

# ENVIRONMENTAL TEST REPORT

Random vibration

ACCORDING TO: MIL-STD 810G

FOR:

**Baran Advanced  
Technologies (1986) Ltd**

EUT:

**Piezo Marine switch with  
integrated relay 20A/ 10A and  
LEDs**

**P/N: 190005XX series**

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## 1 Applicant information

**Client name:** Baran Advanced Technologies (1986) Ltd.  
**Address:** 18 Tzoran Blvd. Industrial Park, Kiryat Gat 8258121, Israel  
**Telephone:** 08-932-6000  
**Fax:** 08-6200021  
**E-mail:** eytans@barantec.com  
**Contact name:** Mr. Eytan Sapir

## 2 Equipment under test attributes

**Product name:** Piezo Marine switch with integrated relay 20A/ 10A and LEDs  
**Product type:** Marine  
**Part numbers:** 190005XX series (See details in Section 5.1)\*  
**Serial number:** KL 00001  
**PCBA version:** REV 1.0  
**Software release:** N/A  
**Product Version:** REV 1  
**Condition of equipment:** Production model  
**Receipt date:** 01-Apr-23  
**\*Note:** The tested part numbers were "19000503", "19000505" and "19000508". The remaining part numbers were added based on DoI presented in Appendix F

## 3 Manufacturer information

**Manufacturer name:** Baran Advanced Technologies (1986) Ltd.  
**Address:** 18 Tzoran Blvd. Industrial Park, Kiryat Gat 8258121, Israel  
**Telephone:** 08-932-6000  
**Fax:** 08-6200021  
**E-Mail:** eytans@barantec.com  
**Contact name:** Mr. Eytan Sapir

## 4 Test details

**Project ID:** 50202  
**Location:** Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 07-Apr-23  
**Test completed:** 07-Apr-23  
**Test specification:** MIL-STD 810G:08

## 5 EUT description

Note: The following data in this clause is provided by the customer and represents his sole responsibility.

### 5.1 General information

The Equipment Under Test (EUT) is a Piezo Marine switch with integrated relay 20A/ 10A and LEDs, P/N: as follows:

EUT Name	Series	Part number
Piezo Marine switch with integrated relay 20A/ 10A and LEDs	190005XX	19000500
		19000501
		19000502
		19000503
		19000504
		19000505
		19000506
		19000507
		19000508
		19000509
		19000510
		19000511
		19000512
		19000513
		19000514
		19000515
		19000516
		19000517
		19000518
		19000519
19000520		

### 5.2 EUT mechanical characteristics

The Equipment Under Test (EUT) measures (H) 209 mm by (W) 136 mm by (D) 18 mm.  
The Equipment Under Test (EUT) weighs 0.7 kg.

### 5.3 Acceptance criteria

The EUT shall not sustain any physical damage or deterioration when subjected to Random vibration conditions expected in its application environment.

Before, during and after the test the EUT shall function properly.

### 5.4 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, during and after Random vibration test, the EUT was visually inspected by the HL engineers and functionally checked by the customer. The functional check result represents the customer sole responsibility.

## 6 Tests summary

Test	Status
MIL-STD 810G:08; Random vibration (Operational) test	Pass

	Name and Title	Date	Signatures
<b>Tested by:</b>	Mr. Sergey Prud, Environmental Test Engineer	23-May-23	
<b>Reviewed by:</b>	Ms. Anna Gorovoy, Environmental Certification Engineer	23-May-23	
<b>Approved by:</b>	Mr. Mihaeli Feldmann, Environmental Group Manager	23-May-23	

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<b>Test specification:</b>		<b>Random vibration (Operational) test</b>	
<b>Test procedure:</b>		STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		07-Apr-23	
<b>Laboratory atmospheric conditions during the test:</b>		<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1010 hPa
<b>Remarks:</b>		<b>Verdict:</b> PASS <b>Relative Humidity:</b> 56 %	

## 6.1 Random vibration (Operational) test procedure and results

### 6.1.1 Test purpose

The test was performed to determine the EUT ability to withstand specified severities of the random vibration while operating.

