Thermal Vibrational Test Equipment

Introduction

- Temperature Range : -40 ℃ ~ 150 ℃
- Relative Humidity : 10 %R.H ~ 95 %R.H
- Vibration Frequency : 1 Hz ~ 2000 Hz
- Vibration Force : 5000 kgf
- Table Size :
  - ➢ XY axis -- 120 cm × 120 cm / 400 kg (M10, Hole spacing 5 cm)
  - ➢ Z axis -- 80 cm × 80 cm / 180 kg (M10, Hole spacing 10 cm)
  - ➢ Z axis -- 180 cm × 70 cm / 400 kg (M10, Hole spacing 10 cm)
- Table Chamber :
  195cm (W) × 160cm (H) × 200cm (D)

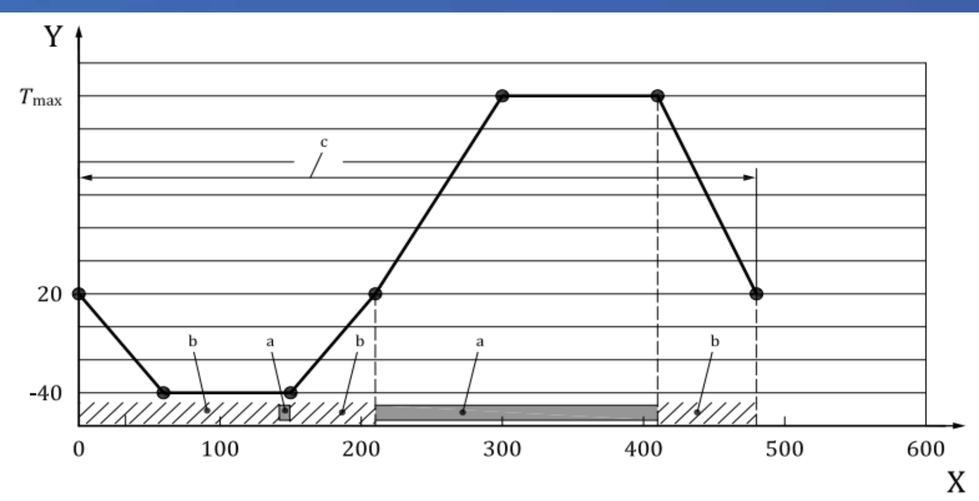
Test Principle

- The Thermal vibration tester can imitate the natural environment, warm humidity and vibration change and injury of the products of three kinds of physical quantities, and to the adaptability of the environment by already assessing the reliability of the products, so can carry on the warm humidity to changes and shakes at random at the same time, find out some of limit of the products and products flaw.

Test Procedure

- Specially engineered systems deliver stress of rapid thermal cycling and random vibration which are used to rapidly reveal design weaknesses and product problems.
- Stresses are usually delivered in an ordered sequence:
  - ➢ Ex : Combined Environment
    - Rapid Thermal Cycling
    - Vibration Step Stress

- According to standard
  - IEC 60068-2-6
  - IEC 60068-2-64
  - MIL-STD-810H
  - ISO 16750-3
  - ISTA 1 Series、ISTA 2 Series、ISTA 3 Series、ISTA 6 Series…



Key
Y temperature [°C]
X time [min]

a Operating mode 3.2 according to ISO 16750-1.
b Operating mode 2.1 according to ISO 16750-1.
c One cycle.

Figure 1 — Temperature profile for the vibration test

Table 516.8-VII Procedure II - Transportation shock test sequence[1, 2, 3].

On Road (5000 km)[4] Terminal Peak Sawtooth Pulse Duration: 11 ms			Off Road (1000 km)[4] Terminal Peak Sawtooth Pulse Duration: 5 ms	
Amplitude (G-Pk)	Number of Shocks		Amplitude (G-Pk)	Number of Shocks
5.1	42		10.2	42
6.4	21		12.8	21
7.6	3		15.2	3

Note 1: *The shocks set out in Table 516.8-VII must always be carried out together with ground transportation vibration testing as specified in Method 514.8, Category 4 and/or Category 20.*

Note 2: *The above tabulated values may be considered for both restrained cargo and installed materiel on wheeled and tracked vehicles. Transportation shock associated with two-wheeled trailers may exceed off-road levels as defined.*

Note 3: *The shock test schedule set out in Table 516.8-VII can be undertaken using either terminal peak sawtooth pulses applied in each sense of each orthogonal axis, or a synthesis based on the corresponding SRS that encompasses both senses of each axis.*

Note 4: *The above number of shocks is equivalent to the following distances: a) On-road vehicles: 5000 km; b) Off-road vehicles: 1000 km. If greater distances are required, more shocks must be applied in multiples of the figures above.*

Temperature and Humidity Test Chamber

Introduction

- Model No. :

➢ GIANT FORCE GTH-1000-60-CP-AR-H

- Temperature Range : -60 ℃ ~ 150 ℃
- Relative Humidity : 10 %R.H ~ 95 %R.H
- Chamber Size :
  100 cm (W) × 100 cm (H) × 100 cm (D)

➢ GIANT FORCE GTH-1000-60-CP-AR15

- Temperature Range : -60 ℃ ~ 150 ℃
- Temperature Change Rate : 15 ℃/min
- Chamber Size :
  100 cm (W) × 100 cm (H) × 100 cm (D)

