KUNSHAN WANTONGHE MACHINERY CO.LTD.

Dynamic fatigue tester for frame pedaling force
WTH-JC-3040 User manual

Company address： 388 Songjiagang Road, Zhoushi Town, Kunshan City

Postal code：215314

Tel:0512-55162080 55161698 Fax:0512-55161698

Catalogue

1. Equipment function:

This device is used for dynamic fatigue testing of pedal force on bicycle frames.

2. Reference standards:

ISO4210-6-2014 "Bicycles - Safety requirements for bicycles - Part 6: Test methods for frames and forks" 4.3 ISO4210-3-2014 "Bicycles - Safety requirements for bicycles - Part 3: General test methods" 4.5

QB 1880-2008 Bicycle Frame 6.2.5

3. Test requirements:

a) If the upper tube is detachable or movable, the upper tube should be removed or fixed on the lower side for testing.

b) In the experiment, for the shock absorber frame equipped with pivot connections, adjust the spring, air pressure, or damping device to provide maximum damping, or for the pneumatic shock absorber equipped with a pneumatic shock absorber that cannot adjust air pressure, replace the shock absorber component with a rigid connecting rod and ensure that its two ends are fixedly connected, accurately simulating the original structure with lateral rigidity.

c) For shock absorption frames that rely solely on flexible connections and rear forks without a pivot, ensure that any shock absorption device can provide minimum resistance to allow the frame to undergo sufficient testing.

d) If the shock absorber frame has adjustable brackets or linkage mechanisms to change the contact resistance of the bicycle to the road or change the height of the bicycle, the position of those adjustable components can be adjusted to ensure maximum force on the frame.

e) When the frame of an electric power assisted bicycle, such as the cover of the electric drive part, is used as part of the frame, the cover should be installed and tested.

4. Test method:

1. Use a brand new frame/front fork assembly, accompanied by a standard front fork assembly for testing. The front fork can be replaced by a simulated front fork of the same length, with at least the same rigidity as the original

front fork. Note: If a practical front fork is used, it is likely to be damaged during the test. Therefore, for convenience, it is recommended to use a simulated front fork with better rigidity and strength than the former.

2. Install the frame components onto the base shown in Figure 4, and clamp the front fork or simulated front fork onto a rigid bracket with a height of Rw (radius of wheel/tire components ± 30 mm) using its shaft. The wheel hub can rotate freely on the shaft. Clamp the rear hook claw onto a vertical connecting rod at the same height as the front axle rigid bracket using its shaft. The upper part of the connecting rod can rotate freely around the axis, but cannot move laterally. The lower part of the connecting rod is equipped with a ball joint.
3. Install the crankshaft, sprocket, and chain components at the central shaft as described in a) or b) below, but prioritize using substitutes with certain strength and rigidity.

a) As shown in Figure 4, a crank/sprocket combination is used. The two cranks need to be tilted forward and downward by 45 ° relative to the horizontal position (accurate to ± 2 °), and the front end of the chain is clamped on the sprocket. The sprocket is made of three pieces, clamped in the middle piece, the two pieces are clamped on the small piece, and the single piece is directly clamped on it. The rear end of the chain is fixed at the rear axle and perpendicular to the rear axle axis.

b) If an alternative assembly is used (as shown in Figure 5), ensure that the assembly can rotate freely around the axis of the center joint. The length of the two crank replacement components is 175 mm (L), and they are at a 45 ° ± 2 ° angle to the horizontal line forward and downward. Tighten the vertical arm in place of the crankshaft (which replaces the sprocket), and in addition, the connecting rod with a ball shaped connection at both ends is connected to the rear axle and perpendicular to the rear axle axis. The length (Rc) of the vertical arm should be 75 mm, and the axis of the connecting rod should be parallel to the vertical plane of the frame centerline, with a parallel distance of 50 mm. Additionally, when the connecting rod comes into contact with the frame, a bent connecting rod can also be used.

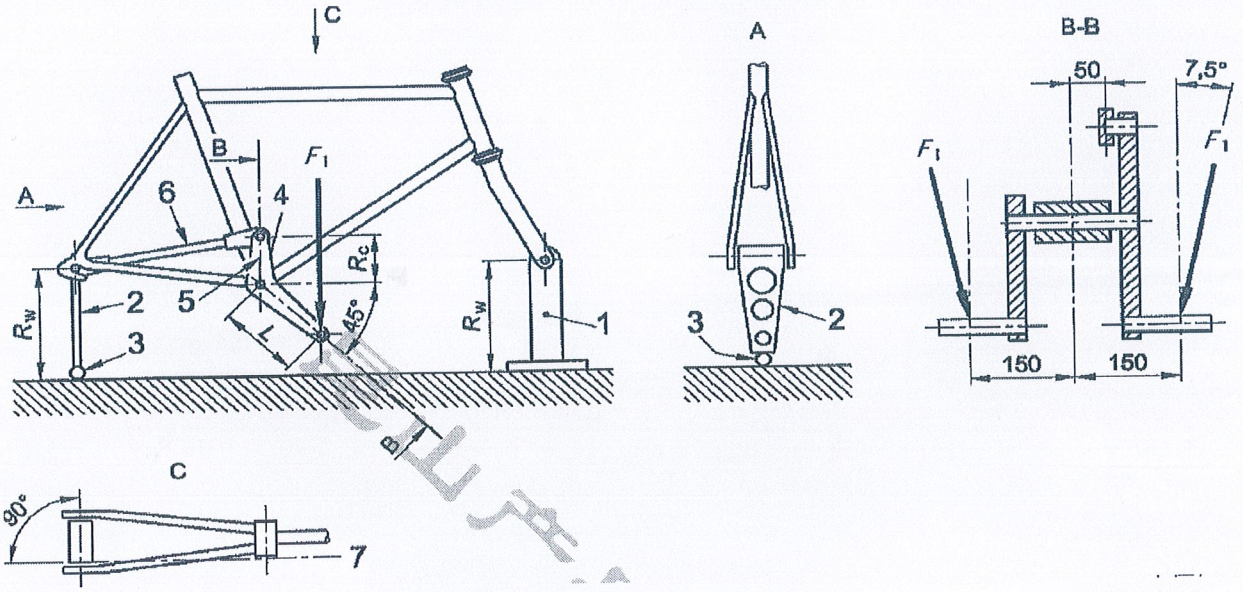
4. Apply a repeated downward force F1 to the left and right pedal axes (or equivalent test components), with a position 150 mm away from the center plane of the frame. The front/rear plane of the frame should tilt 7.5 °

towards the transverse plane (with an accuracy of ± 0.5 °) as shown in Table 3 and Figure 4. During the application of these experimental forces, it is necessary to ensure that the force applied to one "pedal axis" drops to 5% or less of the peak value before starting to apply force to the other "pedal axis".

5. Apply 100000 cycles of test force, each cycle including loading and unloading of two test forces. The maximum test frequency is 10Hz.

