HERMON LABORATORIES

MECHANICAL TESTING
0839.04

Hermon Laboratories Ltd.
66 HaTachana str., P.O. Box 23, Binyamina
3055001, Israel
Tel. +972 4628 8001
Fax. +972 4628 8277
E-mail: mail@hermonlabs.com

ENVIRONMENTAL TEST REPORT

Random vibration and Shock

ACCORDING TO: IEC 60721-4-7:2001+A1:03, Class 7M1

FOR:

Compulab Ltd.

EUT:

Fitlet3

P/N: FITLET3-CX6425-D8-N256-W210M

S/N: 1240118-00801

Table of contents

1 Applicant information

Client name:	CompuLab Ltd.
Address:	17 HaYetsira Street, Moradot HaCarmel Industrial Park, Yokneam Elite 20692, Israel
Telephone:	04-8290113
Fax:	04-8290180
E-mail:	erkes@compulab.co.il
Contact name:	Mr. Moshe Erkes

2 Equipment under test attributes

Product name:	Fitlet3
Product type:	Industrial
Part number:	FITLET3-CX6425-D8-N256-W210M
Serial number:	1240118-00801
Hardware version:	Rev 1.1
Software release:	Rev 1.0
Condition of equipment:	Sample
Receipt date	03-Mar-24

3 Manufacturer information

Manufacturer name:	CompuLab Ltd.
Address:	17 HaYetsira Street, Moradot HaCarmel Industrial Park, Yokneam Elite 20692, Israel
Telephone:	04-8290113
Fax:	04-8290180
E-Mail:	erkes@compulab.co.il
Contact name:	Mr. Moshe Erkes

4 Test details

Project ID:	53056
Location:	Hermon Laboratories Ltd. 66 HaTachana str., P.O. Box 23, Binyamina 3055001, Israel
Test started:	03-Mar-24
Test completed:	03-Mar-24
Test specification:	IEC 60721-4-7:2001+A1:03, Class 7M1

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 Fitlet3 unit, P/N: FITLET3-CX6425-D8-N256-W210M, S/N: 1240118-00801.

The Fitlet3 is low power Class III (EN/IEC 62368-1 Audio/video, information and communication technology) equipment that is to be powered from external DC Low Power (LPS) unregulated power supply. The external power supply ratings and unregulated voltage boundaries should comply with ones defined in specifications of the specific model. Nominal current rating (A) should be increased if external peripheral devices are to be powered by Fitlet3. Compulab delivers fitlet3 with a general purpose 12V 3A AC-DC power adapter that isn't an integral part of Fitlet3 and may be ordered separately as an accessory.

5.2 EUT mechanical characteristics

The Equipment Under Test (EUT) measures (H) 34.8 mm by (W) 132.8 mm by (D) 100 mm.
The Equipment Under Test (EUT) weighs 0.42 kg.

5.3 Acceptance criteria

The EUT shall not sustain any physical damage or deterioration when subjected to Random vibration and Shock 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 and Shock tests, 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
IEC 60721-4-7:2001+A1:03, Class 7M1	
Random vibration test	**Pass**
IEC 60721-4-7:2001+A1:03, Class 7M1	
Shock test	**Pass**

	Name and Title	Date	Signatures
Tested by:	Mr. Sergey Prud, Environmental Test Engineer	18-Mar-24	
Compiled by:	Ms. Tal Alon, Environmental Technical Writer	18-Mar-24	
Reviewed and approved by:	Mr. Mihaeli Feldmann, Environmental Group Manager	18-Mar-24	

Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

6.1 Random vibration 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 in operational mode.

6.1.2 Test procedure

6.1.2.1 The EUT in operational mode and the control accelerometer 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 specifications in Table 6.1.2.

6.1.2.3 The Paragraphs 6.1.2.1 and 6.1.2.2 were repeated along the transverse and longitudinal axes, as presented in Photograph 6.1.2 and 6.1.3.

6.1.2.4 The control accelerometer signal is presented in Plot 6.1.1 to 6.1.3.

6.1.2.5 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 2190	HL 5741	HL 3460	HL 4019	HL 3951	HL 2139

Full description is given in Appendix A.

Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Table 6.1.2 Random test profile

Frequency [Hz]	**Acceleration [(m/s²)² Hz]**	**Demand RMS [m/s²]**	**Duration (per each axis) [min]**
10	1	32.54	30
100	1		
200	0.5		
2000	0.5		

Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

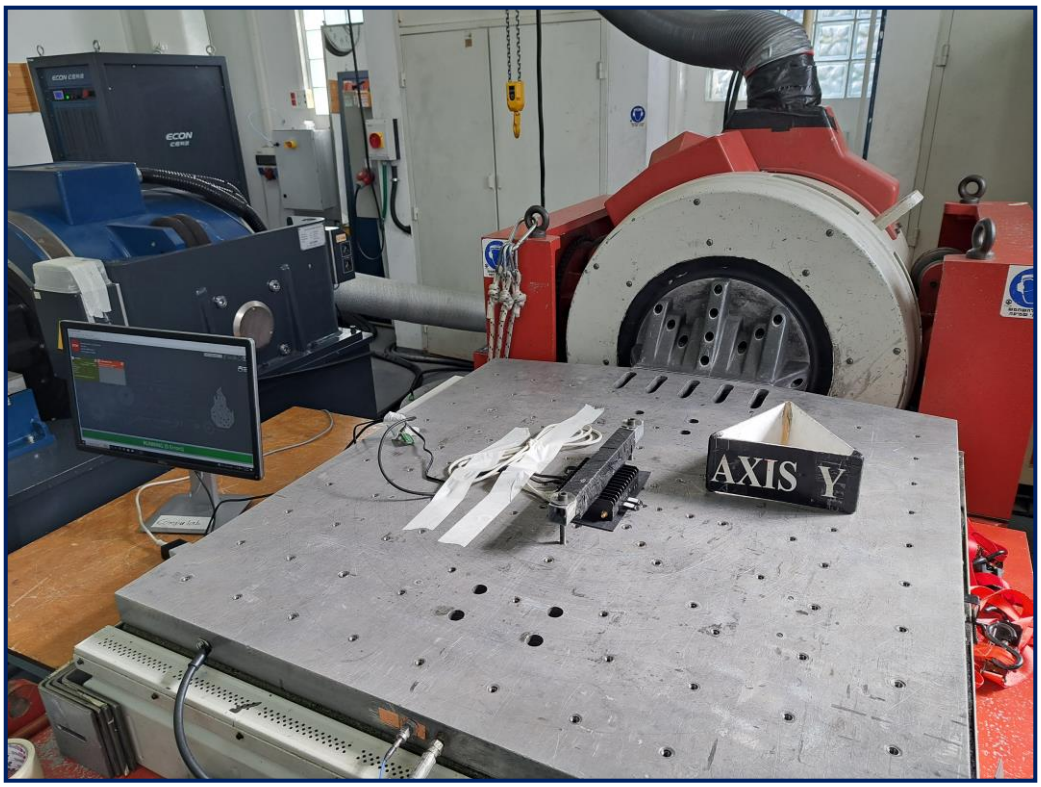
Photograph 6.1.1 Random vibration test setup (vertical axis)

Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Photograph 6.1.2 Random vibration test setup (transverse axis)

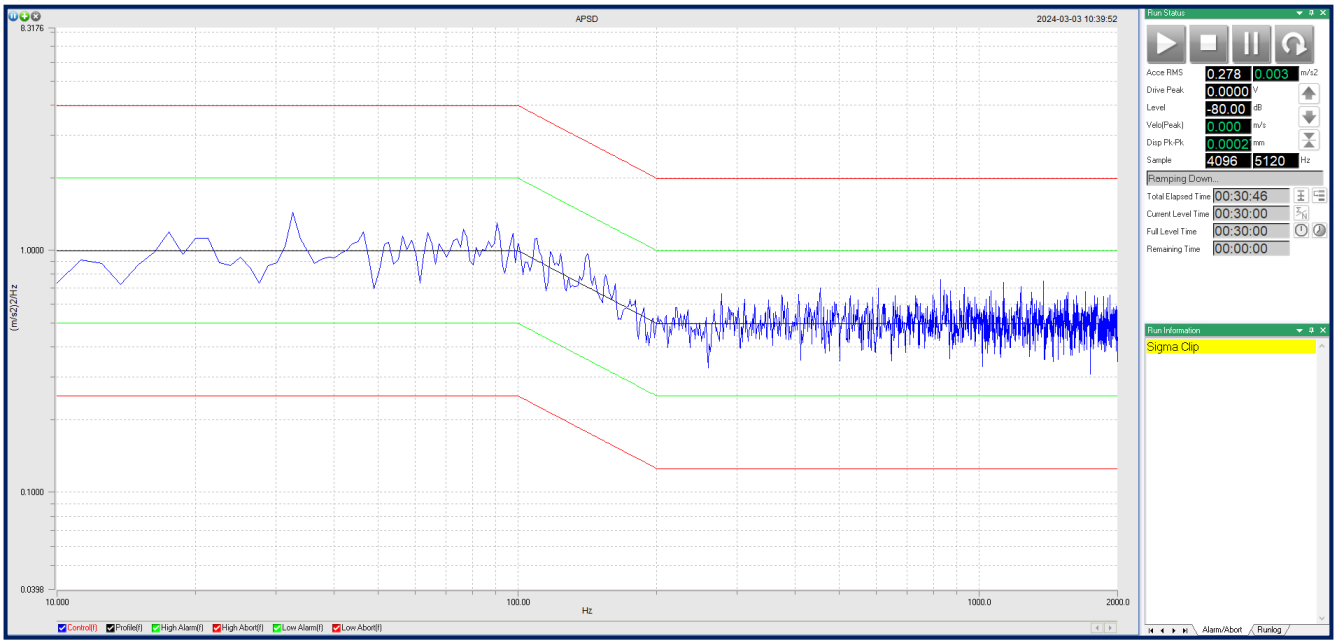
Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Photograph 6.1.3 Random vibration test setup (longitudinal axis)