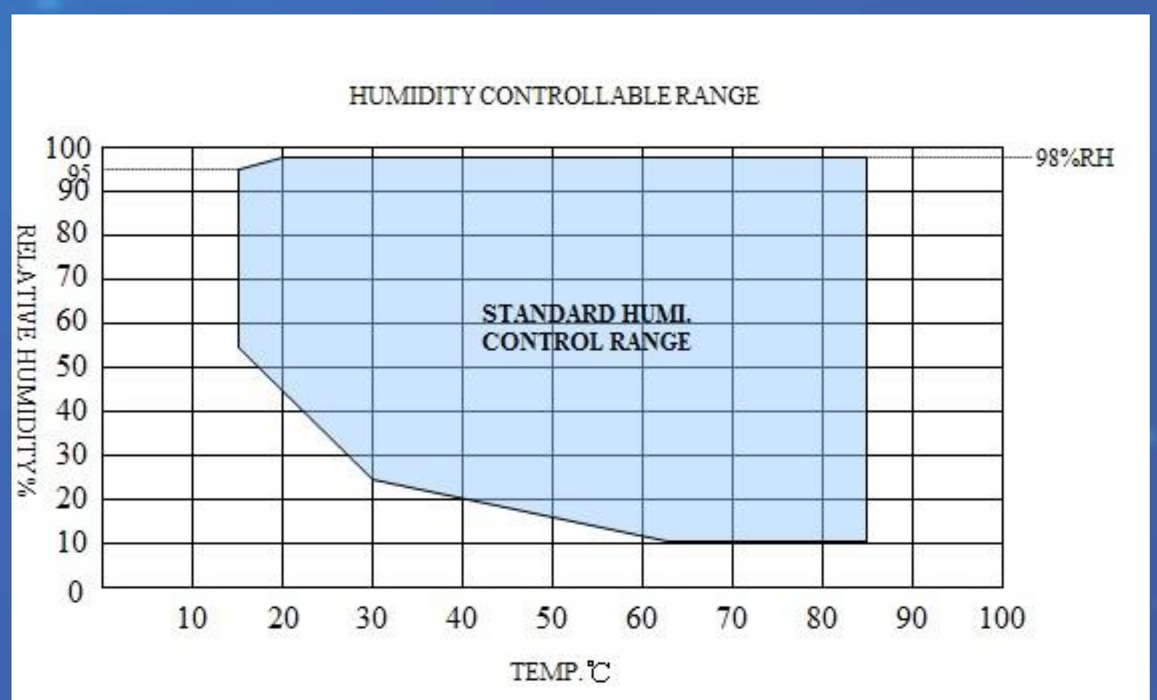
Test Principle

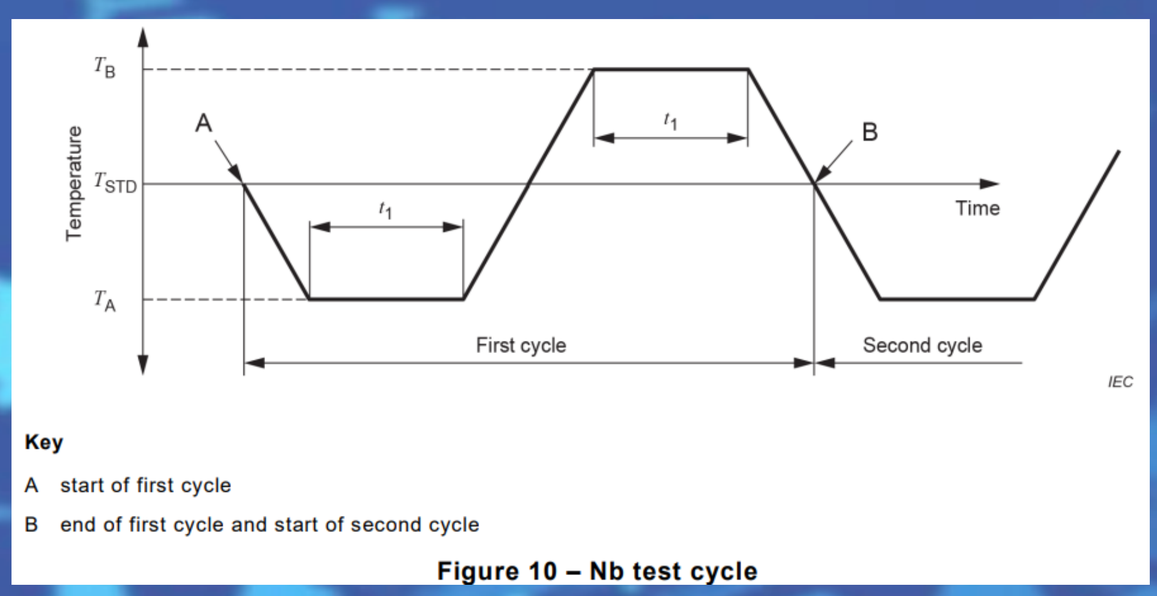
- During the life cycle of a product, it will face various environmental conditions, which will expose the fragile parts of the product, causing damage or failure of the product, thereby affecting the reliability of the product.
- These two tests are not just about simulating actual conditions, but one of their purposes is to apply stress to the object to be tested, accelerate the aging factor of the sample, and allow the sample to identify components or materials that may be damaged under environmental factors to determine whether the sample has been damaged. Correctly designed or manufactured.

Test Procedure

- Conduct a series of high and low temperature cycle tests on temperature changes at a temperature change rate of 1 to 5 degrees per minute.