Table 3 — Forces on pedal spindle

Bicycles type	city and trekking bicycles	young adult bicycles	Mountain bicycles	Racing bicycles
Force, F1	1000	1000	1100	1200



Key:

Rw height rigid mount and vertical link

3——ball joint

Rc length of vertical arm (75 mm)

L length of crank replacement (175 mm)

1——rigid mount

2——vertical link

4——adaptor assembly

5——vertical arm

6——tie rod

7——centreline of tie rod

Figure4 Frame — Fatigue test with pedalling forces

Dimensions in millimeters

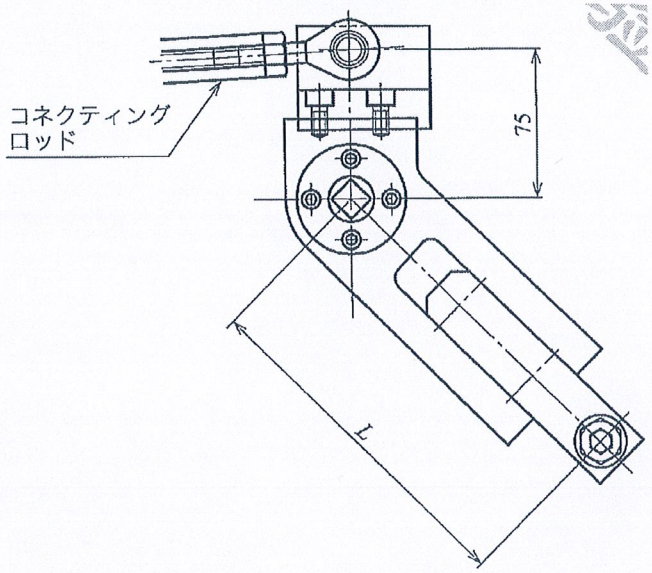


Figure 5 Example diagram of a return connector

5. Software documentation:

1、Software interface

The main interface includes toolbar, menu, force peak value, displacement acquisition, parameter setting before testing, real-time curve drawing, etc (Figure4.1)

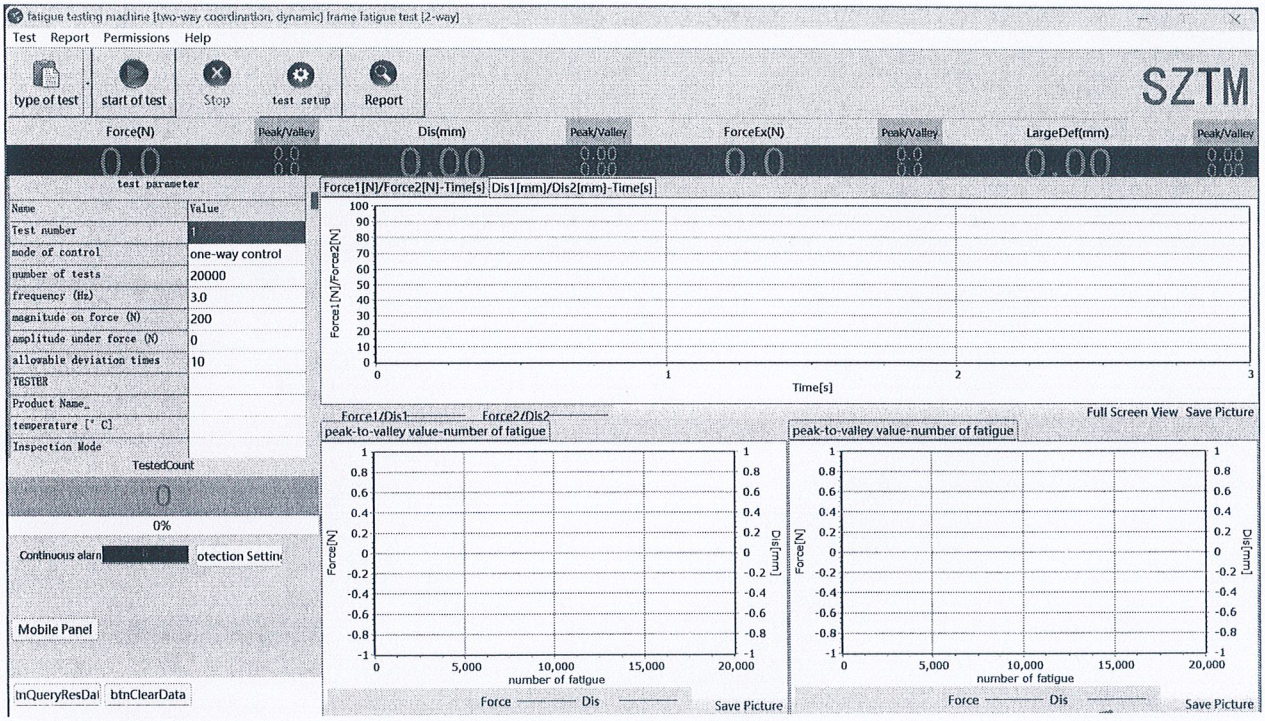


Figure4.1

2、Experimental parameters

1) Set and fill in relevant parameters before the experiment, including control method, testing frequency, fatigue number, etc (Figure5.1) 。

test parameter	
Name	Value
Test number	测试1
mode of control	two-way
number of tests	20000
frequency (Hz)	1
magnitude on force (N)	1
amplitude under force (N)	-1
allowable deviation times	10
TESTER	
Product Name_	
temperature [° C]	
Inspection Mode	

Figure5.1

2）Reached the corresponding number of fatigue cycles and completed the test. After completion, the following prompt box will pop up，Figure5.2。

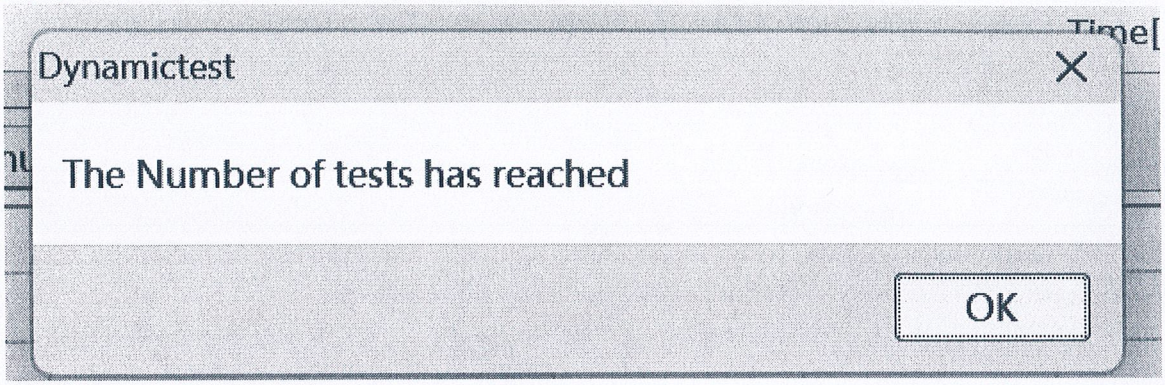


Figure5.2

3、Toolbars and menu bars

The upper left corner of the software will display the current software's tonnage, driver type, standalone or networked version (networked version is configured according to customer requirements), and the software's testing type。（Figure6.1）

1）Start Experiment Menu

This menu is used to start the experiment. Before starting the experiment, the relevant test parameters, such as specimen number, control method, and speed, are usually set in the test information column on the left side of the interface. The functions on the toolbar are the same as those on this menu。