### 6.1.2 Test procedure

6.1.2.1 The EUT in operational mode, control and monitor accelerometers were installed on the vibration test system, as presented in Photograph 6.1.1.

6.1.2.2 The required vibration level was applied to the operational EUT along the vertical axis, according to the requirements presented in Table 6.1.2.

6.1.2.3 A functional check was performed, as presented in Photograph 6.1.2.

6.1.2.4 The Paragraphs 6.1.2.1 and 6.1.2.2 were repeated along the transverse axis, as presented in Photograph 6.1.3.

6.1.2.5 A functional check was performed, as presented in Photograph 6.1.4.

6.1.2.6 The Paragraphs 6.1.2.1 and 6.1.2.2 were repeated along the transverse axis, as presented in Photograph 6.1.5.

6.1.2.7 A functional check was performed, as presented in Photograph 6.1.6.

6.1.2.8 The control accelerometer signal results are presented in Plots from 6.1.1 to 6.1.3.

6.1.2.9 A visual inspection was performed after the random vibration test.

### 6.1.3 Test results

**Table 6.1.1 Test results**

Observation	Verdict
No structural or mechanical damages were registered during the visual inspection. According to customer statement, no deterioration in functional performance was noticed.	Pass

### Reference numbers of test equipment used:

HL 6042	HL 6043	HL 2190	HL 5741	HL 2136	HL 3460	HL 4020
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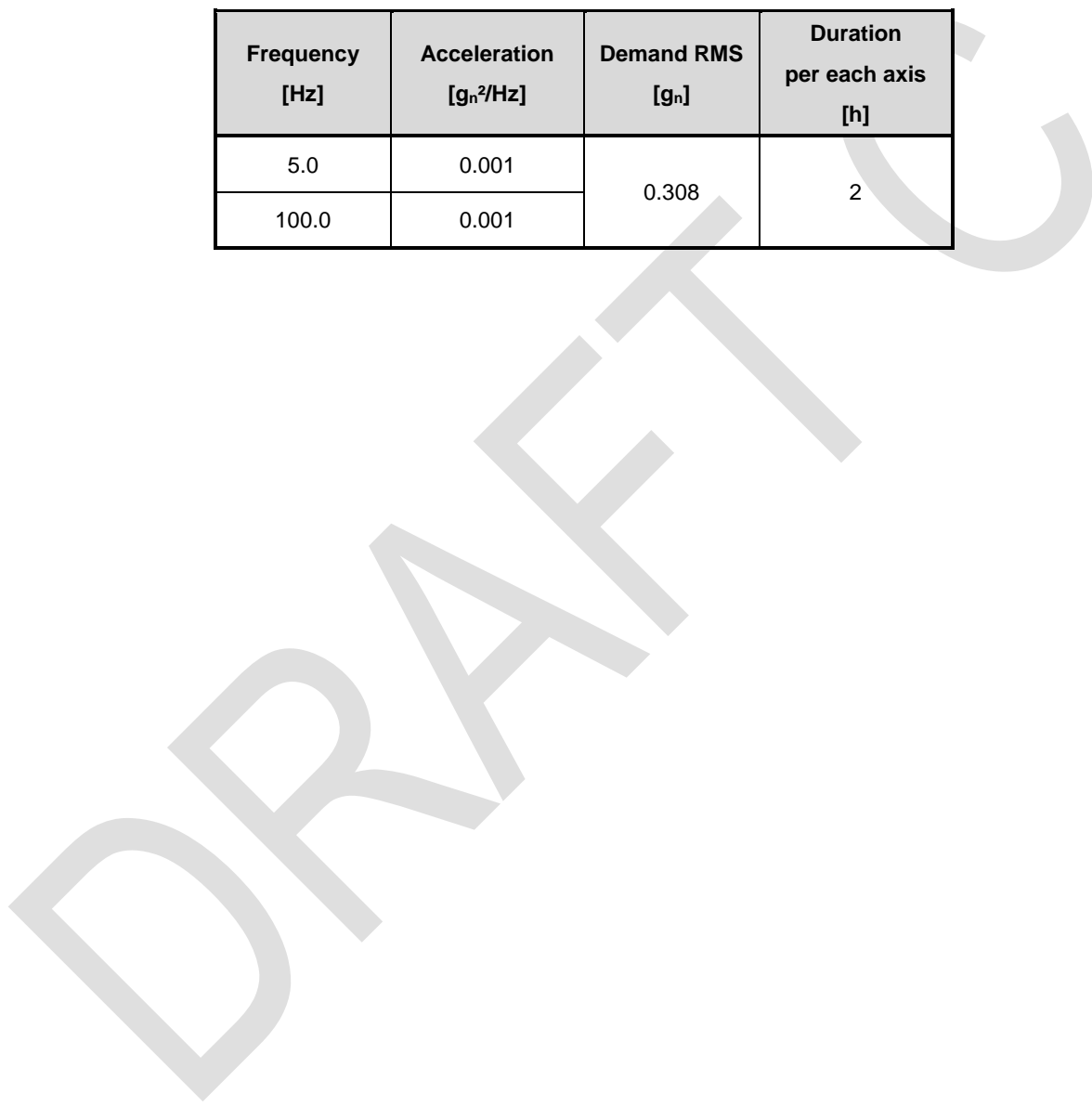
Full description is given in Appendix A.