- According to standard
  - IEC 60068-2-1
  - IEC 60068-2-2
  - IEC 60068-2-14
  - IEC 60068-2-30
  - IEC 60068-2-38
  - IEC 60068-2-78
  - MIL-STD-810H
  - ISO 16750-4





Key

A start of first cycle

B end of first cycle and start of second cycle

Figure 10 – Nb test cycle

WHEN YOU NEED TO BE SURE

Thermal Shock Test Chamber

Introduction

- Model No. : ESPEC TSD-100
- Temperature Range : -65 ℃ ~ 200 ℃
- Temperature Transition Time : ≦1 minute
- Chamber Size :
  71 cm (W) × 41 cm (H) × 34.5cm (D)

- Model No. :

➢ GIANT FORCE GTST-720-65-AW-2

- Temperature Range : -40 ℃ ~ 150 ℃
- Temperature Transition Time : ≦1 minute
- Chamber Size :
  70 cm (W) × 70 cm (H) × 160 cm (D)

➢ GIANT FORCE GTST-1800-65-AW-2

- Temperature Range : -50 ℃ ~ 150 ℃
- Temperature Transition Time : ≦1 minute
- Chamber Size :
  100 cm (W) × 100 cm (H) × 180 cm (D)

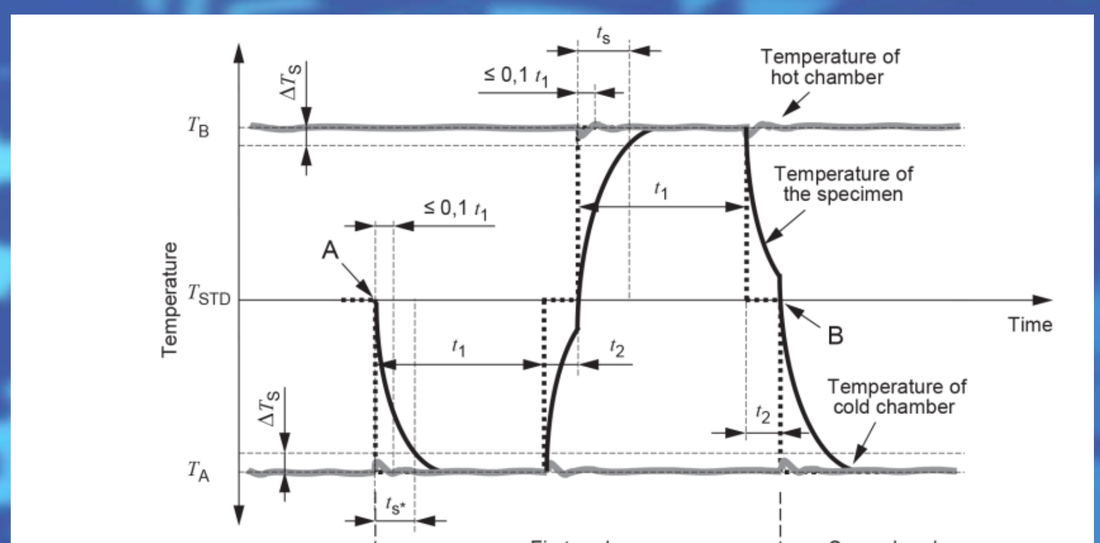
Test Principle

- Thermal shock test can be used to test the material structure or composite materials, in an instant by the very high temperature and very low temperature, whether it can withstand the extent of continuous environment in order to test if there is any chemical changes or physical hurtcaused by the thermal expansion and contractionin the shortest possible time

Test Procedure

- With a temperature change rate of more than 40 degrees per minute, high and low temperature shock tests are conducted under extremely harsh conditions on rapid temperature changes.
- The test method includes an air tank type device that uses air to change temperature, temperature change time must be controlled to be completed within 60 seconds.

- According to standard
  - IEC 60068-2-14
  - MIL-STD-810H



Key

A start of first cycle

B end of first cycle and start of second cycle

Figure 8 – Na test cycle, two-chamber method

Salt Spray Test Equipment

Introduction

- Model No. : Pin Tai SSL-S90
- Salt solution : (5 ± 1) wt.% NaCl solution
- PH of solution : 6.5 to 7.2
- Temperature : (35 ± 2) ℃
- Quantity of fog :
  (1.0 ~ 2.0) ml/ 80 cm^2/ hour
- Chamber Size :
  90 cm (L) × 60 cm (W) × 50 cm (H)

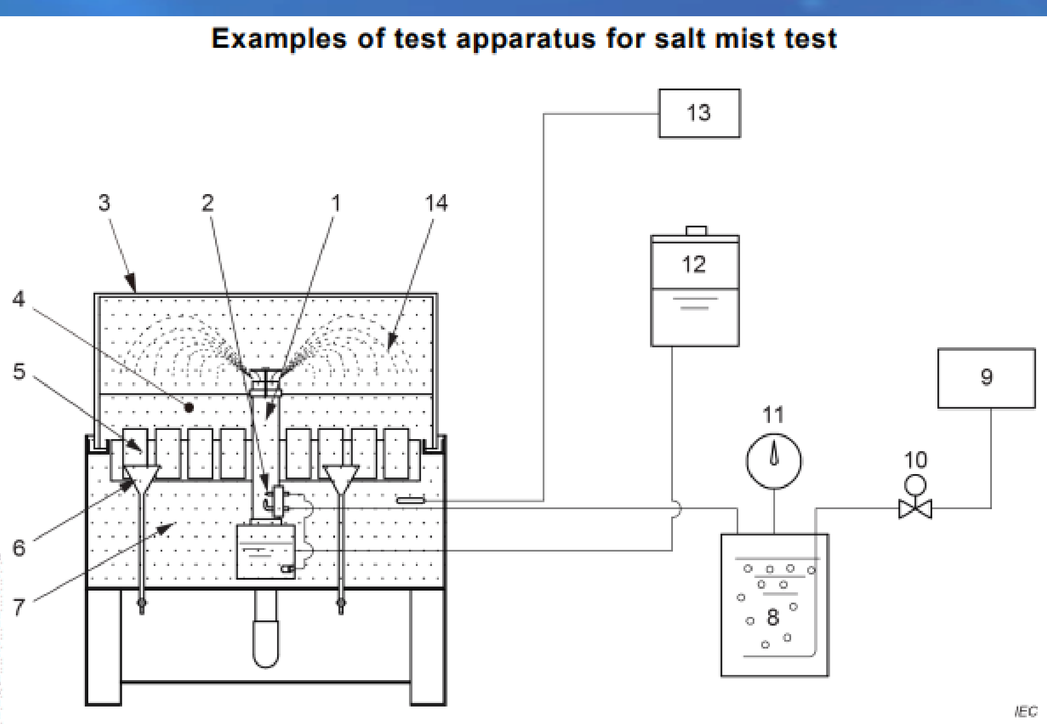
Test Principle

- It is suitable for testing various metal materials and products. After anti-corrosion treatments such as paint coating, electroplating, inorganic and organic films, anodizing, and anti-rust oil, the product's salt spray corrosion resistance is tested.