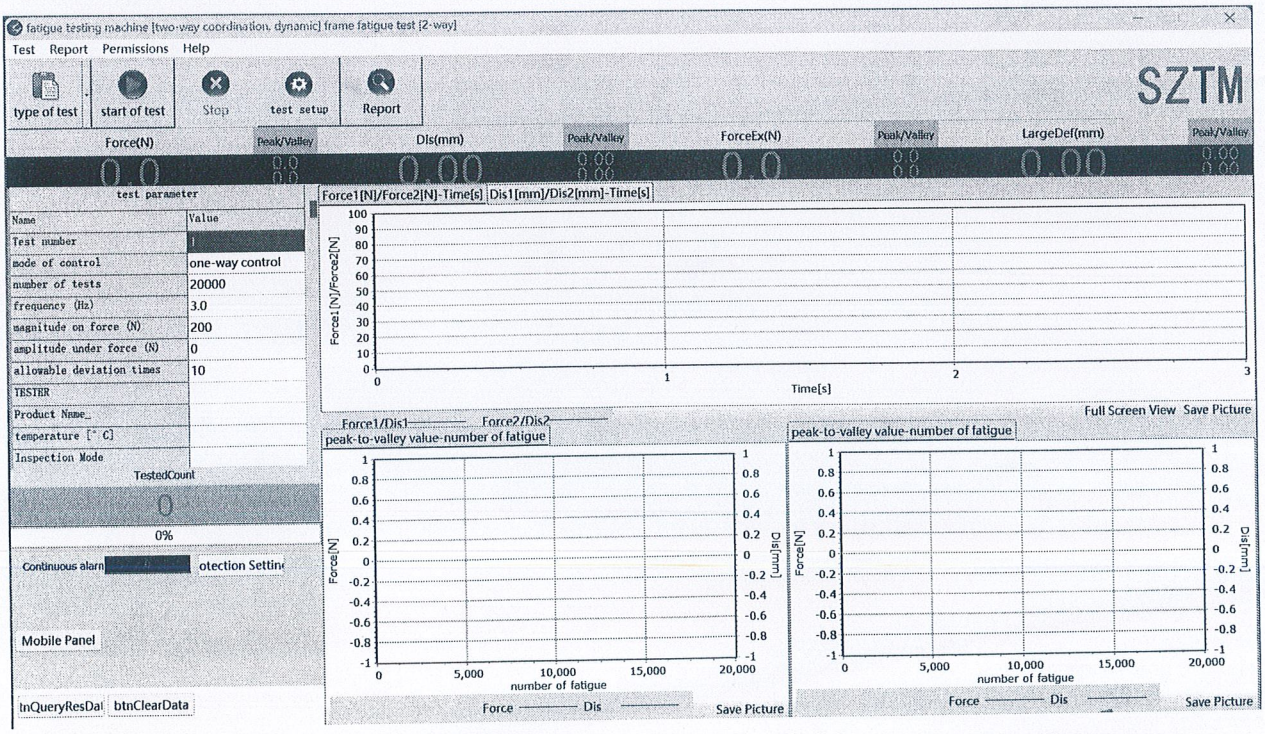


Figure6.1

2) Stop menu:

This menu is only available after the start of the test (or calibration). Used to end the current experiment (or calibration). The stop function on the toolbar is the same as the menu function. Stopping the experiment will not save the data。

3) Experimental Type Menu:

This menu is used to open the experimental type selection dialog box. The name of the currently selected experimental type will be displayed in the title bar. The experimental type on the toolbar is the same as the menu function。

4) Start calibration menu:

(Administrator privileges; click on Permissions - Login, log in with "Administrator" privileges, default "Administrator" password is 111111.) After logging in, calibration will appear as shown in the following figure. Click on Calibration to display the calibration interface dialog box (Figure 6.2), and find the desired calibration

5) Start Verification dialog box:

Select calibration objects: calibration of force 1, force 2, displacement 1, displacement 2, and displacement velocity

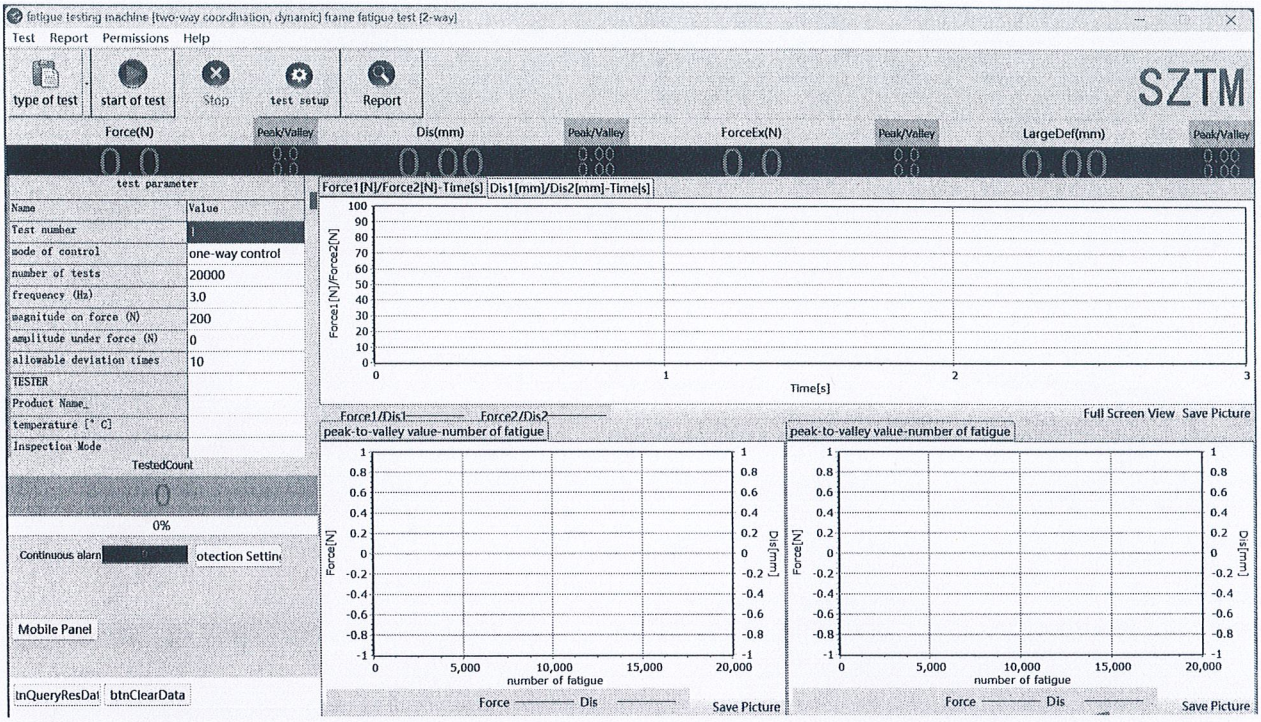
Calibration method

Force calibration: First, the force value needs to be reset to zero, and then the standard weight is pressed or suspended at the force point of the sensor. The current code value will display a code value, and then the corresponding standard weight value will be input into the calibration value. Click on calibration to proceed. (If the weight is KG, it needs to be converted to N, 1KG=9.8N)

Displacement calibration: Measure the distance between the electric steel and the machine, then record how many millimeters it is. The software points up or down by a few millimeters. Measure the distance between the electric steel and the machine, and subtract the initial measurement from the current measurement. Calculate the specific distance traveled by mm, then enter the calculated value in the standard and click on calibration.

