

UTM-E50  
ELECTRONIC UNIVERSAL TESTING MACHINE  
SOFTWARE MANUAL



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# Chapter 1 Introduction

## I. Foreword

Thank you for your trust in our products!

This company owns all independent intellectual property rights for the software described in this manual. Without the written authorization of the company, no unit or individual may extract, copy and imitate the content, screen or form, etc. as other profit-making purposes. The company will be deemed as infringing and reserves the right to take further measures.

Due to the different models ordered by different users, the user's method of use, the implementation of the standards are also very different, the company does not guarantee that each user's software includes all the features in this manual. Nor does it guarantee that every user's software is exactly the same as in this user's manual.

The instruction manual is based on the software developed at the time of publication. With the continuous improvement of the product, the contents of the book may be different from the software produced after the development, especially for non-standard customized products, the difference may be even greater. Where changes are made, no further notice, please understand!

Special statement: This instruction manual cannot be used as the basis for any request to the company. The right to use this manual is in this company.

After-sales service: If you encounter any problems or equipment failure during the use of the equipment, you can quickly contact the company, in order to ensure that the company can solve the difficulties for you as soon as possible, I hope you use the text form of the service request to the company .

Although we have tried our best, omissions and errors are still inevitable. We sincerely welcome users to criticize and correct.

## II. Characteristics

- 1, A host can configure up to 4 force sensors at the same time, and users can change them at any time as needed;
2. A host can configure up to 4 deformation sensors (electronic extensometers), and users can change them at any time as needed;
3. The project uses an open database structure definition, the standard configuration includes the national standard GB/T 228.1-2010, GB7314-2005 and other test methods, according to user requirements can be customized special test methods;
4. The whole process display the test force and peak, the minimum resolution can be set according to the need, can be automatically calibrated and certified; the entire process resolution is same;
5. The whole process display the deformation, the minimum resolution can be set according to the need, can be automatically calibrated and certified; the entire process resolution is same;
6. Simultaneously record force-time, deformation-time, displacement-time, stress-time, strain-time, force-deformation, force-displacement, stress-strain, etc. test curve, and can switch observations and high-speed sampling at any time;

7. Analyze and calculate the mechanical properties of test materials by human-computer interaction. At the end of the test, the elastic modulus, yield strength, and plastic elongation stress are automatically calculated (the test method is different, and the analyzed data will be different), and Based on automatic analysis, it is also manually correct the analysis results and improve the accuracy of the analysis.
8. The test data adopts the database management method to automatically save all test data and curves;
9. To provide a variety of report printing interface, the user can edit any format report as needed, and print out;
10. SmartTest software package also includes other tool software, such as configuration toolbox, projectmer, etc. They all provide a lot of practical and powerful features; (this manual also contains their instructions for use)
11. The reserved data interface can be directly connected to the integrated information management network of the enterprise (laboratory).

### III. Control Performance

Suitable for microcomputer control electronic universal testing machine.

1. Contains various closed-loop control methods such as constant velocity stress, constant velocity strain, constant velocity displacement, displacement maintenance and force maintenance;
2. Adjust the loading process with variable structure PID control algorithm, the constant speed control error  $\leq 1\%$ , and the pressure control error  $\leq 0.5\%$ ;
3. To provide professional users "control project editor" software, the user can customize the specific control project according to actual needs.

## Chapter 2 Installation and Operation

### I. Operating environment:

#### 1. Microcomputer hardware configuration.

Pentium MMX200/512M or more memory PC, SVGA color display (support 1024 \* 768 or above display resolution), mouse, various printers;

#### 2, Microcomputer operating system

English WINDOWS 2000/XP/Windows7/Windows8/Windows10 operating system.

- 3, **SED universal test card** is directly connected to the computer through the USB interface, connected to the test machine through the control line; you can achieve automatic measurement and control of the computer, truly plug and test.

## II. Install and Uninstall

### 1. Install

- 1.1, Open the CD-ROM, the corresponding model to open the software folder that needs to be installed, click "Setup" to install;
- 1.2, next appears installation directory settings window , install project default to the "D:\project Files\SmartTest" directory, unless necessary, please do not change the installation directory, directly select the "next";
- 1.3, in the installation ready window select "Next", the installation guide will begin to copy the installation file to the hard disk;
- 1.4. The copying process will continue for a period of time. Finally, a prompt window for successful installation will appear.
- 1.5. After the software is successfully installed, the [SmartTest] project group will appear in [projects] of [Start] of Windows (hereinafter referred to as [Start]), and the project can be executed by clicking "SmartTest". Users can also click the "SmartTest" shortcut on the desktop.

### 2. Uninstall

- 2.1, "Start" menu -> "All projects" -> "Uninstall SmartTest", you can uninstall the software.
- 2.2, Open the control panel, select "Add / Remove projects", select "SmartTest" in the project list, and then select "Uninstall", you can safely and quickly delete SmartTest.

### 3. Files list

By default, the project is installed in the D:\project Files\SmartTest file directory. After the first installation, the files in the installation directory should include:

No.	File name	Instructions
1	SmartTest.exe	Test Control Main project
2	SmartTest.ini	Parameter configuration file
3	SmartTest.mdb	Database file
4	SmartDebug.exe	Configuration Toolbox
5	Smartproject.exe	Compiler
	Report folder	Report folder
6	Language folder	Language folder
6	Temple folder	Report template folder
7	SED.dll	Hardware driver
8	Language_SmartDebug.xml Language_Smartproject.xml Language_SmartTest.xml	Language configuration file

Note: If there is an abnormality in the system, first determine whether the above file exists. If it is missing, you should back up the existing software and reinstall the software.

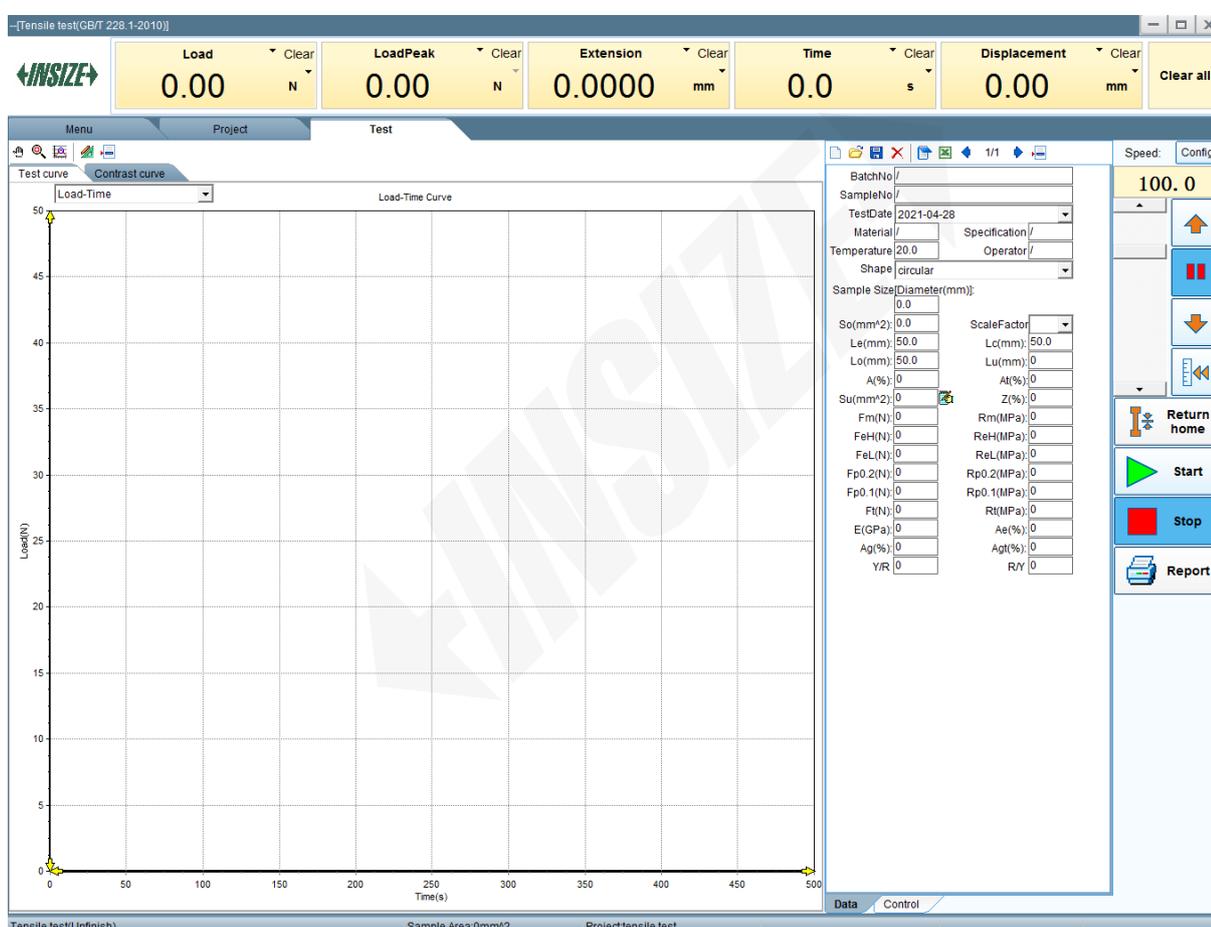
## III. Start

- 1, Turn on the computer power

- 2, Open the controller power
- 3, Start the test machine host power
- 4, Start the software, software startup methods are as follows:
  - ☆ Double-click the desktop SmartTest shortcut icon
  - ☆ Select [Start] → [All projects] → [Microcontroller Universal Testing Machine] → [SmartTest]

The following sections are introduced in order according to the order of each functional module. As the project is continuously upgraded, the appearance of each module may be changed, but its core function is unchanged.

## Chapter 3 Interface Operation

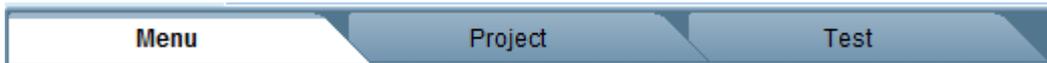


The main window is the control center of the project and is mainly divided into seven parts: A title bar, B display bar, C menu bar, D curve bar, E data bar and control process bar, F control bar, and G status bar. It can perform system settings, calibration, verification, display settings, test selection, and test status and so on.

The following describes the use and function description of the functional areas of the main window:

### I. Menu bar

The menu bar is mainly divided into three parts: "Menu", "Project", and "Test", and they can be quickly switched by options. As shown below:



## 1. Menu option

### 1.1 Settings

System parameters: set system-related parameters;

### 1.2 Adjustment

Calibration, Verification: Calibration and verification of sensors, extensometers, large deformations, displacements, and displacement speeds

Control parameter adjustment: Adjust some parameters related to control.

### 1.3 Tools

Compressed database: Compresses the database storing data to reduce redundancy;

Hardware testing: detection of hardware components such as sensors, extensometers, displacement sensors, and output signals;

Control observation: Direct observation of the tools that control the regulation process.

### 1.4 Help

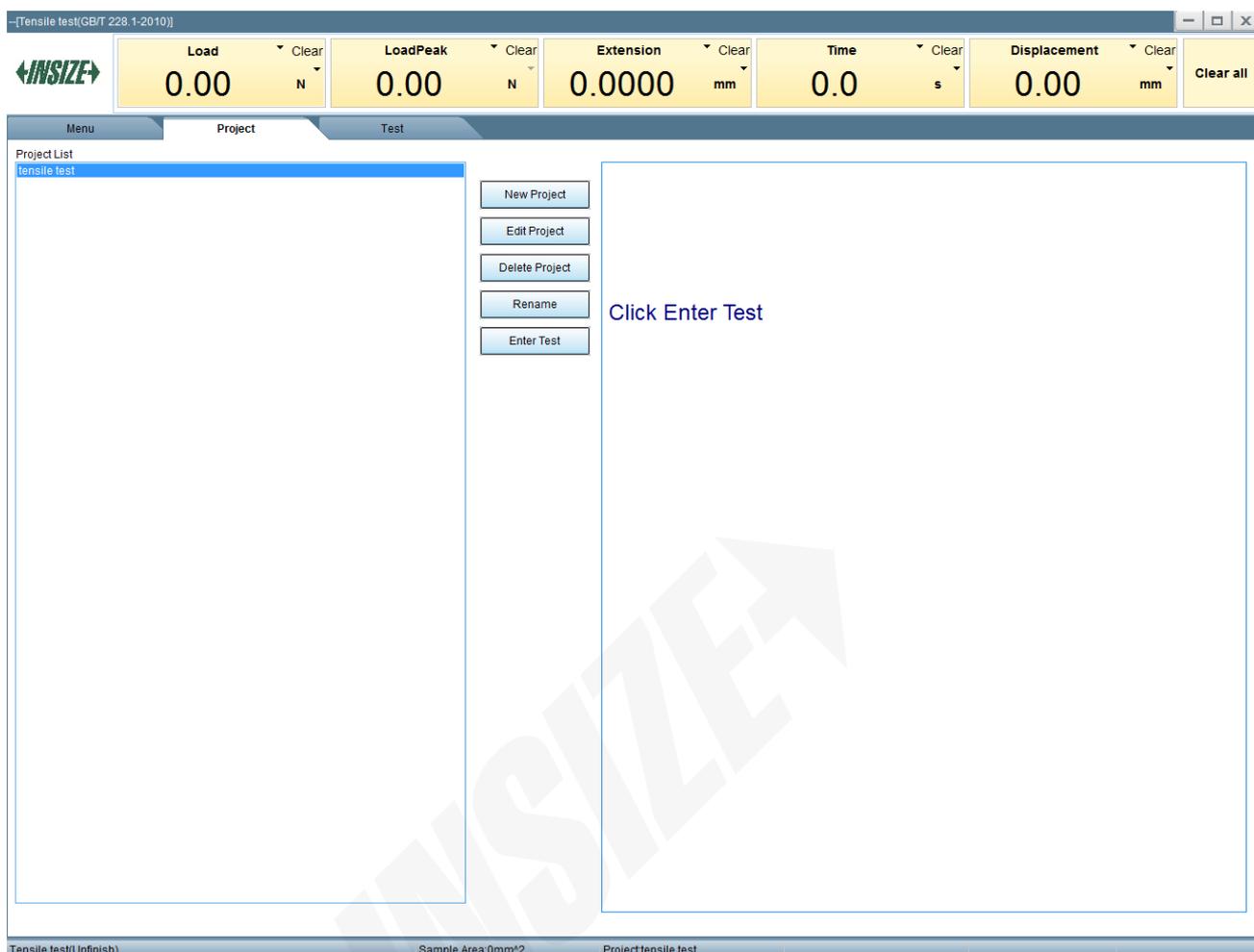
About: Displays information about the execution project version, control driver type, and version.

Help: This feature can be linked to the manual for easy reference.

### 1.5 Exit

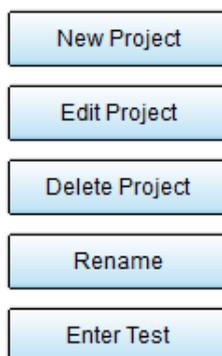
Click the exit option to pop up a prompt box and click "Yes" to exit the software.

## 2. Project option



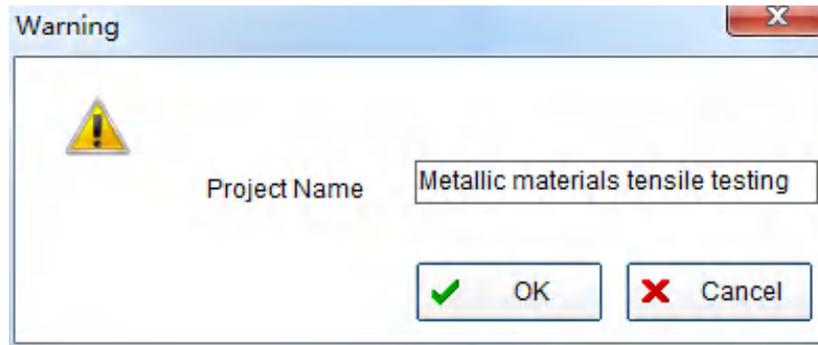
The test project is mainly for the user's frequently used settings and operations, integrated into a test project, to provide users with a more concise operation, complete the entire test quickly and easily.

Project operation:



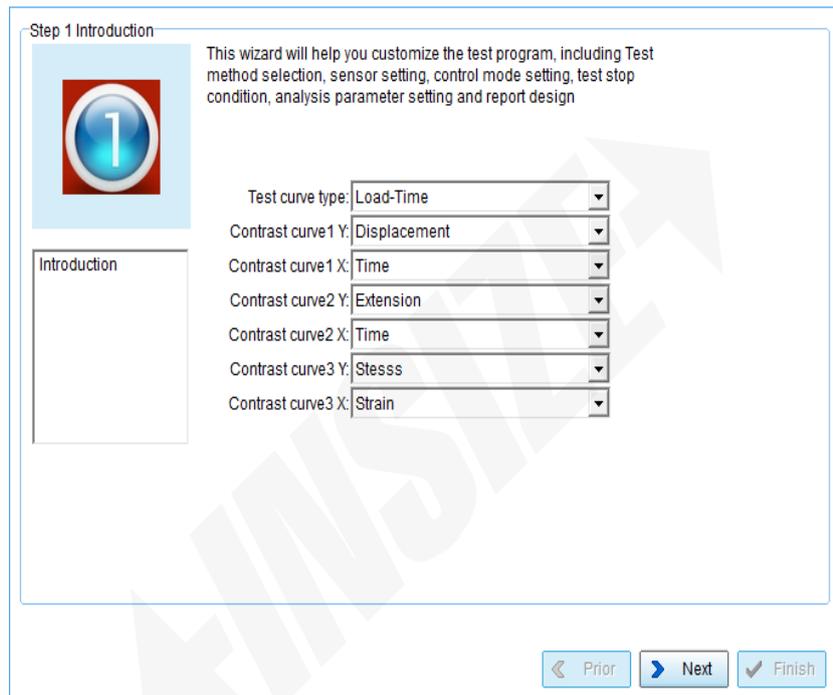
### 2.1, New project:

Click to prompt for the project name, for example: enter the project name for Metallic materials tensile testing



### Step 1: Introduction

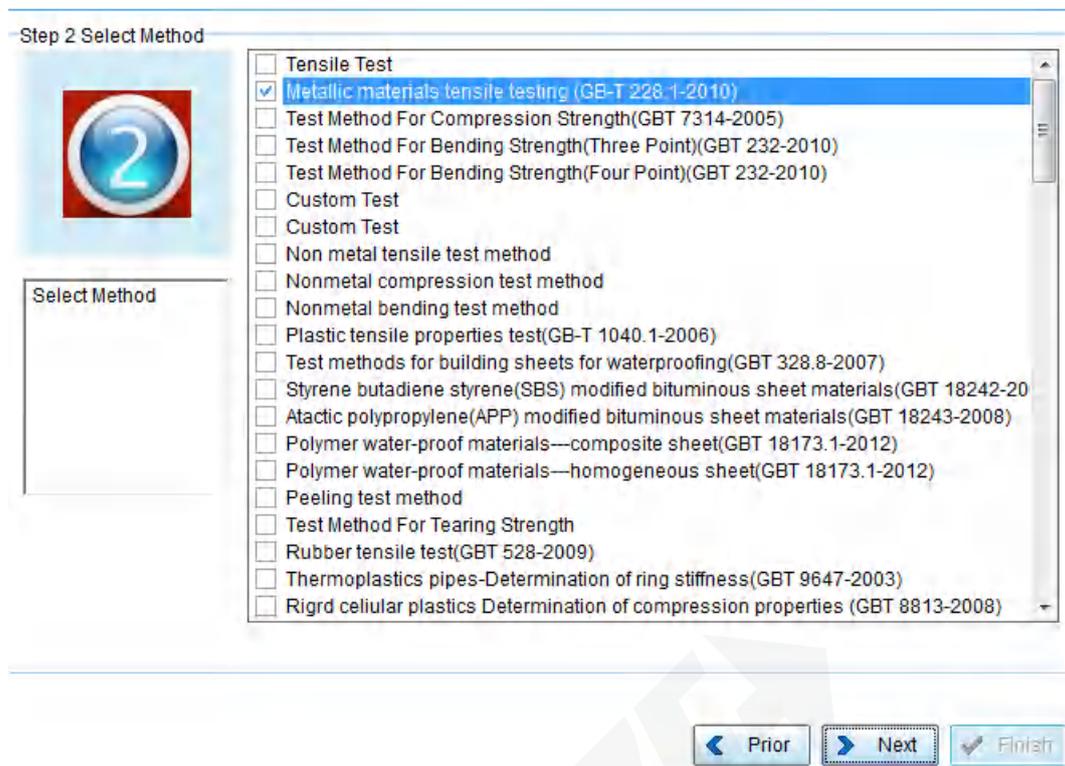
This section describes the parts that need to be set and the type of curve display for a custom test project, as shown below.



### Step 2: Select Method

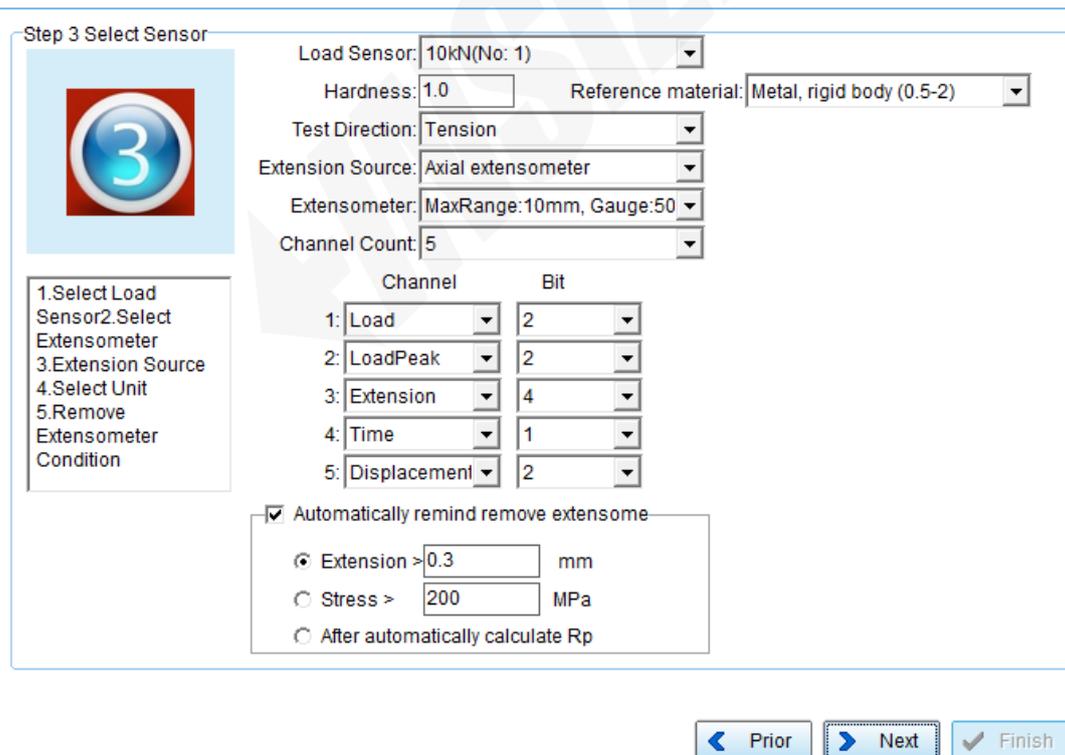
Select the current test method to do the project, the user can choose the appropriate test method according to their needs.

