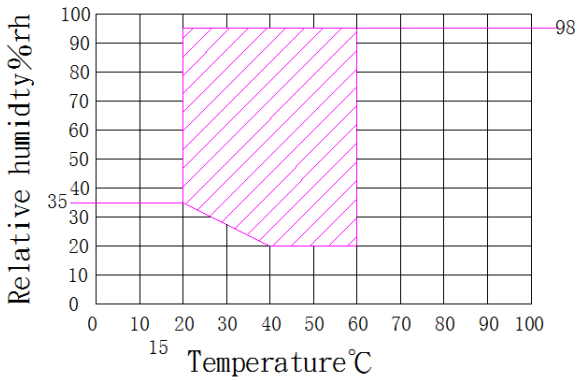
Specification for Combined Vibration and Temperature and Humidity Test Chamber

（The photo is only for reference, specification is subject to the physical chamber）

Model: KMVH-1000S-C5

Company: KOMEG Technology Ind. CO., Ltd

Compiling Dep.: Technology Department

Ⅰ. Performance (Water cooled, Water temperature +25℃, no load)	
1. Temperature range	-70℃ ～ +150℃
2.Temperature deviation	≦±2.0℃
3.Temperature fluctuation	±0.5℃
4.Temperature uniformity	≦2.0℃
5.Temperature change rate	Heating rate: -70℃ to +150℃ nonlinear 5℃/min no load Cooling rate: +150℃ to - 70℃ nonlinear 2℃/min no load
2. Humidity	
1. Humidity range	20%R.H～98%R.H
2.Humidity range	
3. Humidity deviation	±3.0％RH（＞75％RH） ±5.0％RH（≤75％RH）
4. Humidity fluctuation	±2.0％RH
Temperature and humidity performance test is in accordance with the relevant provisions of the IEC60068 -3 standard measurement; sensor placed in the unit outlet.	
Ⅱ. Chamber Structure	
1. Chamber size	Workspace volume: W 1000 × H 1000 × D 1000 mm Exterior size: W 1200 × H Pending × D 2650 mm (about)
2． Insulation box	※ wall material: high-quality carbon steel with static color spray ※ inner wall material: SUS304 # matte stainless steel plate

	※ Insulation materials: rigid polyurethane foam insulation layer + glass fiber.
3. Heater	High-quality nickel-chromium alloy wire electric heater, non-contact control (SRR).
4.Supply air circulation system	A. Special stainless steel lengthened axis of the motor 1 B. SIROCCO FAN C. Adjustable shutter outlet
5． Door	Single door, single window, left open, handle on right hand side A. Window W460 * H560mm with energy-saving lamps 1 only B. Explosion-proof handle C. Button: SUS # 304
6. Temperature measuring body	High precision DIN A class, dry bulb SUS # 304 PT 100Ω 1 Pcs
7． Cable port	Φ50mm*1 located on both sides(each*1) with rubber stopper and plastic cover
8． Sample holder	Two layers of stainless steel sample holder, load capacity 30kg/layer
Ⅲ. Refrigeration system	
1.Compressor	BOCK Semi-hermetic compressors
2.Refrigerant	R404A/R23（Ozone damage index is 0）environmental friendly
3.Condenser	Air cooling fin condenser.
4. Evaporator	Copper aluminum finned evaporator.
5. Other accessories	High-precision expansion valve, oil separator, desiccant, etc. components are imported using internationally renowned brands
6.Refrigerant flow control	Automatic adjustment of energy consumption output of the refrigeration system.
7.Refrigeration Technology	※ Nitrogen welding, two-stage rotary vane vacuum pump, ensure that the internal cooling system clean and reliable. ※water tray located at the bottom of the compressor to ensure condensate water drain through pipe freely at the rear of the chamber.

Ⅳ. Control System	
Sensor	high precision DIN A class, dry bulb Φ 4.8mm SUS #304 PT 100 Ω
Controller	KOMEG brand KM-5166 LCD Touch screen controller with PID control 
3. Display Function	Temperature settings (SV) Actual (PV) value can be displayed directly, Execution of the program can display numbers, Paragraphs, remaining time and cycles, running time display, Program editing and graphic curve display, Fixed or program operation status display, Resolution: 800 * 480, 7-inch TFT display screen.
4. Display Resolution	Temperature: + 0.01ºC; Humidity: + 0.1%; time: 1min.
5. Setting Range	Temperature conditions: －100～200 ℃ Temperature can be adjusted based on the working temp. range of the equipment (the upper limit: +5ºC, the lower limit : -5ºC) Humidity conditions:0～100 %RH
6. Operation Mode	Programmable running, constant running and booking boot
7. Setting mode	Touch mode input
8. Interface	Data collection and curve display when connected with a computer Can be used as monitoring and remote control system Multi machines synchronization control available
9. U Disk Memory Card	1G-8G available for downloading historical curve, data, pluggable Data can be converted to curves, such as Excel file format report.
10. Data collection	RAM with battery protection settings, data can be saved, maximum historical data memory storage is 90 days (when the sampling time is 1min)
11. Power Off Memory	Power recovery mode can be set as hot start, cold start and