Displacement speed correction: Enter a fixed value in the calibration speed, and then click on the corresponding rise or fall on displacement 1 or 2 (rise or fall is a jog). Then, after the corresponding displacement velocity display stabilizes, click on the correction

button.



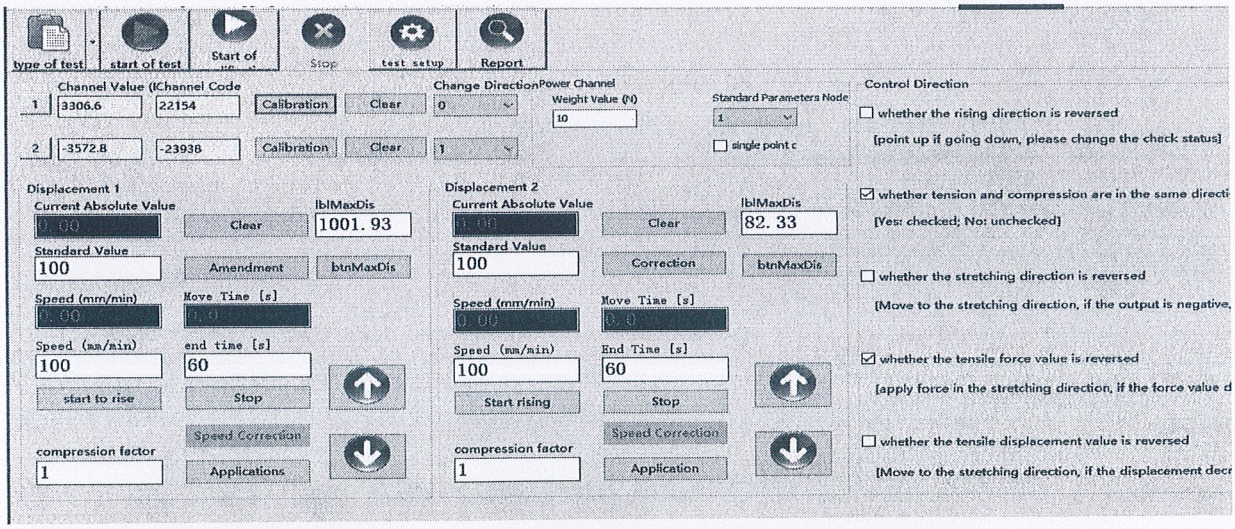


Figure6.2

4、Jog panel

Used for the rise or fall of electric cylinder 1 and electric cylinder 2, with adjustable speed。 （Figure7.1）

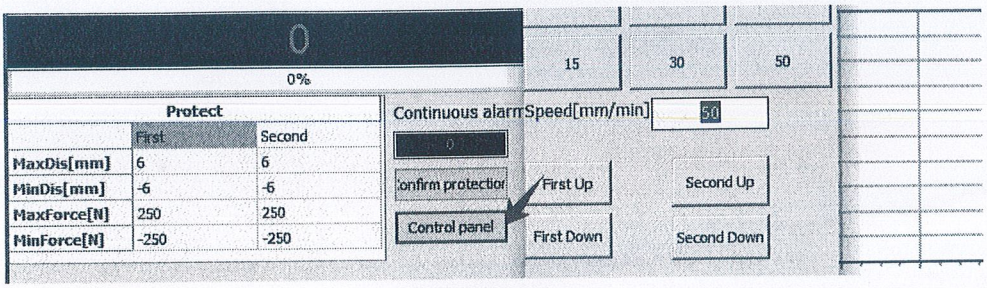


Figure7.1

5、Protection panel

1) Limit protection sets the upper and lower limit protection values for displacement of electric cylinder 1 and electric cylinder 2, the upper and lower limit protection values for force values, and the value of the number of consecutive alarms

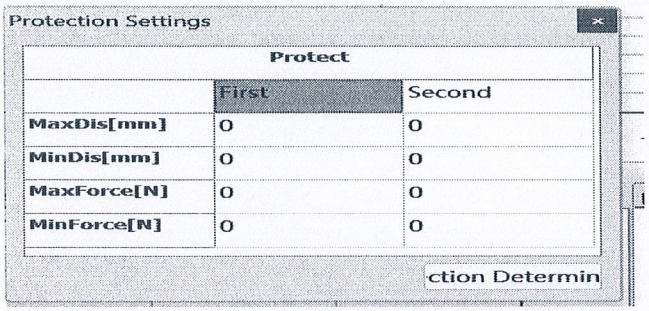


Figure8.1

6、Value display and curve

1) (Figure 9.1) The red arrow 1 represents the real-time collected value, and if the decimal places need to be changed. You can double-click on the green number. After double clicking, the corresponding prompt box will pop up, and you can enter the number of digits you need to modify.

2) (Figure 9.1) The red arrow 2 represents real-time collection of the curve, and the curve will be automatically saved to the report after the experiment is

completed .

