

**GOTESTER**

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## UTM-1001B UNIVERSAL TESTING MACHINE



**INSTRUCTION MANUAL**

# ATTENTION ON SAFETY

## 1. Security on the mark:

About the safety precautions and the use of instruments in this manual, the following important matters of each display, in order to prevent accidents and dangerous, sure to observe the following danger, warning, attention to the narration:

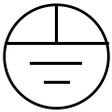
<p><b>Danger:</b></p> 	<p>This display of the project, who fails to comply, the operation may be affected by the injury.</p>
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<p><b>Warning:</b></p> 	<p>This display of the project, such as failing to comply with possible damage to the instrument.</p>
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<p><b>Attention:</b></p> 	<p>This displays the project may affect the test results and quality.</p>
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<p><b>【Note】</b></p> 	<p>In this display, the product use help in the operation.</p>
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## 2. In this instrument, the mark that attention,warning.

	<p>Warning sign</p>	<p>This notation is necessary to refer to the place of the operating manual.</p>
	<p>Hazardous voltage sign</p>	<p>This notation is the danger of high voltage.</p>
	<p>Ground protection mark</p>	<p>In the instrument on the ground terminal.</p>

**Technical Parameter:**

Model	UTM-1001B 1KN Computer Servo Peeling Testing Machine
Maximum load	1KN
Capacity choice	200N, 500N, 1KN or less than can be self-selected
Unit	KG,N,LB, TON can be exchanged.
Measurement system	Load cell + HZ-2000
Accuracy load of measurement	the load cell + HZ-2000 screen $\pm 0.5\%$ (full range of 5% -100%)
Resolution	1 / 50000
Maximum test stroke	About 500mm ( can be customized )
Test speed	50-300mm / min with stepless speed and 5 fixed-speed (can be customized )
Data sampling frequency	200times/sec
Machine with thermal printers can automatically output the testing results.	
Can store 10 testing results and auto-calculate its average, auto-grab maximum force and the force at break.	
Display	Computer display
Machine size	45x58x135cm (length*width*height)
Weight	75KG
Ratio of Breakpoint	from 0 ~ 99%, which the user can set according to different materials to stop the machine, realizing stop machine at any position.
Safety	The system would shut down if overload or over-trip.
Shape	column shell is made of aluminum material.
Power system	AC Motor
Power	120W(depending on different demand of force using different motor)

**Equipment Summary:**

UTM-1001B 1KN Computer Servo Peeling Testing Machine a simple type machine, simple structure, convenient operation, It can be tested on the operated table, Using the electronic control systems, load sensor is rising and falling to test the tension or compression through the motor rotation, transmission machinery and T-screws. This machine is simple to operate, especially suitable for controlling quality in production line, This series of machine is mainly applied to test the non-metallic and metallic materials which the load is less than 1KN.

**Main Functions:**

This machine can be test all the material in tensile, compression, bending, shear, peel, tear, two-point extended (need add extensometer) and others for control products quality. Such as textile, rubber, plastics, synthetic leather, tape, adhesive, plastic film, composite materials, electronics, metals and other materials.

**Main Feature:**

1. Excellent design. my company has focused on product appearance over the years, company has developed many products that is similar with the foreign products, the surface of product is made of aluminum and process by electrostatic spray
2. Digital force displayed by LCD , discernible tension or pressure, LCD display clearly
3. Three kinds of units: N ,Kg ,Lb ,ton option or automatically exchange;
4. LCD with backlight can be used in low-light environments
5. Single measurement, it can record the max force of tension and compression in both directions, automatic or manual cleared to zero.
- 6.The system would shut down if overload or over-trip
7. Structure of single-column is beautiful and sophisticated, seating operation, relaxation and nature.

**Corresponding Standard:**

《GB/T16491-1996 electronic universal testing machine》

**Applicable Industry:**

It is widely used in wire and cable, hardware, electronic and electrical equipment, packaging, printing, medical equipment, auto parts, textiles and leather, clothing, shoes, rubber and plastic products, colleges and universities; research laboratories; inspection arbitration, technical supervision departments and many other industries, it is the basic equipment for quality management and physical tested.

# 1 Introduction of TM2101 measurement and control system

The TM2101 measurement and control system is designed purposely for microcomputer controlled electronic universal testing machine, microcomputer controlled universal hydraulic testing machine and microcomputer controlled compress testing machine, used for the test of tension, compress, bend, shear, tearing and peel. With the personal computer and interface plate, it could collect, save, process and print test result. Further it can calculate multiple parameters, i.e. maximum force, yield strength, average peel force, maximum deformation, yielding point and elastic modulus; this system is featured in curve process, multi-sensor support, image interface, flexible data process and powerful system function.

## 1.1 Main function

### 1. Hardware

With a 32 bits ARM as the MCU, the test system has better overall performance, faster computational speed and higher control accuracy than the traditional test system with 8 bits MCU.

The core device of acquisition system is ultra-high-precision 24 bits AD (analog-to-digital converter) IC with data rate up to 2000 times per second, so it can capture the transient process of the force, and the resolution can up to 500000 indexing. The system with 6 points calibration has high accuracy which is far exceed the requirement of national standard.

The displacement encoder with 4 frequency doubling technology can increase by 4 times the resolution of displacement, up to 0.0005mm.

2 output control method: pulse and voltage, can control any Servo motor, inverter motor or DC motor with pulse or voltage interface, achieve smooth stepless. In addition, with switch signal (such as up, down or stop) to drive the external relay or solenoid valve, in order to control DC and pneumatic, hydraulic pressure equipment.

Advanced loosed-loop technology for velocity, displacement and force can achieve precise control of arbitrary waveform.

Multiple serial interfaces: Up to 4 channels 24 Bits analog input, 3 channels 16 bits analog input, 3 channels pulse input, 3 channels AB phase optical encoder input, 9 channels switching value input, 8 channels switching value output, 1 USB, 1 RS232, 1 485, 4 types of LCD interface, 1 parallel port micro print interface, 1 serial port micro print interface, 1 8X4 matrix keyboard interface.

All input and output interface use high-speed photoelectric isolation technology, which makes the system to have strong anti-interference capability.

### 2. Software

It is the most easy to use software in the test machine industry with windows standard style, structured mode of operation and detailed help documentation and tips, so that you can significantly improve the efficiency of debug and software training.

Use Multi-threaded parallel processing make the software can display "Force-Displacement", "Force-Time"、"Displacement-Time" and "Stress-Strain" curves simultaneously, so you can switch to any graph which you want to see and check the user settings.

Standard test process control and report output temperate, can define any number of testing standards (including GB, ASTM, DIN, JIS, BS, etc.) for user to call. Flexible and strong customize testing method, with multi-control mode (Constant Speed, Constant Displacement, Constant Force, Constant Force and Velocity, Constant Stress, Constant Stress and Velocity, Constant Strain, Constant Strain and Velocity, etc.). Realize complex multi-step nested-loop control. Setting automatic return, automatically determine the fracture and automatic zero.

Strong ancillary tools with capability of data analysis, statistics and graphical analysis of curves, which have zoom, pan, cross cursor, check points and other functions. Can transfer historical data to graph many times, and can display to compare at the same time. Up to 7 interval setting, 30 manual sampling points and 60 automatic sampling points. Multiple statistical functions including maximum, minimum, average, average after remove the maximum and minimum, median, standard deviation and overall standard deviation.

Opening testing results edit method make user get any wanted test data. Up to 400 (such as maximum force, **fracture force**, **peel strength**, **tensile strength**, **shear strength**, **tear strength**, **maximum deformation**, **yield strength**, **elongation**, **elastic modulus**, **ring stiffness**, **non-proportional elongation**, **minimum force range**, **average force range** and **elongation under constant force**) can be called by user.

Microsoft Word report format for easily use.

Permission management can help you lock any function mode of the software, separate the software into multiple permission levels, make the operation of software more secure.

Digital calibration system make the calibration process easily and efficient, double protection on calibration data.

Powerful unit system, adapt to all unit system over through the world, for example, there are more ten types of force unit, such as gf, kgf, N, kN, tf, lbf, ozf, tf (SI), tf (long), tf (short).

Multiple protection mechanism: Over range protection of force, route and displacement, hardware setting protection for up and down limit switch.

Intuitive and efficient test data management system: Single test data can be stored in Windows standard format with free storage path and file name, so the data store has no limits.

All operations can instead of by shortcuts, can connect with the external manual control box, can connect all the commonly used buttons such as Fast Up, Fast Down, Middle Speed UP, Middle Speed Down, Slow Up, Slow Down, Zero, Clear, Return, Pause and Stop.

The language version can be easily switched: Chinese Simple, Chinese Traditional, English and the advanced version have up to ten types of language: Japan, Korean, Russia, German, French, Spanish, Portugal.

Green software, need not to install, can copy to computer directly (need install serial port driver first), very easy to maintenance and upgrade.

## 1.2 Technical specifications:

Force:	
Resolution	1/250000
Precision	0.1%
Range	Free option from 1 N to 20000 kN
Transducer sensitivity	1--40mV/V
Excitation voltage	9VDC
Small Extension ( strain gauge)	
Resolution	1/100000
Precision	0.1%
Range	Free option from 1mm to 2000mm
Transducer sensitivity	1--40mV/V
Excitation voltage	9VDC
Large range Extension(photoelectric encoder):	
Resolution	Yielding to the mechanical system and photoelectric encoder; normal requirement: 1um
Precision	Zero error of the instrument system
Range	Free option from 0mm to 20000mm
Transducer type	photoelectric encoder
Position(a photoelectric encoder):	
Resolution	Yielding to the mechanical system and photoelectric encoder; normal requirement: 1um
Precision	Zero error of the instrument system
Range	Free option from 0 to 20000mm
Transducer type	AB-phase quadruple output photoelectric encoder
Sampling rate:	50000 times/s
Speed control: (for an electronic universal testing machine):	
Control mode	Pulse
Frequency coverage	0.072 Hz -- 50 kHz
Precision	0.05% (standard test point)
Speed control: (for an electronic universal testing machine):	
Control mode	Voltage
Output range	0~5V
Precision	0.05% (standard test point)

Suitable for a servo controller with pulse input or a stepper motor controller with pulse input; and used for AC frequency variable controller.

## 1.3 Working conditions

Temperature: 0~55°C;  
Humidity: Relative humidity <85%;  
Power: 220±10%VAC, 50Hz;  
Away from strong electromagnetic interference.

## 2 TM2101 software installation and upgrade guide

### 2.1 The PC hardware's requirements:

- 1). CPU: Intel Celeron 2GHz or higher.
- 2). Memory: >512MB
- 3). HDD: >2GB
- 4). Screen resolution: >1024×768
- 5). A printer (if need print the report) .

### 2.2 The PC software's required:

1. Operation system must be Windows XP.
2. Microsoft Word 2003 is required if you need a report of word format.

### 2.3 The content in the installation disc

The following folder must be inquired in the disc:

- 1."TM2101Vx.xx": This folder include the measurement and control software, it don't need be installed. Just copy it to any place of the HDD.
- 2."DriverV8.6": This folder include the driver of the measurement and control software, you must install this driver so you can run the soft TM2101Vx.xx.

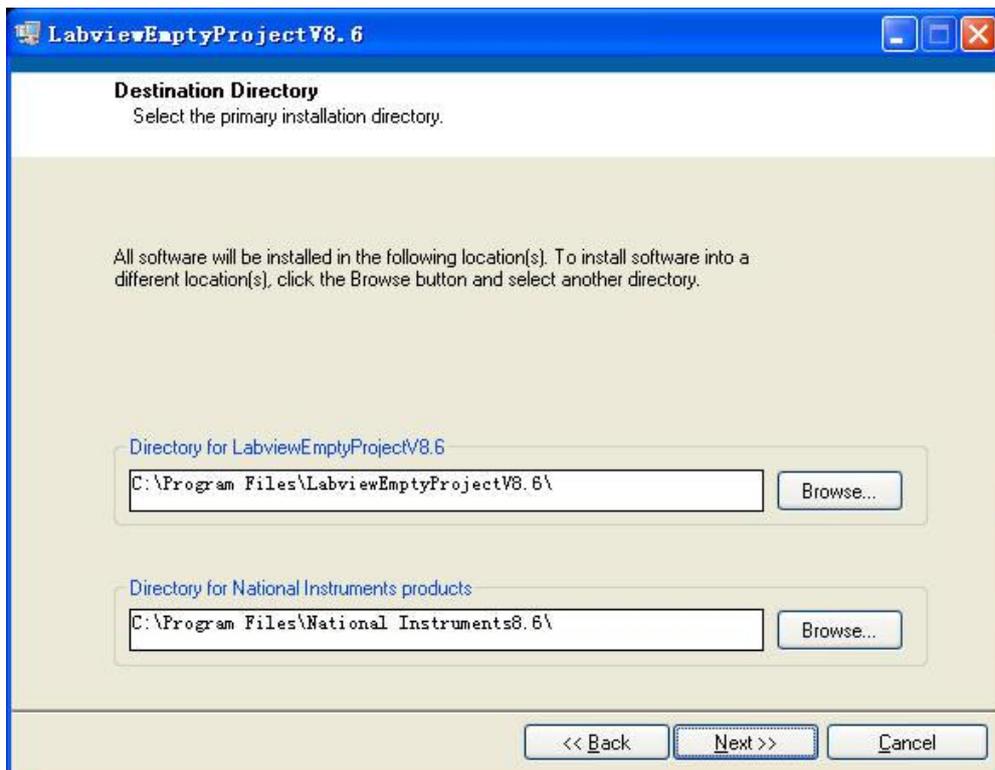
### 2.4 Installation guide:

For computer which is first use the test software, the driver should be installed first. The install process as below:

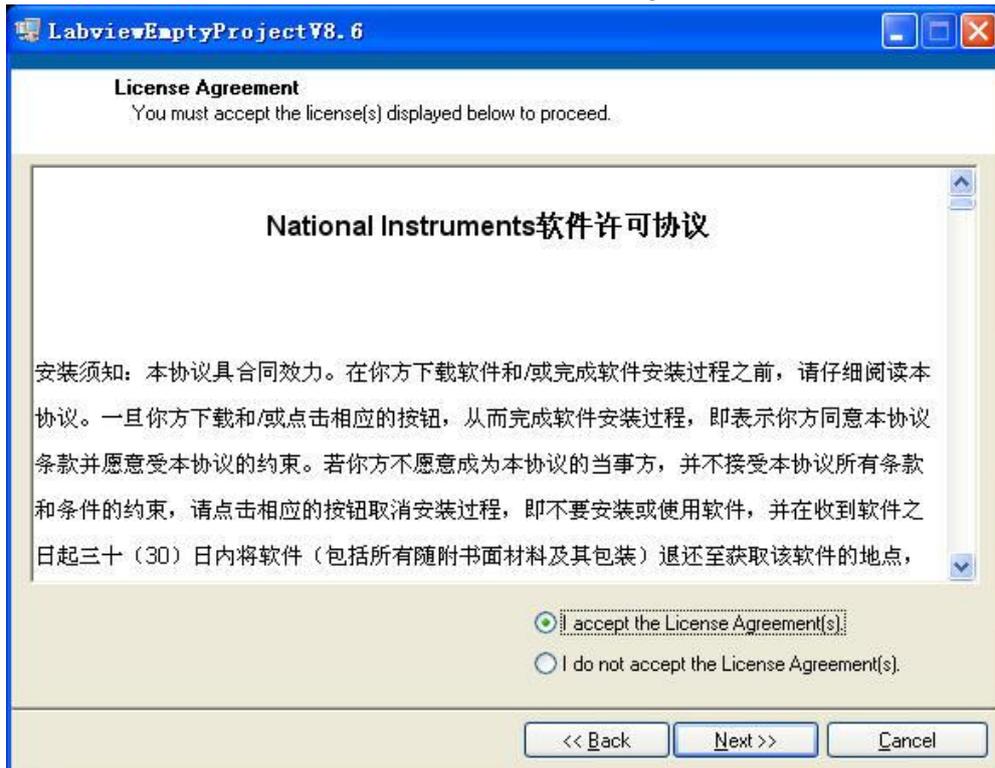
1. Quit all other application
2. Double click to open "Driver V8.6" folder, the window will look like this:



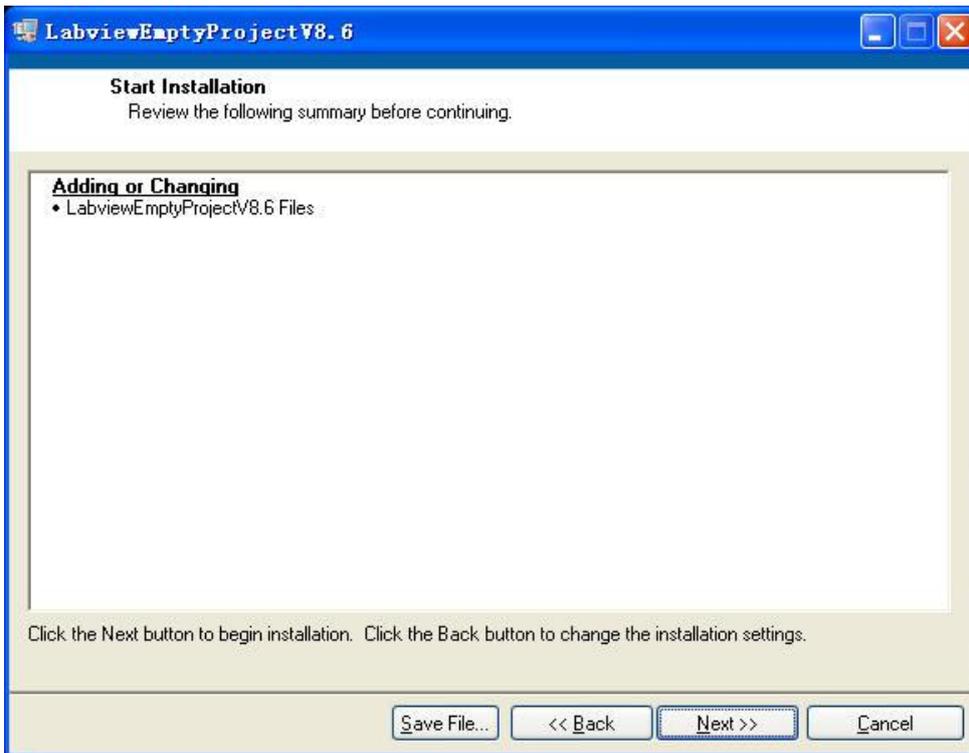
3. Double click "setup" to start installation program. The welcome dialog will appear:



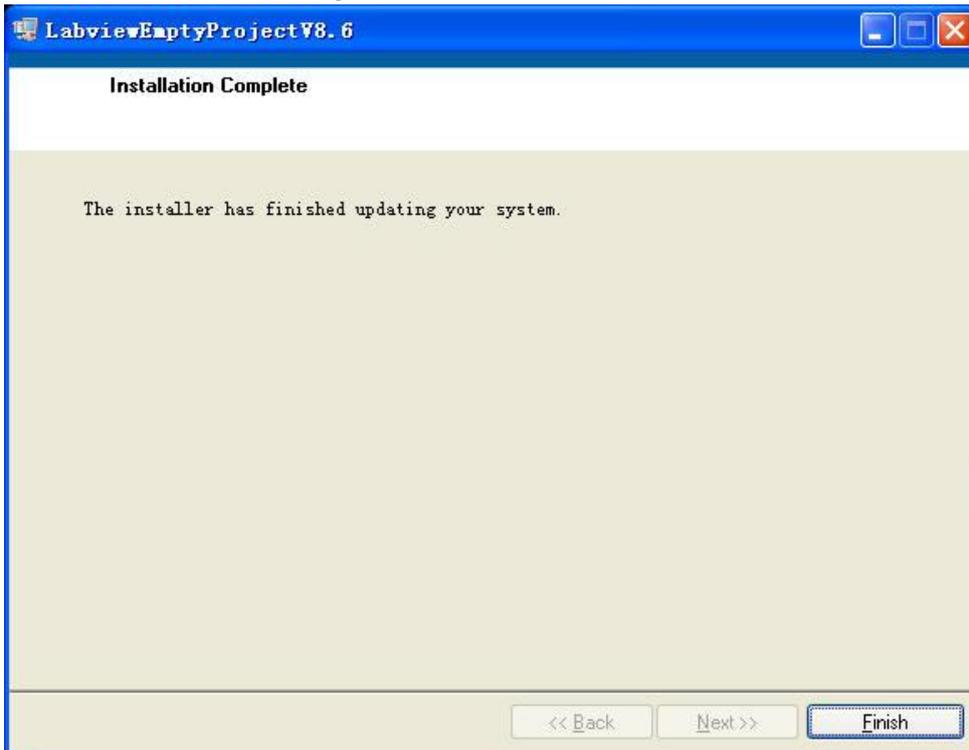
4. Click “Next>>” button, read the License Agreement in the following dialog:



5. Check “I accept the License Agreement (s)” option and click “Next>>” to enter the next step:



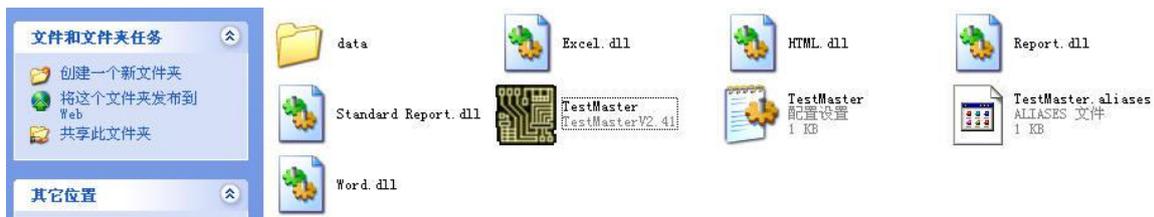
6. Click “Next>>” and start the installation, it may take several minutes, please be patient until the following screen shows.



7. Click “Finish” to complete the installation. It will ask you whether or not to restart the windows system immediately.

8. Click “Yes” to restart your computer.

9. Copy “TM2101V2.xx” folder to local disk and double click to open it.



10. Right-click the “TestMaster” program icon and choose “Send to...” -> “Desktop shortcut” menu to create a shortcut on the desktop.



11. The software installation is completed.

## 2.5 Software upgrade guide

If the drivers have been installed before and previous version of TM2101 software can run, the following steps will guide you to update it to a newer version. Suppose the old version is “TM2101V2.41” and the new version is “TM2101V2.42”.

1. Copy the folder “TM2101V2.42” that contains the new version to local file system
2. Go to the location of the old version. If you forget the location, you can find it as following instructions:

Right-click the “TestMaster” shortcut on the desktop



Choose “Property” menu to open the property dialog:



Click “Find target...”, it will open the folder where the old version is.



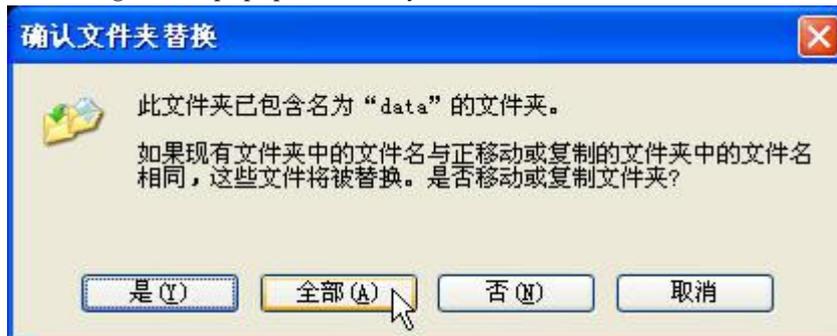
3. Right-click the “data” folder of the old version, choose “Copy” in the popup menu:



4. Open the “TM2101V2.42” folder that contains the new version, Right-click to show the popup-menu, choose “Paste”:



A Dialog will popup to ask you whether to overwrite the “data” folder:



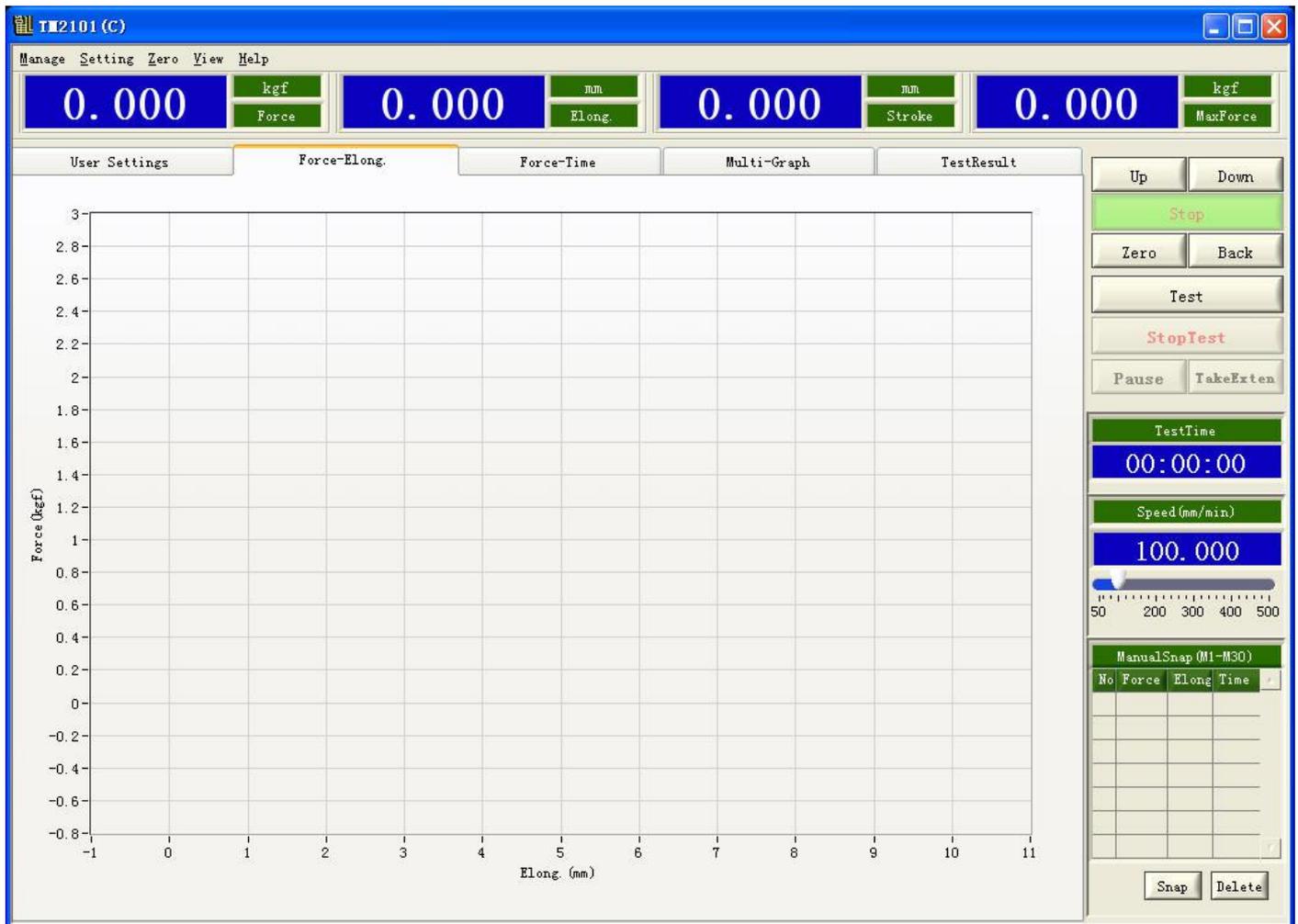
Choose “All” to overwrite all the data.

5. Delete the old shortcut named “TestMater” on the Desktop. Right-click “TestMaster” executable and choose “Send to..” → “Desktop shortcut” in the popup menu to create a new shortcut:



6. The software is updated.

# 3 Operation Guide of TM2101 Software



## 3.1 Quickstart

A complete testing process includes three steps: Setting before test; execute test and get test results.

1. Setting before test:

- ① Select a sample or add a new sample, as Fig.1;
- ② Select a project or add a new project, as Fig.2;

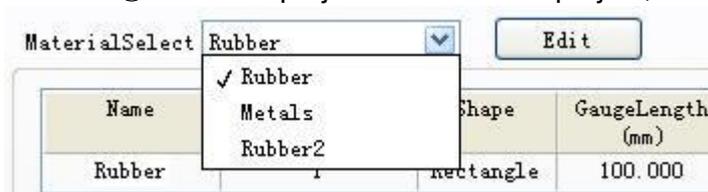


Fig. 1

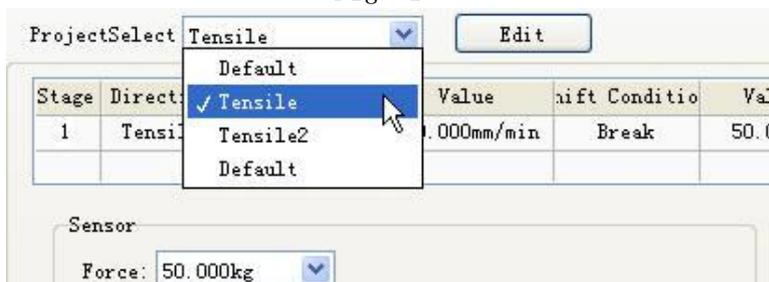
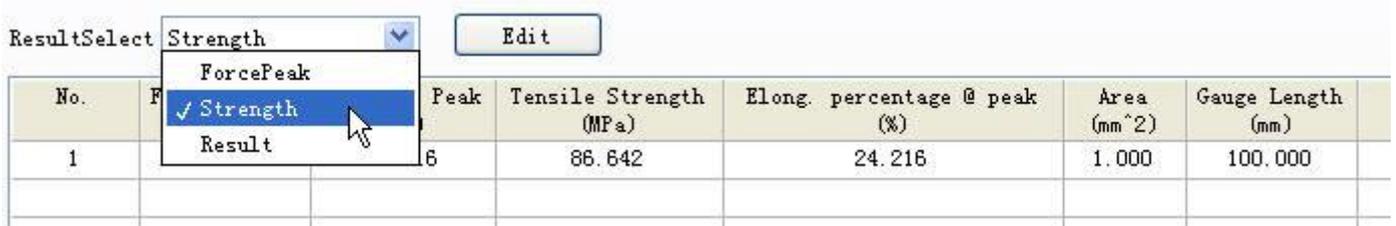


Fig. 2

2. Execute test: click 'Test' button or press its shortcuts 'F7' (Refer to 4.1 shortcuts instruction), when 'Test' button is in green connected state, it indicates that testing process is running and awaiting ending automatically or manual stop the test.
3. Get test results: Testing results will return automatically in the end. You can also get different test results by choosing other items in the dropdown list. as Fig.3.



No.	ForcePeak	Peak	Tensile Strength (MPa)	Elong. percentage @ peak (%)	Area (mm <sup>2</sup> )	Gauge Length (mm)
1	6	86.642	24.216	1.000	100.000	

Fig. 3

Notice: Testing should be executed in online state.

### 3.2 Main Interface Introduction

Main interface show in Fig. 1 and Fig. 2:

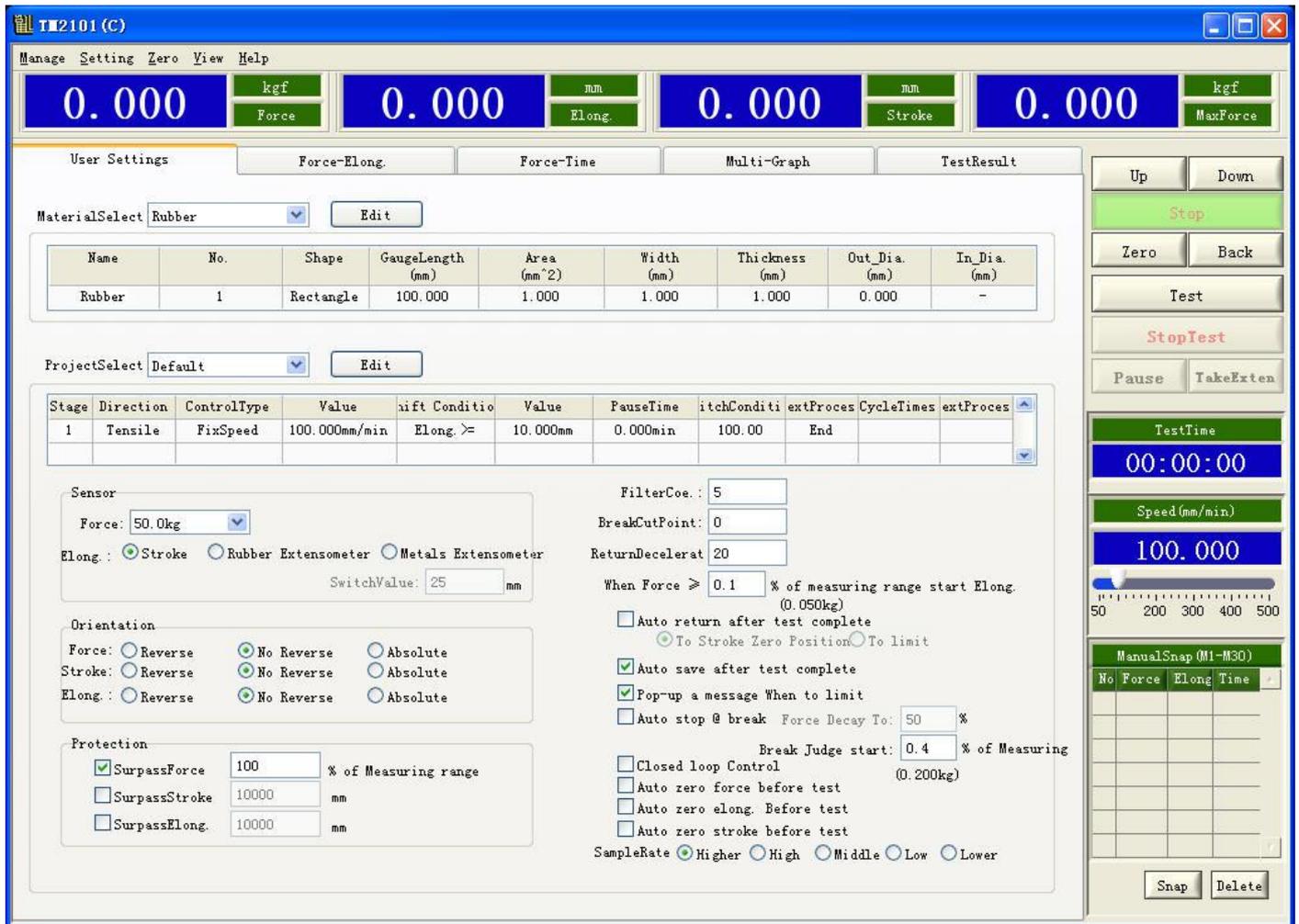


Fig. 1



Fig. 3

Control Panel: Control the machine up and down and testing execution operation and so on.  
 Rising and falling speed of machine: Adjust lifting and falling speed of machine.

