



Taiway Technology Co., LTD.
Environmental Technology &
Testing Laboratories

TEL:03-3286995 FAX:03-3287180
NO. 10, Dinghu 3rd St.,
Guishan District, Taoyuan City 333,
Taiwan



ENVIRONMENTAL TEST REPORT

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CUSTOMER	Perfectron Co., Ltd. Taiwan Branch		JOB NO.	A-7935
ADDRESS	2F., No.190, Sec.2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan (R.O.C.)			
SPECIMEN	Rack-mount Fanless computer		REPORT NO.	C-8990
QUANTITY	1 set	MODEL	HORUS200 Serial model: HORUS200-XXXX (X=0~9, A~Z, a~z, - or blank, for different markets)	




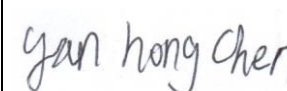
TEST ITEM:

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(According to MIL-STD-810F 5 May 2003)

Issue date: Nov. 13, 2019.

P.S. It takes responsibility only for the specimen been tested.

COMPANY	APPROVAL SIGNATORY	MANAGER OF DEPARTMENT	TEST ENGINEER
	Wan Yi Wang 	Geeng Chang Chen 	Yang Hong Chen 



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1. Low temperature storage test:

Test equipment :

Chamber : MALLIER Temperature/Humidity Testing Chamber, Model: MHT-4YP.

Recorder : YOKOGAWA, Model: 436106, S/N: S5R905831,

Calibration Date: Jun.04, 2019.

Test ambience :

Temperature : $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $44\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Rack-mount Fanless Computer

Model : HORUS200

Quantity : 1 set

Test condition :

Temperature : -33°C , 4 hours, Change rate: $\leq 20^{\circ}\text{C}/\text{hour}$.

Performance Check: The performance check was carried out after the Low temperature storage test.

Test procedure: MIL-STD-810F method 502 procedure I

Test results:

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.2.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal after the Low temperature storage test.



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2. High temperature storage test:

Test equipment :

Chamber : MALLIER Temperature/Humidity Testing Chamber, Model: MHT-4YP.

Recorder : YOKOGAWA, Model: 436106, S/N: S5R905831,

Calibration Date: Jun.04, 2019.

Test ambience :

Temperature : $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $46\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Rack-mount Fanless Computer

Model : HORUS200

Quantity : 1 set

Test condition :

Temperature : 71°C , 4 hours, Change rate: $\leq 20^{\circ}\text{C}/\text{hour}$.

Performance Check: The performance check was carried out after the High temperature storage test.

Test procedure : MIL-STD-810F method 501 procedure I

Test results:

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.3.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal after the High temperature storage test.



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3. Low temperature operating test:

Test equipment :

Chamber : MALLIER Temperature/Humidity Testing Chamber, Model: MHT-4YP.

Recorder : YOKOGAWA, Model: 436106, S/N: S5R905831,

Calibration Date: Jun.04, 2019.

Test ambience :

Temperature : $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $47\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Rack-mount Fanless Computer

Model : HORUS200

Quantity : 1 set

Test condition :

Temperature : 0°C , 4 hours, Change rate: $\leq 20^{\circ}\text{C}/\text{hour}$.

Performance Check: The performance check was carried out during and after the Low temperature operating test.

Test procedure: According to MIL-STD-810F method 502 procedure II.

Test results:

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.4.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after the Low temperature operating test.



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4. High temperature operating test:

Test equipment :

Chamber : MALLIER Temperature/Humidity Testing Chamber, Model: MHT-4YP.

Recorder : YOKOGAWA, Model: 436106, S/N: S5R905831,

Calibration Date: Jun. 04, 2019.

Test ambience :

Temperature: $24^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $46\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Rack-mount Fanless Computer

Model : HORUS200

Quantity : 1 set

Temperature : 50°C , 4 hours, Change rate: $\leq 20^{\circ}\text{C}/\text{hour}$.

Performance Check: The performance check was carried out during and after the High temperature operating test.

Test procedure: According to MIL-STD-810F method 501 procedure II.

Test results:

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.5.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after the High temperature operating test.



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5. Humidity test:

Test equipment:

Chamber : MALLIER Temperature/Humidity Testing Chamber, Model: MHT-4YP.
Recorder : YOKOGAWA, Model: 436106, S/N: S5R905831,
Calibration Date: Jun.04, 2019.

Test ambience :

Temperature: $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$
Humidity : $46\% \pm 5\%(\text{RH})$

Specimen & Model quantity:

Specimen : Rack-mount Fanless Computer
Model : HORUS200
Quantity : 1 set

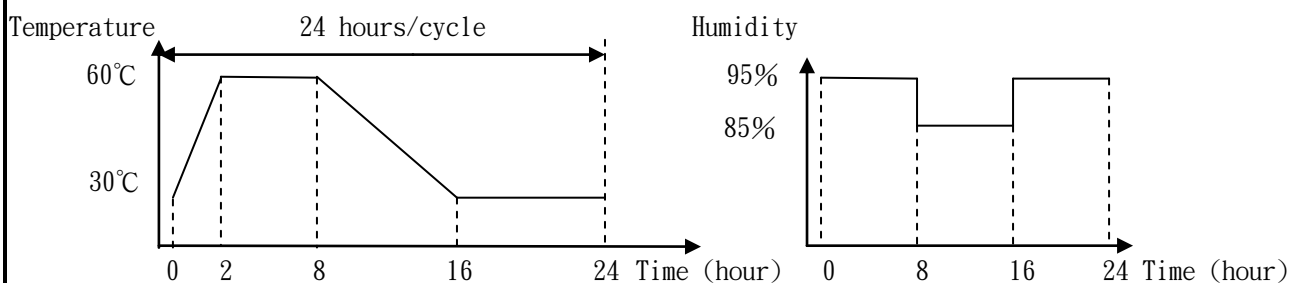
Test condition :

Temperature / Humidity :

Pre-conditioning period: $23 \pm 2^{\circ}\text{C}$ and $50 \pm 5\% \text{RH}$, maintain for 24 hours.
 $30^{\circ}\text{C} \sim 60^{\circ}\text{C}$, $85\% \sim 95\% \text{RH}$ without condensation, 24 hours/cycle, conduct 10 cycles.

Performance Check: The performance check was carried out before, during (before the end of 1, 5, 10 cycle) and after the Humidity test.

Test procedure : According to MIL-STD-810F method 507.4.



Test results:

1. Test configuration was shown in Fig.1.
2. The testing data were shown in Fig.6A~Fig.6D.
3. Test specimen was visually inspected after test. There are some oxidation corrosion of screws, shown as Fig.6E.
4. The function of specimen was normal during and after the Humidity test.



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6. Vibration test:

Test equipment:

U-D vibration machine, model: TA240D-208/CSTA.

Control System: VCS-USB CONTROLLER.

Control Accelerometer: DYTRAN 3055B2, sensitivity: 102.869 mv/g,

Calibration date: Dec.25, 2018.

Test ambience:

Temperature : $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $49\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Rack-mount Fanless Computer

Model : HORUS200

Quantity : 1 set

Test condition:

Frequency Range: 5 Hz~500 Hz °

G_{rms} level: Vertical 2.20 g_{rms}, Transverse 1.62 g_{rms}, Longitudinal 2.05 g_{rms}.

Test time: 40 minutes/axis.

Test procedure: According to MIL-STD-810F Method 514.5 Table 514.5C-VII
and Figure 514.5C-3. (Table and figure were shown as next
two pages.)

Test results:

1. Test configuration was shown in Fig.7.
2. The testing data were shown in Fig.8.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after the Composite wheeled vehicle vibration test.



