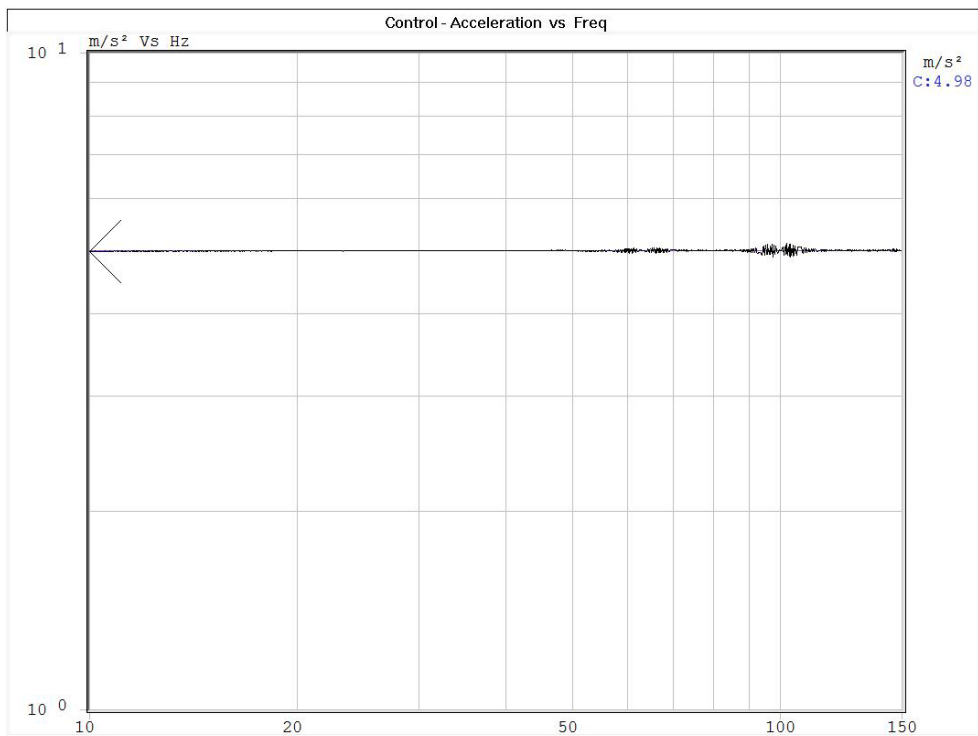






<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

**Plot 6.5.2 Sinusoidal vibration along transverse axis (operational)**

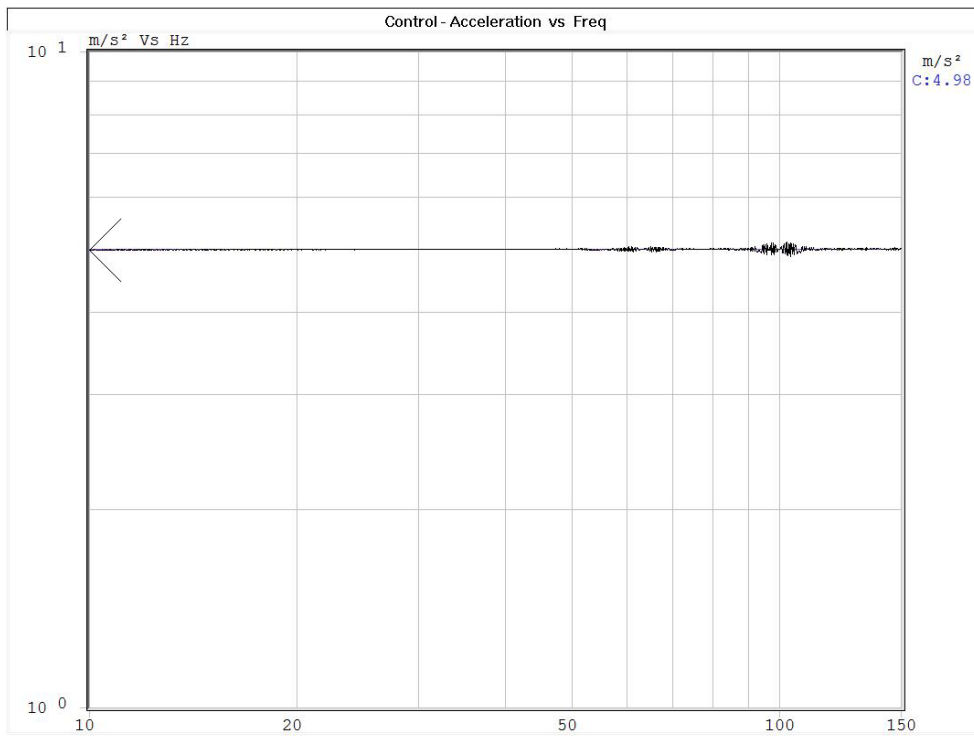




HERMON LABORATORIES

<b>Test specification:</b>	<b>Sinusoidal vibration (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 16 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-6 Test Fc: Vibration (sinusoidal)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Plot 6.5.3 Sinusoidal vibration along longitudinal axis (operational)





<b>Test specification:</b>		<b>Shock (Operational) test</b>	
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

## 6.6 Shock (Operational) test procedure and results

### 6.6.1 Test purpose

This test was performed to demonstrate the EUT immunity to mechanical shocks, which are likely to occur, in the service environment.

### 6.6.2 Test procedure

- 6.6.2.1** After BDT, the EUTs in operational mode were fastened to the shaker's armature, as presented in Figure 6.6.1 and Photograph 6.6.1.