Snap manually: Snap feature points manually in the curve, details in [Fig. 3.4 Function detailed information-Snap the point manually](#)

Material selection and modification: See details in [Fig. 3.4 Function detailed information-Material editor](#)

Testing method selection and modification: See details in [Fig. 3.4 Function detailed information-Control method](#)

Select and modify the control parameters: See details in [Fig. 3.4 Function detailed information-Control parameters](#)

Select and modify the results: See details in [Fig. 3.4 Function detailed information-Testing Results](#)

Displayed results form: Get required results of testing

History record operation: Open record means open a bypass testing record only one at a time, when repeated open it would cover the last one; Delete record means delete one or more selected records; Add record means new open one or more records based on last one.

Report form operation: print form means export report form to the printer for printing execution; Edit report form means open the report form for editing; Word report form means generate a report form of Word format according to template of Word report form.

Force-Displacement curve Display: Display test curve. Details in [Fig. 3.4 Function detailed information-Graph Operation](#)

### 3.3 Menu Introduction

Menu List:

Main menu	First level sub-menu	Illustration	Second level sub-menu	Illustration
Management (M)	Log in	Details in <a href="#">3.4 Detailed explanation of all functions Log in</a>		
	Authority Management	Details in <a href="#">3.4 Detailed explanation of all functions Authority Management</a>		
	Modify password	Details in <a href="#">3.4 Detailed explanation of all functions Modify password</a>		
	Log out	Exit software, short key Ctrl+Q		
Setting(S)	Unit System	Details in <a href="#">3.4 Detailed explanation of all functions Unit System</a>		
	Calibration	Details in <a href="#">3.4 Detailed explanation of all functions Calibration</a>		
	Connect	Details in <a href="#">3.4 Detailed explanation of all functions-Connect</a>	COM1-COM6	Details in <a href="#">3.4 Detailed explanation of all functions Connect</a>
	Other	Invalid		
Zero(Z)	Zeroed	Zeroed current force value		

	Force			
	Zeroed Route	Zeroed current route value		
	Zeroed Displacement	Zeroed current displacement value		
	Zeroed All	Zeroed all of the above values		
Vision(V)	Language		Simplified Chinese	Switch to selected language of the software
			Traditional Chinese	Details in <a href="#">3.4 Detailed explanation of all functions Language Switch</a>
			English	
	Option	Details in <a href="#">3.4 Detailed explanation of all functions Option</a>		
Help(H)	Help Documents	Open help documents		
	About...	Show information of the testing system		
	Register	Details in <a href="#">3.4 Detailed explanation of all functions Register</a>		
	Active	Details in <a href="#">3.4 Detailed explanation of all functions Active</a>		

### 3.4 Detailed Information of all functions

- 1、 [Log in](#)
- 2、 [Authority Management](#)
- 3、 [Modify Password](#)
- 4、 [Unit System](#)
- 5、 [Calibration](#)
- 6、 [Online](#)
- 7、 [Swich Language](#)
- 8、 [Option](#)
- 9、 [Register](#)
- 10、 [Active](#)
- 11、 [Edit Material](#)
- 12、 [Control Methods](#)
- 13、 [Control Parameter](#)
- 14、 [Testing Result](#)
- 15、 [Edit Report Form](#)
- 16、 [Word Report Form](#)
- 17、 [Snap Point Manually](#)
- 18、 [Graph Operation](#)

## 1. Log in

Click Menu “Management”->”Log in”, or press composite key Ctrl+L(3.5 Shortcut Key lists) to enter Login interface, as shown in Fig.1:

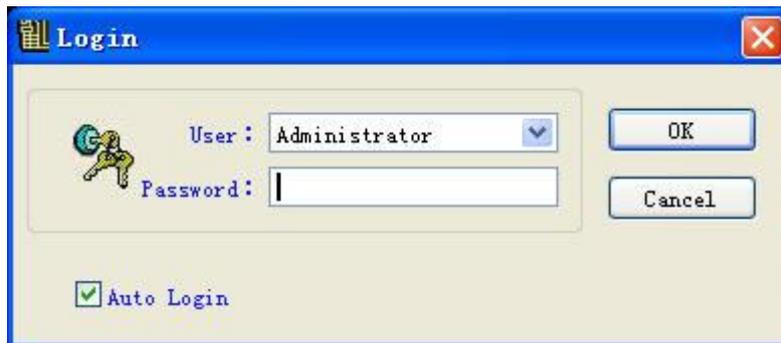


Fig. 1

Choose user, input correct password and click confirm button, then you can use the software within corresponding user authority. Administrator owns the highest user authority and Anonymous owns the lowest. When selected 'Always login as the user', user will log in automatically as the same user when software start next time.

## 2. Authority Management

Click menu “Management”->”Authority Management” to enter Authority Management Interface, as shown in Fig. 2:

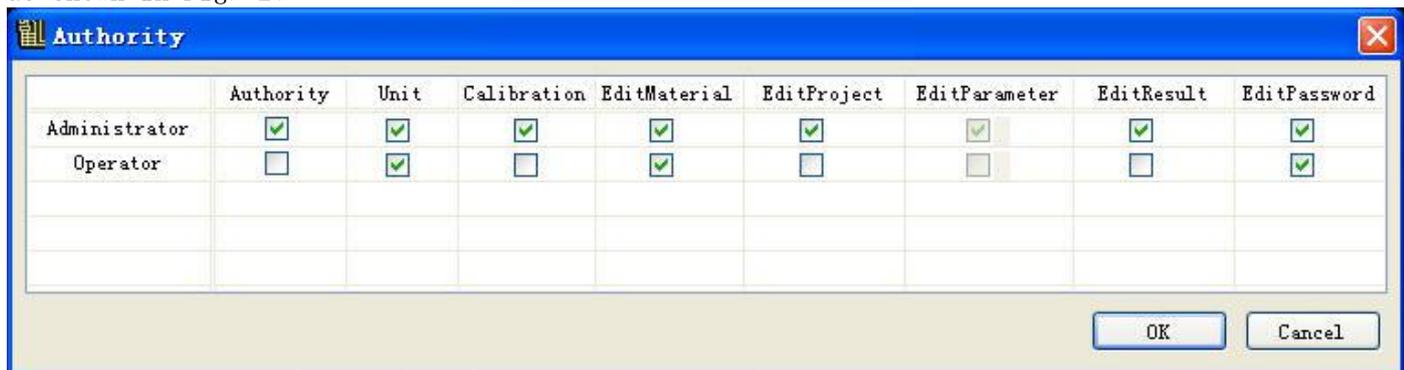


Fig. 2

Authority Management is in disabled status when log in as Anonymous, as anonymous has the lowest administrative privileges which does not have right of authority management. User permission of all functions can be set in the Authority Management, the selected item shows that user owns permission of it, otherwise does not have. For example, in “Authority Management” project of above picture, Administrator is selected while the tester is not selected, it shows the administrator has the right of authority management and the tester does not have the permission.

## 3. Modify Password

Click menu “Management”-> “Modify login password” to enter Modify Login Password Interface, see Fig. 3:



Fig. 3

Modified password is current login user's password. For example, when current login user is administrator, and then modifies the administrator password, when current login user is tester, and then modifies the tester's password.

#### 4. Unit System

Click menu "Setting" -> "Unit System", or press composite key Ctrl+U (3.5 Shortcut Key lists) to enter Unit System Interface, see Fig. 4:

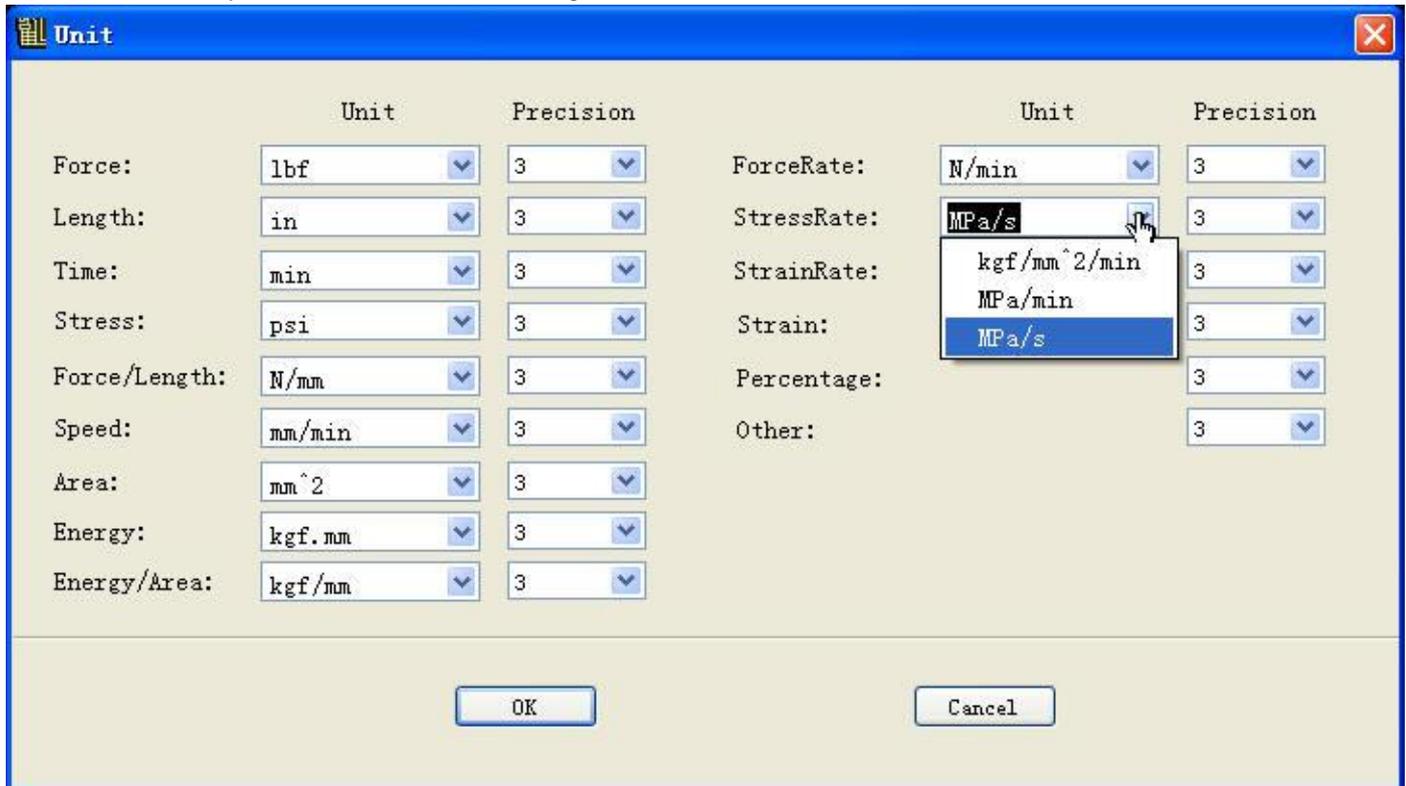


Fig. 4

Choose a unit and accuracy from the drop list, the accuracy means the digits after the decimal point. And the unit determines the unit of the whole system, the operation of all variable must according to this unit system.

#### 5. Calibration

Click menu "Setting" -> "Calibration", or press composite key Ctrl+Shift+C (3.5 Shortcut Key lists) to enter Calibration Password Input Interface, see Fig. 5:

Enter into the Calibration Interface after input the right password, see Fig. 6:



Fig. 5

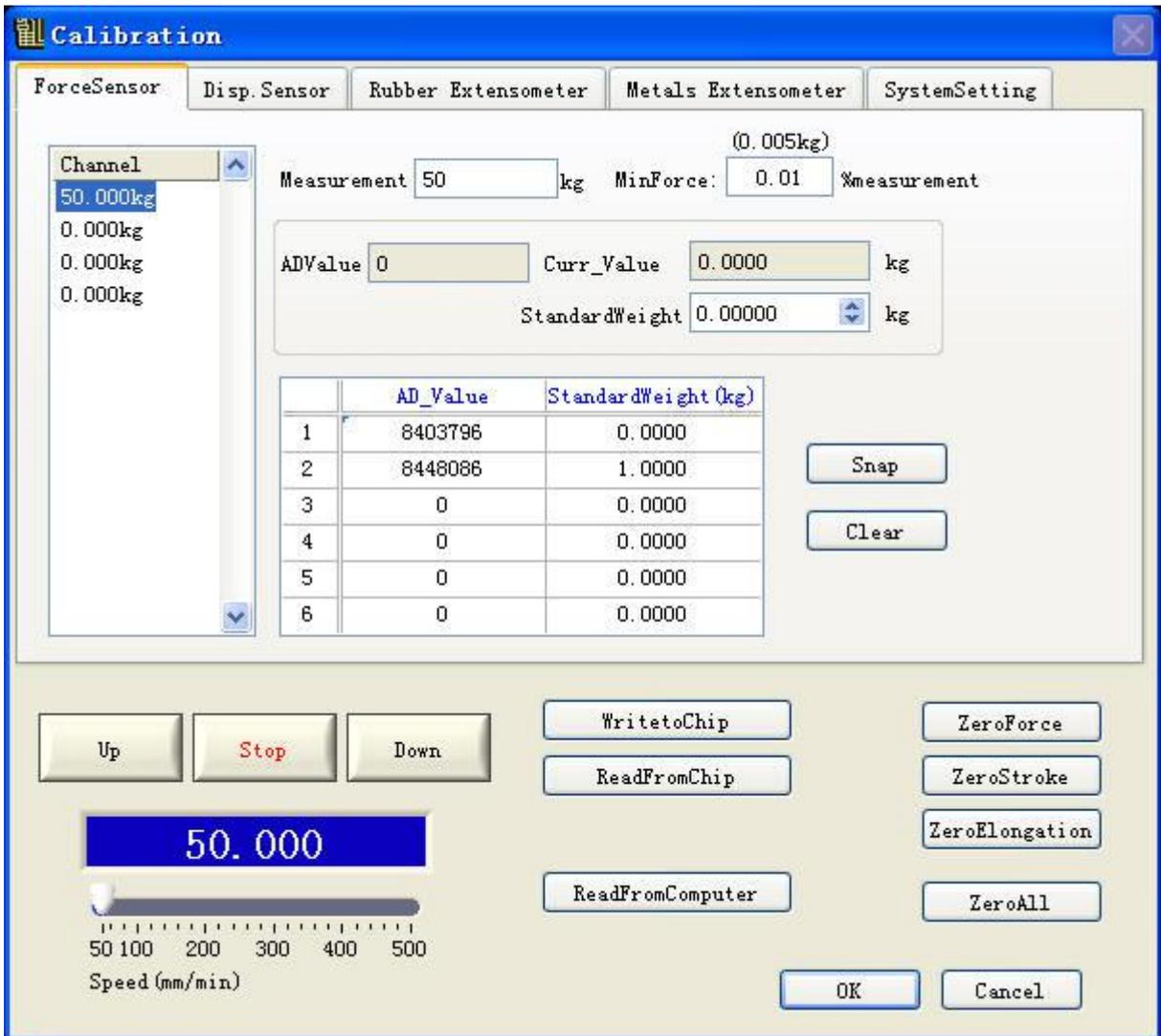


Fig. 6

The Calibration Interface contains five tabs: Force Sensor、Displacement Sensor、Rubber Extensometer、Metal Extensometer and System Setting.

1. Calibrate the force sensor

Choose the tab “Force Sensor”, see Fig. 6. In the left side, there are four force sensor channels: “50kg”、“0.0kg”、“0.0kg”、“0.0kg”.

Calibrate process as below:

- 1). Plug in a force sensor (for example: range of the force sensor is 50kg) to be calibrated, select a sensor channel on the left side;
- 2). Input the range of force sensor into “Range”, for example “50kg”;
- 3). Input zero value into “Zero”, the default value is “0”;

- 4). Click "Empty" to empty the calibration table;
- 5). Calibrate the first point: empty the sensor, and input "0" kg in "Standard Weight Value", then click button "Sample", so the AD value and standard weight value will be input into the calibration table;
- 6). Calibrate the second point: Add certain value of load (for example 5 kg) on the sensor, and input "5" kg into the "Standard Weight Value", then click button "Sample", so the AD value and standard weight value of the second point will be input into the calibration table;
- 7). Calibrate the third point: The method is same with the second point, if continue to calibrate the third point, the AD value and standard weight value of the third point must bigger than the second point, or the calibration will be inaccurate;
- 8). Calibrate the fourth point: The method is same with the second point, if continue to calibrate the fourth point, the AD value and standard weight value of the fourth point must bigger than the second point, or the calibration will be inaccurate;
- 9). Calibrate the fifth point: The method is same with the second point, if continue to calibrate the fifth point, the AD value and standard weight value of the fifth point must bigger than the second point, or the calibration will be inaccurate;
- 10). Calibrate the sixth point: The method is same with the second point, if continue to calibrate the sixth point, the AD value and standard weight value of the sixth point must bigger than the second point, or the calibration will be inaccurate;
- 11). Click the button "Write the Standard Data into the acquisition", the calibration of a sensor will be completed if prompts "write successful", please retry if prompts "write failed";
- 12). Please redo 1~11 steps if you need to calibrate the second force sensor, or set the range of other sensors to zero, then click button "Write the Standard Data into the acquisition".