Function	stop
12. Pre-set Function	Boot time can be set freely and machine runs automatically when turning on power
13.Software environment	Windows2000 or Windows XP
14. Network Connection	Can be connected to Ethernet via professional software, remote control & assistance function and data collection can be achieved through network, multiple machine can be controlled simultaneously
15.Fault handling	Fault alarm and causes handling prompts, power protection, the lower limit temperature protection, timer function (automatic start and automatic stop running), self-diagnostic function.

Ⅴ. Control Panel

a. Emergency stop switch
b. Power switch
c. Over temperature protection device
d. RS-485 or RS-232 Interface

Ⅵ. Safety protection device

A. Heater dry combustion protection switch
B. Humidifier empty burn prevent protection switch
C. Heater overcurrent circuit breaker
D. Humidifier over-current circuit breaker
E. circulation fan over current overload protection
F. Compressor high pressure protection switch
G. compressor over temperature protection switch
H. compressor overcurrent protection switch
I. Overvoltage open phase, reverse protection switch
J. Circuit breaker
K. No fuse switch
L. Low humidifier protection
M. Water tank low water level warning
N.Controller noise isolation protection
O. Zero-crossing gate fluid power controller

3. Alarm indication: When the above protection, the device stops running, and sound and light alarm, At the same time in the controller display fault location and its causes and solutions.

Ⅶ. Others

1.Enclosure backplane	The bottom of the box designed can be replaced, according to the vibration direction (horizontal or vertical) for backplane replacement, the machine with a vertical vibration backplane, horizontal vibration backplane and blind backplane each 1 pcs
2. Box lifting device	The machine can automatically lift, can adjust height according to the height of the vibration platform.
3. Horizontal mobile device	The machine body adopts the electric left and right translation design. When do horizontal vibration test, vibration platform can be moved to the horizontal relative position; When do vertical vibration test, vibration platform can be moved to the vertical relative position.

Ⅷ. Installation environment

1. Power Supply	AC 3 ψ 4W 380V 50Hz (R.S.T.N ground wire)(voltage fluctuation≦ ±10%)
2.Surrounding environment	Ensure operating environmental temperature range: 5∽35℃
3.Ground protection	ground resistance ≦4Ω

P.S. 1. Please equip the above power demanded to the terminal box of the machine control; user must prepare an exclusively no-fuse switch for the machine.
2. Please confirm whether it can enter the door or access elevators.
3.This offer is for the price of the machine only and does not include the cost of the power cord, water tower and piping costs

Main parts list

	Parts	Brand	Remarks
	Compressor	Bock compressor	
	Oil separator	Emerson	EMERSON.
	Plate heat exchanger	Germany GEA	GEA
	Press switch	DANFOSS	Danfoss

	Condenser	Yongqiang	
	Evaporator	Yongqiang	
	Dryer	Denmark DANFOSS	
	Capillary	KOMEG	
	Expansion valve	Denmark DANFOS / HONEYWELL	
	Expansion valve	HONEYWELL	
	Magnetic valve	Japan SAGLNOMLYA or Nickideu	
	Magnetic valve	Denmark DANFOS	
	Controller	KOMEG	
	Residual current circuit breaker	Taiwan SHIHLIN	
	No-fuse switch	French Schneider	
	AC contactor	French Schneider	
	Thermorelay	French Schneider	
	Phase sequence relay	Carlo Gavazzi	
	Solid-state relay	Carlo Gavazzi	