- 6.6.2.2** The shocks were applied to the operational EUTs along the vertical axis, according to EN 50130-5 standard Class IVA, as presented in Table 6.6.2.
- 6.6.2.3** The Paragraphs 6.6.2.1 and 6.6.2.2 were repeated along the transverse and longitudinal axes, as presented in Figure 6.6.1, Photograph 6.6.2 and Photograph 6.6.3.
- 6.6.2.4** The control accelerometer signal was monitored and results are presented in Plots from 6.6.1 to 6.6.6.
- 6.6.2.5** A visual inspection followed by BDT was performed.

### 6.6.3 Test results

**Table 6.6.1 Test results**

Observation	Verdict
No structural or mechanical damages were registered during the visual inspection. All BDT passed. No un intentional signals or messages, no change in system status (armed). The EUTs passed the shock operational test.	<b>Pass</b>

#### Reference numbers of test equipment used:

HL 2190	HL 3460	HL 4020	HL 4888	HL 3953	HL 3960
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Full description is given in Appendix A.



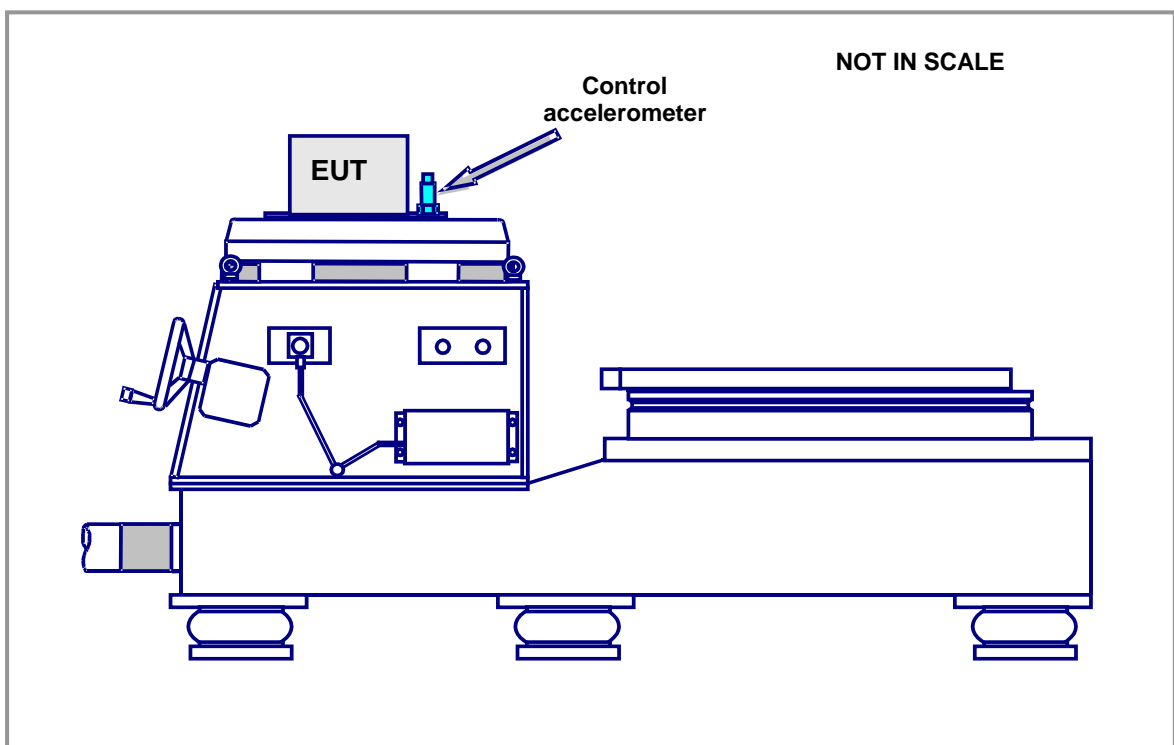
<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Table 6.6.2 Shock test specification (Operational)