Attention: At least two points should be calibrated, step 7~10 can be skipped. According to the character of most domestic sensors, normally need 3 points to be calibrated to get very good accuracy, the value of the second point can be set as 3~5% of the range of sensor, and the value of the third point can be set as 30~50% of the range of sensor. The AD value and standard weight value of the latter point must bigger than the point in front if calibrate more than 3 points, or the calibration will be inaccurate. If the AD value decreases when the "Standard Weight Value" increases, you can exchange the two signal line of sensor. AD value is about 8400000 when empty, and the AD value will be proportional change when with load on the sensor, if the AD value doesn't change when with load on the sensor, there must be some errors on the hardware, maybe the force sensor damaged or the acquisition card has malfunction, please contact with manufacturer.

If there is a little difference between measure force value and the standard weight after calibration, please re-calibrate or modify the value of standard weight in the calibration table, if the measure force value is bigger than the value of standard weight, modify the value of standard weight of the second point in the calibration table smaller, then click button "Write the Standard Data into the acquisition", then re-clear and re-compare until the two value become equal.

## 2. Calibration of displacement sensor

Select "Displacement sensor" tab, see Fig. 7:

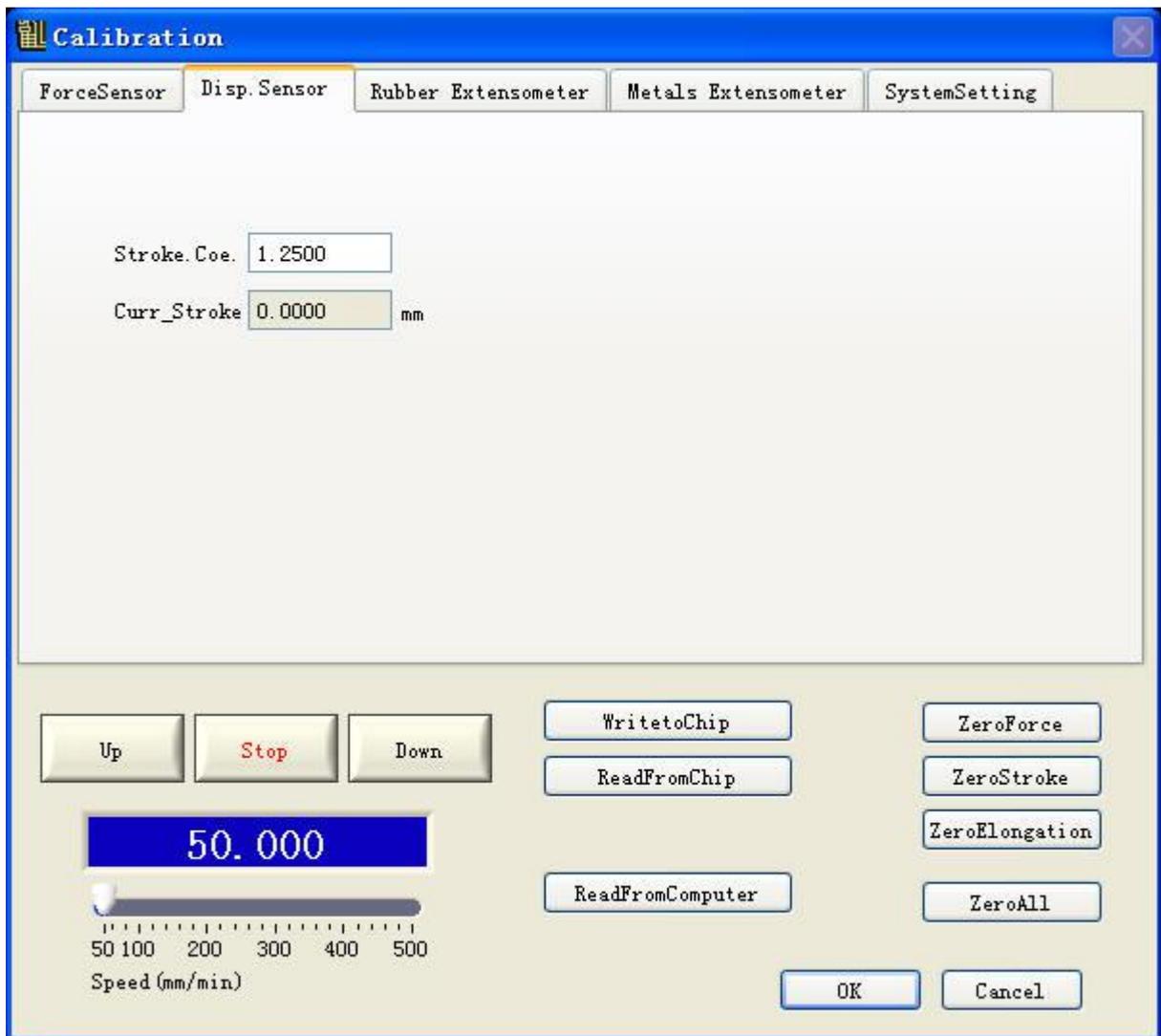


Fig. 7

1). Fill the displacement coefficient value into the right input box of "Displacement Coefficient", displacement coefficient means the displacement when the acquisition receive per 1000 pulses, acquisition card make the encoder lines for the four harmonic, for example the number of encoder lines is 4, the screw lead is L mm, then the corresponding displacement coefficient value is  $L/n/4*1000$ . If you don't know the number of encoder lines or screw lead, you can input any number (for example number "1") for try.

2). Click button "Write the Standard Data into the Acquisition Card" to write the displacement coefficient value into the acquisition card;

3). Click button "Clear the Displacement" to clear the current displacement;

4). Click button "Up" or "Down" to make the machine move a certain distance, then measure the distance via calipers;

5). Check whether the "current displacement" value is equal with the measured value, if the "current displacement" value is bigger than the measured value, please decrease the displacement coefficient value, or increase the displacement coefficient value, then click button "Write the Standard Data into the Acquisition Card" to write the new displacement coefficient value into the acquisition card;

6). Redo 3~5 step until the "current displacement" value is equal with the measured value;

7). Finish the calibration of displacement sensor;

3. Calibration of rubber extensometer

If the machine connects with a rubber extensometer (known as the large deformation), you need to calibrate it. Please choose the “Displacement” for “Rubber Extensometer” via click “User Parameter Setting” -> “Control Parameter” -> “Sensor” before calibration, or the calibration could not be carried on. The calibration interface of rubber extensometer is shown if Fig. 8:

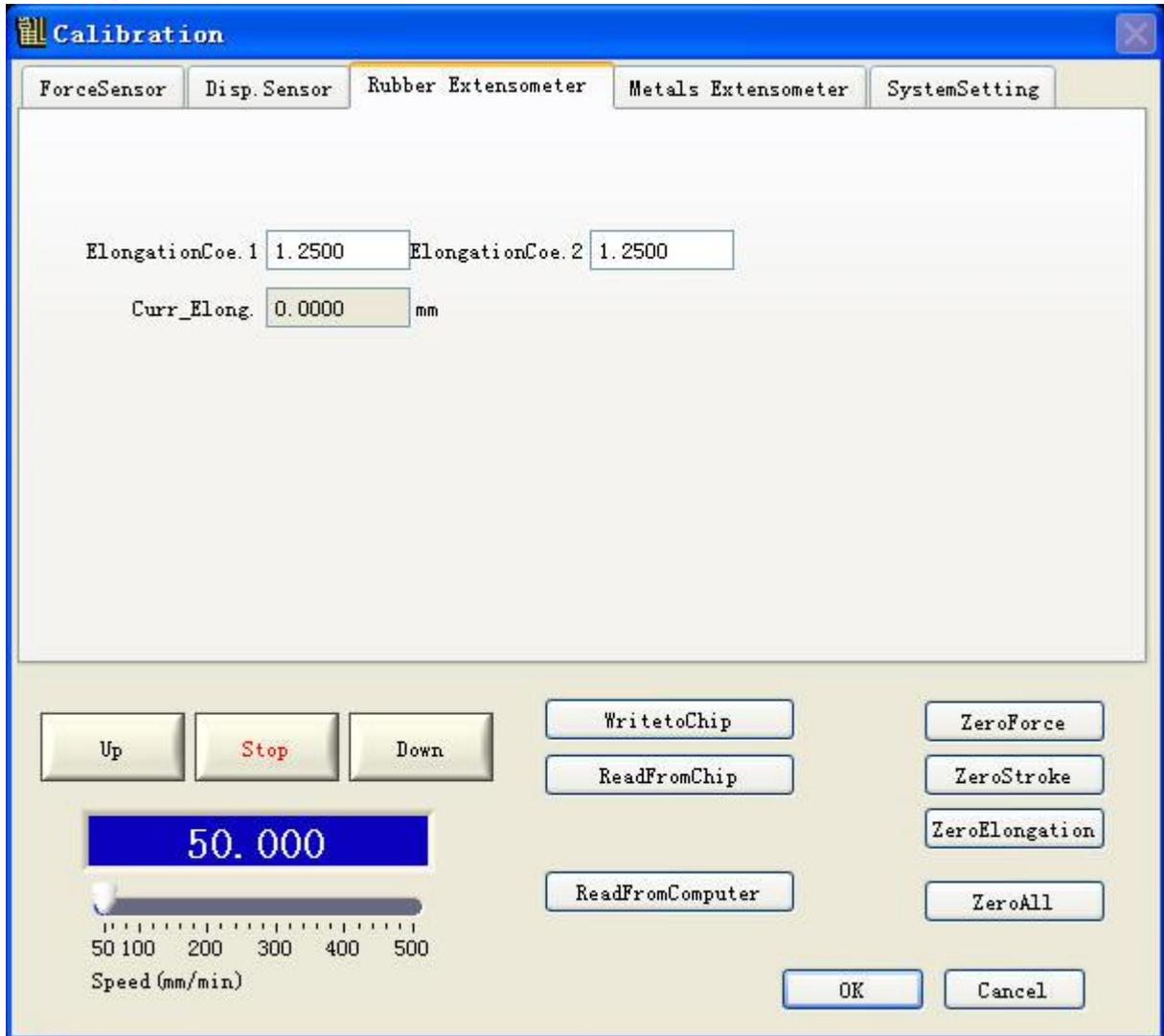


Fig. 8

The calibration process of rubber extensometer is same with the force sensor.

#### 4. Calibration of metal extensometer

If the machine connects with a metal extensometer, you need to calibrate it. Please choose the “Displacement” for “metal extensometer” via click “User Parameter Setting” -> “Control Parameter” -> “Sensor” before calibration, or the calibration could not be carried on. The calibration interface of metal extensometer is shown if Fig. 9:

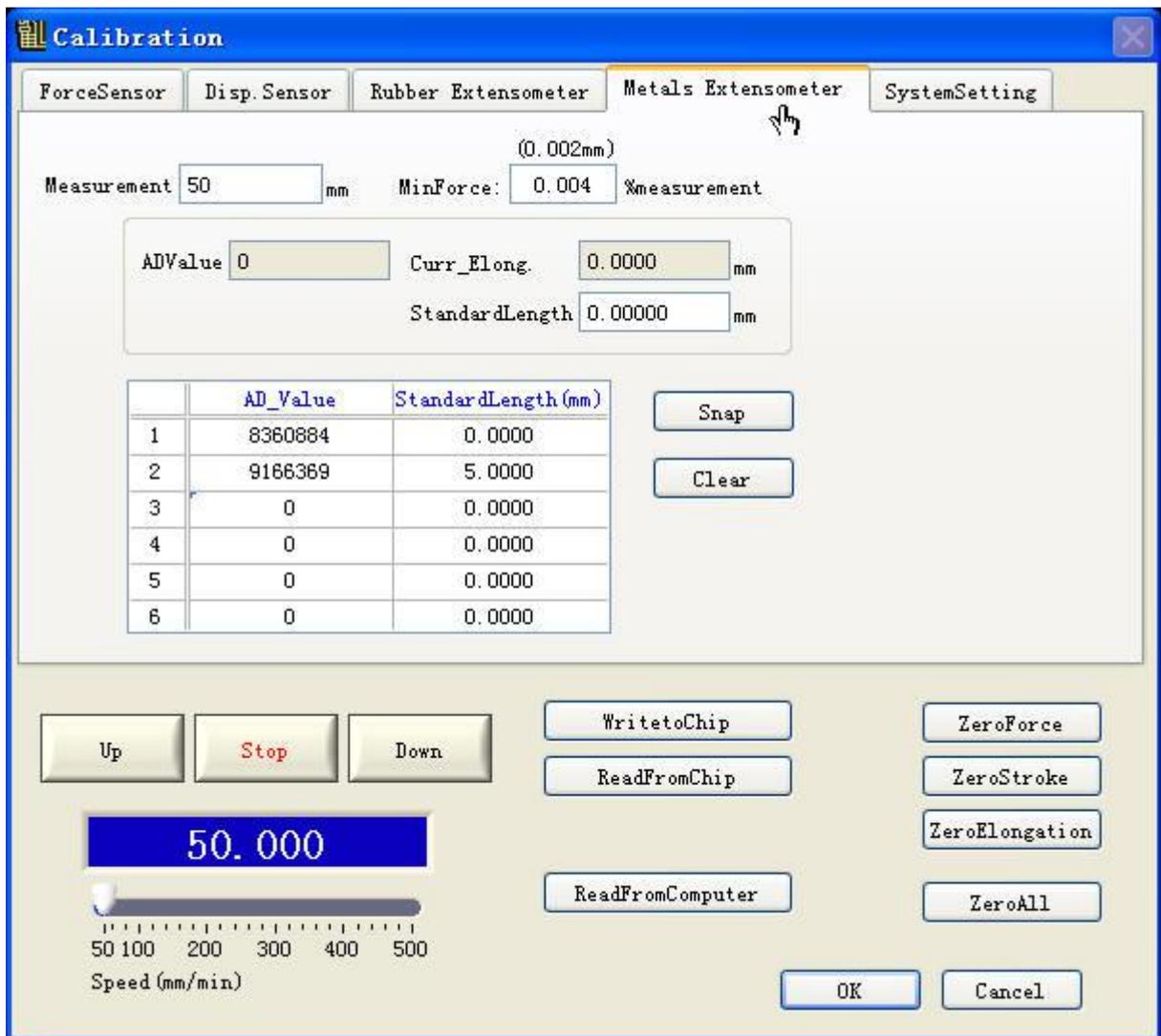


Fig. 9

The calibration process of metal extensometer is same with the force sensor.

### 5. System Setting

Choose "System Setting" tab, see Fig. 10:

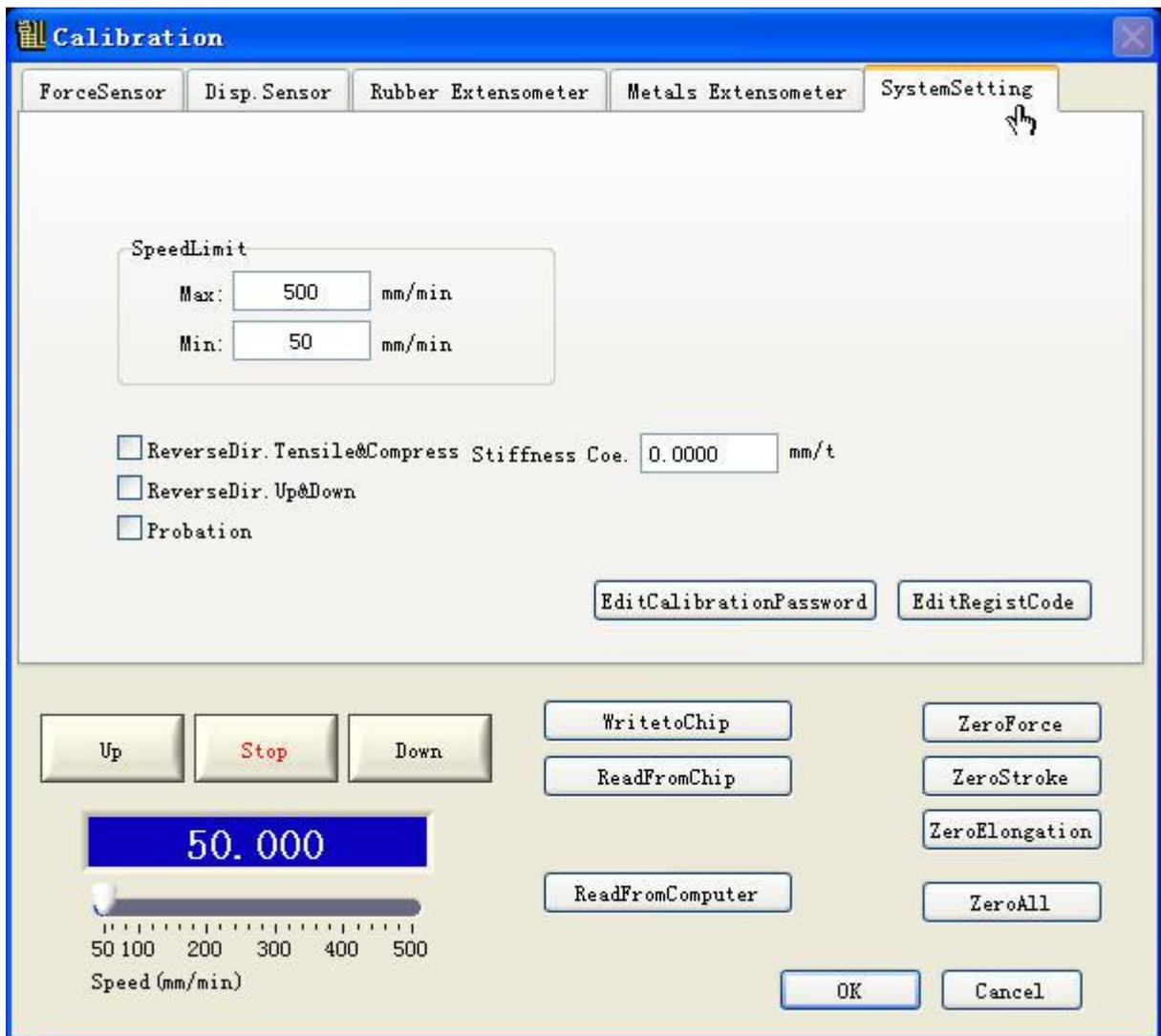


Fig. 10

Velocity Limit: Setting the maximum operate velocity and minimum operate velocity of machine.