<b>Test specification:</b>		<b>Random vibration (Operational) test</b>	
<b>Test procedure:</b>		STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure	
<b>Test mode:</b>		Compliance	
<b>Test Date:</b>		07-Apr-23	
<b>Laboratory atmospheric conditions during the test:</b>		<b>Verdict:</b> PASS	
		Temperature: 24 °C	
		Air Pressure: 1010 hPa	
		Relative Humidity: 56 %	
<b>Remarks:</b>			

Table 6.1.2 Random vibration test profile

Frequency [Hz]	Acceleration [g <sub>r</sub> <sup>2</sup> /Hz]	Demand RMS [g <sub>r</sub> ]	Duration per each axis [h]
5.0	0.001	0.308	2
100.0	0.001		





<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 56 %
<b>Laboratory atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C		
<b>Remarks:</b>			

Photograph 6.1.1 Random vibration test setup (vertical axis)



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<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	Temperature: 24 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %
<b>Remarks:</b>			

Photograph 6.1.2 The EUT functional check after random vibration (vertical axis)





<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 56 %
<b>Remarks:</b>			

Photograph 6.1.3 Random vibration test setup (transverse axis)





<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 56 %
<b>Remarks:</b>			

Photograph 6.1.4 The EUT functional check after random vibration (transverse axis)





<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 56 %
<b>Remarks:</b>			

Photograph 6.1.5 Random vibration test setup (longitudinal axis)







<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	Temperature: 24 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %
<b>Remarks:</b>			