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TABLE 514.5C-VII. Break points for figure 514.5C-3

Composite wheeled vehical vibration exposures figure 514.5C-3					
Vertical		Transverse		Longitudinal	
Hz	g ² /Hz	Hz	g ² /Hz	Hz	g ² /Hz
5	0.2366	5	0.1344	5	0.0593
8	0.6889	7	0.1075	8	0.0499
12	0.0507	8	0.1279	15	0.0255
21	0.0202	14	0.0366	16	0.0344
23	0.0301	16	0.0485	20	0.0134
24	0.0109	17	0.0326	23	0.0608
26	0.0150	19	0.0836	25	0.0148
49	0.0038	23	0.0147	37	0.0040
51	0.0054	116	0.0008	41	0.0059
61	0.0023	145	0.0013	49	0.0016
69	0.0111	164	0.0009	63	0.0011
74	0.0029	201	0.0009	69	0.0040
78	0.0048	270	0.0051	78	0.0008
84	0.0033	298	0.0021	94	0.0020
90	0.0052	364	0.0099	98	0.0013
93	0.0034	375	0.0019	101	0.0025
123	0.0083	394	0.0073	104	0.0014
160	0.0041	418	0.0027	111	0.0024
207	0.0055	500	0.0016	114	0.0014
224	0.0139	1.62 g rms		117	0.0020
245	0.0031			121	0.0012
276	0.0129			139	0.0024
287	0.0036			155	0.0021
353	0.0027			161	0.0034
375	0.0049			205	0.0042
500	0.0010			247	0.0303
2.20 g rms				257	0.0027
		293	0.0092		
		330	0.0116		
		353	0.0231		
		379	0.0083		
		427	0.0220		
		500	0.0014		
				2.05 g rms	



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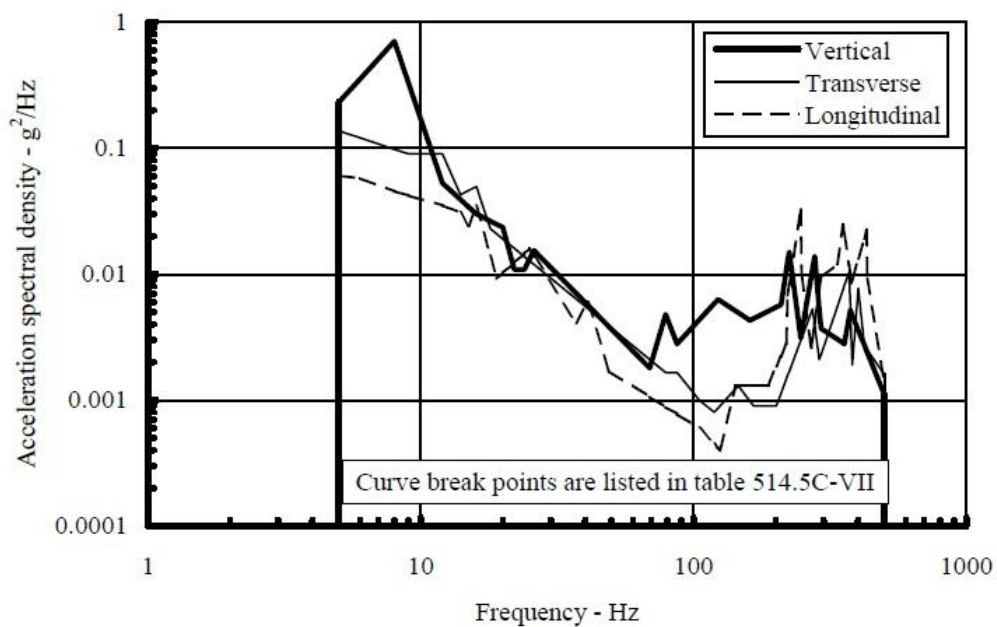


FIGURE 514.5C-3. Composite wheeled vehicle vibration exposure.



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7. Shock Test :

Test equipment :

U-D vibration machine, model: TA240D-208/CSTA.

Control System: VCS-USB CONTROLLER.

Control Accelerometer: DYTRAN 3055B2, sensitivity: 102.869 mv/g,

Calibration date: Dec.25, 2018.

Test ambience :

Temperature : $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $49\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Rack-mount Fanless Computer

Model : HORUS200

Quantity : 1 set

Test condition :

Wave Form : Saw Tooth Wave

Acceleration Peak: 20 Grms, for all 3 axes.

Duration : 11ms

Shock Times : 10 times for each direction, 6 directions, 60 times in total.

Test procedure: According to MIL-STD-810F Method 516.5 Procedure I.

Test results:

1. Test configurations were shown in Fig.7.
2. The testing data were shown in Fig.9.
3. Test specimen was visually inspected after test. No physical damage occurred.
4. The function of specimen was normal during and after Shock test.



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8. Drop test :

Test equipment :

TAIWAY Drop Machine.

Model : TW-D-065.

Test ambience :

Temperature : $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : $55\% \pm 5\%(\text{RH})$

Specimen & Model quantity :

Specimen : Dual Removable Solid-State Disk

Quantity : 1 set

Test condition : (Packaged)

Height : 122 cm.

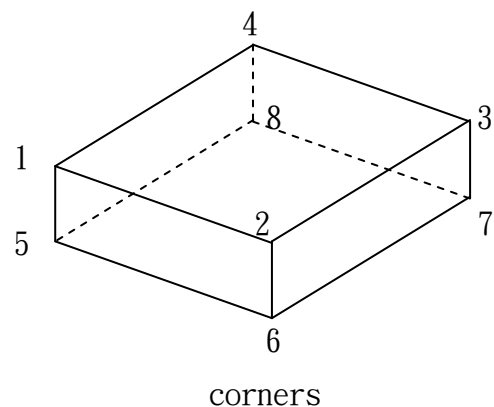
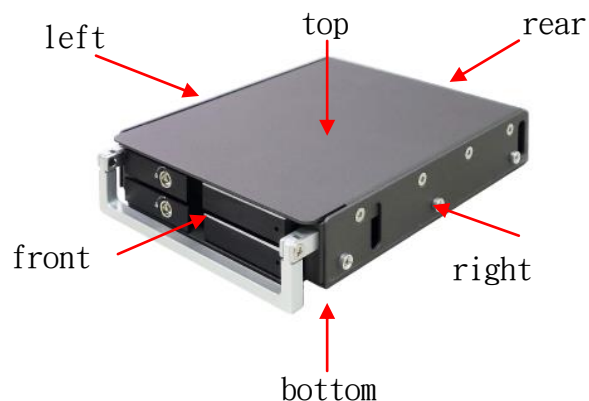
Times of drop : 1 time for each of

8 corners (1, 2, 3, 4, 5, 6, 7, 8),

12 edges (corner 1-5, 2-6, 3-7, 4-8, 1-2, 3-4, 5-6, 7-8, 1-4, 2-3, 5-8, 6-7),

6 faces (front, rear, left, right, bottom, top).

Test procedure: According to MIL-STD-810F Method 516.5 Procedure IV.





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Test results:

1. Test configurations were shown in Fig.10A~ Fig.10H.
2. Test specimen was visually inspected after test. There are some distortions on metal casing. The Dual Removable Solid-State Disk can be installed into Rack-mount Fanless Computer, and work normal.
3. The function of specimen was normal after Drop test.