Test Procedure

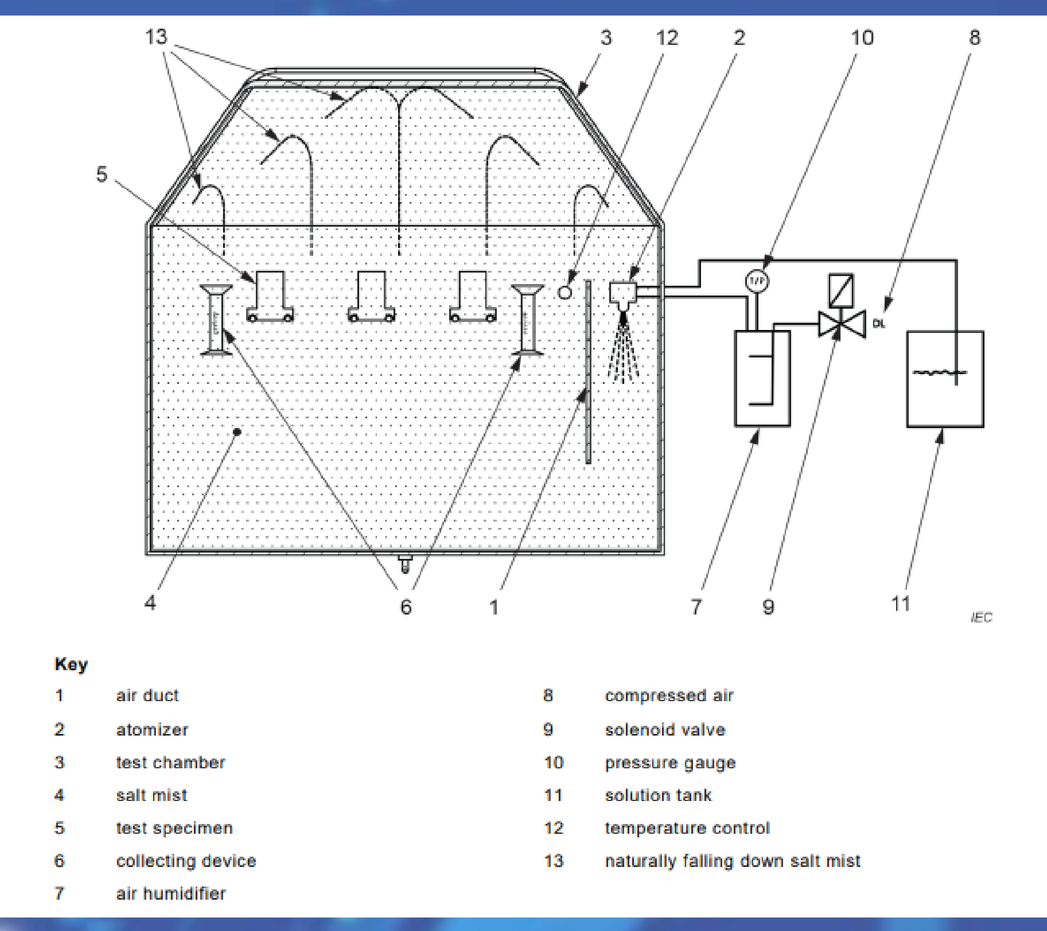
- According to standard
  - IEC 60068-2-11 Ka
  - IEC 60068-2-52 kb (Method 1、2)
  - ASTM B117
  - ISO 9227 (NSS test)
  - CNS 8886
  - ISO 16750-4

Examples of test apparatus for salt mist test



Key

1	dispersion tower	8	saturation tower
2	atomizer	9	compressed air
3	cover	10	solenoid valve
4	test chamber	11	pressure gauge
5	test specimen	12	solution tank
6	collecting device	13	temperature controls
7	salt mist	14	naturally falling down salt mist

