KUNSHAN WANTONGHE MACHINERY CO.LTD.

Dynamic fatigue tester for frame horizontal force vertical force WTH-JC-3023 User manual

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Catalogue

1. Equipment function:

This device is used for vertical force fatigue testing of bicycle frames.

2. Reference standards:

EN14766-2005 "Mountain Bikes - Safety Requirements and Test Methods" 4.8.6
ISO4210-6-2014 "Bicycles - Safety requirements for bicycles - Part 6: Test methods for frames and forks" 4.5 ISO4210-3-2014 "Bicycles - Safety requirements for bicycles - Part 3: General test methods" 4.5
JIS D9313-4 4.5

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) Without a test fork, a workpiece with the same rigidity can be used to replace the fork.

c) If equipped with a shock-absorbing front fork, lock it to the same length as an 80 kg (40 kg for teenage bikes) rider sitting on the bike.

d) During the experiment, the shock absorber frame locks the movable part of the frame to a position similar to an 80kg rider sitting on a bicycle through a rotating connection mechanism. This can be achieved by locking the shock absorber, or if a certain shock absorber system is not allowed to be locked, it can be replaced by a solid link of equal length when the shock absorber system is compressed. Ensure that the front and rear axles are on the same horizontal line, as shown in Figure 6

e) For the rear fork of the shock absorber frame, it does not rotate and only relies on flexible connections to ensure that any damping device provides minimum resistance during the frame test, ensuring the accuracy of the frame test.

f) 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:

Vertical force fatigue test of the frame:

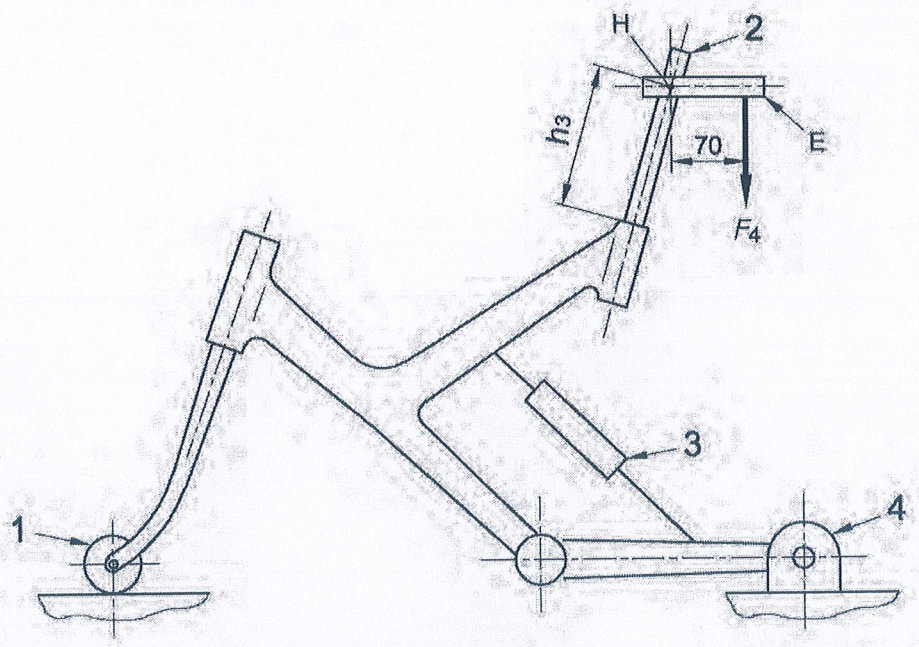
1. Install the frame in its normal posture and tighten it at the rear hook without hindering its rotation (preferably around the rear axle), as shown in Figure 7. Install a suitable roller at the front axle in order to provide room for expansion and contraction of the test frame in the front and rear directions.
2. Insert the actual saddle tube into the riser at the minimum insertion depth, or insert an equally long steel rod into the riser at a depth of 75 mm, and clamp it with a standard fixture according to the manufacturer's instructions. Install a horizontally backward extension (as shown in Figure 7 E) on the upper part of the steel bar, with a mounting point H and a mounting height of h3 (as shown in Figure 7 dimension h3). For a specific frame, the recommended maximum saddle height H-point is equivalent to the center of the bicycle saddle clamp. Alternatively, if there is no data on the maximum saddle height, the h3 dimension should be 250 mm.
3. Apply a periodic vertical downward dynamic force F4 at a distance of 70 mm behind the intersection point H between the extension E and the axis of the solid steel rod, as shown in Figure 5, for a test period of 50000 times. The force values are given in Table 5.
4. The maximum test frequency is 10Hz.
5. For composite frame, the peak displacement at the stress point during the test should not exceed 20% of its original value

Table 5 — Forces on seat stem

Forces in newtons

Bicycle type	General bicycles		Sports bicycles	
	City and trekking bicycles	Young adult bicycles	Mountain bicycles	Racing bicycles
force, F_4 N	1000	500	1200	1200