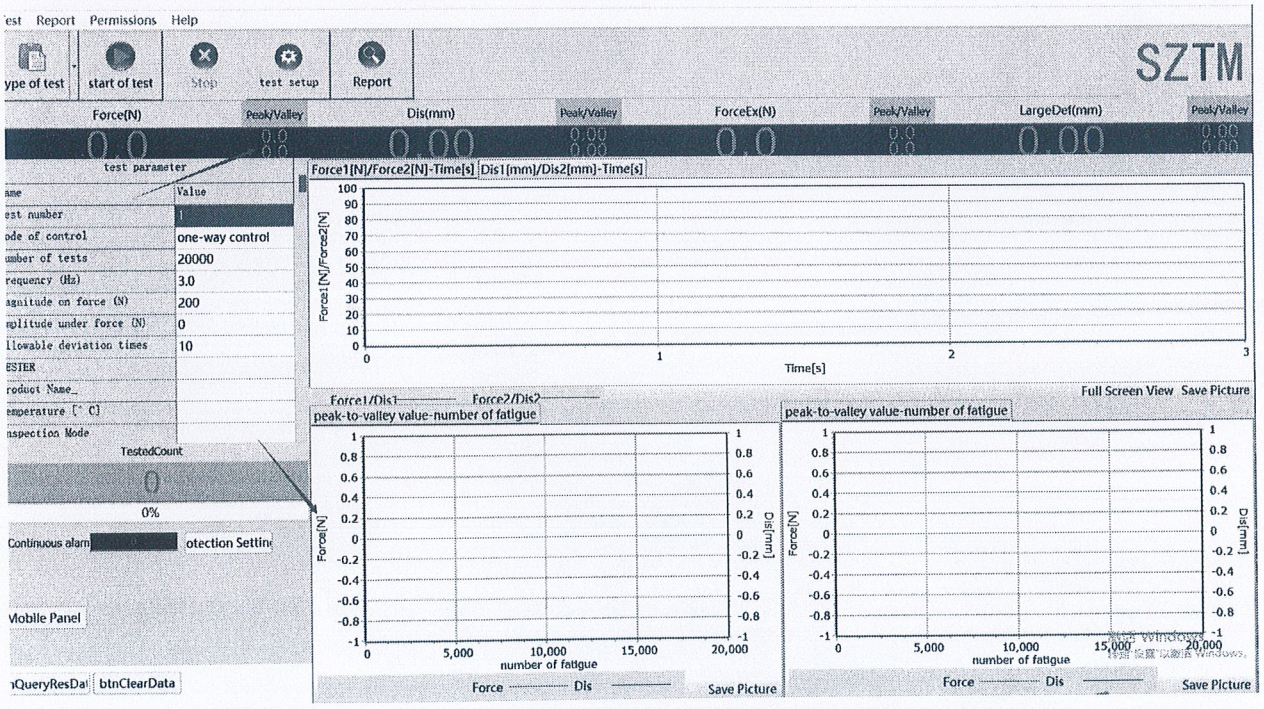


Figure9.1

7、Viewing experimental results and reports

1) After completing the above settings, the experiment can begin.

2) After the experiment, open the report button to view the experimental data (Figure 10.1).

3) (Figure 10.2) is the report opening interface where experimental data can be viewed in the secondary interface. Select the corresponding experiment according to the arrow markings and click on the curve to

view the comprehensive curve, as well as the peak valley value curve. (Click on the curve with the left mouse button, hold down the left mouse button and pull it to the right to enlarge the curve. Reverse direction and restore the
curve)

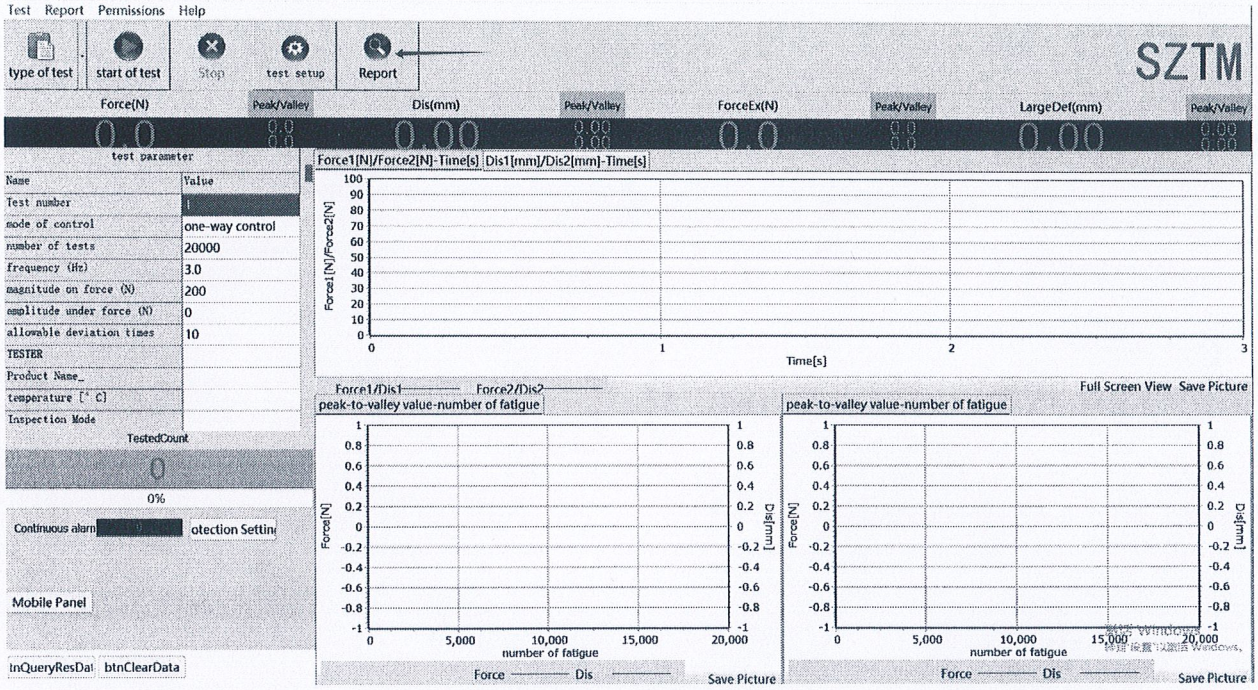


Figure10. 1

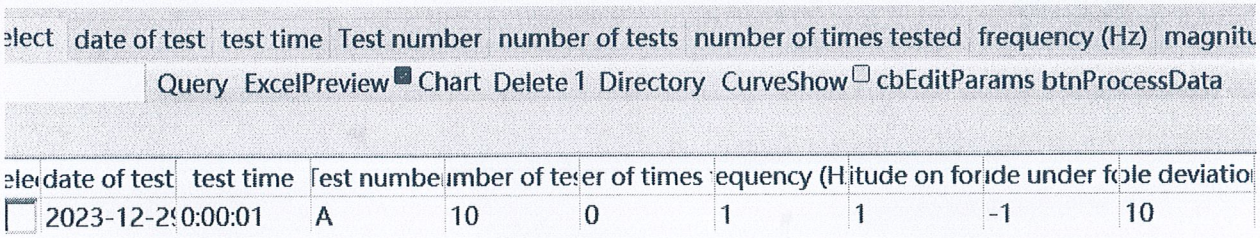


Figure10. 2

8、Parameter tuning and wiring of servo

UTC2000 And Delta E3		P2-10=001 Restore Enable P2-15、P2-16、P2-17 Change the number of hundreds to 1 to release AL013 emergency stop P1-01=0000(position control) P1-00=0002(pluse+direction) P2-10=001(Internal Enabling) =101
8-core aviation plug	44pin	
1(PULSE +) (Red)	43(PULSE)	
2(PULSE -) (Blue)	41(/PULSE)	
3(direction	39(SIGN)	

+) (Green)		Changing parameters requires disabling P2-10=0001(External Enabling) P1-44=Electronic gear ratio molecules (default 16777216) P1-45=Denominator of electronic gear ratio (default 100000) P2.004=500(Improve response and adjust rigidity)
4(direction -) (yellow)	37(/SIGN)	
5(A+) (with)	21(OA+)	
6(A-) (brown)	22(OA-)	
7(B+) (grey)	25(OB+)	
8(B-) (black)	23(OB-)	

9、Wiring Definition

1)

25 Definition of needle parallel port

1	Servo 2 pulses +	2	Servo 2 direction -	3	B+	4	A+	5	B2+	6	A2+
7	V5V	8	IN7		IN5	10	IN3	11	+12v	12	Servo directio n -
13	Servo pulses +	14	Servo 2 pulses -	15	Servo 2 direction +	16	B-	17	A-	18	B2-
19	A2-	20	GND	21	IN6	22	IN4	23	IN2	24	Servo directio n +
25	Servo pulses -	26									

2)

15 Definition of Pin Serial Port

1	IN2	2	IN0	3	OUT1	4	OUT3	5	VIN1	6	DAOUT0
7	V5V	8	12V	9	IN1	10	OUT0	11	OUT2	12	VIN2
13	DAOUT1	14		15							

3)