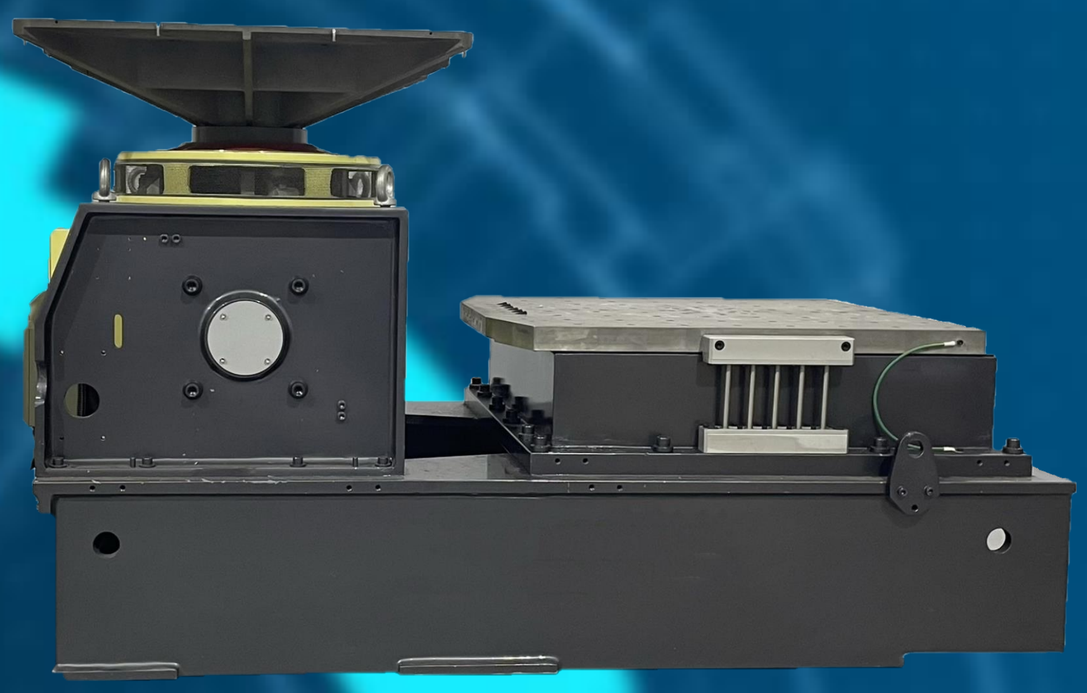


Key

1	air duct	8	compressed air
2	atomizer	9	solenoid valve
3	test chamber	10	pressure gauge
4	salt mist	11	solution tank
5	test specimen	12	temperature control
6	collecting device	13	naturally falling down salt mist
7	air humidifier		

Vibrational Test Equipment

Introduction



- Vibration Frequency : 1Hz ~ 2000Hz
- Vibration Force : 1000 kgf
- Table Size :
  - XY axis -- 84 cm × 80 cm (M10, Hole spacing 10cm)
  - Z axis -- 80 cm × 80 cm (M10)
  - Z axis -- 30 cm × 30 cm (M10, Hole spacing 5cm)

Test Principle

- The significance and purpose of vibration test：
  - Test for fatigue damage：About 80% of the structural damage we experienced is fatigue damage, while the impact is momentary strength damage.
  - In a vibration environment, whether the product fails, the accuracy of the instrument is reduced, the parameters of component change, parts loosening, sealing damage, and so on.

Test Procedure

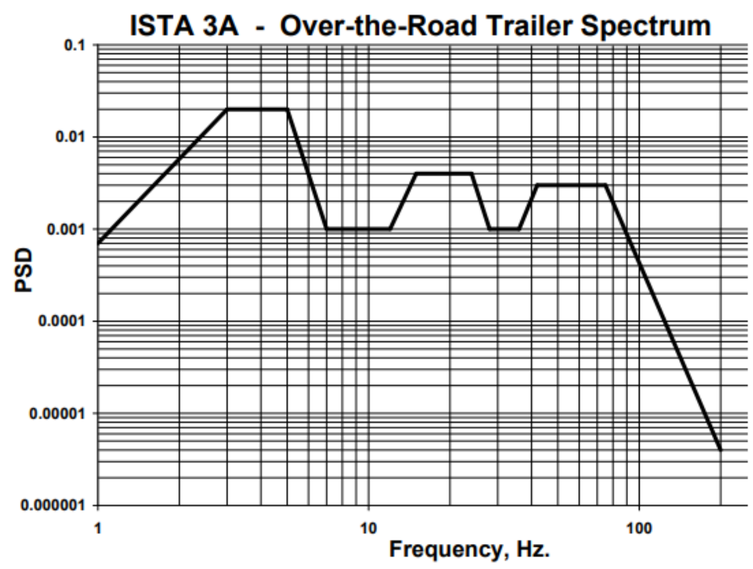
- Vibration testing analyzes the following parameters, typically in the frequency domain, to understand the condition of the test object:
  - Velocity is the speed at which an object moves in a given direction during the test period.
  - Acceleration measures how quickly movement picks up speed in a given period.
  - Displacement is the distance the measuring point has moved during the testing period.

- According to standard
  - IEC 60068-2-6
  - IEC 60068-2-64
  - MIL-STD-810H
  - ISO 16750-3
  - ISTA 1 Series、ISTA 2 Series、ISTA 3 Series、ISTA 6 Series…

OVER-THE-ROAD TRAILER SIMULATION

The following breakpoints are for an Over-the-Road trailer typical for parcel delivery movement and shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) with an overall G_{rms} level of 0.53 (see below). The theoretical stroke required to run this vibration profile is 47.12 mm (1.855 in) peak to peak:

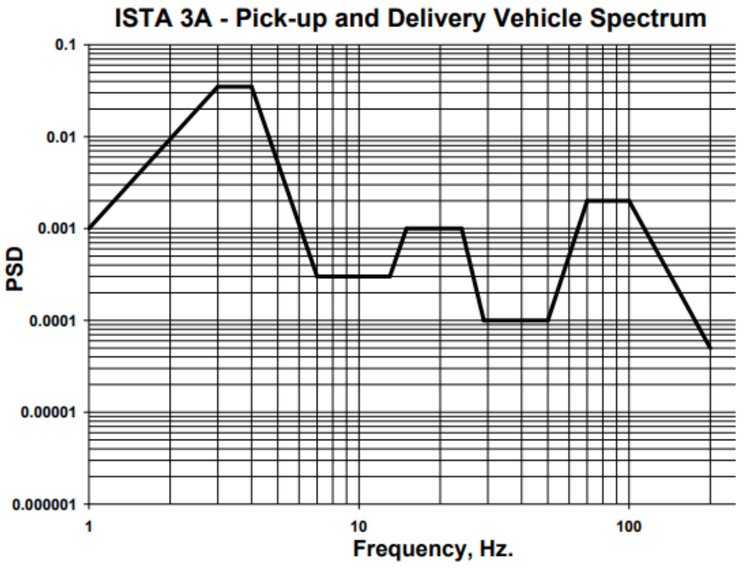
Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.0007
3.0	0.02
5.0	0.02
7.0	0.001
12.0	0.001
15.0	0.004
24.0	0.004
28.0	0.001
36.0	0.001
42.0	0.003
75.0	0.003
200.0	0.000004