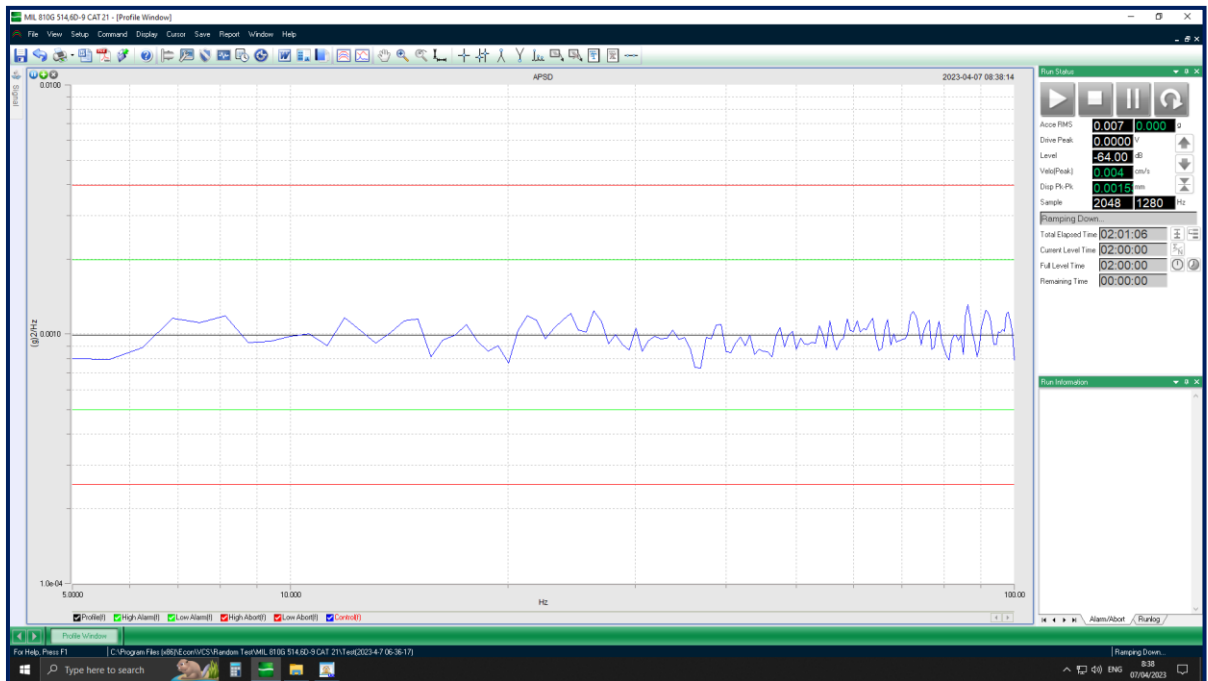
Photograph 6.1.6 The EUT functional check after random vibration (longitudinal axis)





<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 56 %
<b>Remarks:</b>			

Plot 6.1.1 Random vibration along vertical axis

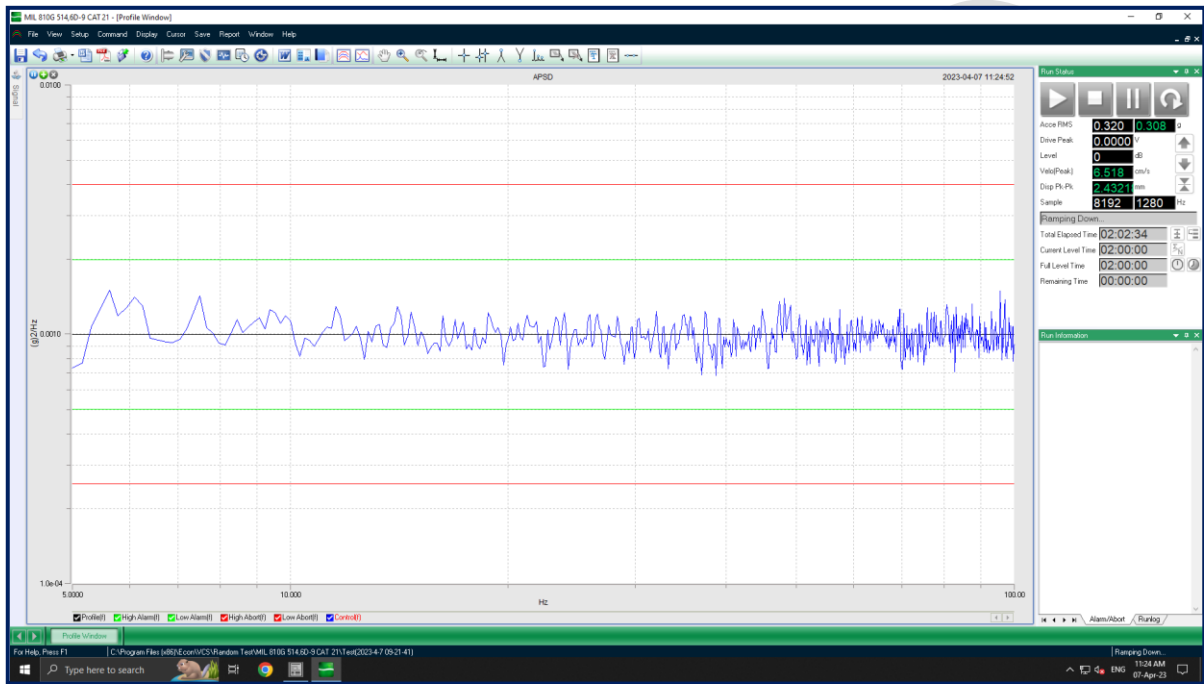


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<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23		
<b>Laboratory atmospheric conditions during the test:</b>	Temperature: 24 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %
<b>Remarks:</b>			

