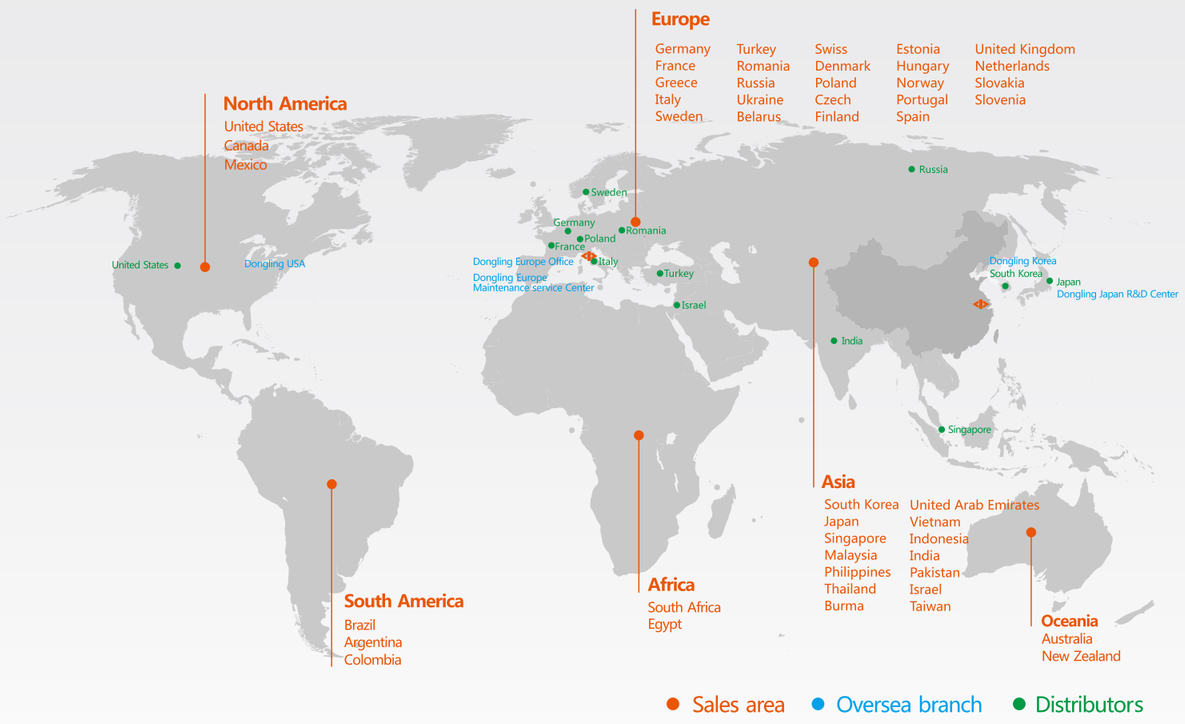
DONGLING

DONGLING TECHNOLOGIES

VIBRATION TEST SOLUTIONS



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Company Profile

During the past 20 years, DONGLING's growth and development has attracted the attention of the testing industry worldwide. DONGLING has come to the forefront with its global research and development, Technology and production of test equipment and has shown its strength in numerous international projects.

DONGLING has achieved considerable advancements in reliability testing, environmental testing, fatigue testing and strength testing with its more than 300 products, new technologies and standards at the highest international levels. DONGLING's products and services are widely used in automotive, aerospace, rail transit, aviation, ship building, defense and electronics industries and is a leading supplier of test equipment and integrated solutions in more than 48 countries.

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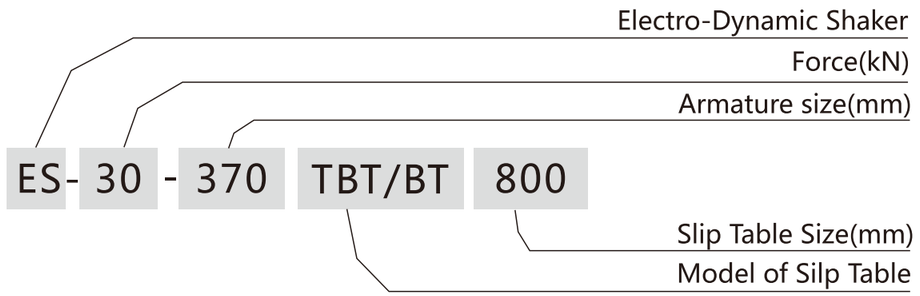
System Model



Test condition and Standard choice methods of Vibration device

To select the proper vibration device, the most important thing is to determine the required force during the test process. The test required force can be decided on the basis of the following test condition setting and the calculated force value.

1. Setting up test condition

- Frequency and frequency range
- Max. Acceleration
- Max. P-P displacement
- Max. Velocity
- Weight of Specimen and fixture
- Assumed value of fixture weight m_1 (kg)
  Taking into consideration of the tested specimen, weight of the fixture and vibration performance, choose the best fixture from the fixture list. Take the weight of the fixture as the assumed value. (Need negotiation for special specification)
- Assumed value of armature weight m_0 (kg)
  Choose from the series list. Take the weight of the armature as the assumed value.

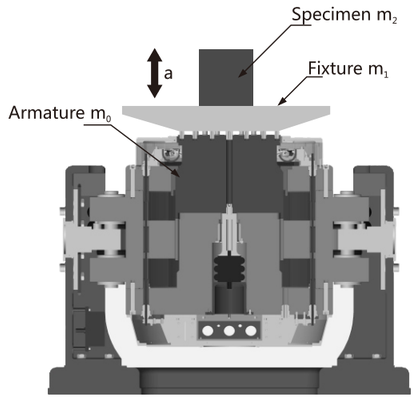
2. Calculation of the force

Figure out the required force under vibration test condition according to the following formula.

Formula of force F

$$F=(m_0+m_1+m_2)x\ a$$

F : Force (N)
A : Acceleration
m_0: Weight of armature
m_1: Weight of fixture
m_2: Weight of specimen



E.g.: If the weight of the armature m_0=30kg, weight of the fixture m_1=45kg, weight of the specimen m_2=35kg, maximum acceleration a=98.0m/s^2 and the model of test device is ES-30-370TBT/BT800, then the test required force would be:

F= (30kg+45kg+35kg)x98.0m/s^2=10780N

This value is the minimum force. The actual required force would be 1.2~1.3 times more, so it needs 10780Nx1.3=14014N or above force capability.