Select the test method of the current project, as shown below:



### Step 3: Select Sensor

Set the sensor, extensometer, display window, etc. as shown below

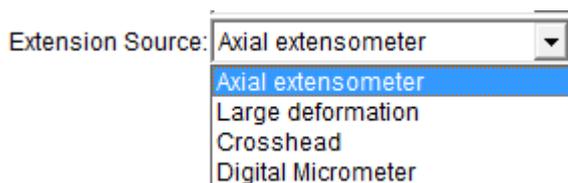


Load sensor: According to the force sensor installed in the testing machine, different serial numbers represent different sensor range;

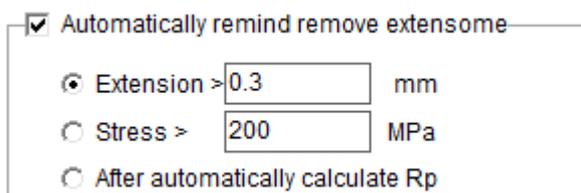
Extensometer: The configuration and principle of the extensometer are the same as those of the sensor.

Extension source: According to the specific machine configuration for the appropriate settings, select the axial

extensometer, Large deformation, Crosshead, Digital micrometer.

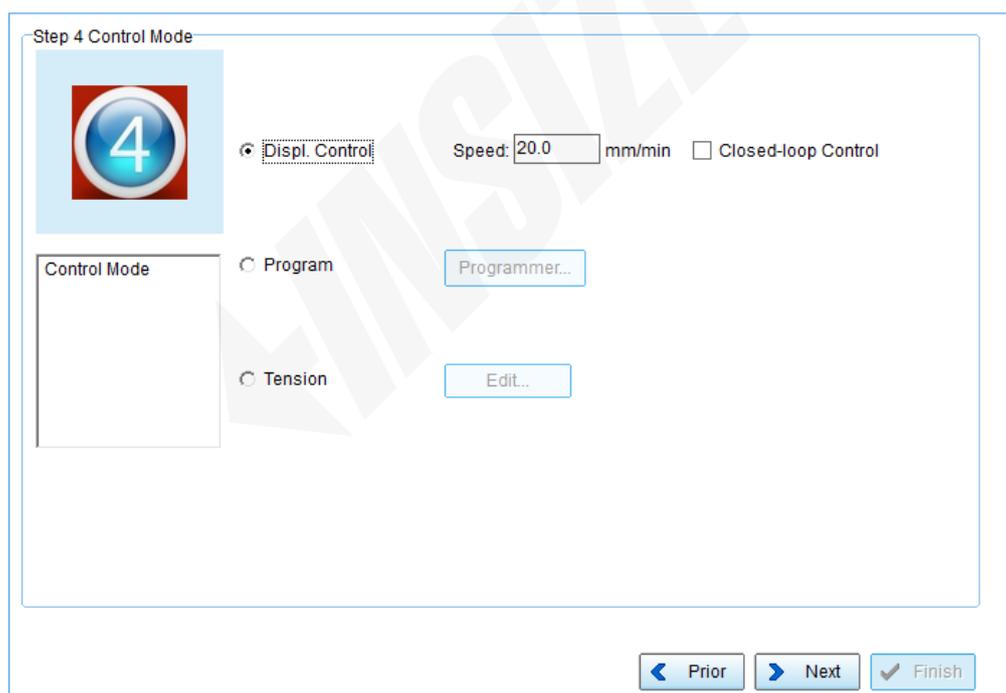


Automatically remind remove extensometer: can be set according to specific conditions, it automatically prompts when the test meets the conditions, it is recommended to select the first item (deformation reaches the set value), can protect the extensometer.



#### Step 4: Control Mode

The control mode can be selected, including displacement control (open loop), program control (project control), tension, three control modes. In the project-control mode, if you project a new project, you can click on the compiler; when you select the standard tension control mode, you can create a new project.



#### Step 5: Test Options

The shutdown parameters setting when the test is completed, as shown below

Step 5 Stop Condition



Fracture/Broken judge  
 Start load = Full scale  %  
 Judge point:   
 Judge condition  
 Load decreased >  kN  
 Load decreased > peak  %  
 Load decreased to  kN

Stop Condition

Stop condition

Load >	<input type="text" value="100.0"/>	kN	<input type="checkbox"/>	Active
Extension >	<input type="text" value="10.0"/>	mm	<input type="checkbox"/>	Active
Stress >	<input type="text" value="100.0"/>	MPa	<input type="checkbox"/>	Active
Strain >	<input type="text" value="10.0"/>	%	<input type="checkbox"/>	Active

Other

Load >  kN

Clear displacement when test start

*Fracture/broken judge:* It is the judgment condition of the sample break, and the software will automatically finish the test only if the break condition is satisfied. The first judgment is based on the magnitude of the drop in force and the ratio of the current range. This is mainly for specimens or compression tests with high toughness. The characteristic is that the force value is slowly decreasing; the second third condition is based on the Magnitude of sudden drop in force value. mainly for the tensile test, The feature is that the moment the specimen breaks, the force value suddenly drops. Note that as long as any one of the above conditions is met, the software will consider the sample break to be automatically terminated.

*Note:* The precondition for the setting of the 'fracture/broken' judgment works here is to tick the 'fracture/break' judgment button in the test force and deformation panel. In addition, if the test force during the entire test is less than the starting point of the judgment, the software will not automatically stop.

*Stop conditions:* Set according to specific conditions during the test.

*Other:* Set when the test force is greater than ? value, record deformation;

*Whether clear displacement when start test.*

*Deformation begins:* Recording starts when the test force is greater than the set value

### Step 6: Analyze Parameter Settings

According to different test methods, select the feature points to be analyzed and others, as shown below.

Step 6 Analysis Para

Feature point selection
Feature settings
A Result accuracy
Other

6

Analysis Para

**Rp**

Position1  %

Position2  %

Graphic method

Gradual approaching method

Hysteresis loop method

**Elastic section**

P1, P2 position	P1(%)	P2(%)
Peak *	<input type="text" value="20.0"/>	<input type="text" value="40.0"/>

Rt  %

**Yield-yield standard value**

Y/R

R/Y

**Yield judge method**

Yield starting  % Peak

Yield sensitivity

Metal

Nonmetal

Points

Sensitivity

< Prior
Next >
✓ Finish

### Step 7: Report Design

Step 7 Report

7

1.Select Report  
Type2.Design Report

Simple Report Edit...

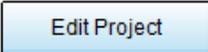
Office Report Edit...

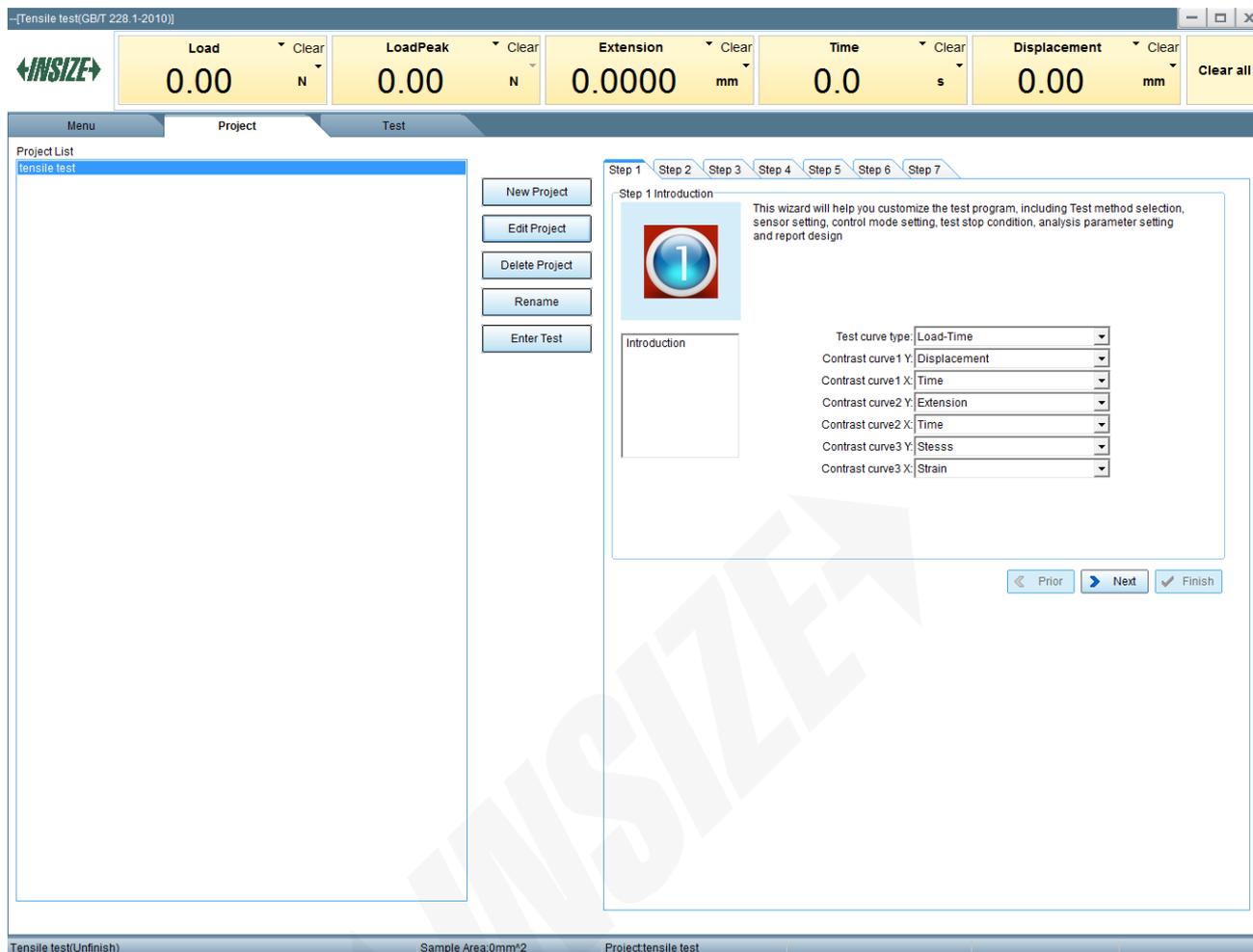
< Prior
Next >
✓ Finish

Select the report type, including simple report and Office report. Click the [Edit] button to design it. After all the settings are complete, click the "Finish" button. This project is ready to return to the "project" interface. Later when do the test, it can be directly selected appropriate project to do the test, do not have to reset the parameters to facilitate the operation.

### 2.2, Edit project:

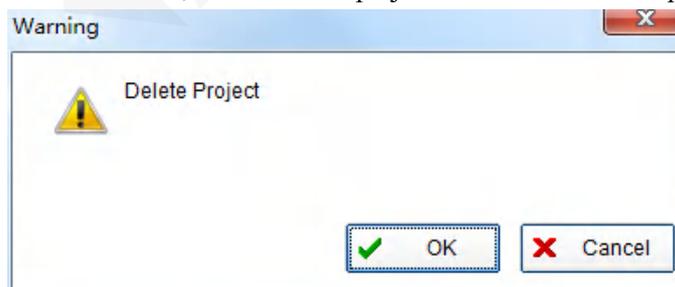
If you want to edit the settings in the project, you can select the name in the project box, for example: select the

"metal room temperature tensile test" project; then click the  button to edit the previous parameters in sequence, as shown below;



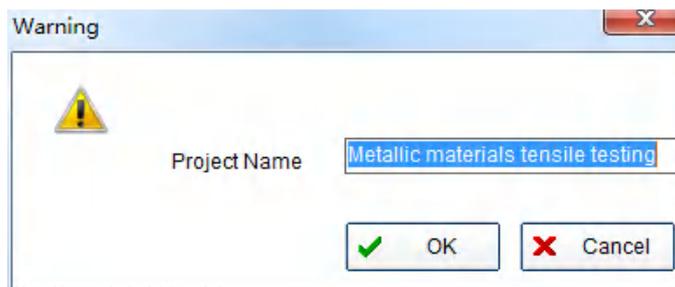
### 2.3, Delete project:

Select the name of the project to be deleted, Click "Delete project" to delete the entire project, as shown below.



### 2.4, Rename:

Rename the selected test project as shown below.



**2.5, Enter test:**

Enter the test interface for selecting the appropriate solution.

**3. Test option**

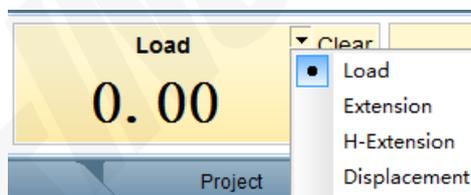
Select the test project, enter the appropriate test interface, and conduct the test.

**II. Display Board**

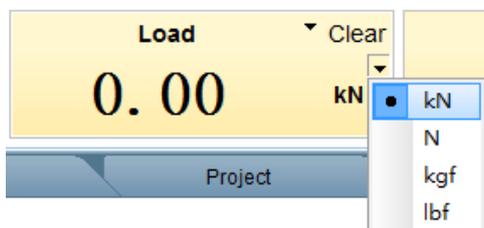
The indication window is the display window of the system display channel data. The user can add/delete the indication window (up to 5 windows) in the main menu display. The display type, decimal place, and unit can be switched on the indication display window.



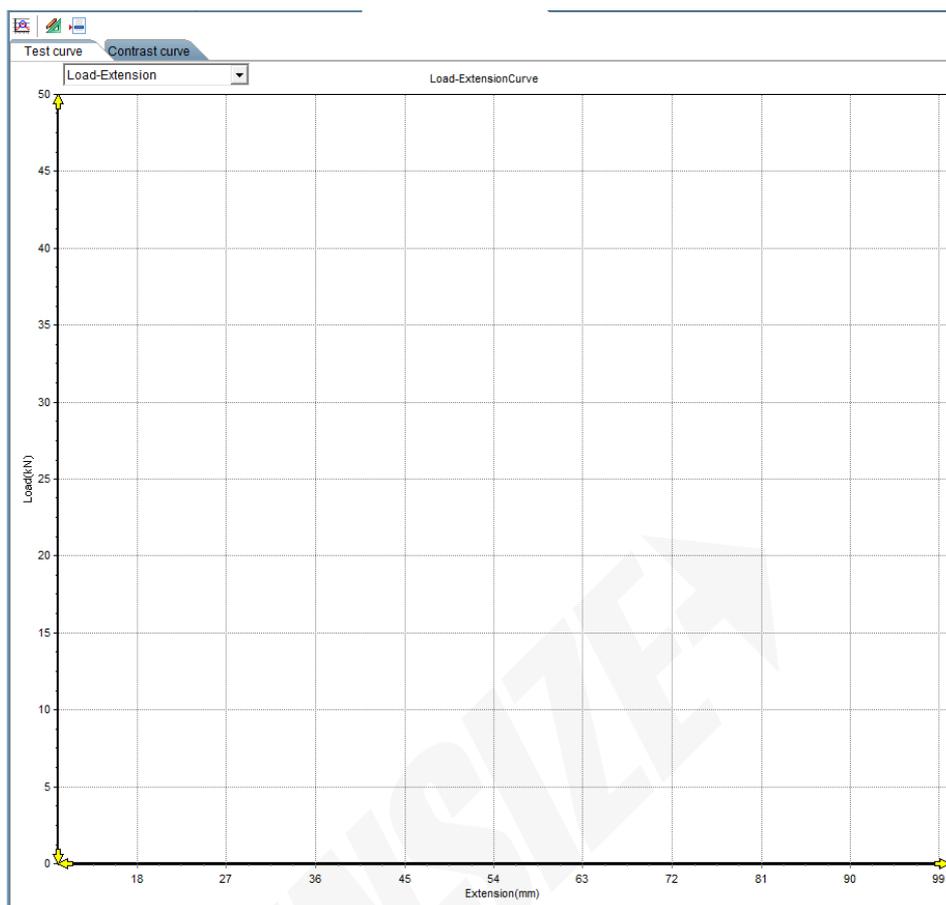
Switch the indication window type: right-click the window title box area, select the indication type in the displayed menu list, as shown below:



Switch the indication window decimal: Right-click in the window indication area and select the decimal place in the displayed menu list, as shown below:

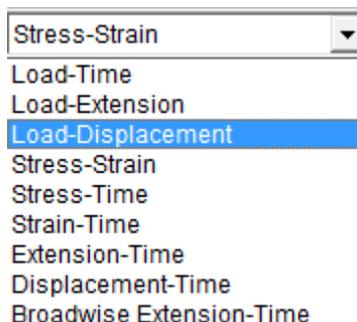


### III. Curve Board



Curve display window, in the test project, real time display the measurement curve. When browsing historical data, synchronously display the corresponding historical curve. In the analysis, provide the online analysis function of the user.

**1. Curve type selection:** Use the left mouse button to single click on the drop-down menu of the curve type selection (or single mouse right click in the curve panel). Users can select one of the types of curves to be observed as needed, as shown below.



**2. Curve Toolbar:** The Curve Toolbar contains tools for curve observation and processing.

From left to right: Adaptive, Recover, Print, Save to BMP, Curve Coordinates Setting, Save Rack Stiffness File, Display Data Points, Analysis Board, Select Toolbar Buttons

	Click to enlarge the curve to the right position in the entire curve
	Recovery curve coordinate value
	Print the curve of the current display type: Unlike the print report on the "data board", here only print the curve
	Save the displayed curve as a BMP bitmap format file
	Can accurately set the coordinates of the corresponding curve
	Save the stiffness file for stiffness correction of the test stand
	Pop up the analysis board interface for user data analysis

Note: The above buttons can be selected in the Select Toolbar button to display or not (except analysis board)

### 3. Curve type page:

The curve board is divided into two pages: test curve and contrast curve. Among them, the test curve page shows the current or historical data corresponding single curve; the contrast curve can show different types of curves, contrast curves for observation and analysis.

### 4. The curve shows the scale value,

which changes with the scaling and movement of the curve. You can also click the yellow arrow on the curve display scale to adjust the curve position.

### 5, Hidden features:

Move: Press the left mouse button to move the curve left or right (the toolbar button must be on the first one)

Zoom: After the mouse is pointed to a place, slide the mouse wheel to zoom in or zoom out (the toolbar buttons are not limited on any one)

Restore: After the curve is dragged or enlarged, double-click curve on the curve board to restore it to a suitable state.

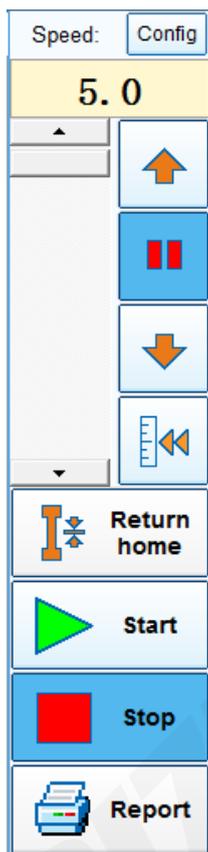
## IV. Control board

### 1. Control method

The system supports constant velocity displacement, constant velocity force, constant velocity deformation control, and can also conduct corresponding tests on the test materials through project-controlled editing of the test procedures needed by itself; at the same time, it supports the method A strain control, method B stress control, two tensile modes, specified in the GB/T 228.1-2010 standard.

### 2. Control buttons

This section is the software's control center, command the overall situation; When using, please operate after clear see the button, in order to avoid accidents, below introduce their respective functions one by one:



**Speed: Config** : Sets the initial default speed for up, down, and return

**5.0** : Current speed display box (you can manually enter changes)

 : Load the beam up at the set speed

 : Stop test

 : Load the beam downwards at the set speed

 : Control beam returns to starting position and then automatically stops

 **Return home** : After the sample clamps, there is a reverse force. When the reverse force value exceeds the limit, the sample is bent, so protection is required. When select this button before clamping the sample, the machine beam will automatically run after the reverse force value appears, to elimination of this force.

 **Start** : Press this button, the machine loads and draws curves according to the set mode and speed

 **Stop** : Test stop

 **Report** : Open the report according to the report format set in the project

**Clear all**

: Clear all the values in all display boxes

**Remove  
extens.**

: It is effective when using a extensometer to collect deformations when performing a tensile test.

During the test, you need to click the button before removing the extensometer (or set the automatic-press under the test project), and then remove the extensometer.

### 3. Custom program control

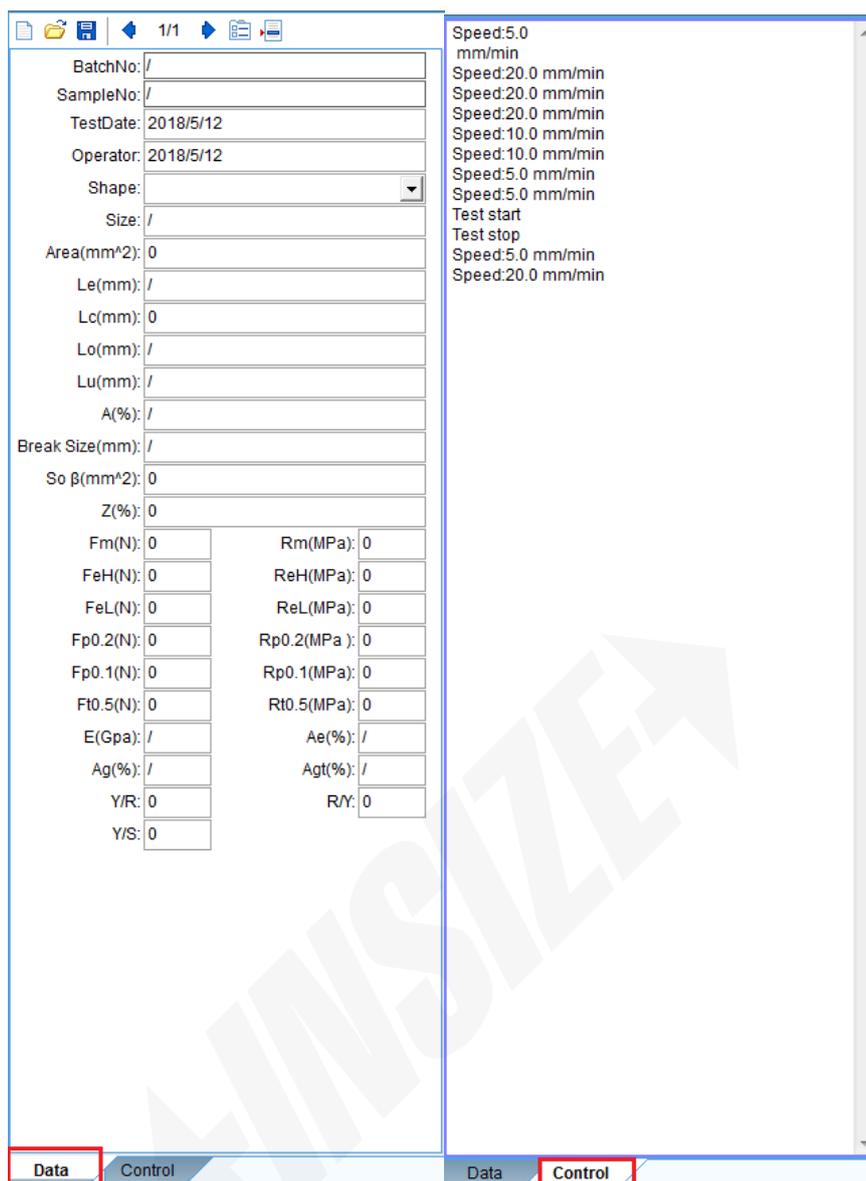
Under the custom project control mode, the system will control according to the user's own projectming. For the preparation and use of the project, please refer to appendix II projectming and project Execution. It is recommended that users use it on the basis of full understanding.