PICK-UP AND DELIVERY VEHICLE SIMULATION

The following breakpoints are for a pick-up and delivery vehicle and shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) with an overall G_{rms} level of 0.46 (see below). The theoretical stroke required to run this vibration profile is 58.72 mm (2.312 in) peak to peak:

Frequency (Hz)	PSD Level, g^2/Hz
1.0	0.001
3.0	0.035
4.0	0.035
7.0	0.0003
13.0	0.0003
15.0	0.001
24.0	0.001
29.0	0.0001
50.0	0.0001
70.0	0.002
100.0	0.002
200.0	0.00005



Mechanical shock Test Equipment

Introduction

- Pulse Shape : Half-Sine
- Peak acceleration : 15 g ~ 100 g
- Pulse Duration : 3 ms ~ 25 ms
- Table Size :
  - 50 cm × 48 cm (M12, Hole spacing 8cm)

Test Principle

- Mechanical shock test machine is designed to simulate the transport environment non-repetitive high impact conditions, through the impact of the appropriate application, to detect the transport of weaknesses and certain features of the degradation of the situation.
- This will help to understand the structural strength and the impact resistance, drop resistance of the appearance, and prevention from the fall based on the characteristics of products, to analyze the strength of the withstand of impact environment, and to effectively prevent the occurrence of product damage.

Test Procedure

- Mechanical shock test used to determine the ability of a sample to withstand non-repetitive or repeated impacts of a specified intensity. The purpose of this test is to reveal mechanical weaknesses or deterioration in specified properties or cumulative damage or deterioration caused by impact.

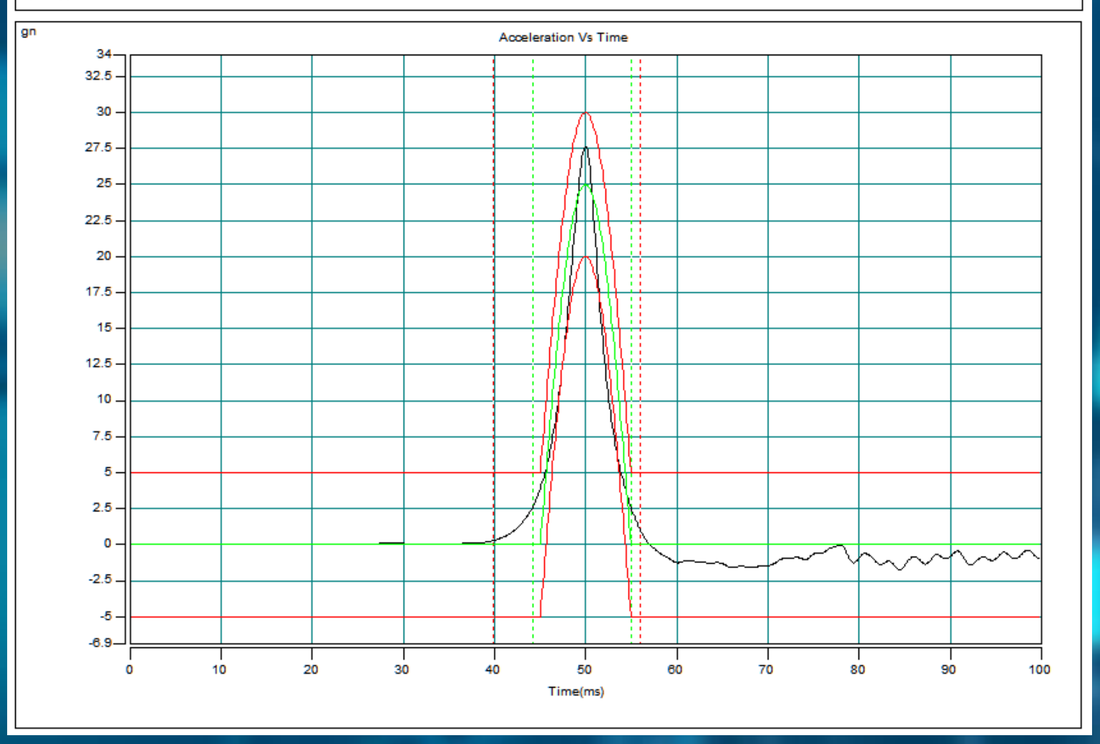
- According to standard
  - IEC 60068-2-6
  - IEC 60068-2-64
  - MIL-STD-810H
  - ISO 16750-3
  - ISTA 1 Series、ISTA 2 Series、ISTA 3 Series、ISTA 6 Series…

Table 24 — Number of shocks

	Shock profile 1	Shock profile 2
	500 m/s²; 11 ms	300 m/s²; 6 ms
Driver's door, cargo door	13 000	100 000
Passenger's doors	6 000	50 000
Trunk lid, tailgate	2 400	30 000
Engine hood	720	3 000