Dimensions in millimeters



Key

E horizontal, rearward extension

H position equivalent to that of the centre of the saddle clamp with the bicycle

1 free-running roller

2 steel bar

3 locked suspension unit or solid link for pivoted chain stays

4 rigid, pivoted mounting for rear axle attachment point

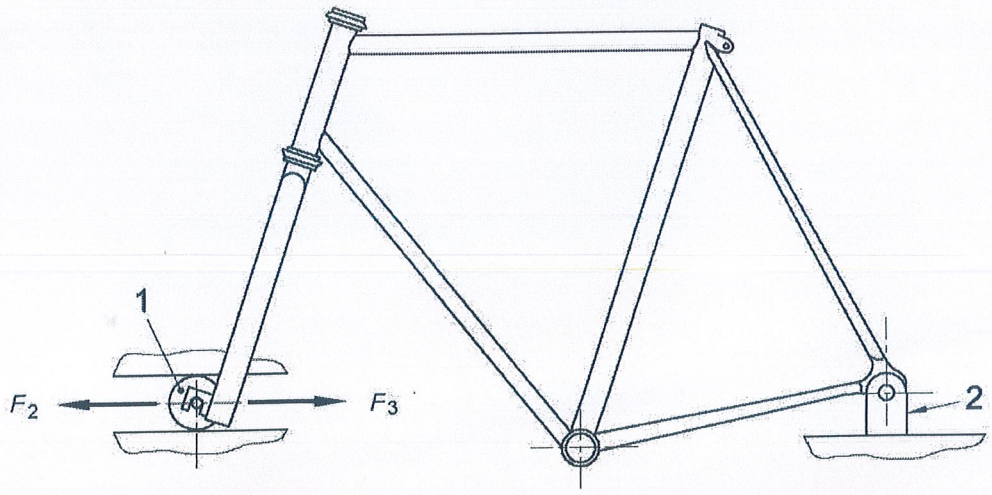
Figure 5 — Frame — Fatigue test with a vertical force

Horizontal force fatigue test of the frame:

1. Install the frame in its normal posture and secure it at the rear hook without hindering its rotation (e.g., preferably around the rear axle), as shown in Figure 6. Ensure that the front and rear axles are in the same horizontal position.
2. Apply periodic dynamic horizontal force to the opening of the front fork, F2 forward and F3 backward, with a testing cycle of C1 times, as shown in Table 4 and Figure 6. Although the front fork is restricted in the vertical direction, it can move freely horizontally forward and backward under the action of the force.
3. The maximum test frequency is 10Hz.
4. For composite frame, the peak displacement at the stress point during the test should not exceed 20% of its original value

Table 4 — Forces and cycles on front fork dropouts

Bicycle type	General bicycles		Sports bicycles	
	City and trekking bicycles	Young adult bicycles	Mountain bicycles	es Racing bicycles
Forward force, F_2 N	450	450	1 200	600
Rearward force, F_3 N	450	450	600	600
Test cycles, C_1	100 000	100 000	50 000	100 000