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Fig.1 : Low / High temperature storage / Operating and
Humidity test



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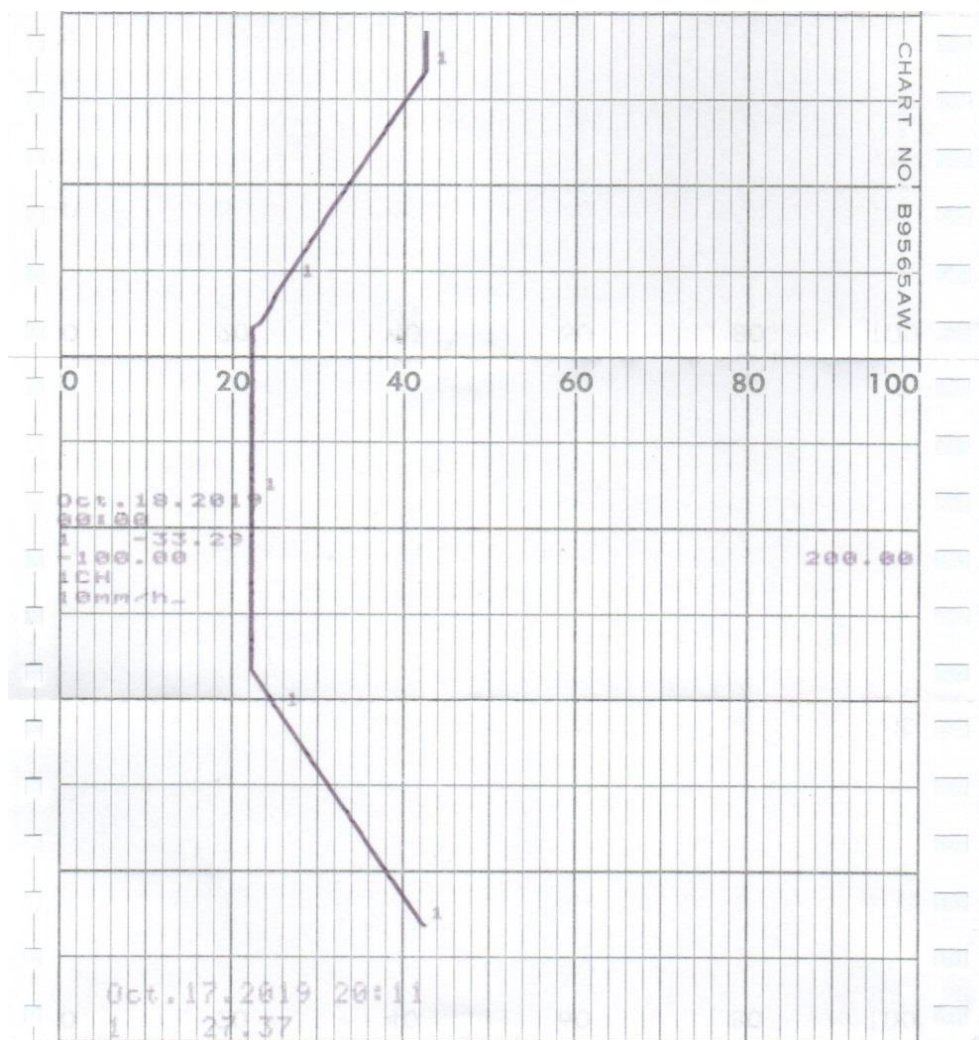
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div}$.

Chart speed: 10 mm/hr

Fig. 2 : Low temperature storage test record



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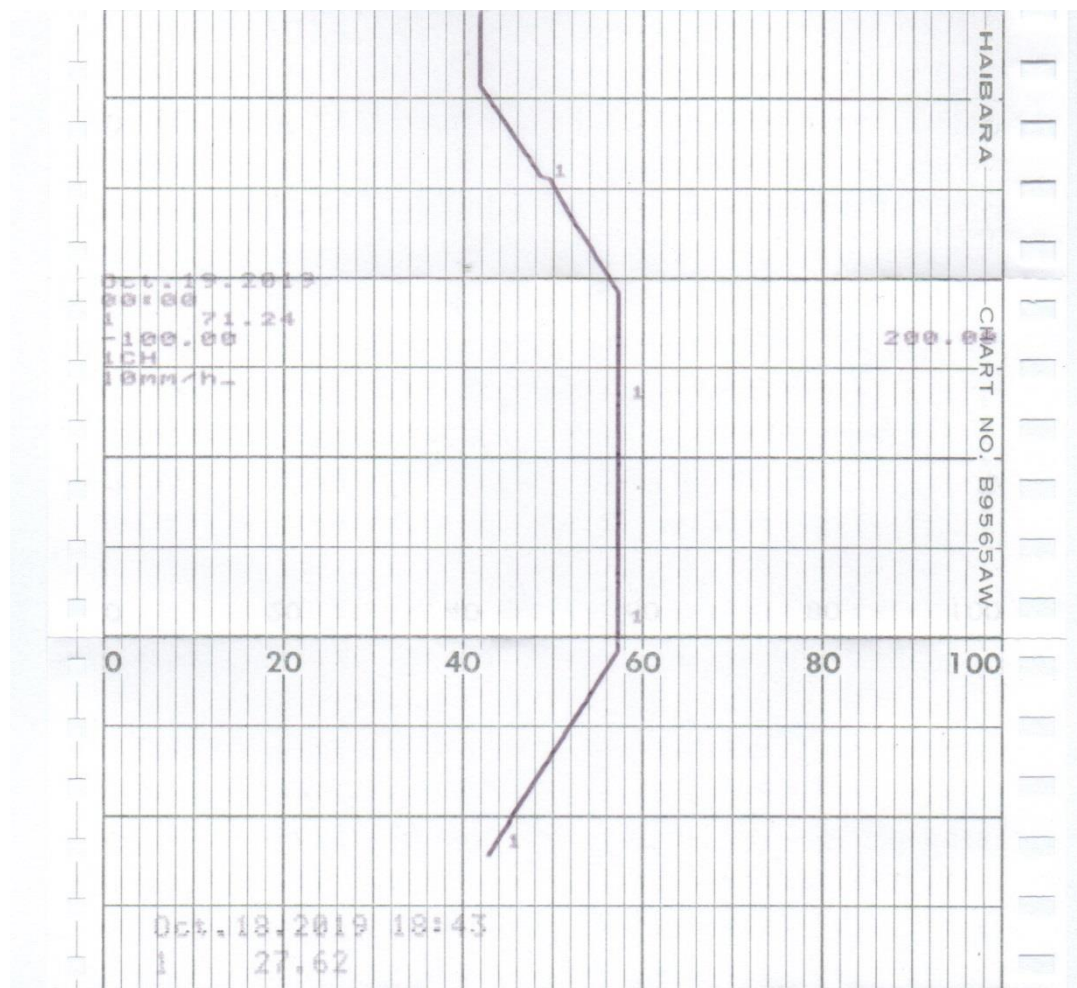
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div}$.
Chart speed: 10 mm/hr