9 Needle Definition

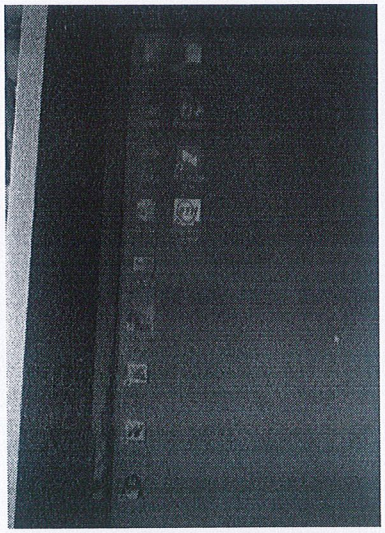
1	VIN1+	2	SCL	3	GND	4	SDA	5	VIN2+	6	VIN1-
7	Power supply positive	8	Power supply negative	9	VIN2-						

Note: VIN1 is the first route, and VIN2 is the second route. Power supply positive, power supply negative, GND shared。

6. Power on operation

1. Software operation

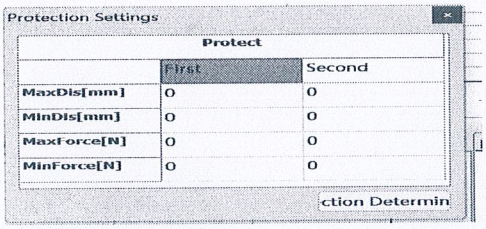
a. Open the computer and software



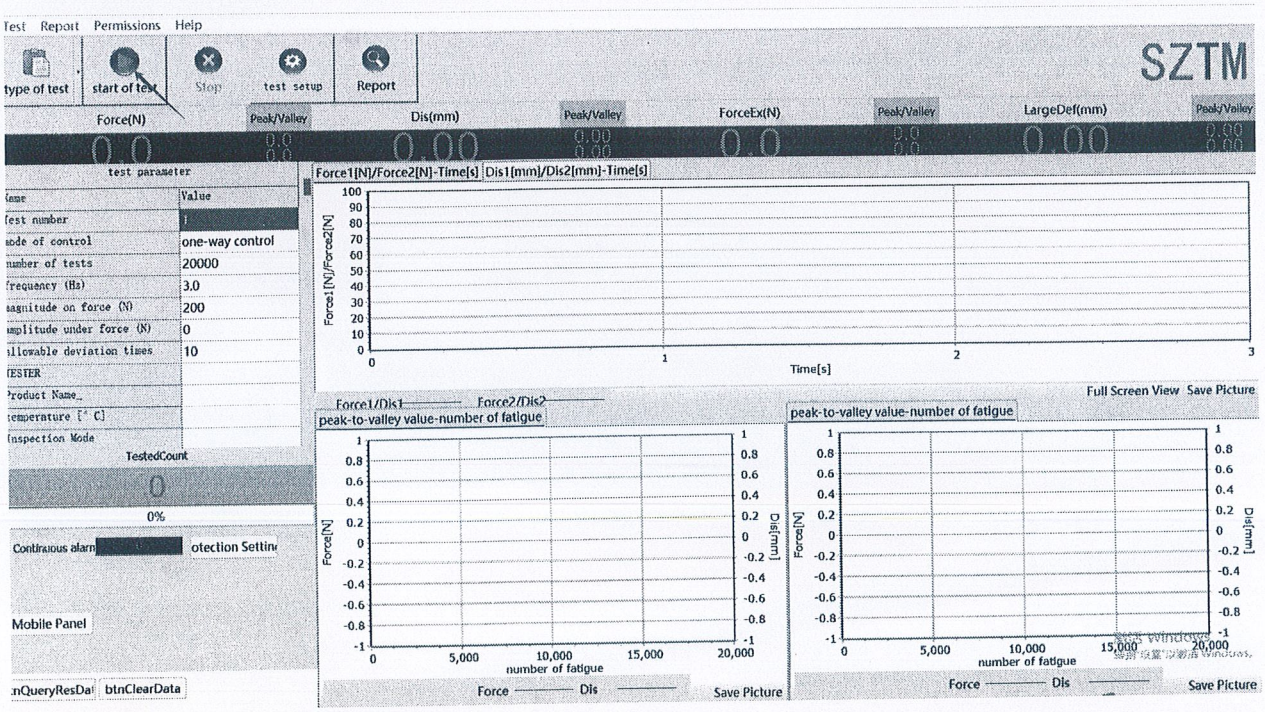
b. Filling in test sample information and setting parameters

test parameter	
Name	Value
Test number	A
mode of control	two-way reverse control
number of tests	20000
frequency (Hz)	2
magnitude on force (N)	200
amplitude under force (N)	-200
allowable deviation times	10
TESTER	
Product Name_	
temperature [° C]	
Inspection Mode	
Inspection Standard	
_Remarks	
Company Name	

c.Test sample protection setting (fill in according to the displacement peak to peak value, note: the numerical setting is larger than the peak to peak value, for example, if the peak value is 600N, the limit protection can be set to 700N)

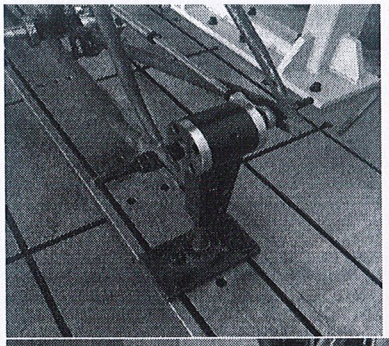
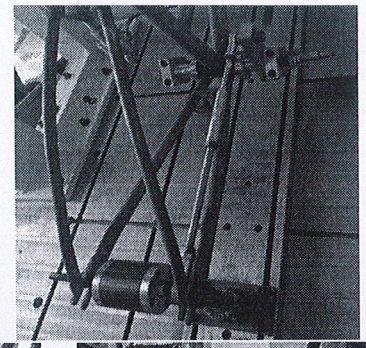
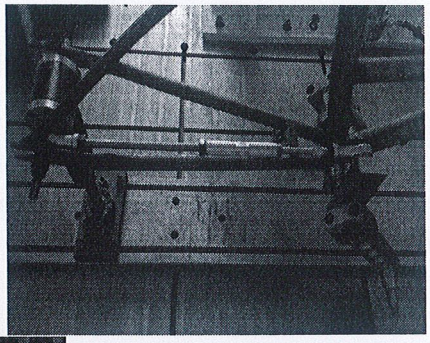
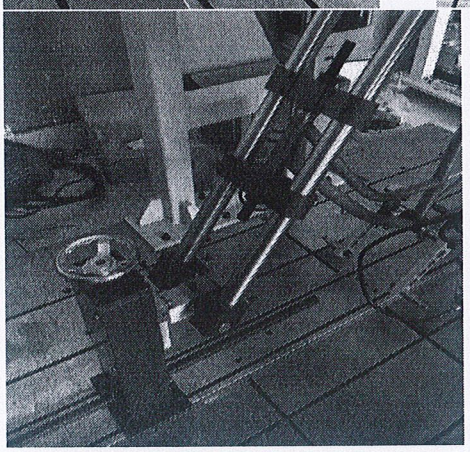
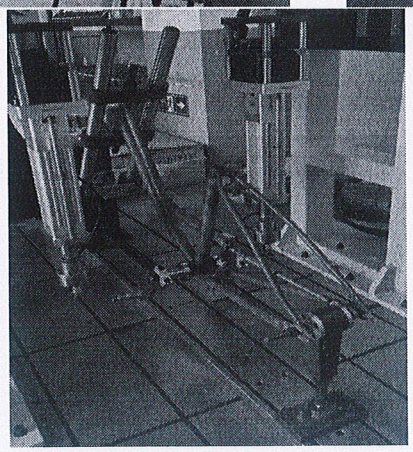


d. Click to start the experiment

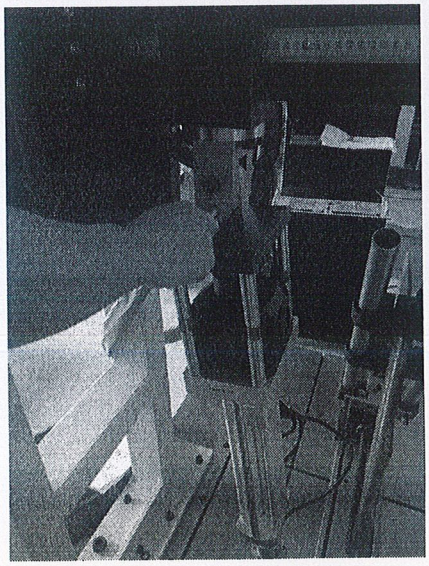
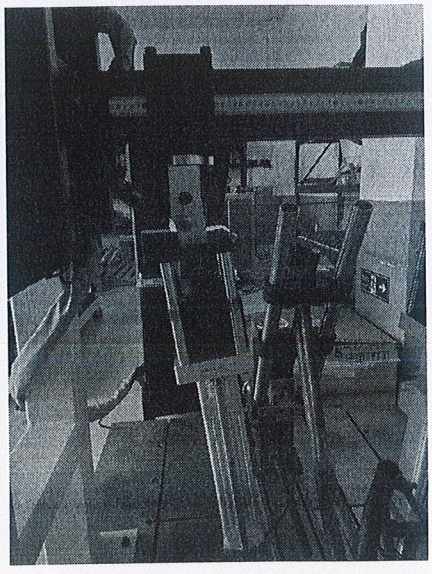


2. Frame installation and fixation

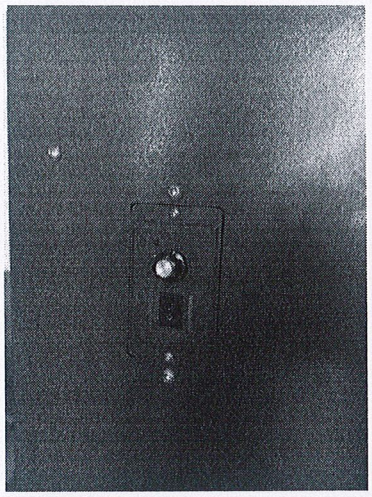
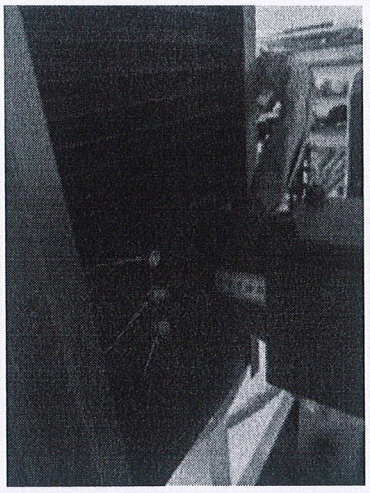
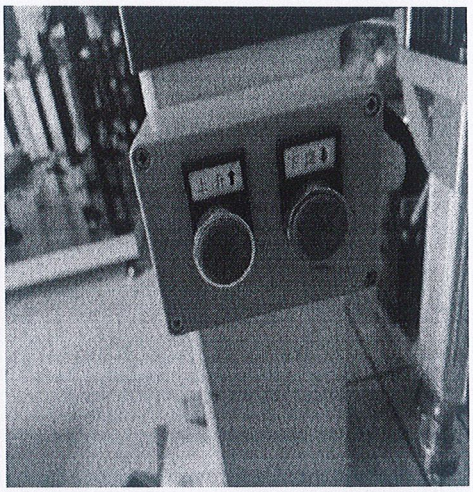
a, Firstly, install the frame according to the style shown in the figure below

b, Insert the positioning pin and adjust the position of the electric cylinder

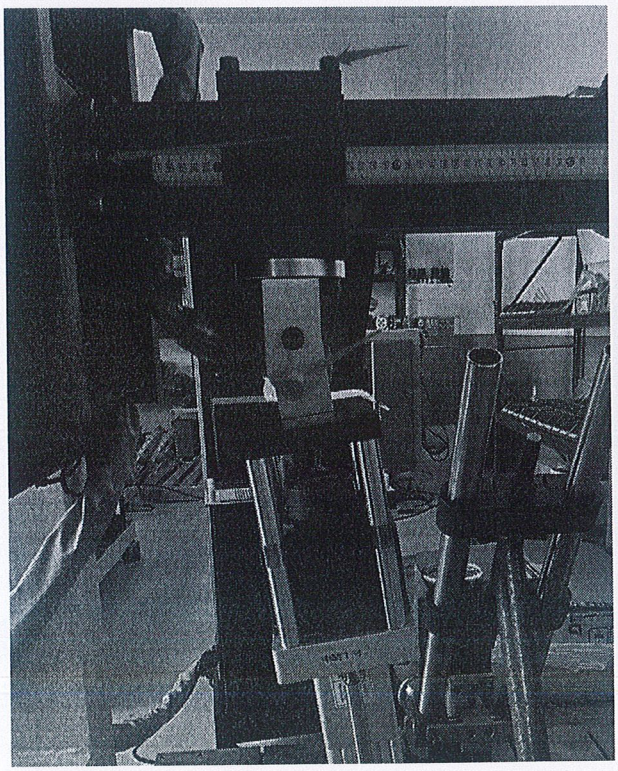
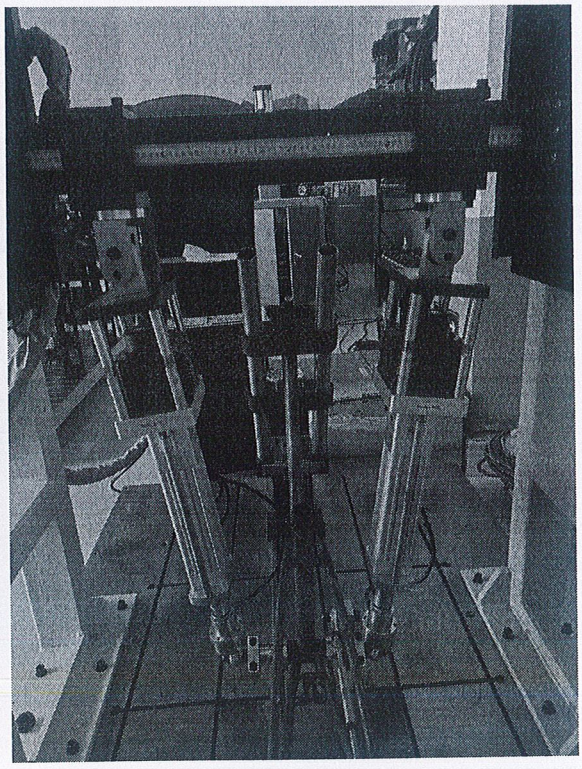



c. Adjustment of the height and position of the electric cylinder (note: this operation can only be adjusted when there is a significant difference in height between the electric cylinder and the frame. If the difference is not significant, it can be directly adjusted on the internal computer (installation adjustment)