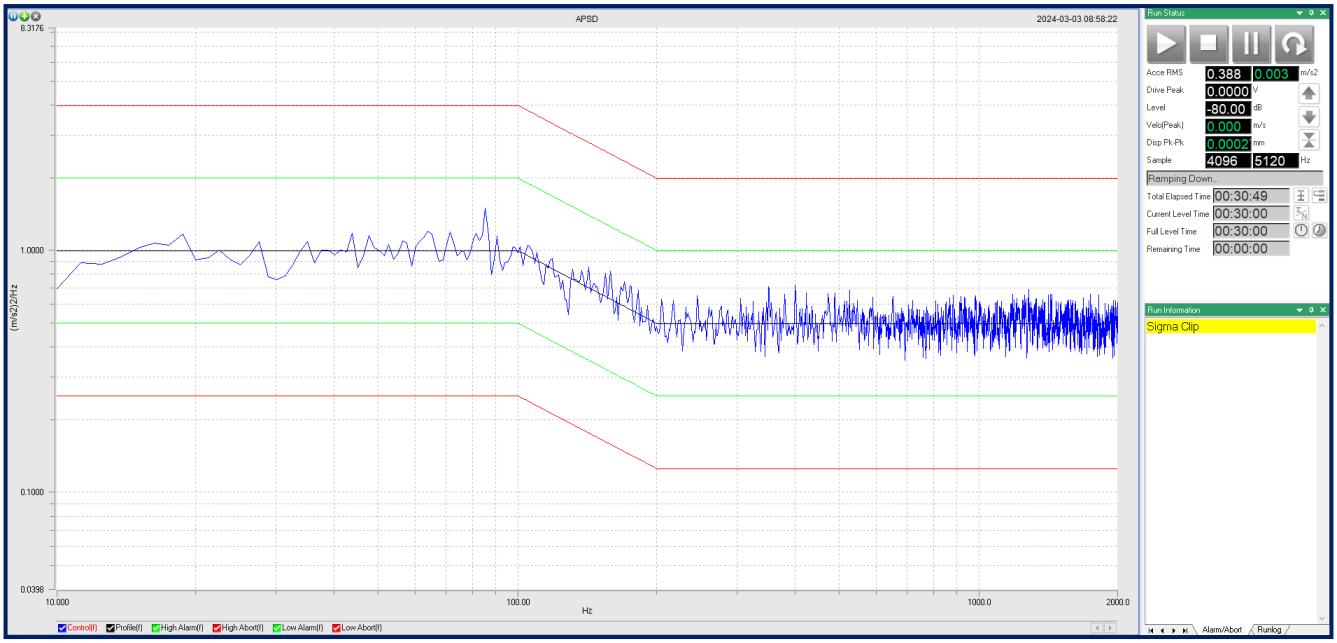
Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.1.1 Random vibration along vertical axis