Key：

1——free-running guided roller

2——rigid, pivoted mounting for rear-axle attachment point

Figure6 Frame — Fatigue test with horizontal forces

5. Software documentation：

1、software interface

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

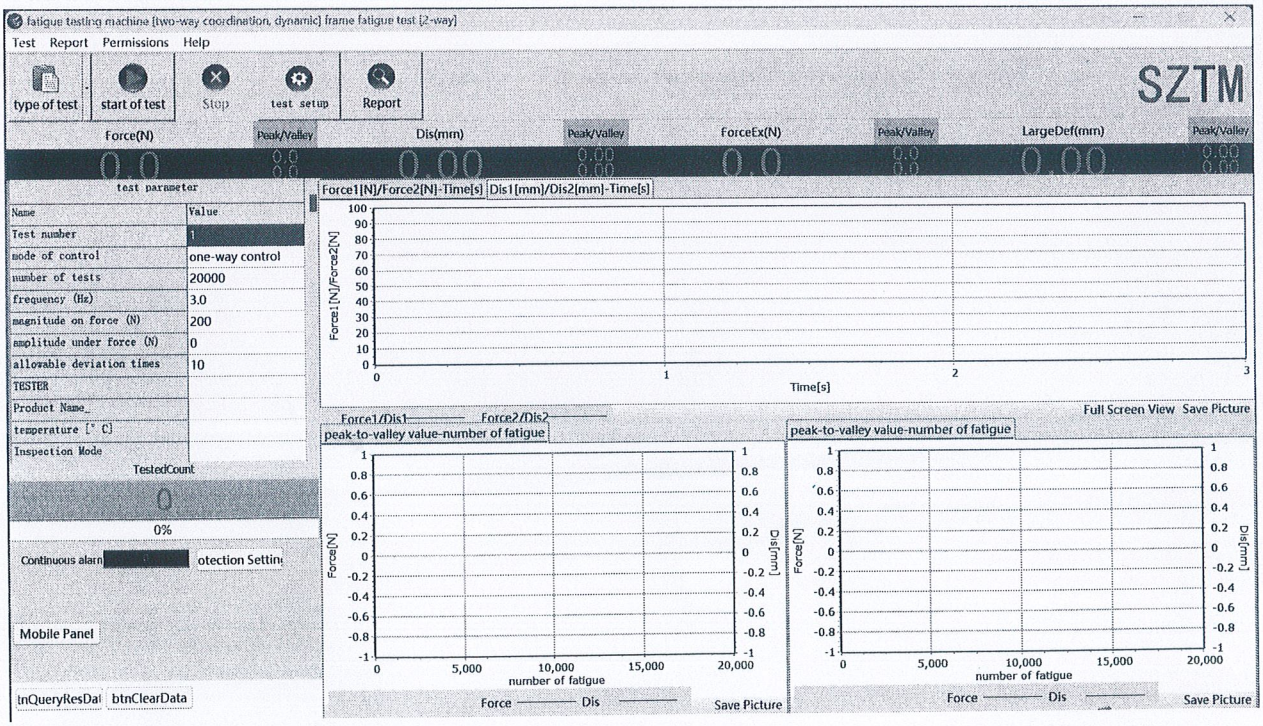


Figure4.1

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	

Figure**5.1**

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

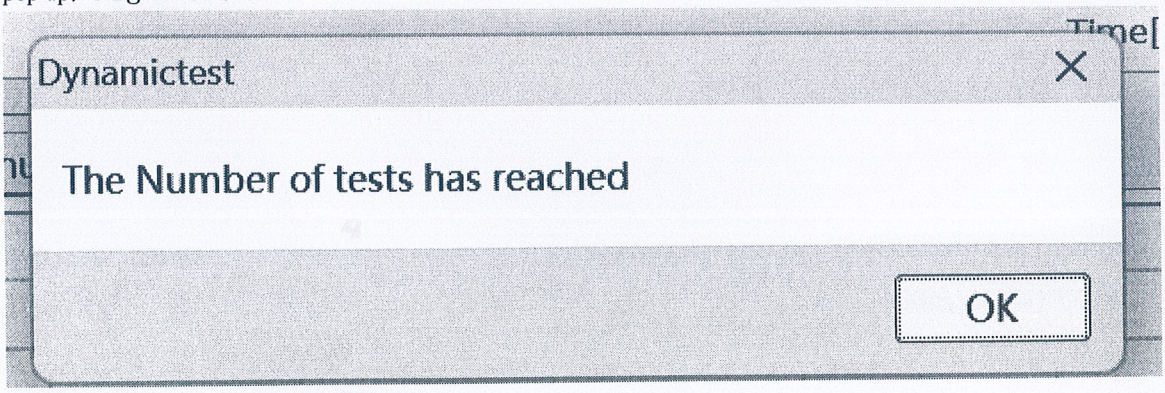


Figure**5.2**

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.

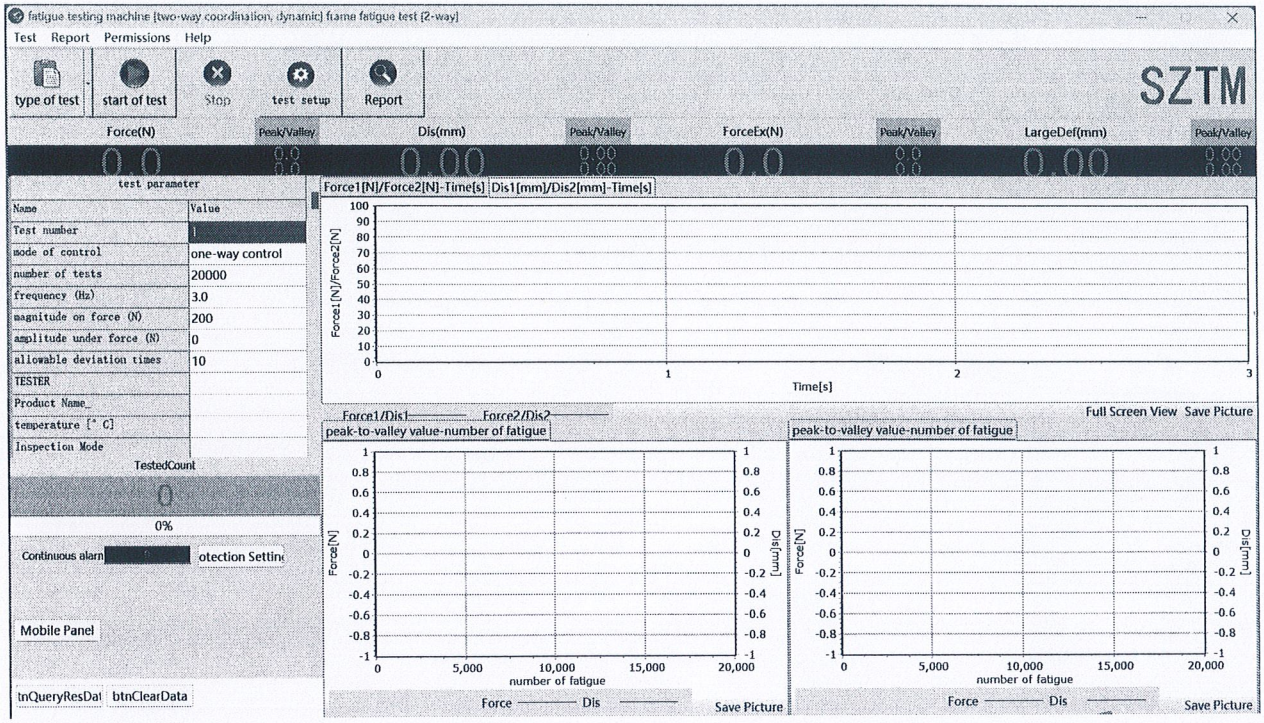


Figure6.1

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 (as shown in Figure 6.2), and find the desired calibration5)

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

7) 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.