Fig. 3 : High temperature storage test record



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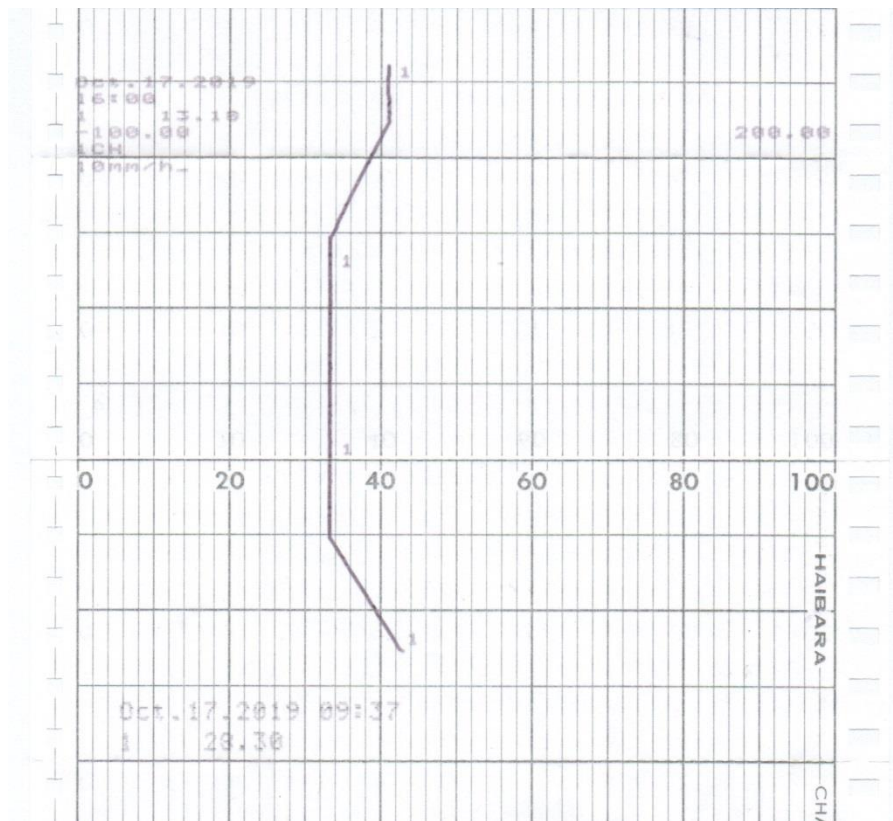
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div.}$

Chart speed: 10 mm/hr

Fig. 4 : Low temperature operating test record



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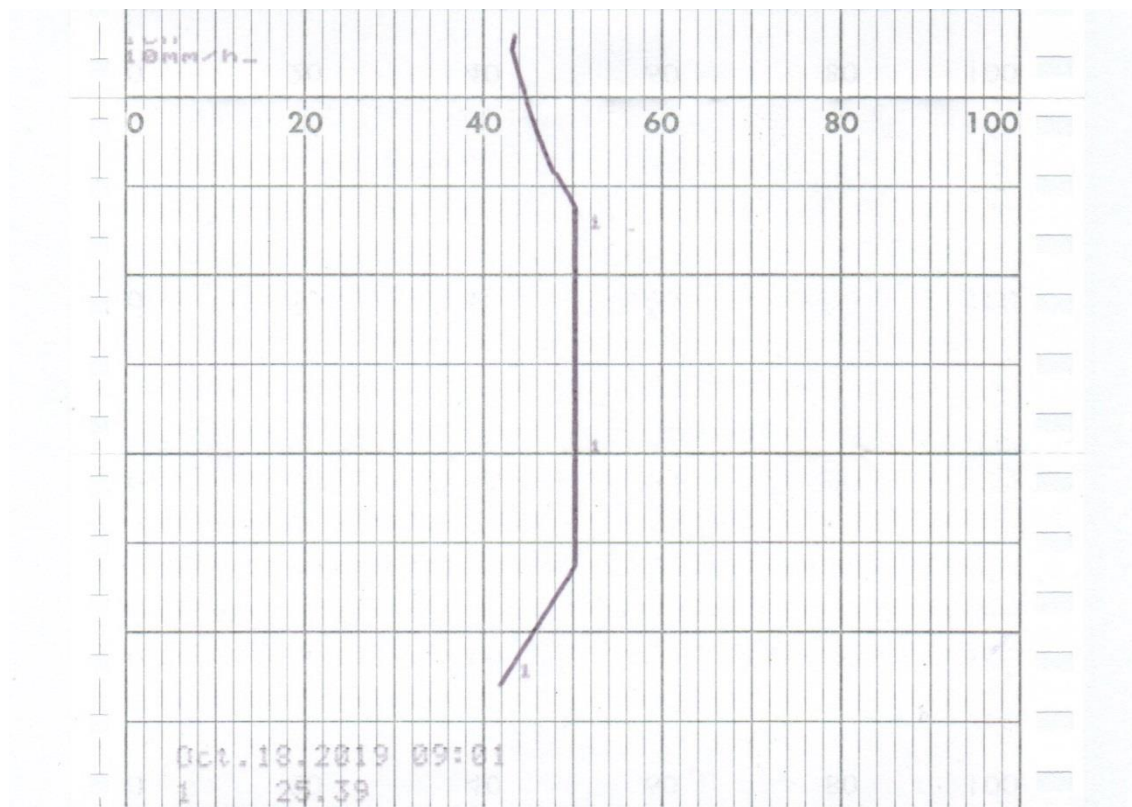
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div}$.

Chart speed: 10 mm/hr

Fig. 5 : High temperature operating test record



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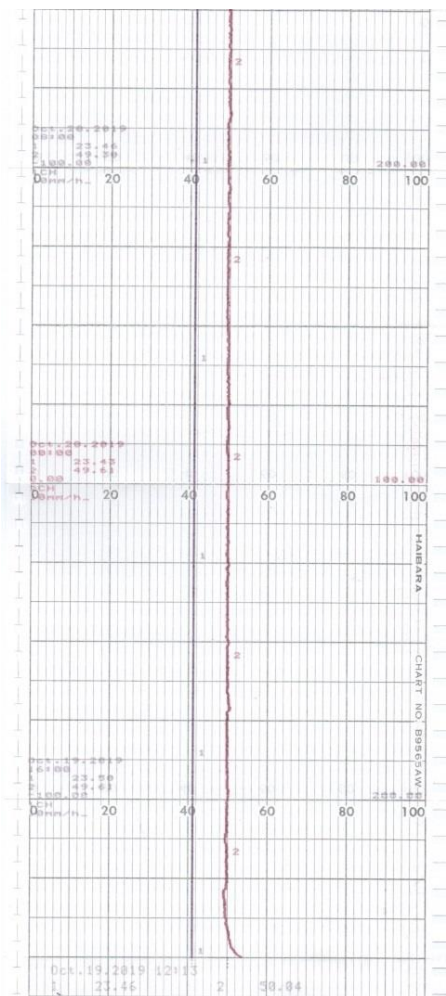
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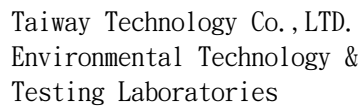
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div.}$
Humidity span: $0\% \sim 100\%(\text{RH})$, Humidity scale: $2\%(\text{RH})/\text{div.}$
Chart speed: 10 mm/hr.

Fig.6A : Humidity test record (Pre-conditioning period)