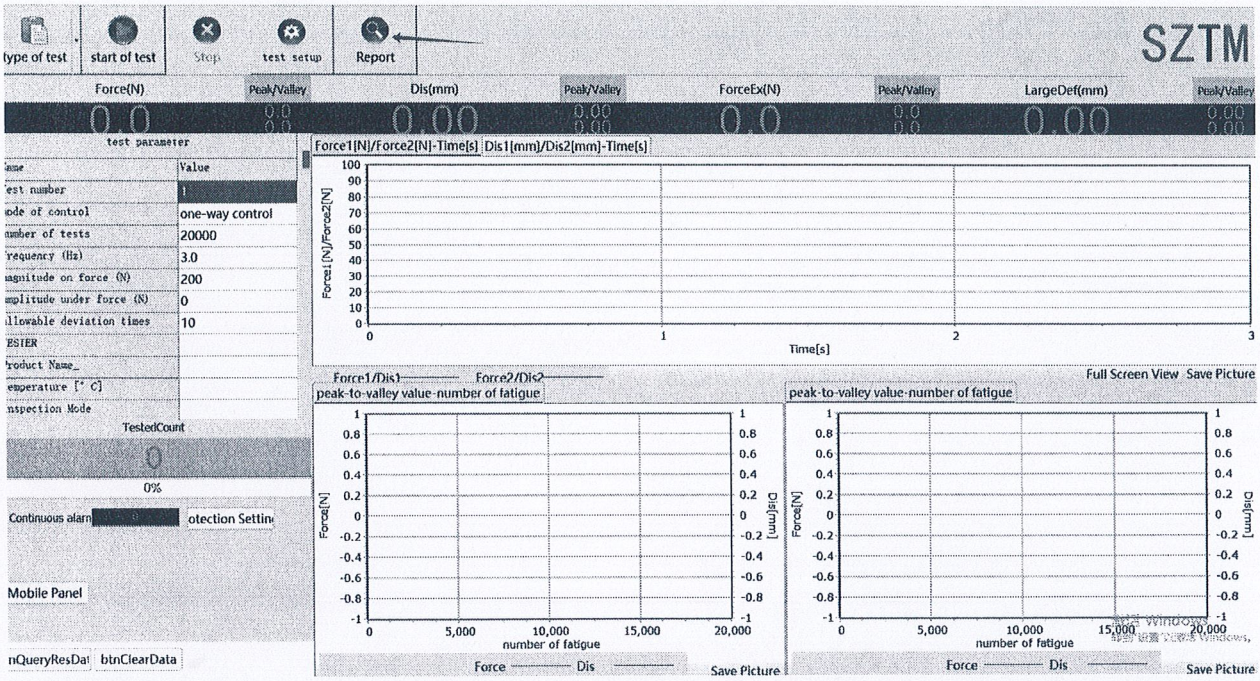
Turn on the switch and slightly loosen the stainless steel screws (note: loosen appropriately, not completely). Press and hold the up and down buttons

d, After fixing, tighten the screws and remove the pin (note: this operation must not be missed)

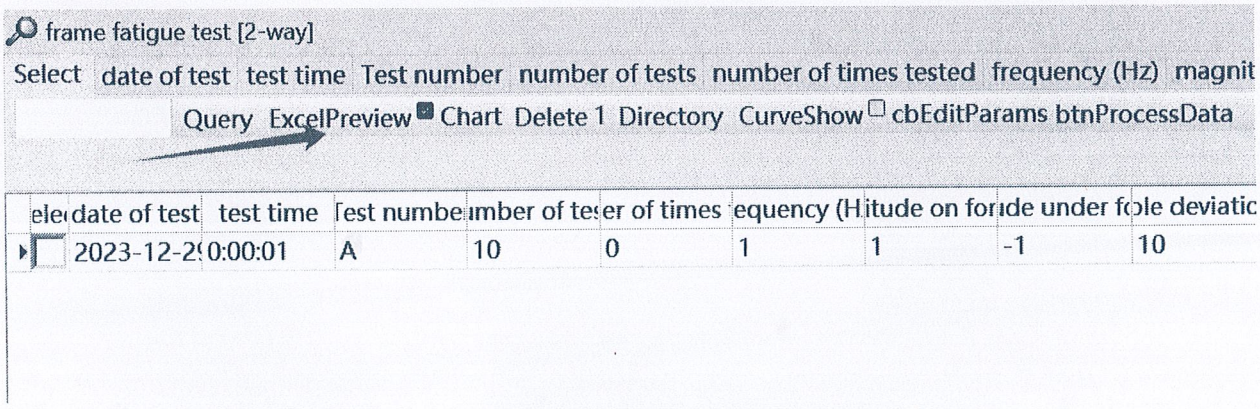



3. Report printing

a. Enter the interface and select the report



b.Select the report that needs to be printed and click Preview. If you want to copy and print, simply save it as a desktop file。



7. Technical parameter:

1. Measurement range of force sensor: 5000N, 2 pieces
2. Sensor resolution: 3/10000
3. System force measurement accuracy: 5% (dynamic)
4. Force sensor: customized
5. Motor: Servo motor
6. Working cylinder: 2 electric cylinders
7. Power source: Electric, single-phase 220V
8. Maximum frequency: 5Hz
9. Test frequency: 0-999999 times can be set
10. Computer: Industrial computer
11. Control software: Wantong and self-made
12. Data acquisition system: high-speed precision acquisition card
13. Control method: Computer automatic control
14. Display method: 19 inch LCD display screen
15. Data storage: Hard disk capacity 256G
16. External dimensions: 1970X1300X2150 (mm)
17. Report generation method: Computer automatically generates reports
18. Total power of equipment: 2.5KW
19. Shutdown method:

1. Automatic shutdown when force/displacement exceeds the limit protection value;

2. Automatic shutdown due to specimen damage;

3. Automatically shut down after reaching the set number of times

8. Maintenance and upkeep:

1. Wipe the outside of the machine clean with a dry cloth every week, without any dust.
2. Add lubricating oil to the transmission part of the machine before starting up to ensure lubrication and rust prevention.
3. Use a vacuum cleaner to clean the interior of the electrical cabinet, once every six months.
4. The machine should be turned off in a timely manner when not in use to ensure safety.
5. Sensors need to be calibrated annually.

9. Equipment composition:

1. One industrial computer
2. One control cabinet
3. One set of tooling
4. One set of main frame
5. One instruction manual