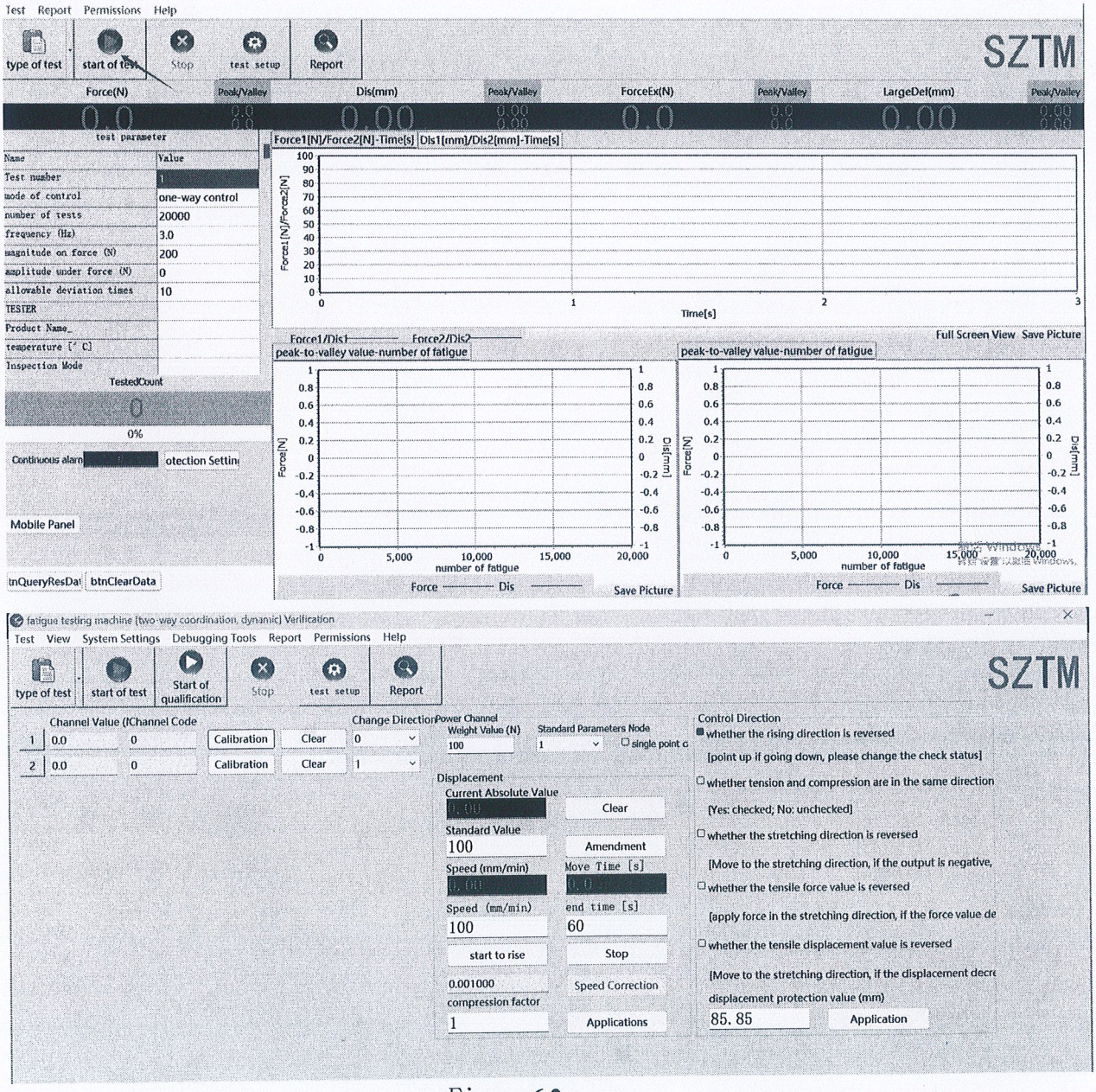


Figure**6.2**

4、Jog panel

Used for the rise or fall of electric cylinder jog, with adjustable speed. (Figure 7.1)