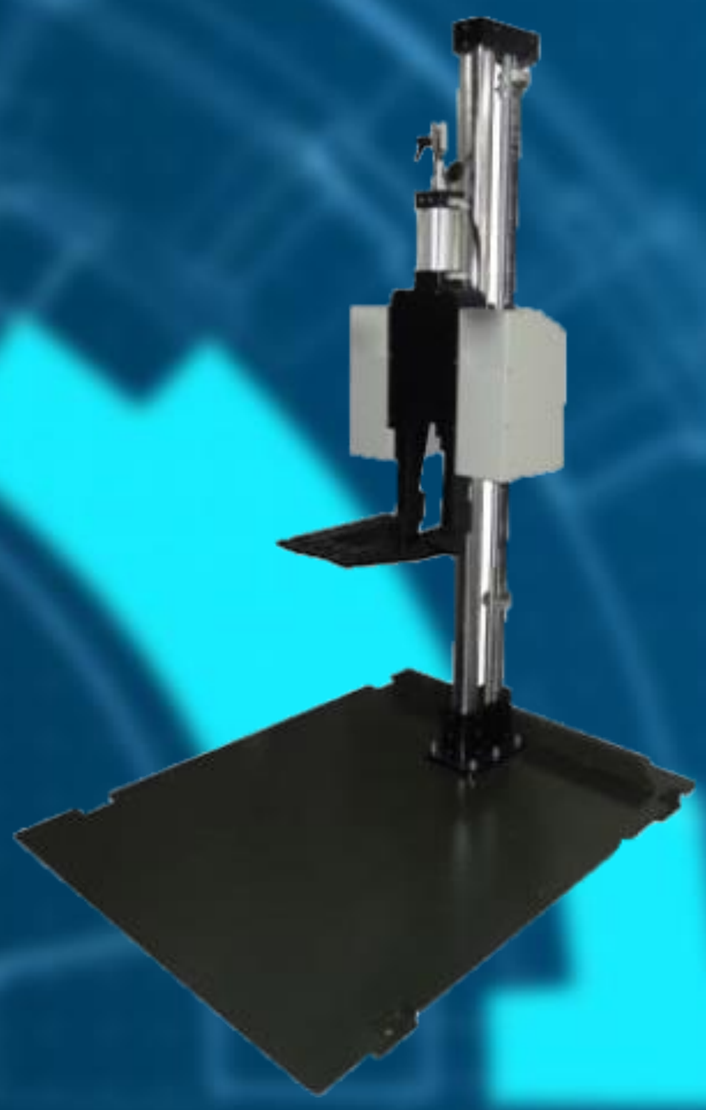
Acceleration Vs Time

Signal Name	gn	ms	m/s	Low Pass Filter (Hz)	Max. gn	Min. gn
Input1(t)	27.65	10.59	1.40	600.00	27.65	-1.72



Drop Test Equipment

Introduction



- Drop height : 30 cm ~ 130 cm
- Test surface :
  - ➢ Steel plate (150 cm × 125 cm , Thickness 1 cm)
  - ➢ Concrete plate
    (60 cm × 60 cm, Thickness 10 cm)

Test Principle

- The test aims for the products that have been packaged. It is important to determine whether the packaging design can be improved by measuring the shock-proof, cover-fullness, and adequacy of the product's durability to drops. The use of packaging equipment is to help customers to purchase from shelf spot, based on the acceptance of the test categories to determine whether it is in line with their own need, and whether it is good or bad in the market of similar products.

Test Procedure

- Cushion packaging design, packaging material selection, packaging contend design, drop specifications test.

- According to standard
  - IEC 60068-2-31
  - IEC 60068-2-32
  - MIL-STD-810H
  - ISO 16750-3
  - ISTA 1 Series、ISTA 2 Series、ISTA 3 Series、ISTA 6 Series…

SHOCK - DROP			
Step	**Action**		
1	Determine the method(s) of test and the required drop height or impact velocity in Before You Begin Shock Testing.		
2	Do you have a packaged-product with only 6 faces as identified in Face, Edge and Corner Identification? • If **Yes**, continue with the next Step. • If **No**, then go to Step 6.		
3	Test the packaged-product according to the method(s) and level(s) determined in Step 1. Follow the sequence in the table below.		
4	**Sequence #**	**Orientation**	**Specific face, edge or corner**
	1	Corner	most fragile face-3 corner, if not known, test 2-3-5
	2	Edge	shortest edge radiating from the corner tested
	3	Edge	next longest edge radiating from the corner tested
	4	Edge	longest edge radiating from the corner tested
	5	Face	one of the smallest faces
	6	Face	opposite small face
	7	Face	one of the medium faces
	8	Face	opposite medium face
	9	Face	one of the largest faces
	10	Face	opposite large face
5	All testing is now complete. Go to the Reporting an ISTA Test section at the end of this Procedure.		
6	Select a bottom face corner to replace the corner required in Step 4 Sequence 1 to begin the test.		
7	Identify the edges of the packaged-product that meet the Step 4 Sequence 2 through 4 requirements.		
8	Select any 6 faces to replace the faces required in Step 4 Sequence 5 through 10.		
9	Using the corner, edges and faces from Steps 6 through 8 go to Step 3 and proceed.		
10	All testing is now complete.		

Water Ingress Protection Test Equipment

Introduction

- Model No. :
  - ➢ CHTEK CH-2010-S6
    - IP Code Level : IPX1 ~ IPX6
  - ➢ M-2000L Immersion Tank
    - IP Code Level : IPX7 ~ IPX8
    - Specification:
      Inner diameter: 131 cm
      Bottom: 118 cm
      Height: 164 cm
      (The maximum water depth that IPX8 can perform the test)

Test Principle

- IP test standard determines the product's ability to protect against solid objects and liquids (anti-solid intrusion, dust-proof, waterproof).
- These tests provide a numerical representation of a product's protective capabilities based on IP ratings. For example, IP11 to IP68 levels represent different levels of protection capabilities.