Reverse the Direction of Tensile and Compress: Determine whether reverse the direction of Tensile and Compress.

Reverse the Direction of Up and Down: Determine whether reverse the direction of up and down.

Probation Period: Can modify the probation period of software after choose this button, the software can be continue used only if you input the right license when the probation period expired.

Modify the Calibration Password: Modify the password calibration interface.

Modify the License: Modify the software License.

Write the Standard Data into the Acquisition: Write the current standard data into the acquisition card, the data will be valid only when write the data into the acquisition.

Get Standard Data from acquisition card: Get Standard Data from acquisition card to current display.

Get Standard Data from computer: Get Standard Data from computer to current display.

OK: Save all data, switch the force sensor to the current choose channel. It is independent with "Write the Standard Data into the acquisition", Click "OK" does not mean the current data is valid, the data will be valid only when write the data into the acquisition.

Cancel: Don't save all data, so the setting is invalid.

## 6. Calibration of machine operating velocity

Before calibrate the machine operating velocity, please calibrate the force sensor first, and disable “User Parameter Setting” -> “Control Parameter”, or the machine operating velocity could not be calibrated.

### 6. Connect

Click button “connect” in menu “Set”, chose the right COM to connect the equipment. As shown in Fig. 11:

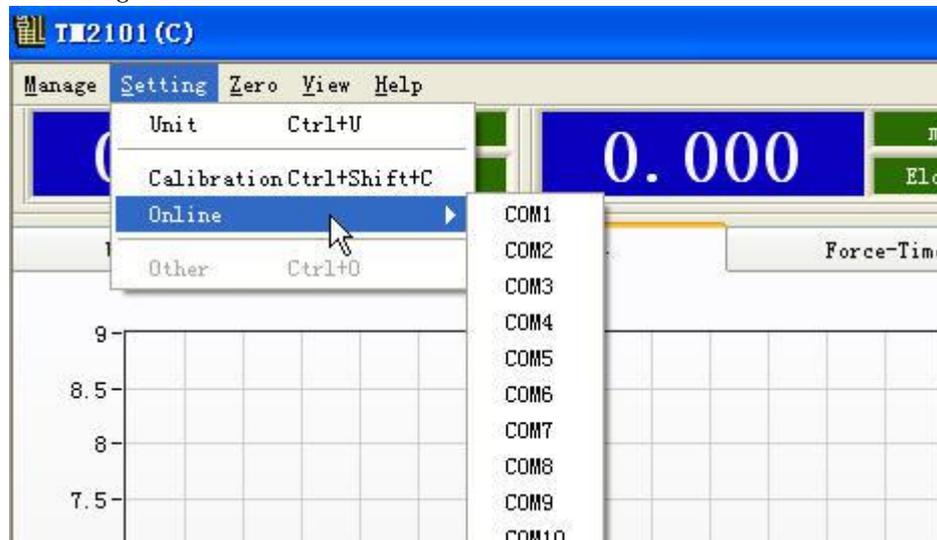


Fig. 11

A fail prompt window will be ejected when connect failed (as shown in Fig. 12), if connect success, no prompt window eject. If the connect success, the software will connect one time when it startups, the software will connect via the current COM at the next startup time, the test can be successful only if the connect successfully.



Fig. 12

## 7. Language Change

Click Menu “View”-> “Language” to change the language of software, as shown in Fig.13:

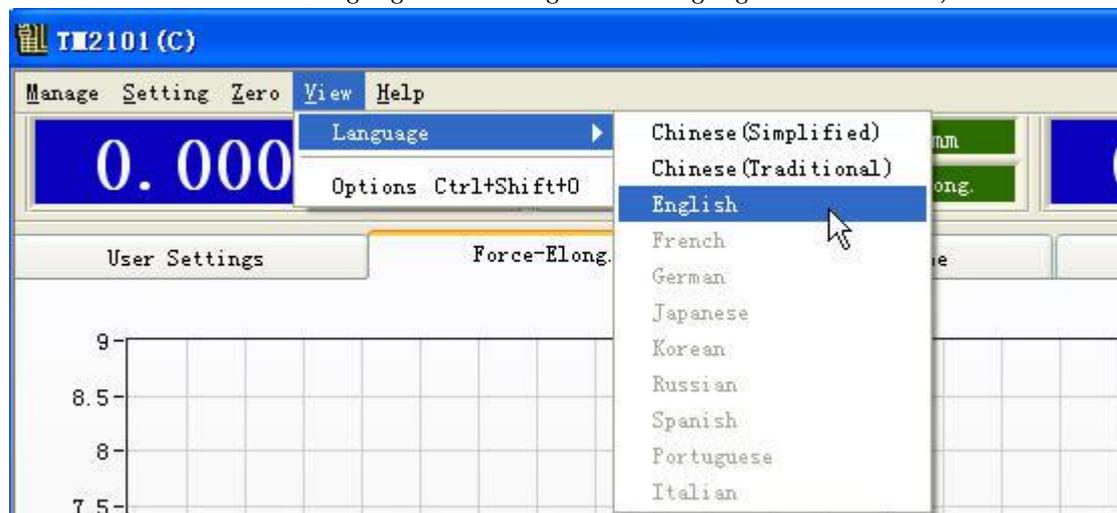


Fig. 13

The general version has three types of language: Chinese Simple、Chinese Traditional and English. And the advanced version has ten types of language, if you have any special requirement, please contact us.

## 8. Option

Click Menu “View”-> “Option” or press the combination keys Ctrl+Shift+0 (See 3.5 Shortcuts), then you can enter into the option interface, as shown in Fig. 14:

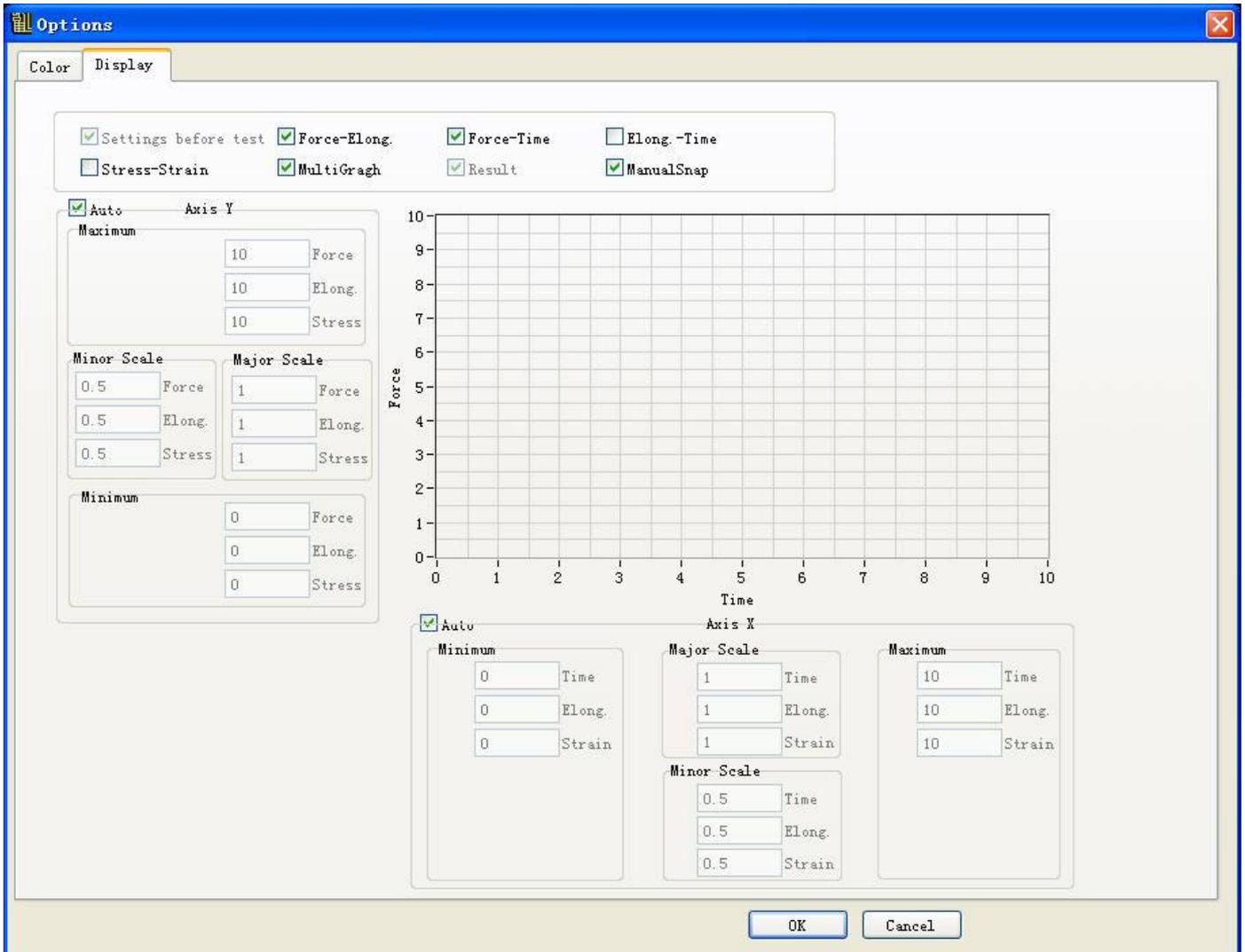


Fig. 14

There are two tabs in the “Option”: “Color” and “Display”, which can set up the color and display.

## 9. Registration

Click Menu “Help”-> “Registration” or press and hold on the combination keys Ctrl+R (See 3.5 Shortcuts), then you can enter into the registration interface, as shown in Fig. 15:



Fig. 15

The software contain a probation period, you can continue to use the software only if you input the right license when the probation period expired.

## 10. Activation

Click Menu “Help”-> “Activation” or press and hold on the combination keys Ctrl+Shift+A (See 3.5 Shortcuts), then you can enter into the activation interface, as shown in Fig. 16:

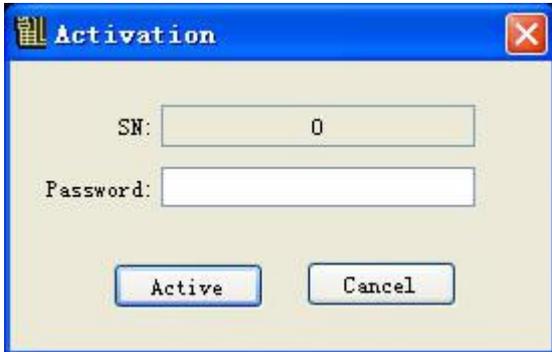


Fig. 16

According to the license of the system, you can activate the software to the advanced version after input the right activate license. If connect fail, the license will be shown as 0, the activation can be operated only if the connect successfully. If the function of the current software could not meet your test requirement, please contact with us to upgrade to the advanced version.

## 11. Material Edit

You can choose an existed sample through the drop list of “Sample Data Choose” (As shown in Fig. 17) or click button “Edit” to add or edit the sample data (As shown in Fig. 18):

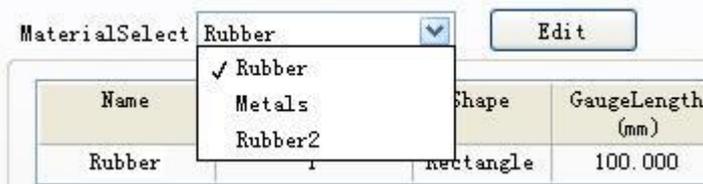


Fig. 17

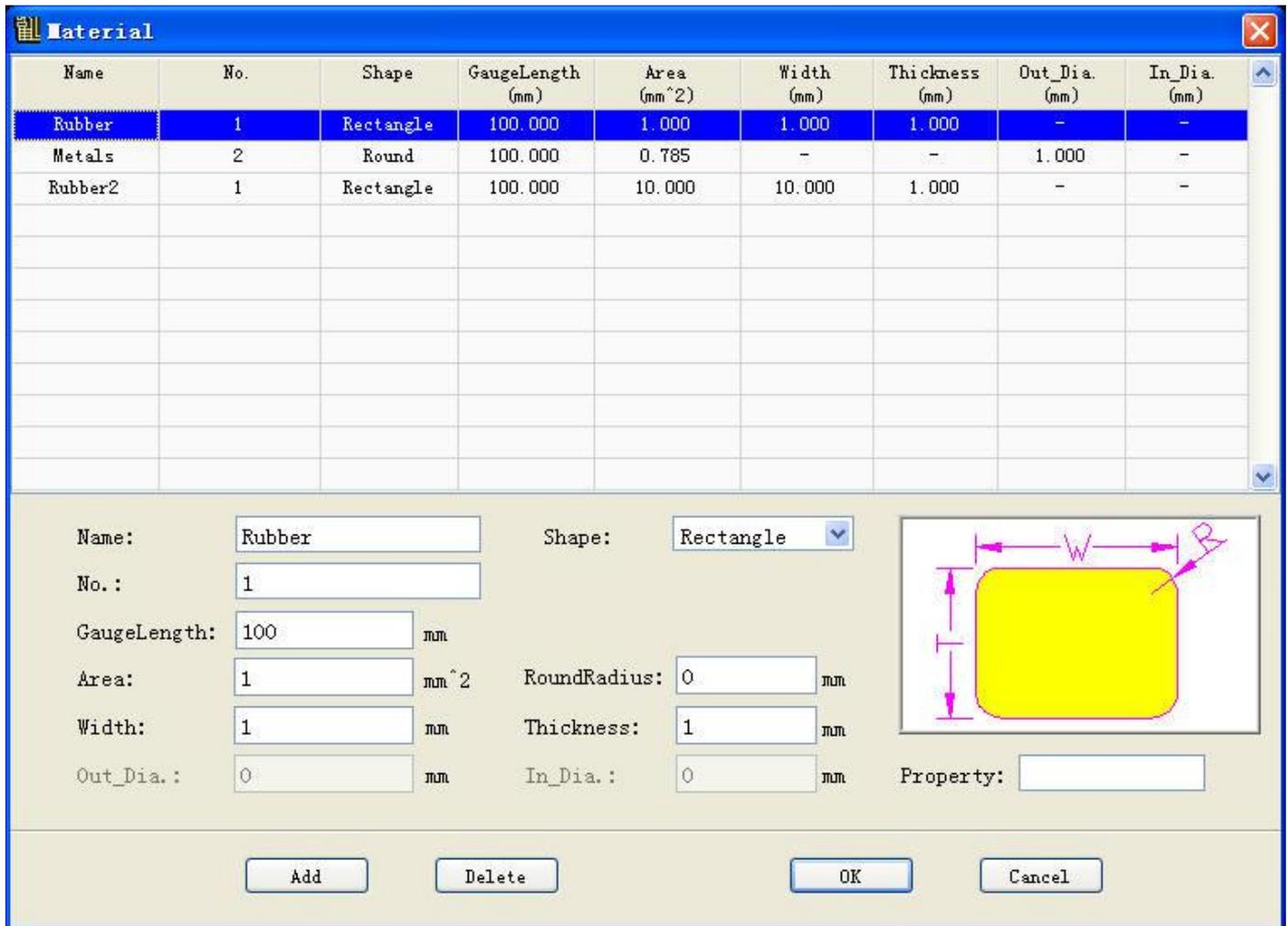


Fig. 18

Add: Add a new material

Delete: Delete the selected material

OK: Save all modifies

Cancel: Don't save the modify

## 12. Test method edit

You can choose an existed Project via drop list of "Project Select" (As shown in Fig. 19) or click button "Edit" to add or edit the control program, each control program contains "Test Method" and "Control Parameter", you can click tab "TestMethod" to edit the test method (As shown in Fig. 20)