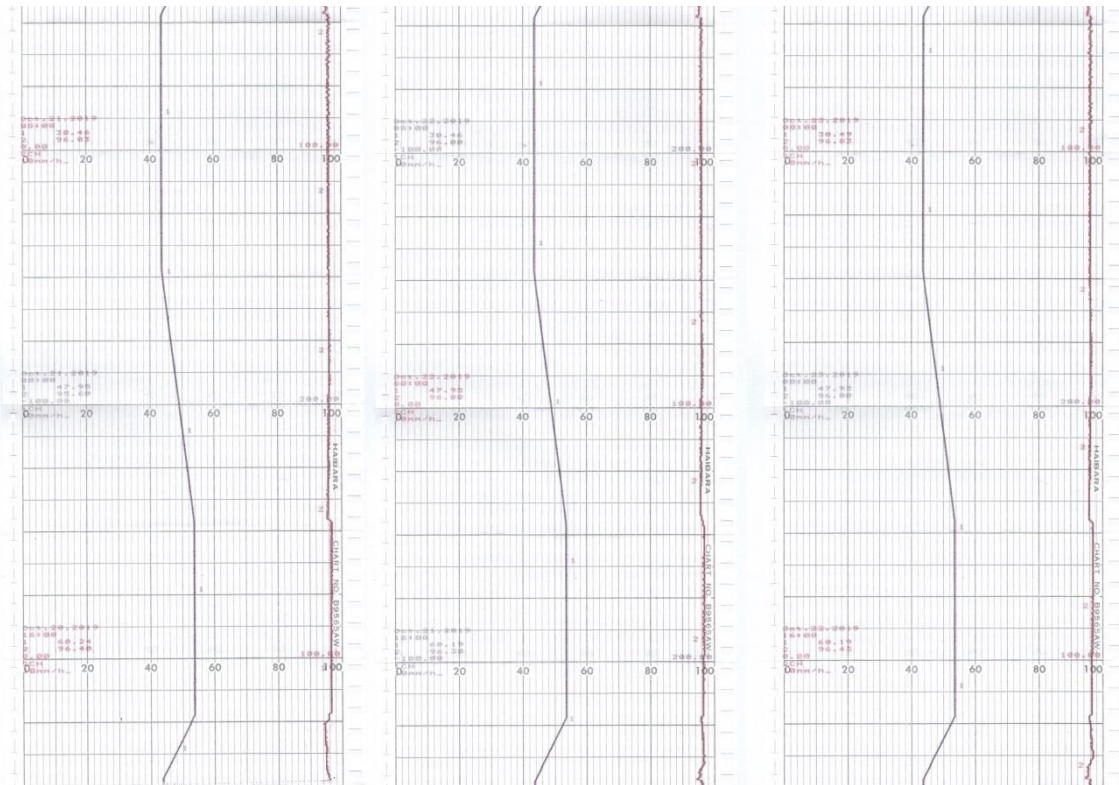
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Temperature span: $-100.0^{\circ}\text{C}\sim+200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div}$.

Humidity span: 0%~100%(RH), Humidity scale: 2%(RH)/div.

Chart speed : 10 mm/hr.

Fig.6B : Humidity test record (cycle 1- 3)



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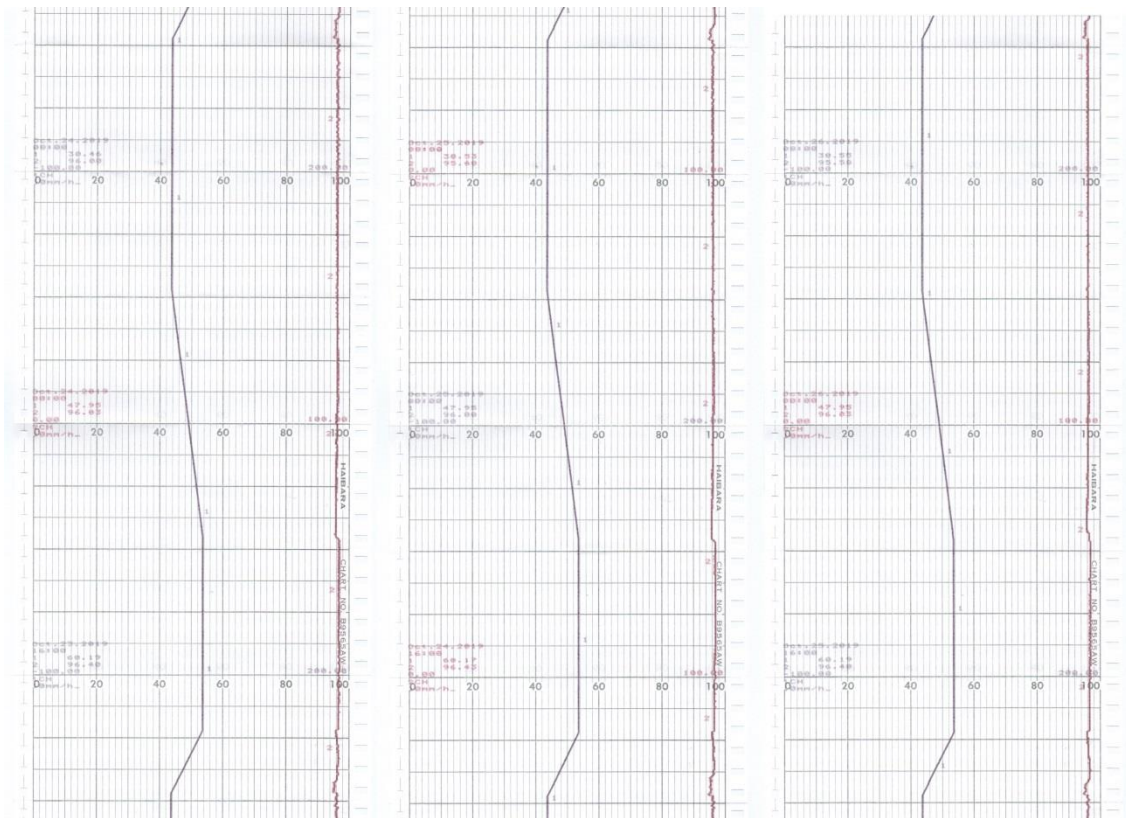
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div.}$
Humidity span: $0\% \sim 100\%(\text{RH})$, Humidity scale: $2\%(\text{RH})/\text{div.}$
Chart speed: 10 mm/hr.

Fig.6C : Humidity test record (cycle 4- 6)



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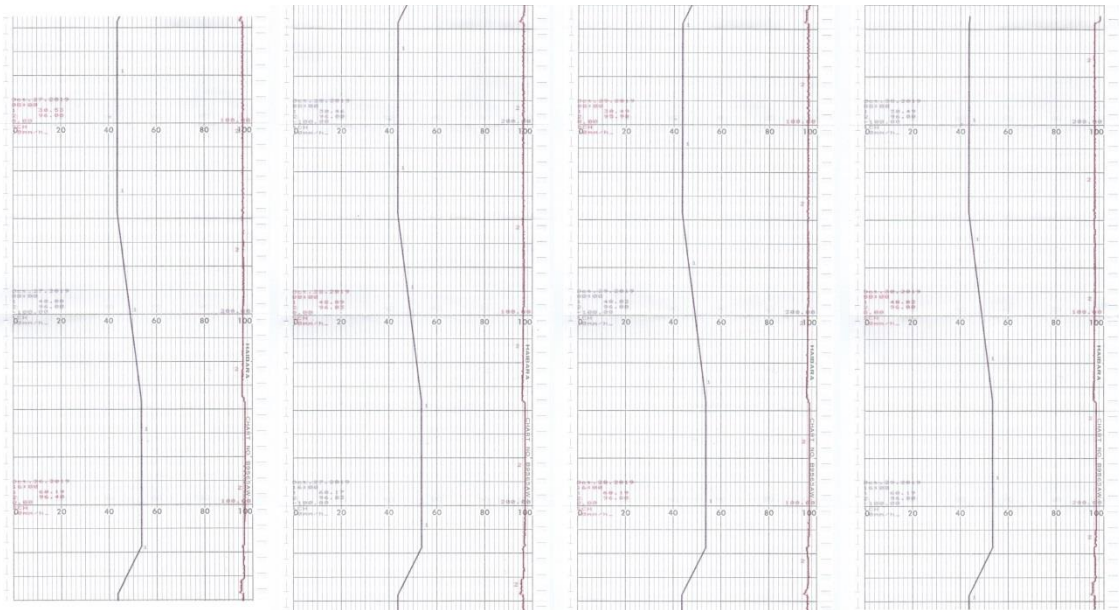
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Temperature span: $-100.0^{\circ}\text{C} \sim +200.0^{\circ}\text{C}$, Temperature scale: $6^{\circ}\text{C}/\text{div.}$
Humidity span: $0\% \sim 100\%(\text{RH})$, Humidity scale: $2\%(\text{RH})/\text{div.}$
Chart speed: 10 mm/hr.