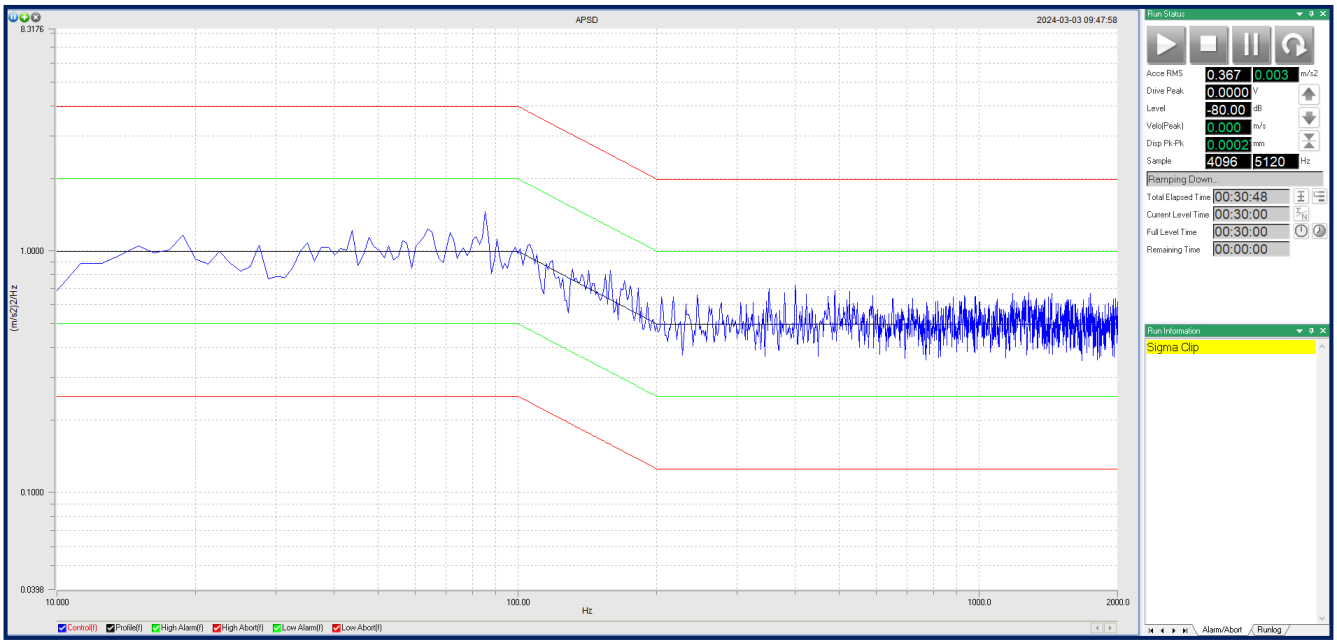
Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.1.2 Random vibration along transverse axis



Test specification:	**Random vibration test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-64 Test Fh: Vibration, broad-band random (digital control) and guidance		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.1.3 Random vibration along longitudinal axis



Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

6.2 Shock test procedure and results

6.2.1 Test purpose

This test was performed to determine the EUT ability to withstand the dynamic shock stresses expected during operation.

6.2.2 Test procedure

6.2.2.1 The EUT in operational mode and the control accelerometer were installed on the vibration test system.

Note: the test setup is presented in Section 6.1.

6.2.2.2 The shocks were applied to the operational EUT along the vertical axis, according to the specifications in Table 6.2.2.

6.2.2.3 The Paragraphs 6.2.2.1 and 6.2.2.2 were repeated for transverse and longitudinal axes.

6.2.2.4 The control accelerometer signal is presented in Plots 6.2.1 to 6.2.6.

6.2.2.5 A visual inspection was performed after the shock test.

6.2.3 Test results

Table 6.2.1 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 2190	HL 5741	HL 3460	HL 4019	HL 3951	HL 2139

Full description is given in Appendix A.