Specification for Electric Vibration Test System

Equipment: Three axial electric vibration test system

Model: KM-DC-2000-20/SC-0606/TB-0606/ VENZO 820

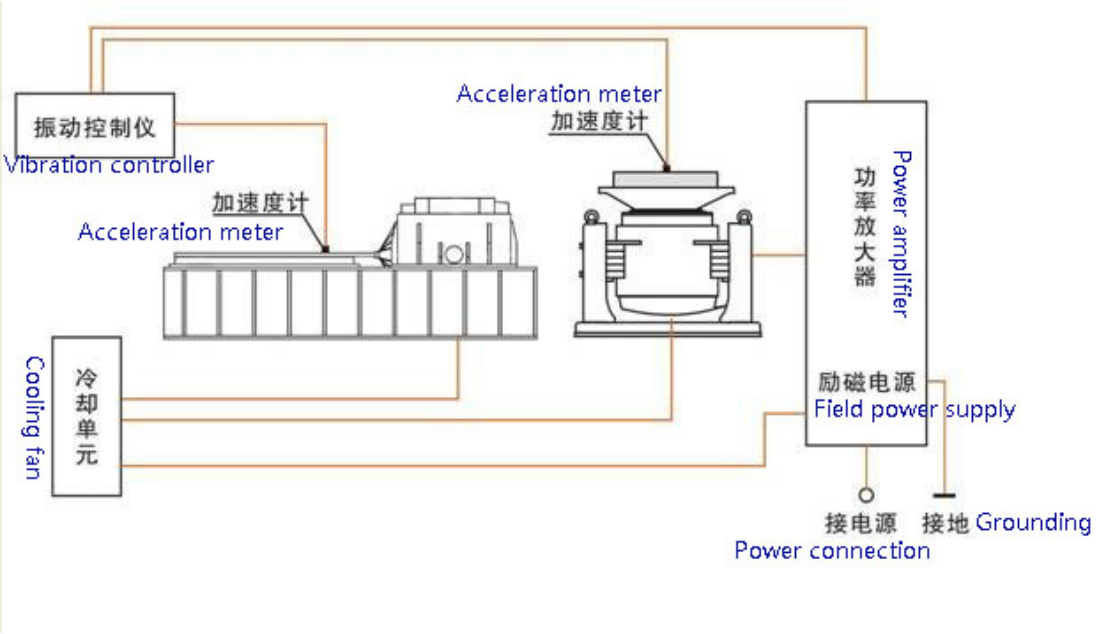
Company: KOMEG Technology Ind Co., Limited

1. System composition:

DC-2000-20 / SC-0606 / TB-0606 vibration test system equipment are composed of DC-2000-20 electric vibration table, VENZO 820 multi-function controller, KA-20 switching power amplifier, SC-0606 horizontal slide, TB -0606 vertical additional table and FJ-2000 cooling fan.

2. Equipment composition:

SN	Name	QTY
1	**Vibration table body parts**	
	DC-2000-20 Vibration generator	1
	FJ-2000 Cooling fan	1
	SC-0606 Slip table	1
	TB-0606 Vertical additional table	1
2	**Power amplifier**	
	KA-20 digital switching power amplifier (including excitation power)	1
3	**Digital multi-function controller VENZO 820**	
	Including interface box, computer, printer, piezoelectric acceleration sensor Low noise cable), sine, random, shock, resonant search and resident software	1
4	**Accessory**	
	Cable	1
	Ancillary tools	1



System principle block diagram

3. Main technical specifications

DC-2000-20 body parameters	
Rated Sine Force（peak）:	20 kN
Rated Random Force（peak）:	20 kN
Frequency Range	DC～3000 Hz
Max Displacement(p-p)	51mm
Max Velocity	2.0 m/s
Max Acceleration	1000m/s2
One class resonant frequency	2500Hz±5%
Maximum load	300 kg
Axial vibration isolation frequency	2.5 Hz
Turntable Diameter	Φ320 mm
Equivalent mass of moving parts	20 kg
Body Size(No packing) （L×W×H）	1182mm×758mm×1052mm
Body Weight	About 1695kg
SC-0606 Horizontal slide table (magnesium alloy)	

Table size (mm)	600×600 mm
Use Frequency (Hz):	2000 Hz
Weight （kg）	About 38 kg
TB-0606 Vertical expansion table (magnesium alloy)	
Table size (mm)	600×600 mm
Use Frequency (Hz):	2000 Hz
Weight （kg）	About 38 kg
KA-20 power amplifier parameters	
Output Power	20 kVA
System Protection	Temperature, wind pressure, over displacement, overvoltage, overcurrent, input undervoltage, external fault, control power supply, logic fault, input phase loss
FJ-2000 cooling fan parameters	
Fan power	7.5 kW
Fan flow:	0.71 m3/s
Wind pressure:	3.5 kpa
The length of the duct:	4m
System working environment:	
Humidity	0～90% (No condensation)
Power requirements	380V/50Hz，3phase，42kVA
The standard length of the connecting cable is 6m.	