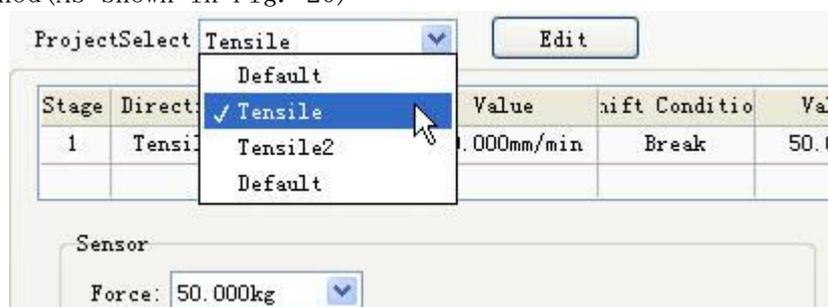


Fig. 19

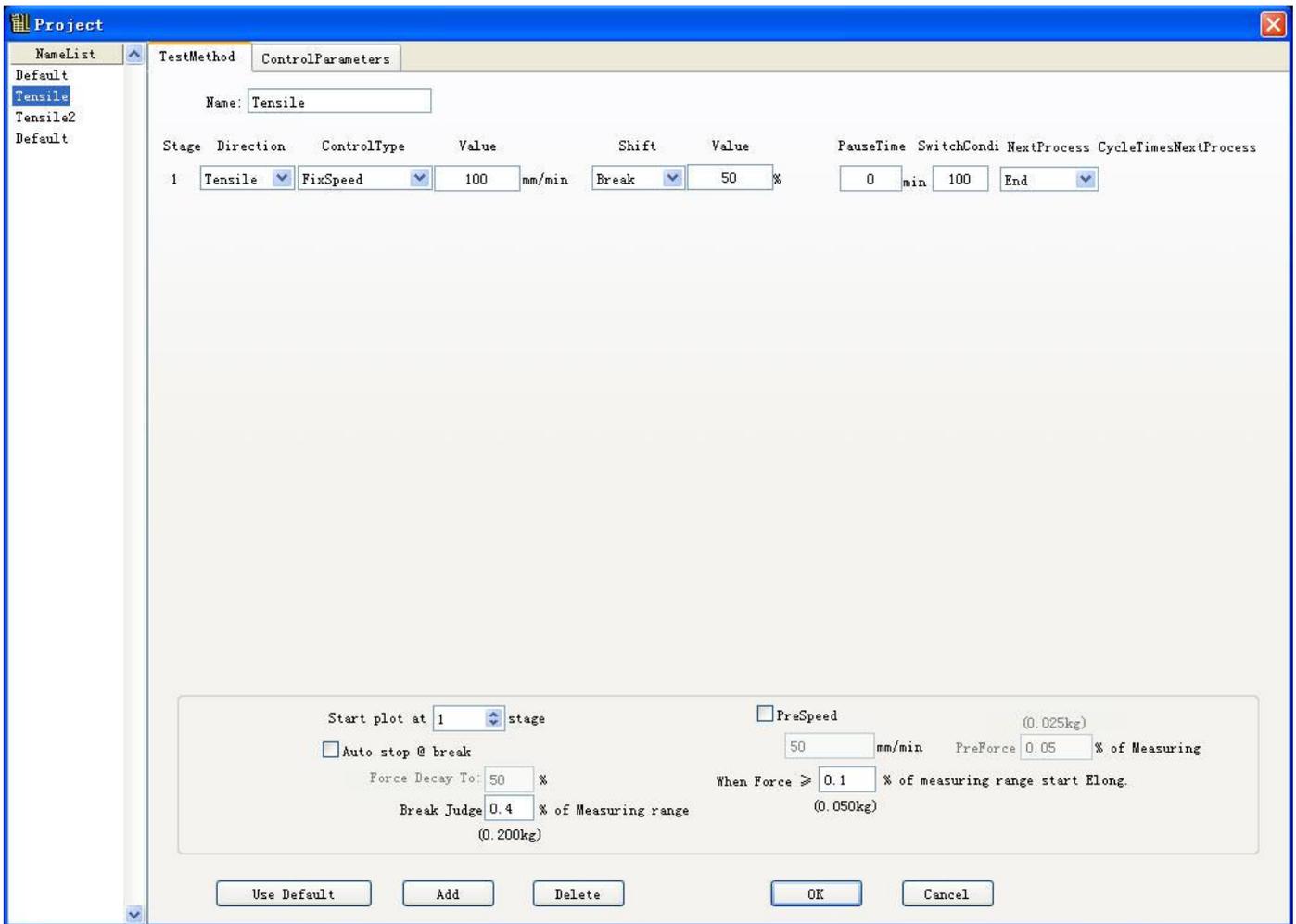


Fig. 20

**Control Mode Value:** The 1~20 steps “Control Mode Value” in the “Results List”

**Shift Value:** The 1~20 steps “Shift Value” in the “Results List”

**Switch Condition:** The percentage of the value of the switching conditions when transform into the next action

**Name List:** List all existed control programs

**Add:** Add a new test method

**Delete:** Delete the selected test method

**OK:** Save all modifies

**Cancel:** Don't save the modify

**Use Default:** Use the default system test method

### 13. Control parameters

Click tab “Control method” in “Control program”, you can edit the control parameter. As shown in Fig. 22:

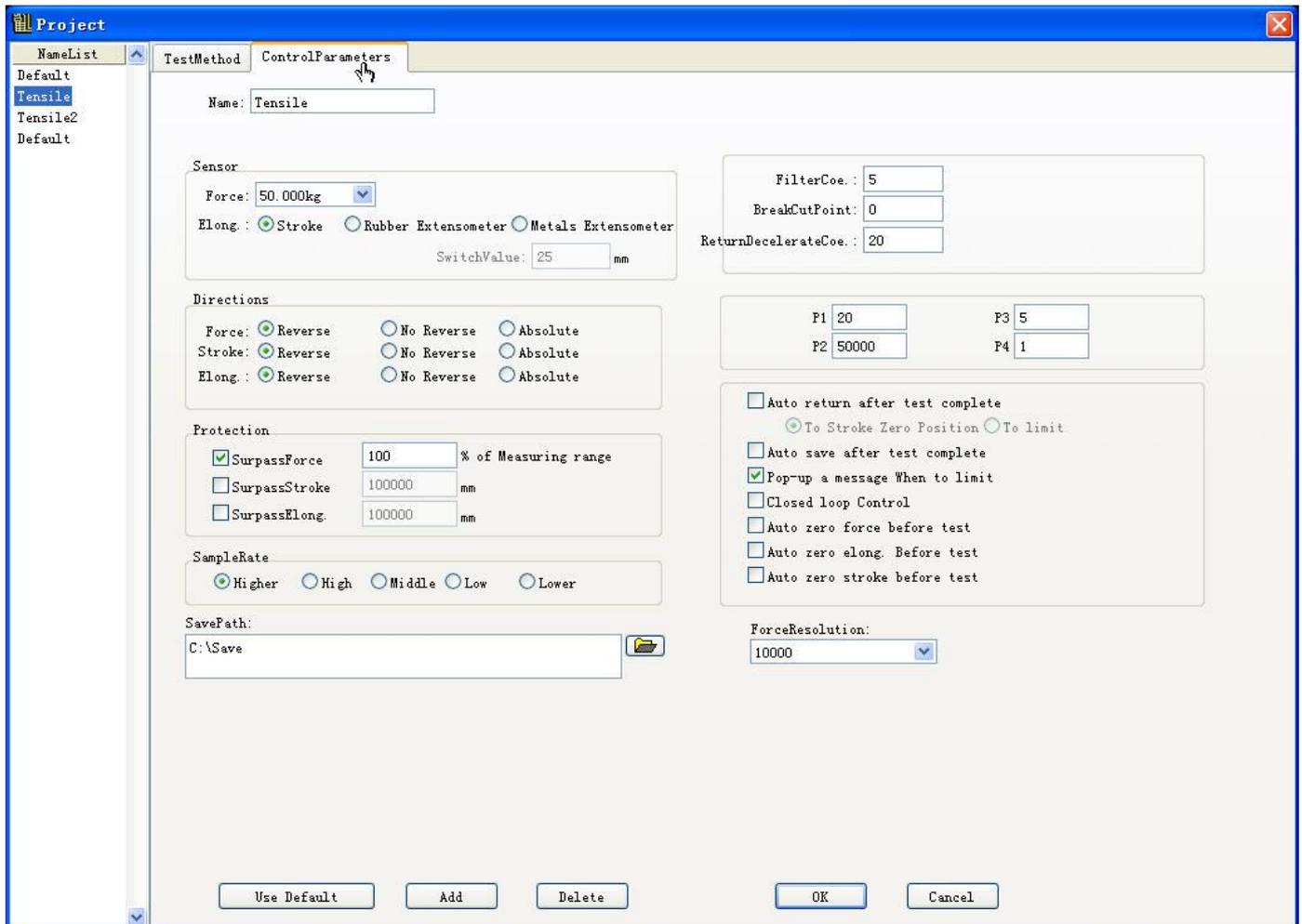


Fig. 22

Sensor: Choose of force sensor and displacement sensor

Direction: Determine whether the force, distance and displacement to take negative value or absolute value

Protection: The system will be automatic shutdown when the current value out of the protection range, choose "Protection" means enable this function

Sample Rate: the number of sampling points per second, you can choose a lower sample rate for a prolonged period of constant load test

Save Path: The test data will be saved in this path

Filter Coe.: Filter Coefficients, the number of mean value filter. Range 1~1000, Normal 5.

BreakCutPoints: Remove the Last few sample points when the sample fracture

Force Resolution: Determine the minimum scale which the system can display

Use Default: Use system's the default control parameter

## 14. Test Results

You can chose a group of existed test result through the drop list of tab "test results select", or click "Modify" to add or edit test results, as shown in Fig. 24:

ResultSelect Strength

No.	ForcePeak	Peak	Tensile Strength (MPa)	Elong. percentage @ peak (%)	Area (mm <sup>2</sup> )	Gauge Length (mm)
1	Strength	6	86.642	24.216	1.000	100.000

Fig. 23

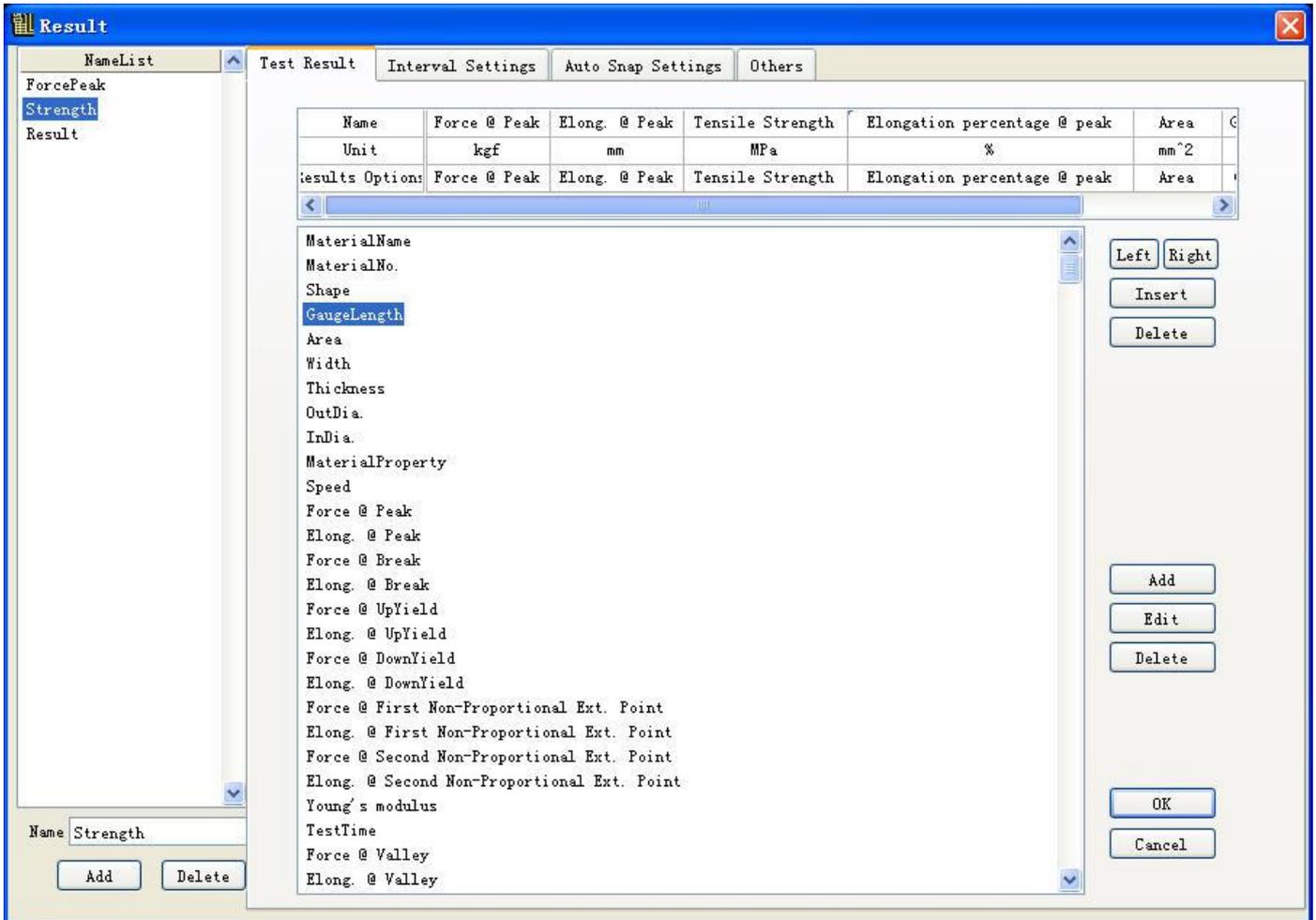


Fig. 24

- Name List: List all existed test results
- Add: Add a new group of test results
- Delete: Delete a group of selected test results
- OK: Save all the modifies
- Cancel: Don't save all the modifies

The content in the result table is all the needed result for a completed test, you can add a parameter to the table from the parameter list, or do some operation such as delete, left shift or right shift via click a table. The button "Add", "Edit" and "Delete" on the right side can operate on the parameter list. For example, chose "tensile strength" in the result parameter, click "Edit" or double click "tensile strength", then the parameter edit interface will be eject. As shown in Fig. 25:

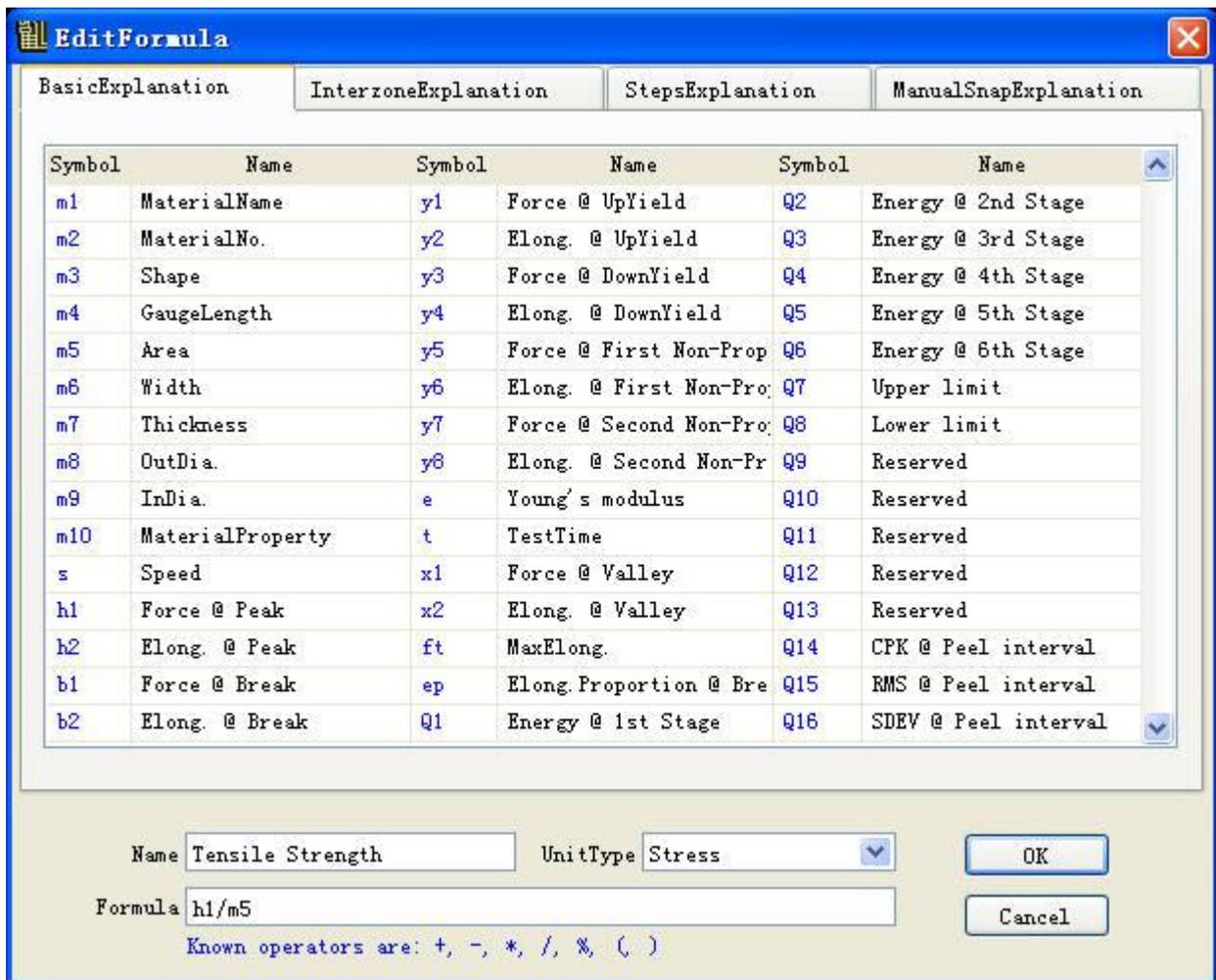


Fig. 25

The name is tensile strength, tensile strength=maximum force/area, in the table above, you can find out the alternative symbol of maximum force is “h1”, the alternative symbol of area is “m5”, so the formula is “h1/m5”, and the unit type is stress (strength), the edit will be finished when click button “OK”. The table above is the explanation of basic parameter symbol.