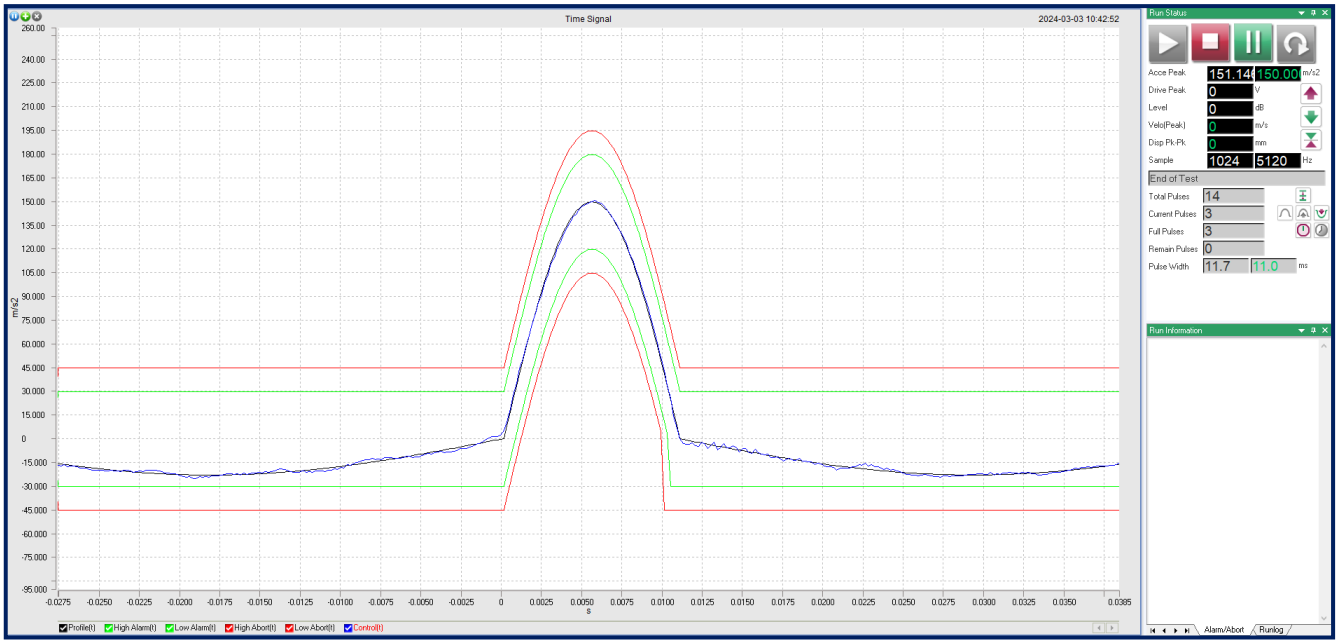
Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Table 6.2.2 Shock test specification

Parameter	Unit	Severity
Pulse type	N/A	Half sine
Amplitude	m/s^2	150
Pulse width	ms	11
Shocks directions	±Z, ±X, ±Y	6
Number of pulses per direction	N/A	3
Total number of pulses	N/A	18

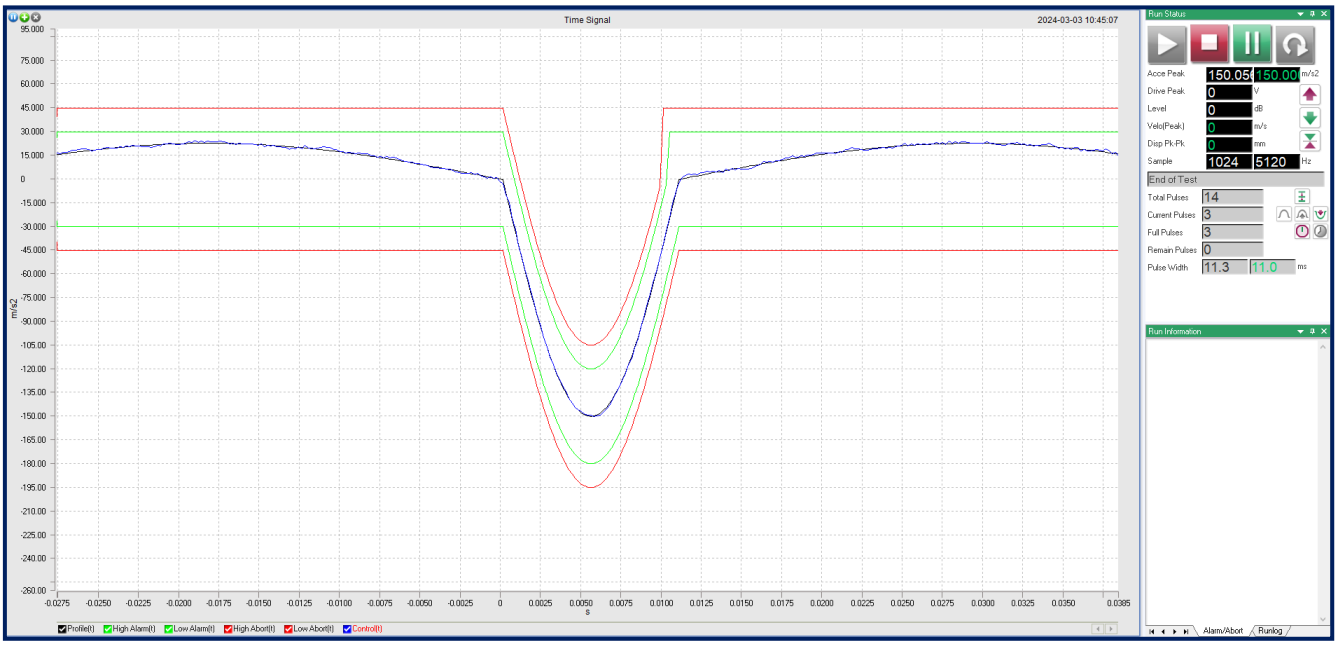
Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.2.1 The positive shock pulse along vertical axis