VENZO 820 Vibration controller

Function：

Two Core i7 Windows7 based CPUs with 24'' LEDs and related accessories.	
Function: sinusoidal control, random control, classic impact control, resonant search and presence	
Configuration: 4 analog input channels, 1 output channel, ICP sensor and charge sensor can be directly connected.	

1. System structure and configuration

System composition

We provide solutions according to the user's demand including:

1) VENZO 820 Vibration control hardware：

4 input channel.1 output channel

2) Vibration control software VibExpert

（1）Random vibration control

（2）Sinusoidal vibration control

（3）Classic impact control

（4）Resonance search and reside (RSTD)

3）Attachment: the power cord, network cable, electronic "user manual", a set of software installation CD, password files, etc.

2. Vibration control equipment technical indicators

VENZO 820 vibration controller appearance

3.1 Main technical parameters：

3.1.1 Input

4 Channel Input

A/D converter：24 bit

Coupled mode: AC Differential, AC single-ended, DC Differential, DC single-ended, IEPE, charge

Anti Alias Filter： All frequency band 160dB protection

Dynamic range：130 dB

Signal to noise ratio: better than 100dB

Input range：0.1，1.0，10V

Input resistance：220kΩ

Max Input Voltage：36V

Amplitude accuracy：-0.005 dB

Phase accuracy：0.05deg

Channel crosstalk <-90dB

Distortion：<-100dB@1kHz

Maximum sampling frequency：102.4 kHz

Input interface：BNC Interface

TEDS： support TEDS

Input Signal Type: charge, IEPE, voltage type sensor signal direct access, highly integrated

3.1.2 Output

1 Channel driver output

24 bit DAC

Dynamic range：Greater than 108 dB

Output voltage range：10V F.S

Maximum output current：20mA Min

Harmonic distortion：<-100dB@1kHz

Anti Alias Filter：160dB/Oct analog and digital anti aliasing filter

3.1.3 Mainframe box

Size：290*210*60

Weight：2.6kg

Working Temperature：-30℃to 70℃

Relative humidity：95%

Power：Lower than 25W

Power Supply：100～240VAC（50～60Hz）

Waterproof Rate：IP43

Cooling mode： Conduction no fan cooling

Mainframe box interface: High-speed standard Ethernet computer interface

Vibration resistance：10-60 Hz @ 0.15 mm peak；60-150 Hz @ 2 gn,，Satisfy the standard of IEC-60068-2-6

Shock resistance：10 gn for 16 ms，Satisfy the standard of IEC-60068-2-27

Meet the EMC standard ： EN61326-1:2006, EN61000-3-2:2006+A1:2009+A2:2009, EN 61000-3-3:2008

Safety Standard：EN 61010-1:2001

CE approved

3.1.4 Software function

Random

Sine, stepped sine, Resonance search and reside (RSTD).

Classic shock;