## V. Data Boards and Control Procedures

### 1. Data board window

Data is at the heart of the entire measurement system because the entire testing process is data-centric. From the test sample data to the test data to the analyse data, this process is displayed on the data board (as shown below).

When the project is started, the default test method is the test method corresponding to the user's last selected test project. If it does not match the actual test, the user must first modify the test project, select the appropriate test method, after selection, 'data board' will change accordingly. That is, different test methods, the data board display content is different. The system has a built-in database dynamic parser, that is, the test method is defined in the database, including data items, calculation formulas, etc. After a certain test method is selected, the system dynamically analyzes the generated project interface in real time. Therefore, the same execution project, equip different databases, its data board interface is also different.



## 2. Control process

The operation display of the control process, that is, press any button on the control panel, here will record the display or show the control step when select the project control project (as shown above)

## 3. Data board toolbar

The detailed description of the toolbar is shown in the figure below. The toolbar contains all the functions of data manipulation, including creating, opening, saving, deleting, and printing test data. From left to right:



*Create new records:* create single or batch data records;

*Open the history record:* recall the historical data according to the specific query conditions;

*Save:* The user saves any changes to the data.

*Delete the current record:* delete the current piece of data, the deleted data can not be restored, please exercise caution;

*Save data as text file:* save the test curve in text file format

*Report printing (classic):* print out the current record data in the set report format;

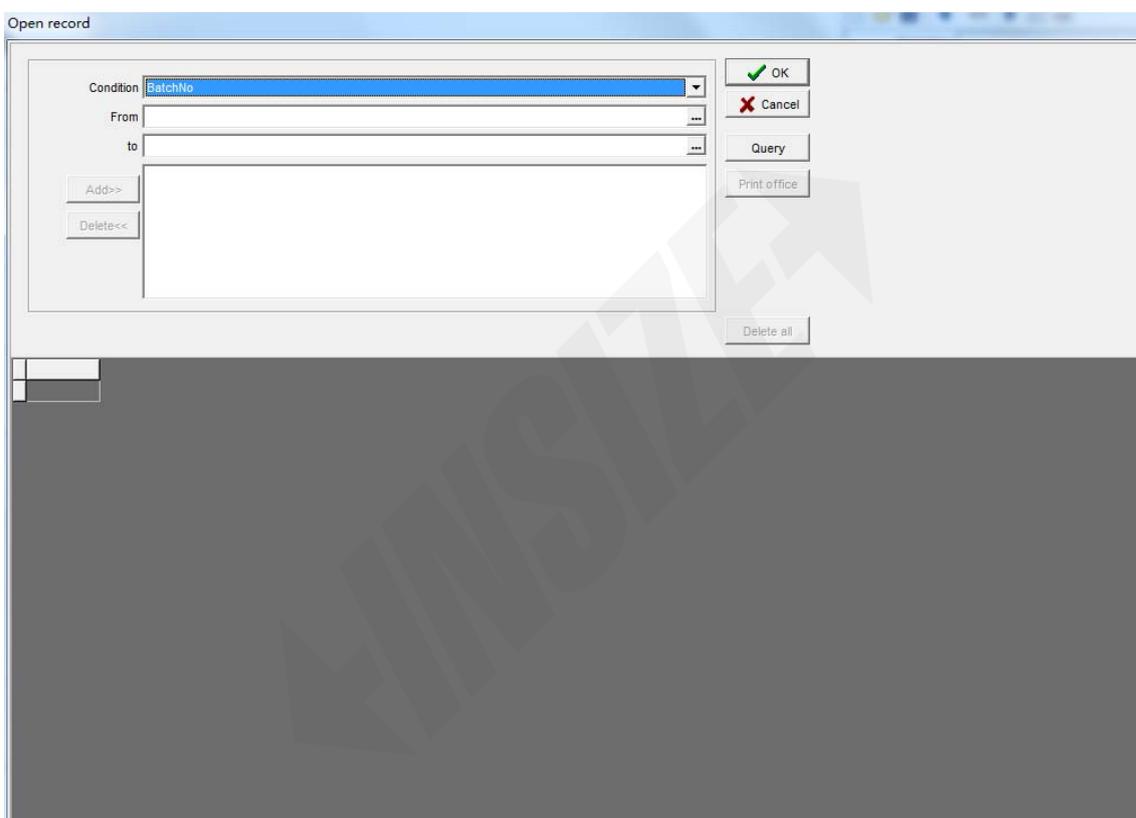
*Output report to office:* Print test data in office report format;

*Custom test methods:* Users can define their own test methods.

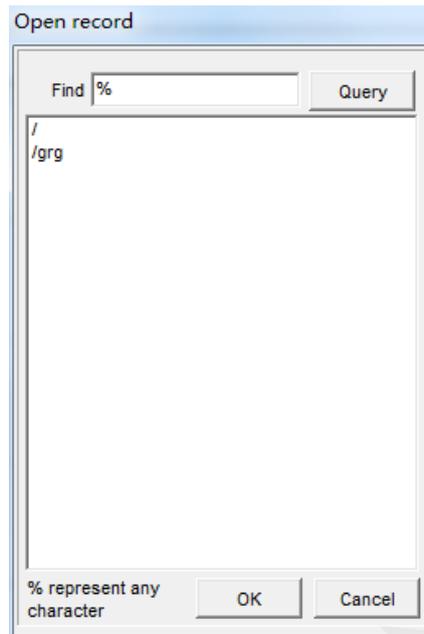
*Database display positioning button* ◀ 1/6 ▶

*Database display and positioning:* 6 in 1/6 of the figure indicates that there are currently 6 records on the data board, and 1 indicates that the first one is displayed on the data board. The user can press the left and right arrows to move the position.

## 4. Open historical data



The above describes the case where the user newly created a sample record and started testing immediately. However, there may be a case where the user completes the creation of all the sample records to be tested at once in the morning, completed part of the test work in the morning, the test work will continue in the afternoon without completing the test in the morning. The sample information was all entered in the morning. The first step of the afternoon test was to open the sample information that was entered in the morning but had not yet been tested. Click the [Open history] button on the data board, an open window will appear, according to the different conditions to open the sample data: batch number, test date, testers and so on. After selecting the query conditions, select the query range (from ... to ...) and click  to select all batch numbers.



Select the test point that was not done in the morning and then return to the initial window. Enter the name of the selected batch number into the query field. Click OK to automatically fill the data to the data sheet for the user to continue with the previous job.

If the user wants to query historical data, the method of operation is the same.

## 5. Report printing

The report printing is divided into two categories: report printing (classic) and output report to Office. Choose according to the user's needs, please refer to Chapter 6 Using and Making Reports.

## VI. Data analysis

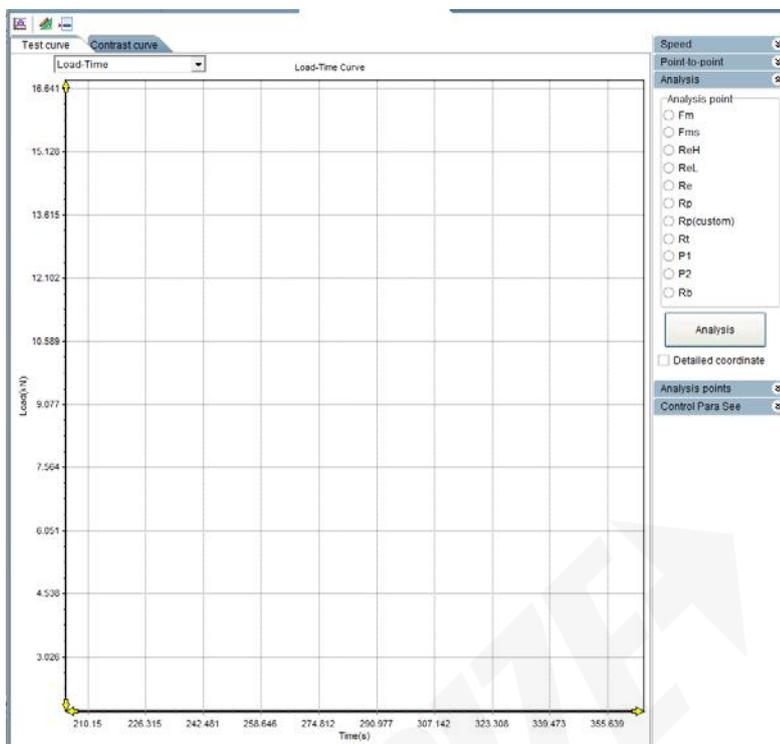


Figure 1

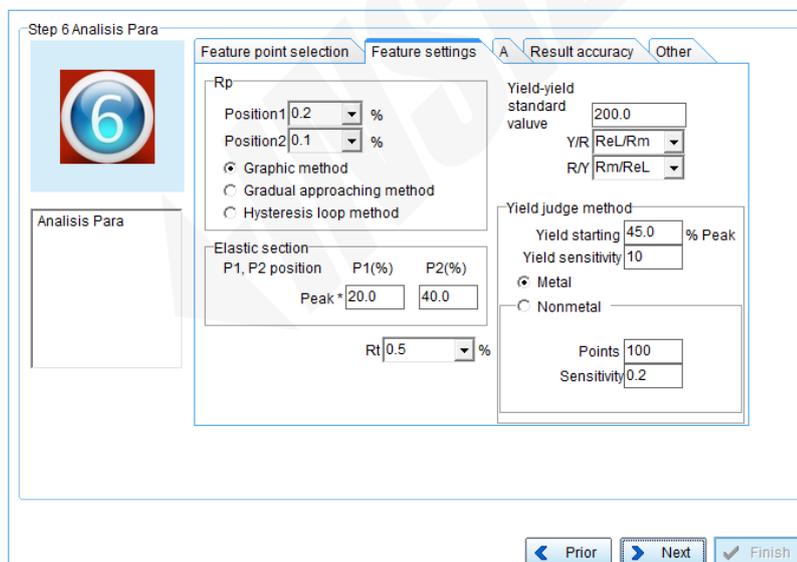


Figure 2

After the test is completed, the project will automatically analyze the test curve to obtain the analysis result and display it in the data board. The analysis board (Figure 1) records the analysis process for the user to see. You can click the [Analysis Board] button in the control panel to open or close the analysis board. In general, at the end of the test, the system will immediately analyze the test curve and populate the data board with the analysis results without manual user intervention.

If the automatic analysis is incorrect, the user can modify the analysis method and then perform a full analysis of the curve. The method of analysis is set by the user before analysis. If the user wants to change the analysis method, he can modify it in the sixth step of the modification project, and the analysis parameter window will appear (Figure 2). The user can select the analysis method according to the specific sample and select it for

testing. After the analysis is completed, the points corresponding to the physical performance parameters of the tested materials will also be marked on the curve. On the one hand, the user can be given an intuitive representation; In addition, if the user is not satisfied with the results of the automatic analysis, the analysis results can be re-analyzed directly in the analysis board by manually taking points, mouse moving the marker points, and the like.

Speed ▾  
 Point-to-point ▾  
 Analysis ▴  
 Analysis point  
 Fm  
 Fms  
 ReH  
 ReL  
 Re  
 Rp  
 Rp(custom)  
 Rt  
 P1  
 P2  
 Rb  
 Analysis  
 Detailed coordinate  
 Analysis points ▾  
 Control Para See ▾

Analytical setup (metal material tension as an example):

## 1, Feature point selection (as picture)

Feature point selection | Feature settings | A | Result accuracy | Other

<input checked="" type="checkbox"/> Rm	<input checked="" type="checkbox"/> A
<input checked="" type="checkbox"/> ReH	<input checked="" type="checkbox"/> At
<input checked="" type="checkbox"/> ReL	<input checked="" type="checkbox"/> Ag
<input checked="" type="checkbox"/> Rp0.2	<input checked="" type="checkbox"/> Agt
<input checked="" type="checkbox"/> Rp0.1	<input checked="" type="checkbox"/> Z
<input checked="" type="checkbox"/> Rt0.5	<input checked="" type="checkbox"/> Y/R
<input checked="" type="checkbox"/> Ae	<input checked="" type="checkbox"/> R/Y
<input checked="" type="checkbox"/> E	<input checked="" type="checkbox"/> Y/S

Data will appear in the data board after selection, otherwise there will be no data in the data board without this item selected.

## 2, Feature settings

- (1) Position 1 and Position 2 are the software calculations for the specified plastic extension strength numerical points. For example, position 1 is 0.2%. This value is Rp0.2.
- (2) Graphical method: A calculation method used when the test material yields significantly.  
Gradual approximation method, hysteresis loop method: Calculation method used when test material yield is not obvious
- (3) Position of point P1 and P2 of elastic section  
P1, P2 two points (in the test force - deformation curve) must be taken in the elastic curve of the curve (before yielding), according to the curve to adjust the percentage of two points to the appropriate location, the value of the two points is directly related to the Rp value, flexibility Modulus calculation.
- (4) Reynolds ratio (Re) standard value: 400
- (5) Yield determination method  
Yield judgment starting point: When the yield phase exceeds the set point, the software will make a judgment. If the set point is too large, there will be no yield.
- (6) Metals, non-metals: Selection of test material properties.

## 3, Result accuracy

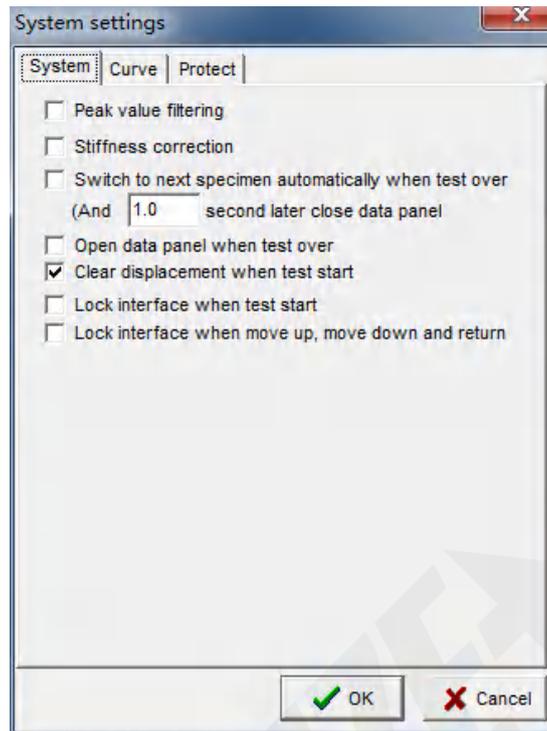
The revision of the test data. Mainly on the metal tensile GB/T228.1-2010 data repair. If the customer has special requirements, he can make repair selection according to the test requirements. (The revision rules for other tests are set at the time of the custom test method. For details, see Chapter 7 Custom Test Methods.)

# Chapter 4 System Parameter Settings

## I. System parameters

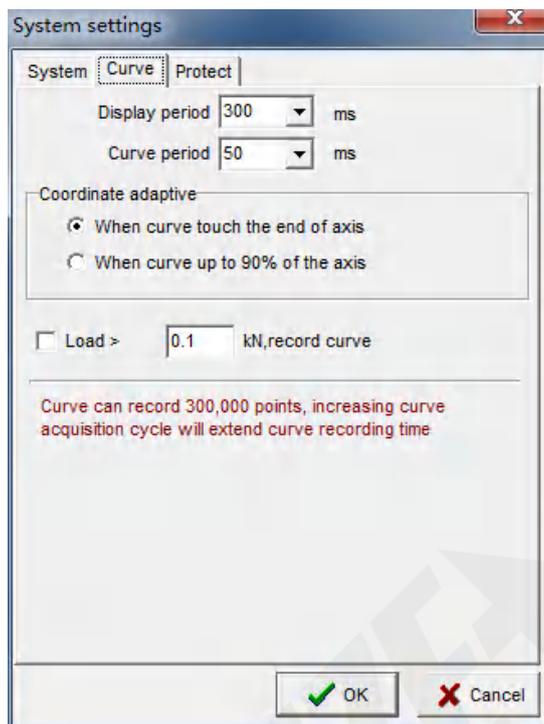
In the system main menu [Settings], there is a submenu [System Parameters]. Clicking with the mouse will pop up the "Authentication" dialog box. After entering the correct configuration password, the system parameters window appears. The system setting window adopts multi-page mode and is divided into system, curve, and protect.

## 1. System



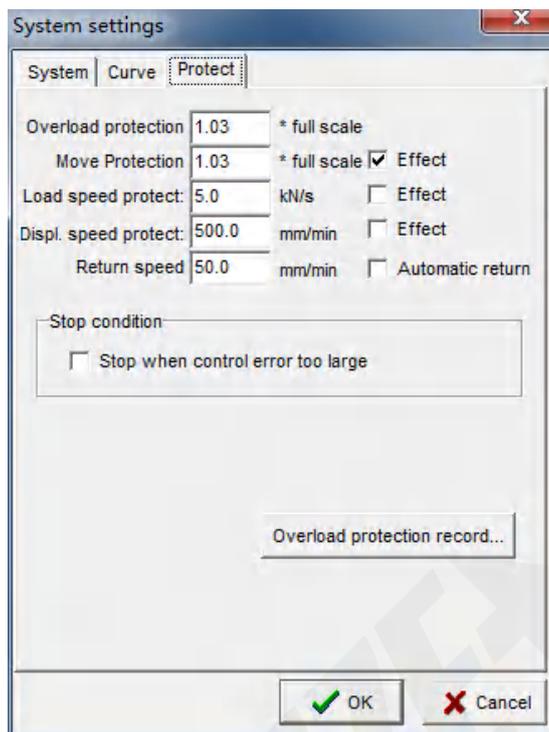
- 1.1. Peak value filtering: When there are magnetic fields, electric fields, and large equipment around the testing machine, it will cause interference to the signal collected by the tester. It appears that there are instantaneous fluctuations in the test force, displacement, etc. In this case, the peak filtering can be selected to remove the interference.
- 1.2. Stiffness correction: When it is necessary to modify the stiffness of the rack, it must be selected first, and then save the corresponding stiffness file on the curve board.
- 1.3, Lock interface: after select, click the start (rise, drop) interface lock, do not allow other operations.

## 2. Curve

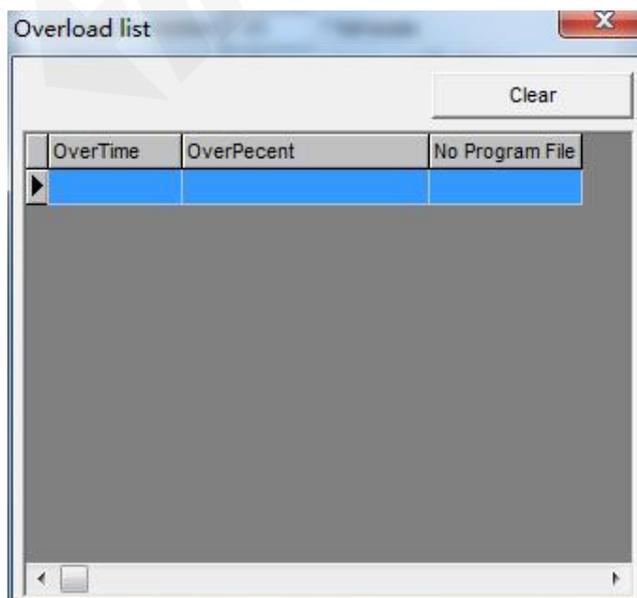


- 2.1 Display Period: The "Display Panel" performs various displays with the settings here as the cycle. The default setting is 300ms. The "refresh cycle" should be set to ensure that it is suitable for human eyes.
- 2.2, Curve Period: The "curve plate" performs the test curve record with the settings here as the cycle. The default setting is 50ms. The 'curve period' should not be set too small; otherwise, it will record too many unnecessary duplicate points and occupy a lot of system resources.
- 2.3. Coordinate adaptive: The curve board automatically transforms coordinates according to the specific size of the curve;
- 2.4. Start of curve record: The curve starts to be recorded when the test force is greater than the set value.

### 3. Protect



- 3.1, Overload protection: The default is 1.03 times full scale;
- 3.2, Move protection: It is mainly used when adjusting the beam position;
- 3.3, Return speed: At the end of the test, the beam return speed;
- 3.4, Displacement speed protect: allow the highest displacement speed;
- 3.5, Load speed protection: allow maximum speed;
- 3.6. Stop conditions: When the actual control quantity and the display difference are great, it will stop.
- 3.7. Overload protection record (record test force overload times and overload time)



## II. Control parameter adjustment

### 1. PID parameters

When the software performs closed-loop control, the valve parameters are adjusted. Each control mode has two control modes: load and hold phases.

After the parameter is modified, you need to press Enter to validate.

	Experience parameters	Experience range
Displacement P	2	2-20
Displacement I	0.2	2-20
Displacement D	0	0-100
Load P	0.1	0.05-0.2
Load I	2	0.2-1.0
Load D	0	0-100
Gain	1	0.1-1
Synovial membrane	0.1	0.05-0.2
Phase locked loop	0.3	0.1-1.0
Extension P	02	0.2-5
Extension I	0.2	0.2-1.0
Extension D	0	0-100

### 2. Options

Closed-loop deceleration control:

When the force is about to reach the target value, the force value will enter the gradual loading stage after selecting this item, and will enter the holding stage until the deceleration time passes (the greater the smoothness, the greater the arc displayed on the curve).



### 3. Test protect

- 3.1. The real-time force is less than 0.1 times the protective force value to stop adjustment
- 3.2. The real-time force within 0.1 times to 1 times the protection force value refer to the host stiffness adjustment
- 3.3. The real-time force is greater than the value of the protection force in accordance with the nonlinear coefficient adjustment

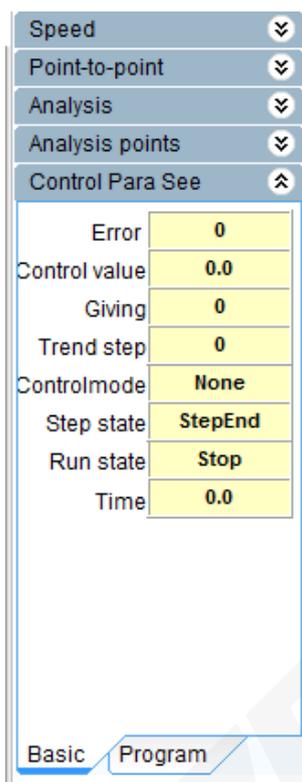
### III. Hardware test

For sensors, extensometers and other hardware components detection tools.



