KASON-HWN Computer Controlled Electronic Bending and Torsion Testing Machine

(Picture just for reference)

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1. Introduction

Our KASON-HWN series electronic bending and torsion testing machines are suitable for bending and torsion testing of pillar insulators. They can be used for pillar insulators, composite insulators, pin insulators, rod insulators, rod composite insulators, glass insulators, lightning arresters, and sheaths. Bending and torsion testing of insulators, porcelain core rods, composite core rods, bushings, hollow insulators, wall bushings, etc. Meet the bending test, torsion test, deflection test under load and mechanical test one by one for pillar porcelain insulators of 1000kV and below.

The processing of all parts of the company's products is controlled by the ISO9001 quality management system. Key outsourced components are all imported, which effectively improves the accuracy and long-term stability of the equipment.

The HST-HWN series electronic bending and torsion testing machine is a device produced in accordance with the relevant testing standards for insulators. It not only meets the requirements, but can also perform 4-point (or 1-point) bending program tests and destruction tests, as well as torsion program tests and destruction tests of insulators.

This equipment is the latest generation of bending and torsion composite testing machine. It adopts electronic servo motor control technology. Bending, torsion and height adjustment are all driven by servo motors. It can automatically control force, deformation and displacement in any closed loop. It has load holding function and high control accuracy. High, long-term use stability and easy maintenance. It avoids the past loading of the oil cylinder, changes in grease and oil temperature after long-term use that affect the control accuracy, as well as oil leakage and difficulty in maintenance.

This latest generation (fully electronic) bending and torsion testing machine is currently used in the insulator industry and the country at home and abroad.

2. Working Principle

This equipment is a special equipment used to complete bending and torsion tests of composite and pillar insulators. The main body adopts a vertical structure and is equipped with 1 working station (note: bending and torsion are tested separately), which can simulate the working state of the test piece or conduct bending and torsion tests in accordance with the calibration standards. A computer program is used to control the servo motor drive through the ball screw transmission to automatically control the test force, deformation, displacement, and angle in multiple modes to complete the bending and torsion testing of the specimen. Test parameters, test results and test process curves can be displayed, stored and printed.

Select four-point bending test steps:

(1) Install the sample on the workbench turntable, and the movable beam reaches the specified height through the screw lifting mechanism.

(2) Set the test program (only needs to be set for the first time), quickly drive the ejector to the approaching position, and when it reaches the program's preset force value (200N), contact the sample at the set speed. At this time, the test force, The displacement is automatically cleared at the same time, and then the test is carried out at the test speed. When the set force value or 20%, 50%, or 70% of the

specified mechanical failure load is reached, load holding (or continuous load holding test in stages) can be selected to hold the load. The time can be set arbitrarily. For example, after 5 minutes, the program will return to the zero point at high speed, and the program will send out a signal. The turntable on the workbench will quickly rotate 90 degrees, and the second point test will be performed until the 4-point bending test is completed. When the 4-point bending program is selected, the test bench It automatically and quickly rotates 90 degrees after every 1 point, and ends the test at 4 points. The test method is automatically stored and can be directly called for the next test.

(3) Just like the model specification test, you only need to install the sample, call the test method, and click Run to automatically complete all test steps.

Select one point bend test steps:

(1) Set the test program (only needs to be set for the first time), quickly drive the ejector to the approaching position, and when it reaches the program's preset force value (200N), contact the sample at the set speed. At this time, the test force, The displacement is automatically cleared at the same time, and then the test is carried out at the test speed. When the set force value or 20%, 50%, or 70% of the specified mechanical failure load is reached, load holding (or continuous load holding test in stages) can be selected to hold the load. The time can be set arbitrarily, such as returning to zero at high speed after 5 minutes, or increasing the load value to the breaking load or the actual breaking load at a rate of 35% to 100% per minute to end the test. The test method is automatically stored and can be directly called for the next test. .

(2) Just like the model specification test, you only need to install the sample, call the test method, and click Run to automatically complete all test steps.