Kurtosis control

Grooves and limit control

3.1.5 Analysis & auxiliary functions

Harmonic distortion measure

Data storage

FFT

SRS

FRF

The waterfall figure signal

Signal calculate

Signal caching function

Signal editor

Word/PDF test report

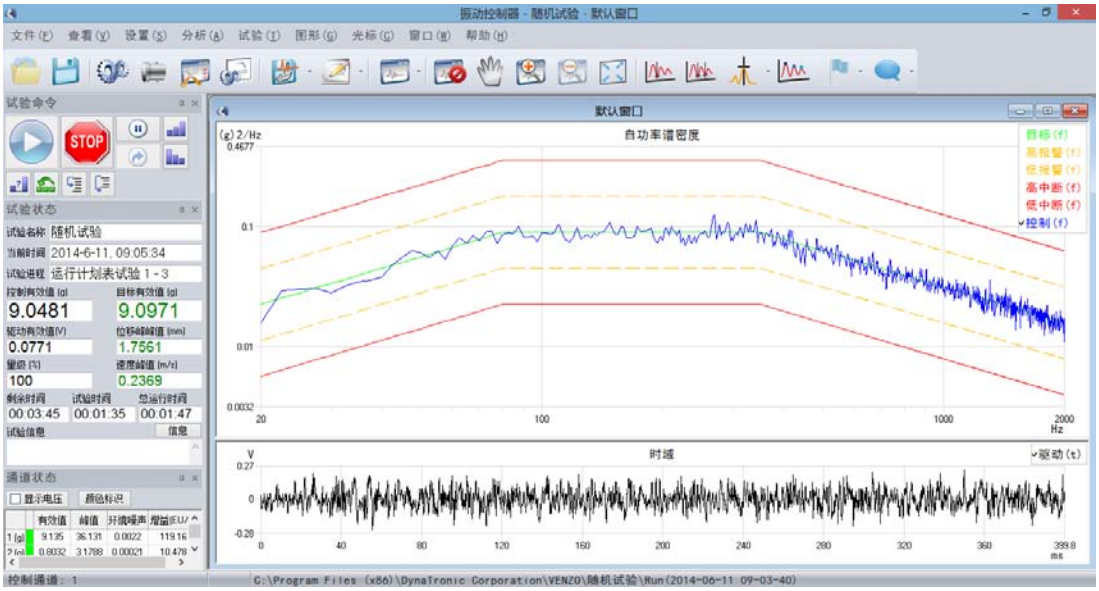
Email test report

Offline reader

The shock wave transient capture, force deformation analysis, shock response spectrum analysis

3.3 Software functions Introduction

- Random Control



Real-time closed-loop random control based on PSD

Frequency Range：DC~5000Hz, Can be extended to 40000Hz

Sample frequency：51.2 KHz, Can be extended to 102.4 kHz

Line number：6400line, the max optional 25600line

Dynamic range：100dB

Driver Cut：1~100sigma

Control precision：±1dB@120DOP

Kurtosis：3~100sigma

Control strategy：Weighted average, minimum, maximum

Degrees of freedom：4~12736

Stop Rate: Defines the drive signal reduced to zero rate

Loop compensation gain: Definitions update rate transfer function

Frequency change: define the frequency response function of the maximum rate of change

Start mode: Optional for the online measurement or the last test

Open-loop detection levels: standard, strict and loose three levels selectable

Channel maximum noise: set the maximum allowed noise

Maximum system impedance: balanced or test run, checks the system maximum impedance value

Optional functions

High frequency extension

It can increase the frequency of random controls to 20,000Hz, or 40000Hz

Sine and Random

Up to 16 sinusoidal signal can be superimposed on broadband random background signal

Random-Random

Up to 16 narrowband random signal on broadband random background signal

Sine-Sine

Up to 16 sinusoidal signals can be superimposed, each sinusoidal signal can reside or sweep

Sine Random-Random

Narrowband random signals and sinusoidal signal can be superimposed on broadband random background signal

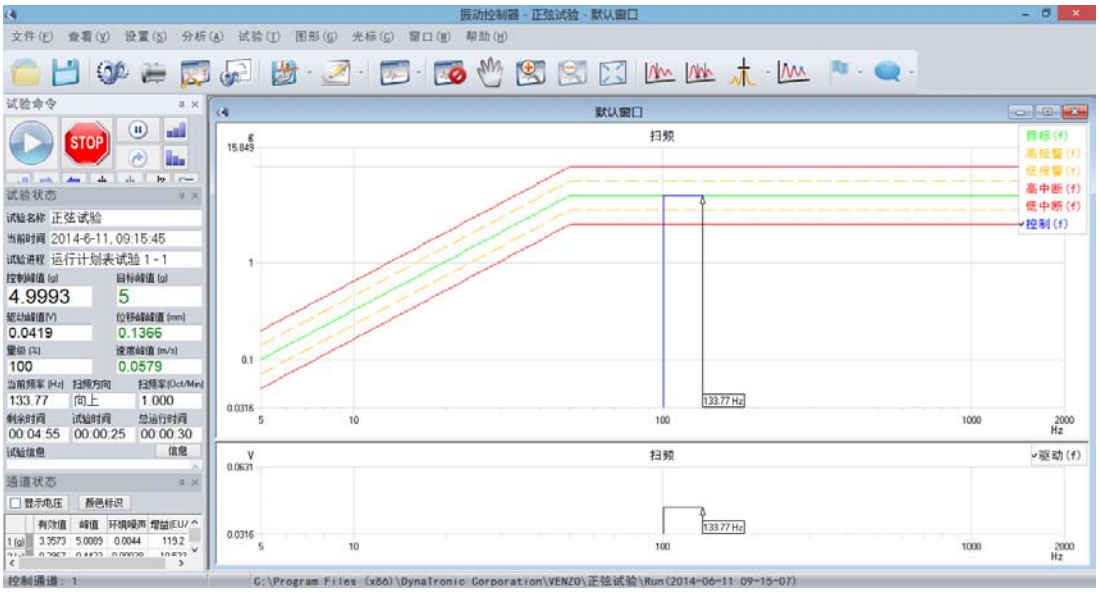
Kurtosis control

Loadable non-Gaussian distribution random signal to the vibration table

Grooves and limit control

Can set any measurement channels vibration magnitude auxiliary reference curve for maximum specimen protection