Plot 6.1.2 Random vibration along transverse axis



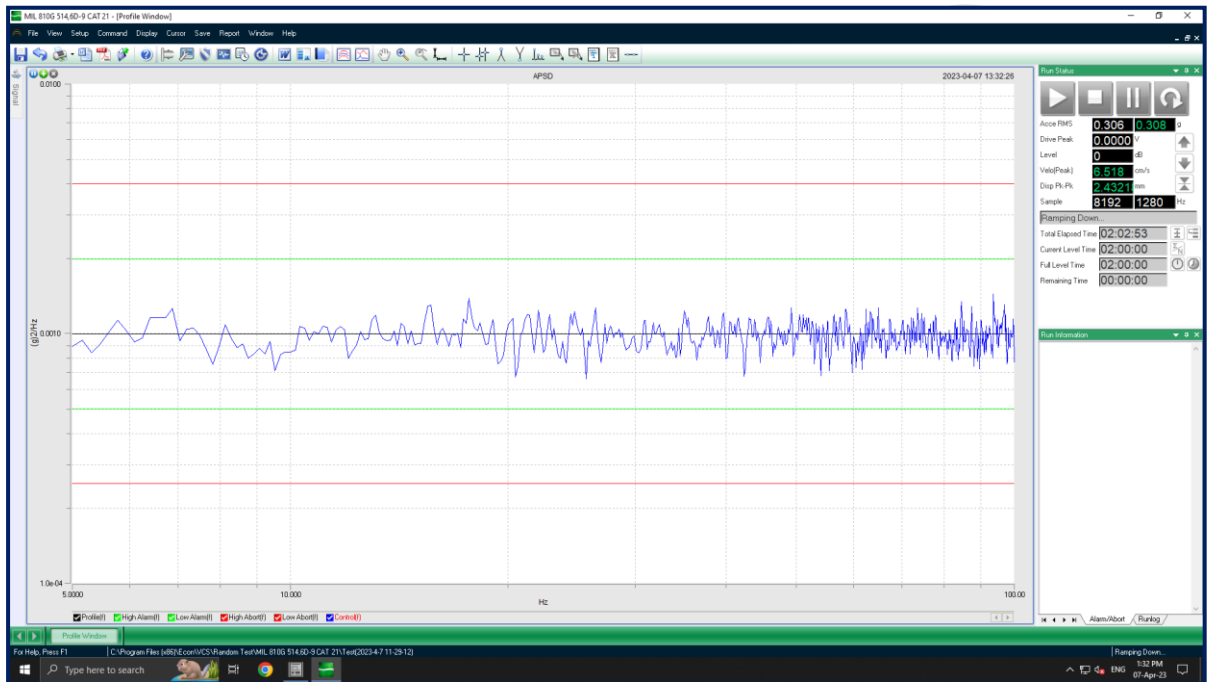
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HERMON LABORATORIES

<b>Test specification:</b>	<b>Random vibration (Operational) test</b>		
<b>Test procedure:</b>	STANDARD: MIL-STD-810G TEST METHOD: 514.6 Vibration PROCEDURE: I, General vibration CATEGORY: 21, Watercraft - marine vehicles FIGURE: 514.6D-9. Category 21 - Shipboard random vibration exposure		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Test Date:</b>	07-Apr-23	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 56 %
<b>Laboratory atmospheric conditions during the test:</b>	<b>Temperature:</b> 24 °C		
<b>Remarks:</b>			