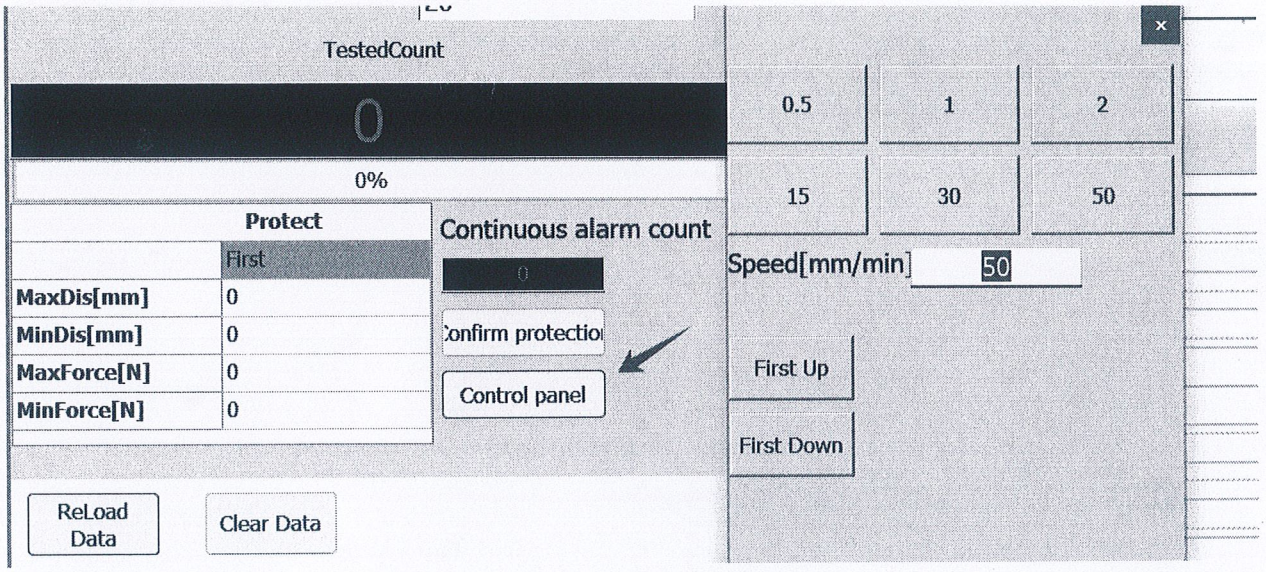


Figure7.1

5、Protection panel

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

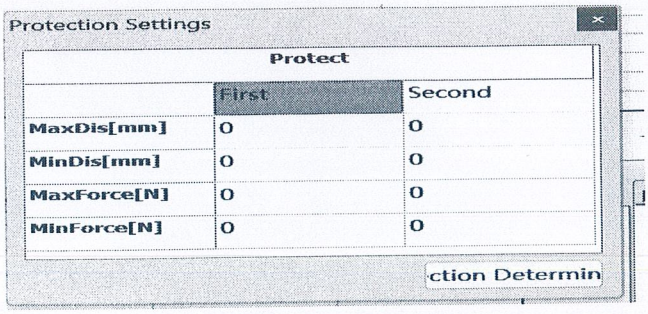


Figure8.1

6、Value display and curve

1) (As shown in 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) (As shown in 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.

3) (As shown in Figure 9.1, the red arrow 3 represents) is a shortcut for the administrator, which can quickly jump to channel parameters, software parameters, setting experiment types, etc. (permission is required, only displayed when logging into the administrator interface)

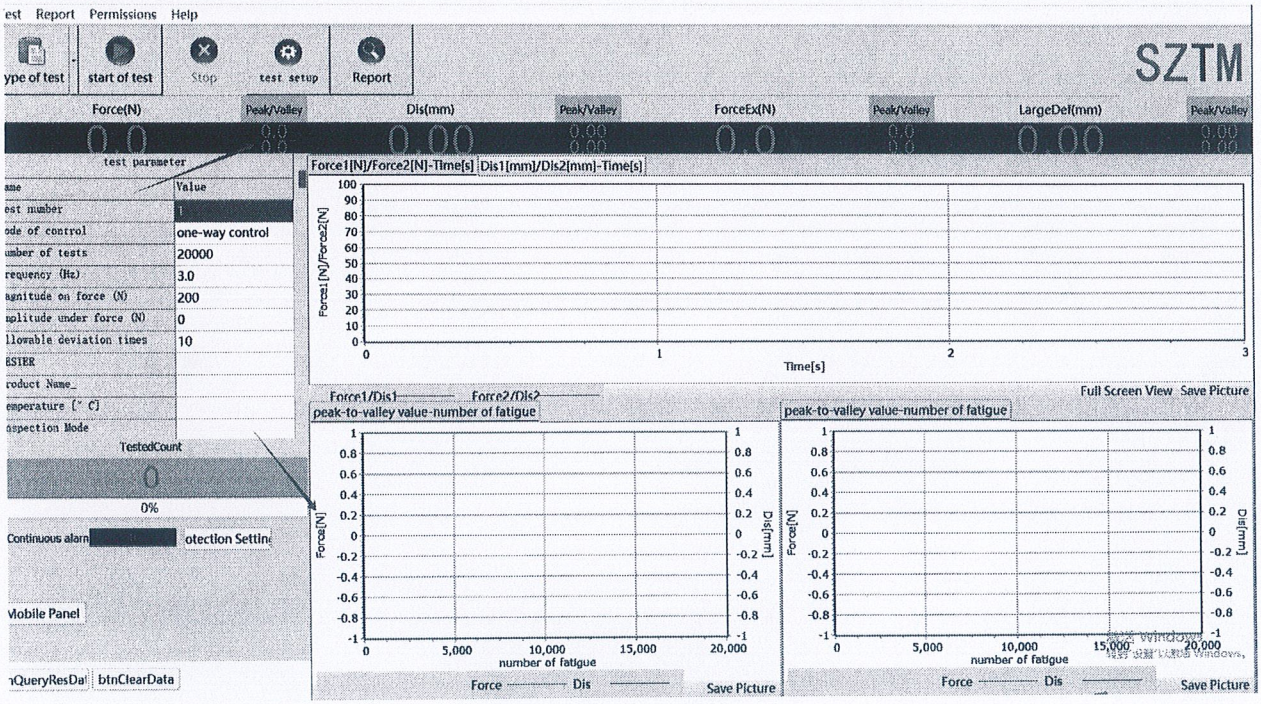


Figure9. 1

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 (as shown in Figure 10. 1).