Test Procedure

- According to standard
  - IEC 60529
  - IEC 60598-1 Section 9
  - ISO 20653

Tube radius R mm	Degree IPX3		Degree IPX4	
	Number of open holes $N^{1)}$	Total water flow q_v l/min	Number of open holes $N^{1)}$	Total water flow q_v l/min
200	8	0,56	12	0,84
400	16	1,1	25	1,8
600	25	1,8	37	2,6
800	33	2,3	50	3,5
1 000	41	2,9	62	4,3
1 200	50	3,5	75	5,3
1 400	58	4,1	87	6,1
1 600	67	4,7	100	7,0

1) Depending on the actual arrangement of the hole centres at the specified distance, the number of open holes N may be increased by 1.

Dust Ingress Protection Test Equipment

Introduction

- Model No. : 3
  - ➢ CHTEK CH-7139-CF-20
  - IP Code Level : IP1X ~ IP6X
  - Powder Type : Talcum Powder
  - Chamber Size :
    220 cm (W) × 115 cm (H) × 110 cm (D)

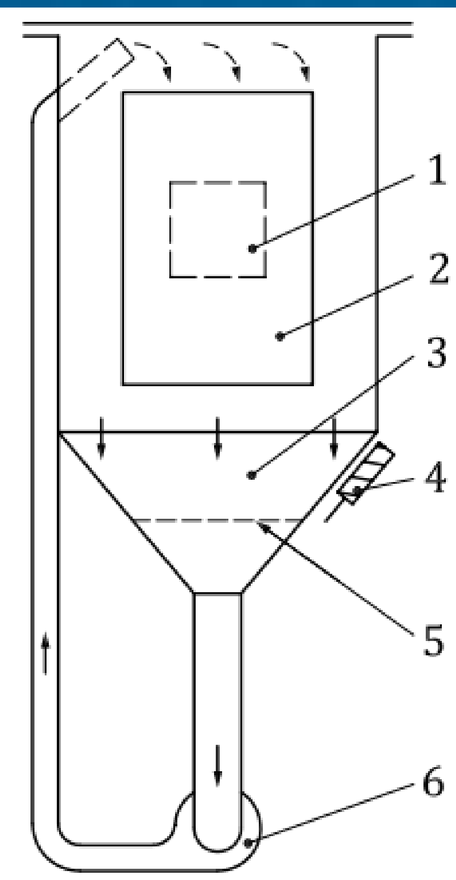
  - ➢ CHTEK CH-7139-CF8
  - IP Code Level : IP1X~ IP6X
  - Powder Type :
    Arizona dust (According ISO 12103-1)
  - Chamber Size :
    200 cm (W) × 190 cm (H) × 200 cm (D)

Test Principle

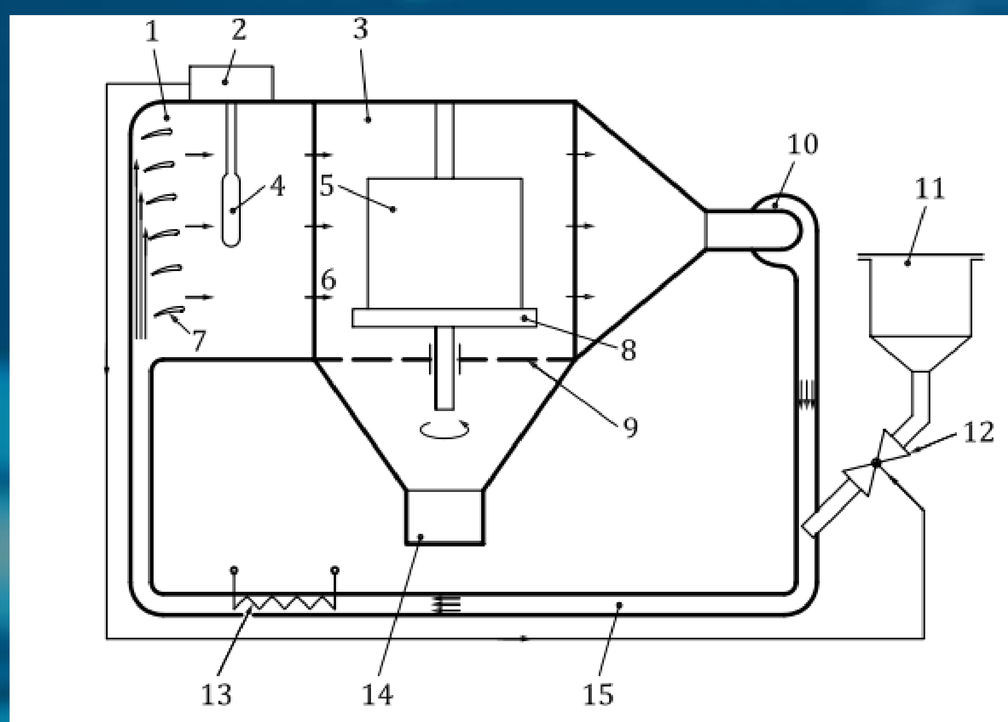
- IP test standard determines the product's ability to protect against solid objects and liquids (anti-solid intrusion, dust-proof, waterproof).
- These tests provide a numerical representation of a product's protective capabilities based on IP ratings. For example, IP11 to IP68 levels represent different levels of protection capabilities.

Test Procedure

- According to standard
  - IEC 60529 (Talcum Powder)
  - IEC 60598-1 Section 9 (Talcum Powder)
  - ISO 20653 (Arizona dust)



Key
1 DUT
2 glass window
3 dust
4 vibrator
5 protective grating
6 circulating pump or other equipment for suspending the dust



Key
1 pre-chamber
2 dust density controller (control unit)
3 test chamber
4 probe
5 DUT
6 laminar air flow
7 air baffles
8 test bench
9 protective grating
10 dust circulating pump (radial fan)
11 reservoir for test dust
12 solenoid valve (proportioning valve)
13 heating
14 collecting tank for test dust
15 air duct