Plot 6.1.3 Random vibration along longitudinal axis



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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
2136	Isotron Accelerometer 100 mV/g	Endevco	256-100	12698	08-Dec-22	08-Dec-23
2190	Vibration Test System (Amplifier #SP6893-011/1, Remote Control Panel #SP6963-008/1, Vibrator #SP6893-005/1, Slip Table, Driver Bar, Pump, Fan, Head Expander)	Ling Dynamic Systems	V875	SP6963-005/1-011/1	08-May-22	08-May-23
3460	Precision Barometer, 870 - 1050 hPa	LUFFT Mess- und Regeltechnik GmbH	DKD-K-26701	100469	17-Jul-22	17-Jul-24
4020	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99)% RH	Mad Electronics	HTC-1	NA	28-Aug-22	28-Aug-23
5741	Vibration Controller	ECON	VT-9008	294687769	16-Nov-22	16-Nov-23
6042	Shaker	Econ Technologies Co.,Ltd	EDM-5500-VSA-H563A-50ST-1000M	2050-0003	07-Jun-22	07-Jun-23
6043	Vibration Controller	Econ Technologies Co.,Ltd	VT-9008-4	345019396	17-Nov-22	17-Nov-23



## 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. Mihaeli Feldmann, Environmental Group Manager.

## 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. MIL-STD 810G:08; Environmental Engineering  
Considerations and Laboratory Tests
2. Vibration and shock TP-9\_2019 Vibration And Shock Test Procedure according to MIL-STD – 810 B, C, D, E, F, G, MIL-STD-167 -1A, GR-63-CORE, IEC 60068-2-6, -27, -29, -55, -64, -75, RTCA DO-160D, E, F, G, ASTM D999, ASTM D4169, ASTM D4728, DEF STAN 00-35, IEC 61373, IEC 60601-1-11, ISO 11608-1, ISO 11608-4, IEC 61850-3, IEEE Std 1613 and ISTA 2A STANDARDS

## 11 APPENDIX E Measurement uncertainties

Parameter	Uncertainty estimation at 95% confidence	
	Calculated	Limit
Air pressure	± 1.16 mBar	± 4.1 mBar
Random acceleration	+30.2/-24.6 %	+99.5/-50 %

## 12 APPENDIX F Customer Declaration of Identity

## Declaration of Identity

We, the undersigned,

**Company** Baran Advanced Technologies (1986) Ltd.  
**Address:** 18 Tzoran Blvd. Industrial Park, Kiryat Gat 8258121, Israel  
**Telephone:** 08-932-6000  
**Fax:** 08-6200021  
**E-mail:** eytans@barantec.com  
**Contact name:** Mr. Eytan Sapir

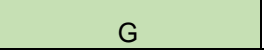
declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
Marine Switch	190005XX	Piezo Marine switch with integrated 20A/ 10A relay and LEDs

Cat. Number	Housing Material	LED 2 - *OFF* State	LED 1 - *ON* State	Relay Rate
19000501	Aluminum 6061 T651	R/G/B Manually controlled by ground to wires		10A
19000518	Aluminum 6061 T651	NONE	R	
19000519	STS316		G	
19000520	STS316		B	
19000504	STS316	R	G	
19000514	STS316		B	
19000515	STS316	G	R	
19000516	STS316		B	
19000506	STS316	B	R	
19000517	STS316		G	
19000500	Aluminum 6061 T651	R/G/B Manually controlled by ground to wires		20A
19000502	STS316	R/G/B Manually controlled by ground to wires		
19000511	Aluminum 6061 T651	NONE	R	
19000512	STS316		G	
19000513	STS316		B	
19000503	STS316	R	G	
19000507	STS316		B	
19000508	STS316	G	R	
19000509	STS316		B	
19000505	STS316	B	R	

19000510

STS316



G

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

<b>Brand/Item</b>	<b>Type/Model</b>	<b>Short Product description</b>
Marine Switch	190000503, 190000508 , 190000505	Piezo Marine switch with integrated 20A/ 10A relay and LEDs

The reason for name change is: Different LEDs color on the PCBA- Marketing Strategy

(date)	1-May-2023
(signature)	<i>Eytan Sapir</i>
printed name)	EYTAN SAPIR
(position)	VP R&D

(company stamp)