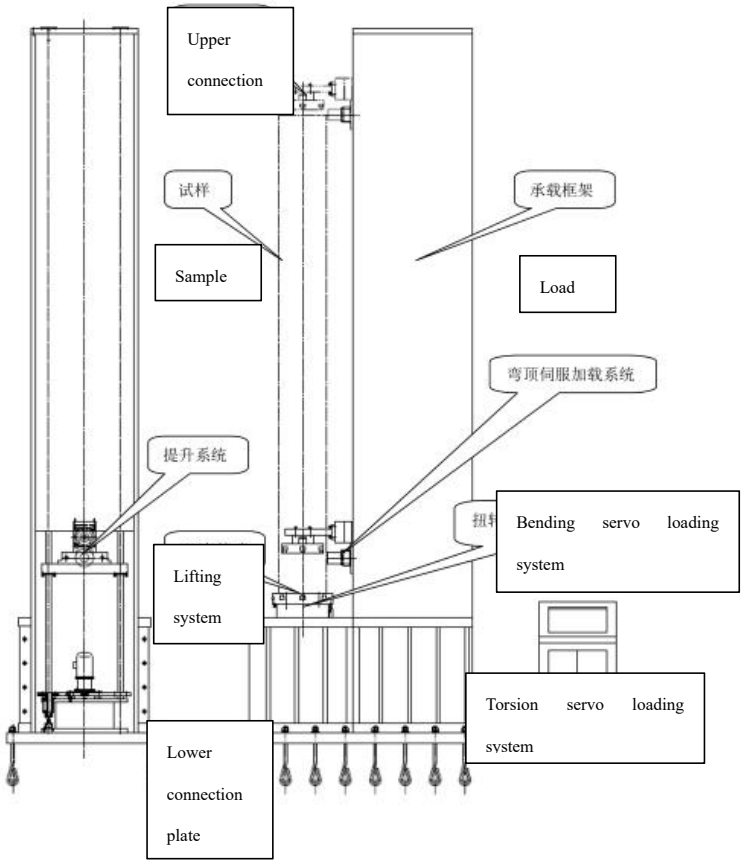
Torsion test steps:

(1) First install the upper torsion disk accessory on the sample, and then install the sample on the workbench turntable.

(2) Use the manual button box to operate the movable beam to reach the specified height through the screw lifting mechanism. Fine-tune the turntable angle and the height of the movable beam so that the torsion plate attachment can be inserted into the slot on the torsion head on the movable beam to achieve a hard connection.

(3) The servo motor controls the action and drives the workbench turntable to achieve torsional motion. The torsion angle and torsion torque can be set arbitrarily. When doing the torsion test, the workpiece does not bear additional force and is in a pure torsion state.

(4) Just like the model specification test, you only need to install the sample, call the test method, and click Run to automatically complete all test steps.



3. Structure

This equipment adopts servo motor control technology and consists of a host frame, loading system, electrical control system, and test software.

1.Host

The main machine consists of a base, a lower bottom plate, a movable beam, an upper beam, a screw lifting mechanism, a reaction I-beam, a rotating mechanism, a loading system, etc.

The space adjustment motor is placed at the bottom, and the movable beam is driven by the motor to move up and down. The test space is adjusted through the movement of the beam to adapt to different sample testing requirements. Through the servo motor loading system, the bending test can be realized.

The sample is placed on the workbench, and there is a turntable on the workbench. When the 4-point bending program is selected, the test bench will rotate 90 degrees through the servo motor program after each point is pressed to improve test efficiency.

A torsion servo mechanism is installed at the bottom of the main machine workbench. The turntable on the workbench is rotated to achieve torsion through servo motor control. The torsion angle can be set arbitrarily. When doing a torsion test, the workpiece does not bear additional force and is in a pure torsion state.

Host structure characteristics

◆L-shaped load-bearing frame with large cross-section, small deformation when subjected to bending test force, reducing foundation requirements.

◆Welded directional pedestal, longitudinal stiffeners are arranged in the direction of force flow, and the stiffness of the stress point is enhanced.

◆Four-column integrated load-bearing frame, the middle gantry area corresponds to the specimen at the work station, and the bending test loading unit is arranged.

◆Welded rectangular section column, double hollow square tube, double web structure, large bending and torsion resistance section modulus.

◆Rectangular guide rails are arranged on the columns, and the moving beams rise and fall along the guide rails.

◆The moving beam adopts a double-screw drive structure with good synchronization to avoid jamming and jamming.

◆Both bending test and tensile test adopt electronic loading, which has the characteristics of high control accuracy and good long-term load stability.

◆Double screw synchronous loading mechanism, with load sensor and loading rod arranged in the middle of the screw.

◆Using ground high-precision ball screw, high loading displacement accuracy and long service life.

◆Imported fully digital AC servo motor with high control precision and reliability.

◆The moving beam of the electric loading unit adopts a guide structure, which has high loading accuracy and strong lateral resistance.

◆Using imported spoke-type load sensors, it has high measurement accuracy and strong anti-eccentric load capability.