Sine Control



Sinusoidal test is used to control vibration table sine sweep vibration, to determine the structure of resonant frequency and damping factor.

Frequency Range: 1Hz~5000Hz, High frequency can be extended to 51200Hz，Low frequency can be extended to 0.01Hz

Line number：512~8192

Dynamic Range：150dB

The closed-loop time：Typical values 5ms

Frequency Accuracy：0.000001Hz

Control accuracy：±1dB@ with 1Oct/Min sweep frequency through Q value 50 resonance point

Resident: User-defined Reside frequency and time, time can be defined by cycle number or length of time.

Harmonic distortion: Automatically calculate total harmonic distortion in the spectrum, can choose the harmonic order

Control strategy: weighted average, minimum, maximum,

Digital Tracking Filter: Proportional band can choose for output frequency from 1% to 100%, or 1Hz to 1,000Hz

Minimum response time: 0.25 ~ 50 cycles

Start mode: fast, smooth modes selectable

Sweep type and sweep rate: Linear Sweep from 0 ~ 6000Hz / min, logarithmic sweep from 0 ~ 100 Oct / min

Compression factor: 1 to 1000

Optional functions:

Stepped sine

At discrete frequency points set by the user, Control vibration table at test frequency step manner do frequency sweep test, sweep mode can be selected as linear or logarithmic

Resonance search and reside

Realize the resonance point tracking and reside

Resonance search

Search target: user-defined incentive channel and response channel

Phase tracking

Feedback Gain：0.01~1

The maximum frequency drift:：0~1000%

Maximum sweep rate:0~10×normal rate

Resident

Residence time: Cycle number or time length

Resident mode: Frequency locking resides, Resonance point tracking resides

Low frequency sine extended to 0.01Hz

High frequency sine extended to 51.2 kHz

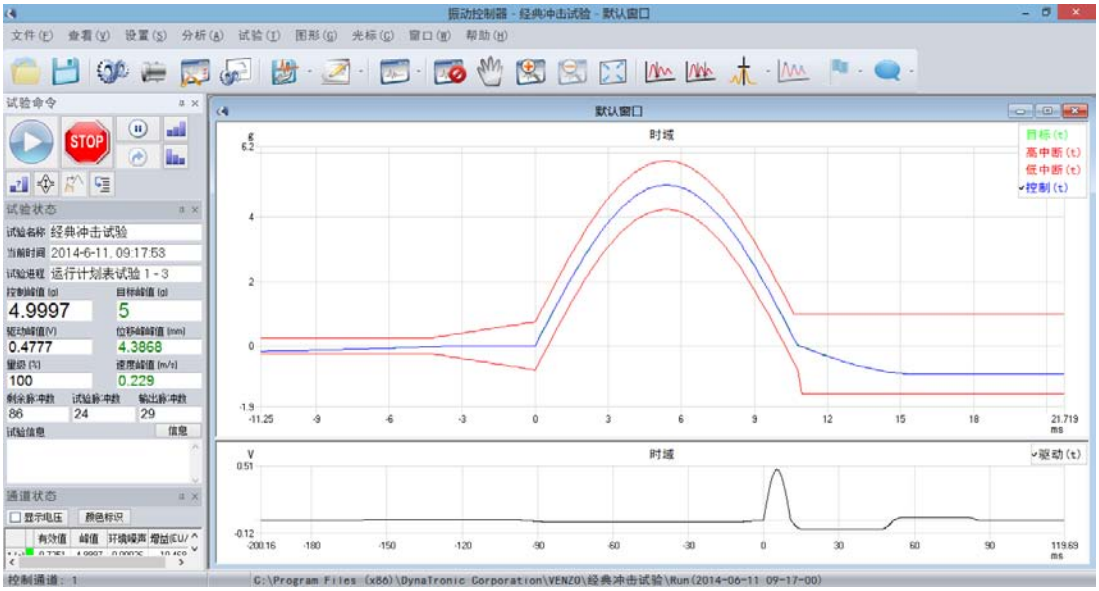
AUX channel

COLA output; differential output; frequency reference output

THD detection

The total harmonic distortion detecting vibration test system

- Classic shock：



Classic Impact function can realize transient shock wave closed-loop control functions; support a variety of shock wave, the software provides a variety of displacement compensation mode.