Fig. 6D : Humidity test record (cycle 7- 10)



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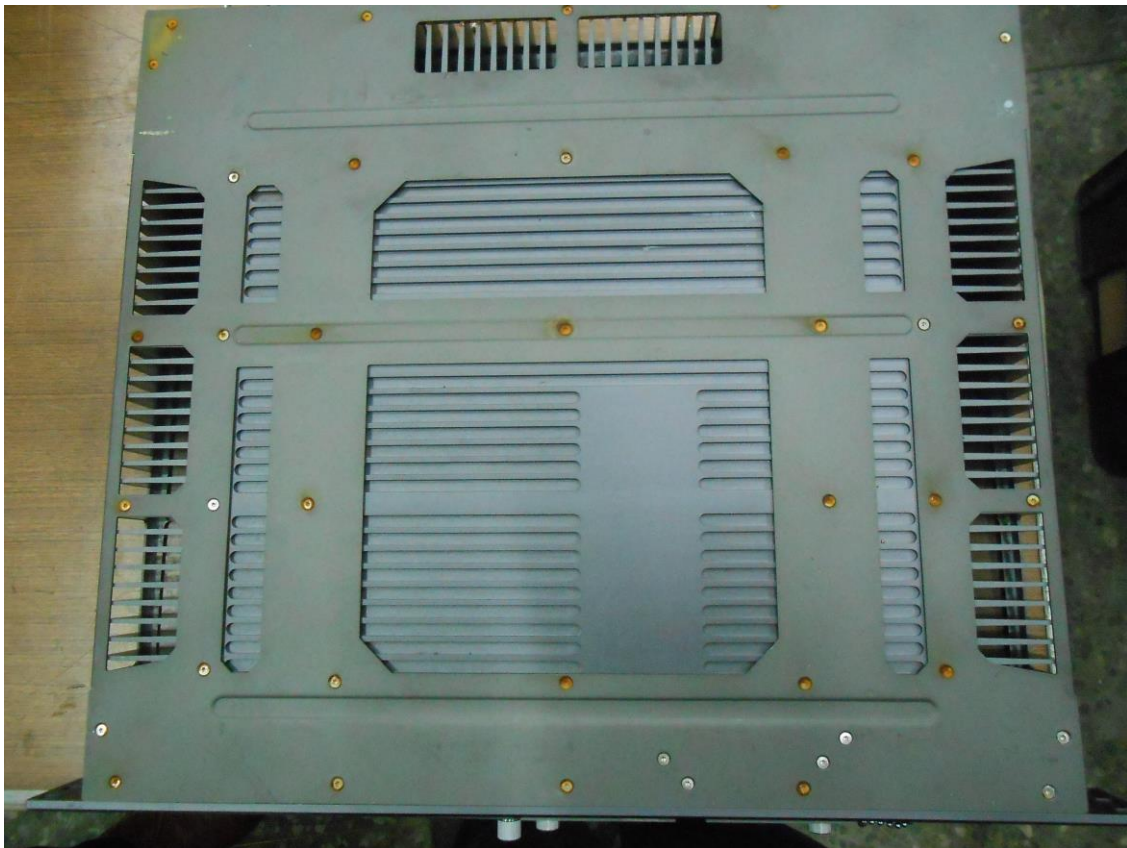


Fig.6E : Corrosion screws after Humidity test



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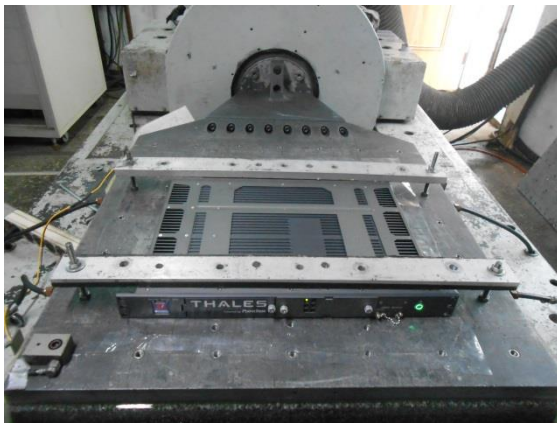
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Longitudinal Axis



Transverse Axis



Vertical Axis

Fig. 7 : Random Vibration Test



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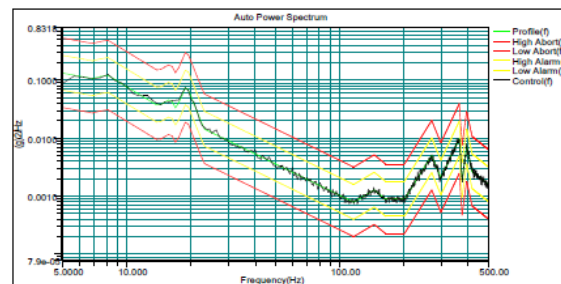
Test Name: 5-500Hz(X-2.05g).ucn
Test type: Random Test



Current Level: 100 % Demand RMS: 2.0973 g Control RMS: 2.10529 g
Frame Time: 1.600000 (s) Lines: 800 dF: 0.625000 Hz
DOF: 150 Test Elapsed: 00:40:19 Remaining Time: 00:00:00
Data was saved as a file at time: 2019-10-9 PM 03:55:58

Longitudinal Axis

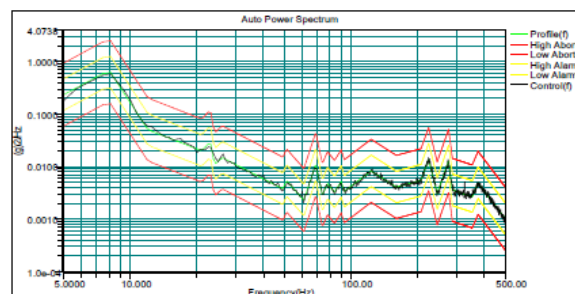
Test Name: 5-500Hz(Y-1.62g).ucn
Test type: Random Test



Current Level: 100 % Demand RMS: 1.59513 g Control RMS: 1.60235 g
Frame Time: 1.600000 (s) Lines: 800 dF: 0.625000 Hz
DOF: 150 Test Elapsed: 00:40:19 Remaining Time: 00:00:00
Data was saved as a file at time: 2019-10-9 PM 04:49:37

Transverse Axis

Test Name: 5-500Hz(Z-2.20g).ucn
Test type: Random Test



Current Level: 100 % Demand RMS: 2.18002 g Control RMS: 2.1824 g
Frame Time: 1.600000 (s) Lines: 800 dF: 0.625000 Hz
DOF: 150 Test Elapsed: 00:40:19 Remaining Time: 00:00:00
Data was saved as a file at time: 2019-10-9 PM 02:52:22