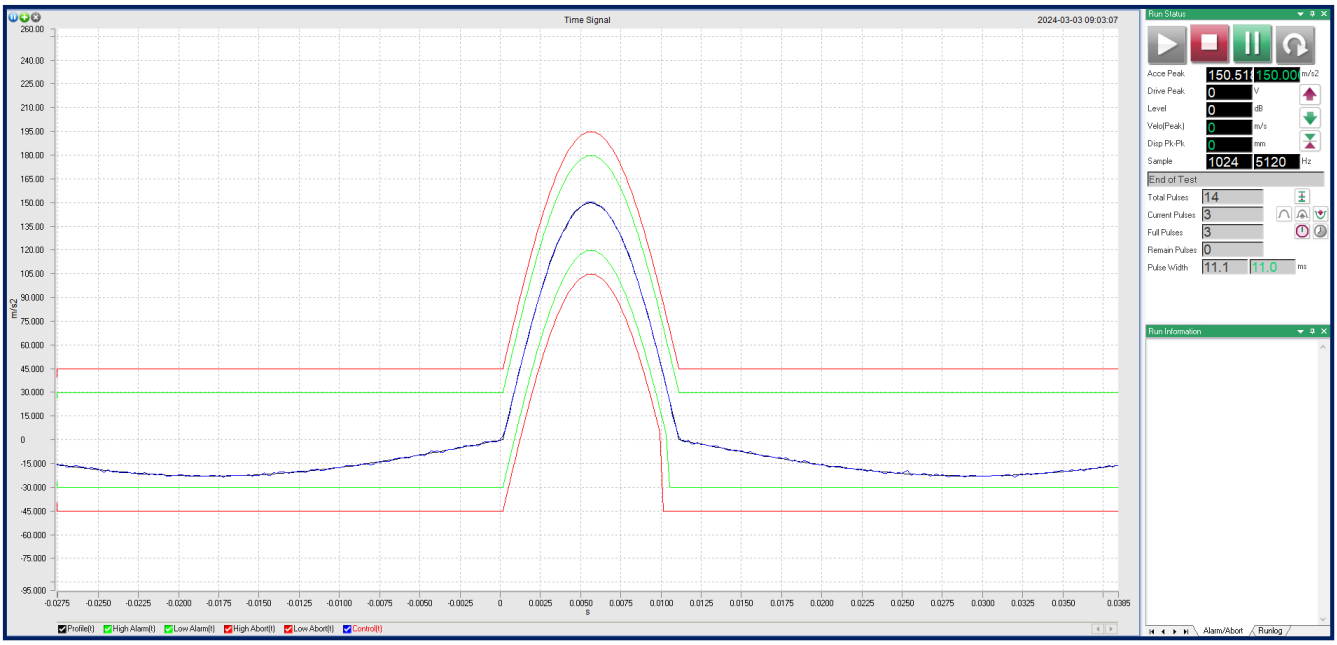
Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.2.2 The negative shock pulse along vertical axis



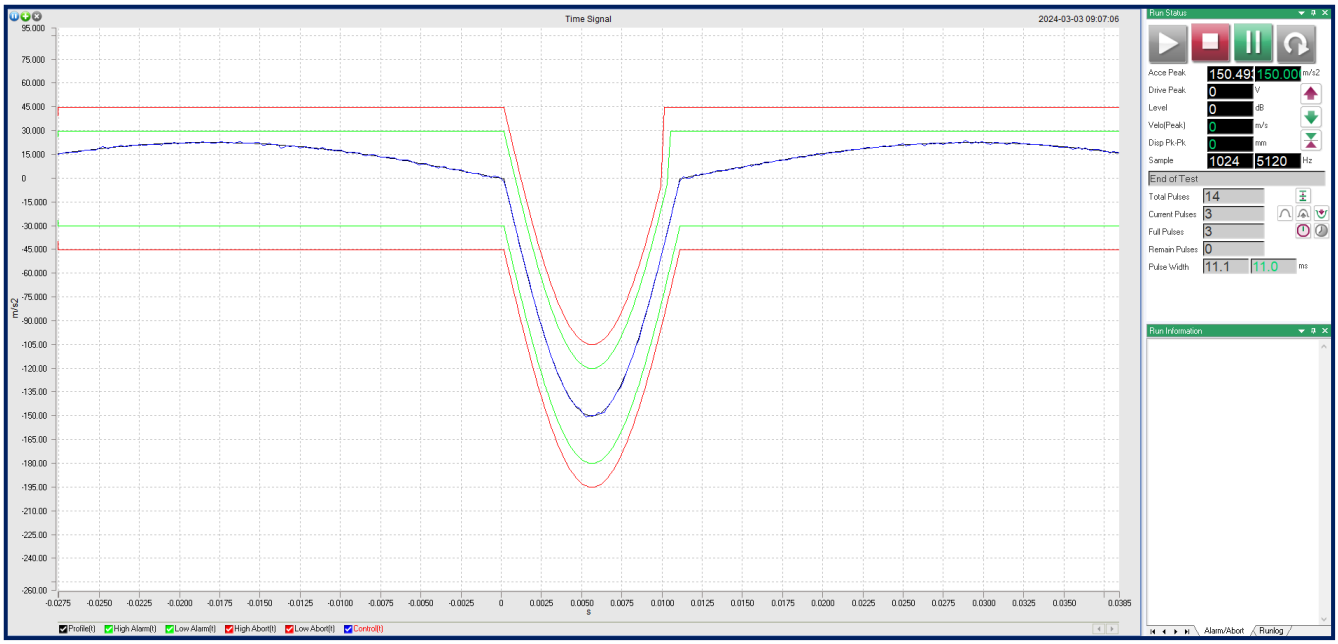
Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.2.3 The positive shock pulse along transverse axis



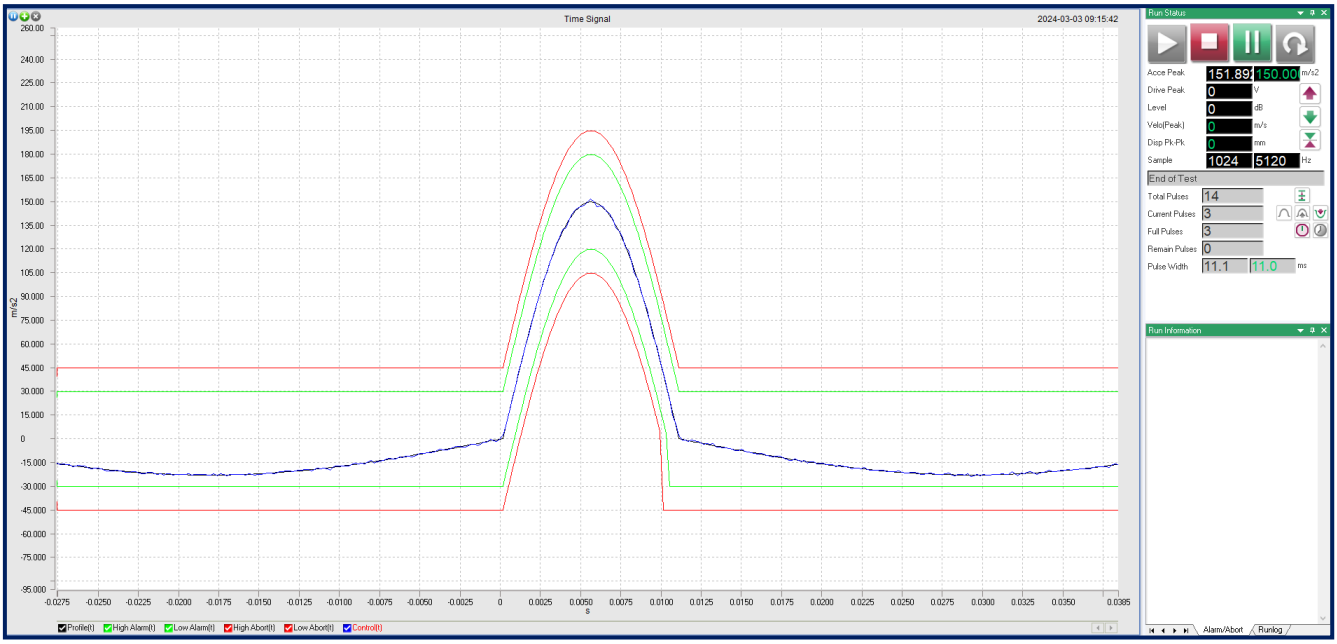
Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.2.4 The negative shock pulse along transverse axis



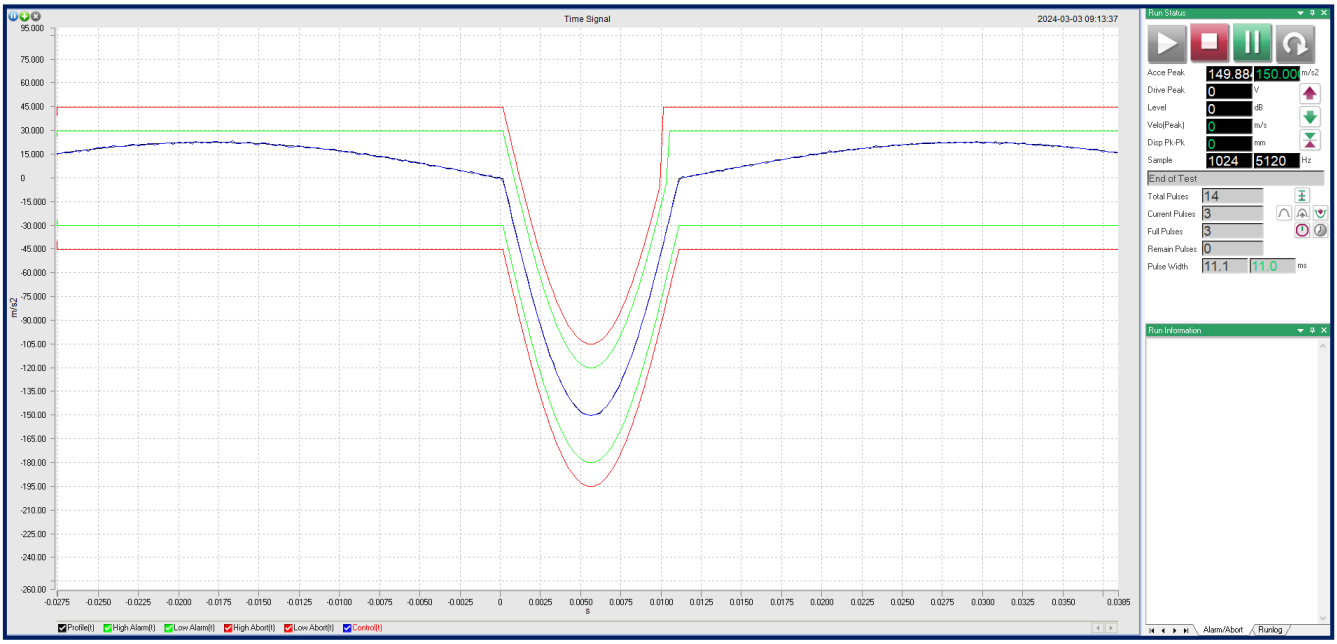
Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.2.5 The positive shock pulse along longitudinal axis



Test specification:	**Shock test**		
Test procedure:	STANDARD: IEC TR 60721-4-7 TEST SPECIFICATION: Table 5: Recommended tests for IEC 60721-3-7 - Class 7M1 TEST METHOD: IEC 60068-2-27 Test Ea and guidance: Shock		
Test mode:	Compliance	**Verdict:**	PASS
Test Date:	03-Mar-24		
Laboratory atmospheric conditions during the test:	**Temperature:** 24 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 56 %
Remarks:			

Plot 6.2.6 The negative shock pulse along longitudinal axis



7 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
2139	Isotron Accelerometer 100 mV/g	Endevco	256-100	12749	16-Nov-23	16-Nov-24
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	03-May-23	03-May-24
3460	Precision Barometer, 870 - 1050 hPa	LUFFT Mess- und Regeltechnik GmbH	DKD-K-26701	100469	17-Jul-22	17-Jul-24
3951	Isotron Accelerometer 101.2 mV/g	Dytran Instruments Inc.	3256A2	10370	16-Nov-23	16-Nov-24
4019	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99)% RH	Mad Electronics	HTC-1	NA	10-Jul-23	10-Jul-24
5741	Vibration Controller	Econ Technologies Co.,Ltd	VT-9008	294687769	15-Nov-23	15-Nov-24

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.	IEC 60721-4-7:2001+A1:03	Guidance for the Correlation and Transformation of Environmental Condition Classes of IEC 60721-3 to the Environmental Tests of IEC 60068
2.	IEC 60068-2-27:87	Environmental Testing - Part 2: Tests - Test Ea and Guidance: Shock
3.	IEC 60068-2-64:93	Environmental testing - Part 2: Tests - Test Fh: Vibration, Broad-band Random (Digital Control) and Guidance
4.	Vibration and shock TP-10_2023	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 %
Shock acceleration	+7.2/-8.2 %	±20.0 %

END OF TEST REPORT