Parameter	Unit	Severity
Amplitude	m/s <sup>2</sup>	920
Pulse type	N/A	half sine
Pulse width	ms	6
Direction of shocks	±Z, ±X, ±Y	6
Number of pulses per direction	N/A	3
Total number of pulses	N/A	18

\*Note: Per EN50130-5 formula  $A[m/s^2]=1000-200 \times M [kg]$ .

Figure 6.6.1 Shock test setup





<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

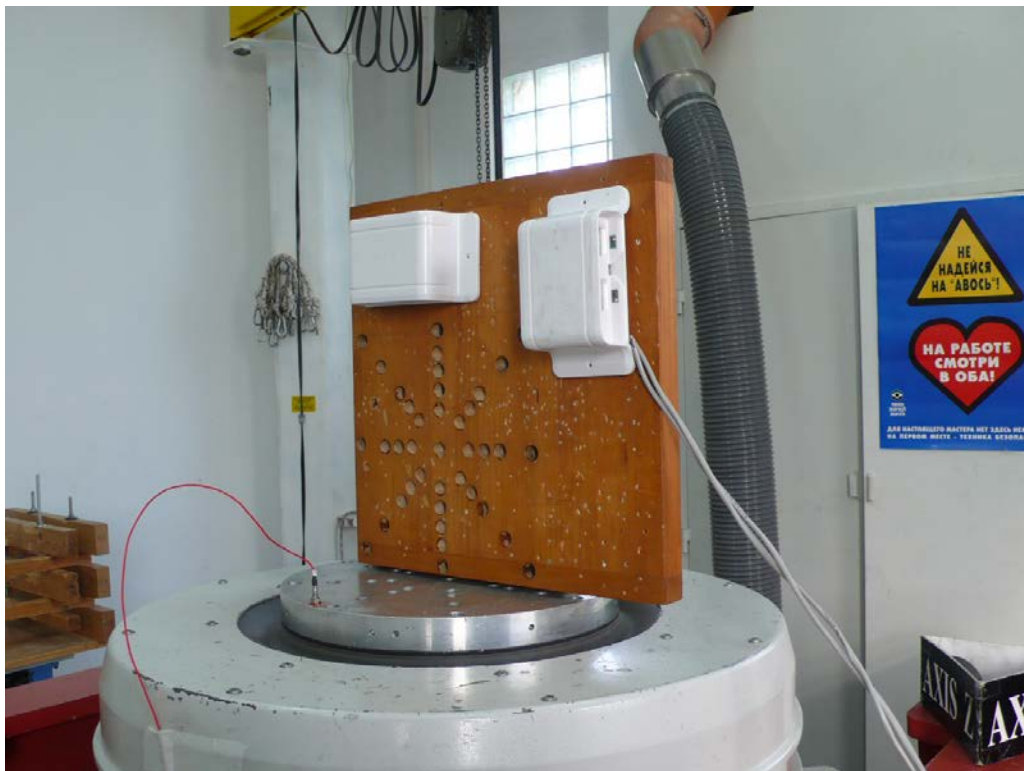
Photograph 6.6.1 Shock test setup (vertical axis)





<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Photograph 6.6.2 Shock test setup (transverse axis)