◆The worktable adopts a rotating form supported by bearings: flexible rotation and four-point 90-degree bending conversion method.

2. Load the system

The transmission principle is: electronic servo loading, the high-precision wide speed ratio range servo driver receives the electrical control signal, controls the high-precision wide speed-adjustable servo motor, drives the reducer to run, and then drives the high-precision gap-free balls through the synchronous toothed belt The screw rotates synchronously and drives the movement (the cross beam is connected to the guide rod) to load the sample.

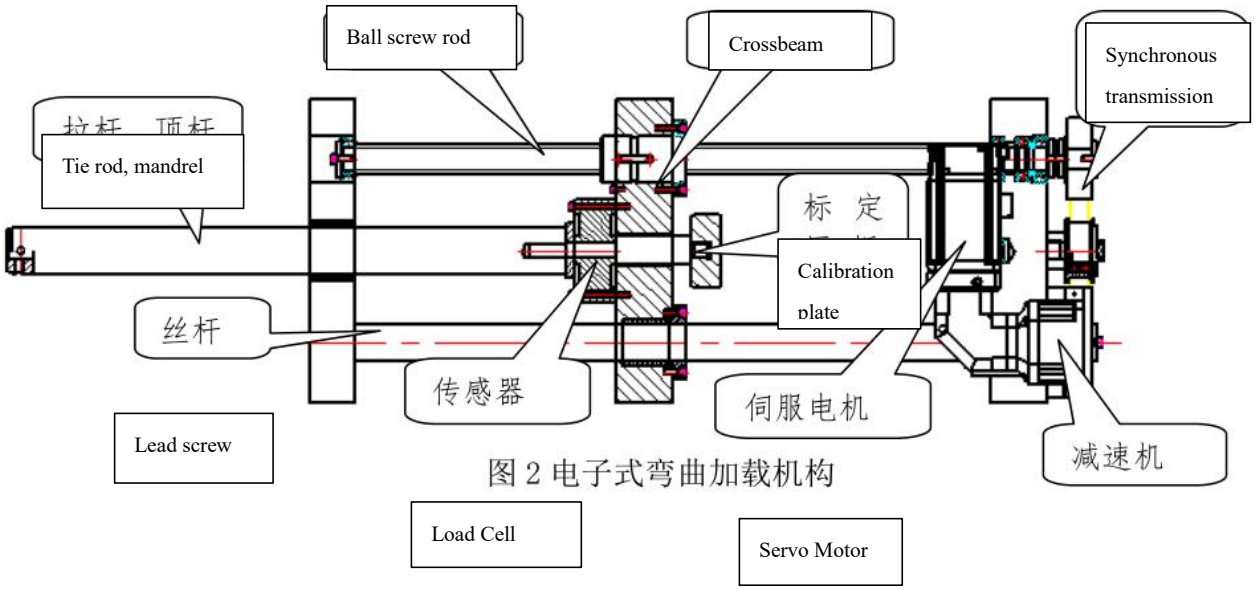


图 2 电子式弯曲加载机构

Fig2 Electronic bending loading mechanism

Taiwan's TBI high-precision, low-resistance, and nut-preloaded gap-free ball screws are used to improve transmission efficiency and ensure displacement measurement accuracy.

Using high-quality high-strength materials for optimized design, it is small in size, light in weight and beautiful in appearance while ensuring sufficient test space.

Using the latest MB series servo driver and servo motor from Taiwan TECO, the host runs smoothly, with high control accuracy and operating noise below 51dB.

It adopts the American Gates arc-shaped toothed belt and toothed pulley, which has excellent meshing status, stable operation and long service life.

The electrical control system uses well-known components such as Schneider and Siemens, which work reliably and stably. The programmable controller PLC has the characteristics of reliable quality, precise acquisition and control, powerful functions, high integration, and compact size. The data (load, deformation) collection adopts The dedicated acquisition module has the characteristics of stable and reliable data acquisition, fast speed, strong anti-interference ability and no drift effect.

The testing machine software is independently developed and installed on the management computer. It is mainly used for project creation (can be created according to different models: control model and test conditions), data statistics, and analysis; the test version is operated by the testing machine operator. , the trial version software is loaded according to different models and test condition settings, and the test can be carried out. It is easy to operate and is a "fool" type test software.

4. Load Cell

(1) Bending force sensor: This equipment is connected to a spoke-type force sensor at the front end of the piston rod. The maximum test force is: 100kN. The sensor is connected to the ejector rod through a flange.

(2) Torque sensor: This equipment is equipped with a torsion servo loading mechanism at the bottom of the main machine workbench. The servo motor is connected to the turntable through the reducer and slewing bearing. When twisting, the servo motor is controlled to achieve thrust for torsion testing.

(3) Bending displacement sensor: The movement of the bending loading rod is measured by a displacement sensor. This sensor uses a photoelectric encoder built into the servo driver. The resolution is 0.001mm and the accuracy is 0.01mm.

(4) Crossbeam height displacement sensor: The height of the movable crossbeam is measured by a displacement sensor. This sensor uses 5000 lines. The displacement sensor is connected to the lead screw with an accuracy of 0.01mm.

(5) Torsional displacement sensor: The displacement of torsional movement is measured by a displacement sensor. This sensor uses a photoelectric encoder built into the servo driver. The resolution is 0.001mm and the accuracy is 0.01mm.

5. Equipment performance

1. This equipment is mainly used for bending and torsion composite testing of insulators

2. It adopts computer calculation, servo motor control, and has automatic control methods such as stress and strain.

3. TestWorld version real-time control test software, automatically collects and processes test data, displays and records load, time, deformation, displacement, angle and load time curve, load deformation curve, and load angle curve in real time.

4. Display the instantaneous values of load and displacement in real time.

5. This equipment uses imported servo motors, which have high control accuracy, long-term stability and reliability, improve work efficiency and are easy to maintain.

6. This equipment uses imported sensors with high measurement accuracy and good linearity, which improves the accuracy of force measurement.

7. Equipment control mode: closed-loop servo control, arbitrary control of force, displacement, and deformation. Loading speed or displacement speed control can be set. Program control is possible. Various control modes can be switched smoothly. Feature points are automatically marked, and the equipment can be controlled. The curve is analyzed and processed; the force or displacement can be optionally controlled: the process control steps can be set at will, and the program will run in the set steps. When the specified target value is reached, the force or displacement will automatically stop loading or hold the load.

6. Parameters

1. Maximum specimen height: 1500mm

2. Accuracy level: Level 1

3. Maximum bending load: 50kN

4. Effective measurement range of bending test force (kN): 0.5%～100%F·S (0.5kN～50kN)

5. Load resistance measurement accuracy: within ±0.5% of the indication value

6. Bending stroke: 1000mm (deformation amount)

7. Bending control method: electronic servo closed-loop control (force, displacement, deformation closed-loop arbitrary program control)

8.Maximum torque: 20kN.m

9. Effective measurement range of torsion test force (kN): 1% ~ 100%F·S

10. Torsional load measurement accuracy: within ±1% of the indication value

11. Four-point direction bending conversion method: 90° automatically completed

12. Torsion angle: 90° arbitrary control (torsion loading speed, angle-time, force value-time can be freely selected and controlled);

13. Torsion angle measurement accuracy: 0.1°

14. Torsion control method: electro-hydraulic servo closed-loop control (force, displacement, angle closed-loop arbitrary program control)

15. Control error during load holding: ≤±1%

16. Test force speed control adjustment range: 0.5～10%F·S/s

17. Relative error of test force speed control:

When control speed <0.05% F·S/s: ±1%

When force control rate ≥0.05% F·S/s: ±0.5%;

18. Speed accuracy: ±0.5%

19. Test speed: 0.001~500mm/min (torsion 0~2r/m). The loading control speed can be set arbitrarily within this range, and the speed is continuously adjustable (when it is fast, work efficiency is improved);

20. Movable beam lifting: driven by servo motor, stepless speed regulation

21. Torsion control method: servo motor closed-loop control (force, displacement, angle closed-loop arbitrary program control)

22. Load resolution: 500,000 codes (no binning inside and outside, only one resolution in the whole process, no range conversion conflict);

23. Workpiece test height: 200mm～1500mm

24. Working flange diameter: Φ800mm (16 equal T-shaped slots)

25. Connection method between specimen and flange: 32 pieces of T-shaped slide blocks, each piece has three internal threads: M18, M20, M22;

26. Displacement measurement accuracy: ≤±0.5%

27. Displacement resolution: 0.001mm;

28. Constant load, constant stress, constant displacement, constant deformation, constant strain maintenance accuracy: better than ±1% of the indication value

29. Working conditions: ambient temperature: 20±10℃, relative humidity: ≤85%;

30. Constant speed stress control range: 2N/mm2.s-1～60N/mm2.s-1

31. Safety protection: electronic limit protection and indicator light flashing

32. Overload protection: Automatic alarm and shutdown when the maximum load exceeds 3%

33. Overload protection: This equipment is a real-time three-closed-loop control automatic adjustment.

When the actual test force is higher or lower than the set test force due to abnormal conditions, it has an automatic adjustment function;

34. Specimen breakage protection: After the specimen is broken, the program automatically stops and the test force is removed.

35. Protection against electromagnetic interference and ground potential rise: The control and measurement systems are protected against electromagnetic interference except for strong electromagnetic interference.

36. Test data can be accessed at will, and re-analysis of data and curves can be realized, including partial amplification and data re-editing, and different report formats can be output according to user requirements;

37. Load retention time: The load retention time is less than 100 hours, meeting the 96-hour load retention test, endurance test, and program-controlled test. It can be set arbitrarily by the user and is continuously adjustable;

7. Packing List

1. One HL-WN series electronic bending and torsion testing machine (total specimen height 5 meters)

2. A set of electronic bending loading system (including the following configurations:)

2.1 One imported TECO servo motor from Taiwan

2.2 A set of imported Taiwan TECO servo drives

2.3 Import one Taiwan Yada precision reducer

2.4 A set of imported Taiwan TBI precision ball screws

2.5 A set of loading frameworks

2.6 One high-precision 100kN load sensor

2.7 A set of bending (compression) force value calibration device (a calibration bracket can be installed on the loading movable beam, which can facilitate on-machine testing and third-party calibration)

2.8 set of displacement sensors (built into the servo drive)

3. A set of torsion loading system (including the following configurations:)

3.1 One imported Taiwan TECO servo motor

3.2 A set of imported Taiwan TECO servo drives

3.3 One imported Taiwan TECO precision reducer

3.4 A set of domestic high-quality slewing bearings

3.5 high-precision 30Kn.m torque sensor

4. A set of height adjustment mechanism (lifting) components (including the following configurations:)

4.1 A set of imported Taiwan TBI gapless ball screws

4.2 A set of imported Taiwan TECO motor

4.3 A set of imported Taiwan Yada precision reducer

4.4 set of lifting space frame

4.5 set of moving beams

5. Independently develop a control system

6. A brand Lenovo computer

7. HP HP1108 laser printer

8. A set of random tools (wrenches and other tools)

9. A set of piano-type operating tables

10. A set of accessories for twisting the upper plate

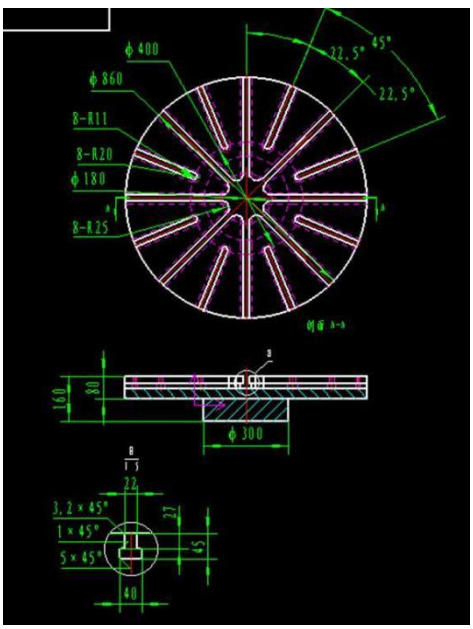
11. A set of equipment safety protective cover (height 2.5 meters)

12. A set of special software for bending and torsion testing machines

List		
1	Frame vertical host	1set
2	bending loading mechanism	1set
3	torsion loading mechanism	1set
4	Lift adjustment mechanism	1set
5	Testing machine console (including electrical control and PLC control system)	1set
6	Connection accessories (see: nine items)	1set

8. Connection accessories (can be designed according to customer requirements)

1. Work plate connection slider: 16 equal sections. T-slot flange plate connection specimen method: 16 T-type sliders in total, each with three types of internal threads: M18, M20, and M22.



2. A set of accessories for the torsion upper plate: a straight convex groove, a diameter of 800mm for the accessory of the torsion upper plate, 16 equal T-shaped slots, and a total of 16 T-shaped sliders. Each piece has three types of internal threads: M18, M20, and M22; of which 8 The specimens with an equal separation center of 90mm and a specimen flange connection hole greater than 180mm shall be installed in 8 equal parts, and the other 8 equal parts shall be installed

in 16 equal parts for specimens with a specimen flange connection hole greater than 400mm. See the reference design drawing. For other special product flanges, customers can make transition plate connections.

FOCUS IN MATERIAL TEST

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