3) (As shown in 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)

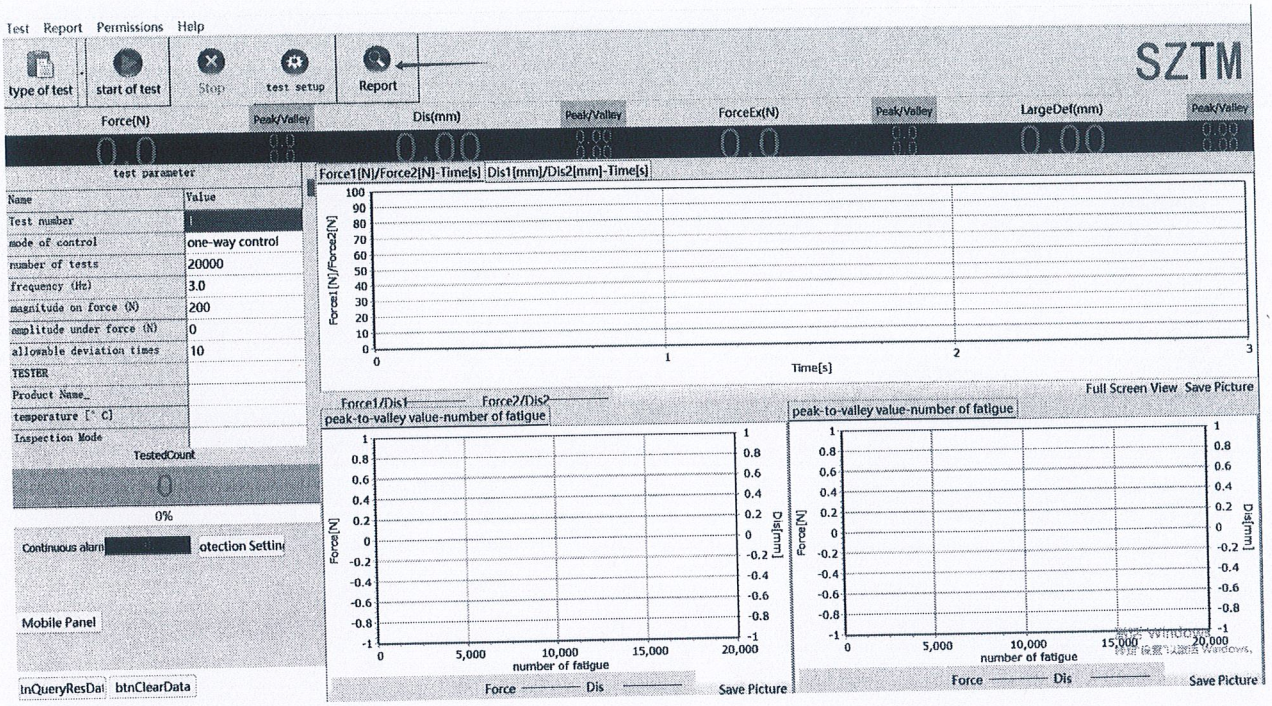


Figure10. 1

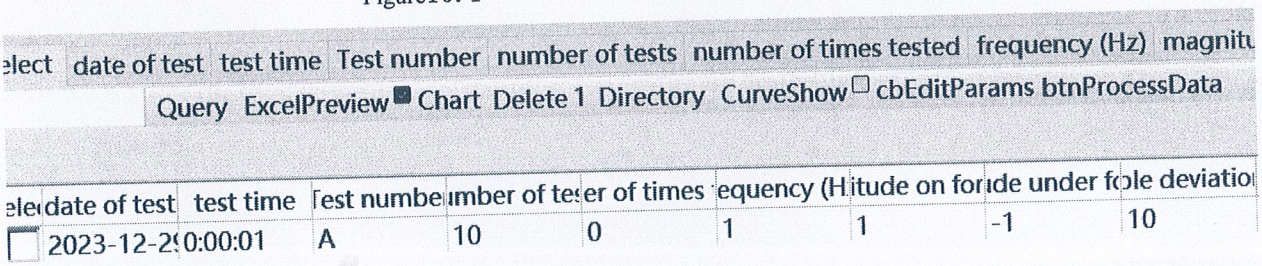


Figure10. 2

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 Changing parameters requires disabling P2-10=0001(External Enabling) P1-44= Electronic gear ratio
8-core aviation plug	44pin	
1(PULSE +) (Red)	43(PULSE)	
2(PULSE -) (Blue)	41(/PULSE)	
3(direction +) (Green)	39(SIGN)	
4(direction -) (yellow)	37(/SIGN)	
5(A+) (with)	21(OA+)	

6(A-) (brown)	22(OA-)	molecules (default 16777216) P1-45=Denominator of electronic gear ratio (default 100000) P2.004=500(Improve response and adjust rigidity)
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	8	Power	9	VIN2-						