3. Selection of the vibration test device

According to the previous calculation, the F-15000BD/LA16AP vibration test device would be a proper choice. Check the following items of the selected vibration test device.

Specification of vibration test device

- Frequency range
- Max. Acceleration
- Max. P-P displacement
- Max. Velocity

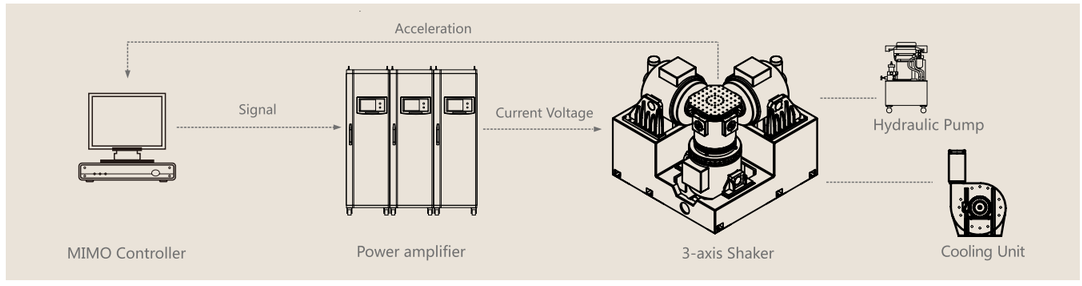
Choose the corresponding vibration test device if it can meet the specification of the test condition. If there are some parts that surpass the maximum capacity of the device, choose the test device that can meet the test condition first, then calculate the force on the basis of this requirement.

Tri-axis Electro-dynamic Vibration Test System

Description

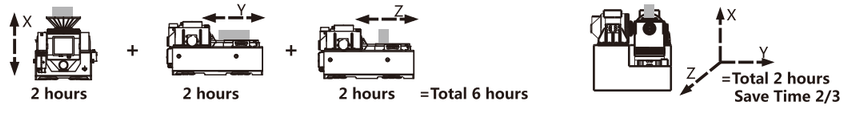
The Tri-Axis shaker test system can more realistically simulate the dynamic environment that is encountered in the real world. The Tri-Axis shaker system can also reduce the exposure to over/under testing. Tri-Axis shaker testing can expose a failure that a single axis shaker may not be able to reproduce.

Working Principle



Main Features

- Reduce test time – 3 axis testing can reduce test time versus performing 3 tests in a single axis.



- More closely reproduce real world environment. More realistic than single axis shaker testing.
- Interlock Protection – Safe design that will shut down all shakers in the event there is an abort or malfunction triggered on any single shaker to protect the test specimen and the shaker system.
- High frequency range – The functional frequency range is up to 2000Hz or more to offer more choices to test engineers.
- **Orthogonal Coupling Bearing Unit(OCBU)**

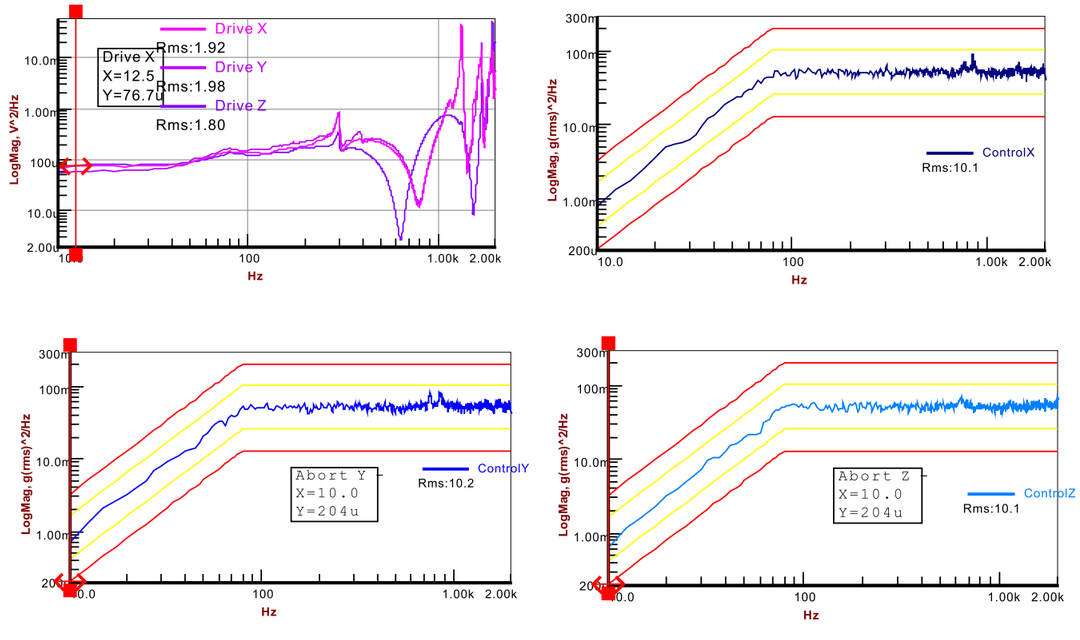
  -High Pressure loading of hydrostatic bearing, no metal contact.
  -Provides pre-tightening stiffness
  -Optimized coupling structure using FEA to ensure low mode.
  -Foundry integrated supporting round shape.
  -Advanced throttle hole distribution to ensure transmission of force. Oil film surface provides stiffness and durability.

Technical Data

System specs / System Model	Table Size(mm) (Rectangle)	Rated Force		Max. Vel(in/s)
		Sine(lbf)	Random(lbf)	
3ES-10-HF Series	400,500,600,800	2200	2200	47.2
3ES-20-HF Series	400,500,600,800	4400	4400	47.2
3ES-30-HF Series	400,500,600,800	6600	6600	47.2
3ES-40-HF Series	400,500,600,800	8800	8800	47.2
3ES-50-HF Series	400,500,600,800,1000,1200	11000	11000	47.2
3ES-60-HF Series	400,500,600,800,1000,1200	13200	13200	47.2
3ES-80-HF Series	400,500,600,800,1000,1200	17600	17600	47.2
3ES-120-HF Series	400,500,600,800,1000,1200	26400	26400	47.2
3ES-160-HF Series	400,500,600,800,1000,1200	35200	35200	47.2
3ES-200-HF Series	400,500,600,800,1000,1200	44000	44000	47.2

Remark: For more technical requirements and features please feel free to contact us.

Performance curve



Electro-dynamic Vibration Test System

Air Cooled Series

The air-cooled series electro-dynamic vibration test system has advantages such as wide frequency range, excellent indicators, high reliability, small floor space, easy to move, and easy to operate. This series has a variety of models of shakers from which to choose. The exciting force range is from 220 lbf to 15400 lbf and maximum load is from 154 lbs to 2204 lbs. Also, the climate and mechanics environmental testing equipment are available.

Performance Characteristics

- Sinusoidal excitation force range: 220 lbf ~ 15400 lbf
- Random to sinusoidal excitation force ratio 1:1
- Two-times-of-sine shock force (Three times optional)
- Displacement peak-to-peak value of 1 inch, 1.6 inch, 2 inch, 3 inch or 4 inch
- Lightweight armature with optimized design and strong vibration-resistant performance, better vibration isolation through air springs at the trunnion position
- Strong bearing capacity of air spring in central room, and good low-frequency performance
- Equipped with an automatic centering system, to control the armature is always in the balance position during movement
- Double magnetic circuit design, with low flux leakage and uniform magnetic field
- Sine, Random and Shock etc. test function
- Good cooling effect and low noise fan

System model	ES-1-150	ES-1.5-150	ES-2-150	ES-2-230	ES-3-150	ES-3-230	ES-6-230	ES-10-240	ES-10d-240
			① Φ2.4 ② Φ4.8 ③ Φ5.9 ④ 13×M8	① Φ4 ② Φ8 ③ Φ9 ④ 17×M8	① Φ2.4 ② Φ4.8 ③ Φ5.9 ④ 13×M8	① Φ4 ② Φ8 ③ Φ9 ④ 17×M8	① Φ4 ② Φ8 ③ Φ9 ④ 17×M8		① Φ4 ② Φ8 ③ Φ9.4 ④ 17×M10
Rated sine/random force (lbf)	220	330	440	440	660	660	1320	2200	2200
Shock force (lbf)	440	660	880	880	1320	1320	2640	4400	4400
Frequency range (Hz)	DC-4500	DC-4500	DC-4000	DC-2500	DC-4000	DC-2500	DC-3500	DC-3000	DC-5000
Max.acceleration (g)	50	75	100	25	100	35	100	100	100
Max. velocity (in/s)	78.7	78.7	78.7	59.1	78.7	59.1	70.9	70.9	70.9
Max.displacement (inch)	1	1	1	1.6	1	1.6	2	2	2
Max. load (lbs)	154	154	154	308	264	308	660	660	660
Shaker model	ET-1-150	ET-1.5-150	ET-2-150	ET-2-230	ET-3-150	ET-3-230	ET-6-230	ET-10-240	ET-10d-240
Mass of moving elements (lbs)	4.4	4.4	4.4	17.6	6.6	18.7	13.2	22	22
Armature diameter (inch)	5.9	5.9	5.9	9	5.9	9	9	9.4	9.4
Weight (lbs)	About 869	About 869	About 869	About 946	About 1056	About 946	About 1298	About 1980	About 1980
Body suspension natural frequency (Hz)	3	3	3	3	3	3	3	2.5	2.5
Dimension (L×W×H:inch)	27.4×24.3×25.7			29.8×24.3×27.6	29.8×24.3×26	29.8×24.3×27.6	32.5×24.3×28.3	36.6×27×31	39.6×27×32
Power amplifier model	SDA-1	SDA-1.5	SDA-2	SDA-2	SDA-3	SDA-3	SDA-6	SDA-10	SDA-10
Power (kVA)	1	1.5	2	2	3	3	6	10	13.2
Power supply requirement (kVA)	4	4.5	5.5	5.5	6.5	6.5	16	21	23
Weight (lbs)	About 352	About 352	About 440	About 440	About 440	About 440	About 528	About 880	About 880
Dimension (L×W×H:inch)	23.9×32.3×62.7								
Cooling type	Air cooled								
Blower model	B-200	B-200	B-200	B-200	B-200	B-200	B-1000	B-1000	B-1000
Power (HP)	1	1	1	1	1	1	5.4	5.4	5.4
Air flow (CFM)	212	212	212	212	212	212	699	699	699
Air pressure (PSI)	0.15	0.15	0.15	0.15	0.15	0.15	0.51	0.51	0.51
Weight (lbs)	66	66	66	66	66	66	253	253	253

Optional accessories • Slip table • Head expander • Movable device • Temperature Chamber • Fixture • Sensor • OPCS • MPCS • RMT • Auto rotation mechanism • Vibration controller

System model	ES-20-320	ES-20-445	ES-30-370	ES-30-550	ES-40-370	ES-40-445	ES-50-445	ES-60-445	ES-20LS3-340
	① Φ4.8 ② Φ9.8 ③ Φ12.6 ④ 17×M10	① Φ8 ② Φ16 ③ Φ17.5 ④ 17×M10	① Φ6 ② Φ12 ③ Φ14.6 ④ 17×M10	① Φ8 ② Φ12 ③ Φ16 ④ Φ20 ⑤ Φ21.7 ⑥ 33×M10	① Φ6 ② Φ12 ③ Φ14.6 ④ 17×M10		① Φ8 ② Φ16 ③ Φ17.5 ④ 17×M12		① Φ4 ② Φ8 ③ Φ12 ④ Φ13.4 ⑤ 21×M10
Rated sine/random force (lbf)	4400	4400	6600	6600	8800	8800	11000	13200	4400
Shock force (lbf)	8800/13200*	8800/13200*	13200/19800*	13200/19800*	17600/26400*	17600/26400*	22000/33000*	26400/39600*	8800/13200*
Frequency range (Hz)	DC-3000	DC-2800	DC-2800	DC-2000	DC-2800	DC-2700	DC-2700	DC-2700	DC-3000
Max. acceleration (g)	100	70	100	50	120	80	100	100	80
Max. velocity (in/s)	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*
Max. displacement (inch)	2	2	2	2	2	2	2	2	3
Max. load (lbs)	660	660	1100	1100	1100	1760	1760	1760	660
Shaker model	ET-20-320	ET-20-445	ET-30-370	ET-30-550	ET-40-370	ET-40-445	ET-50-445	ET-60-445	ET-20LS3-340
Mass of moving elements (lbs)	44	61.6	66	121	72.6	110	110	132	55
Armature diameter (inch)	12.6	17.5	14.6	21.7	14.6	17.5	17.5	17.5	13.4
Weight (lbs)	About 3729	About 3748	About 5478	About 5588	About 5478	About 9900	About 9900	About 9900	About 3729
Body suspension natural frequency (Hz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Dimension (L×W×H:inch)	48.1×30×41.4		52.2×33.6×44.8	52.2×33.6×45.6	52.2×33.6×44.8	68.1×44.8×50			48.1×30×42
Power amplifier model	SDA-20	SDA-20	SDA-30	SDA-30	SDA-40	SDA-40	SDA-50	SDA-60	SDA-20
Power (kVA)	20	20	30	30	40	40	50	60	20
Power supply requirement (kVA)	46	46	52	48	73	73	92	106	46
Weight (lbs)	About 990	About 990	About 1100	About 1100	About 1100	About 1210	About 1210	About 1210	About 990
Dimension (L×W×H:inch)	23.9×32.3×62.7		24.4×39.8×82.9						23.9×32.3×62.7
Cooling type	Air cooled								
Blower model	B-2000LN	B-2000LN	B-3000	B-3000	B-5000	B-5000	B-5000	B-7000	B-2000LN
Power (HP)	10	10	10	10	20	20	20	30	10
Air flow (CFM)	1503	1503	974	974	2329	2329	2329	3388	1503
Air pressure (PSI)	0.51	0.51	1.28	1.28	1.12	1.12	1.12	1.16	0.51
Weight (lbs)	308	308	396	396	561	561	561	748	748

System model	ES-30LS4-445	ES-40LS4-445	ES-50LS3-445	ES-50LS4-445	ES-60LS3-445	ES-60LS4-445	ES-60LS3-550	ES-70LS3-550	ES-70LS3-480
		① Φ4 ② Φ8 ③ Φ17.5 ④ 17×M10			① Φ4 ② Φ8 ③ Φ17.5 ④ 17×M12			① Φ8 ② Φ12 ③ Φ16 ④ Φ20 ⑤ Φ21.7 ⑥ 33×M12	① Φ4 ② Φ8 ③ Φ12 ④ Φ16 ⑤ Φ19 ⑥ 29×M12
Rated sine/random force (lbf)	6600	8800	11000	11000	13200	13200	13200	15400	15400
Shock force (lbf)	13200/19800*	17600/26400*	22000/33000*	22000/33000*	26400/39600*	26400/39600*	26400/39600*	30800/46200*	30800/46200*
Frequency range (Hz)	DC-2600	DC-2600	DC-2700	DC-2600	DC-2700	DC-2600	DC-2500	DC-2500	DC-2700
Max. acceleration (g)	75	90	90	90	100	90	73	85	100
Max. velocity (inch/s)	70.9/98.4*	70.9/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	70.9/98.4*	70.9/98.4*	78.7/98.4*
Max. displacement (inch)	4	4	3	4	3	4	3	3	3
Max. load (lbs)	1100	1100	1760	1760	1760	1760	2200	2200	2200
Shaker model	ET-30LS4-445	ET-40LS4-445	ET-50LS3-445	ET-50LS4-445	ET-60LS3-445	ET-60LS4-445	ET-60LS3-550	ET-70LS3-550	ET-70LS3-480
Mass of moving elements (lbs)	88	99	110	123.2	110	123.2	180.4	180.4	154
Armature diameter (inch)	17.5	17.5	17.5	17.5	17.5	17.5	21.7	21.7	19
Weight (lbs)	About 5588	About 5588	About 9900	About 9900	About 9900	About 9900	About 16060	About 16060	About 9900
Body suspension natural frequency (Hz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Dimension (L×W×H:inch)	52.3×33.6×47.8		68.1×44.8×50.9	68.1×44.8×53.1	68.1×44.8×50.9	68.1×44.8×53.1	71.7×51.1×54.1		68.1×44.8×53.1
Power amplifier model	SDA-30	SDA-40	SDA-50	SDA-50	SDA-60	SDA-60	SDA-60	SDA-70	SDA-70
Power (kVA)	30	40	50	50	60	60	70	70	70
Power supply requirement (kVA)	52	73	92	92	106	106	106	118	118
Weight (lbs)	About 1100	About 1210	About 1430	About 1210	About 1540	About 1540	About 1540	About 1540	About 1540
Dimension (L×W×H:inch)	24.4×39.8×82.9								
Cooling type	Air cooled								
Blower model	B-3000	B-5000	B-5000	B-5000	B-7000	B-7000	B-7000	B-7000	B-7000
Power (HP)	10	20	20	20	30	30	30	30	30
Air flow (CFM)	974	2329	2329	2329	3388	3388	3388	3388	3388
Air pressure (PSI)	1.28	1.12	1.12	1.12	1.09	1.09	1.09	1.09	1.09
Weight (lbs)	396	561	561	561	748	748	748	748	748

Optional accessories • Slip table • Head expander • Movable device • Temperature Chamber • Fixture • Sensor • OPCS • MPCS • RMT • Auto rotation mechanism • Vibration controller

Electro-dynamic Vibration Test System

Water-cooled Series

Water-cooled vibration test systems feature large force, large bearing capacity and high cooling efficiency, which can respectively complete the tri-axial sinusoidal vibration test, broadband random vibration test and classical (semi-sinusoidal, trapezoidal, and postpeak sawtooth) pulse and shock response spectrum test. The multi-environment combined test can be completed with the equipped climate chamber. At present, this series has a variety of models to choose. The exciting force range is from 11000 lbf to 110000 lbf and maximum load is from 1760 lbs to 22000 lbs.

System model	ES-50W-445	ES-60W-445	ES-70W-445	ES-80-445	ES-80-480	ES-100-480	ES-100-550	ES-120-550	ES-160-590	ES-160-650	ES-180-590	ES-180-650	ES-200-650
	 ① Φ8 ② Φ16 ③ Φ17.5 ④ 17×M12				 ① Φ8.3 ② Φ16.5 ③ Φ19 ④ 17×M12		 ① Φ4 ② Φ8 ③ Φ12 ④ Φ16 ⑤ Φ20 ⑥ Φ21.7 ⑦ 37xM12		 ① Φ 8 ② Φ16 ③ Φ21.7 ④ Φ23.2 ⑤ 25×M12	 ① Φ8 ② Φ16 ③ Φ24 ④ Φ25.6 ⑤ 25×M12	 ① Φ8 ② Φ16 ③ Φ21.7 ④ Φ23.2 ⑤ 25×M12	 ① Φ8 ② Φ16 ③ Φ24 ④ Φ25.6 ⑤ 25×M12	 ① Φ8 ② Φ16 ③ Φ24 ④ Φ25.6 ⑤ 25×M12
Rated sine/random force (lbf)	11000	13200	15400	17600	17600	22000	22000	26400	35200	35200	39600	39600	44000
Shock force (lbf)	22000/33000*	26400/39600*	30800/46200*	35200/52800*	35200/52800*	44000/66000*	44000/66000*	52800/79200*	70400/105600*	70400/105600*	79200/118800*	79200/118800*	88000/13200*
Frequency range (Hz)	DC-2700	DC-2700	DC-2700	DC-2700	DC-2500	DC-2500	DC-2500	DC-2500	DC-2200	DC-2200	DC-2200	DC-2200	DC-2100
Max. acceleration (g)	100	100	100	100	100	100	100	100	100	100	100	100	100
Max. velocity (m/s)	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*
Max. displacement (inch)	2	2	2	2	2	2	2/3*	2/3*	2	2	2	2	2/3*
Max. load (lbs)	1760	1760	1760	1760	2420	2640	2200	2200	3520	3520	3520	3960	6600
Shaker model	ET-50W	ET-60W	ET-70W	ET-80	ET-80	ET-100	ET-100	ET-120	ET-160	ET-160	ET-180	ET-180	ET-200
Mass of moving elements(lbs)	110	132	132	132	176	176	198	198	308	330	308	330	330
Armature diameter (inch)	17.5	17.5	17.5	17.5	19	19	21.7	21.7	23.2	25.6	23.2	25.6	25.6
Weight (lbs)	About 9900	About 9900	About 9900	About 9900	About 16060	About 16060	About 15400	About 15400	About 24200	About 24200	About 24200	About 24200	About 24200
Body suspension natural frequency(Hz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Dimension (L×W×H:inch)	68.1×43.4×51			68.1×43.4×51.4	77.5×50.4×53.7		70x50.3x54.3		82.6×59×60.1				83.8×58.2×61.1
Power amplifier model	SDA-50W	SDA-60W	SDA-70W	SDA-80	SDA-80	SDA-100	SDA-100	SDA-120	SDA-160	SDA-160	SDA-180	SDA-180	SDA-200
Power (kVA)	50	60	70	80	80	100	100	120	160	160	180	180	200
Power supply requirement (kVA)	90	100	110	140	140	160	180	180	230	230	250	250	250
Weight (lbs)	About 2200	About 2200	About 2200	About 3960	About 3960	About 4180	About 4180	About 4180	About 5720	About 5720	About 5720	About 5720	About 7260
Dimension (L×W×H:inch)	47.2×39.8×81.5			70.9×39.8×81.5					94.5×39.8×81.5				118×39.8×81.5
Cooling type	Water cooled												
Cooling unit model	CU-1	CU-1	CU-1	CU-2	CU-2	CU-2	CU-2	CU-2	CU-2	CU-2	CU-2	CU-2	CU-2
Internal circle water flow (distilled water) (gal/min)	8.8			17.6									
Internal water pressure (distilled water) (PSI)	145			145									
External circle water flow (city water) (gal/min)	22			35.2									
External water pressure (city water) (PSI)	36~58			36~58									
Water pump power (internal/external)(kW)	4/2.5			8/4									
Distilled water requirement	Hardness 30ppm, PH7-8, conductivity 1Us/cm												
Weight (lbs)	About 550	About 550	About 550	About 550	About 660	About 660	About 660	About 660	About 660	About 660	About 660	About 660	About 660
Dimension (L×W×H:inch)	23.8×39.7×75.7												

Optional accessories • Slip table • Head expander • Moving device • Thermal barrier • Power amplifier remote control • Fixture • Outer circulation unit • Chamber integrated control • Vibration controller

Performance Characteristics

- Random to sinusoidal excitation force ratio: 1:1
- Two-times-of-sine shock force (Three times optional)
- Displacement peak-to-peak: 2 inch, 3 inch or 4 inch
- Lightweight armature and large working table
- Better vibration isolation effect though air springs at trunnion position
- Large bearing capacity of air spring in central room, and goodlow-frequency performance
- Equipped with an automatic centering system, to control assure that the armature is always in balance position during movement
- Double magnetic circuit design, with low flux leakage and uniform magnetic field
- Electric powered rotating mechanism is configured for horizontal and vertical switching

System model	ES-300-870	ES-350-870	ES-400-870	ES-500-1070	ES-50WLS3-445	ES-60WLS3-445	ES-70WLS3-445	ES-80LS3-445	ES-100LS3-550	ES-120LS3-550	ES-200LS3-650
	 ① Φ8 ② Φ16 ③ Φ24 ④ Φ64 ⑤ Φ34.3 ⑥ 33×M12			 ① Φ8 ② Φ16 ③ Φ24 ④ Φ31.9 ⑤ Φ40 ⑥ Φ42 ⑦ 41xM12x50	 ① Φ8 ② Φ16 ③ Φ17.5 ④ 17xM12				 ① Φ4 ② Φ8 ③ Φ12 ④ Φ16 ⑤ Φ20 ⑥ Φ21.7 ⑦ 37xM12		 ① Φ8 ② Φ16 ③ Φ24 ④ Φ25.6 ⑤ 25×M12
Rated sine/random force (lbf)	66000/52800	77000/55000	88000/66000	110000/88000	11000	13200	15400	17600	22000	26400	44000
Shock force (lbf)	132000/198000*	154000/231000*	176000/264000*	275000	22000/33000*	26400/39600*	30800/46200*	35200/52800*	44000/66000*	52800/79200*	88000/132000*
Frequency range (Hz)	DC-1700	DC-1700	DC-1700	DC-1500	DC-2500	DC-2500	DC-2500	DC-2500	DC-2500	DC-2500	DC-2100
Max. acceleration (g)	100	100	100	100	100	100	100	100	100	100	100
Max. velocity (inch/s)	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*	78.7/98.4*
Max. displacement (inch)	2	2	2	2.4	3	3	3	3	3	3	3
Max. load (lbs)	13200	13200	13200	33000	1760	1760	1760	1760	2200	2200	3520
Shaker model	ET-300	ET-350	ET-400	ET-500	ET-50WLS3	ET-60WLS3	ET-70WLS3	ET-80LS3	ET-100LS3	ET-120LS3	ET-200LS3
Mass of moving elements (lbs)	660	660	726	1100	110	132	132	132	198	198	330
Armature diameter (inch)	34.3	34.3	34.3	42	17.5	17.5	17.5	17.5	21.7	21.7	25.6
Weight (lbs)	About 23000	About 23000	About 23000	About 32000	About 9900	About 9900	About 9900	About 9900	About 16060	About 16060	About 24200
Body suspension natural frequency (Hz)	2.5	2.5	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Dimension (L×W×H:inch)	114.1×81.3×78.1			137.8×86.6×88.6	68.1×43.5×51.5				70×50.3×54.3		83.8×58.2×61.1
Power amplifier model	SDA-380	SDA-420	SDA-460	SDA-500	SDA-50W	SDA-60W	SDA-70W	SDA-80	SDA-100	SDA-120	SDA-200
Power (kVA)	380	420	460	630	50	60	70	80	100	120	200
Power supply requirement (kVA)	520	560	600	660	90	100	110	140	160	180	250
Weight (lbs)	About 8800	About 13420	About 13420	About 15400	About 2200	About 2200	About 2200	About 3960	About 4180	About 4180	About 7260
Dimension (L×W×H:inch)	236.2×39.8×81.5			305.5×39.8×81.5	47.2×39.8×81.5			70.9×39.8×81.5			118×39.8×81.5
Cooling type	Water cooled										
Cooling unit model	CU-3	CU-3	CU-3	CU-4	CU-1	CU-1	CU-1	CU-2	CU-2	CU-2	CU-2
Internal circle water flow (distilled water) (gal/min)	26.4			57.2	8.8			17.6			
Internal water pressure (distilled water) (PSI)	145			145	145			145			
External circle water flow (city water) (gal/min)	70.4			147.4	22			35.2			
External water pressure (city water) (PSI)	36~58			36~58	36~58			36~58			
Water pump power (internal/external)(kW)	8/6.5			18/12	4/2.5			8/4			
Distilled water requirement	Hardness 30ppm, PH7-8, conductivity 1Us/cm										
Weight (lbs)	About 660	About 660	About 660	About 770	About 550	About 550	About 550	About 550	About 660	About 660	About 660
Dimension (L×W×H:inch)	23.8×39.7×75.7										

Optional accessories • Slip table • Head expander • Moving device • Thermal barrier • Power amplifier remote control • Fixture • Outer circulation unit • Chamber integrated control • Vibration controller

Power Amplifier

Smart Power Amplifier

Smart power amplifier is composed of the logical unit, power unit and control unit, with prominent advantages of intelligent manipulation, stability and reliability, flexible configuration, efficient and energy saving, compact structure and easy maintenance.

Performance Characteristics

Customer friendly operation
Man-machine dialogue, modular design of the system, "Easy" operation, multi-language switching, and authority management

Powerful function
Externally connect with industrial module, customized multimedia, running log, self-protection, and platform optimization

Superior performance
All-digital debugging, small harmonic distortion, good current sharing effect, and multi-node monitoring

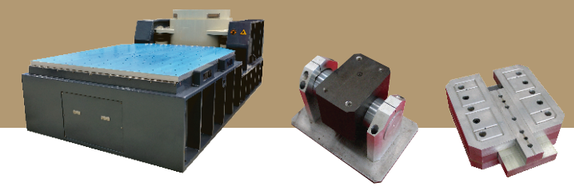
Easy to maintain
System self-diagnosis, fault log, and power unit adopts N +1 mode parallel operation

Test security
Hardware and software dual protection, output force limit, linkage protection, and customized other protection capabilities.

Technical Specifications

Power range	0.1~1000kVA
Output voltage	150Vrms
Input impedance	≥10kΩ
Signal-to-noise ratio	≥65dB
Harmonic distortion (resistive load)	< 1.0% (typical value)
Output voltage measurement error	≤1%
Output current measurement error	≤1%
Output current	≤4800A(120A step increase)
Output current crest factor	≥3
Peak power of the module unit	≥150%(20kVA)
DC stability	Output terminal zero drift ≤50mv/8h
Frequency response DC ~ 5000Hz	±3dB
Medium-frequency gain	≥80
DC / AC conversion efficiency	>95%
Nature of the load	Optional of resistive,capacitive,inductive
Parallel operation current unbalanceness	≤1%
Mean time between failures (MTBF)	>3000h

Slip Table Series



V-shaped Bearing Slip Table

Thickness (inch) / Effective mass (aluminum/magnesium) (lbs)	ES-2-150 ES-3-150	ES-6-200	ES-6-230 ES-10-240	ES-20-320	ES-30-370 ES-40-370	ES-40-445 ES-50-445 ES-60-445	ES-100-480	ES-160-590	ES-200-650	ES-350-870
GT300（300 X 300）	1.2 25.3/18.7	1.2 26.4/19.8	—	—	—	—	—	—	—	—
GT400（400 X 400）	1.2 38.5/27.5	1.2 40.7/29.7	—	—	—	—	—	—	—	—
GT500（500 X 500）	1.2 56.1/38.5	1.2 58.3/40.7	1.2 61.6/45.1	1.6 83.6/60.5	1.6 92.4/69.3	1.8 124.3/94.6	—	—	—	—
GT600（600 X 600）	1.6 101.2/68.2	1.6 102.3/70.4	1.6 106.7/74.8	1.6 111.1/79.2	1.6 121/88	1.8 16.6/118.8	—	—	—	—
GT700（700 X 700）	1.8 151.8/103.4	1.8 154/105.6	1.8 158.4/110	1.8 162.8/114.4	1.8 176/127.6	1.8 204.6/149.6	—	—	—	—
GT800（800 X 800）	—	1.8 195.8/134.2	1.8 200.2/138.6	1.8 211.2/145.2	1.8 220/154	1.8 250.8/180.4	2 303.6/224.4	2 363/283.8	—	—
GT900（900 X 900）	—	—	1.8 246.4/169.4	1.8 259.6/178.2	1.8 268.4/187	2 305.8/215.6	2 360.8/261.8	2 420.2/321.2	—	—
GT1000（1000 X 1000）	—	—	1.8 299.2/204.6	1.8 312.4/213.4	1.8 321.2/222.2	2 365.2/255.2	2 422.4/303.6	2 481.8/363	—	—
GT1100（1100 X 1100）	—	—	1.8 367.4/248.6	1.8 317.8/253	1.8 380.6/261.8	2 429/299.2	2 490.6/349.8	2 550/409.2	—	—
GT1200（1200 X 1200）	—	—	1.8 431.2/292.6	1.8 435.6/297	1.8 444.4/305.8	2 501.6/347.6	2 565.4/398.2	2 624.8/457.6	—	—
GT1300（1300 X 1300）	—	—	—	—	—	—	2 644.6/453.2	2 704/512.6	2 704/512.6	—
GT1400（1400 X 1400）	—	—	—	—	—	—	2 732.6/510.4	2 792/569.8	2 792/569.8	—
GT1500（1500 X 1500）	—	—	—	—	—	—	2 822.8/572	2 882.2/631.4	2 882.2/631.4	2 1179.2/928.4
GT2000（2000 X 2000）	—	—	—	—	—	—	2.4 1705/1159.4	2.4 1764.4/1218.8	2.4 1764.4/1218.8	2.4 2061.4/1515.8
Work environment	Temperature range 5~35℃, humidity range ≤90% (non condensing)									
Note	① Effective mass includes slip plate, drive bar, swing pole, V-shaped bearing(exclude armature mass). ② Usable frequency upper limit 2000Hz. ③ The above effective mass is under common design, if there are special requirement or special design, need to calculate the effective mass again.									

Hydrostatic Bearing, and Medium-pressure Bearing Slip Table

Thickness (inch) / Frequency (Hz) / Effective mass (aluminum/magnesium) (lbs)	ES-30-370 ES-40-370	ES-40-445 ES-50-445 ES-60-445	ES-100-550	ES-160-590 ES-180-590	ES-200-650	ES-350-870
BT800/TBT800（800 X 800）	2 2000 235.4/165	2 2000 246.4/176	2 2000 299.2/220	2 2000 358.6/279.4	—	—
BT900/TBT900（900 X 900）	2 2000 290.4/200.2	2 2000 301.4/211.2	2 2000 356.4/257.4	2 2000 415.8/316.8	—	—
BT1000/TBT1000（1000 X 1000）	2 2000 349.8/239.8	2 2000 360.8/250.8	2 2000 418/299.2	2 2000 477.4/358.6	—	—
BT1100/TBT1100（1100 X 1100）	2 2000 413.6/283.8	2 2000 424.6/294.8	2 2000 486.2/345.4	2 2000 545.6/404.8	—	—
BT1200/TBT1200（1200 X 1200）	2 2000 486.2/332.2	2 2000 497.2/343.2	2 2000 561/393.8	2 2000 620.4/453.2	2 2000 620.4/453.2	—
BT1300/TBT1300（1300 X 1300）	2 2000 563.2/382.8	2 2000 574.2/393.8	2 2000 640.2/448.8	2 2000 699.6/508.2	2 2000 699.6/508.2	—
BT1400/TBT1400（1400 X 1400）	2 1600 646.8/437.8	2 1600 657.8/448.8	2 1600 728.2/506	2 1600 787.6/565.4	2 1600 787.6/565.4	—
BT1500/TBT1500（1500 X 1500）	2 1200 734.8/497.2	2 1200 745.8/508.2	2 1200 818.4/567.6	2 1200 877.8/627	2 1200 877.8/627	2 1200 1174.8/924
BT2000/TBT2000（2000 X 2000）	—	—	2.4 1000 1700.6/1155	2.4 1000 1760/1214.4	2.4 1000 1760/1214.4	2.4 1000 2057/1511.4
Work environment	Temperature range 5~35℃, humidity range ≤90% (non condensing)					
Note	① Effective mass includes slip plate, drive bar, swing pole. ② Above effective mass exclude armature and bearing (the effective mass of one BT hydrostatic bearing is 11 lbs, the effective mass of one TBT medium pressure bearing is 12.1 lbs)					

Head Expander Series

Square (aluminium alloy) Square (magnesium alloy) Round (aluminium alloy) Round (magnesium alloy)

Square head expander specification								
Model \ Table diameter	-150	-200	-230 -240	-320	-370	-445 480	-550	-590
HE300S	15.4 2000	17.6 2000	22 2000	—	—	—	Effective mass (lbs) (Aluminum) Upper limit frequency (Hz)	
HE400S	26.4 2000	28.6 2000	46.2 2000	—	—	—	—	—
HE500S	44 2000	50.6 2000	70.4 2000	70.4 2000	72.6 2000	—	—	—
HE600S	63.8 1200	81.4 1300	83.6 1300	88 2000	88 2000	116.6 2000	—	—
HE700S	—	—	94.6 1000	132 2000	176 2000	176 2000	—	—
HE800S	—	—	132 1000	154 1200	176 1300	187 1300	275 1800	297 1800
HE900S	—	—	176 700	209 800	209 1000	220 1000	264 1000	264 1000
HE1000S	—	—	160.6 400	220 600	242 800	407 1000	440 1000	462 1200
HE1100S	—	—	—	—	—	506 500	539 700	352 700
HE1200S	Effective mass (lbs) (Aluminum) Upper limit frequency (Hz)		—	—	—	550 400	583 500	616 500
HE1500S	—		—	—	—	770 400	880 400	924 400
HE2000S	—		—	—	—	—	1980 300	2200 300

Note: The effective mass of Magnesium head expander is equal to 0.75 time of Aluminum head expander. M(Mg)≈0.75xM(Al)

Square head expander specification								
Model \ Table diameter	-150	-200	-230 -240	-320	-370	-445 480	-550	-590
HE300R	15.4 2000	17.6 2000	—	—	—	—	Effective mass (lbs) (Aluminum) Upper limit frequency (Hz)	
HE400R	22 2000	26.4 2000	30.8 2000	35.2 2000	—	—	—	—
HE500R	44 2000	46.2 2000	50.6 2000	66 2000	70.4 2000	—	—	—
HE600R	—	44 1000	66 1800	72.6 1800	83.6 1800	83.6 2000	—	—
HE700R	—	—	72.6 800	127.6 1500	151.8 2000	154 2000	—	—
HE800R	—	—	—	132 800	154 1200	158.4 1500	—	—
HE900R	—	—	—	—	187 1200	220 1200	—	—
HE1000R	—	—	—	—	—	308 1000	330 1100	352 1100
HE1100R	—	—	—	—	—	440 800	462 900	506 1000
HE1200R	Effective mass (lbs) (Aluminum) Upper limit frequency (Hz)		—	—	—	550 500	572 600	594 600
HE1500R	—		—	—	—	726 400	770 400	880 400

Note: The effective mass of Magnesium head expander is equal to 0.75 time of Aluminum head expander. M(Mg)≈0.75xM(Al)

ESD Modal Shaker

MP Series

Specification \ Model	ESD-005	ESD-010	ESD-045	ESD-100
Sine force(lbf)	11	22	99	220
Usable frequency range (Hz)	DC~10000	DC~6000	DC~6000	DC~6000
Max. displacement(inch)	0.4	0.4	1	0.6
Max. velocity(in/s)	63	63	63	63
Max. acceleration (g)	30	40	100	80
Effective mass of moving elements(lbs)	0.35	0.55	0.99	2.64
First resonance frequency (Hz)	9000	5000	4000	4000
Screw Model	M5	M5	M6	M8
Weight(lbs)	6.6	22	55	88
Dimension (L×W×H:inch)	4.9×3.7×6.3	4.9×3.7×7.1	9.3x7.5x10.2	11×11×13.7
Power amplifier model	MP-500	MP-500	PA-1200	PA-2000
Cooling type	Built-in Blower	Built-in Blower	Blower model QW12T-607	Blower model QW12T-607
Power supply requirement	AC 220 V ±10%, 50 Hz, 600 VA	AC 220 V ±10%, 50 Hz, 600 VA	AC 220 V ±10%, 50 Hz, 1300 VA	AC 220 V ±10%, 50 Hz, 2100 VA

Standard Shaker Series

PA Series

Specification \ Model	ESS-005A	ESS-025A	ESS-050A
Sine force (lbf)	11	55	110
Usable frequency range(Hz)	DC ~ 10000	DC ~ 10000	DC ~ 6000
Max. displacement(inch)	0.24	0.4	0.24
Max. velocity (in/s)	47.2	47.2	47.2
Max. acceleration (g)	30	25	30
Max. load(lbs)	1.1	5.5	6.6
Effective mass of moving elements(lbs)	0.33	2.2	3.3
First resonance frequency (Hz)	7000	7000	5000
Armature table diameter(inch)	1.18	3.7	4.7
Weight (lbs)	11	77	88
Dimension (L×W×H:inch)	3.7×3.7×5.1	12.6×13×12.9	12.6×13×14.8
Power amplifier	MP-500	PA-1200	PA-1200
Cooling type	Air cooled	Built-in Blower	Built-in Blower
Power supply requirement	AC 220 V ±10%, 50 Hz, 600 VA	AC 220 V ±10%, 50 Hz, 1300 VA	AC 220 V ±10%, 50 Hz, 1300 VA

Comprehensive Environmental Test System

Temperature, Humidity, and Vibration

Integrated environmental testing system is designed for the comprehensive test of temperature, humidity and vibration, with the requirements of different working conditions taken into account. This is widely used to produce reliability tests, identification tests and stress screening tests of the comprehensive environment with temperature changed rapidly.
To ensure the optimal performance of the integrated system, we provide a complete system for integrated environmental testing. Users need not to spend a lot of time, effort and funds to create an integrated system for individual components.

Performance Characteristics

- Dual refrigeration systems and superior refrigeration performance;
- Operating system of the chamber can be dynamically monitored by the computer, and can be automatically started up after power recovery, thereby reducing the downtime;
- Combined test of vibration, temperature, and humidity etc in an integrated environment;
- Advanced touch-screen control, for easy program editing;
- Removable chamber bottom plate to connect with a variety of electro-dynamic shakers;
- Insulated multi-layer observation window, to provide wide vision.

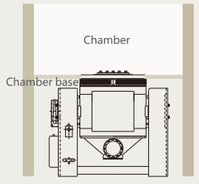
Main Technical Parameters

- Climate chamber capacity: 59.4gal to 2641 gal
- Humidity range: 20 to 98% R.H
- Temperature range: -94 to 356°F
- Temperature change rate: 33.8 ~ 50°F/ min
- Matching vibration shaker: ES series

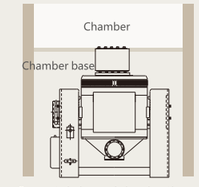
Product Usage

- Integrated environmental reliability test
- Reliability growth test
- Reliability qualification test
- Product reliability acceptance test
- Routine test
- Stress screening (ESS) test

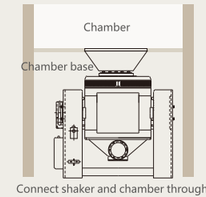
Vibration Table with Temperature Control Box Connection



Directly connect shaker and chamber



Connect shaker and chamber through connector



Connect shaker and chamber through head expander

Comprehensive Environmental Test System

Temperature, Humidity, Low Pressure, and Vibration

This four function combined test system is mainly used in fields such as aviation, aerospace, information, and electronics. And it is also used to determine the environmental adaptability and reliability test of the instrumentation, electrical products, materials, parts, and equipments under low air pressure, humidity, high / low temperature, and vibration individually or in a simultaneous condition. Compared with the single factor condition, this system can reflect more realistically the degree of adaptation to environmental changes of the electronic products in practical use, which is mainly used to simulate the high-altitude environment on the ground, then to analyze and evaluate the performance and behavior of the devices such as avionics electronic products, instruments, meters,components and parts etc. under this environment. This system is composed of the vibration test system and low air pressure, humidity, and high / low temperature test system.

Functions and Features

- Can carry out low air pressure, humidity, high / low temperature and vibration single or combined test
- The reverse force automatic compensation device with independent intellectual property is equipped, to ensure the armature central position when the vibration shaker is working
- Specimen energized in test for measuring the electrical performance parameters
- With large-screen color LCD touch screen and high-performance PLC, the system has high degree of automation, with friendly interface
- Online control with vibration shaker, having the remote control function

Main Technical Parameters

- Temperature range (℃): -94 to 302°F
- Temperature raising and lowering rate (°F/ min): 33.8~50
- Pressure range (Pa): Atmospheric pressure to 500
- Air pressure change rate (kPa / min): 1 to 20
- Pressure recovery rate (kPa / min): ≤ 10
- Relative humidity (RH): 20% to 98% (within 68°F to 185°F temperature range)
- Chamber capacity: customized by the user
- Matching vibration shaker: ES series