Sampling number：256~16384 dot ， Can be extended to 65536 dot

sampling frequency: 20kHz~51.2kHz， High frequency can be extended to 204.8kHz

Loop transfer function: online balance or call existing FRF from disk

Filtering: Choose LPF (Lowpass filtering) and set the cut-off frequency

Pulse interval: define the time interval between consecutive impulse

Waveform Type: Half-sine, bell-shaped wave, before peak sawtooth, after peak sawtooth, triangle wave, square wave, trapezoidal wave

Negative Pulse: opposite polarity pulse can be defined

Average: After the pulse averaged can used to control

Waveform Duration: from 0.05ms to 100,000ms

Compensation Waveform: Rectangular harmonic, rectangular wave, half-sine wave

Compensation Type: before and after compensation, only before compensation, only after compensation

Test standard: ISO, MIL-STD 810F, or user-defined test standard

Restrictions: automatic calculation of maximum acceleration, maximum speed and maximum displacement, and compared with vibration table limit parameters

Optional functions：

Transient capture

Sampling frequency: up to 204.8 kHz

Acceleration Range: Up to 100000gn

Capture time: 1ms ~ 10000ms

Trigger slope: rising edge, falling edge, and double edge

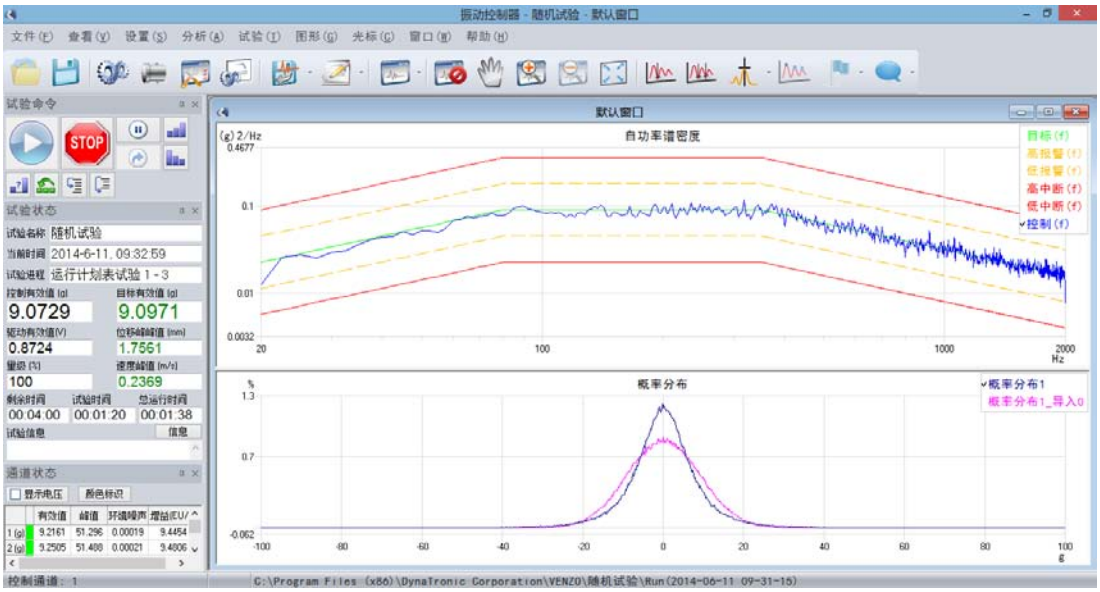
Analysis: deformation analysis, impulse response analysis, SRS analysis

High frequency impact: the impact frequency range can be extends from 20 kHz to 80kHz

- **auxiliary function**

Kurtosis control

Conventional random control test, the output is normally distributed random signal; kurtosis value of the signal is 3. Due to meet the needs of normal distribution, signal peaks greater than 3 SIGMA occupies very little time in the signal. The purpose of the kurtosis control is to adjust the level of random signal amplitude distribution, increase the signal peak in the probability of random signals, but does not change the order of the power spectral density test. Kurtosis test increases the probability of occurrence of the peak value of the control signal, In some cases, make test more close to the real environment