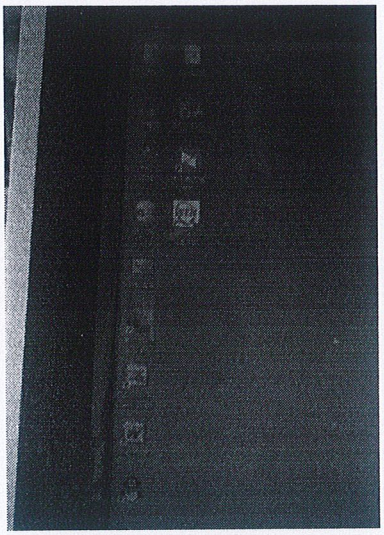
	supply positive		supply negative									

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

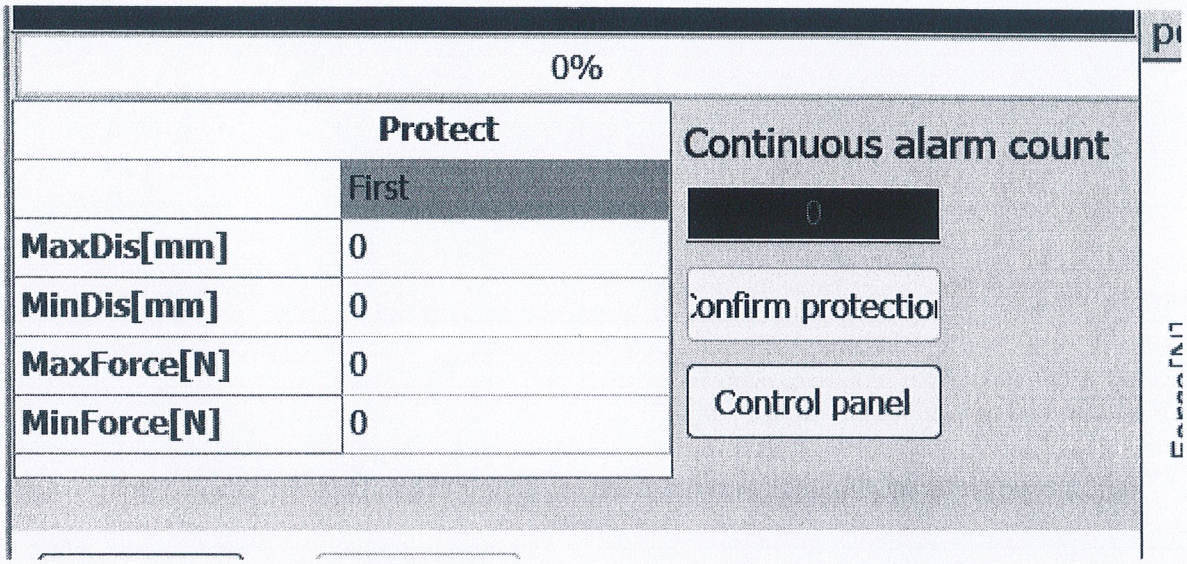
a. Open the computer and software



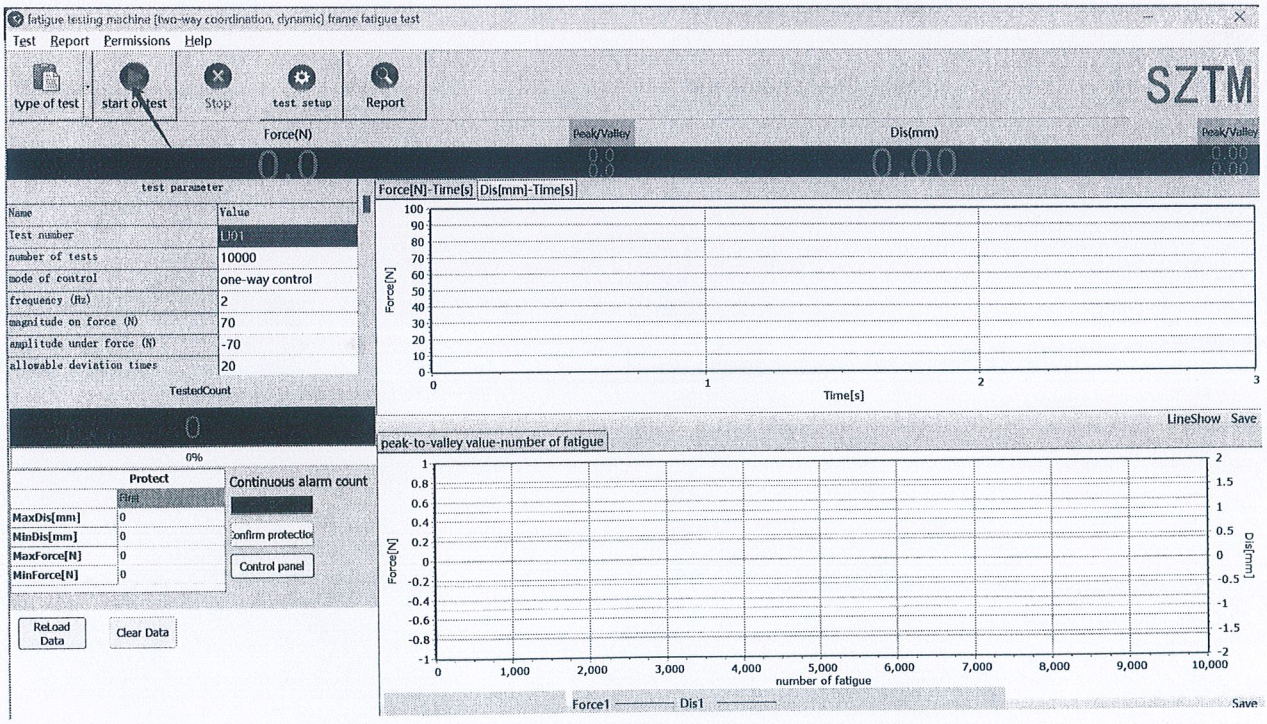
b. Filling in test sample information and setting parameters