### IV. Control observation

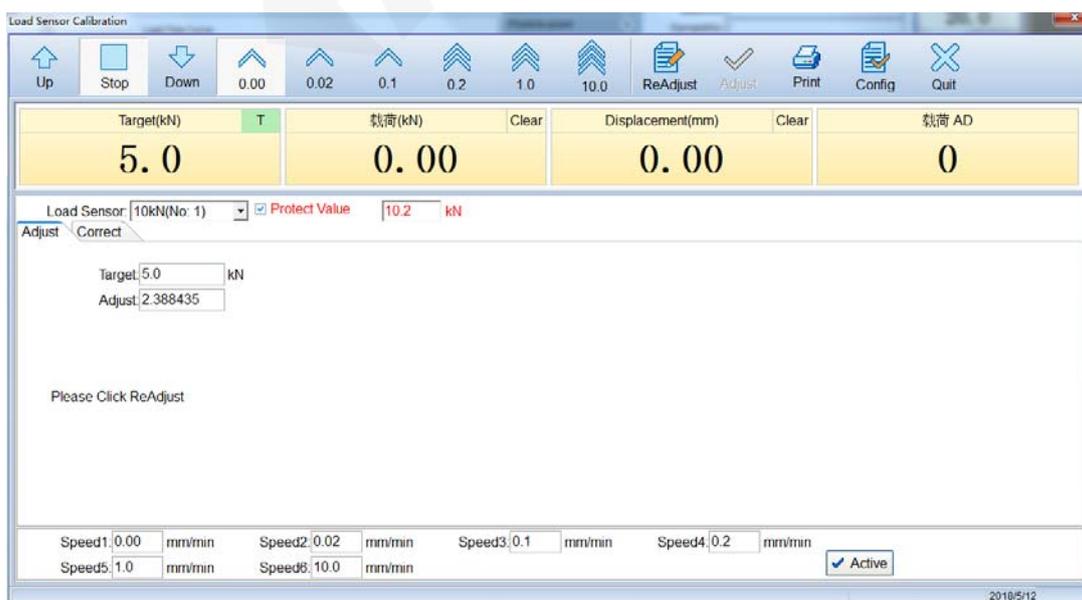
The control observation window centrally displays the relevant control and sampling parameters of the system to facilitate the user and commissioning personnel to diagnose system failures.



## Chapter 5 System Commissioning and Calibration

### I. Force sensor calibration

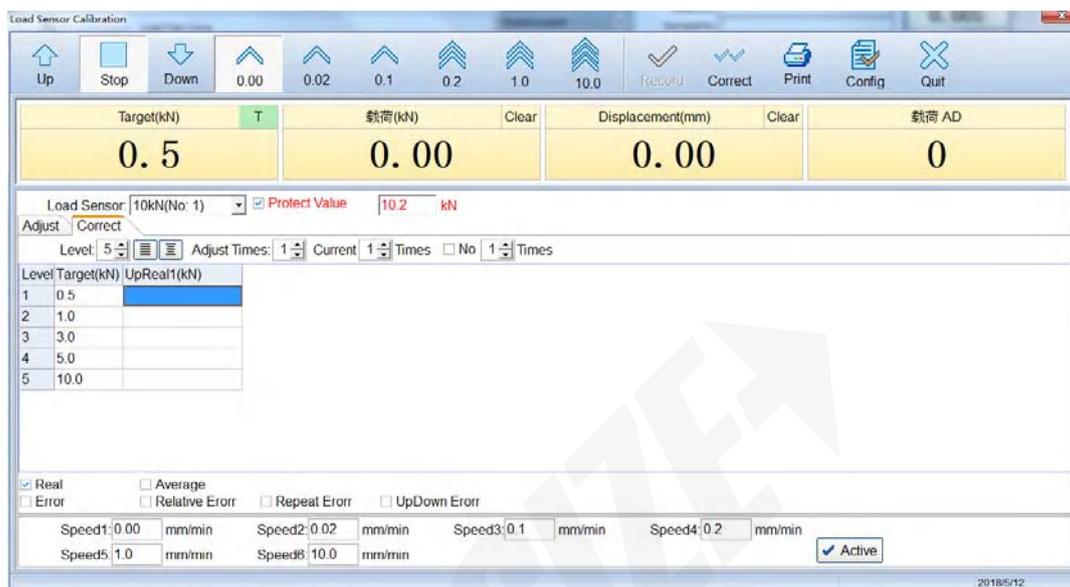
#### 1. Calibration



Set the required speed after calibration (default is 7 speeds for selection), test force is cleared, and the displacement

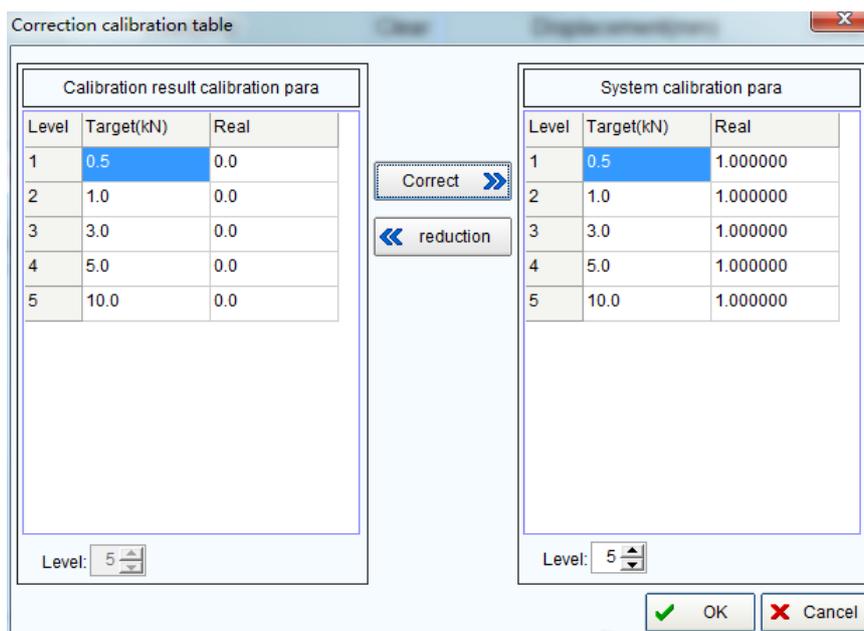
is cleared; enter the calibration value in the calibration value text box (usually take 50% of the maximum range); put the force measuring ring, Select the appropriate speed, and then click [Down] to control the test force loading. When approaching the calibration value, you can select a smaller speed (the principle is to facilitate observation, reading). When the measuring ring reaches the calibration value, press "Record" Button or keyboard [space bar], the display value will be automatically adjusted to the calibration value.

## 2. Correction



If there is bad sensor linearity, it needs to be corrected. Set the number of correction levels (up to 20 levels), click the "Average" "Automatic" button, the target value will be automatically modified (if it is inappropriate, you can manually modify the target value).

After setting, select the first line in the correction list, place the measuring ring, and click the [Down] button to control the test force slowly approaching the first level target value. When the force measurement ring reaches the target value, press "Record" button (or keyboard [space bar]), the display value will be automatically adjusted to match the target value; at the same time automatically switch to the second line, continue to the next point of calibration, until the completion of the last point, it will pop up below Correct calibration table, click the [correct] button to correct the left measurement value to the right and save it. If you do not need to correct it, just click the [Cancel] button to exit.

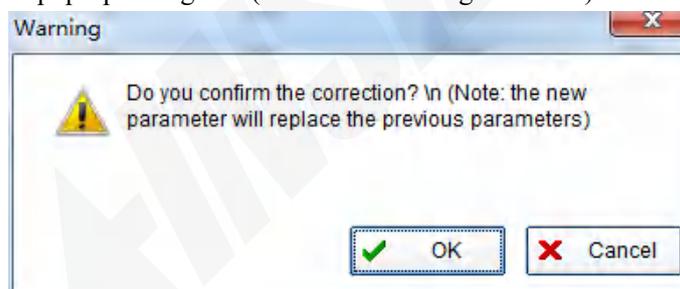


If the indicator is still biased, you can calibrate it again.

### 3. Recalibration

Used for segmented strength after correction, the correction coefficient is not the default of 1.00, when the metrological verification correction out-of-tolerance at all points, then need to be calibrated.

Click Recalibration, the pop-up dialog box (as shown in the figure below)



Click[Ok], correction coefficient will restore factory settings, to be 1.0000.

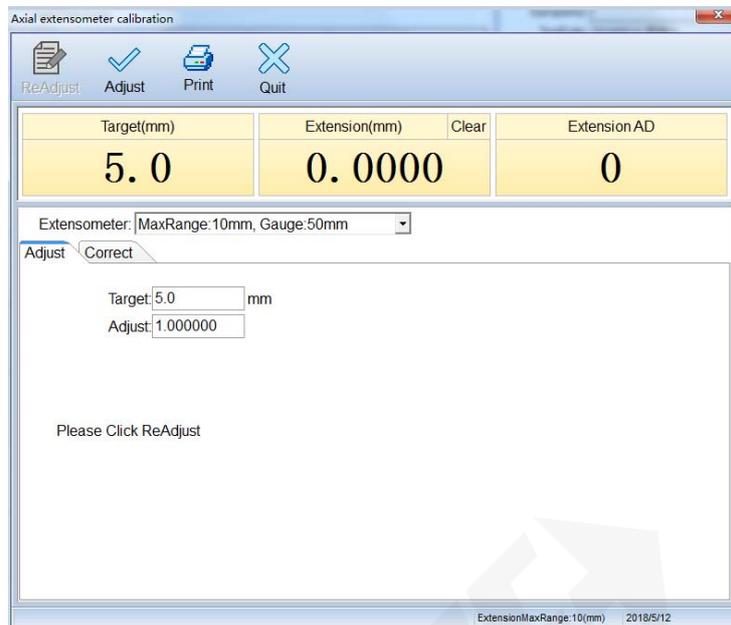
### 4. Force sensor verification

Verification operation procedure is same with the calibration operation, please refer to the calibration operation procedure.

Note:

1. Revised set must be increasing, and no more than range;
2. Standard dynamometer is a precision measuring instruments. Therefore, the user must be careful in the process of operation. If it is the first time pressure it, can be loaded with the appropriate sample instead of the standard dynamometer, holding pressure and unload simulation process, and use the dynamometer when you can operate it skilfully.
3. The parameters are important parameters in the software, please don't change, so as to avoid adverse consequences. And when the user to get started with it, it is best to document these parameters, once the computer hardware failure, or other accident and have to reinstall the program control system, you only need to recover these parameters.

## II. Extensometer calibration



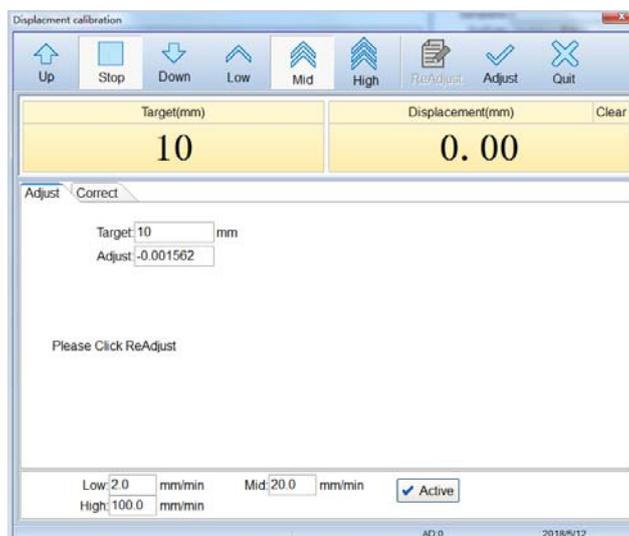
### 1. Calibration

- 1.1 First adjust the extensometer calibration instrument zero point, and then fixed extensometer on the extensometer calibration instrument;
- 1.2 Software deformation reset;
- 1.3 Set required calibration values and click [Enter] to confirm;
- 1.4 Turn the calibration instrument, until the set before calibration values, click on the [calibration] button;
- 1.5 Calibration completed

### 2. Amendment

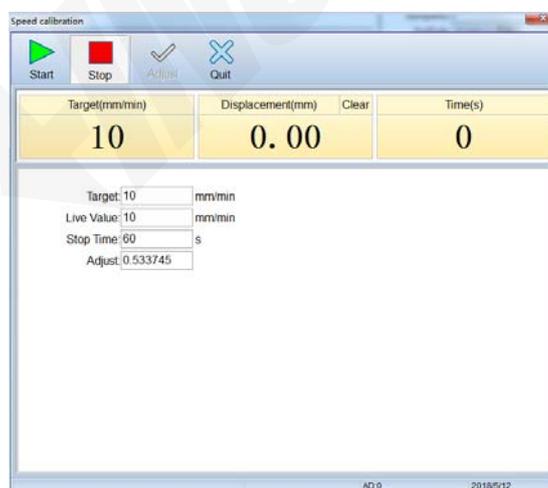
- 2.1 Set correction series and[Edit] calibration value
- 2.2 Set the calibration instrument and software zero point
- 2.3 Turn the calibration instrument, until the first calibration values, click on the [Amendment] button;
- 2.4 Continue to turn the calibration instrument, until aneibt all required revision point.
- 2.5 Revisions to complete

### III. Displacement calibration



1. Clear the displacement to be zero, and then find a rod, a fixed on the column near the beam
2. Click on the software [down] move beam some distance, easy record and the following calculation, can make the beam moves an integer value (such as mobile 10 mm movement distance, this is a ruler moving distance. This suggests that two people finish a person operating software and another records beam mobile number)
3. Please input 10 in the calibration value, then click [Calibration]
4. Moving beam one more time to check whether the ruler's numerical same with the software displacement.

### IV. Speed calibration



Please set a suitable calibration value in the software, such as 10mm/min; Click[Start]software will automatically record time and will automatically stop when reached to the stopping time(or you can manually stop it before arriving the stopping time), the software will record the real value automatically, please click [Calibration] which will finish the speed calibration.

Note:

A. The calibration speed coefficient should be between 1~0.1.

B. If over the above range which need to adjust the driver element and denominator.

Each driver has an electronic gear ratio element, the denominator, adjust this element, the denominator can change

speed (molecular, the denominator see specific drive manual)

The specific algorithm is: the actual value divided by the target value multiplied by the denominator, changed the denominator to be the above got value, and the displacement speed of the test machine can be basically accurate.

Note: target value is displacement showing value, the actual value is selected 'speed'

## Chapter 6 Test Procedure

### 1. Choose the test program

Ready to do an experiment, to choose what to do test. As shown in figure (1), for example: "metal tensile test", on the left we choose the scheme of metal tensile test, click the button "into the test", into the test interface, as shown in figure (2).

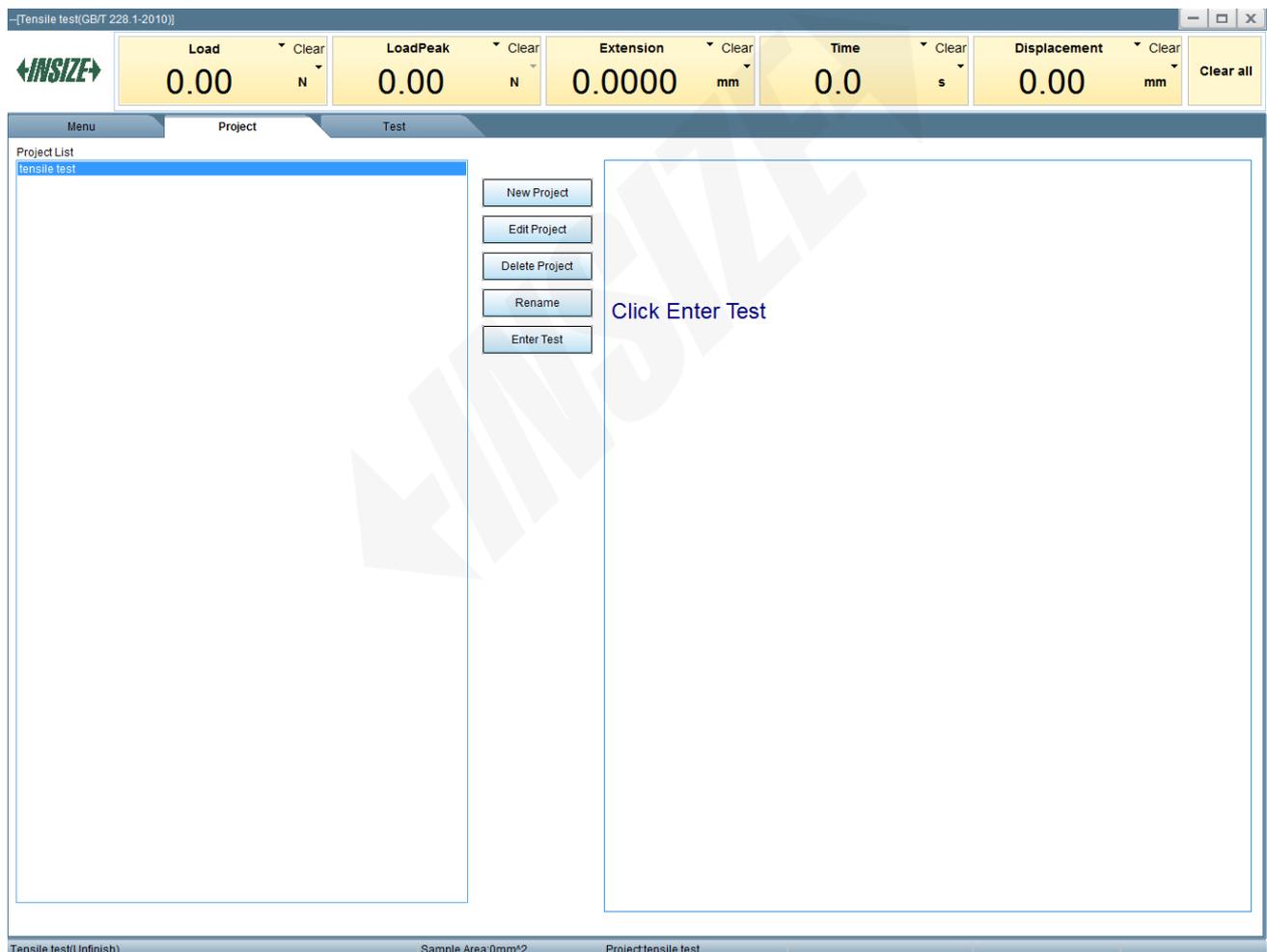


Figure 1

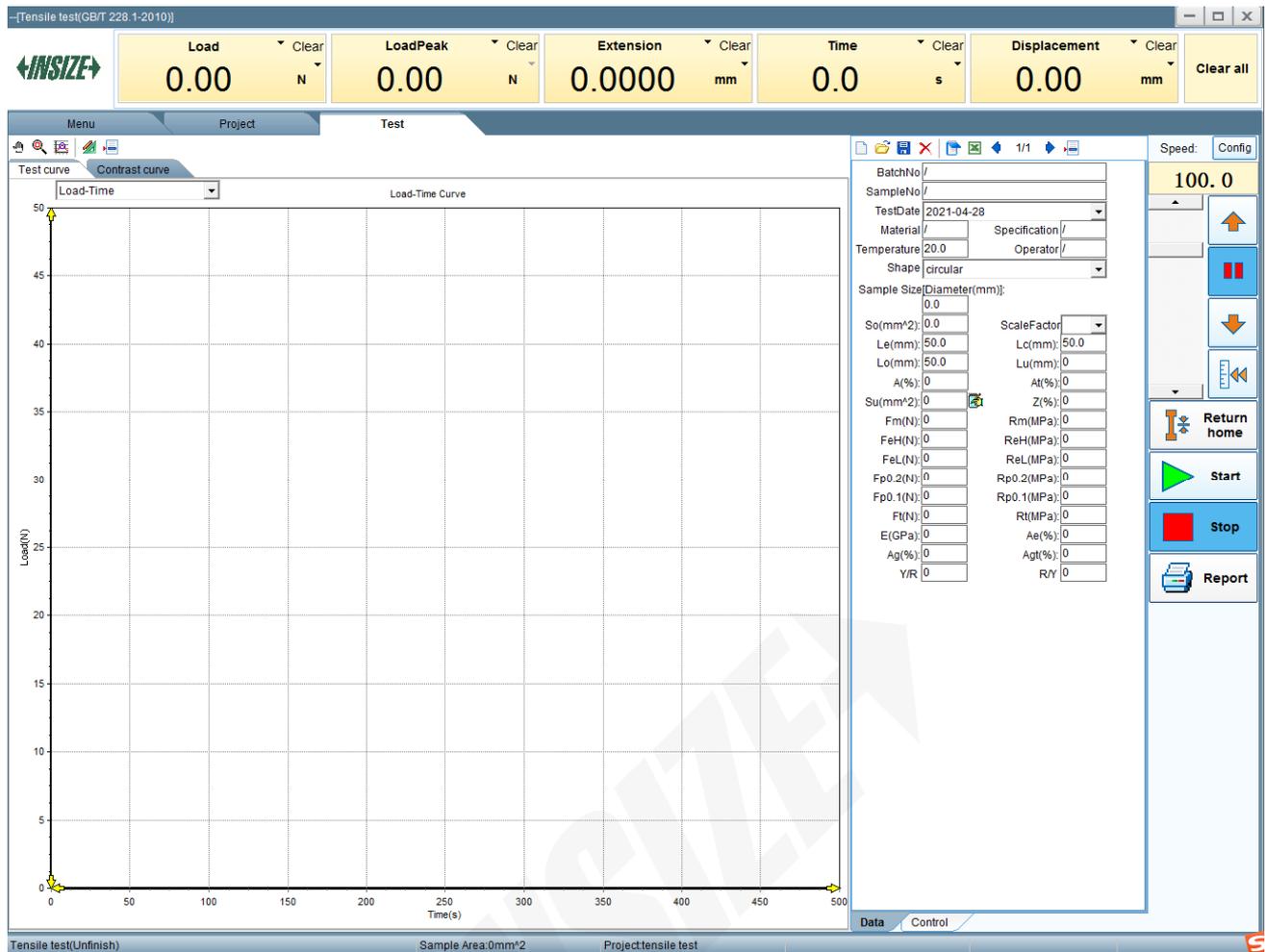


Figure 2

## 2. Input the sample information

And then input the inspection sample information into the computer. All the specimens of information and the test data, SmartTest program is stored in the same database file. In this database, a test data is kept as a record. If the database file as a huge data table, a record is equivalent to a row in the table. This form can be extended.

BatchNo: /  
 SampleNo: /  
 TestDate: 2018/5/12  
 Operator: /  
 Shape: /  
 Size: /  
 Area(mm<sup>2</sup>): /  
 Le(mm): /  
 Lc(mm): /  
 Lo(mm): /  
 Lu(mm): /  
 A(%): /  
 BreakSize(mm): /  
 So β(mm<sup>2</sup>): /  
 Z(%): /  
 Fm(N): /  
 FeH(N): /  
 FeL(N): /  
 Fp0.2(N): /  
 Fp0.1(N): /  
 Ft0.5(N): /  
 E(Gpa): /  
 Ag(%): /  
 YR: /  
 YS: /  
 Rm(MPa): /  
 ReH(MPa): /  
 ReL(MPa): /  
 Rp0.2(MPa): /  
 Rp0.1(MPa): /  
 Rt0.5(MPa): /  
 Ae(%): /  
 Agt(%): /  
 Rz: /

**2.1 Create new record**

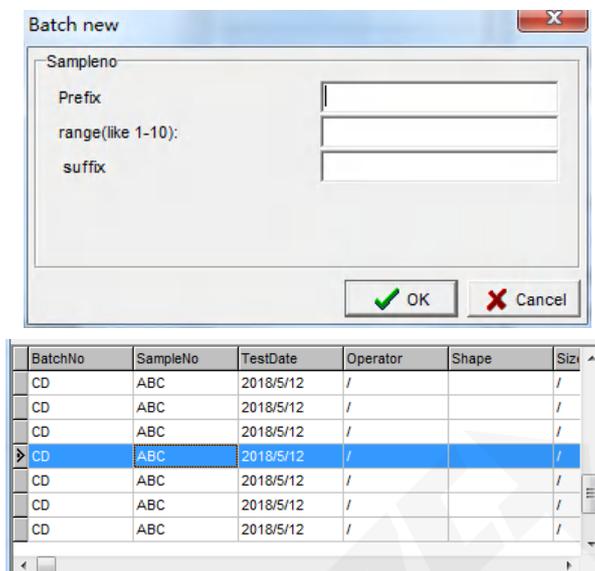
Sample data input area: user input samples of some relevant information here, of course, can also directly open the list on the right save sample template file, and don't have to input one by one. Use the mouse to click on the name of the template, this template contains content will directly fill in the sample. After we received your sample information, click on the window in the middle of the [new] button, fill in the data will be copied to the following sample information data buffer area. The user can start the next sample information input.

**2.2 New button:**

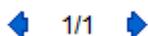
Copy the data from the input area to the input buffer, at this point, the sample data is not saved to the database, the user in the data buffer can also change the sample content according to actual situation.

BatchNo: /  
 SampleNo: /  
 TestDate: 2018/5/12  
 Operator: /  
 Shape: /  
 Size: /  
 Area(mm<sup>2</sup>): /  
 Le(mm): /  
 Lc(mm): /  
 Lo(mm): /  
 Lu(mm): /  
 BreakSize(mm): /  
 Templet: 22, 11  
 Save templet  
 Delete templet  
 New Batch new Delete  
 OK Cancel

**2.3 Create new batches:** the first two steps shows the process of input a sample information one time. In many cases, the sample is in bulk, for the same batch sample, its shape characteristics are the same, different only number. In this case, the system can be producing the same type (same lot number) with different number of sample data, and fill into the data buffer. Click [Batch New] button, a window will appear. It can be used to help users improve the efficiency of the input sample data. The diagram below:



- A. *Sample template name list:* any sample template record the basic information of a specific sample, the user can be any kind of samples and related information is saved as a template sample, so in the next test the same sample, directly open (directly using the mouse to choose the sample template name) of the corresponding template, system will automatically fill in the sample information. For example, if the user test is now 10 mm diameter of round steel, can be a first sample information fill in the sample data input area. And then select the sample template name list of the [save the template] button below, you'll see a dialog box, the user can enter template name in the dialog box, in general, can take a meaningful name, such as [Round sample 10], in this way, knew it from the name of the corresponding to the 10 mm diameter circular sample information. Later, if the test is 10 mm diameter circular sample, just use the mouse to point to take sample template in the list of [Round sample 10], the information contained in this template will automatically transfer into, then only need to modify.
- B. *Sample information data buffer area:* to facilitate the user to enter a variety of different types of sample data, the system will first entered the sample data to fill in this region. The user can check up the accuracy of the data here and then saved to the database. Available the following two buttons to input to modify, and delete the data:
- C. *Edit:* use the mouse to double-click to modify the data area, revised and press enter.
- D. *Delete:* use the mouse to choose to delete rows of data, and then click [Delete] button.
- E. *Ok:* To save data buffer data to the database, and add them to the data sheet, At the same time close the new window. After the group of new display will display in the data plate location button



### 3. Installation and do test

Please clamping the up side of the sample, adjust the beam to the right position place, insall the extemsometer (optional). Adjust the load sensor and strain sensor zero and displacement reset, and then clamp the down side

of sample

## 4. Begin to do the test

Specimen information transferred to data plate, if only one specimen, so the user does not have to choose to test specimen, if the user has built a lot of specimen information, before starting the test, the user must locate test specimen records. For example, users has built 10 specimens after record (No. 000-009), from the 10 specimens take a root, number 006, then, the user must move data record on the data plate at this moment, until the specimen records show numbers for 006. Find specimen number 006, the user can close the data plate, avoid affecting other window display. Here you can start the test operation.

After check your control process is correct, press the [Begin] button of the panel test began. In the process of control, please keep an eye on test process, artificial intervention when necessary. In addition, in the process of test control, had better not to has nothing to do with the trial operation, in order to avoid to affect control. At the same time, pay close attention to the screen prompt.

## 5. Test finished

In the following cases system will stop

Human intervention, press the [Stop] button;

Load overload protection, load exceeding the maximum limit overload protection;

System determine specimen broken.

## 6. Saving result

When a test after completion, and stop the machine operation under normal circumstances, the program will automatically analysis data, and automatically save the test curve and the results of the analysis.

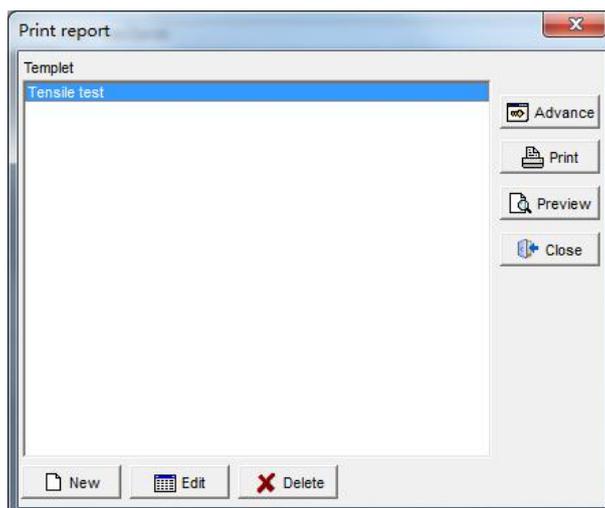
## 7. Data analysis

After finishing the test, the system will automatically analysis test curve , in the test curve, the landmark at the same time, send the results of the analysis to the data plate, at this time, users can directly see the results of the analysis in the data plate. If automatic analysis can not meet the requirements of the user, the user must be manual analysis data, can also analysis of the unity of all the specimen after the completion of the test again.

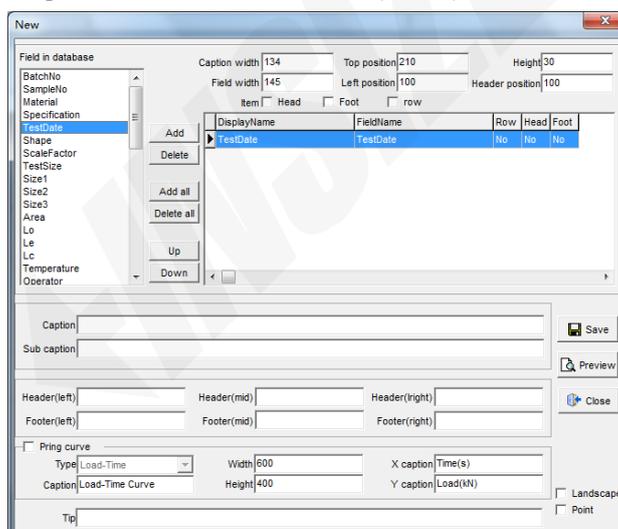
# Chapter 7 Test Report Operation and Making

## I. Report print (Classic)

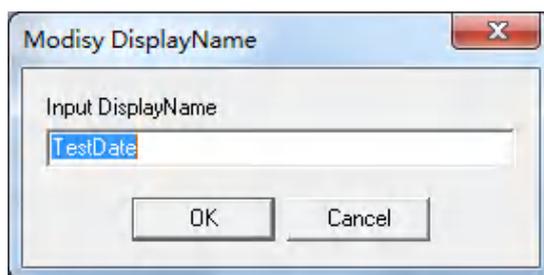
After the test data is analyzed, it can be printed. Click the 'Print ' button on the data panel to have the current test curve and analysis results and other test data printed.



1. Click the Print button on the data panel to pen the report print window (below), select an appropriate report template and click 'Print', the report will be printed.
2. If the report template list is empty, the user can create the report by clicking 'New'. Note, different report templates are available for different test methods, for example, the report templates created for metal tensile test cannot be visible or used for other test methods.
3. The new and edit interface makes it easier for user to print the report and user can create required report if the rules are fully understood. Open the new or edit interface (below) and here we will elaborate on it in detail.



- 3.1 Optional items: the list box at the upper left corner of the screen is the optional item list. Optional items are actually the data names stored in the database and user can easily distinguish them from the name. Click required items for the report and click 'Add', the items will be added to the list box to the right.
- 3.2 Report item: there are 5 columns in the report item list box, among which the second column 'Item name' corresponds to the name in the optional item list on the left and the first column 'Item title' means the actual print content, so it is more detailed and clearer than the item name. When an item is added, the system will provide a default 'Item title' which can be altered by double clicking the item and fill in a new title in the modification box (below), and finally press the Enter key to confirm.



Of course, for added items, the user can click the 'Delete' button to delete, you can also click the 'Up' and 'Down' button to print position regulating project.

For printing of a report, it is defaulted that two items are printed in one line and each item shall contain a maximum of 9 Chinese characters (equivalent to 18 numbers and letters); if any item content goes beyond this range, we can specify it on a single line, that is, set it as a banner (banner can contain 29 characters, equivalent to 58 numbers and letters). Select an item and then click on the banner check box above the list, this line is designated as a banner printing.

3.3 The title can be divided into a main title (the first line) and subtitle (second line), if not input, the item will be printed without a title.

3.4 A test report is generally made up of data and the curve; if the user wants to print the curve, he must specify the curve type to be printed among eight curve types including stress- deformation, stress - strain, stress- time and etc., the height of curve to be printed shall also be specified.

3.5 Some information of the report can be briefly elaborated in the notes, which will be very helpful when there are many report module files.

3.6 The general settings of report is included in the senior setting, which shall not be altered other than really necessary.

3.7 The feature points refer to the points featuring the material property, such as lower yield and maximum stress, etc.

## II. Report print

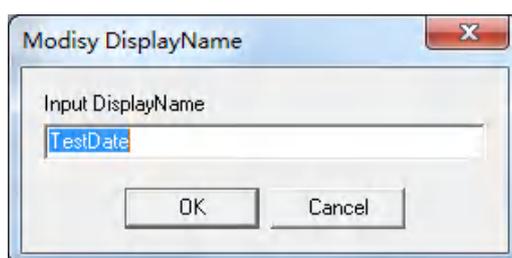
The report editor is extremely simple to operate with its modular design, so the user can finish settings following the software guidelines.

1. Click the dropdown menu to the right of the data panel print icon, select 'Report printing' to open the report editor and you can see the 'New, Title, Data' buttons in the top toolbar of the editor, just follow the red beating button to complete report editing step by step, namely 'New - Title - Data - Curve - Save - Print'. The following is the detailed steps:

1.1 Click 'New' -- the first step to establish a report template and input a name for it.

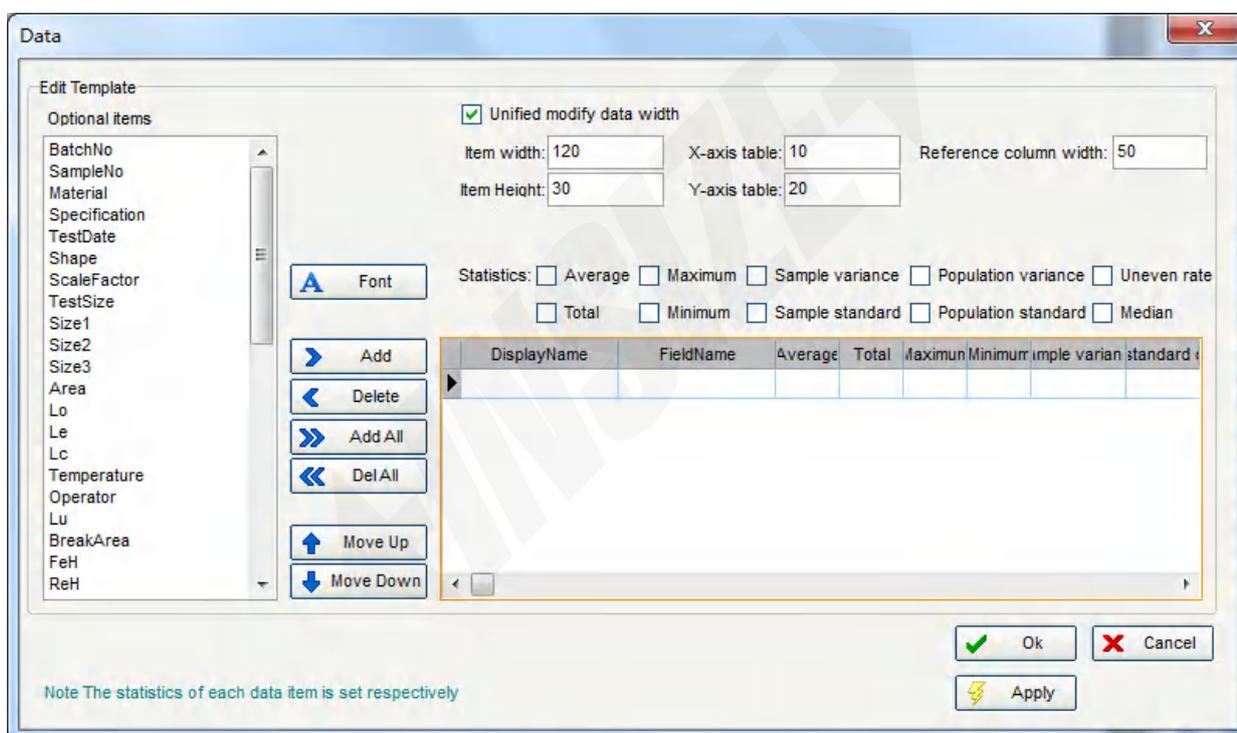
1.2 Click 'Title'-- input a title for the template.

1.3 Click 'Data' – the dialog box as in the following figure will pop up: (general test method)

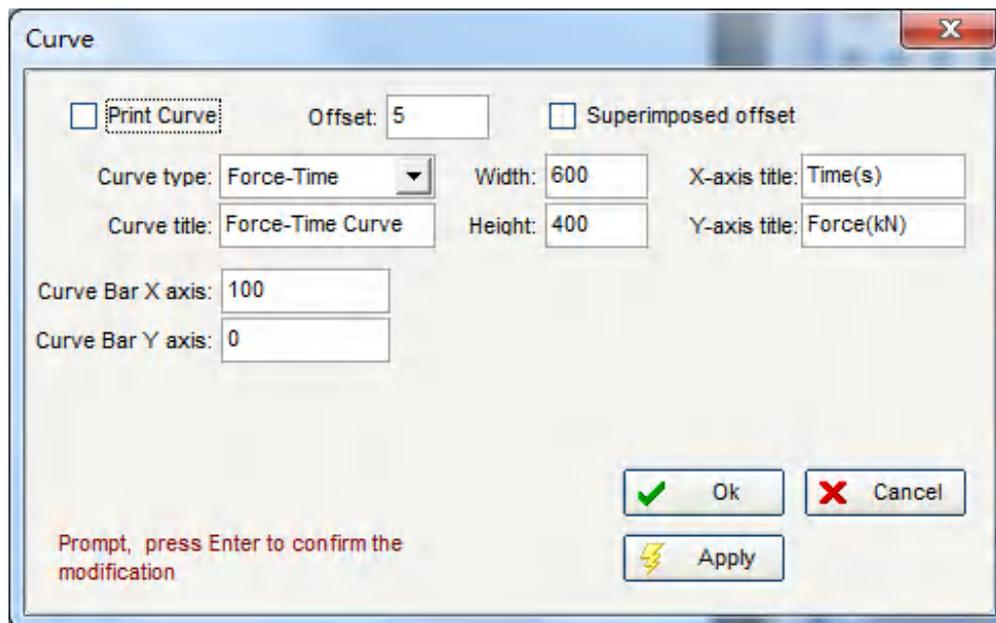


2. The zone 'A' on the left is the list of optional items, which are the data names actually stored in the database and from which we can easily identify the data. Select required items in the report and press the 'Add' button, the items will be added to the item list box on the right. For the added items, the user can select and click 'Delete' to delete it or click 'Up' or 'Down' to adjust the position of item in the report to be printed.
3. The zone 'B' is the report item list box, including columns of item name, item title, average, total, etc., among which 'Item name' is the same as the name in the optional item list on the left, 'Item title' is the actual printed content which will be automatically provided while adding an item and can be altered by double clicking the item and input a new name in the input box and confirm. If the user wants to display the average value or the maximum or minimum value of a data, just select the data and tick the corresponding check box behind the statistics data of zone 'C'.
4. The zone 'D' lists the modifiable items of row height and column width and the template position. The user can tick the 'Data width amend' check box to have all the row height and column width and the template position of the data items, or just select a certain data item and modify the column width and row height and position separately.

In the custom test method interface, zone A is the custom name.



5. Click 'Curve' – the following dialog box will pop up

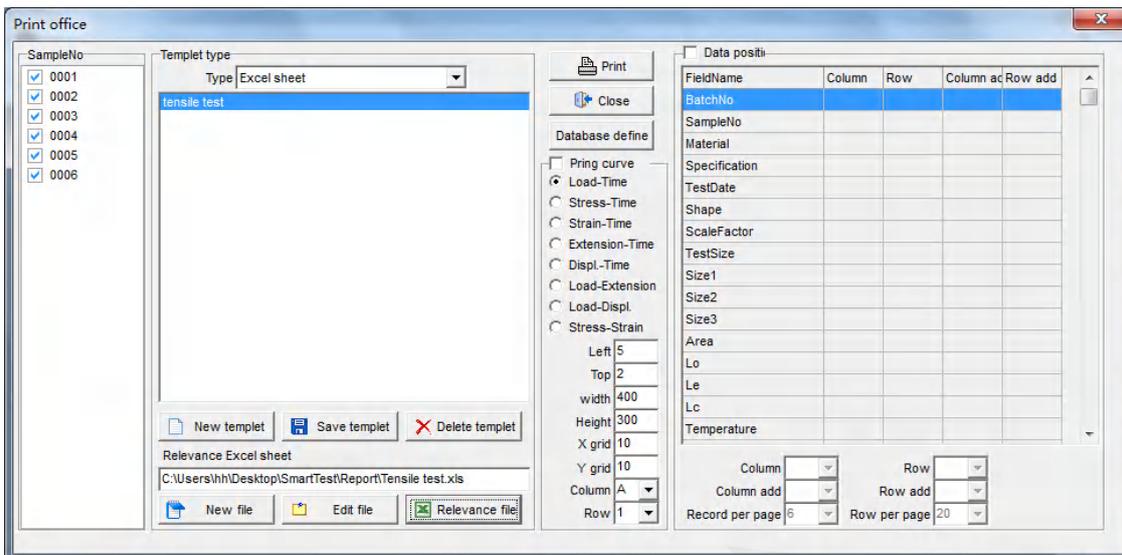


6. If the curves are not to be printed, just have the checkmark before the print curve removed; if the curves are to be printed, just tick the checkbox before the print curve; to make a contrast between printed curves, the user can select to have the curves overlade or with certain coordinates offset. The user can choose the curve type to be displayed from the curve type drop-down menu and can modify parameters of the curve title, titles of X axis and Y axis, curve height and width, and X axis and Y axis of curve bar to comply with the size and visual effect of the report template; of which, the curve height and width defines the area the curve takes in the report, while X axis and Y axis of curve bar specify the curve position in the report.
7. Click 'Save' -- the report is preliminarily established. To modify a certain item, just click the item in the top toolbar and make modification.
8. Adjustment of details – via modifying the template operating bar on the right of the report editor, the user can make adjustments to details of the report. The steps of 'New, Save, Delete, Print' are elaborated above and thus omitted here; select an item in the report bar and click any of the 'left, right, up and down' arrows to adjust the item position in the report; in the data optional bar, the user can randomly select to print or not to print data of certain batches or numbers. Among the advanced options, 'Horizontal print' can be selected as necessary, 'batch print' is generally defaulted 'Yes' and requires no amendment, 'Ruler display' makes the template size more clear and intuitive, 'HTML output' and 'PDF output' make it possible to create and save report of these formats, which can be read on computer that is not installed with SmartTest software.

### III. Export the Report to Office

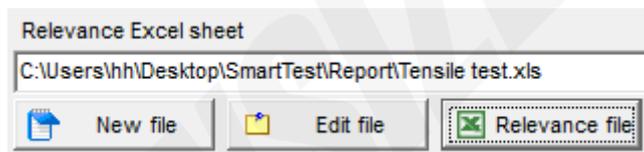
Note: supports for Word and Excel report files of Office 2003, Office 2007 version.

# 1. New module

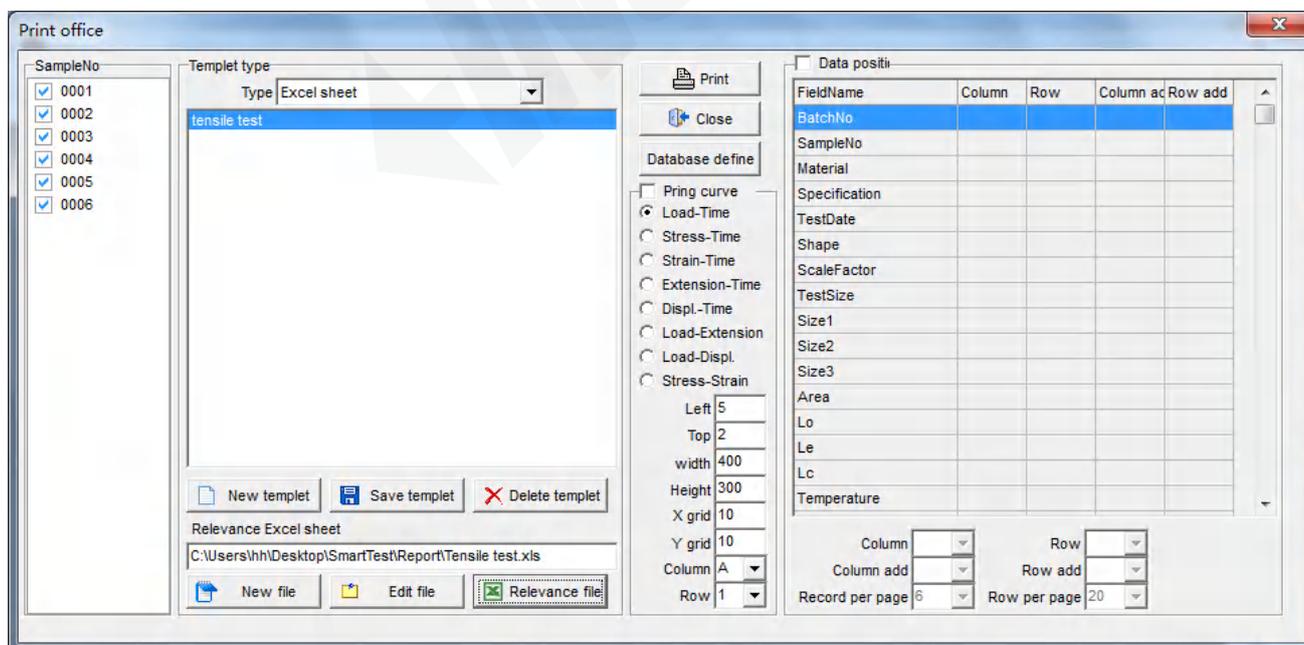


Excel and Word formats are available for user’s choice and here Excel format is taken as an example.

- 1.1 create a new module and input the module name, the newly created module can be removed if it is wrong or will not be used;
- 1.2 Associated to Excel report

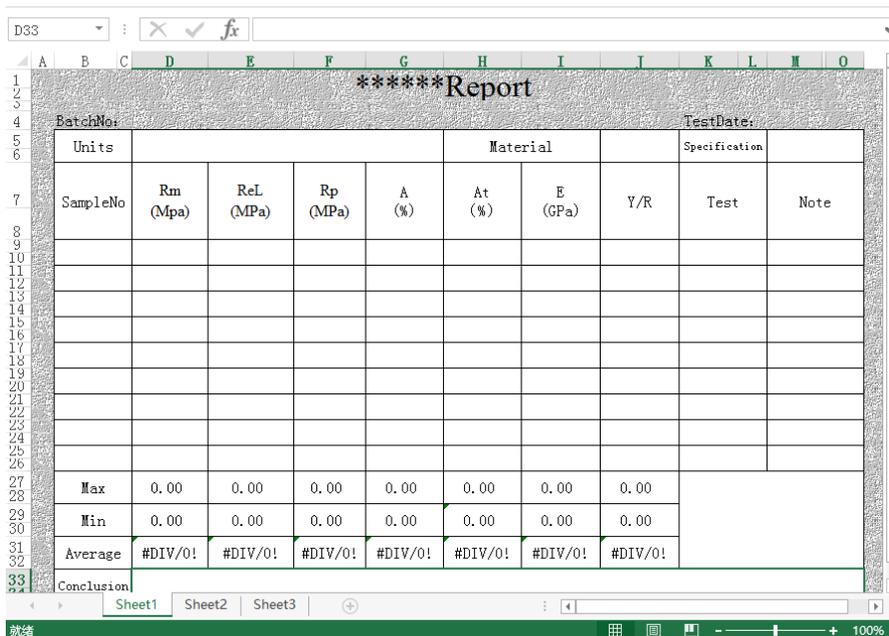


1.3 Click [Open], the software will link to the selected Excel report (below);



1.4 Click [Save], the module is saved as 'Tensile test report (single)'.





Similarly, if you want to output 'Test person' in the cell②, just select cell② (Figure above) and change its coordinate K9 in the name box into the corresponding item 'Test person 1' in the 'Data sheet structure' and then press Enter to confirm (Figure below).



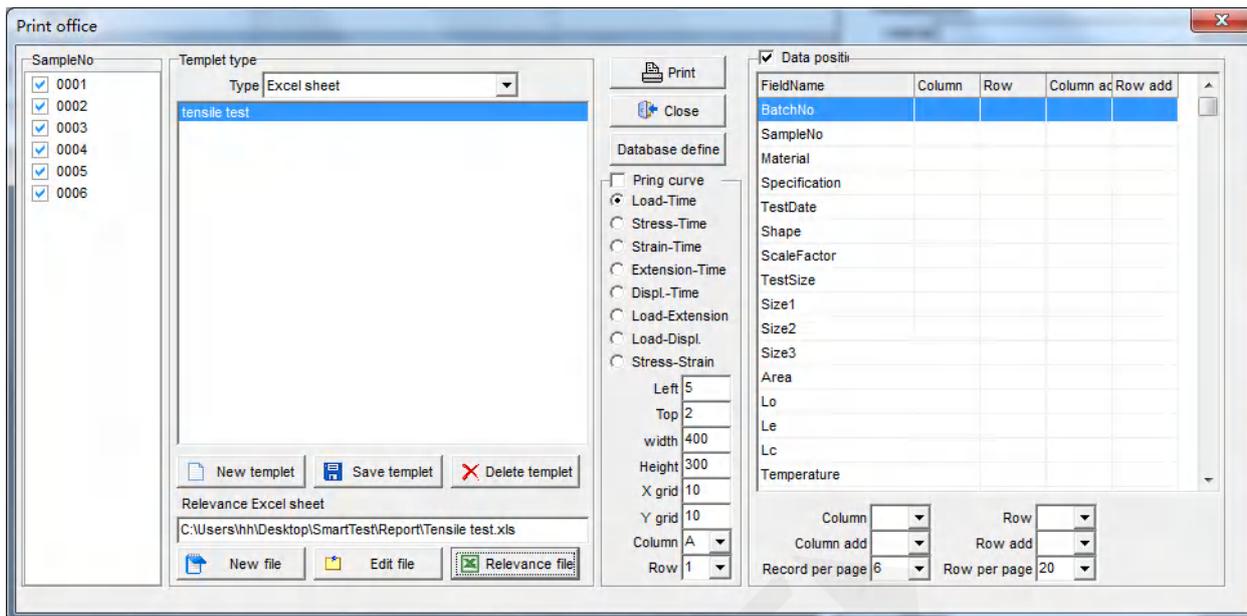
Then the software can recognize the cell as 'Test person 1'. For customized test method report, the name input in the name box is 'Custom 21' as in the figure below. (Customization shall be determined by the corresponding relationship in the data sheet structure).



2.3 If the user inputs a wrong name and wants to redefine it, he has to delete the wrong input first: click 'Insert-Name-Definition' in Excel menu bar, select the wrong name, click 'Delete' at the lower right corner, and then input the correct definition.

The other data to be output shall be operated similarly and thus is omitted here.

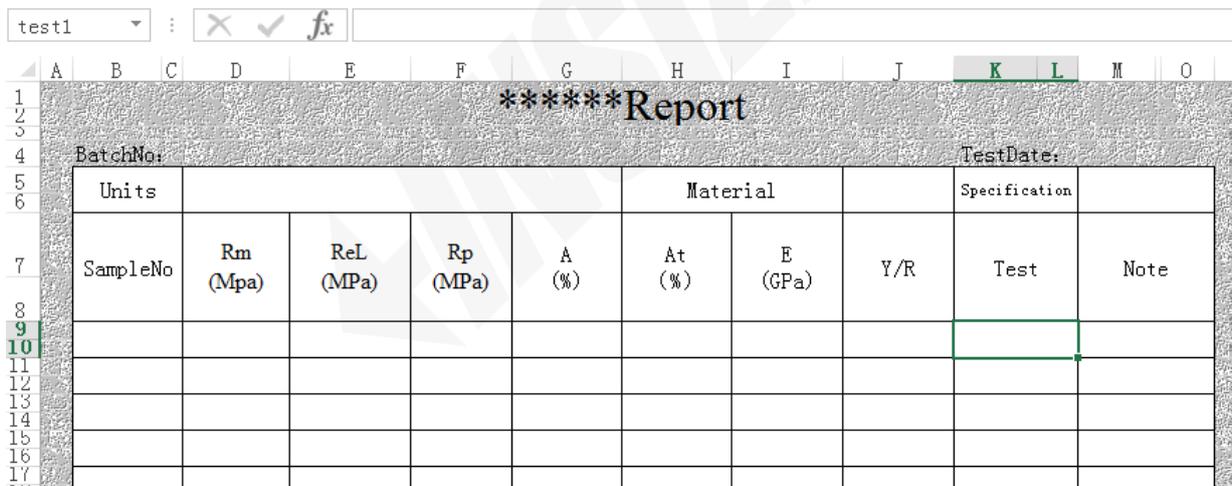
### 3. Compiling of Excel report (method two)



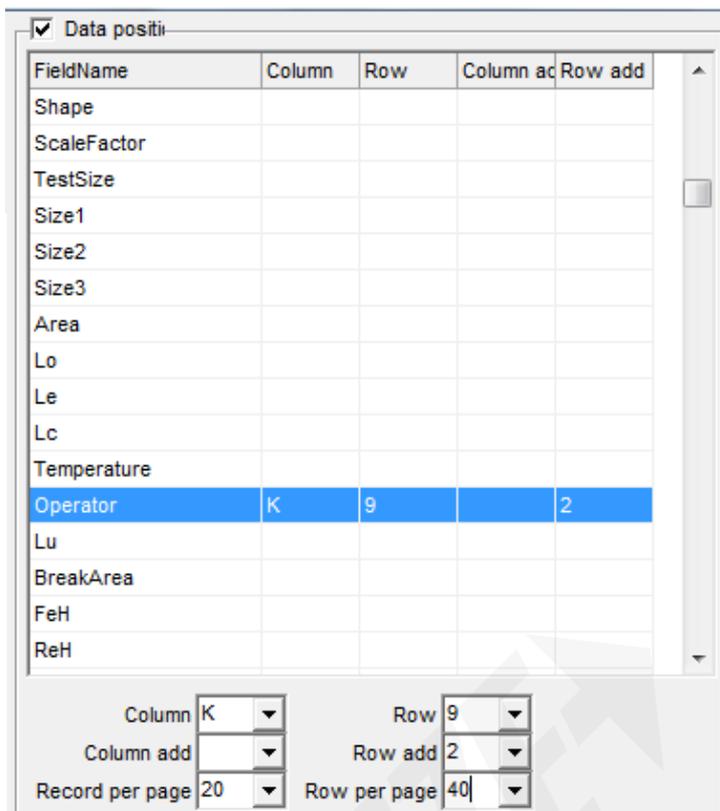
Number selection: the user can select batch report output as necessary (for example, the user wants to have three among five samples output, he only needs to select the corresponding numbers of the three samples)

Tick the checkbox before the positioning data at the middle top.

Open a report with sheet name undefined.



The coordinate of cell ① is K9, select 'Test person' in the window 'Output of Office report' and input the coordinate in the coordinate bar below.

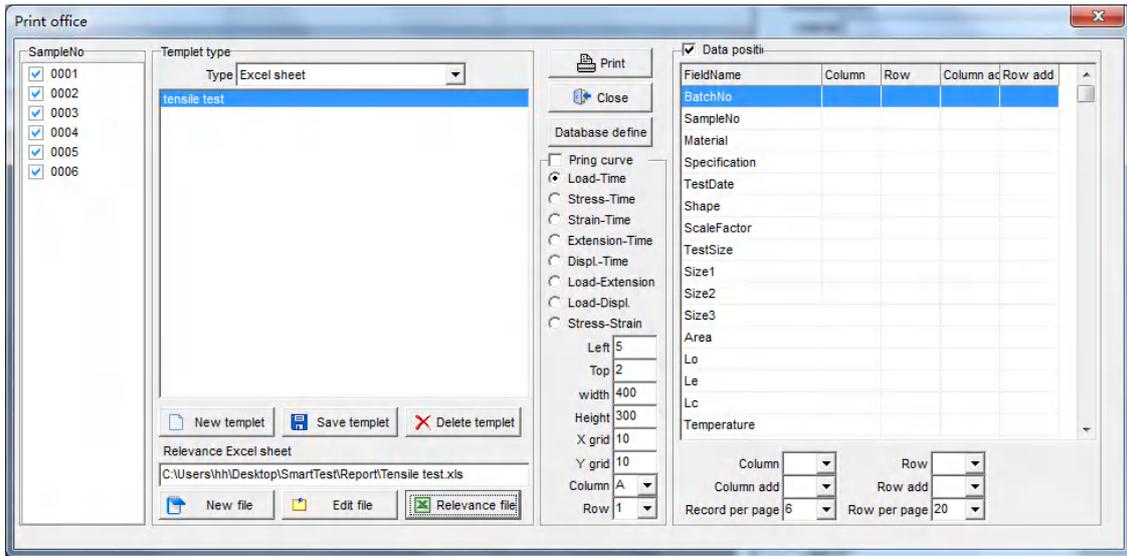


[Column position] K, [Row position] 9, [Row increasing] 2, [Records per page] 10, [Rows per page] 40; there's generally 40 rows in one page and if there are too much test results, the user can have the results output in more than one page. For example, if there are 40 test results, the user can set as [Records per page] 20 and [Rows per page] 40, the test results will be output in two pages.

#### 4. Curve

Output mode of test curve is similar to that of data output, it shall be noted that the user shall set the position and size of curve as he requires. Select the cell to output the curve, modify the coordinate in the name box into 'Curve' and press Enter, the software will automatically output the curve in Excel sheet, the position and size of which is default by the software and the user can make adjustment following the steps below:

- 4.1 Open SmartTest software, select the 'Data panel', then select the drop-down menu of print report and select 'Report output to Office', as shown below:



4.2 Curve printing position adjustment

The area the curve takes in the Excel sheet can be adjusted by adjusting the height and width of the curve, and the curve position can be adjusted by modifying the left and top margin.

4.3 X axis grid and Y axis grid separately refer to division value of X axis and Y axis of the curve and determine the fine degree of the curve, and the value can be adjusted as required.

4.4 By this step, the editing of the entire report is completed and the user shall have the work saved, the save path of 'File\SmartTest\Report' is recommended.

5. Preparation of Word report

Compared to output in Excel file, the output in Word is similar in basic principle, only different in positioning mode.

The steps are generally elaborated here:

First, create a Word form and appropriately adjust the format as required, the legend as above:

5.1 If the user wants to output 'Number' in cell ① of the table, just input '%Number%' and the software will automatically input 'Number' in this cell.

Sample batch		Sample number	%Number%
Original gauge length (mm)		Cross-sectional area (mm <sup>2</sup> )	
Test temperature (°C)		Test person	
Test curve			
Maximum stress (kN)		Tensile strength (MPa)	% Tensile strength %

5.2 In the same way, if you want to output 'Tensile strength' in cell ②, just input '%Tensile strength%' in the cell. In a word, the user only needs to input a data item in the form of '%data name%', the software can automatically specify the position of output.

5.3 The same principle shall be taken to set data items to be output.

5.4 The output mode of curve is the same as that in Excel, namely, just input '%Curve%' in the cell to output the curve, the software will have the curve automatically output in the Word table, the size and position of the

curve can be adjusted similarly as in Excel.

5.5 By this step, the editing of the entire report is completed and the user shall have the work saved, the save path of 'File\SmartTest\Report' is recommended and file name shall be given by the user (Similar as in Excel).

## 6. Averaging in Excel

6.1 If you want to output in the cell B9 the average of values in cells from B2 to B8, just select the cell B9 and then open the drop-down menu by clicking the 'Autosum' button 'Σ' in the 'Common' toolbar.

6.2 Select 'Average' and the B10 cell displays '= AVERAGE ()', then drag the cells from B2 to B9 and press the Enter key.

6.3 For functions of the maximum and minimum values and variance, the same steps as above shall be followed.

Note: if you cannot find 'Autosum' button 'Σ' in the 'Common' toolbar, click 'Tools'- 'Custom' and tick the checkbox under the Tool bar.

## 7. Averaging in Word

In fact, similarly as in Excel, the cells in Word form can also be described in the way A1, A2, B1, B2....., of which letters and numbers represent the column number and line number. The average of values of a column or a line can be acquired in the following steps.

7.1 Click the cell to output the result;

7.2 Click 'Form – Formula' in the menu bar and the 'Formula' dialog box as in Figure 2 will pop up.

7.3 Averaging:

Select VERAGE function from the 'Paste function' list box, then select the data form and establish the formula '=AVERAGE (left)' or '=AVERAGE (B2:F2)' to acquire value in G2 cell. For functions of the maximum and minimum values and variance, the same steps as above shall be followed.

# Chapter 8 Custom Test Method

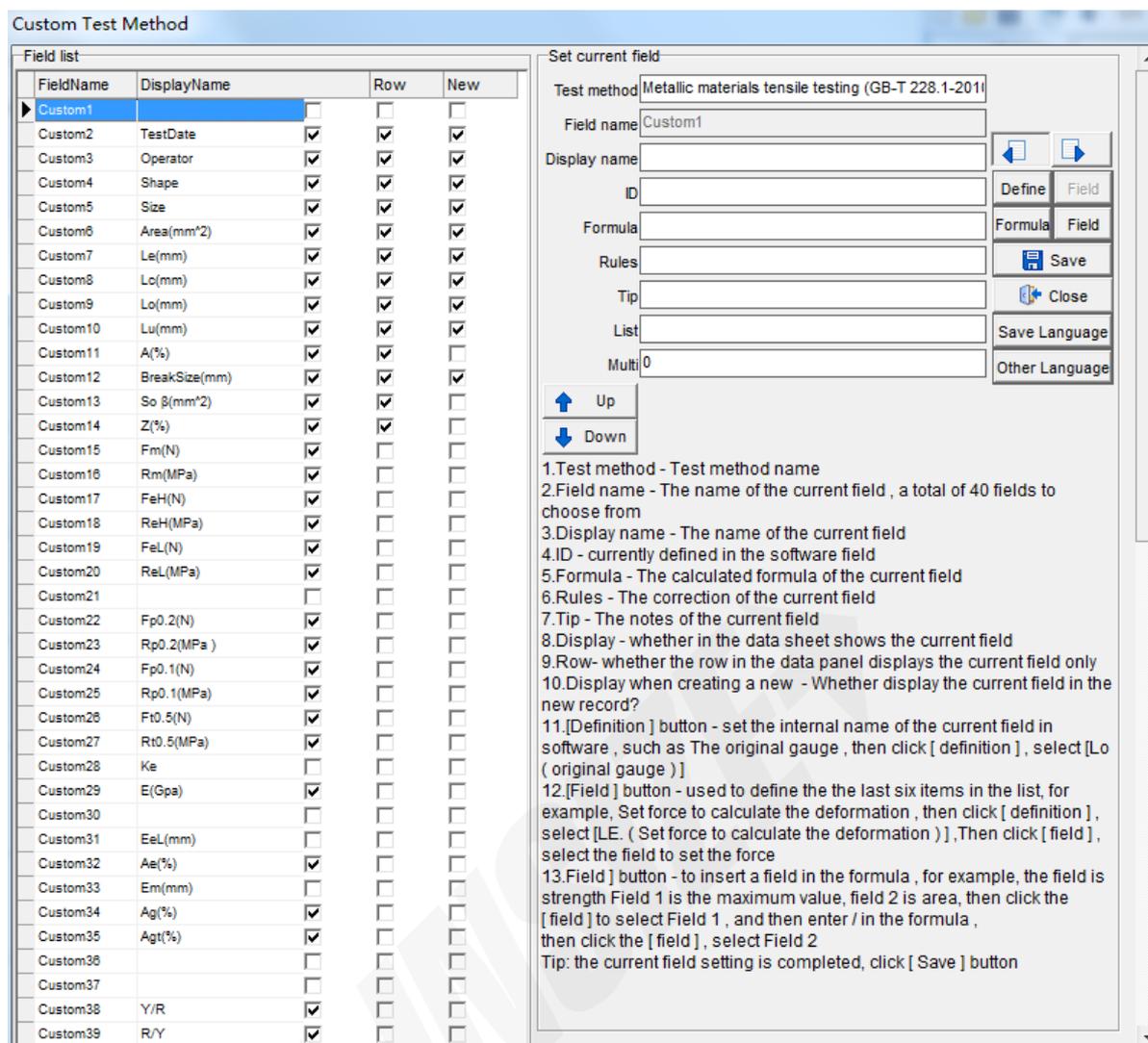
## I. Choose blank test method

Create a new plan and choose a test method to be done

## II. Open the production interface

Select the "Custom" button on the software data board





### III. Function introduction

- 1, Test method - the name of the test method (standard number, name, etc. may be entered as follows: elastomer modified bituminous waterproof membrane (GB18242-2008));
- 2, Field name - the name of this field. With the "custom" + serial number, there are a total of 40 fields to choose from. (Custom 1~Custom 40, field name can not be modified, only select);
- 3, Display name - the name of the current field display (eg: custom 5 display name is So (mm), can be modified);
- 4, Internal definition - the definition of the current field in the software;
- 5, Calculation formula - current field formula (such as:  $So = \pi * d * d / 4 = 3.1415926 * [\text{custom } 4] * [\text{custom } 4] / 4$ );
- 6, Repair rules - the current value of the field rounding;
- 7, Tips - comments on the current field. (Hold the mouse over the title on the data board)
8. Whether to display - whether the current field is displayed in the data board;
- 9, Exclusive line - in the data board is this line only shows the current field;
10. Show on New - Whether to display the current field in the new record.
11. Save the language - Save the modified test method language

12, Save other languages - the current language in the display name, list and prompts in the keyword extracted, translated into other languages, and then save, after the software to switch the corresponding language, this test method will be presented accordingly

Remarks: [Test Method] is the overall name of this test method. The rest of the items are the fields in each row of the left side that follow the changes. Therefore, after the definition of each row, you need to 'Save'.

## IV. Part function summary

### 1. Internal definition



The 'Define' is the internal definition of the software (except for the last six). The last six are used together with the 'Field'. For example, first click 'Define' to select 'Set force to seek deformation' and then click the 'Field' to select the field name of the required force -- LE. [Custom 20].

- 1.1. Lo (original gauge length) -- Before stretching, mark a distance on the specimen with a notch cutter or a cutter, measure the length, which is the original gauge length;
- 1.2. Le (extensometer gauge length) -- The initial gauge length of the extensometer used when measuring the extension of the specimen with an extensometer;
- 1.3. Lc (parallel length) -- the distance between the two jaws after clamping, or the length of the same part of the standard specimen as the parallel length;
- 1.4. Lu(gauge length after fracture) - gauge length after specimen fracture;
- 1.5. Area(sample area) -- the area of the test sample;
- 1.6. TestDate(Test date) -- the date of the test day;
- 1.7. TestTime(Test time) -- the specific time of the test;
- 1.8. kE(Slope of elastic segment) -- The slope of the curve and abscissa of the elastic segment;
- 1.9. Fm (Maximum force) -- When the tensile test is performed, the force value corresponding to the highest point of the curve is the maximum value;
- 1.10. FeH (upper yield force) -- the maximum stress before the specimen is yielding and the force drops for the first time;
- 1.11. FeL(lower yield force) -- The minimum stress in the yield phase when initial transient effects are not taken into account;
- 1.12. Rp (prescribed plastic extension force) -- on the force-deformation curve, a point parallel to the curve's straight line segment is made on a point equal to  $R_p * L_e$  on the force axis, intersecting the curve at a point. The corresponding force is the specified plastic extension force;
- 1.13. Rp1 (specified plastic extension force customization) -- the corresponding specified plastic extension force;
- 1.14. Ft (define the total extension force) -- on a force-deformation curve, draw a parallel line whose distance parallel to the force axis is equivalent to the specified total elongation. The point of this parallel line with the curve is the specified total extension force;
- 1.15. Fb (Fracture Force) -- The force at which the specimen breaks or breaks instantaneously;
- 1.16. Em (deformation at maximum force) -- deformation at maximum force;
- 1.17. EeH (deformation in the upper yield force) -- the amount of deformation in the upper yield force;
- 1.18. EeL (deformation under lower yield force) -- the amount of deformation under the yield force;

1.19. Ep (deflection when the plastic extension force is specified) -- the amount of deformation when the plastic extension force is specified;

1.20. Ep1 (defining the deformation when the plastic extension force is customized) -- determines the deformation amount when the plastic extension force is customized;

1.21. Eb (deformation at break) -- The amount of deformation at the time of the fracture of the specimen.

For example: set stress to stress

[Custom 13] Set display name as 'Set Force';

[Custom 14] Set the display name as 'Set Strain Force' Internally defined as 'SL. [Custom 13]' (At this time, 'Custom 13' is also the value set by the setting force mentioned above) (This Items are not displayed in the data board);

[Custom 15] Set the display name to 'Set stress to stress' as '[Custom 14] divided by sample area. Use the above three customizations to find the required stress value. Other algorithms are basically the same as this algorithm, and are not described in detail here.

## 2. Field

Formula		Formula	Field
---------	--	---------	-------

The 'Field' is used in the calculation formula, and the calculation formula is directly expressed as 'custom + serial number', such as:

Formula	$[(\text{Custom6}) - (\text{Custom13})] / (\text{Custom6}) * 100$	Formula	Field
---------	---	---------	-------

## V. Production of test method

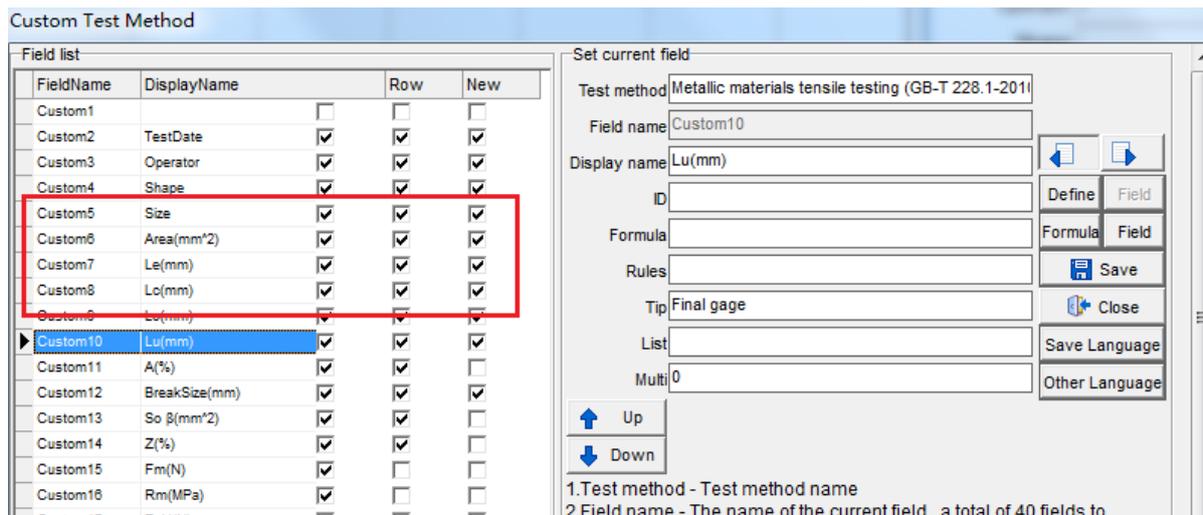
We extract the special definition name in the software database, and then use a simple addition, subtraction, multiplication, and division calculation to generate a calculation formula to meet the requirements in the standard. The next is illustrated by a simple example.

1. Requirements:

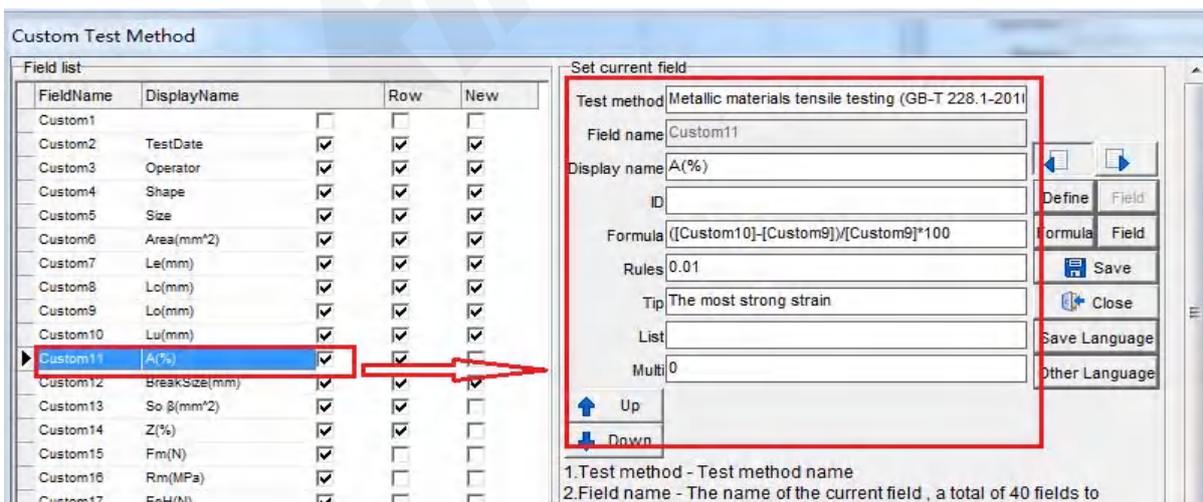
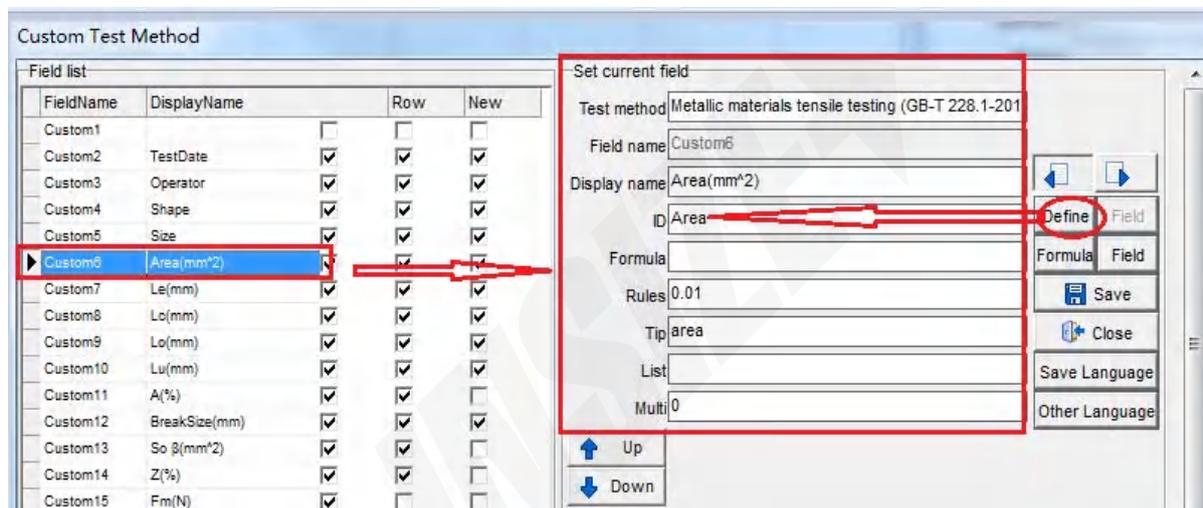
Tensile strength calculation in metal stretching: strength = maximum force/area, unit MPa

2. List the fields and auxiliary fields required for strength

Fields of maximum force, area, and diameter, such as the following figure



3. Modify calculation formulas, internal definitions, etc.



4. Edit completed, return to the software interface test

Shape:	Bar (diameter)	
Size:	10	
Area(mm <sup>2</sup> ):	78.54	
Le(mm):	50	
Lc(mm):	0	
Lo(mm):	/	
Lu(mm):	/	
A(%):	/	
BreakSize(mm):	4	
So β(mm <sup>2</sup> ):	12.57	
Z(%):	84.00	
Fm(N):	6.50	Rm(MPa): 82.76

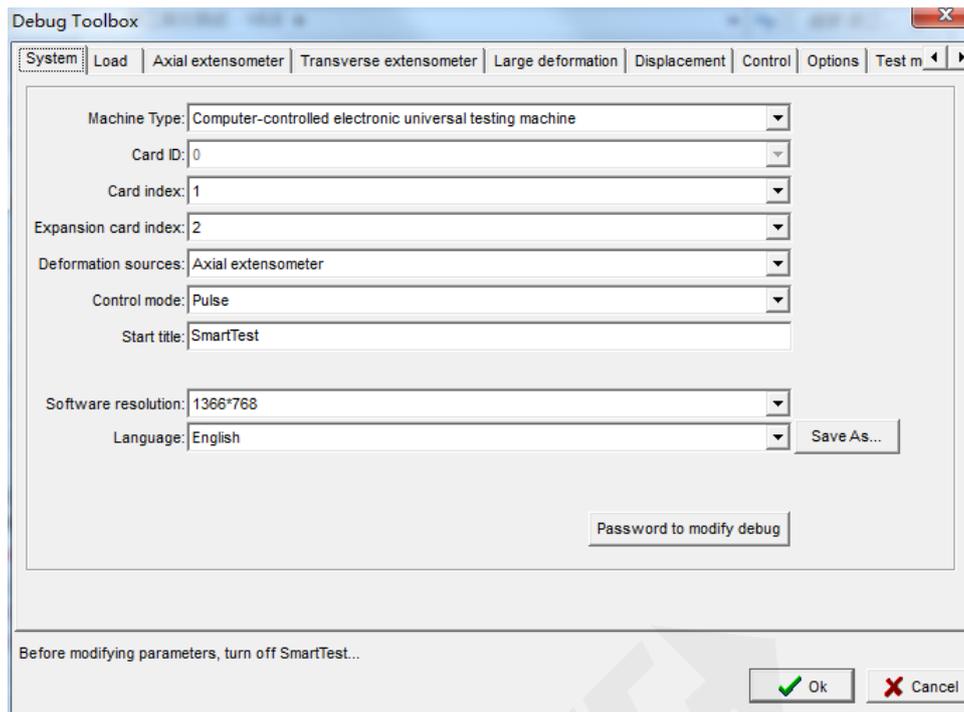
The "custom" in the test method and the "custom" in the field name are not one meaning, do not confuse

## Appendix I Configuration Toolbox

[Configuration Toolbox] is a debugging tool program for the universal testing machine control program SmartTest.exe, which can help the debugging personnel to configure the SmartTest program according to the actual situation of the machine and the user's requirements, that is, to view and modify the basic configuration of the system by means of the user interface. Parameters, read and write configuration file SmartTest.ini file.

[Configuration Toolbox] Installed together with the SmartTest.exe control program, located in the same directory as SmartTest.exe (usually C:\Program Files\SmartTest directory). Use the mouse to click on the program name under the program group to run. To avoid irrelevant personnel changing the system parameters, the user must enter the password before entering the program (the initial password is 123456, which can be modified in the program).

The program adopts a multi-page method, which is divided into nine parts according to the content: system, force sensor, extensometer, large deformation, displacement, control, option, test method and external control. The following are introduced in sequence:



## 1. System

- 1.1. Machine type: SmartTest software supports a variety of host systems, such as screen display universal, electronic universal, etc., the actual operation of the software according to the card automatically identifies the corresponding host type;
- 1.2. Card ID: The default is '0'. When no test card is inserted, the default is '0'. When the computer inserts the test card, the software will automatically detect the type of the inserted board.
- 1.3. Deformation source: set according to the specific machine;
- 1.4. Control mode: According to the specific control mode, relevant selections are made;
- 1.5. Motor type: AC servo motor and stepper motor. Users choose the type of motor you use according to your own motor.
- 1.6. Card Index: Software Identification of the Current Board
- 1.7. Expansion card index: When a board card cannot meet the test requirements, an auxiliary board needs to be added. This is an expansion board card.
- 1.8. Language: There are several languages under the root directory of the software. There are several options here.  
Note: The language name in the switch drop-down list is to copy the files in this language package to the root directory. Save As is to copy the files in the root directory to a new language in Language.

## 2. Load

Depending on the force sensor installed in the tester, up to 4 sensors can be used at the same time. The commissioning staff can add, modify and delete the contents of the sensor list. among them:

- 2.1. serial number: SmartTest system can configure up to four groups of force sensors;
- 2.2. the maximum range: The parameters here should be set according to the sensor on the test machine host, pay attention to the unit is kN;

- 2.3. minimum resolution: maximum can be set to 1/1000000;
- 2.4. the configuration of multiple sensors;
  - 2.4.1. Add: Click the [Add] button, the maximum number of sensors will automatically increase by 1, but the maximum will not exceed 4;
  - 2.4.2. Delete: When deleting a sensor, it must start with the last group of sensors. When the deletion is successful, the maximum serial number of the sensor will be automatically reduced by 1, but the minimum number will not be less than 1;
  - 2.4.3. Save: After adding a new set of sensors and modifying existing sensor parameters, you must click the [Save] button to save them. Otherwise, all changes will be invalid. Of course, the program will alert the user with a change in the color of the value.

### 3. Extensometer

#### 3.1. Axial extensometer

The configuration method and principle of the axial extensometer are the same as those of the sensor configuration. Up to four can be configured and will not be described here.

#### 3.2. Transverse extensometer

The configuration and principle of the lateral extensometer are the same as those of the sensor configuration. Up to four can be configured. This will not be described here.

Lateral extensometers are used to determine the lateral/radial deformation of the specimen.

### 4. Large deformation

Set according to the actual situation, similar displacement.

### 5. Displacement

Gain Calibration: The parameters here refer to the displacement values corresponding to each pulse during displacement acquisition. Please set according to the specific conditions. For non-stroke testing machines, this item is meaningless and is not displayed.

### 6. Control

Configure the control program's range of displacement, force, and deformation speed adjustment files (the following figure shows a group of configurations that control the program's displacement speed):

- 6.1. minimum: The nominal value of the first gear is also the lower limit of the speed. As 0.005 in the example.
- 6.2. stalls: a total of how many files to provide speed adjustment, according to the multiple of 2,5,10 increments. The number of files in the example picture is 15. Note that the number of gears must be between 5 and 15 (with 5 and 15 and displacement control up to 18 gears). If it is out of range, the program may not be normal.
- 6.3. the maximum speed: because the gear is in accordance with the multiple of 2,5,10, and the maximum speed of the system does not necessarily meet the requirements, such as the maximum speed of the system displacement request is 250mm/min, and according to the figure, the last file the speed can only be 200mm/min. If you increase the first gear to 500mm/min, the host can't reach this speed. At this time, the user can set the maximum speed to 250mm/min, and the system will automatically expand the speed adjustment

range. If your maximum speed setting is less than the speed of the last gear, this maximum speed setting will not work.

Displacement speed control		
Minimum <input type="text" value="0.001"/> mm/min	Amount <input type="text" value="17"/>	Maximum <input type="text" value="500.0"/> mm/min
Load Speed Control		
Minimum <input type="text" value="0.001"/> kN/s	Amount <input type="text" value="10"/>	Maximum <input type="text" value="1.0"/> kN/s
Deformation speed control		
Minimum <input type="text" value="0.001"/> mm/s	Amount <input type="text" value="10"/>	Maximum <input type="text" value="1.0"/> mm/s

## 7. Options

Debug Toolbox

System | Load | Axial extensometer | Transverse extensometer | Large deformation | Displacement | Control | Options | Test m

- Enabling three user rights management
- Allows you to modify the analysis parameters
- Rise, fall converse
- Frame is a horizontal structure

Frame structure

- Single space ( downwards tension and compression, tension and compression reverse direction )
- Single Space(One way or another on the pressure, tension and compression reverse)
- Double room ( Upper space for tension, lower space for compression, tension and compression in the same direction )
- Double space(Pull on the pressure, tension and compression in the same direction)

- Digital Micrometer negated
- On the dial gauge, large deformation measured deformation preload and stiffness correction

Before modifying parameters, turn off SmartTest...

Ok Cancel

7.1. Enabling three user rights management: When this item is selected, it prompts you to enter the ‘User’ name and ‘Password’ as shown below when running the software. Simultaneously log in the software and display it in the tool.

**Login**

User:

Password:

OK Cancel

**Adjuster**

User

- Tester
- Manager
- Adjuster

Change password

Add

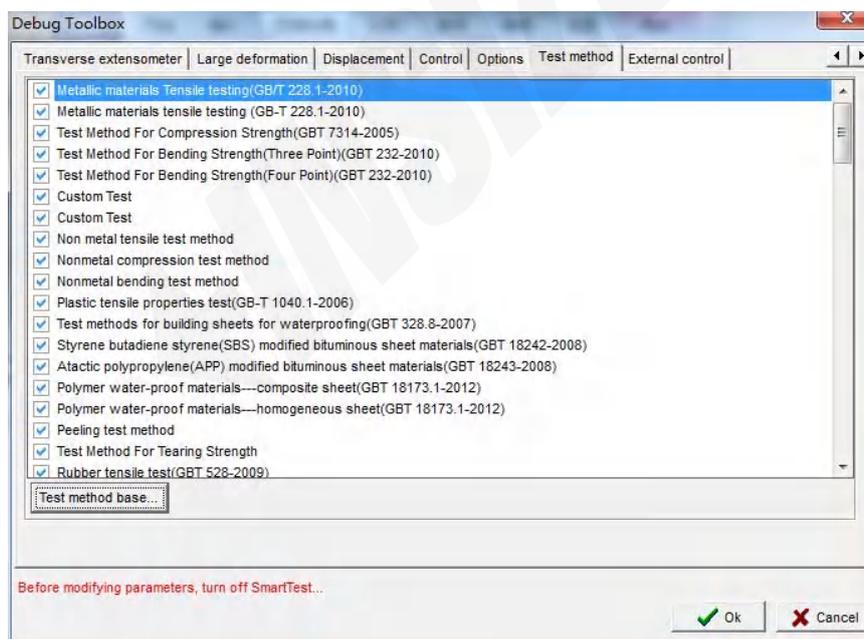
Delete

Close

- 7.2. Rise, fall converse: The direction of the beam's movement (used in the electronic universal class).
- 7.3. Frame structure: The electronic universal class has a single space (downwards tension and compression, tension and compression reverse direction) and double space (Upper space for tension, lower space for compression, tension and compression in the same direction) and double space (Pull on the pressure, tension and compression in the same direction), single space(one way or another on the pressure, tension and compression reverse); servo (two-way cylinder) has a single space, dual space, the cylinder is on the top, under the difference; servo (one-way cylinder) only double space, but can be divided Set, under the set.
- 7.4. Digital dial indicator inverted: When the deformation source is a digital dial indicator, the software acquisition of the deformation signal is reversed.
- 7.5. Predistortion and stiffness correction of the distortion measured by the dial gauge and large deformation: When the source of deformation is the dial gauge or large deformation, the force value is greater than the pretightening force before recording, and when the deformation is less than the preload, the deformation Display 0.

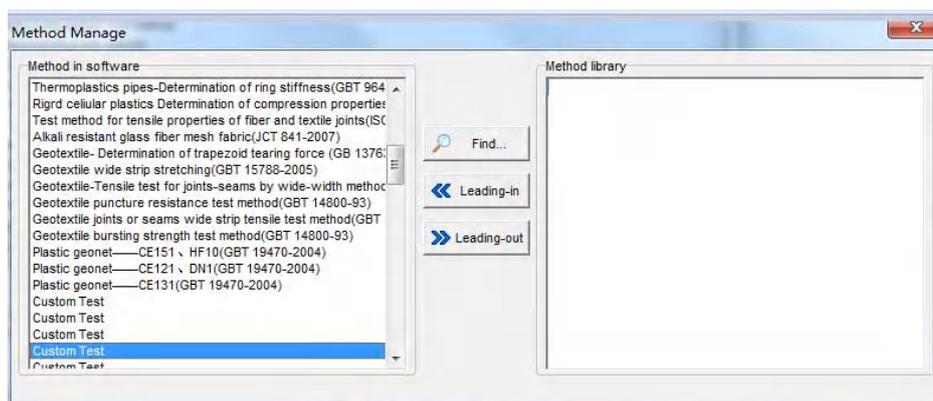
## 8. Test methods

All the built-in test standards of the SmartTest program are listed in the list. Some of them may not be needed by the user. The user only needs to remove the previous standard from the listed standard and it will not be displayed in the control program. (The latter several are their own customized test methods. The customization methods have already been described in the foregoing and will not be repeated here.)

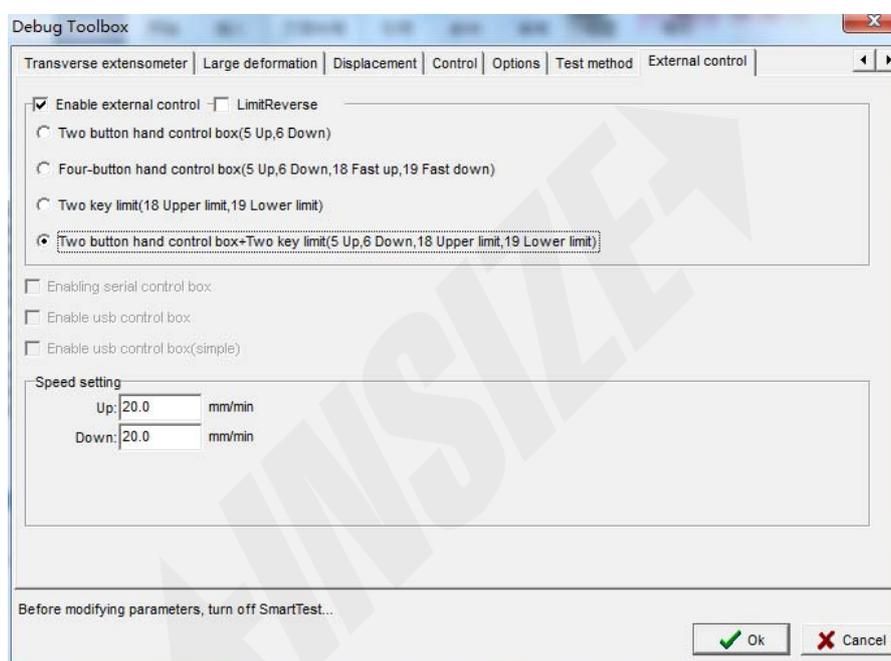


### Test method library

It is convenient for the user to import or export the test method, etc.; the completed test method can be imported into the current system; or the existing test method can be exported for storage.



## 9. External control



Enable external manual box, enable serial port control box and enable USB manual box. The speed setting is to set the moving speed when rising or falling. When only the limit is selected in the external control, one of the other two manual control modes can be enabled to use the following figure.

External control refers to the rising, falling, and reaching limit stop actions made by the input software that determines the digital signal.

## Appendix II Programming and Program Execution

Note: It is applicable to microcomputer controlled electro-hydraulic servo universal testing machine and microcomputer controlled electronic universal testing machine.

## I. Application

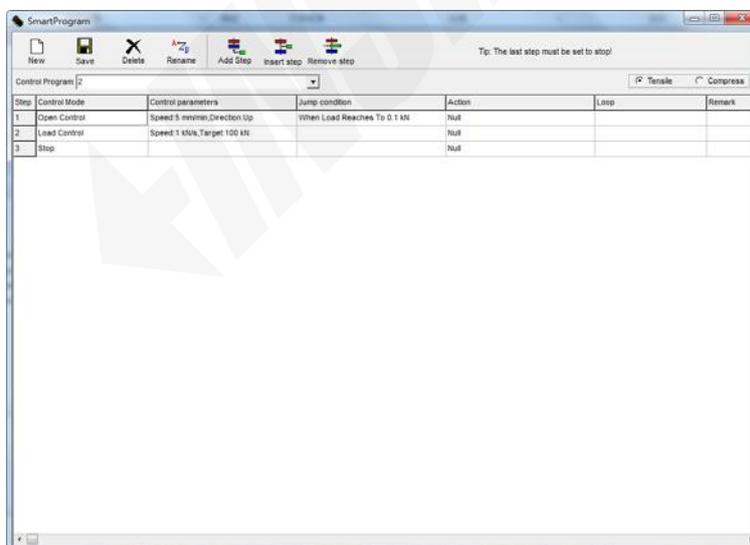
Programmable control allows users to customize a multi-step control program file according to their own needs according to certain programming specifications. This control program is saved as a file, and the user can invoke or modify the edit according to the name.

## II. Program execution

In the fourth step of the program, select program control and click [Program] to pop up the programming interface. After the production is completed, save the program. After entering the test, press the [Start] button to start the test. The system will be gradually executed according to the set procedure. At the same time, the content display will be dynamically refreshed as the steps continue, ie, the current execution step is displayed in different colors, and the user can see at a glance. Depending on the procedure, users may not interfere with the entire control process. However, sometimes the user may have to intervene in the continuation or stopping of the control procedure (see the programming instructions for details).

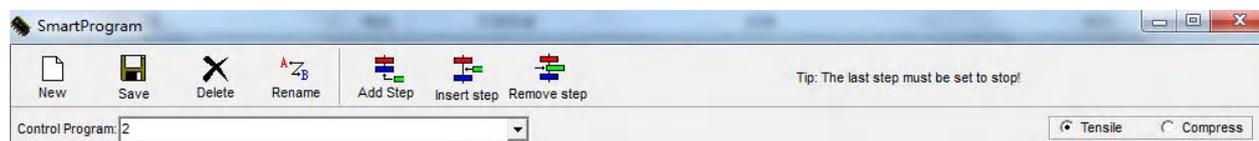
## III. Programming

Relative to the execution of the program, the preparation of the program becomes more complicated. In the stop state, click the [program] button and the programming interface will appear. (below) (Program Editor SmartProgram is a separate application, so it is also possible to run SmartProgram.exe directly to run this program).

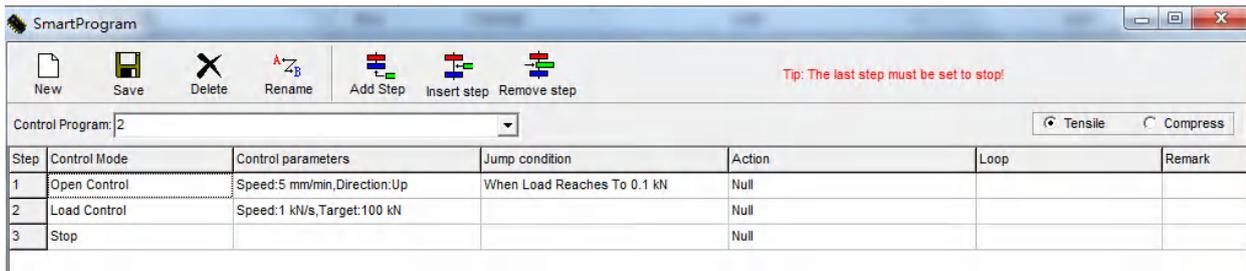


### 1. New, Delete and Rename control program

Users can create new program files according to their own needs. When entering the program name, it is usually best to select a meaningful name. In this way, you can get a general idea of the content from the name. Renaming allows you to change the name later. Deleting will delete the control file you selected.



## 2. Program content



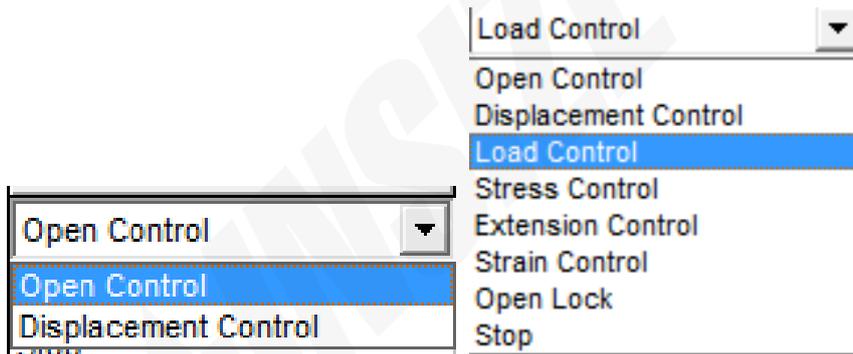
The details of the program control program are shown in the table below, and it is also where the user edits the contents of the program.

## 3. Edit program structure

When the user creates a new program, there is only one step at the beginning, and the user must add the program line as needed (press the [Add Step] button). The new line is at the end of the program; during the editing process, it is sometimes necessary to delete the program line. Program line (press the [Remove step] button), the current line is deleted. [Insert step] can be anywhere in the program. After the program changes, press the [Save] button to save the changes to the hard disk.

## 4. Edit program content

### 4.1. Control mode settings



Click the control mode column of the step row that needs to be edited. A drop-down list of control modes will appear. Users can select from the list:

*Open-loop displacement control:* The displacement sampling value is the control index, and the open-loop mode has only one speed parameter. The direction of the displacement is determined by controlling the positive and negative of the speed, which is positive upward and negative negative. It is suitable for occasions where the control speed accuracy is not high, such as the high-speed breaking process in the final stage of the metal tensile test. Because it is open-loop control, it has a higher response speed;

*Closed-loop displacement control:* The displacement sampling value is the control index, closed-loop mode, it has two parameters of control target and control speed, the system will automatically determine the control direction according to the control target value;

*Constant force control:* The force value is the control index, closed-loop control;

*Constant velocity stress control:* The stress value is the control index, closed-loop control;

*Constant velocity deformation control:* The deformation value is the control index, closed-loop control;

*Constant velocity strain control:* Strain value is the control index, closed-loop control;

*Open-loop lock:* It can also be called output lock without control parameters. It cannot be used alone. It must follow the above specific control mode. When switching to control lock, the system will lock the switching control output. During the entire control lock mode, this control output will remain unchanged. Until you switch to

another control mode. Obviously, it is an open-loop control and is suitable for some difficult-to-control phases of closed loops, such as the yield phase of metal tension control.

*Stop:* The test is stopped;

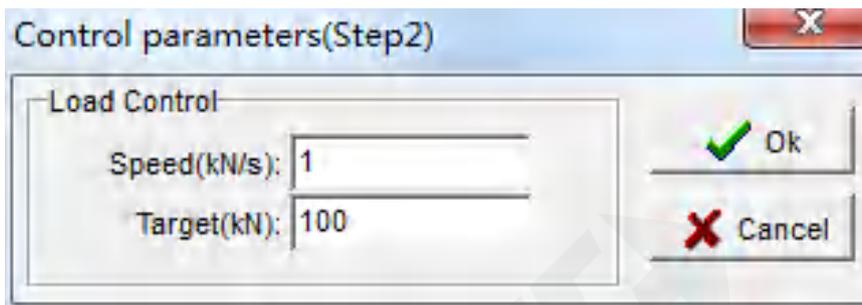
*Displacement hold:* keep the displacement value when switching;

*Force maintenance:* keep the force value when switching;

*Deformation hold:* Holds the deformation value when switching.

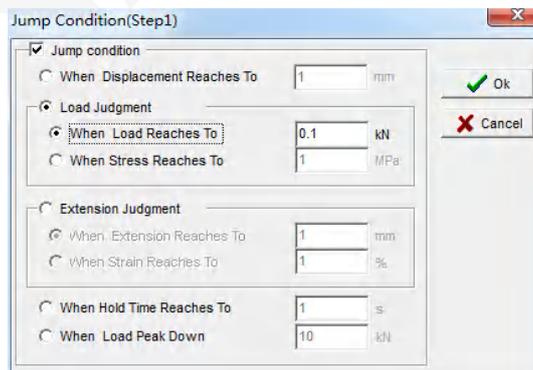
**Note:** The last three hold controls are only used if you cannot determine the size of the hold target in advance. If you are known to keep the target value in advance, use closed-loop control of the displacement, force, or deformation.

#### 4.2. Control parameter setting



Click the control parameter column of the step row to be edited by the mouse, and a control parameter setting window will appear. According to the different control modes, the setting of the control parameter is different. If the control mode has no parameters, this window does not appear. The control parameters are generally speed and target. The setting range of speed is related to the maximum and minimum control of the single control mode of the control board. Click on the [Displacement] control page of the [Control Panel]. If the velocity file is at a minimum of 0.05 and a maximum of 500, then the displacement control mode (both open and closed loop) must be between 0.05 and 500 if the user enters it. The value is outside this range and the system will pop up a prompt box. The same applies to other forces and deformation controls. The setting of the target will determine the direction of system control. (This will be explained further in the following programming example).

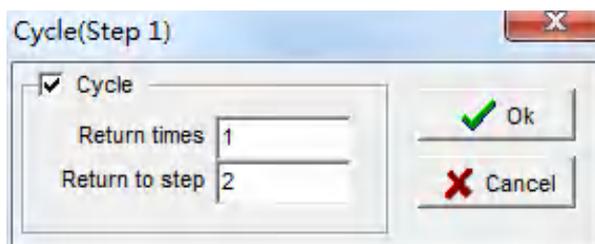
#### 4.3. Jump condition settings



A program control program is composed of multiple steps. When a step is executed, there must be a question of when to execute the next step (the so-called next step is not necessarily the next step of the current step). Therefore, we introduce Jump condition settings. Click on the jump condition column of the step row to be edited by the mouse, and a jump condition setting window will appear. First, select [Auto Jump] to be effective, and the jump conditions are as shown in the figure, mainly determined by the displacement, force, deformation, and time. Then, the user selects and enters values as needed. There are two points to be explained

here: First, the meaning of "When...reaches to", "When...reaches to" sometimes means greater than, sometimes the representative is less than, and is determined in the actual control process. For example: In this step, the displacement judgment is selected and the judgment value is 100mm. If you call this step, the displacement value is less than 100mm, then this condition is equivalent to the displacement > 100; if the displacement value is greater than 100, then this condition is equivalent to the displacement < 100; the second is the meaning of "duration", The duration condition is generally used to maintain the control, and when the sampled value is within  $\pm 1\%$  of the packing target, it is considered that the packing is started (see the programming example below).

#### 4.4. Cycle settings



Sometimes, users need to repeat a control process several times or even hundreds of times. If this control process is repeated, it will be a very tiring job. Therefore, the system has one loop setting at each step. Mouse click on the loop setting column of the step row to be edited, a loop setting window will appear. Under normal circumstances, the user does not need to set it. After the program finishes the current step, the following step will be performed next. If the user sets the cycle, after the current step is executed, the program will repeat the step according to the setting and return to the previous step, so that one cycle at a time until the number of cycles exceeds the set value. When this step is executed again, the next step is executed. One step below it is to jump out of the loop.

#### 4.5. instructions setting

A program may have many steps. There may be many parameters for a step. Thus, for program editors, he understands the role of each step. For other people who use this program, it may be difficult to read. Therefore, it is a good practice to add a clearly defined explanation to each control step. Click on the description column of the step line to be edited with the mouse and a description setting window will appear.

### 5. Programming examples

#### 5.1. Procedure 1: Stretching Control Procedure for a Certain Metallic Material

**Requirements:** The loading speed of the elastic section is 10 KN/s, and the yield point is approximately 200 MPa.

After the yield is completed, the specimen is broken at a speed of 20 mm/min.

**Programming:** The force loading direction is the stretching direction, the preloading speed is 5mm/min, and the specific program is set to 4 steps (below).

Step	Control Mode	Control parameters	Jump condition	Action	Loop	Remark
1	Open Control	Speed: 5 mm/s, Direction: Up	When Load Reaches To 0.1 kN	Null		
2	Load Control	Speed: 10 KN/s, Target: 100 kN		Null		
3	Stop			Null		

**Note:** According to requirements, the first step of the program is open-loop constant-velocity displacement control with a speed of 5 mm/s. When the force value reaches 0.1 kN, it jumps. The second step is to use constant velocity force control as required. The target value of speed 10KN/s is set to 300KN. The purpose is just to keep the system in a loaded state. It will never reach the target value because the jump condition of this step is the force value. To reach 19kN, (from the front that this material yield point is about 200MPa, but in the yield stage can not be forced control, it must jump ahead) that is when the force value is greater than 19kN, jump to

the second step. The third step uses constant velocity deformation control. When the deformation reaches 1mm, we think that the yielding segment is over, so the jump condition is set to 1mm. The third step is the rapid separation phase. A target value of 50 mm will ensure that the system will always move in the direction of increased displacement before the specimen is broken. The jump condition at this time is actually a pull judgment. The stop of the fourth step is not necessary. If the procedure to be executed exceeds the steps of program editing, the system will issue a stop command. However, it is a good habit to set the stop as the final step.

**5.2. Procedure 2: Automatic Ring Calibration Procedure for 100kN Sensors**

*Requirements:* The system automatically loads to 20kN, 40kN, 60kN, 80kN, 100kN points in order, and the low speed passes through the above points to ensure accurate readings. Then automatic uninstallation ends.

*Programming:* The direction of force loading is the direction of compression (if there is an inverter, it is the direction of tension), and the preload speed is 5mm/min.

The screenshot shows the SmartProgram software interface. At the top, there is a toolbar with icons for New, Save, Delete, Rename, Add Step, Insert step, and Remove step. A red tip message reads: "Tip: The last step must be set to stop!". Below the toolbar, the "Control Program" is set to "test1" and the test mode is "Compress". The main area contains a table with the following data:

Step	Control Mode	Control parameters	Jump condition	Action	Loop	Remark
1	Displacement Control	Speed:5 mm/min,Target:500 mm	When Load Reaches To 1 kN			
2	Load Control	Speed:2 kN/s,Target:20 kN	When Hold Time Reaches To 20 s			
3	Load Control	Speed:2 kN/s,Target:40 kN	When Hold Time Reaches To 20 s			
4	Load Control	Speed:2 kN/s,Target:60 kN	When Hold Time Reaches To 20 s			
5	Load Control	Speed:2 kN/s,Target:80 kN	When Hold Time Reaches To 20 s			
6	Load Control	Speed:2 kN/s,Target:100 kN	When Hold Time Reaches To 20 s			
7	Open Lock					

*Note:* Step 1 is the approach of the beginning. At this time, since there is no contact with the force measuring ring, the displacement control must be used. When the actual contact (the force value reaches 1kN), it jumps to step 2 and adopts the force control mode. The duration of the jump condition from step 2 to step 6 is 20 seconds, that is, the target hold time is approximately 20 seconds. When approaching the target value, the system will automatically slow down, so the time can be set accordingly longer. Step 7 is to uninstall. Stop manually by the user.

## Appendix III Treatment of Common Problems

### I. Install

No.	Error message	Solution
1	The system file is outdated and must be restarted	Restart the operating system after exiting.
2	A DLL file is being used by another application and cannot be updated	Close other applications in use, or simply "ignore".

### II. Start

No.	Error message	Solution
1	A DLL file or other file could not be found	1) Find this file on the installation CD and copy it to the program working directory (C:\Program Files\SmartTest); 2) Rerun the SmartTest installer and select [Repair].
2	System illegal error or program cannot start	Check whether the driver and installation of the monitoring and control card are correct. For the inspection method, see the installation instructions of the card.
3	Demo version	Run the configuration toolbox program "SmartDebug.exe" to check the system configuration.
4	The software has expired and needs to be re-registered	1) Check if the system date of the computer is correct. If it is not correct, please re-run the program after modification; 2) The authorized system registration use date has arrived and ask the provider for a new registration code. <i>Note: If the software expires, you need to re-register. In this case, please contact the manufacturer in a timely manner. Do not reinstall the software yourself. This will change the control parameters for the machine and cause it to fail to recover.</i>

### III. Run-time

No.	Questions	Cause of failure (solution)
1	Both force and deformation are shown as 0	1) Restart the computer or reset the monitoring card in the computer to a slot; 2) Check sensor lines and sensors.
2	After the test curve is recorded for a period of time, it is no longer recorded	The test is taking too long and the default settings have been exceeded. You can change the recording frequency of the curve in the [System Settings] menu.

3	Automatic analysis result is wrong	Check the [Analysis Parameters], if there is no problem with the analysis settings, then the test curve may not meet the requirements of automatic analysis. Please manually analyze.
4	No force	1) no board driver; 2) sensor damage; 3) Card damage.
5	Force jumps, no effect on shielding	1) No sensor connected; 2) The sensor cable is not fully connected or short-circuited; 3) sensor damage; 4) Card damage.
6	Force continues to rise to full scale	1) No sensor connected; 2) The sensor cable is not fully connected or short-circuited; 3) The sensor is damaged.
7	No value for deformation	1) The source of deformation does not have an extensometer selected; 2) Extensometer cable damage; 3)Extensometer cable is not fully connected or short-circuited 4) Damage to the extensometer; 5) Card damage.
8	Deformation jump	1) The extensometer does not connect; 2) Extensometer cable damage; 3) External interference.
9	Displacement is abnormal	1) The encoder wiring is wrong; 2) The encoder is not connected; 3) The encoder has a problem; 4) The encoder is an open-drain output and needs to be connected to a pull-up resistor; 5) Card damage.
10	Sample pulls off the software without stopping	1) There is no choice to break the judgment, the sample does not stop after breaking; 2) The maximum force at which the specimen breaks is too small, and the condition for starting the breakage judgment is not reached.
11	No data	1) There is no choice to break the judgment, the sample does not stop after breaking; 2) The maximum force when the specimen is pulled off is too small to meet the conditions for starting to break the judgment; 3) Did not enter the sample information involved in the calculation; 4) Did not click the software start test button; 5) There is no new sample, cover the previous data.
12	The original gauge length L0 of the sample diameter also changes	Remove the scale factor (gage scale magnification). If it is a standard sample, you can also use the scale factor: 11.3 for fine, 5.65 for coarse, not empty for standard samples.
13	Universal machine stiffness correction (deformation - time)	1) First, press the plate (rigidity of the iron) against the pressure, press to full scale, click the [storage rack stiffness] button above the

	curve	<p>curve plate;</p> <p>2) [Settings] → [System Parameters] → Rectify the stiffness of the rack;</p> <p>3) Once again for pressure, this time the deformation should be approximately 0, indicating that the rack stiffness is corrected.</p>
14	The encoder value does not move (the value goes in one direction)	<p>1) The line connection is wrong;</p> <p>2) Deformation source selected "beam displacement", control mode "pulse";</p> <p>3) The driver selects the "direction + pulse" control method.</p>
15	Electronic universal speed is fast or small speed does not move the driver alarm	<p>1) The number of pulses emitted by the board to the driver is too much, the driver reacts to alarm, then the speed factor can be multiplied by about 0.4 (the multiplier is determined by the driver output pulse, and then the numerator and denominator are adjusted);</p> <p>2) The electronic universal displacement calibration coefficient should be kept within 0.1~0.005 (or so). If not, please adjust the output of the driver by the multiplier (smaller).</p>
16	Yield Strength	<p>1) In general, said yield strength means "lower yield strength";</p> <p>2) The calculation of yield must have "force";</p> <p>3) If yielding but the yield point is not obvious can be replaced by Rp0.2;</p> <p>4) Judging that ReH, ReL, Rp, Rt must all be in the yield section (obvious yield), if ReH, ReL is not in the yield section, then the yield judgment starting point is set unreasonably; if Rp, Rt is not in the yield section, the elastic section marker point P1, P2 settings are unreasonable.</p>
17	The difference between elongation and elongation	<p>Elongation: The ratio of the elongation of the specimen to the original length when subjected to uniaxial tension.</p> <p>Elongation: corresponds to the elongation at which the load reaches the tensile strength, whereas the elongation is actually a specific value of the elongation.</p>
18	Force calibration factor cannot be changed	<p>1) There is no "save" → "OK" when configuring the toolbox.</p> <p>2) The correction factor is first changed to the initial value and then decalibrated. The initial value is "1".</p>
19	Stepper motor start too fast, crash?	<p>1) In the software [Adjustment] → [Stepper motor speed adjustment] → Loading speed 0.1Hz;</p> <p>2) Increase the division number.</p>
20	No curve or small curve after the start of the point	<p>1) sample slip;</p> <p>2) Click Fit on the curve board toolbar.</p>
21	When must use extensometer	<p>1) There is strain and deformation control in the control process;</p> <p>2) The data required in the test results are related to the elastic section of the material (such as elastic modulus).</p>
22	Under what circumstances can not use extensometer	Only seek to yield ReH, ReL, specify plastic elongation strength Rp0.2, tensile strength Rm, etc.

23	Open software prompt "Invalid called party"	The system needs to reinstall software.
24	Prompted in the trial "no registration category"	1) Restart the computer; 2) reinstall software; 3) Reinstall the operating system.
25	Electronic universal action	1) Check whether the card output is normal; 2) Check if the lines are all connected properly; 3) Observe whether the servo driver alarms; 4) Whether the servo driver needs an external switching power supply.
26	Open software data board does not appear	Click [Test Selection] to select the test method to see if the data board appears, otherwise reinstall the software.
27	No response to rise or fall in electronic universal operation	1) Check the wiring, whether the connector plug is paired; 2) whether the selected driver corresponds to the software configuration toolbox; 3) Whether the parameters in the driver are correct; 4) Whether the driver alarms, and then restart after power off and restart; 5) Really did not find out the reasons, self-test drive, whether the motor rotation, there is no action to explain the problem with the drive. 1)
28	Rp0.2 is not accurate	1) whether the force value is accurate; 2) The accuracy of the extensometer acquisition deformation; 3) whether the extensometer is clamped (or skid); 4) Whether the values of P1 and P2 in the test force-deformation curve are accurate 5) Whether the hydraulic cylinder of the hydraulic tester is not raised or not cleared; 6) Select [Step-by-Step Approach] in [Settings] → [Analysis Parameters] to test.
29	Open software prompt please insert universal test card	1) no board driver; 2) The computer slot is damaged; 3) Damaged board or insufficient board contact.
30	Electro-hydraulic servo test rises normally, falling reset is not normal	1) Rise, stop, drop alternate points several times; 2) Open the reversing valve and clean it with gasoline 3) Replace the reversing valve.
31	The displacement increases continuously after the start of the test, but the force value does not increase	1) The jaws of the brace sample are slipped; 2) The tensile specimen has a large amount of deformation.
32	Displacement at high speed	If the displacement calibration coefficient is too small, the driver pulse output frequency must be turned down to ensure that the displacement calibration coefficient is kept at 3 decimal places.

33	Device movement, force, displacement are not displayed on the software	Observe whether the force and deformation are normal in the hardware test; reinstall the software if the hardware test is normal.
34	After reinstalling the system, open the software prompt and insert a universal test card.	After reinstalling the system, no card driver is installed and the board driver is reinstalled.
35	Two computers, one finished testing, how to put the results on another machine.	In the curve, data two folders, copy the required data.
36	After the board is mounted, the equipment moves, but there is no displacement.	1) Check the connection; 2) The encoder is an open-drain output and needs to be connected with a pull-up resistor; 3) Replace the card.
37	Open the software prompt "A lot of mistakes."	Card driver lost, reload the card driver.
38	The force value on the software shows a negative value.	Add a negative sign before the force calibration factor.
39	How to restore the original software operation after the computer reinstalls the system	1) Find the software installation disk to reinstall drivers and software; 2) Find the original software backup copy and paste it into the software installation directory to cover.

## Appendix IV: Universal Test Card Wiring Definition