Vertical Axis

Fig. 8: Random Vibration Test Data



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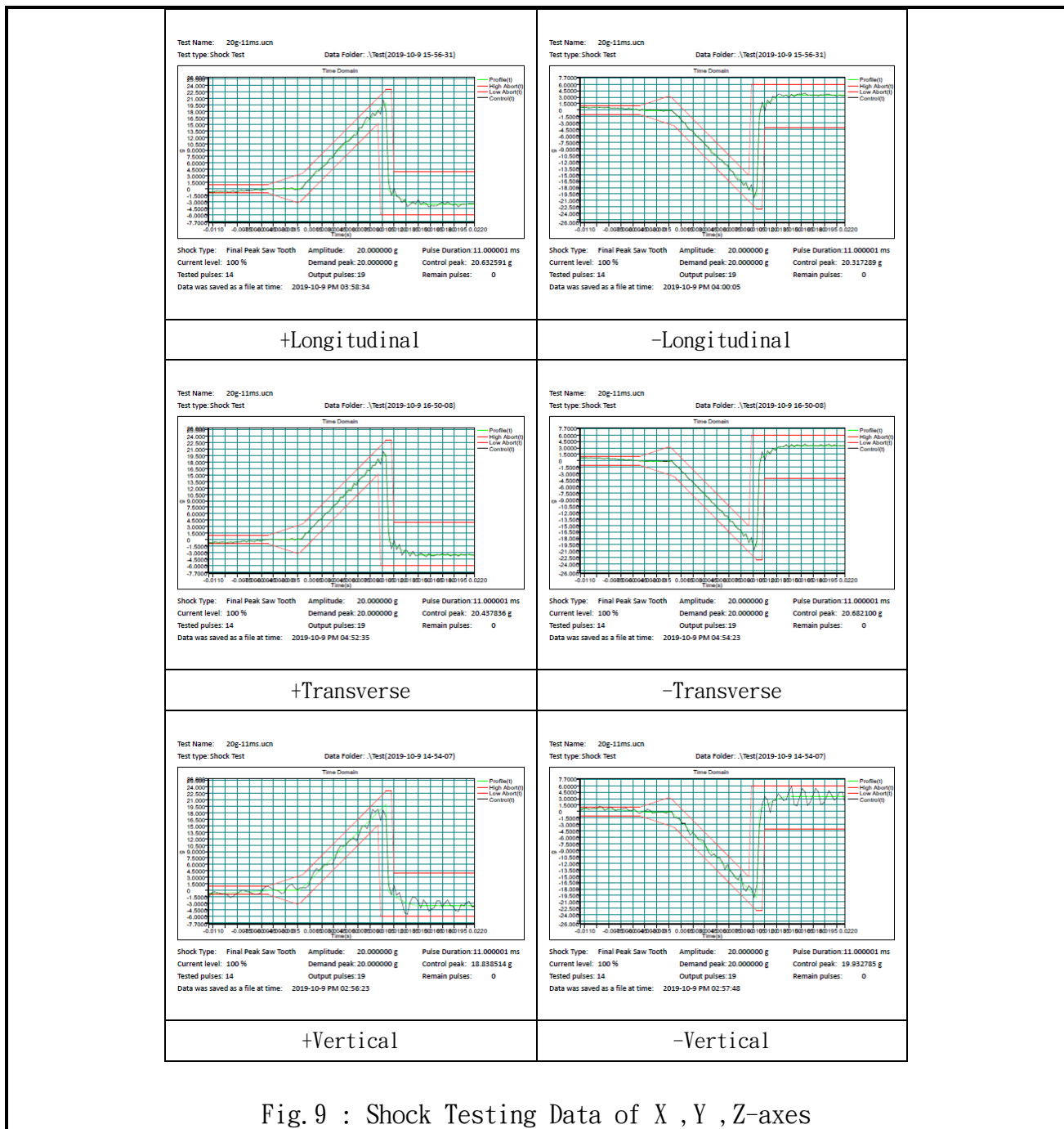


Fig.9 : Shock Testing Data of X ,Y ,Z-axes



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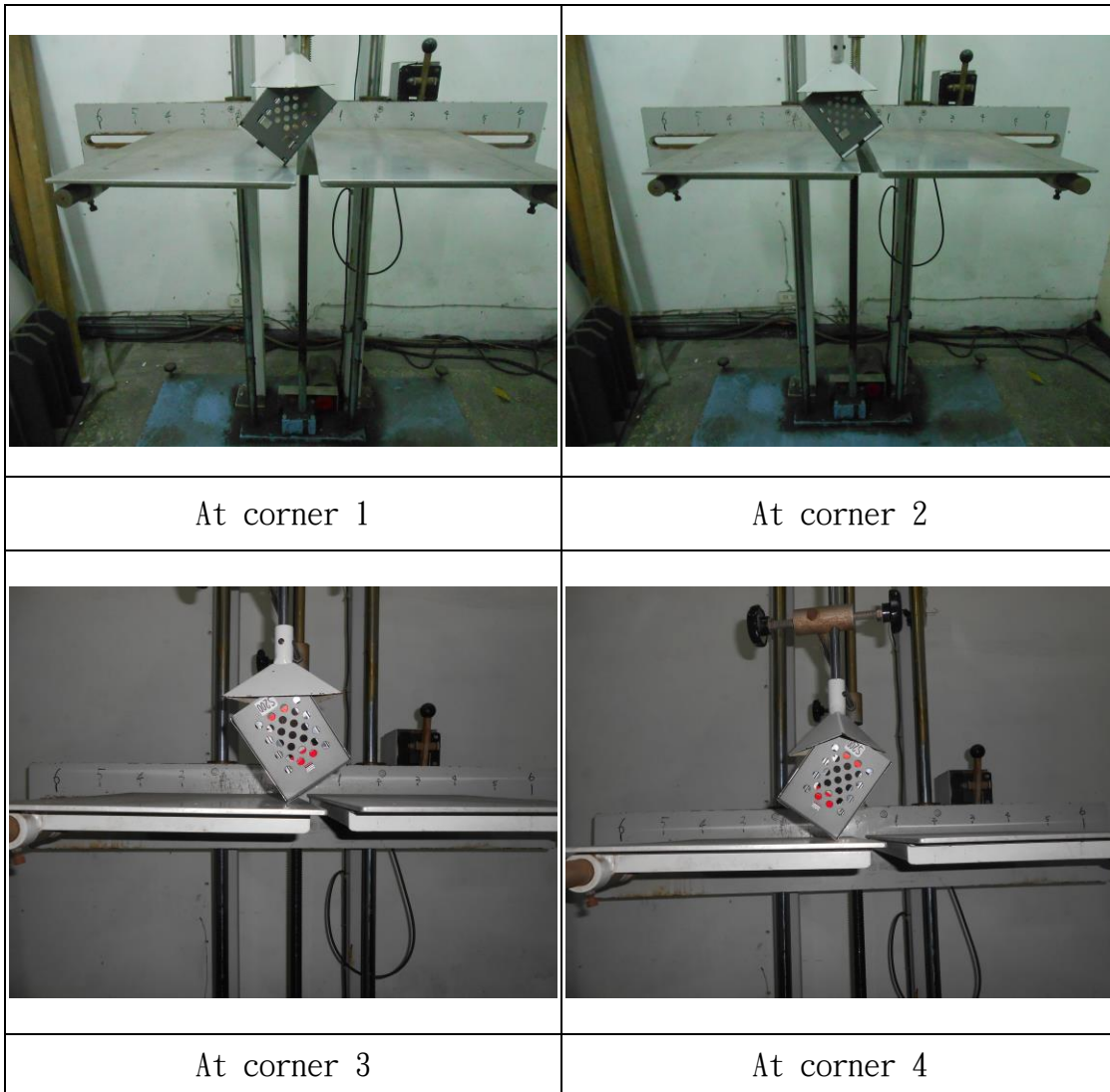


Fig.10A: Drop test (At corner 1~ 4)



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At corner 5



At corner 6



At corner 7



At corner 8

Fig.10B: Drop test (At corner 5~ 8)



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At edge 15



At edge 26



At edge 37



At edge 48

Fig.10C: Drop test (At edge 15, 26, 37, 48)