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

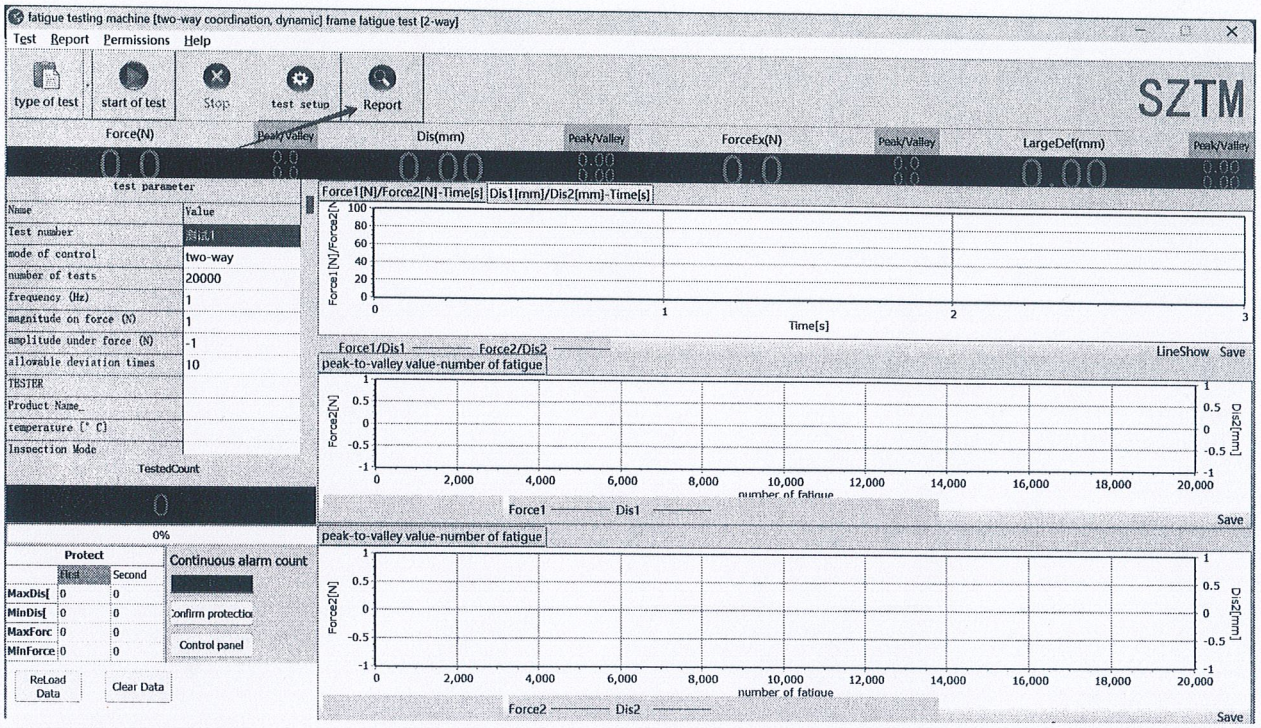


2. Frame installation and fixation

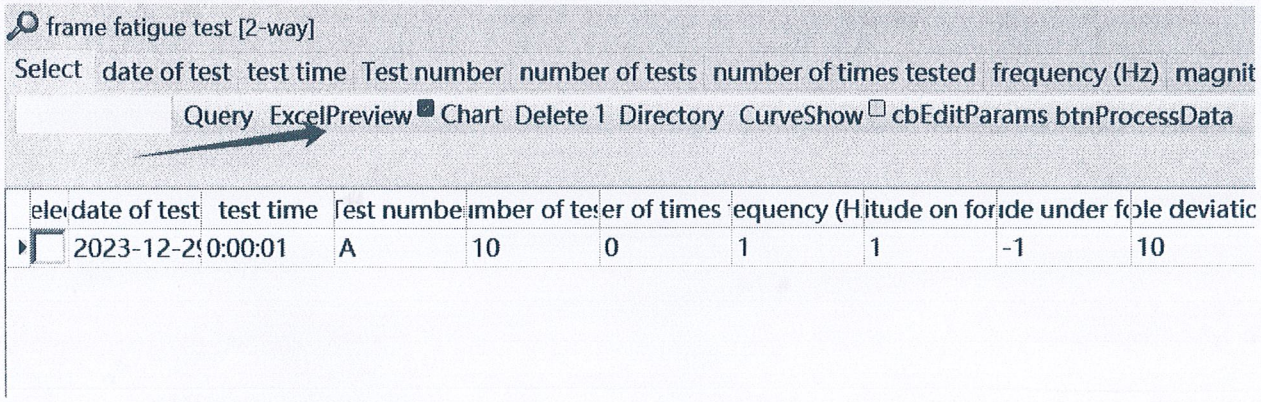
a, Install the vertical and horizontal force frame according to the style shown in the figure below (note: when testing one force, the fixed connection head of the other force should be loosened)

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 1pcs
2. Sensor resolution: 3/10000
3. System force measurement accuracy: 5% (dynamic)
4. Force sensor: customized
5. Motor: Servo motor
6. Working cylinder: 1 electric cylinder
7. Power source: Electric, AC220V
8. Test frequency: 1-5Hz
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: Industrial computer automatic control (force control)
14. Display method: 19 inch LCD display screen
15. Data storage: Hard disk capacity 256G
16. External dimensions: length, width, height (1950X800X2510) mm
17. Report generation method: Computer automatically generates reports
18. Total power of equipment: 1.2KW
19. Weight: Approximately 500KG
20. 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 control cabinet
2. One set of tooling
3. One set of main frame
4. One instruction manual