Sebert Trillingstechniek B.V.

Report: M25.001-P25.001 One Display Solution
Date 26 March 2025

MIL-STD 810/AECTP 400 Random Vibration and Terminal Peak Sawtooth Shock Tests on a PSM-P86RV1

Client
One Display Solution
Tjalk 1 e
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The Netherlands

Contact Person
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Order conformation
One Display Solution Purchase Order Number ODS20250046

Present at the tests
Mr. S. W. van Tongeren of One Display Solution was partially present

S2T Quotation
Q25.001

Certificate number
C25.001-P25.001 One Display Solution

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Technically approved by
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No of pages
35

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1. Introduction

Under contract of One Display Solution at Bodegraven in The Netherlands, AECTP 400 random vibration and terminal saw tooth shock tests have been carried out on PSM-P86RV1 unit. The tests were carried out on 17 to 20 March 2025. All dynamic tests (for example impact and vibration tests) have been carried out under ISO 17025 accreditation and all static tests (for example the ambient test registrations) are not carried out under accreditation. The fixation of the test item to the test equipment has been made by securing the flat metal base of the shock damper base inside a transport frame directly onto the test surface. Transport wheels were removed to improve the transfer of test energy through the test item and create a worst case transportation scenario.

One Display Solution will carry out the final inspection after the complete test sequence. The purpose of the tests is to determine if the test item meets the mechanical stress requirements. In accordance with One Display Solution no acceptation criteria were defined and no preconditioning was carried out. The test results in this report will be related to the tested test item only.

2. Test procedure and equipment

2.1. General

One test item has been used for the tests, see Table 1 for the details of the test item. The test item which was delivered on 17 March 2025 was checked before starting the test for visual damage and no deviations were found.

Table 1: Test item #1

Product name*	PSM-P86RV1
Product number / SN*	PSM-P86RV1 / ODSPSM2025001
Monitor model / SN*	PHL-86BDL4511D / AU0A2351003926
Decoder model / SN*	VUWALL PAK40-3 / P-11002734
Actuators model / SN*	OKIN-MEGAMAT20MODIFIED / 10032025
Dimensions [LxWxH]	196 x 181 x 96 cm (including test frame)
Weight	264 kg (including test frame)
Figure	#1 #2

*IFC (Information from Customer)

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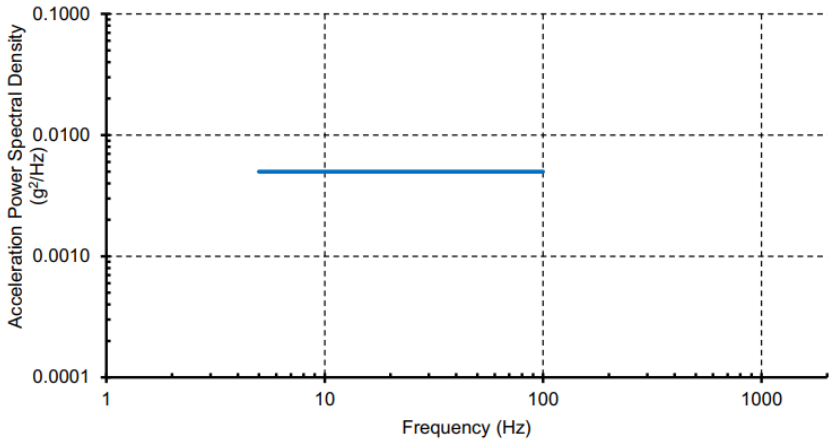
2.2. Test requirements and Test Plan

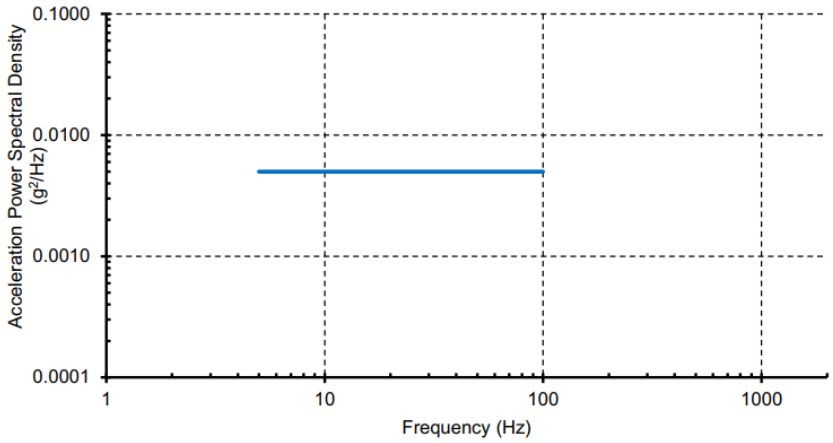
The following tables (Test A - D) present the test specifications. See Table 2 for the test plan.

Test A: Sea Random vibration test in all direction

Test standard	AECTP 400 (2019) method 401 – Material Transported by Sea	
Normative document	MIL-STD 810H	
Profile	f_1 = 5Hz f_a = 10Hz f_b = 50Hz f_2 = 200Hz	$PSDf_1$ = 0,00005 $PSDf_a,f_b$ = 0,001 g^2/Hz PSDf2 = 0,00005 $G_{r.m.s.}$ value = 0,28 (displacement 1,3 mm pp)
Fig. A-6 Frequency/amplitude Break points		
Cross motion	Is not required in specification and therefore will not be measured	
Degrees of Freedom	≥ 120 DOF	
No spectral lines	≥ 200 lines (or first frequency line is at 0,5 of F_1)	
Test duration	60 minutes (≈ 3 months sea). Total 3 hours (≈ 9 months sea)	
Direction	X, Y and Z	
Functional test	No	
Control strategy	Multi point weighted average control (When a multi point strategy is not possible, a single control point shall be used)	
Remark	This test will be carried out under accreditation	

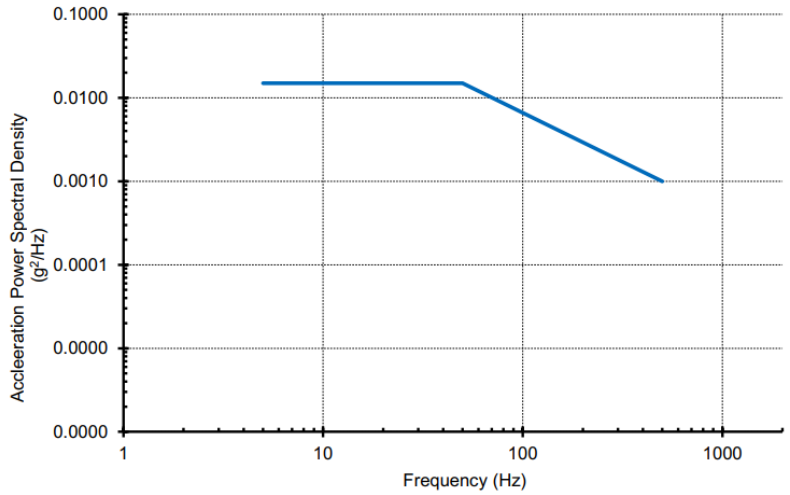
*Max pitch and roll moment 19.500Nm and Max Yaw moment 250Nm

Test B: Rail Random vibration test in all direction

Test standard	AECTP 400 (2019) method 401 – Material Transported by Rail	
Normative document	MIL-STD 810H	
Profile	f_1 = - f_a = 5Hz f_b = 100Hz	$PSDf_1$ = - $PSDf_a,f_b$ = 0,005 g^2/Hz $G_{r.m.s.}$ value = 0,69 (displacement 5,4 mm pp)
Fig. A-5 Frequency/amplitude Break points		
Cross motion	Is not required in specification and therefore will not be measured	
Degrees of Freedom	≥ 120 DOF	
No spectral lines	≥ 200 lines (or first frequency line is at 0,5 of F_1)	
Test duration	60 minutes (≈ 10.000km). Total 3 hours (≈ 30.000km)	
Direction	X, Y and Z	
Functional test	No	
Control strategy	Multi point weighted average control (When a multi point strategy is not possible, a single control point shall be used)	
Remark	This test will be carried out under accreditation	

*Max pitch and roll moment 19.500Nm and Max Yaw moment 250Nm

Test C: Common carrier random vibration test (in all direction)

Test standard	AECTP 400 (2019) method 401 – Common Carrier	
Normative document	MIL-STD 810H	
Profile	f_1 = - f_a = 5Hz f_b = 50Hz f_2 = 500Hz	$PSDf_1$ = - $PSDf_a,f_b$ = 0,015 g^2/Hz $PSDf_2$ = 0,001 g^2/Hz $G_{r.m.s.}$ value = 1,16 (displacement 9,4 mm pp)
Fig. A-4 Frequency/amplitude Break points		
Cross motion	Is not required in specification and therefore will not be measured	
Degrees of Freedom	≥ 120 DOF	
No spectral lines	≥ 200 lines (or first frequency line is at 0,5 of F_1)	
Test duration	60 minutes (≈ 1600km). Total 3 hours (≈ 4800km)	
Direction	X, Y and Z	
Functional test	No	
Control strategy	Multi point weighted average control (When a multi point strategy is not possible, a single control point shall be used)	
Remark	This test will be carried out under accreditation	

*Max pitch and roll moment 19.500Nm and Max Yaw moment 250Nm

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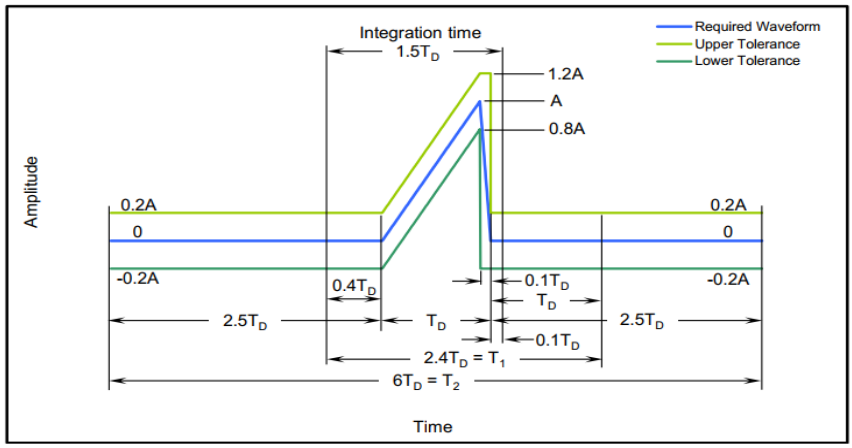
Test D: Transport Shock Test

Test standard	AECTP 400 (2019) method 403 – Shock – Procedure II – Transport Shock Test
Normative document	MIL-STD 810H
Pulse shape	Terminal Peak Sawtooth
Profile*	**On Road (5000 km)[4]** Terminal Peak Sawtooth Pulse Duration: 11 ms Amplitude (G-Pk) / Number of Shocks: 5.1 / 42; 6.4 / 21; 7.6 / 3 **Off Road (1000 km)[4]** Terminal Peak Sawtooth Pulse Duration: 5 ms Amplitude (G-Pk) / Number of Shocks: 10.2 / 42; 12.8 / 21; 15.2 / 3
Figure 3 Pulse Configuration and Tolerance Limits	
Pre/post- pulse height	Max 15%
Impact velocity	10 seconds per impact
Number of impacts	2x 66 impacts per direction (total 132 impacts)
Filter	Must be calculated
SRS	Yes
Direction	X+/-, Y+/- and Z+/-
Functional test	No
Control strategy	Multi point weighted average control (When a multi point strategy is not possible, a single control point shall be used)
Remark	This test will be carried out under accreditation

*Max pitch and roll moment 19.500Nm and Max Yaw moment 250Nm

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Table 2: Test plan

Step	Test	Direction
1	A	Horizontal transversal (X)
2	B	Horizontal transversal (X)
3	A	Vertical (Z)
4	B	Vertical (Z)
5	C	Vertical (Z)
6	D	Vertical (Z) +/-
7	A	Horizontal longitudinal (Y)
8	B	Horizontal longitudinal (Y)
9	C	Horizontal longitudinal (Y)
10	D	Horizontal longitudinal (Y) +/-
11	C	Horizontal transversal (X)
12	D	Horizontal transversal (X) +/-

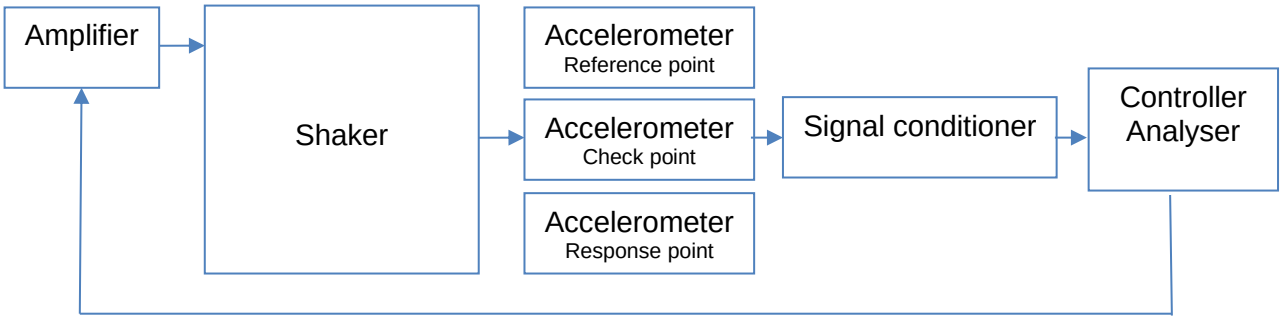
2.3. Mounting and orientation of the test item

For tests A to D, the test item was fixed to the test surface by clamping the flat metal base of the shock damper base inside a transport frame directly onto the test surface. Transport wheels were removed to improve the transfer of test energy through the test item and create a worst case transportation scenario. The test item was mounted on the vibration table in the normal orientation with respect to the vertical. The tests were carried out in three mutually perpendicular directions, see Figure #3 for the vertical (Z) direction, see Figure #4 for the horizontal transversal (X) direction and see Figure #5 for the horizontal longitudinal (Y) direction.

2.4. Description of the used apparatus and instrumentation

Apparatus and/or instrumentation	Supplier	Model Number	Serial Number	Last / Next date of Calibration, Verification and/or Inspection	
Monitoring of the environmental conditions	E+E Elektronik	HUMOLOG20 THIP	056.0420. 0802.034	02/04/24	02/04/26
Weighing instrument	Stimag B.V.	STL-H/ESP20	28199	10/06/24	10/06/26
Electric-dynamic shaker	Tira	TV 59355/AIT-440 TGT Model 48XXL	036/07	20/06/23	20/06/25
Shaker control system	Dactron	Laser	8969761	09/08/24	09/08/25
Signal Conditioner	PCB Piezotronics	482C16	428	11/08/23	11/08/25
ICP Accelerometer (reference/check point)	PCB Piezotronics	353B34	LW235695	25/04/24	25/04/25
ICP Accelerometer (reference/check point)	PCB Piezotronics	353B34	LW235696	25/04/24	25/04/25
ICP Accelerometer (response point)	PCB Piezotronics	352C22	LW341978	25/10/24	25/10/25
ICP Accelerometer (reference/check point)	PCB Piezotronics	353B18	149911	10/07/24	10/07/25

2.5. Sketch of the test A - D configuration



2.6. Measurement uncertainty and tolerances

All the measurements were carried out with a signal tolerance includes instrumentation errors lower than 5% according to the standards. The combined standard uncertainly and the expanded uncertainty (k=2) *U* is lower than 10% according. Measurement Uncertainty Calculator form version 25.7. For lower vibration frequency (>1 <10Hz), large size and high mass the signal tolerance is lower than 10%. Temperature and relative humidity are not operational factors.

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3. Random vibration and terminal peak sawtooth shock tests

3.1. General

The vibration and shock tests were carried out in three mutually perpendicular directions on a shaker.

3.1.1. Test A to C: Random vibration test setup

The vibration tolerance bands at the reference point is within ±3dB. The initial slope is less than +6dB/octave and the final slope is -24dB/octave. The used frequency range of the measuring system is 0,5 times the low frequency and 2 times the highest frequency. The frequency response is flat within ±5% over the test frequency range. The cross-axis motion and the vibration response (investigation) measurements were not carried out. See Table 3 for the used vibration parameters.

Table 3: Random vibration control parameters

System	Parameters
Controller	Closed loop – Automatic Equalization
Number of Spectral Lines:	800
Max. Test Frequency:	500.00 Hz
Measurement Strategy:	Weighted Average
Line Abort Ratio:	0.30
Line Abort Number:	240
Averaging Number:	77
Drive Limit:	10.00 Volts
Sigma Clip Number:	5.00
Data Points/Frame:	2048
Frame Time:	1.600000 Seconds
Sampling Rate:	1280 Hz
DOF:	154
dT:	0.000781 Seconds
dF:	0.625000 Hz

3.1.2. Test D: Shock test setup

The used peak acceleration tolerance is 0,8 and 1,2 times for the half-sine shock test. The effects of gravity will be considered when considering the altitude of the test. The minimum monitored pulse time for the produced shocks is 6x duration of the nominal pulse. The positive and/or negative peak acceleration at the check point(s), perpendicular to the intended shock direction, does not exceed 30 % of the value of the peak acceleration of the nominal pulse in the intended direction. See Table 5 for the used shock parameters.

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Table 4: Shock control parameters

System	Parameters
Controller	Closed loop – Automatic Equalization
Block Size:	Auto
Averaging Number:	4
Drive Limit:	10.00 Volts
Pulse Interval:	10.000 seconds
Point Abort Ratio:	0.10
Low-Pass Filter Type:	Apply filter using user-defined cutoff frequency
Filter Cutoff Frequency:	800.000000Hz
Data Points/Frame:	8192
Frame Time:	0.682667 Seconds
Sampling Rate:	12000 Hz
dT:	8.33333e-005 Seconds
Maximum Analysis Frequency:	5273.44 Hz
SRS Analysis:	Enable
SRS Analysis Low Frequency Bound:	1.000000Hz
SRS Analysis High Frequency Bound:	1000.000000Hz
SRS Analysis Reference Frequency:	100.000000Hz
SRS Analysis Damping Ratio:	0.050000
SRS Analysis Fractional Octave Number:	1/3

3.1.3. Accelerometers location and orientation

See Table 5 for the location and orientation of the used accelerometers during the tests.

Table 5: Used accelerometers

Test item	Direction	Channel	Accelerometer Serial number	Location on test item	Figure
1	XYZ	1	LW235695	On table, front left	#3 - #5
1	XYZ	2	LW235696	On table, rear right	#3 - #5
1	XYZ	3	LW341978	On test item	#3 - #5
1	XYZ	4	149911	On shock damper base	#3 - #5

3.2. Test Results

3.2.1. Test A: Random vibration test result (Sea)

One test item has been used for the random vibration test which was carried out in the three mutually perpendicular directions, see Table 6 for the result summary. See Figure #6 for a typical vibration plot and Figure #7 to #9 for the transmissibility measurements of accelerometer response channels 3 and 4. The natural frequency (Fn) of the test item was identified at 8-9Hz, damping started to occur at 12Hz. No visual damage or functional errors were found on the test item after the complete test sequence.

Table 6: Random vibration test result summary

Test item	Direction	Test time [min]	Remarks*
1	Horizontal transversal (X)	60	Pass
1	Vertical (Z)	60	Pass
1	Horizontal longitudinal (Y)	60	Pass

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

3.2.2. Test B: Random vibration test result (Rail)

One test item has been used for the random vibration test which was carried out in the three mutually perpendicular directions, see Table 7 for the result summary. See Figure #10 for a typical vibration plot. See Figure #11 to #13 for the transmissibility measurements of accelerometer response channels 3 and 4. The natural frequency (Fn) of the test item was identified at 7Hz, damping started to occur at 10Hz. No visual damage or functional errors were found on the test item after the complete test sequence.

Table 7: Random vibration test result summary

Test item	Direction	Test time [min]	Remarks*
1	Horizontal transversal (X)	60	Pass
1	Vertical (Z)	60	Pass
1	Horizontal longitudinal (Y)	60	Pass

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

3.2.3. Test C: Random vibration test result (Common carrier)

One test item has been used for the random vibration test which was carried out in the three mutually perpendicular directions, see Table 8 for the result summary. See Figure #14 for a typical vibration plot, see Figure #15 to #17 for the transmissibility measurements of accelerometer response channels 3 and 4. The natural frequency (Fn) of the test item was identified at 6Hz, damping started to at 8,5Hz. No visual damage or functional errors were found on the test item after the complete test sequence.

Table 8: Random vibration test result summary

Test item	Direction	Test time [min]	Remarks*
1	Vertical (Z)	60	Pass
1	Horizontal longitudinal (Y)	60	Pass
1	Horizontal transversal (X)	60	Pass

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

3.2.3. Test D: Terminal peak sawtooth shock test result

One test item has been used for the terminal peak sawtooth shock test which was carried out in the three mutually perpendicular (±) directions, see Table 9A – 9C for the result summary. See Figure #18 for a typical shock plot. See Figure #19 to #24 for the shock response measurements of accelerometer inputs 3 and 4 during the shocks with the highest intensity. For shock number 12, the input shock value was 15,2g. The maximum amplitude measured by the response sensor placed on the back of the display was 1g in the vertical, 1g in the longitudinal and 1,5g in the transversal thereby reducing the shock by between 90% to 93%. No visual damage or functional errors were found on the test item after the complete test sequence.

Table 9A: Shock test result summary vertical (Z) direction

Test no	Direction	Amplitude [g]	Pulse duration [ms]	No of shocks	Remarks*
1	Vertical (Z-)	5,1	11	42	Pass
2	Vertical (Z+)	5,1	11	42	Pass
3	Vertical (Z-)	6,4	11	21	Pass
4	Vertical (Z+)	6,4	11	21	Pass
5	Vertical (Z-)	7,6	11	3	Pass
6	Vertical (Z+)	7,6	11	3	Pass
7	Vertical (Z-)	10,2	5	42	Pass
8	Vertical (Z+)	10,2	5	42	Pass
9	Vertical (Z-)	12,8	5	21	Pass
10	Vertical (Z+)	12,8	5	21	Pass
11	Vertical (Z-)	15,2	5	3	Pass
12	Vertical (Z+)	15,2	5	3	Pass

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 9B: Shock test result summary horizontal longitudinal (Y) direction

Test item	Direction	Amplitude [g]	Pulse duration [ms]	No of shocks	Remarks*
1	Longitudinal (Y-)	5,1	11	42	Pass
1	Longitudinal (Y+)	5,1	11	42	Pass
1	Longitudinal (Y-)	6,4	11	21	Pass
1	Longitudinal (Y+)	6,4	11	21	Pass
1	Longitudinal (Y-)	7,6	11	3	Pass
1	Longitudinal (Y+)	7,6	11	3	Pass
1	Longitudinal (Y-)	10,2	5	42	Pass
1	Longitudinal (Y+)	10,2	5	42	Pass
1	Longitudinal (Y-)	12,8	5	21	Pass
1	Longitudinal (Y+)	12,8	5	21	Pass
1	Longitudinal (Y-)	15,2	5	3	Pass
1	Longitudinal (Y+)	15,2	5	3	Pass

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 9C: Shock test result summary horizontal longitudinal (Y) direction

Test item	Direction	Amplitude [g]	Pulse duration [ms]	No of shocks	Remarks*
1	Transversal (X-)	5,1	11	42	Pass
1	Transversal (X+)	5,1	11	42	Pass
1	Transversal (X-)	6,4	11	21	Pass
1	Transversal (X+)	6,4	11	21	Pass
1	Transversal (X-)	7,6	11	3	Pass
1	Transversal (X+)	7,6	11	3	Pass
1	Transversal (X-)	10,2	5	42	Pass
1	Transversal (X+)	10,2	5	42	Pass
1	Transversal (X-)	12,8	5	21	Pass
1	Transversal (X+)	12,8	5	21	Pass
1	Transversal (X-)	15,2	5	3	Pass
1	Transversal (X+)	15,2	5	3	Pass

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

3.3. Final inspection

After the complete test sequence, a visual inspection has been carried out on the test item. See Table 10 for the inspection results.

Table 10: Visual inspection results

Test item	Results and/or remarks	Figure
#1	After all testing had been completed, the display was able to be powered on without error. The display was also able to be raised and lowered by the motorized extendable feet without error.	#25 #29

One Display Solution will carry out the final inspection and report the results after the completed test sequence.

3.4. Laboratory ambient (during test)

See Figure #30 for the environmental measurements during the test sequence.

4. Conclusion and remarks

One test item has been subjected to vibration and shock tests according to the normative documents:

- Department of Defense Test Method Standard - Environmental Engineering Considerations and Laboratory Tests – MIL-STD-810H: 2019
  - NATO Standard AECTP-400 Mechanical Environment Tests Edition D Version 1 November 2019 - method 401. (Vibration)
  - NATO Standard AECTP-400 Mechanical Environment Tests Edition D Version 1 November 2019 - method 403. (Shock)

See the following table for the summary of the test results:

Test A: Random vibration test Material Transported by Sea	During the random vibration test, the test item was not functional. No visual damage or functional errors were found on the test item after the complete test. This result validates the test items ability to endure sea transportation of 9 months
Test B: Random vibration test Material Transported by Rail	During the random vibration test, the test item was not functional. No visual damage or functional errors were found on the test item after the complete test. This result validates the test items ability to endure rail transportation of 30.000km
Test C: Random vibration test Common carrier	During the random vibration test, the test item was not functional. No visual damage or functional errors were found on the test item after the complete test. This result validates the test items ability to endure transportation by wheeled vehicles predominantly on improved roads by common carrier for 4800km
Test D: Terminal peak sawtooth shock test	During the shock test, the test item was not functional. No visual damage or functional errors were found on the test item after the complete test. This result validates the test items ability to endure the shocks encountered during transportation by road over 5000km and by off-road over 1000km

One Display Solution will carry out the final inspection on the test item after the completed test sequence.

Approved by
M.J.H. Magendans

Director • Test Specialist

Testing carried out by
R. Morris

Test Lab Manager

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Figures

Figure 1: Test item

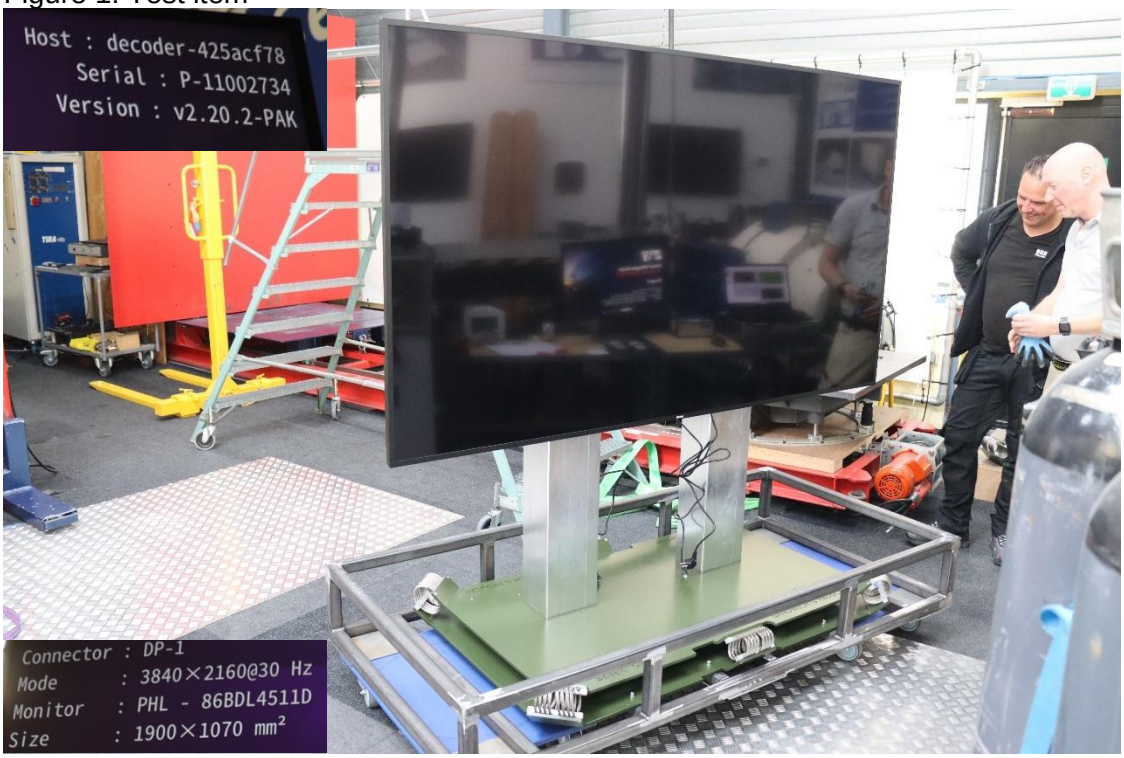

Figure 2: Test item

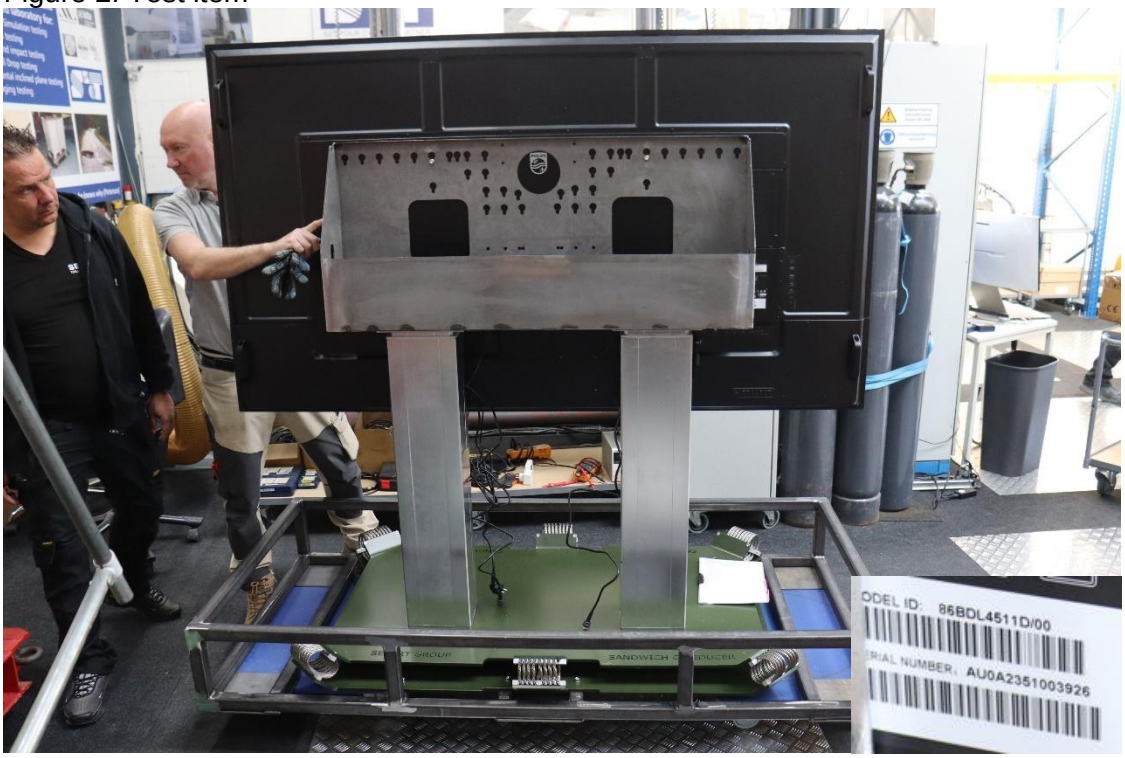

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Figure 3: Test direction vertical (Z) and accelerometer location

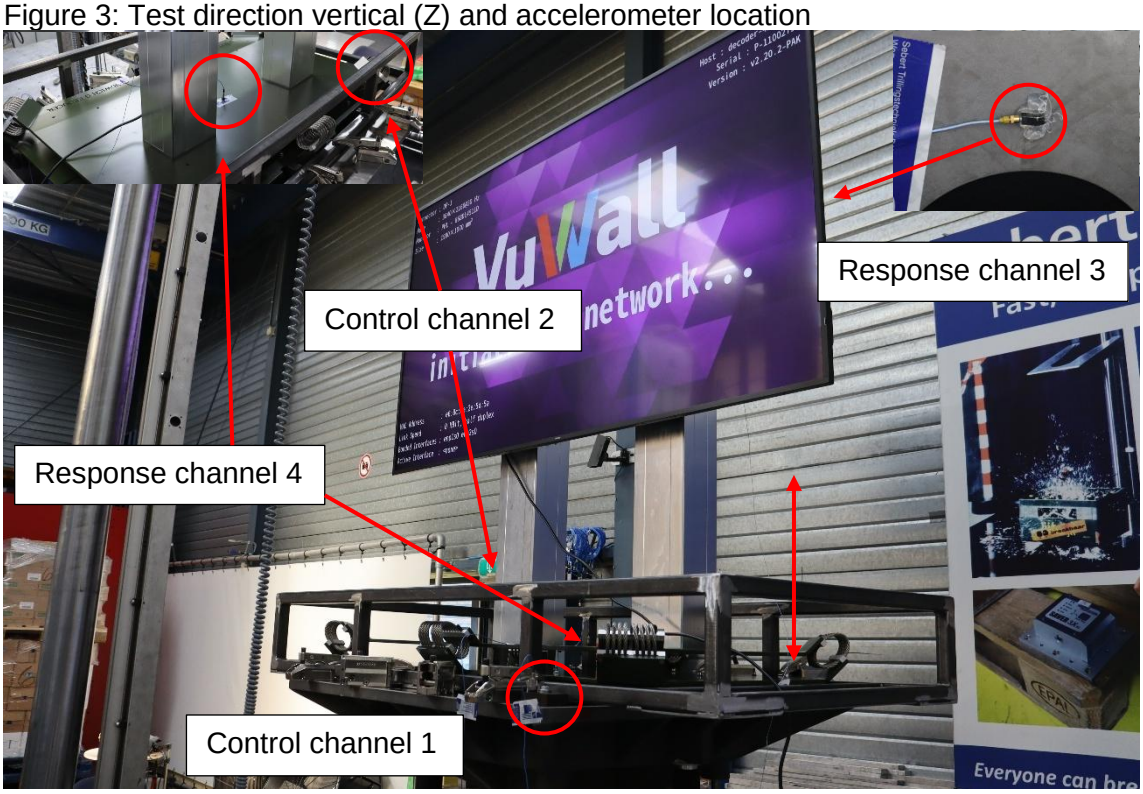

Figure 4: Test direction horizontal transversal (X) and accelerometer location

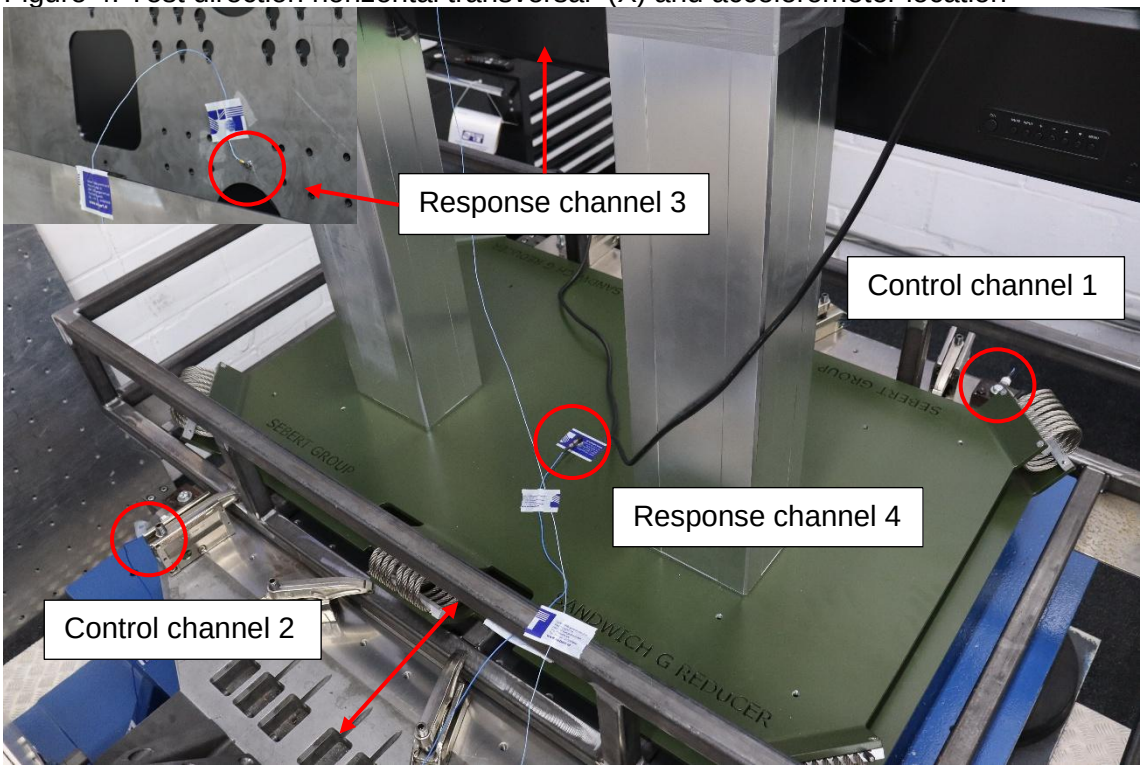

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Figure 5: Test direction horizontal longitudinal (Y) and accelerometer location

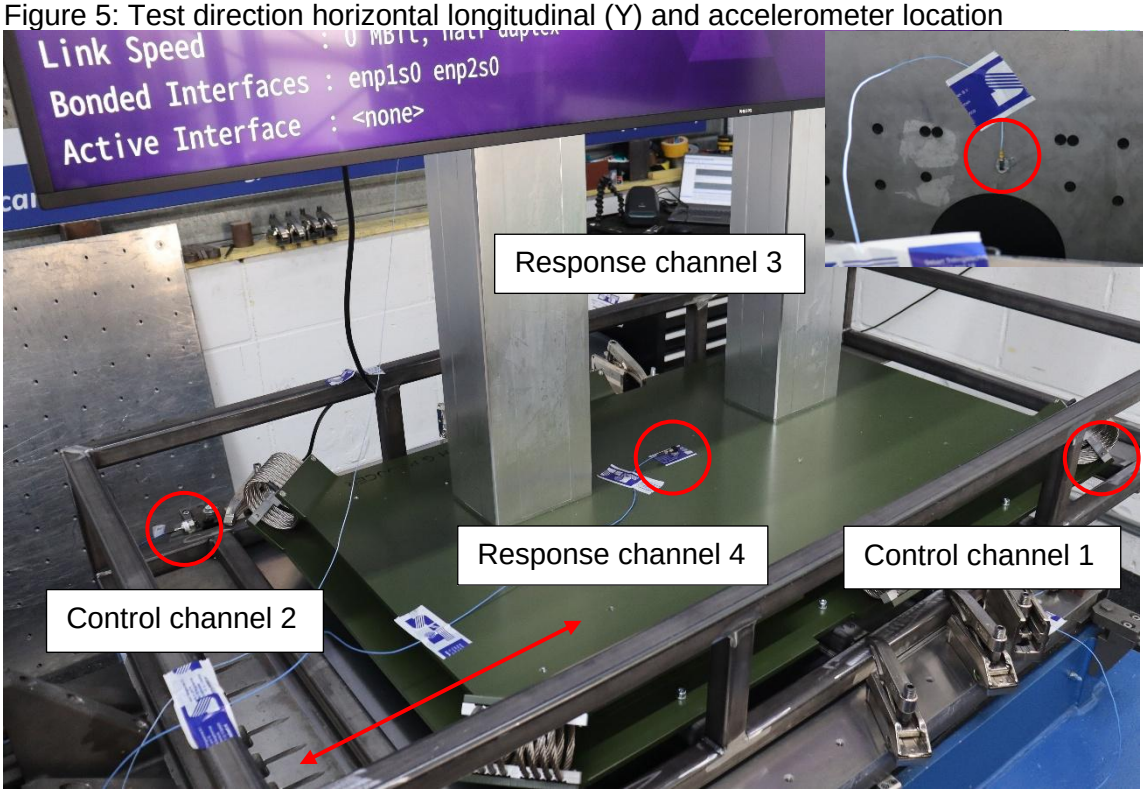
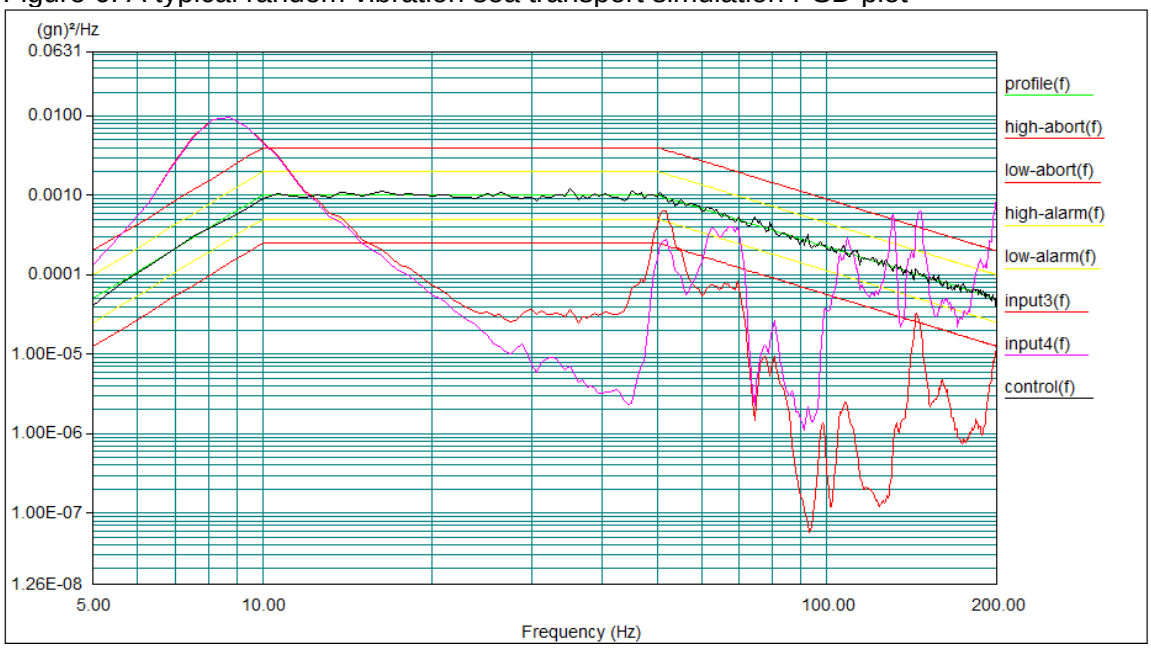


Figure 6: A typical random vibration sea transport simulation PSD plot



Level: 100 %
Control RMS: 0.275869 gn Full Level Elapsed Time: 01:00:03 Lines: 400 Frame Time: 1.600000 Seconds
Demand RMS: 0.276148 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.625000 Hz

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Figure 7: Test A Sea - Transmissibility measurement, input 3 and 4 transversal X

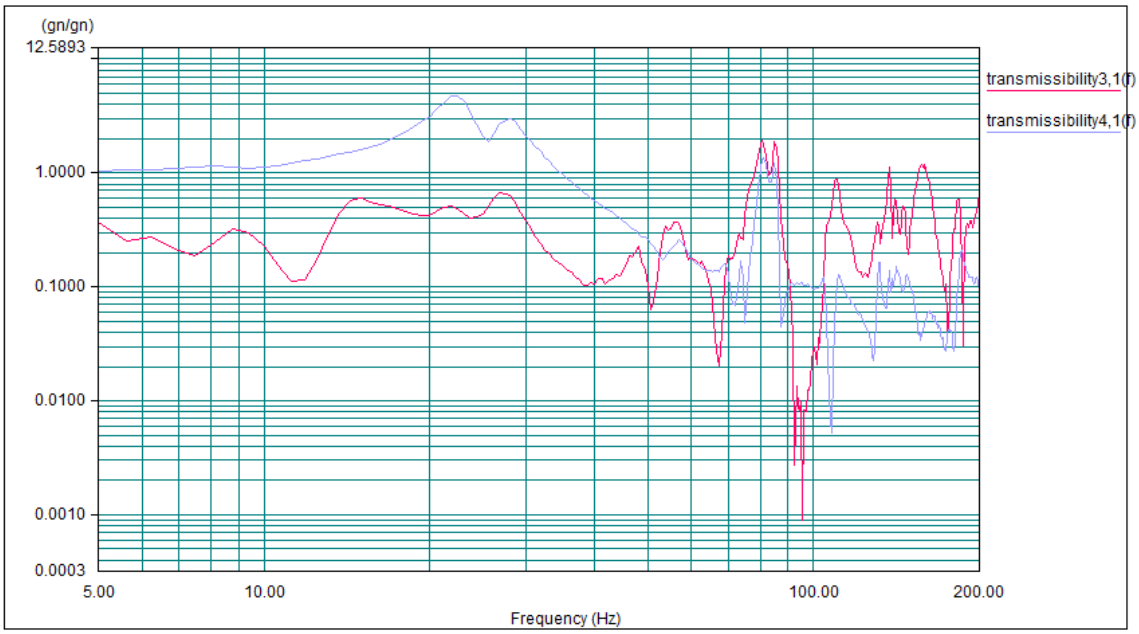


Figure 8: Test A Sea - Transmissibility measurement, input 3 and 4 vertical Z

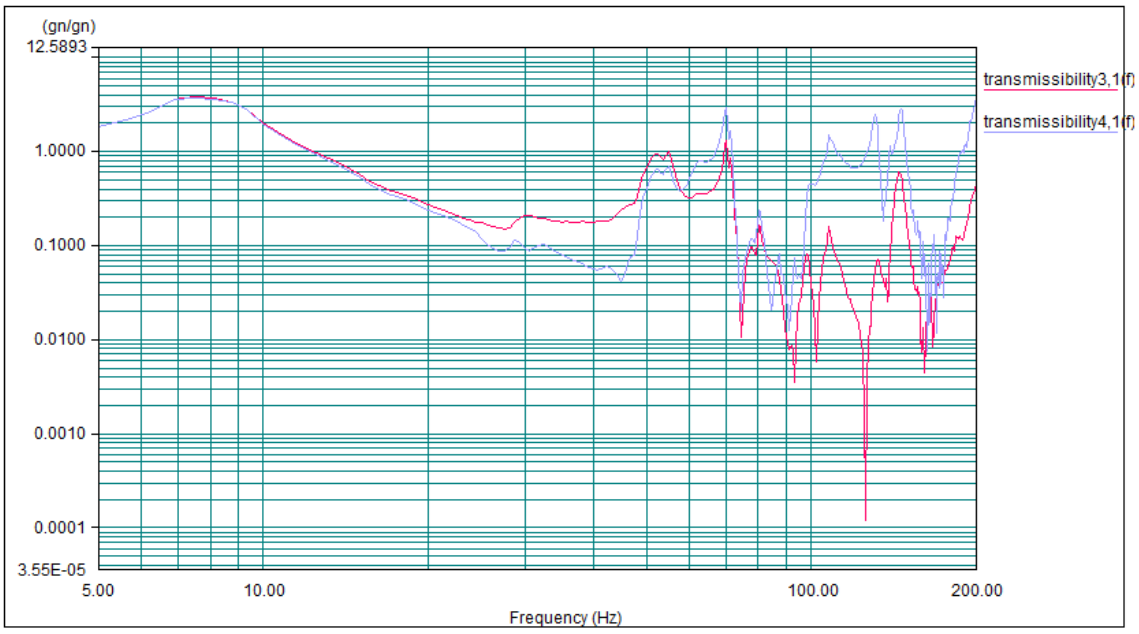


Figure 9: Test A Sea - Transmissibility measurement, input 3 and 4 longitudinal Y

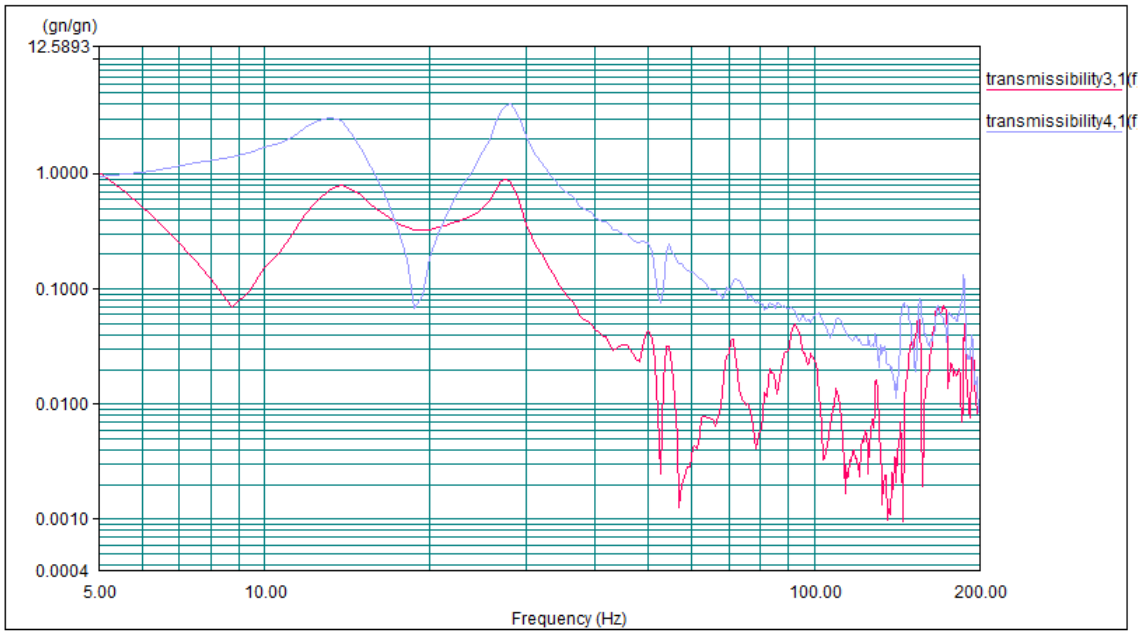
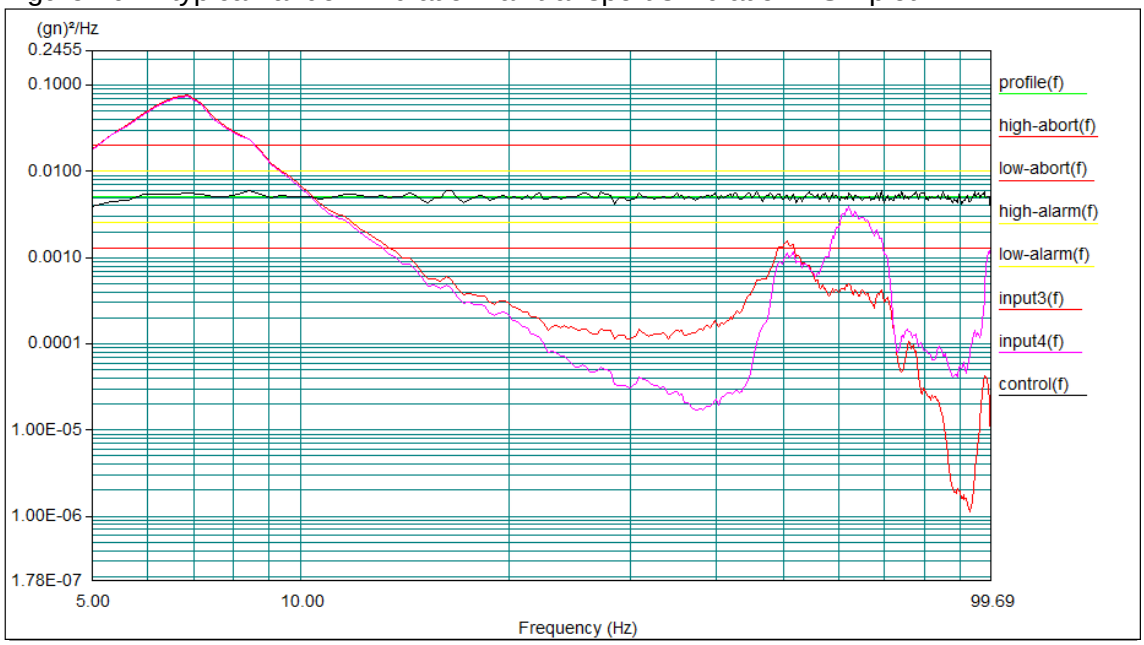


Figure 10: A typical random vibration rail transport simulation PSD plot



Level: 100 %
Control RMS: 0.689777 gn Full Level Elapsed Time: 01:00:03 Lines: 800 Frame Time: 3.200000 Seconds
Demand RMS: 0.689019 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.312500 Hz

Figure 11: Test B Rail - Transmissibility measurement, input 3 and 4 transversal X

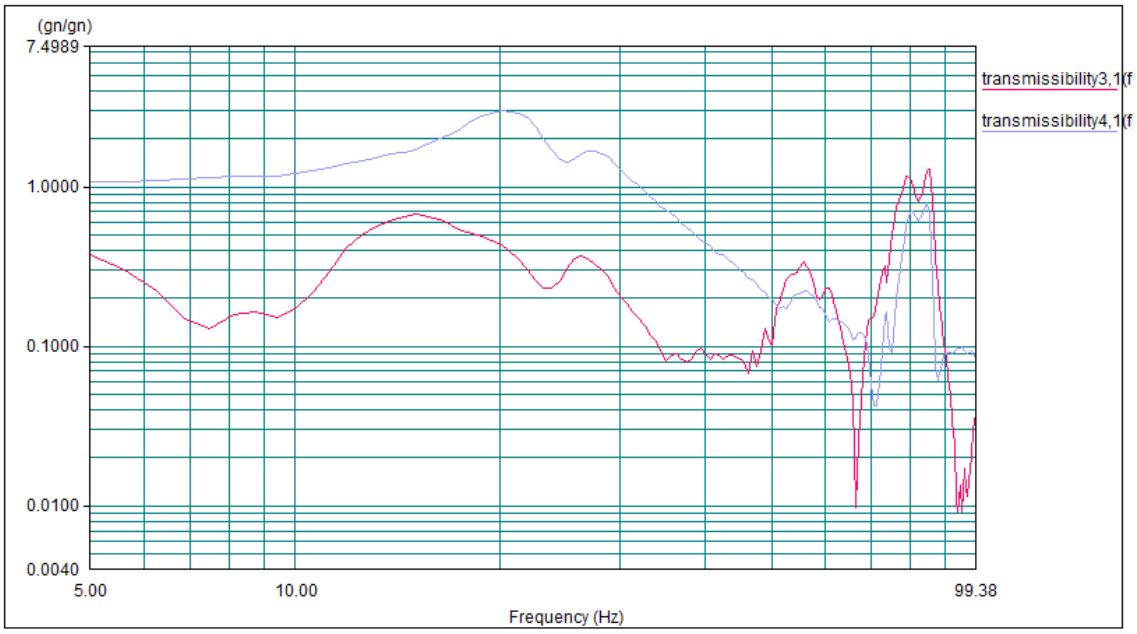


Figure 12: Test B Rail - Transmissibility measurement, input 3 and 4 vertical Z

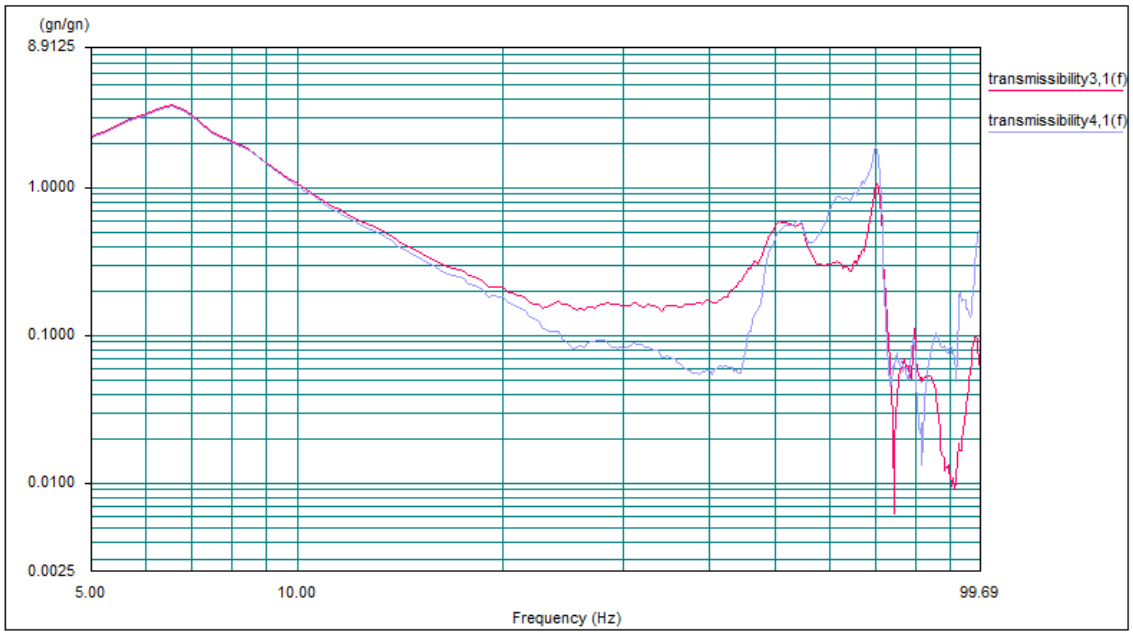


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Figure 13: Test B Rail - Transmissibility measurement, input 3 and 4 longitudinal Y

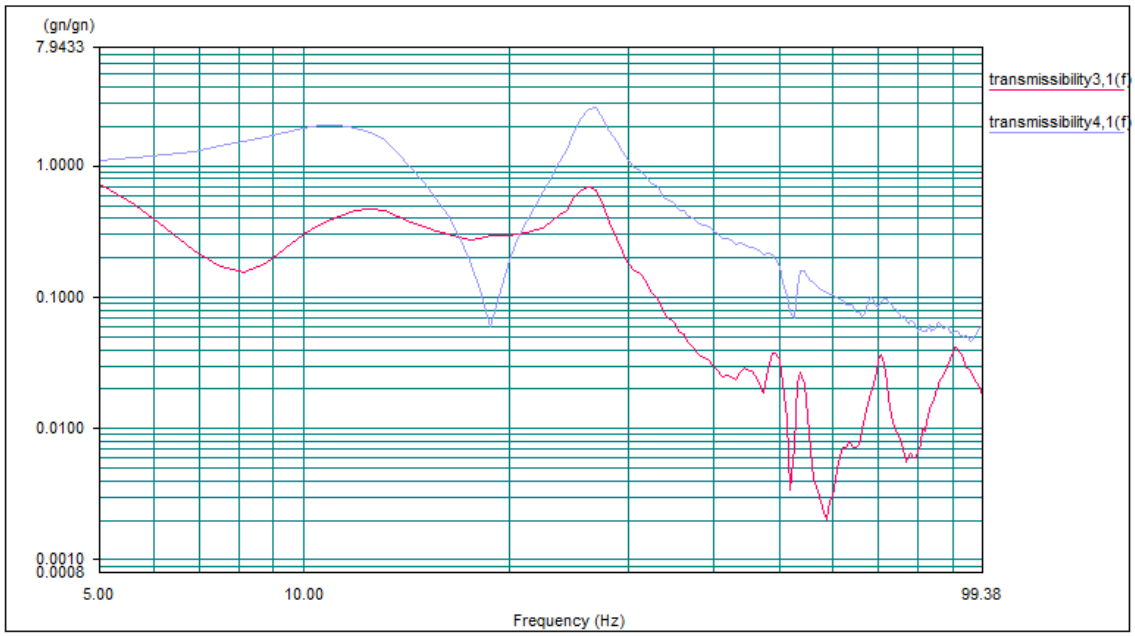
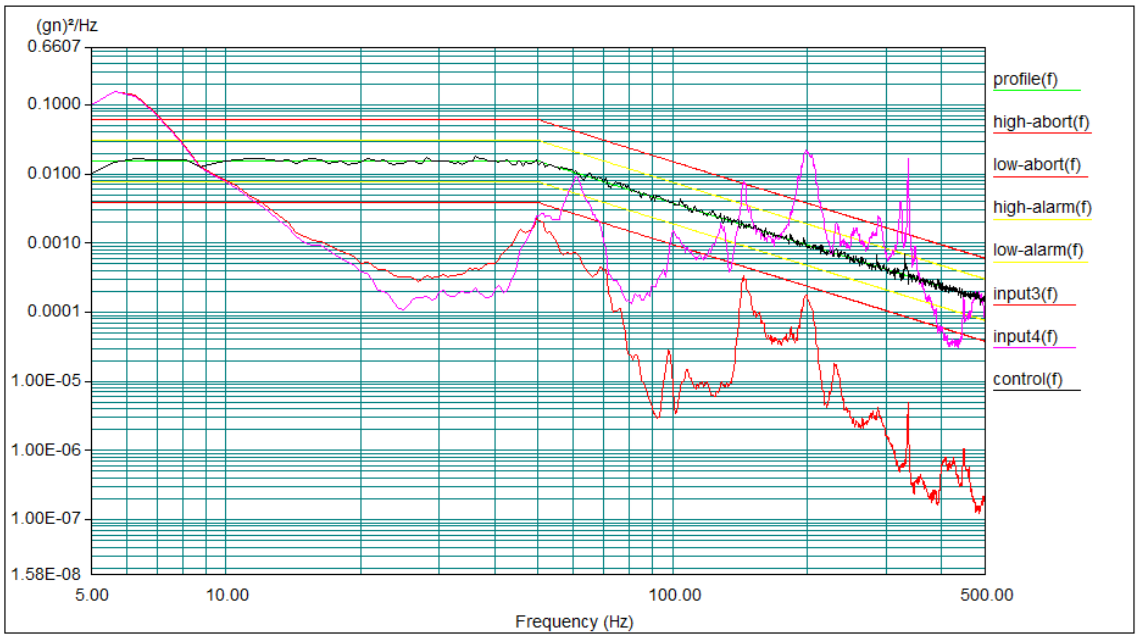


Figure 14: A typical random vibration common carrier transport simulation PSD plot



Level: 100 %
Control RMS: 1.168720 gn Full Level Elapsed Time: 01:00:03 Lines: 800 Frame Time: 1.600000 Seconds
Demand RMS: 1.162590 gn Remaining Time: 00:00:00 DOF: 154 dF: 0.625000 Hz

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Figure 15: Test C - C.Carrier Transmissibility measurement, input 3 and 4 vertical Z

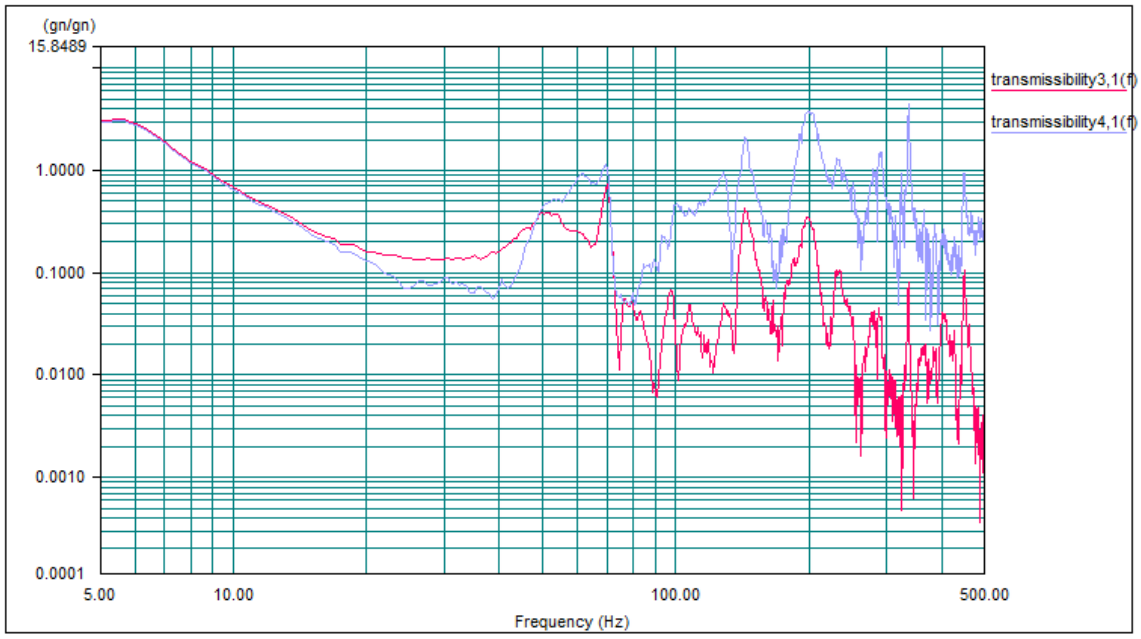

Figure 16: Test C - C.Carrier Transmissibility measurement, input 3 and 4 longitudinal Y

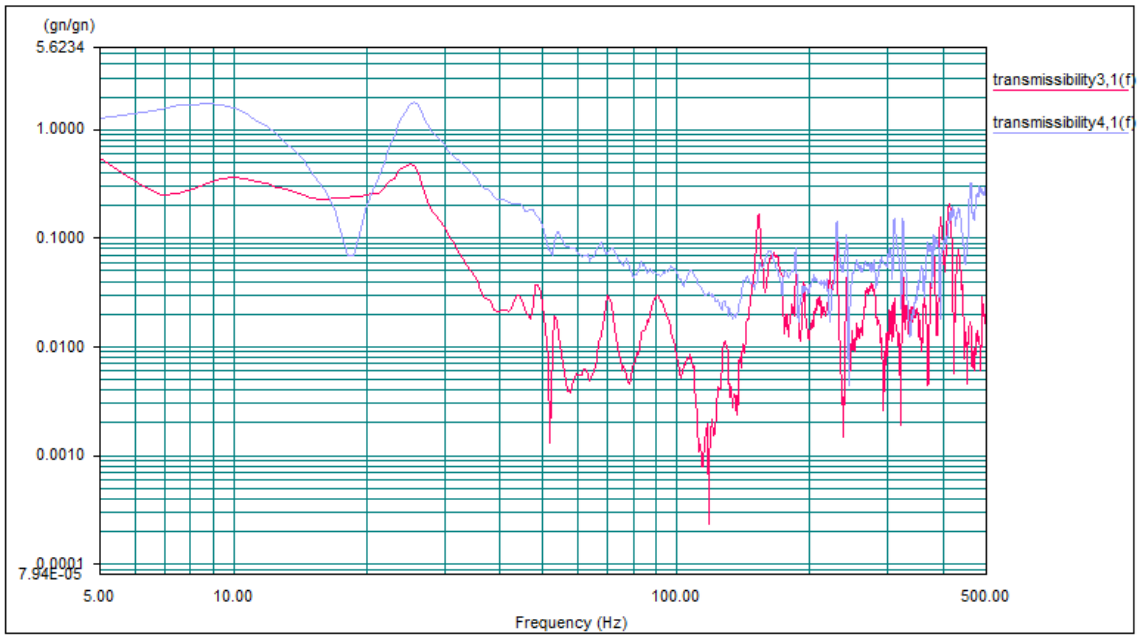

Figure 17: Test C - C.Carrier Transmissibility measurement, input 3 and 4 transversal X

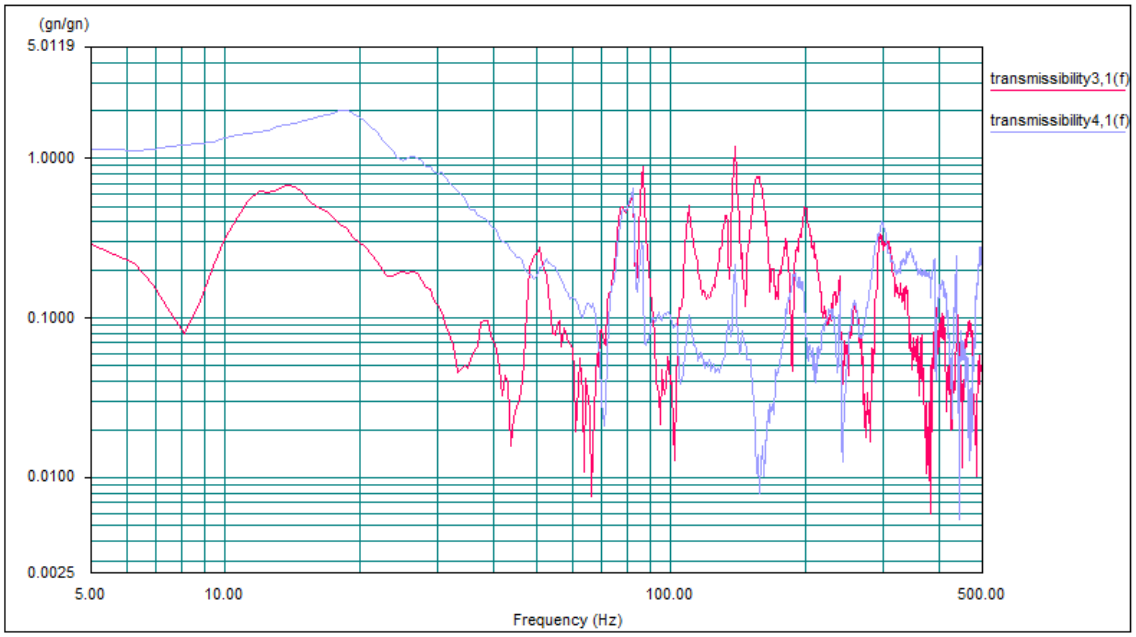

Figure 18: A typical terminal saw tooth shock plot

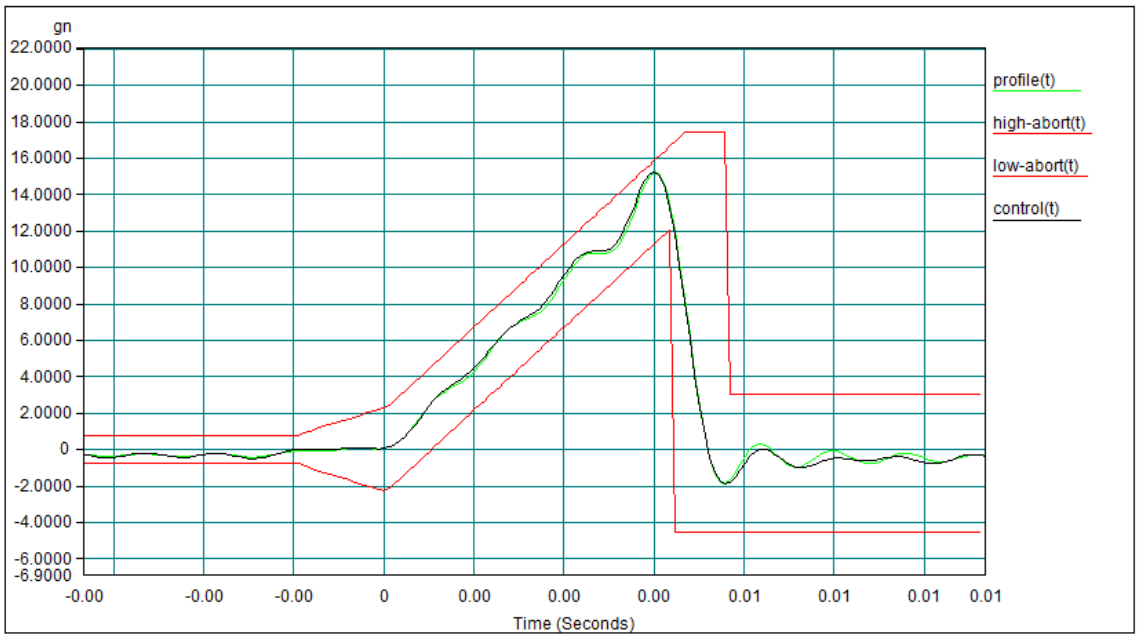

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Figure 19: A typical terminal saw tooth shock plot vertical (Z) 7,6g @ 11ms

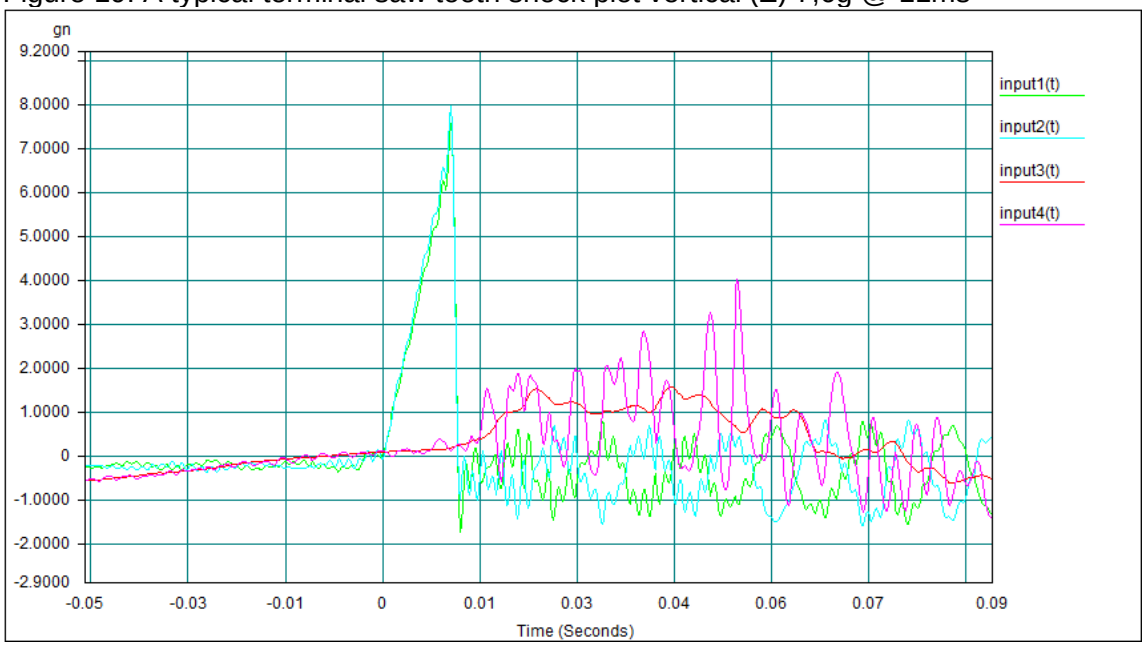

Figure 20: A typical terminal saw tooth shock plot vertical (Z) 15,2g @ 5ms

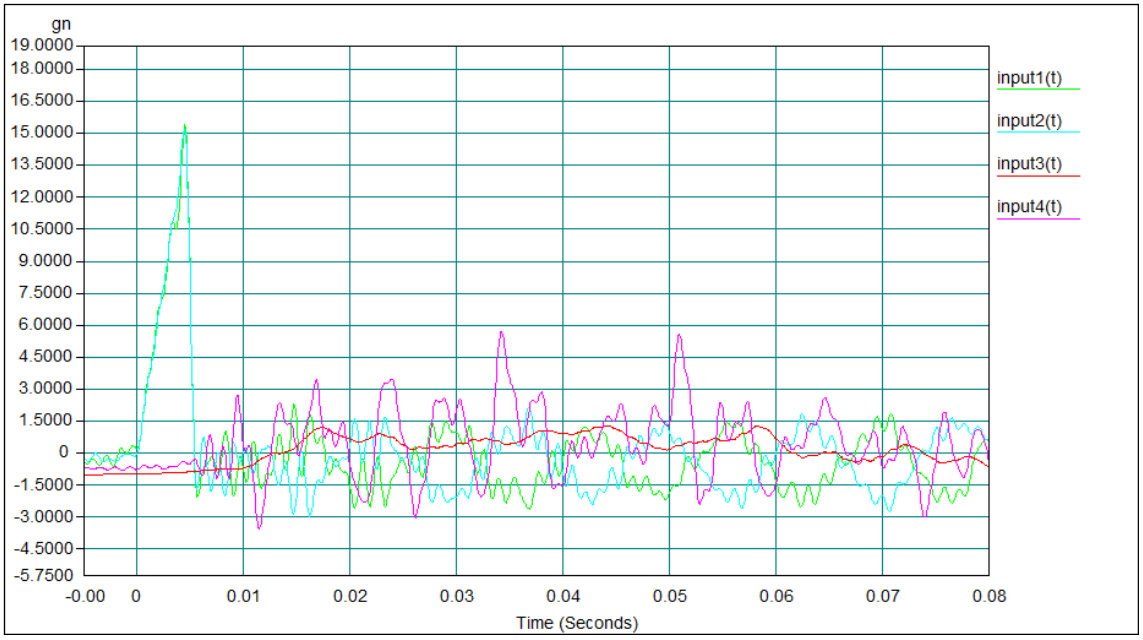

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Figure 21: A typical terminal saw tooth shock plot longitudinal (Y) 7,6g @ 11ms

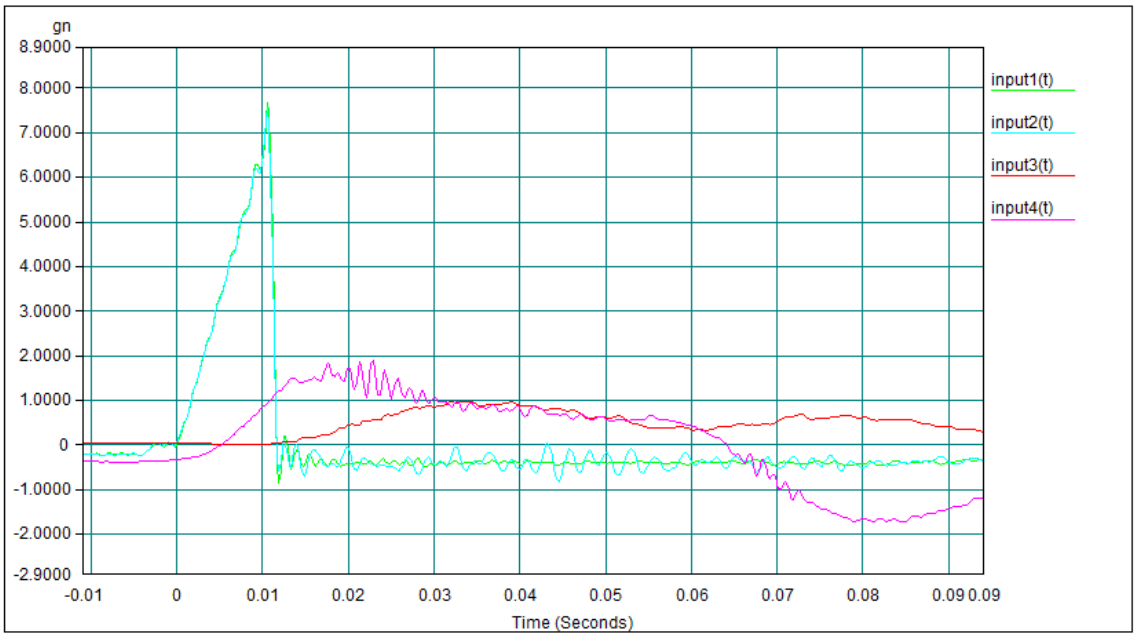

Figure 22: A typical terminal saw tooth shock plot longitudinal (Y) 15,2g @ 5ms

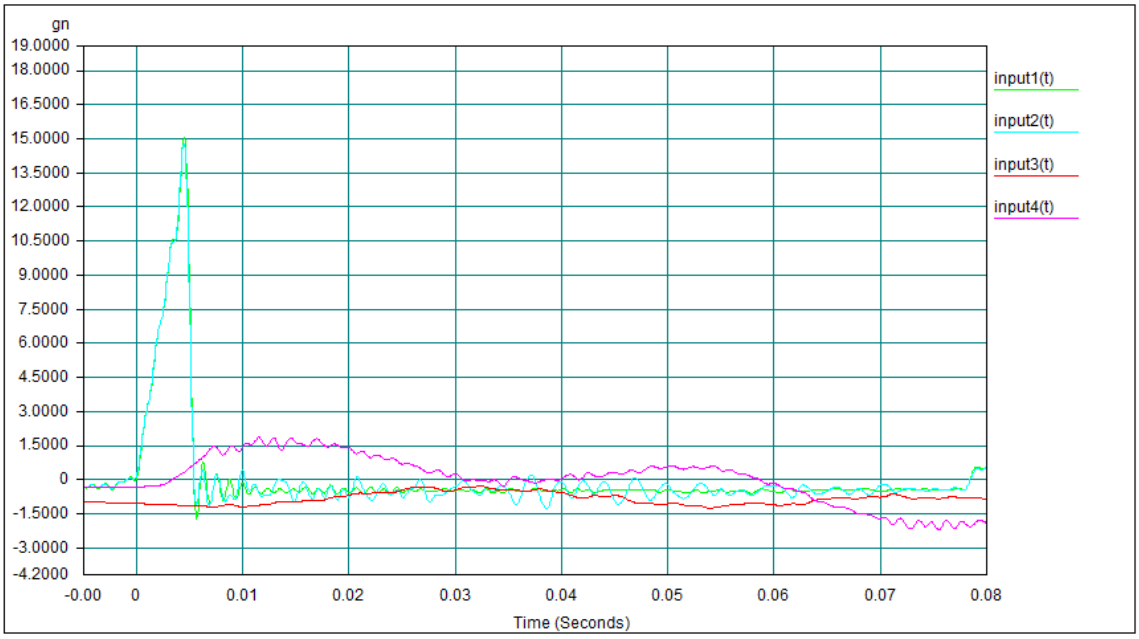

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Figure 23: A typical terminal saw tooth shock plot transversal (X) 7,6g @ 11ms

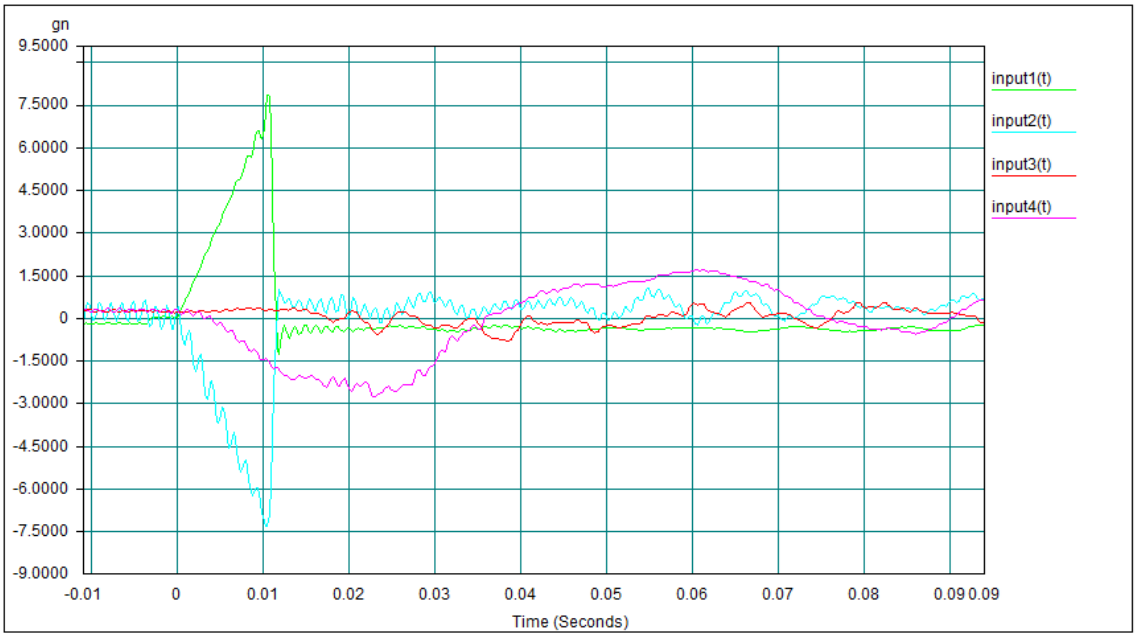

Figure 24: A typical terminal saw tooth shock plot transversal (X) 15,2g @ 5ms

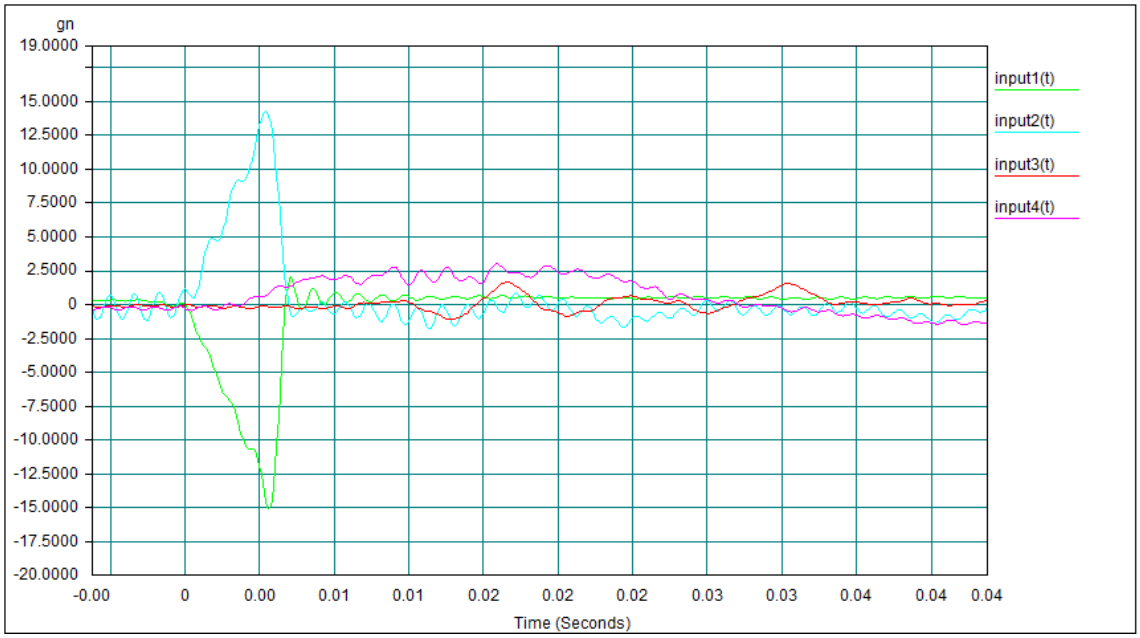

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Figure 25: Final inspection

Figure 26: Final inspection

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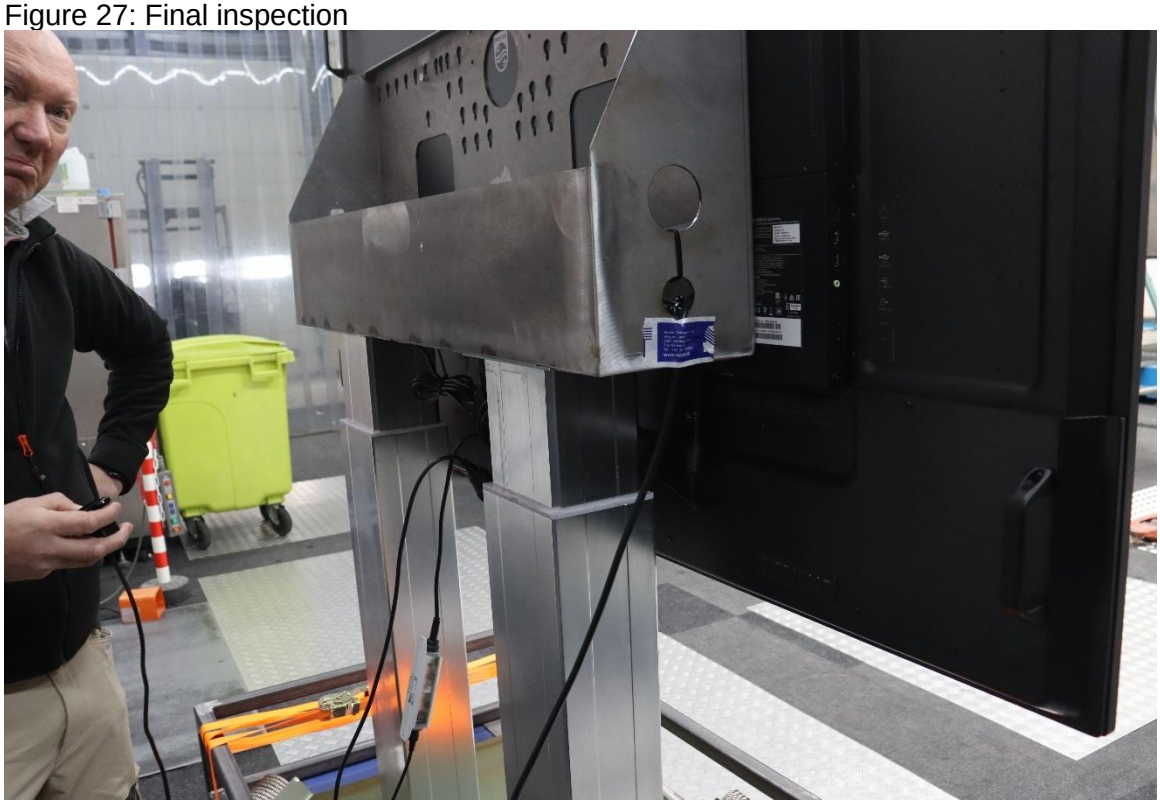
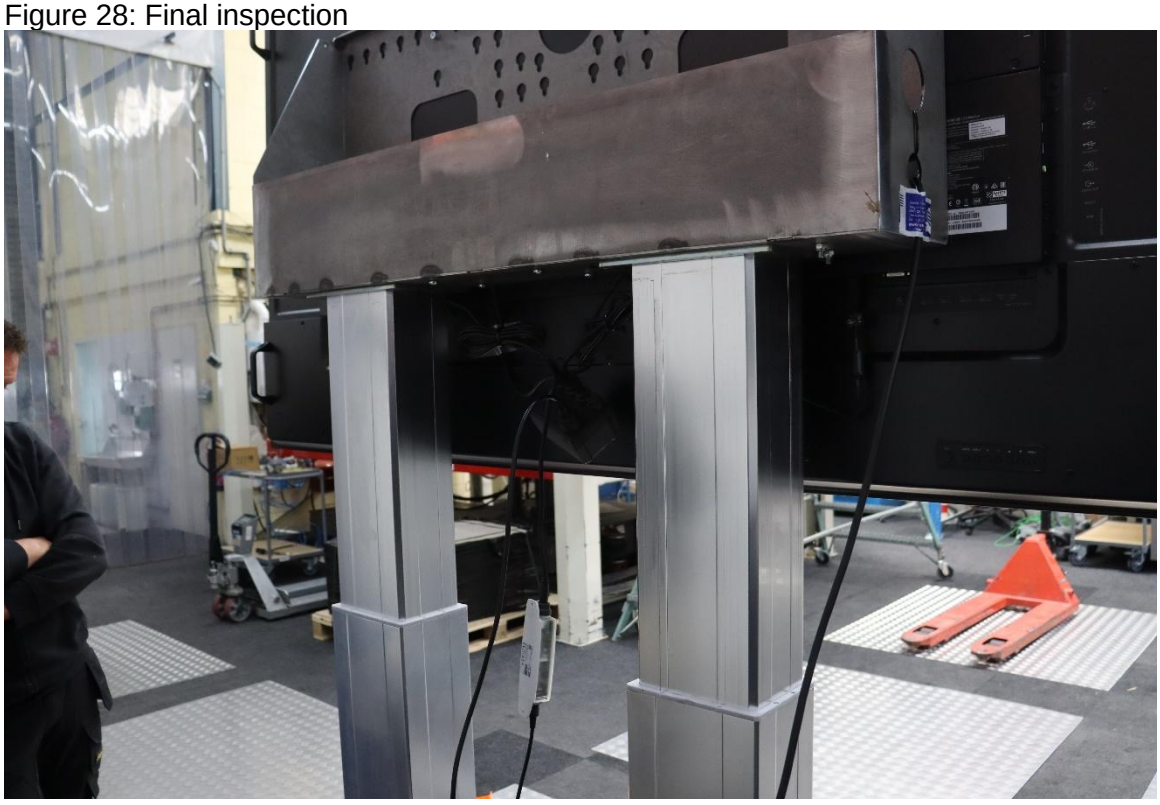


Figure 28: Final inspection



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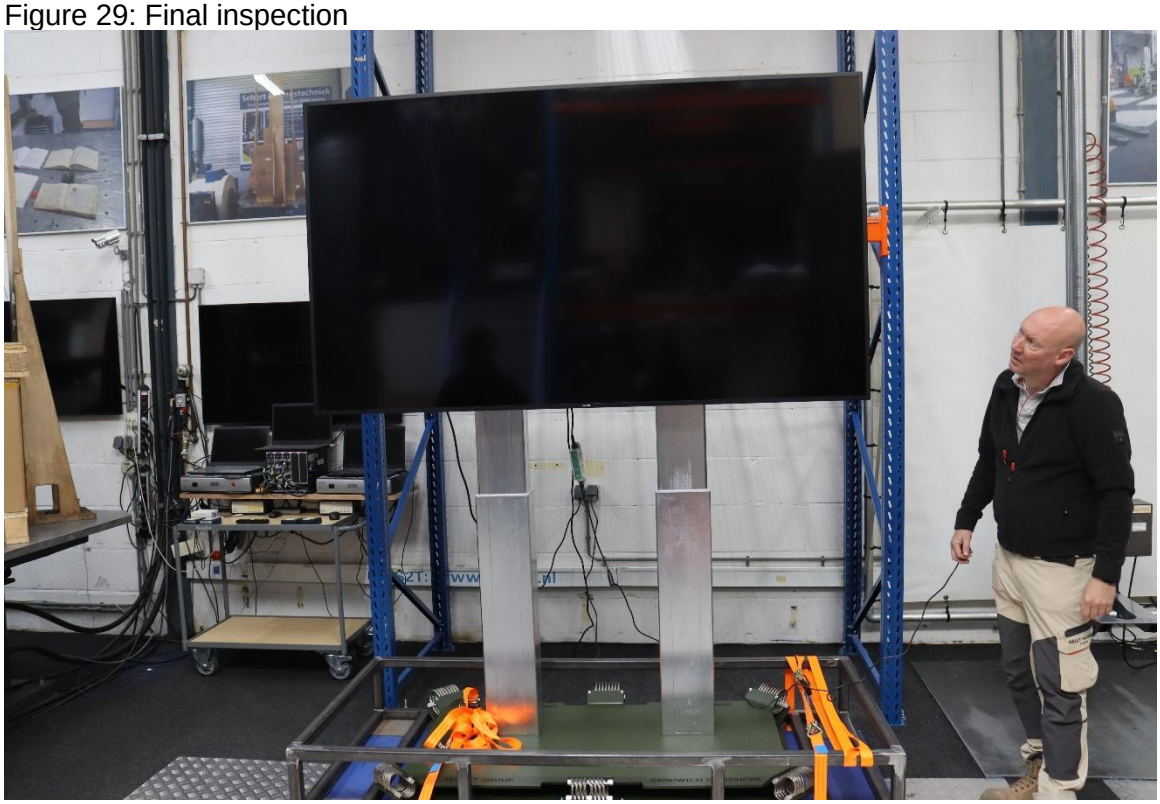
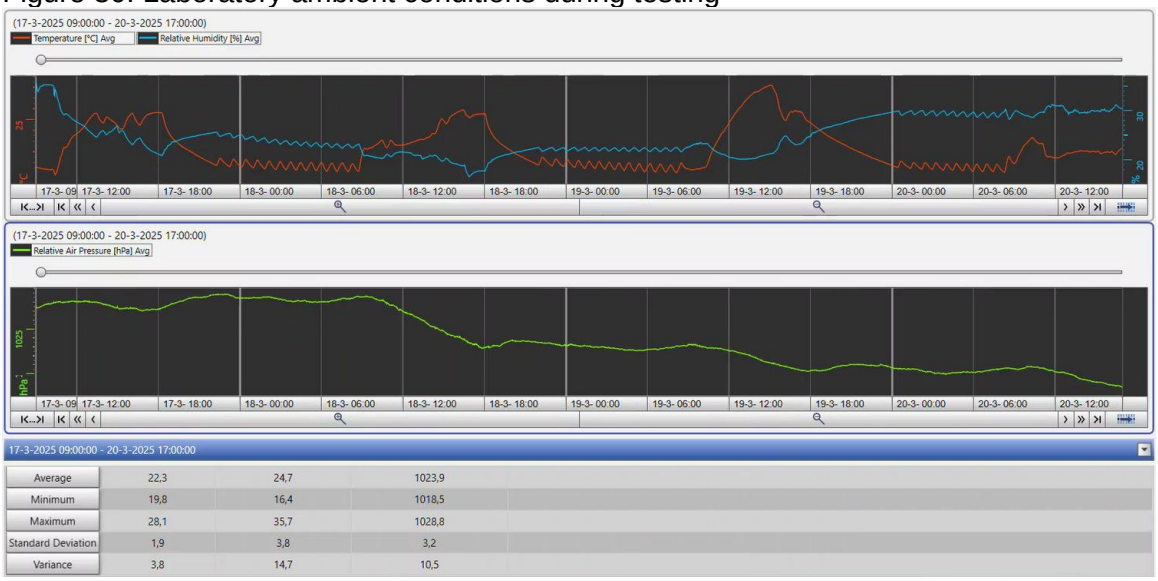


Figure 30: Laboratory ambient conditions during testing



Average	22,3	24,7	1023,9
Minimum	19,8	16,4	1018,5
Maximum	28,1	35,7	1028,8
Standard Deviation	1,9	3,8	3,2
Variance	3,8	14,7	10,5

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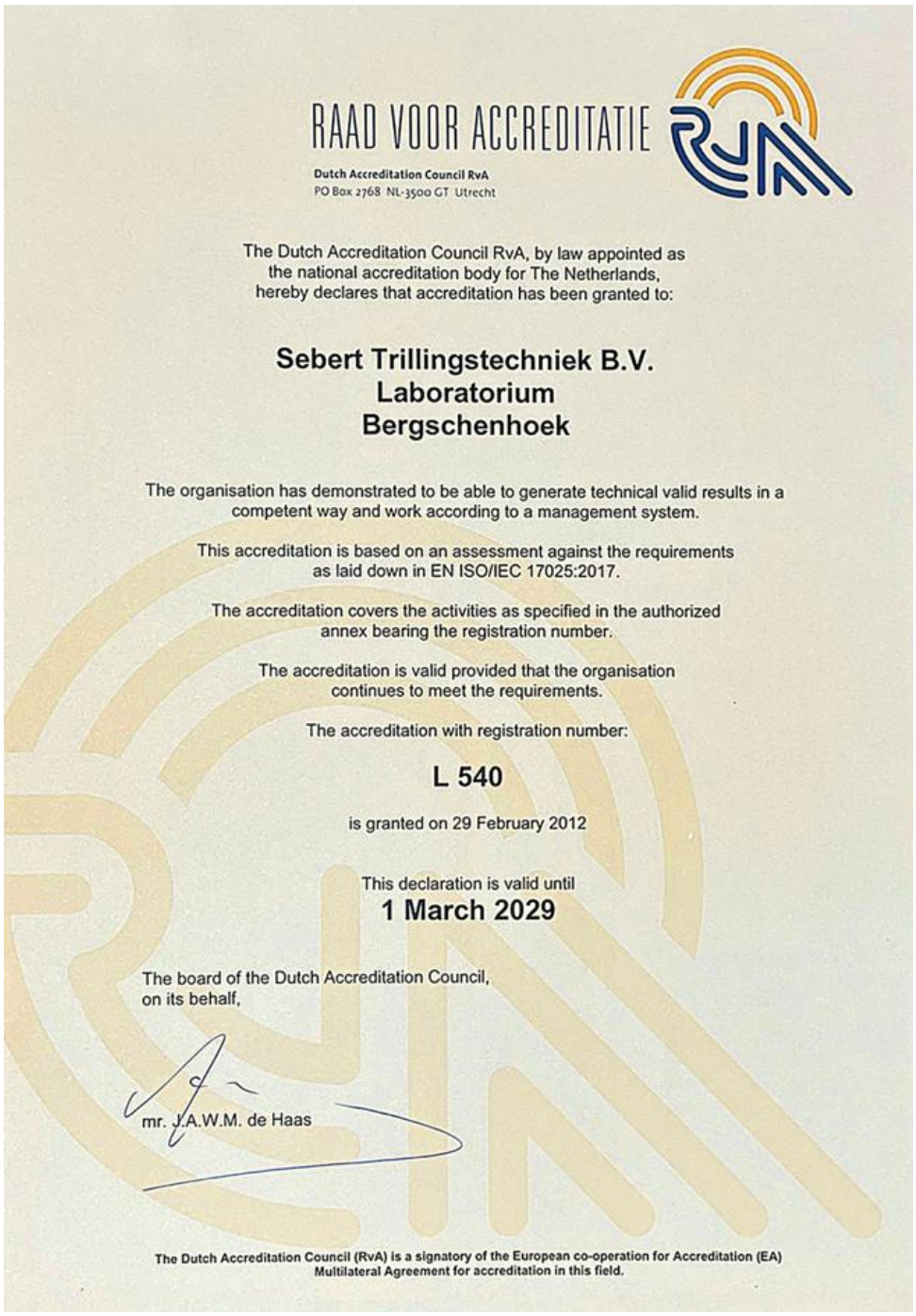
Abbreviations

Acc	Acceleration
ASD	Acceleration Spectral Density
AvC	Average Control
dB	decibel
DOF	Degrees of Freedom
Drive	Voltage output of the controller used to drive the shaker
DUT	Device under test
Dwell	Endurance test on ‘fixed’ frequency
Fail	Criteria if the DUT is tested outside the described TS of the normative doc
Fn	Natural frequency
g	Acceleration due to gravity (equal to 9,81 m/s^2)
Hz	Hertz
IFC	Information from customer
kg	Kilogram
Manuf	Manufacturer
ms	Milliseconds, nominal duration
N	Newton (force)
Oct/min.	Sweep rate
Oper	Operational
Pa	Pressure
Pass	Criteria if the DUT is tested as described in the TS of the required normative doc
PK	Peak
PK-PK	Peak to Peak
PSD	Power Spectral Density
Q	Quality, Sharpness measure of a resonance
Res	Resonance
RS	Resonance Survey
RMS	Root Mean Square
Seq	Sequence
S/N	Serial Number
SRS	Shock Response Spectrum
Sweep	One sweep up or down
TS	Test Specification
V	Voltage

ISO/IEC 17025 accreditation certificate



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Dutch Accreditation Council RvA
PO Box 2768 NL-3500 GT Utrecht

The Dutch Accreditation Council RvA, by law appointed as the national accreditation body for The Netherlands, hereby declares that accreditation has been granted to:

Sebert Trillingstechniek B.V.
Laboratorium
Bergschenhoek

The organisation has demonstrated to be able to generate technical valid results in a competent way and work according to a management system.

This accreditation is based on an assessment against the requirements as laid down in EN ISO/IEC 17025:2017.

The accreditation covers the activities as specified in the authorized annex bearing the registration number.

The accreditation is valid provided that the organisation continues to meet the requirements.

The accreditation with registration number:

L 540

is granted on 29 February 2012

This declaration is valid until
1 March 2029

The board of the Dutch Accreditation Council, on its behalf,

mr. J.A.W.M. de Haas

The Dutch Accreditation Council (RvA) is a signatory of the European co-operation for Accreditation (EA) Multilateral Agreement for accreditation in this field.

ILAC stands for International Laboratory Accreditation Cooperation. The European Union (EU) has entered into mutual recognition agreements (MRAs) with various countries. This means that the countries have to accept each other's products. The technical aspect of the ISO/IEC 17025 standard relates to the use of qualified and experienced staff. All test equipment in our Sebert Trillingstechniek laboratory has been calibrated and checked in accordance with the ISO/IEC 17025 standard. This ensures that the tests, obtained in an independent, professional and objective manner, are extremely reliable

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