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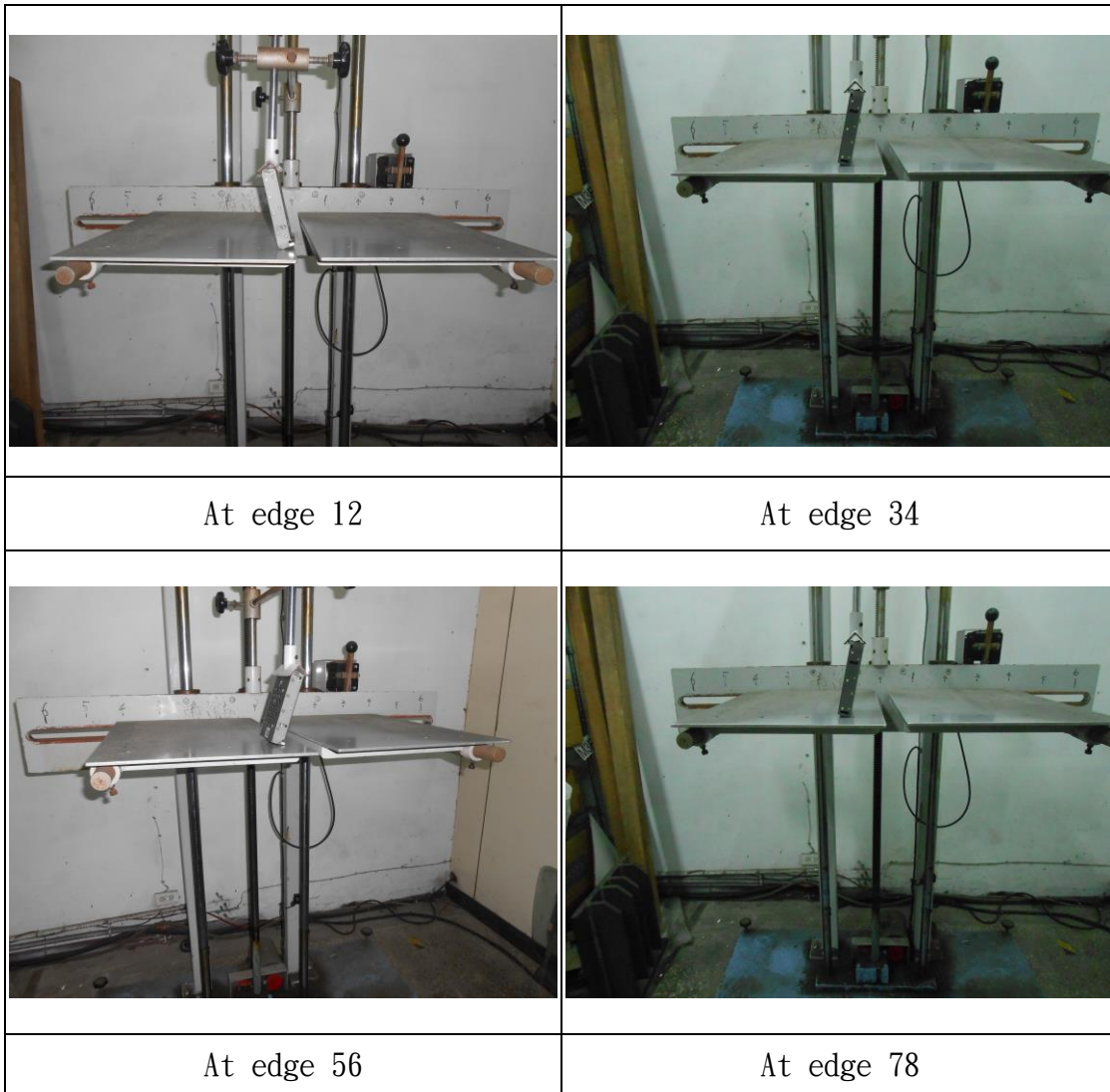


Fig.10D: Drop test (At edge 12, 34, 56, 78)



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At edge 14



At edge 23



At edge 58



At edge 67

Fig.10E: Drop test (At edge 14, 23, 58, 67)



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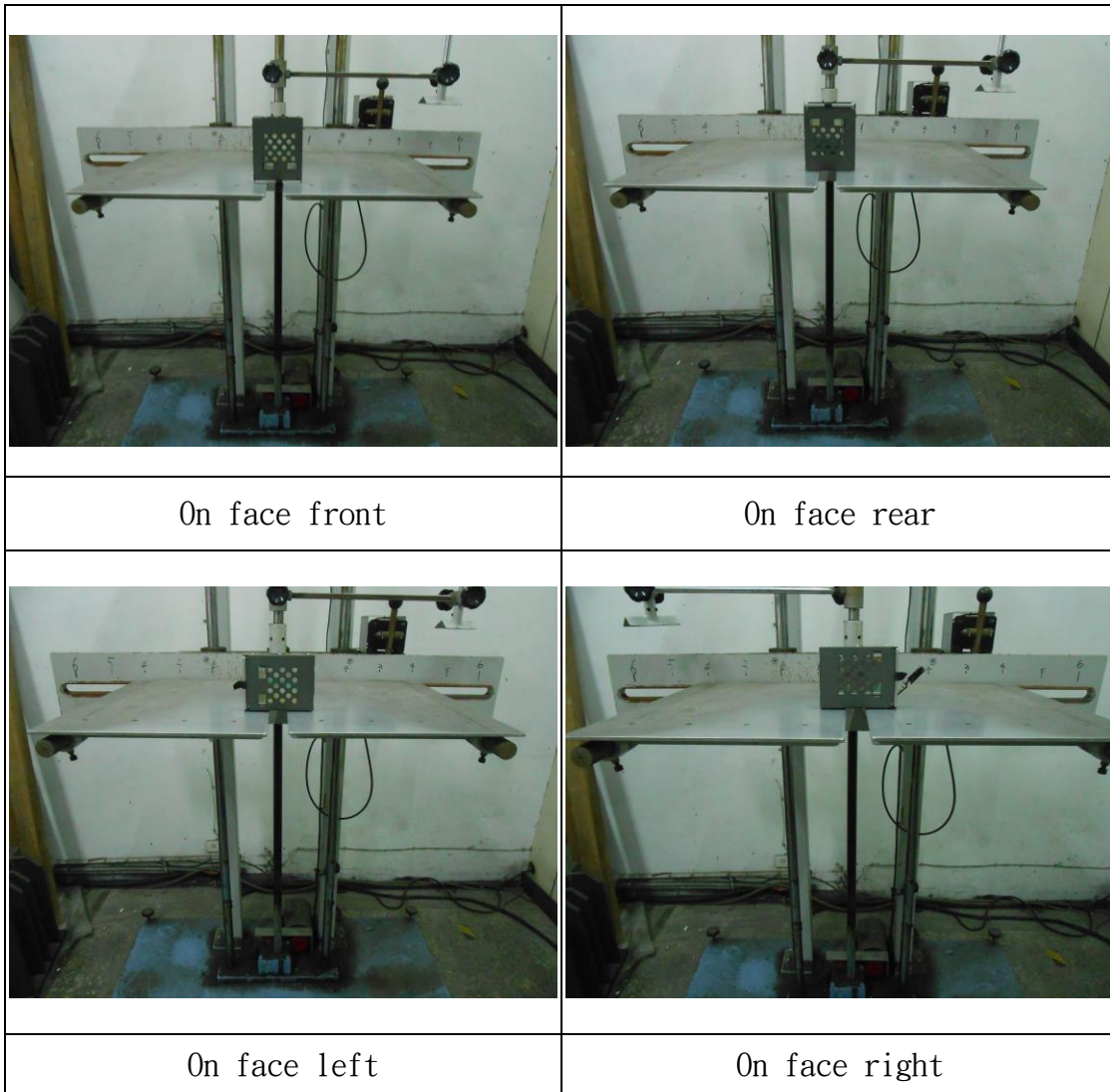


Fig.10F: Drop test (At face front, rear, left, right)



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On face bottom



On face top

Fig.10G: Drop test (At face bottom, top)