<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

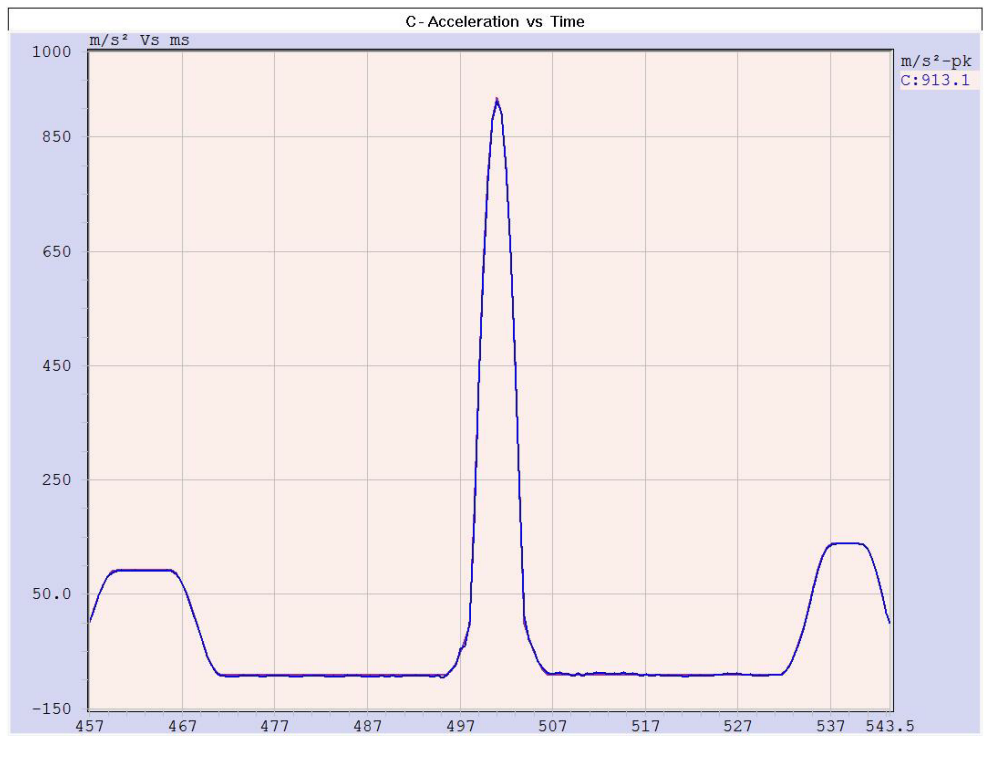
Photograph 6.6.3 Shock test setup (longitudinal axis)





<b>Test specification:</b>		<b>Shock (Operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		20-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa
<b>Remarks:</b>		<b>Verdict:</b>	<b>PASS</b>
		<b>Relative Humidity:</b> 49 %	

Plot 6.6.1 The positive shock pulse along vertical axis (operational)







<b>Test specification:</b>		<b>Shock (Operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		20-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa
<b>Remarks:</b>		<b>Relative Humidity:</b> 49 %	<b>Verdict:</b> <b>PASS</b>

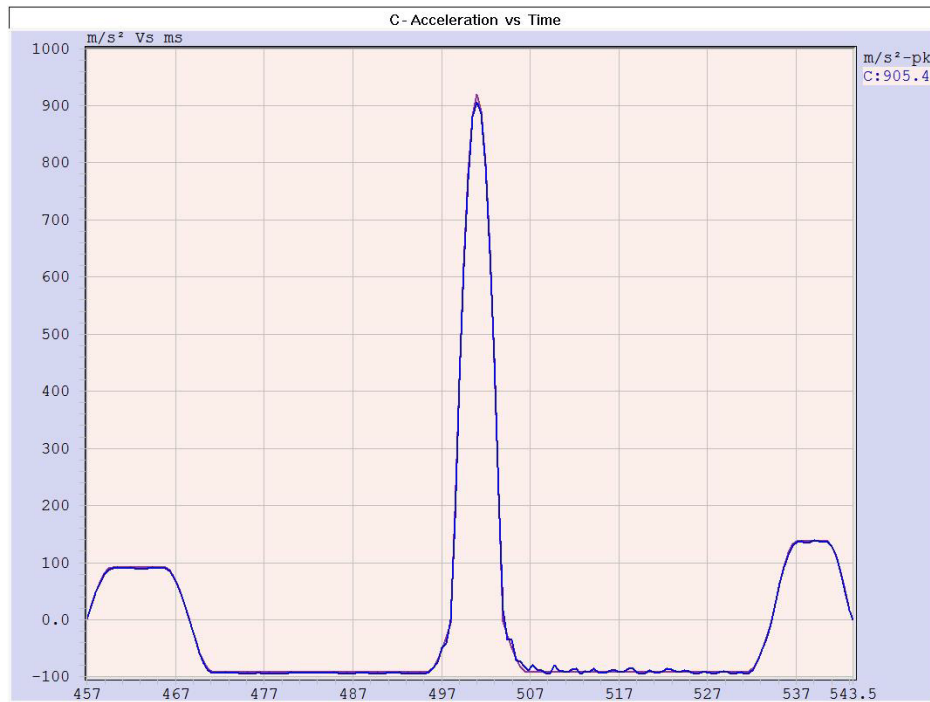
Plot 6.6.2 The negative shock pulse along vertical axis (operational)





<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Plot 6.6.3 The positive shock pulse along transverse axis (operational)





<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

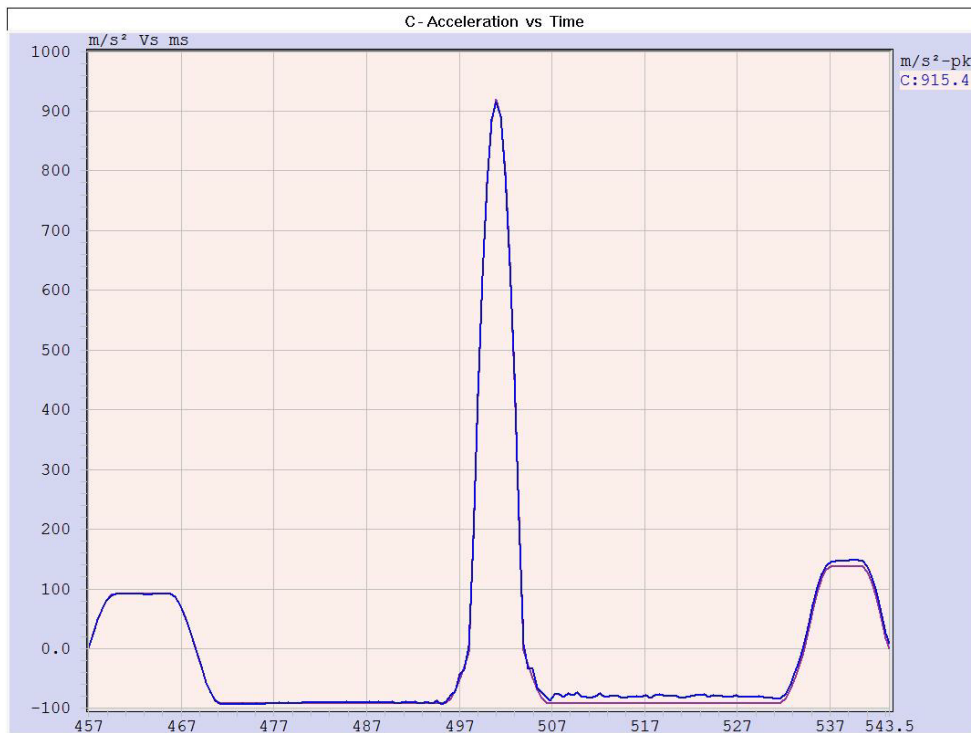
Plot 6.6.4 The negative shock pulse along transverse axis (operational)





<b>Test specification:</b>		<b>Shock (Operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		20-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa
<b>Remarks:</b>		<b>Verdict:</b>	<b>PASS</b>
		<b>Relative Humidity:</b> 49 %	

Plot 6.6.5 The positive shock pulse along longitudinal axis (Operational)





<b>Test specification:</b>	<b>Shock (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 13 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 49 %
<b>Remarks:</b>			

Plot 6.6.6 The negative shock pulse along longitudinal axis (Operational)





<b>Test specification:</b>		<b>Impact (Operational) test</b>	
<b>Test procedure:</b>		TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 14 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-75 Test Eh: Hammer tests	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		20-Dec-15	
<b>Atmospheric conditions during the test:</b>		<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1023 hPa
<b>Remarks:</b>		<b>Verdict:</b>	<b>PASS</b>
		<b>Relative Humidity:</b> 45 %	

## 6.7 Impact (Operational) test procedure and results

### 6.7.1 Test purpose

The impact test was performed to demonstrate EUT immunity to mechanical impacts upon the surface, which it may sustain in the normal service environment.

### 6.7.2 Test procedure

6.7.2.1 After BDT, The EUTs were installed in their operational position, as presented in Photograph 6.7.1.

6.7.2.2 The EUTs were subjected to impacts (according to Table 6.7.1) from a small hemispherical hammer-head on any exposed surfaces of the each EUT.

6.7.2.3 A visual inspection followed by BDT was performed after the impact test.

### 6.7.3 Test results

Table 6.7.1 Test results

Observation	Verdict
No structural or mechanical damages were registered during the visual inspection. No any unwanted signals or messages recorded. BDT passed. The EUT passed the impact test.	Pass

### Reference numbers of test equipment used:

HL 3013
---------

Full description is given in Appendix A.



<b>Test specification:</b>	<b>Impact (Operational) test</b>		
<b>Test procedure:</b>	TEST SPECIFICATION: EN 50130-5:2011 TABLE: Table 14 ENVIRONMENTAL CLASS: IVA TEST METHOD: IEC 60068-2-75 Test Eh: Hammer tests		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	20-Dec-15		
<b>Atmospheric conditions during the test:</b>	<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1023 hPa	<b>Relative Humidity:</b> 45 %
<b>Remarks:</b>			

Table 6.7.2 Impact test configuration

EUT name	Impact energy (J)	Number of points	Number of impacts per point	Number of exposed surfaces
NV780MX	1	5	3	5
NV780MR	1	5	3	5

Photograph 6.7.1 Impact test setup



**7 APPENDIX A Test equipment and ancillaries used for tests**

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
3990	Temperature & Humidity chamber, -73 to 177 degr.C, 20 to 95 % RH	Thermotron	F-52-CHMV-25-25-2	28795	04-Mar-15	04-Mar-16
3898	Temperature & Humidity chamber, Temp. from -73 to +190 °C, Humidity from 10 to 98% RH	Cincinnati Sub-Zero	ZPHS-16-2-2-H/AC	ZP0941951	02-Apr-15	02-Apr-16
4019	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99 )% RH	Mad Electronics	HTC-1	NA	18-Jun-15	18-Jun-16
4755	Digital Hygrometer / Thermometer, (0 to +50) deg., (20 to 99) %RH	WESTERN Humidor Corporation	Caliber 4	NA	02-Nov-15	02-Nov-16
2663	Flowmeter, 12-115 LPM	Blue-White Industries Ltd	F-451	0403	04-May-15	04-May-16
2143	Rain Test Spray- head Piping, UL50, MIL-STD-108E	Hermon Laboratories	WS1	2143	02-Jun-15	02-Jun-16
3633	Tape-measure, 8 m	The Stanley works Israel Ltd	33-198	NA	20-Dec-15	20-Dec-16
2190	Vibration Test System (Amplifier #SP6893-011/1, Remote Control Panel #SP6963-008/1, Vibrator #SP6893-005/1, Slip Table, Driver Bar, Pomp, Fan, Head Expander)	Ling Dynamic Systems	V875	SP6963-005/1-011/1	07-May-15	07-May-16
3460	Precision Barometer, 870 - 1050 hPa	LUFFT Mess- und Regeltechnik GmbH	DKD-K-26701	100469	07-May-14	07-May-16
4020	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99 )% RH	Mad Electronics	HTC-1	NA	07-Sep-15	07-Sep-16
4888	APEX SL VIBRATION CONTROLLER	Unholtz-Dickie	Apex SL	1244	31-Mar-15	31-Mar-16
3953	Isotron Accelerometer 100.2 mV/g	Dytran Instruments Inc.	3256A2	10373	12-Mar-15	12-Mar-16
3960	Isotron Accelerometer 10.2 mV/g	Dytran Instruments Inc.	3049E1	711	12-Mar-15	12-Mar-16
3013	ED&D Universal Spring Hammer	Educated Design & development, Inc.	F 22.50	I1145127	29-Dec-14	29-Dec-16





## 8 APPENDIX B Test laboratory description

The tests were performed at Hermon Laboratories Ltd., which is a fully independent, private Environmental, EMC, Radio, Product safety and telecommunication testing facility recognized through the entire world. The Laboratory is accredited by American Association for Laboratory Accreditation (A2LA, USA) for Environmental testing (Certificate No. 0839.04, Mechanical testing).

Address: P.O. Box 23, Binyamina 30500, Israel.  
Telephone: +972 4628 8001  
Fax: +972 4628 8277  
e-mail: mail@hermonlabs.com  
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

## 9 APPENDIX C Abbreviations and acronyms

°C	degree Celsius
cm	centimeter
dB	decibel
EUT	equipment under test
$g_n$	acceleration due to gravity
HL	Hermon Laboratories
hPa	hectopascal
Hz	Hertz
kg	kilogram
m	meter
min	minute
ms	millisecond
oct	octave
pH	acidity scale
RMS	root mean square
RH	relative humidity
s	second

## 10 APPENDIX D Tests specifications

- |     |                                    |   |
|-----|------------------------------------|---|
| 1.  | EN 50130-5:2011                    | Alarm systems -<br>Part 5: Environmental test methods   |
| 2.  | IEC 60068-2-1:07                   | Environmental Testing - Part 2: Tests – Tests A: Cold   |
| 3.  | IEC 60068-2-2:07                   | Environmental Testing - Part 2: Tests - Tests B:<br>Dry Heat  |
| 4.  | IEC 60068-2-6:07                   | Environmental testing - Part 2: Tests - Test Fc: Vibration<br>(Sinusoidal)  |
| 5.  | IEC 60068-2-27:08                  | Environmental Testing - Part 2:<br>Tests - Test Ea and Guidance: Shock  |
| 6.  | IEC 60068-2-30:05                  | Environmental Testing - Part 2-30: Tests - Test Db:<br>Damp Heat, Cyclic (12 h + 12 h cycle)  |
| 7.  | IEC 60068-2-75:97                  | Environmental testing - Part 2: Tests - Test Eh:<br>Hammer Tests  |
| 8.  | IEC 60529:89+A1:99                 | Degrees of Protection Provided by Enclosure (IP Code)   |
| 9.  | Impact_TP-2_2011                   | Impact Test Procedure according to EN 50130-5 and<br>IEC 60068-2-75 Test Ehb  |
| 10. | Temperature and humidity TP-9_2015 | Temperature And Humidity Test Procedure according to<br>ETSI EN 300 019-2-0,-1,-2,-3,-4,-5,-6,-7,-8, IEC 60721-4-1,-2,-3,-4,<br>MIL-STD-202G, MIL-STD- 810 B, C, D, E, F, G, RTCA DO-160D, E,<br>F, G, IEC 60068-2-1, -2, -14, -30, - 38, -56, -78, ASTM D 4332,<br>ASTM F1980 and GR-63-CORE standards |
| 11. | Vibration and shock TP-7_2014      | Vibration And Shock Test Procedure according to MIL-STD – 810 B,<br>C, D, E, F, G, MIL-STD-167 -1A, GR-63-CORE, IEC 60068-2-6, -27,<br>-29, -64, RTCA DO-160D, E, F, G, ASTM D999 and ISTA 2A<br>standards  |
| 12. | Water IP Code TP-7_2014            | Water Test Procedure according to IEC 60068-2-18, IEC 60529<br>standards  |



11 APPENDIX E Measurement uncertainties

Parameter	Uncertainty estimation at 95% confidence	
	Calculated	Limit
Air pressure	± 1.16 mBar	± 4.1 mBar
High (Low) temperature	± 1.8°C	± 2 (3)°C
Relative humidity	± 2.86 %	± 5.0 %
Sine acceleration	+14.8/-13.8 %	+41/-30 %
Shock acceleration	+7.2/-8.2 %	±20.0 %
Water rate	3.6 %	5 %
Wind velocity	5 %	10 %

**END OF TEST REPORT**