You can fill in interval set, automatic sample set and other tab on demand.

## 15. Report Edit

Click button “Edit Report”, you can enter into the report edit interface. As shown in Fig. 26:



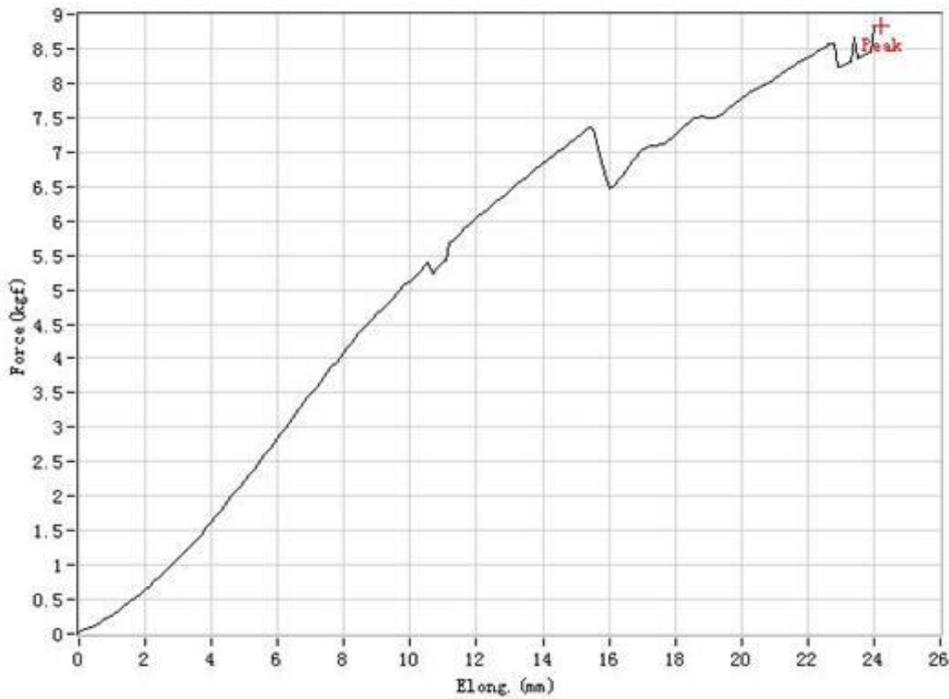
Input the needed information in header, then click button "Print" can print the report directly, Click button "Save as" can save the current report as a Word format file, click button "Close" can exit current file.

## **16. Word report**

Click button "Word report" can generate a word report. User can create a new Word template, and chose the template in the drop-down list in "Word report" in tab "Others" of menu "Test Results", then the Word report will be produced by this template. And a bookmark "Graph" and a table with two lines and two columns must be included in the template; the position of the bookmark is the position of the curve, and the table will be replaced by the test results. As shown in Fig. 27:

## Shanghai Rixine Technology

Test No.:		Customer:	
Test date:		Gauge length:	
Operator:		Area:	
Sample name:		Temperature:	
Lot No.:		Result:	



No.	Force @ Peak (kgf)	Elong @ Peak (mm)	Tensile Strength (MPa)	Elong percentage @ peak (%)	Area (mm <sup>2</sup> )	Gauge Length (mm)
1	8.835	24.216	86.642	24.216	1.000	100.000

Fig. 27

Click Menu "Insert" → "Bookmark" to insert a Curve, as shown in Fig. 28 and Fig. 29:



Fig. 28

Fig. 29

Input bookmark "Graph", then click 添加(add), the curve will be add to current position of the cursor.

In addition, if there has a text format "?\*?" in the template and the content between two "?" is same with the character in the test formula table, it will be replaced by the actual value of the test.

You can change the maximum accommodate column number of the report test result if you modify "NumCols=10" in file "Config.ini" under folder "data", the default value is 10.

## 17. Manual Snap

Click Menu "View"→"Option", function manual snap can be activated if you select "manual Snap" in the display tab. As shown in Fig. 30 and Fig. 31:

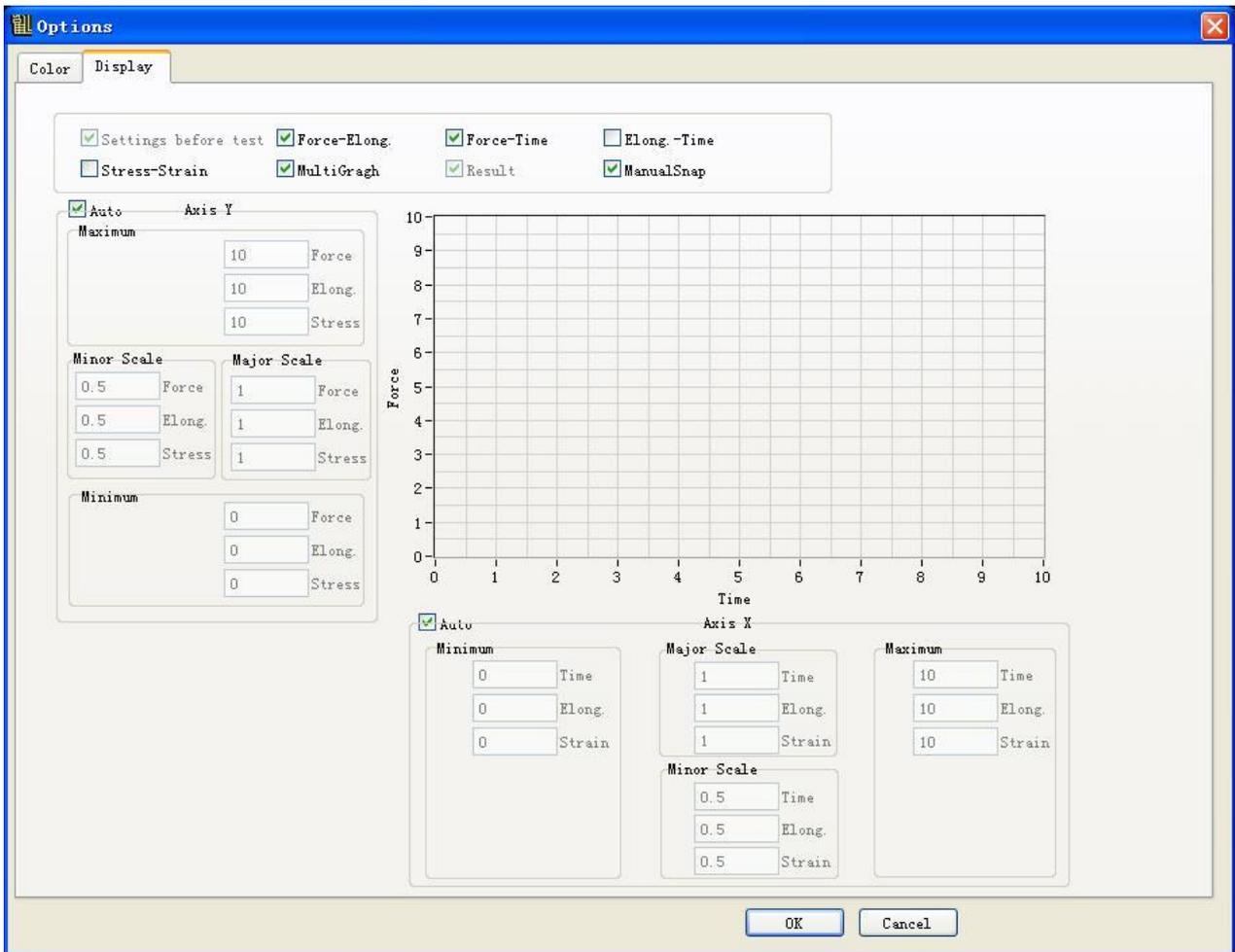


Fig. 30

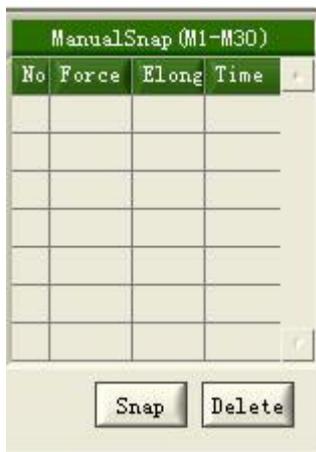


Fig. 31

During the test proceed, click button “Snap” or shortcuts F10, will fill the current force, displacement and time into the form. During the non-test proceed, click button “Snap”, if the cursor is invisible, it will be visible; if you don’t snap at the first time and the cursor is visible, then the position of the cursor will be set as the current Snap position.

## 18. Graph operation

Click right button of the mouse in the curve display window, then the graph operation will be popped, As shown in Fig. 32:

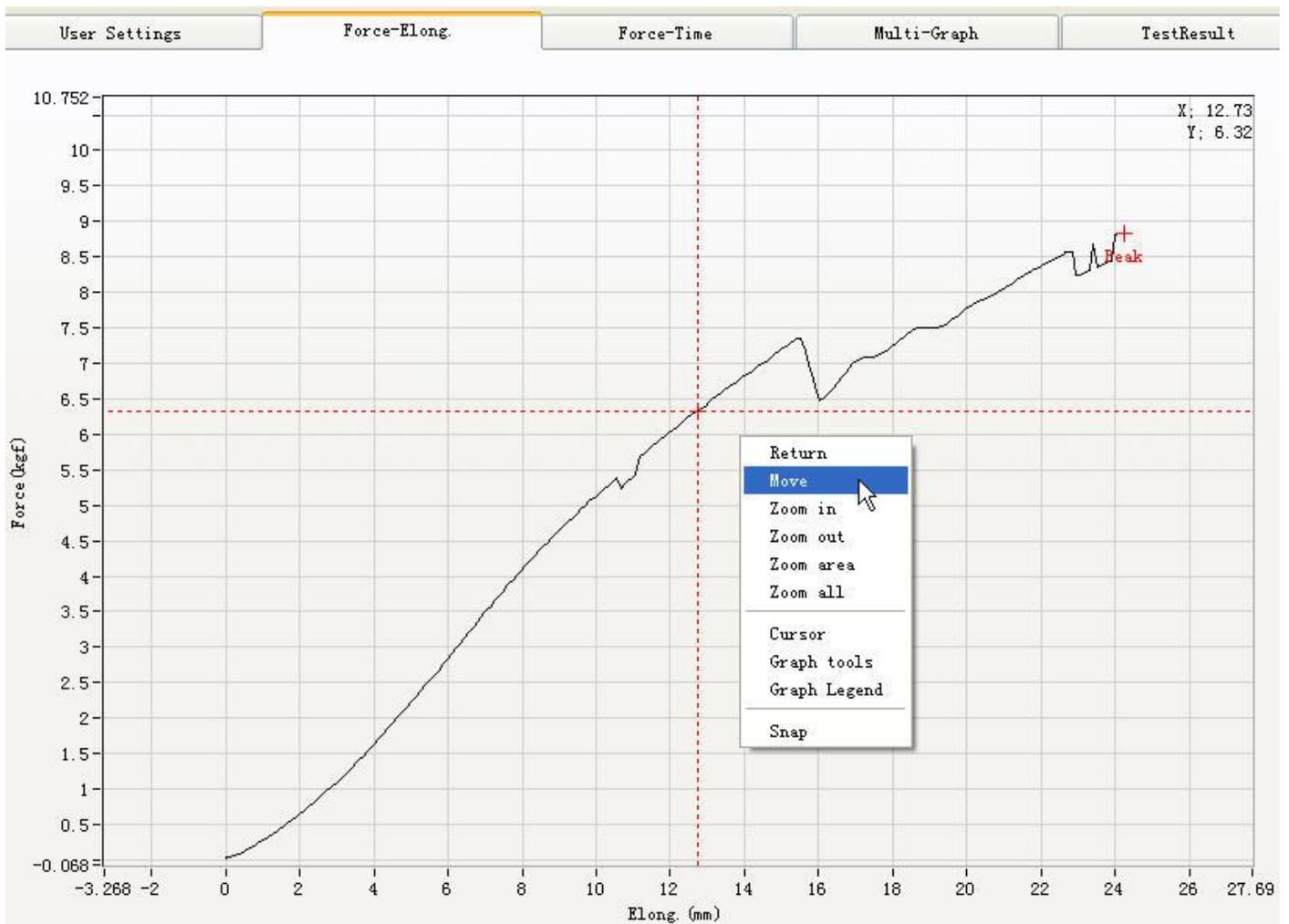


Fig. 32

Return: Return to the initial state of the mouse, the mouse must return to initial state if you want to drag the cursor on the curve

move: Parallel move the curve

Zoom in: Zoom in the curve

Zoom out: zoom out the curve

Zoom area: Press and hold on the left button of the mouse, drag a rectangular box to zoom in part of the curve

Zoom all: Display the whole curve in the picture

Cursor: Indicate the cursor, current position of the cursor will be display on the upper right corner, As shown in the blue marking in Fig. 32

Graph Tools: Indicate the graphics tools, show as the red marking in Fig. 32. the graphics tools can also operate the curve, such as parallel move and zoom

Snap: Has the same function with "Manual Snap"

### 3.5 Shortcuts

Shortcuts list:

Shortcuts	Function	Shortcuts	Function
F2	Up	Ctrl + L	Log in
F3	Down	Ctrl + Q	Exit
F4	Stop	Ctrl + U	Unit System
F5	Clear	Ctrl + Shift + C	Calibration

F6	Back position	Ctrl + F	Zero Force
F7	Start	Ctrl + S	Zero Course
F8	Finish	Ctrl + E	Zero Displacement
F9	Pause/Continue	Ctrl + Shift + Z	Zero
F10	Manual Sampling	Ctrl + Shift + O	Option
Ctrl + H	Help		
Ctrl + R	Registration		
Ctrl + Shift + A	Activation		

### 3.6 Configure files:

Text "AdFilter=5" in file "Initial.ini" means the sliding filter number of AD Value, it will be effected when write acquisition card in the calibration interface.

Text "NumColumns=10" in file "Config.ini" use for control the maximum accommodate column number of the report test result.

## 4 Q&A

Q: The software complains “connection failed” when starting the test, how to solve the problem?

A: “Connection failed” means the software cannot connect to the machine. Please check the serial port is correctly connected; the machine is already powered on. If these are confirmed, click “Option” → “Connection”, choose the expected COM port to connect. If you don’t know which COM port to connect, just try each COM port one by one until successful connected. If all the above are done and the problem remains. Quit the software, power off the machine, restart both the machine the software and retry.

Q: What to do when the software popup the “Software expired, please contact the provider.”?

A: Please contact the software provider to get registration code. The prompt will disappear after register the software using the new registration code. For more information, see section 3.4.

Q: When I click “Up” or “Down” the speed of the workbench does not match the configured speed (faster than expected) , how to solve the problem?

A: Please uncheck “User options” → “Project Edit” → “control parameters” → “Close loop control”. Please don’t check this option without displacement coder or the displacement has been calibrated.

Q: After click the “Test” button, the workbench works for a while but stops when the sample is just under stress, how to solve the problem?

A: Please increase the value of “User options” → “Project Edit” → “TestMethod” → “Break judge \*.\*\*% of measuring range”. The software will not check break when the test value is below this value. So that the experiment will not stop at the beginning because of the misjudgment of break.

Q: Encoder not connected, can the workbench back automatically?

A: No. A coder is required for the back function.

Q: When I click “Up” or “Down”, the move direction of the workbench is opposite to the configured value, how to solve the problem?

A: Please check “Options” → “Calibration” → “System options” → “reverse Up-Down direction” and click “write to chip” button.

Q: When the value of “Test Method” is set to “Tensile” or “Compress”, the move direction of the workbench is opposite to the configured value, how to solve the problem?

A: Please check “Options” → “Calibration” → “System options” → “reverse dir. Tensile&Compress” and click “write to chip” button.