Limit / notching control

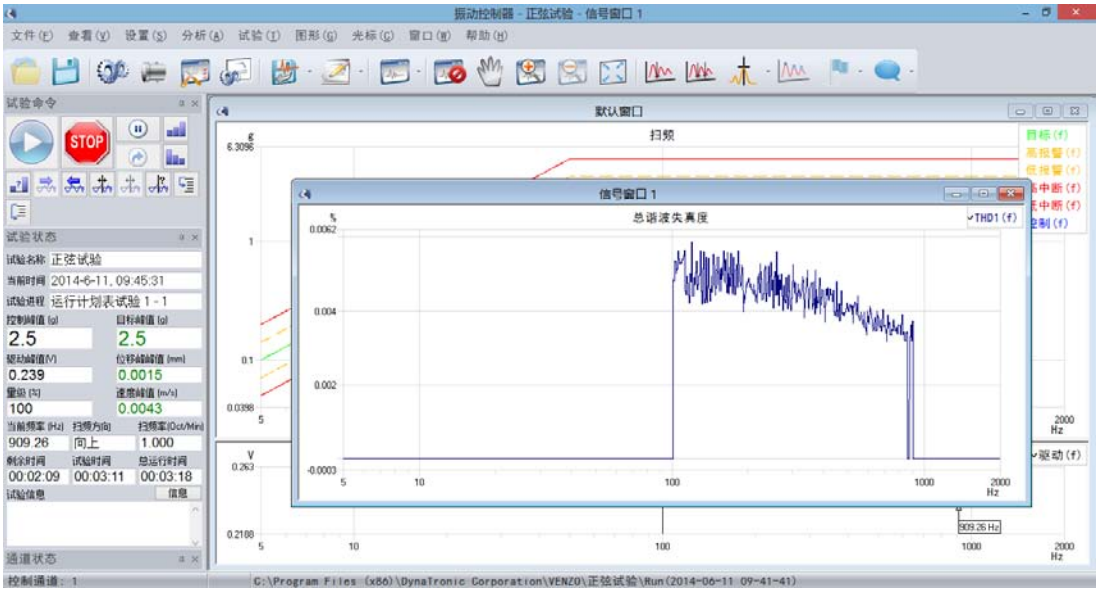
Using measurement channel limit/ notching control help users in the testing process to effectively protect the specimen. During the test, some points on the specimen may be caused a great vibration due to resonance, Limit / notching control the vibration magnitude of any measurement channels setting auxiliary reference spectrum to maximize the protection of specimen.

Multivariable control

Multivariable control is adopted high frequency acceleration control low frequency axis displacement control of hybrid control strategy. This approach can broaden the range of frequency control, VENZO vibration control can realize continuous sine sweep test from 0.01Hz ~ 51.2 kHz, control dynamic range

150dB. Especially for the hydraulic vibration table, add displacement control channel can greatly improve the accuracy of the low-frequency control.

Total Harmonic Distortion



The total harmonic distortion degree of the vibration test system can be detected

Signal editor

It allows users to input and edit time-domain waveform. This function and long-wave function corresponding to the reproduction

test report

Click the report generation button to generate WORD/PDF report, report Settings can be customized according to user requirements.

Email report

Email report function, no matter where you are, can let you receive the test report at the end of the test.

Off-line browser

Applicable to all software functions

Analysis Functions

FFT analysis (random, sine), FRF analysis (random, sine), lead in stored signal,

signal calculation, waterfall figure analysis, experimental playback, data logging, signal caching function. In addition, Classic shock and transient impact function can perform shock response spectrum analysis.

Hardware calibration

Using the system calibration function can automatically complete hardware system calibration and produce the complete calibration report. (Requires calibration accessory package, including:. BNC cable and converter)

4: User installation preparation requirements

I. Installation conditions:

1. three-phase power source for system power supply

(1) Frequency: 50 Hz

(2) The line voltage: 380V

(3) Voltage fluctuation range: < 10%

2. Users equipped three-phase isolation power master switch power for vibration table system exclusive amplifier maximum output power of 80 Kva

II. Operating environment condition check

1. Temperature range: 5℃～35℃;

2. Humidity range: ≤80%;

3. Installation location ground flat, no corrosion gas, less dust around, best with the air conditioning.

III. Ground wire

The vibration test system must be equipped with a laboratory-specific ground wire.

Ground grounding resistance is less than 4Ω

IV. Lifting condition check

The user should be prepared with the corresponding spreader, forklift