## 5 Functional differences between software versions

The software of TM2101 has three versions: Version A (Starter Edition); Version B (Basic Edition); Version C (Professional Edition). The performance differences between versions are as follows:

Function	Version A	Version B	Version C
Management for USER Permission	Y	Y	Y
Management for Unit	Y	Y	Y
Calibrate System	Y	Y	Y
Sample Data Editor	Y	Y	Y
One-dimension Tension or Compression Test	Y	Y	Y
Fixed Displacement Test	Y	Y	Y
Fixed Strain Test	Y	Y	Y
Multi-interval Analysis	Y	Y	Y
Fixed Format Reports for Test Results	Y	Y	Y
Word Format Reports for Test Results	Y	Y	Y
Force-Displacement Curve	Y	Y	Y
Force-Time Curve	Y	Y	Y
Displacement -Time Curve	Y	Y	Y
Stress-Strain Curve	Y	Y	Y
Setting of Software Probation Period	Y	Y	Y
Over Range Protection for Force/Route/Displacement	Y	Y	Y
No. of Force Sensor Channels	4	4	4
Rubber Extensometer(for Large Deformation)	Y	Y	Y
Metal Extensometer(for Small Deformation)	Y	Y	Y
Closed-loop Control for Velocity	Y	Y	Y
Closed-loop Control for Displacement	N/A	Y	Y
Closed-loop Control for Force	N/A	Y	Y
Fixed Force Control	N/A	Y	Y
Fixed Stress Control	N/A	Y	Y
Holding Pressure Test with Carton	N/A	Y	Y
Single-pass Go Back and Forth Test	N/A	Y	Y
Repeated Go Back and Forth Cycle Test	N/A	N/A	Y
Multi-layer Nested Reciprocate Cycle Test	N/A	N/A	Y
Multi-step Test	N/A	N/A	Y
Fixed Force & Velocity Control	N/A	N/A	Y
Fixed Stress & Velocity Control	N/A	N/A	Y
Fixed strain & Velocity Control	N/A	N/A	Y
Multi-step Data Analysis Capabilities	N/A	N/A	Y
No. of Automatic Sampling Point	3	6	20
No. of Manual Sampling Point	5	10	30
Language	Chinese Simple	Chinese Simple/Chi nese	Chinese Simple/Chi nese

		Traditional/ English	Traditional/ English
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The control method of version A is 1 step, suit for simple one-dimension tension or compression test;

The control method of version B is 2 steps, suit for slightly complex test, such as single reciprocating test and holding pressure test with carton;

The control method of version C is multi-step, suit for various complicated control test.

## **6 Technical Support**

If you have any question during use process, please contact us, we will be happy to serve you. Please submit the issue via writing or e-mail, so that we could solve the problem for you as soon as possible. Although we make every effort to, there maybe still be some omissions and errors, you are welcome to criticize correction.

# 7 Appendix 1: Explanation of some calculate formula for test result

## 1. Ring stiffness

Thermoplastic pipe Determination of ring stiffness calculates according to GB/T 9647-2003.

$$S=(0.0186+0.025Y/d)F/(LY)$$

F---Force @ 3.0% elongation percentage. The unit is kN.

L---Sample length. The unit is m.

Y---Elongation @ 3.0% elongation percentage. The unit is m, Em.  $Y/d=0.03$ .

Please fill the form input fields with the following values:

Gauge column of sample data--> inside diameter of the measured pipe

Width column--> the length of the tested tube

First point of "test results" "auto sample setting" -->3

## 2. Elastic modulus:

Calculate according to GB8653-1988

Elastic modulus=Stress difference/strain difference of any two points in elastic range

The two points for elastic modulus calculation are set up in Tab "Other" in "Test Result".

## 3. Tensile strength

Tensile strength=the large force/area

## 4. Fracture gauge

The Distance after sample fracture, need manual input.

## 5. Elongation after sample fracture

Elongation=(Fracture Distance -Original Distance)/Original Distance

## 6. Upper yield strength

Upper yield=Force on upper yield point/area.

## 7. Low yield strength

Low yield=Force on low yield point/area

For the material with no significant yield, use  $R_{p0.2}$  as yield strength.

## 8. Provision of non-proportional extension strength

Non-proportional extension strength=Force on non-proportional extension point/area.

## 9. Provision of the total extension strength

Total extension strength= Force on total extension point/area.

## 10. Shear strength

Shear strength= Large Force/ (Distance \* Width)

## 11. Shear modulus

Shear modulus= (Young's modulus \* Area/ Distance)\*Thickness/ (Distance \* Width)

## 12. Maximum bending strength

Maximum bending strength= $3 * \text{Large Force} * \text{Distance} / (2 * \text{Width} * \text{Thickness} * \text{Thickness})$

## 13. Bending modulus

Bending modulus= (Young' s modulus \* Area/ Distance) \* Distance \* Distance \* Distance/ (4 \* Width \* Thickness \* Thickness \* Thickness)

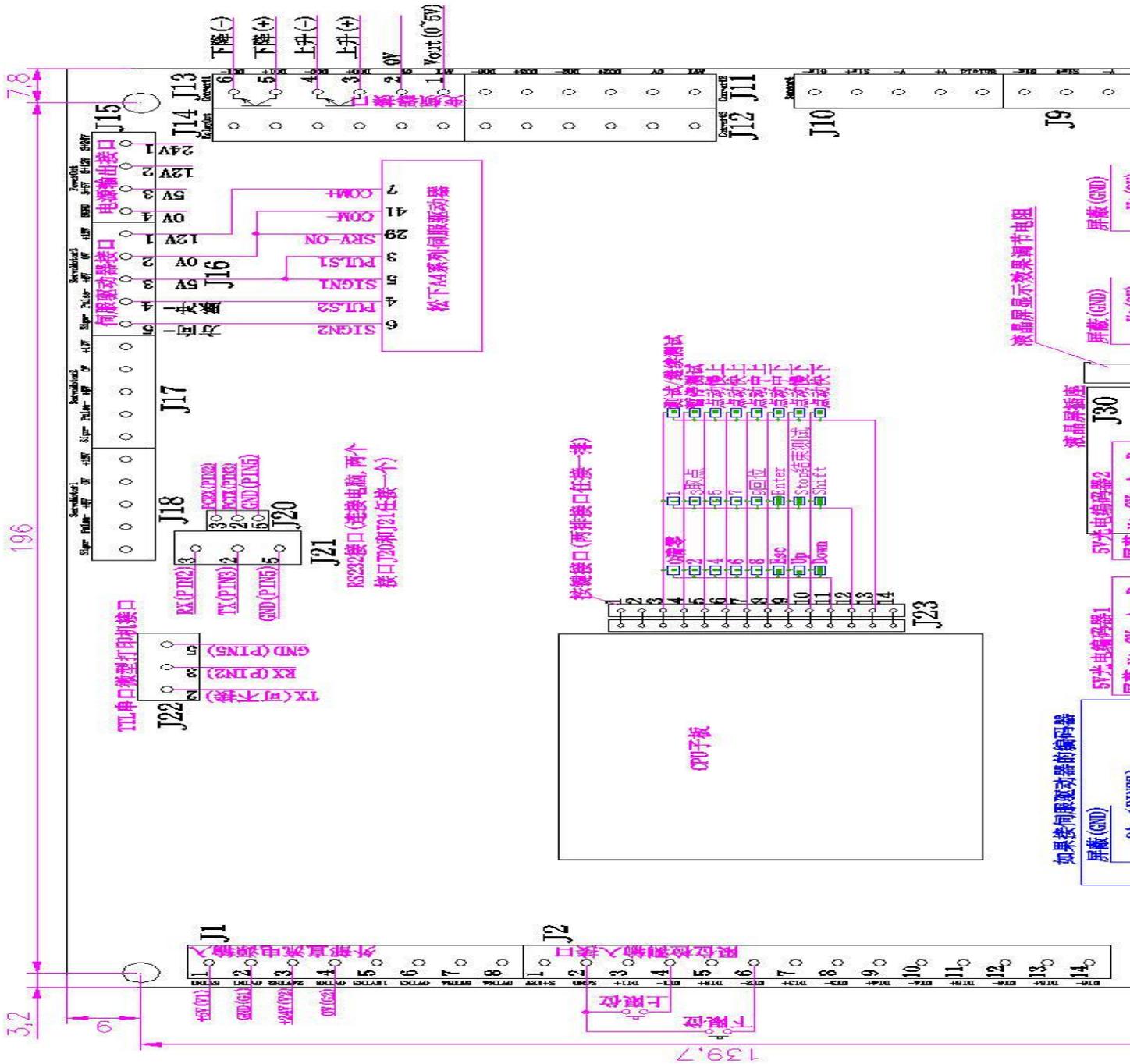
## 14. SDEV (Standard deviation)

SDEV= Radical of  $[(x_1-x)^2+(x_2-x)^2+\dots+(x_n-x)^2]/(n-1)$ .  $X_n$  is the value of each sample,  $\bar{x}$  is average of all samples,  $n$  is the number of samples.

#### 15. CPK(Process capability index)

$C_{pk}=C_p(1-|C_a|)$ , 其中  $C_a=(\bar{X}-U)/(T/2)$ ,  $C_p=T/(6\sigma)$ ,  $T$ =Upper specification limit - Low specification limit ;  
 $U=(\text{Upper specification limit} + \text{Low specification limit})/2$ ;  $\bar{X}$  is the average,  $\sigma$  is standard deviation.

# 8 Appendix 2: Wiring diagram of RX2101



## 9 Appendix 3: Reference of connection diagram for RX2101 with common servo drive

### 1. Panasonic A4 series AC servo drive:

The connection diagram can see in the wiring diagram, in addition, some parameters should be configured as below:

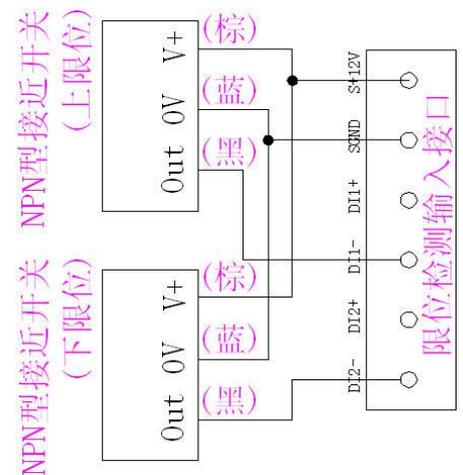
1. P02=0(Position control mode).
2. P42=3(Pulse & direction control mode), P41 is use for change the direction of motor rotation. P48、P49、P4A、P4B use for joint velocity control, the initial value of them can be set as: P48=10000, P49=1, P4A=0, P4B=10000. If you use the internal encode of servo motor, please set P44<=2500/reduction ratio of reducer, P45=0.
3. The frequency range of output pulse is 0.1~50 kHz.

### 2. Panasonic A series AC servo drive:

P02=0(Position control mode), P42=3(Pulse & direction control mode), P41 use for change the direction of motor rotation. P46、P4A and P4B use for joint velocity control, the initial value of them can be set as: P46=10000, P4A=0, P4B=10000.

●The servo drive must be earthling.

The wiring diagram of J2 (input connector of limit detection) and proximity switches:



▲The force sensor must connect with the board via shield wire, or there may exist some interference.

# 10 Appendix 4: Reference of connection diagram for RX2101 with inverter

**J13 use for connect with inverter, the connection diagram as below:**

Helips A series inverter:

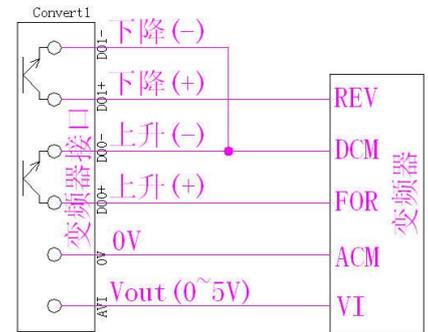
Parameters configure:

CD033=1,

CD034=1,

CD068 Use for velocity calibration.

In addition, please pay attention to the configuration of CD007 (Maximum operate frequency)、CD006 (Minimum velocity control, prevent the motor hot because of low velocity)、CD012 (Time of start to accelerate)、CD013 (Time of stop to slow down)、CD032 (Stop mode)、CD066~CD070. For the other parameters, use the initial value.



Helips C series inverter:

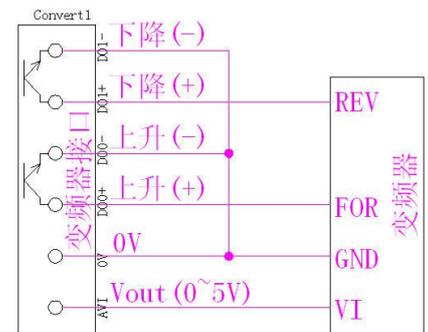
Parameters configure:

C012 (Operation control) =1,

C013 (Operation frequency) =1,

C075 (High-frequency of analog) Use for velocity calibration

In addition, please pay attention to the configuration of C010 (Maximum frequency) and C100 (Automatic compensation of torque). For the other parameters, use the initial value.



YTB-S5 & YTB-T5 series inverter:

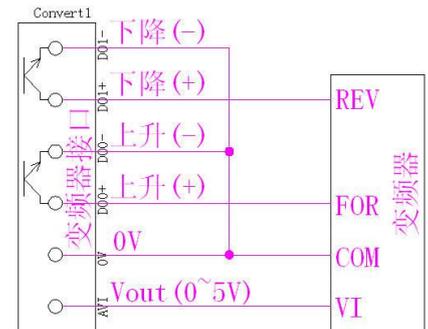
Parameters configure:

D031 (Source of frequency command) =1,

D032 (Source of operation command) =1,

D093 (High-frequency of analog) Use for velocity calibration

In addition, please pay attention to the configuration of D002 (Maximum operation frequency), D009 (Maximum output frequency), D062 (Automatic compensation of torque). For the other parameters, use the initial value.



Delta VFD-M series inverter:

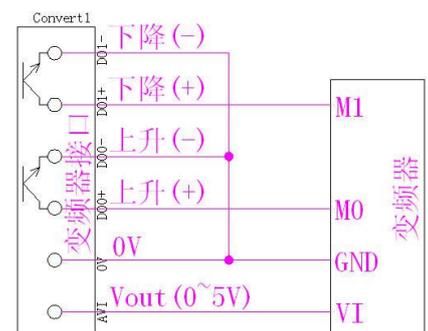
Parameters configure:

P00 (Source of frequency command) =1,

P01 (Source of operation command) =1,

P03 (Maximum operation frequency) Use for velocity calibration

In addition, please pay attention to the configuration of P36 (Minimum output frequency, prevent the motor hot because of low velocity) 、P37 (Maximum output



frequency) 、 P10 (The first acceleration time) 、 P11 (The first deceleration time) 、 P54 (Automatic compensation of torque). For the other parameters, use the initial value.

### Taian E2 series inverter:

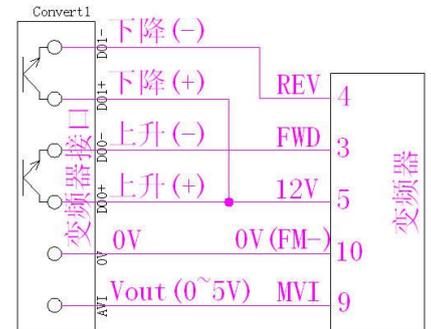
#### Parameters configure:

F\_10 (Operation control) =1,

F\_11 (Frequency control) =1,

F\_6 (Maximum frequency) Use for velocity calibration

In addition, please pay attention to the configuration of F\_7 (Minimum output frequency, prevent the motor hot because of low velocity) 、 F\_1 (The first acceleration time) 、 F\_2 (The first deceleration time) 、 F\_13 (Compensation of torque). For the other parameters, use the initial value.



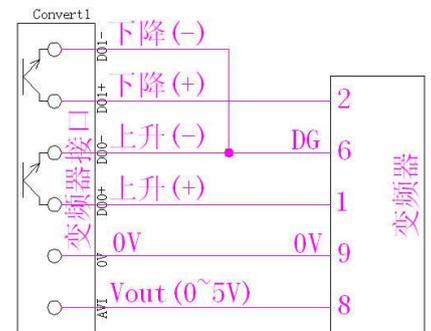
### Dongyuan 7200CX series inverter:

#### Parameters configure:

Pn01 (Mode choice of operation stop)=1000,

Pn02 (Maximum output frequency) Use for velocity calibration

In addition, please pay attention to the configuration of Pn07 (Minimum output frequency, prevent the motor hot because of low velocity) 、 Pn18 (The acceleration time) 、 Pn19 (The deceleration time) 、 Pn68 (Automatic torque increase gain). For the other parameters, use the initial value.



### Delta VFD-B series inverter:

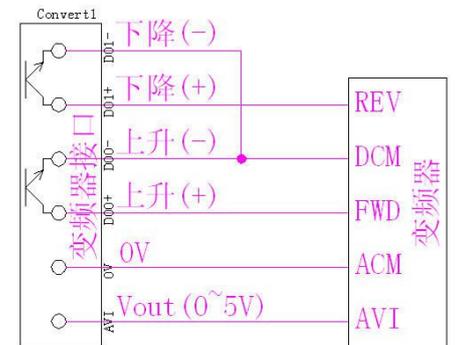
#### Parameters configure:

02-00(Source of first frequency command) =01,

02-01(Source of first operation command) =01,

01-01(Rated frequency of the motor) Use for velocity calibration

In addition, please pay attention to the configuration of 01-00 (Maximum operation frequency) 、 01-09 (The first acceleration time) 、 01-10 (The first deceleration time). For the other parameters, use the initial value.



●The inverter must be earthling.

The wiring diagram of J13 with “Up” &”down” solid state relay or 24V relay:

