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Version	Revise Date
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V3.2	March 18,2020

I. Contour Measuring Instruments Overview

The measuring work principle of this instrument is the rectangular coordinate measurement method. The surface contour coordinate points of the measured parts are mapped by the X-axis and Z-axis detector, the coordinate point data measured by the detector is transmitted to the upper PC through the electrical components.

The collected original coordinate data will be made mathematical processing by software, and annotate the required engineering measurement items.

II. Installation Requirement

Power Supply: AC 220V±5% 50Hz Separated ground wire

Power Request: Around 500W

Environment Request

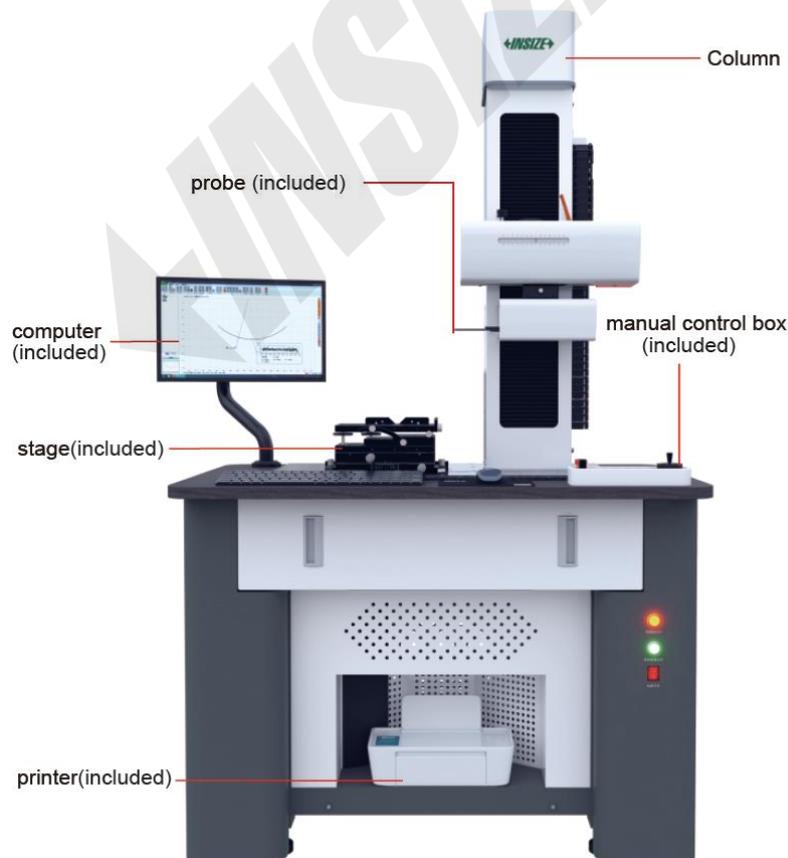
Work Site Temperature: 15~25°C

Ideal Temperature: 20±2°C

Relative Humidity: <85%

There should be no dust, vibration, noise, airflow, corrosive gas and strong magnetic field affecting the measurement around the room.

III. Instrument Structure Diagram





IV. Contour Measuring Instruments Operation Procedure

1. Pay attention to whether the stylus is freely floating while opening the software (if touch on the measured parts, move the stylus away firstly), and then make initialization.
2. Clean the measured parts before the measurement. Choose suitable fixture and clamping method according to the specific measurement position of the measured parts, and fix the measured parts on the fixture.
3. Move the column and the lateral direction of the measured parts according to its measurement position, adjusting the placement angle of the measured parts. The measured position must be contact with the stylus tip.
4. The benchmark of the measured parts measurement must be consistent with the machining benchmark. For the measurement of shaft measured parts, the contour measurement along the axis direction must adjust the axis direction is same with the measurement direction, finding the highest point (outer circle) or the lowest point (inner hole) on the measured parts.
5. Notes: The highest point of the measurement position must be below the stylus range, and the lowest point of the measurement position must be above the stylus range. This can be achieved by moving the column and adjusting the angle of the measured parts. If it can not be achieved after adjustment, the height of the measured parts in the Z direction is higher than the range of the instrument, the measurement cannot be operated.
6. After the adjustment, choosing suitable speed and measuring length, collecting data.
7. According to measurement request, choose rotate graphics or rotate annotate coordinates.
8. Fit the elements of the required project (for straight lines and arcs).
9. Annotate requested measuring items.
10. Please remove the stylus for safe operation next time while disassembling measured parts after the measurement.

V. Contour Measuring Instruments Software Installation

5.1 Software Installation File

- a. Contour Measuring Instrument Software Installation Package



- b. Dongle Driver Installation Package



HASPUserSetup.exe

- c. Capture Card Driver Installation Package



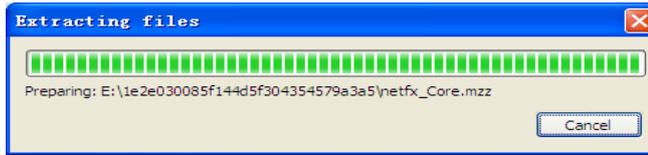
5.2 The Setup Computer Running Environment

Double click icon that is

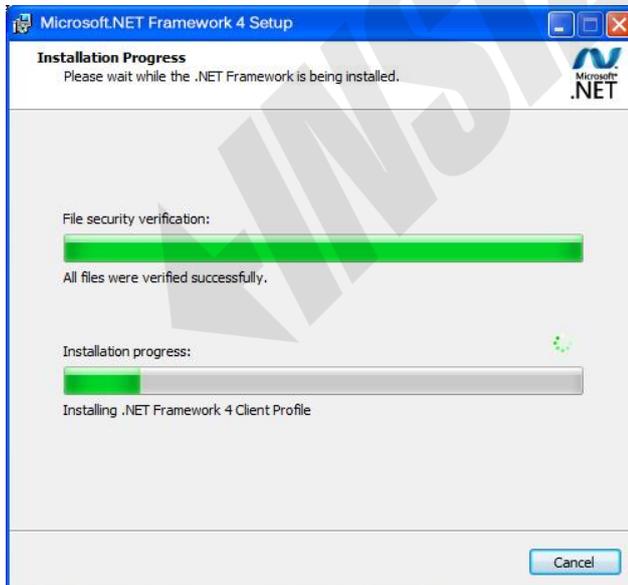


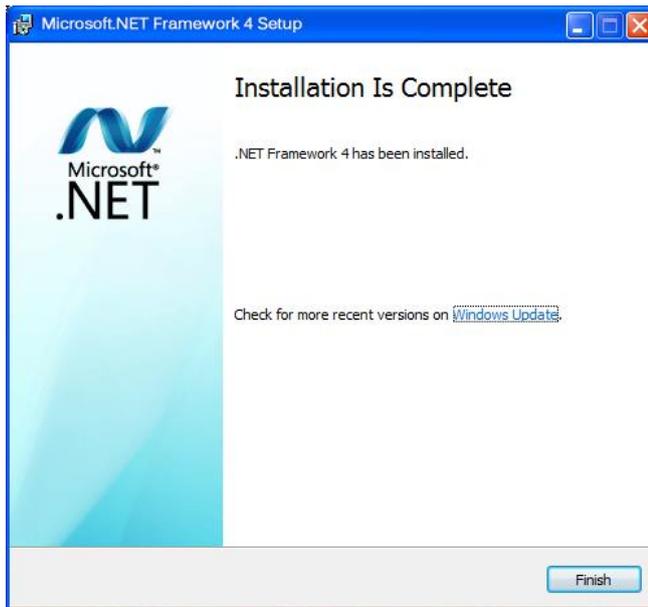
dotNetFx40_Full...
Microsoft .NET F...
Microsoft Corpor...

, If the following page pops up



Select the **I have read and accept the license terms.** and click the (set up) button, and the following page will pop up

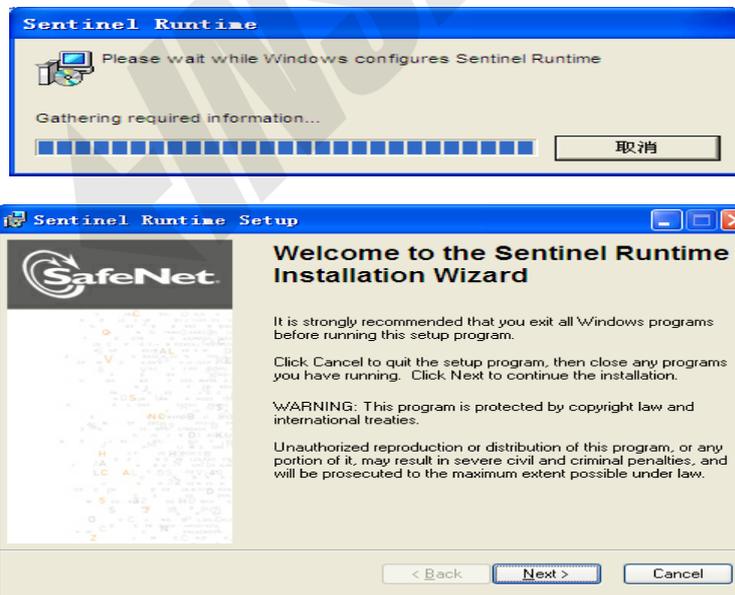


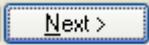


After the page appears in the above, click the [Finish] button to complete the installation of the operating environment

5.2 Dongle Driver Installation Package

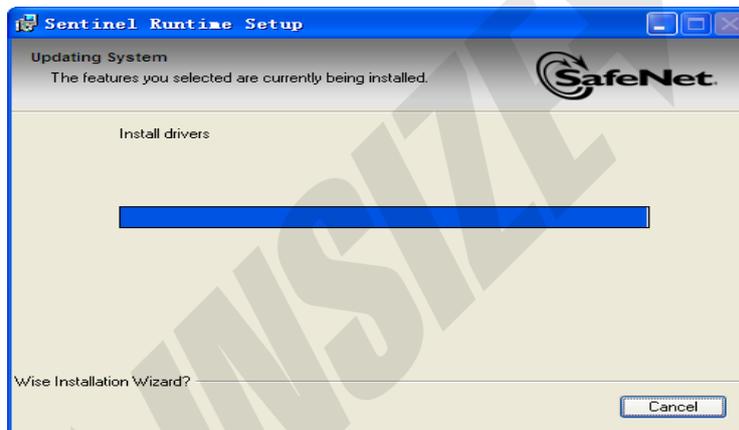
Double click  HASPUserSetup.exe , will see below interface.



Click , will see the following interface.



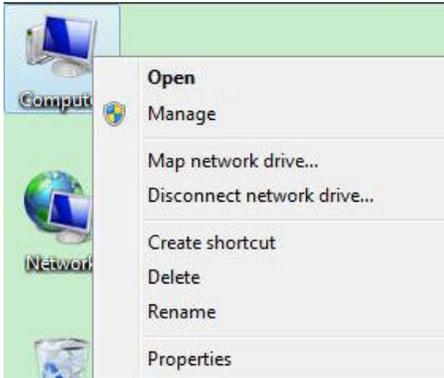
Choose I accept the license agreement, click will see the following interface.



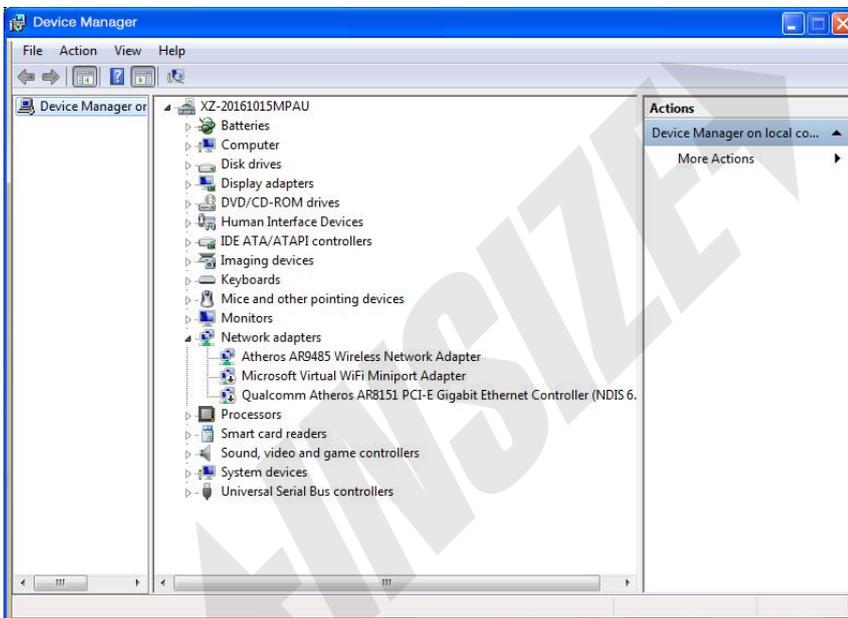
Click "OK", finish dongle running environment installation.

5.4 Capture Card Driver Installation Package

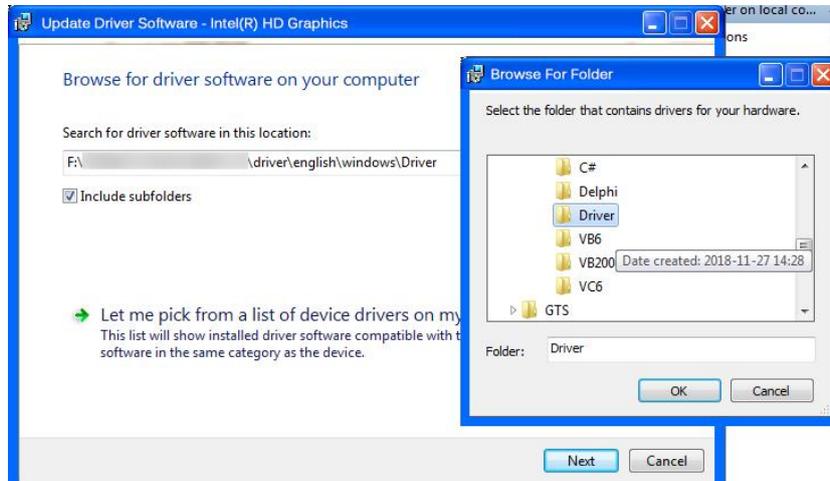
Right-click mouse on computer: select Manage.



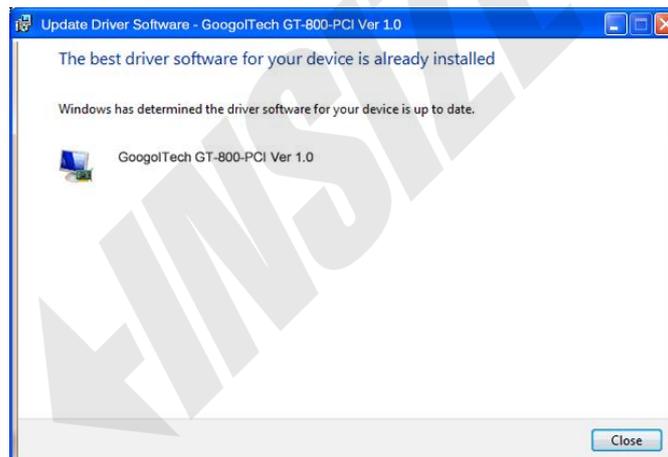
Select device manager and click scan to detect hardware.



Choose  **Browse my computer for driver software**, locate and install driver software manually, browse specified file path.



Choose Drive/Windows/Driver file, click OK, then click Next, will see the below interface.

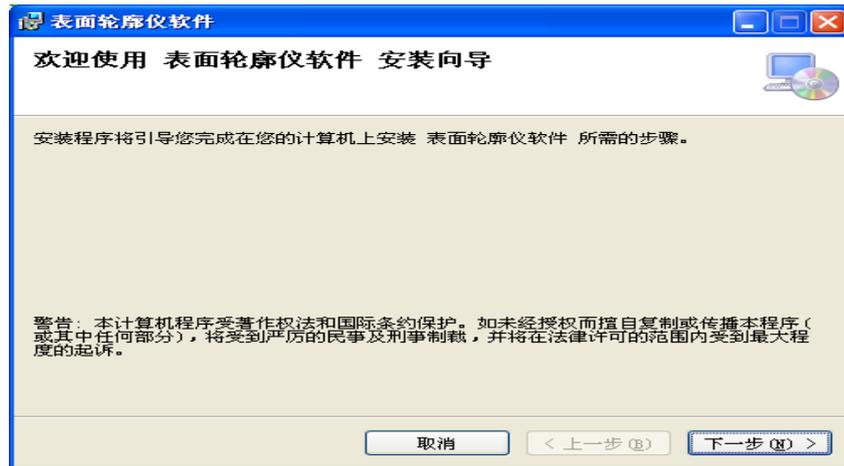


5.5 Contour Measuring Instruments Software Installation Package

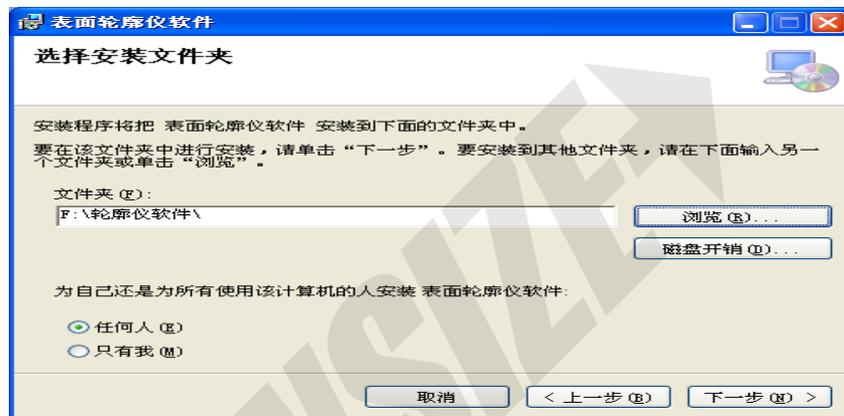
Create new folder “Contour Measuring Instruments Software” in F Disk, mouse double click

this icon  , will popup below interface.

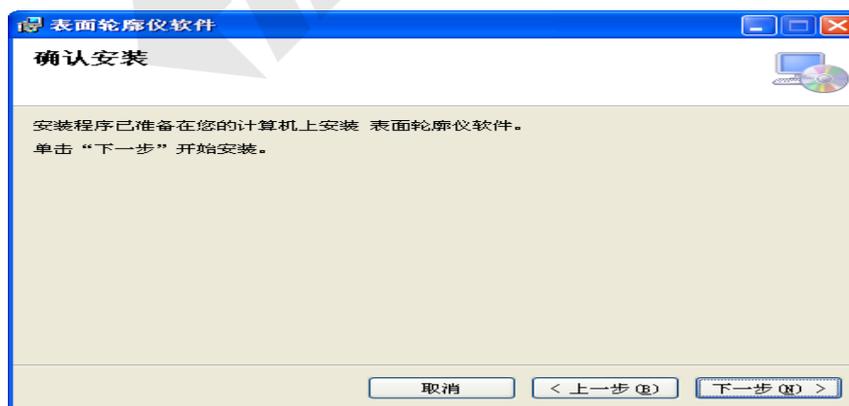
SPWSetup...



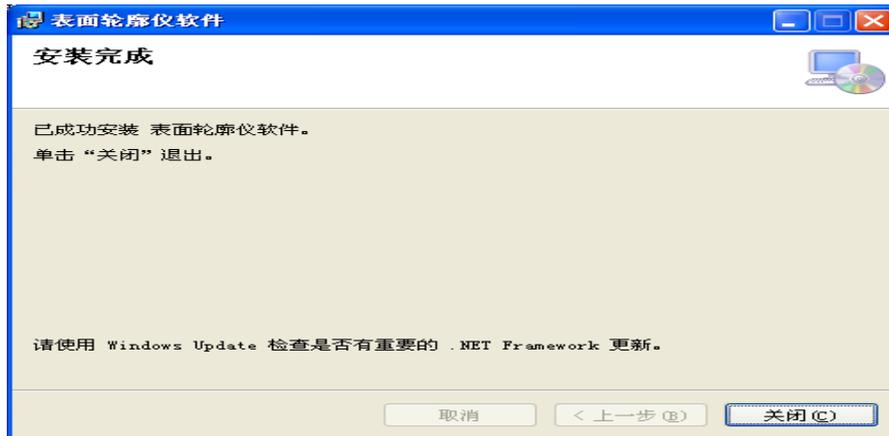
Click Next, will popup below interface.



Choose installation file location in new folder “Contour Measuring Instruments Software”, click Next.



Click Next, will popup below interface.



Click Close, finish all software installation procedure.

VI. Software Operation Instructions

6.1 Software Start



Click this icon on computer desk, enter in Contour Measuring Systems.

6.2 Stylus Initialization

In order to find the lowest point of the stylus, the stylus need to be initialized every time while the software is opened. Please make sure the stylus can reach the lowest point while the stylus is initialized every time.

(NOTE: The full-automatic model can complete initialization automatically. The manual operation model needs to move measurement arm upward and downward to complete the initialization.)

6.3 Software Interface Instructions

The software has two parts function: data collection and contour analysis.

Data collection: The adjustment and set before measurement.

Contour analysis: The data processing after the measurement.

Enter data collection interface after software opened, click start measurement after set. The interface page will be jumped to contour analysis page automatically after measurement finish.



Functional area

Control area

Drawing area

Feature point capture

Quick annotation

Reporting area

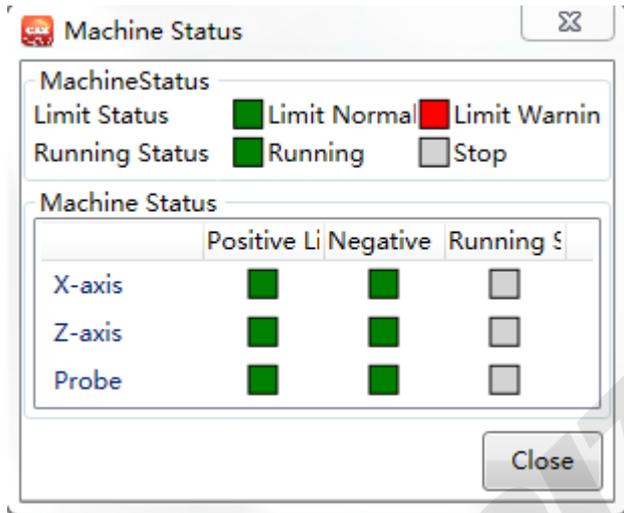
Normal Mark	Point Mark	Require	Measure	Pass												

VII. Data Collection

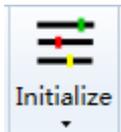
7.1 Collection Interface Menu Bar



7.1.1 Instrument Status

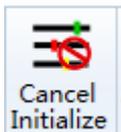


It can be judged from the status of the instrument whether the limit position and running status of the instrument are normal.



Initialization: The horizontal and detector will be initialized after click this button.

(NOTE: The stylus need to be removed from measured parts and the left side must be have no measured parts while initialization. Or make initialization after move up horizontal)



Cancel initialization: cancel the current initialization.



STOP: click this button will stop all work.

7.1.2 Automatic Measurement



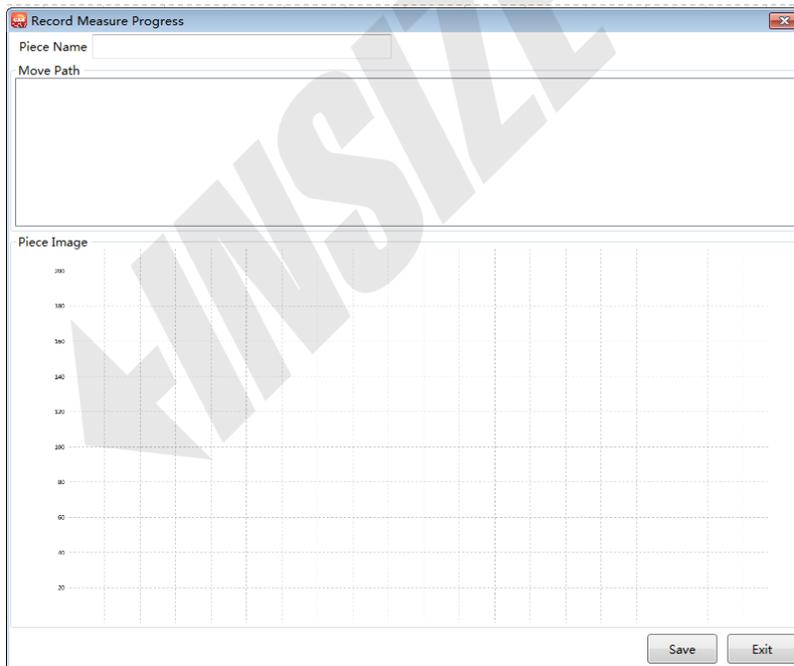
Start Record: Record a script file that measures the same type measured parts.
 Recording procedure: Adjust measured parts position, measuring speed, sampling space, click Start Recording and then click measurement start.

Length mm
 Speed mm/s
 Interval μm

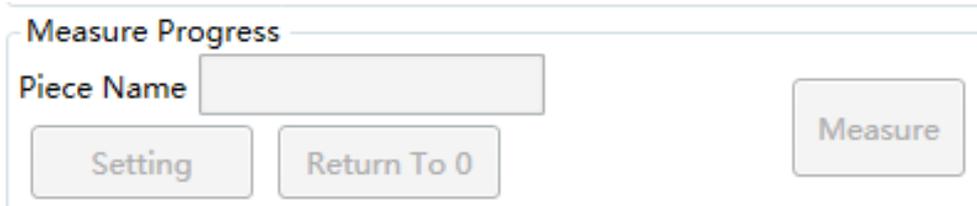
Click Stop Measurement after data collection finished.



will see following interface



Save: Save this script program.
 Exit: Don't save this script program.
 The saved script program is kept in Set.



Return To 0

: The stylus returns to the measurement starting point of this script program.

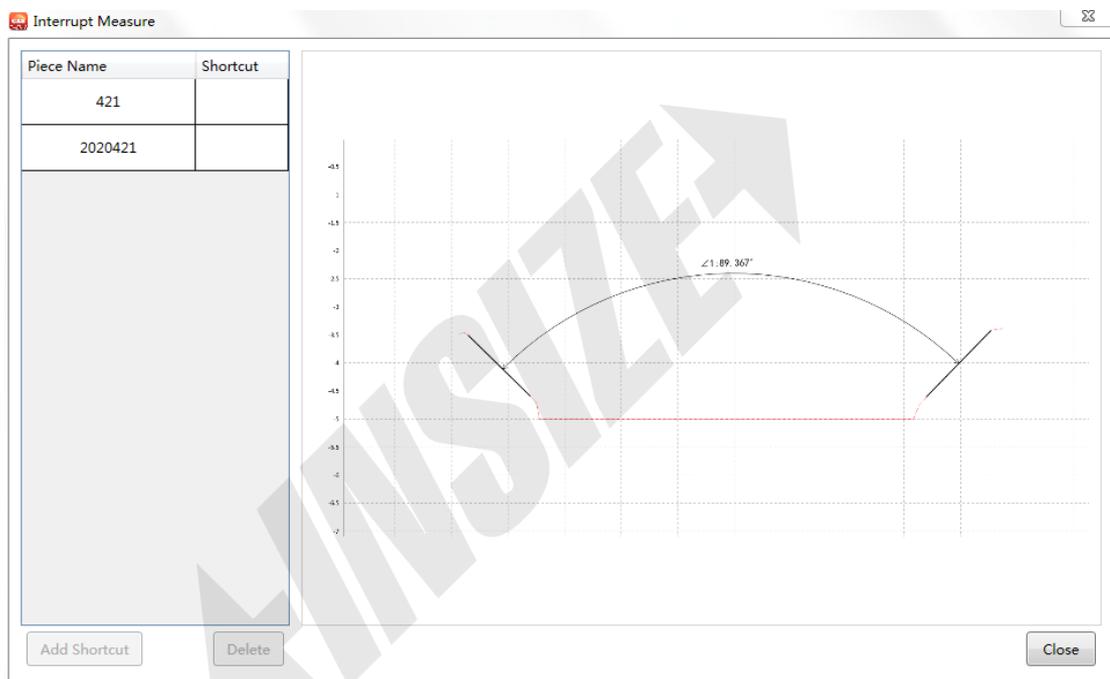
Notice: Keep away from the measured parts during the stylus retraction, and there is no obstruction in the stylus retraction direction.

Measure

: use this script program to make measurements.

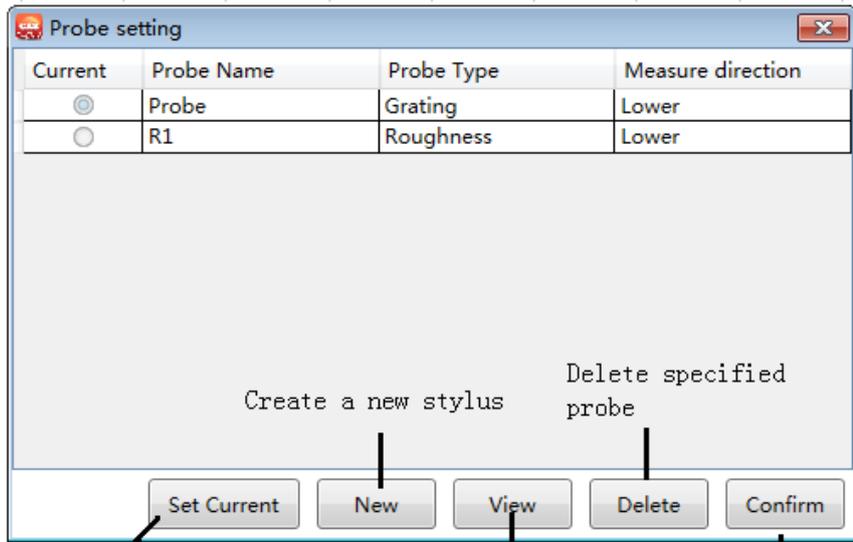
Setting

Click will see following interface.



Add Shortcut: This command can add a script program to the software interface, which can be used quickly and conveniently, as shown below.

7.1.3 Measurement Stylus Set



Set a probe to the current probe

View the specific parameters of the rod

Confirm operation

The measurement arm is divided into grating measurement arm, inductive measurement arm, roughness measurement arm.

Set as current: Set a certain measurement arm as the currently used measurement arm.

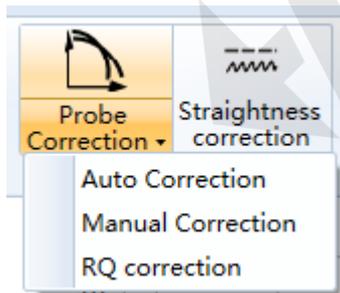
Creat: Create a new measurement arm.

View: View the specific parameters of the measurement arm.

Delete: Delete one measurement arm.

Confirm: Confirm last step order.

7.1.4 Calibration



7.1.4.1 Routine Calibration

The calibration required conditions: 2 gauge blocks, forming 1 drop. 2 standard balls of different diameters.

NOTE:

1. When combining gauge blocks, the exposed length of the bottom gauge block must exceed 5 mm, that is, the gauge blocks are combined into a stepped shape.
2. When measuring a standard ball, the collected data must be symmetrical and the arc angle should be between 115 degrees and 125 degrees.

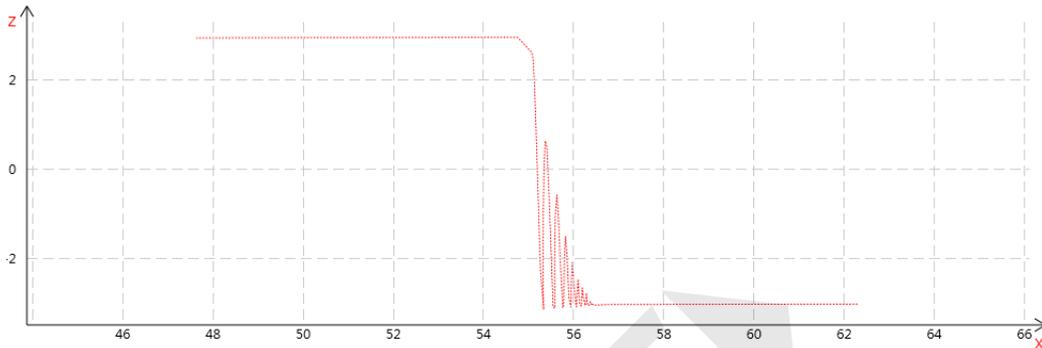
Calibration Procedure

A、 Place the combined gauge block on the fixture, set a reasonable length and sampling speed, collect intervals, and adjust the height position.

Press start button for data collection. The start point and end point of the collection must be on two gauge blocks. If not, the re-acquisition is required. After the collection is completed,

click  to make exporting calibration data operation for the graphic and save it.

Please pay attention the file save location is clear. The below diagram is the data collection reference.

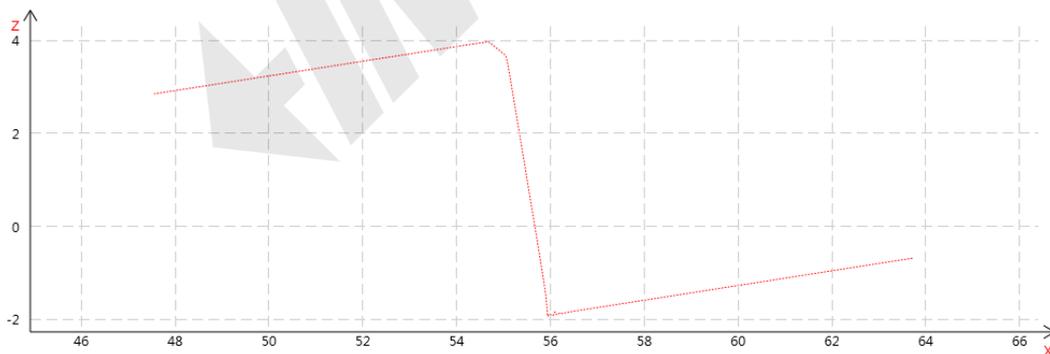


B、 Clamp the combined gauge block 10-15 degrees on the fixture, set a reasonable length and sampling speed, collection interval, adjust the height position, click start button for data collection.

After the collection is completed, click  to make exporting

calibration data operation for the graphic and save it.

Please pay attention the save file location is clear. The below diagram is the data collection reference.

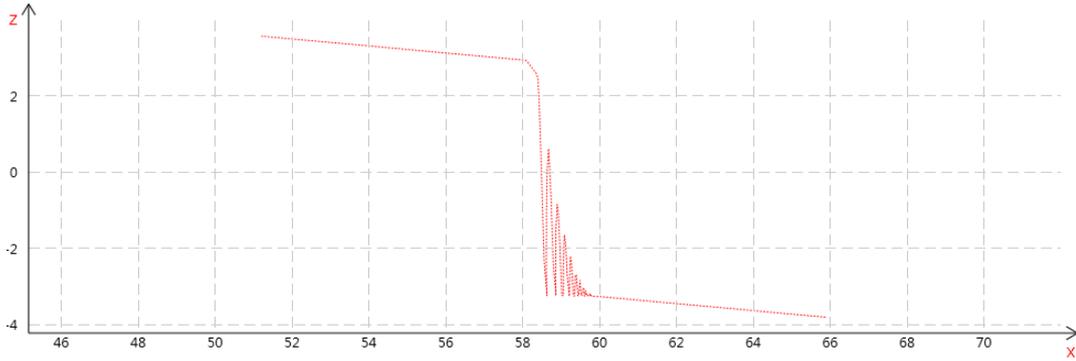


C、 Clamp the combined gauge block with a negative tilt of 10-15 degrees on the fixture, set a reasonable length and sampling speed, collection interval must select “calibration”, adjust the height position, click start button for data collection.

After the collection is completed, click  to make exporting calibration data operation

for the graphic and save it.

Please pay attention the save file location is clear. The below diagram is the data collection reference.



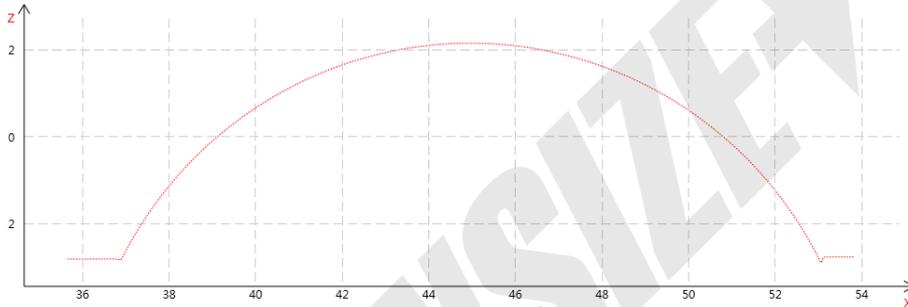
D、 Measure the standard ball 1, adjust the measurement height, and click to start.

NOTE: The measuring arc can be measured on both sides of the plane.

After the collection is completed, click  to make exporting calibration data operation

for the graphic and save it.

Please pay attention the save file location is clear. The below diagram is the data collection reference.



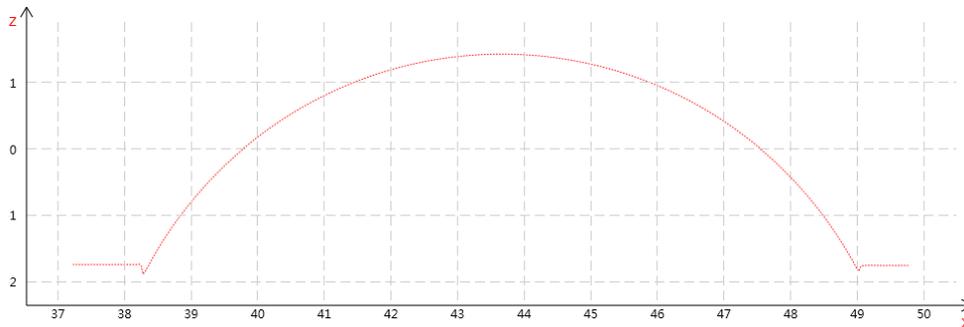
E、 Measure the standard ball 2, adjust the measurement height, and click to start.

NOTE: The measuring arc can be measured on both sides of the plane.

After the collection is completed, click  to make exporting calibration data operation

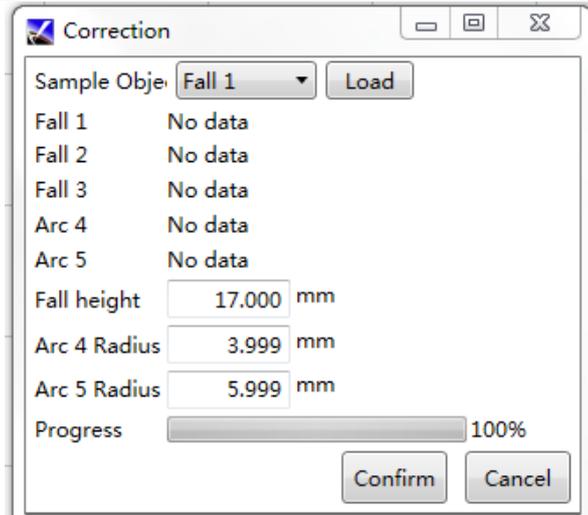
for the graphic and save it.

Please pay attention the save file location is clear. The below diagram is the data collection reference.



After saving the data need to be calibrated, click calibrate, as picture

Note: Standard probes measure approximately 80° from the top of the calibration sphere for ball measurements. chisel and cone probes calibrate from the plane of the calibration sphere. Ball probes calibrate by measuring approximately 180° from the top of the calibration sphere.



For data loading, the Fall 1 is corresponding to the first data collection file, the other sources are in same way.

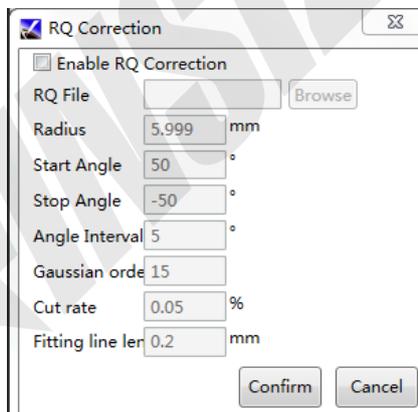
for example, to measure a 10mm block, set the value of Fall height to 10mm.

After loading, fill in the fall height and fill in the arc radius accordingly. The arc source file must correspond to the filled arc radius. Click “confirm” to complete the calibration.

7.1.4.2 RQ Calibration

RQ calibration required for ball probes only.

Add the calibrated arc data to the RQ correction file and enable it.



7.1.5 System Set

Click this icon , will see below interface.



	Speed 1	Speed 2	Speed 3	Speed 4	Approach	
Axis-X	5	10	15	20	5	mm/s
Axis-Z	5	10	15	20	5	mm/s

Each axis zero position setting

Zero Pos

Axis-X 0 mm

Other Setting

System Language English

Confirm Cancel

Axis-X Zero Position: refers to the coordinate value in the software coordinate system where the physical zero position is located after horizontal initialization

Axis Move Speed: The horizontal and vertical columns are set by 4 gears, they are related to speed adjustment. The value filled in the gear will match the speed of the bottom layer.

7.1.6 Collection Set

The icon is , click this icon will see following interface.

Preset Value: Set sampling speed, measuring length max. value, min. value.

Measure information and piece information: Enter measurement information and measured parts name in the report.

Sample Result Setting: Set data automatic save path, naming method while data automatic save, set sampling results accuracy, sampling points, filtering method.

Refresh frequency at current position: Image refresh rate during measurement.

Auto Contact Speed: Falling speed of column during automatic contact.

7.2 Control Area Operating Instructions

Axis-R 0.0000mm
Axis-X 0.0000mm

Contour measure
Sample Range $\pm 10\text{mm}$

Length mm

Speed mm/s

Interval μm

Bearing Parameter
Bearing Type

Whorl select

Piece Name:

Measure Progress
Piece Name

Axis Move
Axis-X

Axis-Z

Probe Move
Probe Up Value mm

Contact
Value mm

Approach
Move type Location Distance
Move Axis Axis-X Axis-Z
Direction Left Right
Distance mm

Current Status

7.2.1 Each Axis Status

Z1	X
0.0	0.000

The detector indicates the lifting amount of the measurement arm, and the horizontal direction indicates the position of the guide rail.

7.2.2 Measurement

Contour measure
Sample Range $\pm 10\text{mm}$

Length mm

Speed mm/s

Interval μm

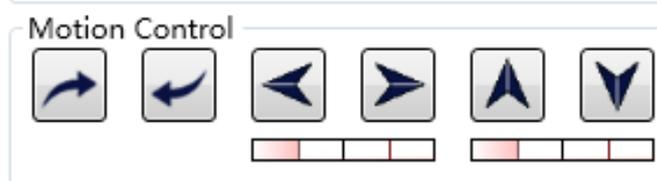
Measuring Length: can enter the measurement length value manually, unit: mm or adjust the measurement length by dragging the bar.

Measurement Speed: set sampling speed, unit: mm. Normal measurement recommended speed: 0.2mm/s or 0.3mm/s, can be entered manually or dragging the bar.

Sampling Interval: set distance between sampling point, unit: mm, can be entered manually or adjust the sampling interval by dragging the bar.

Start Measure: icon is , click it to start measurement. Click the Stop button right side of measurement progress bar will stop measurement, jump to contour analysis page.

7.2.3 运动控制 Motion Control

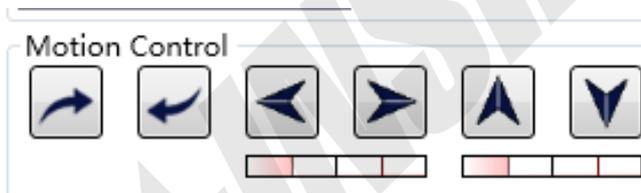


Horizontal left side move, the icon is , long press button will keep moving left, release button will stop moving, equivalent as left direction of operation handle.

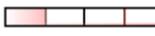
Horizontal right side move, the icon is , long press button will keep moving right, release button will stop moving, equivalent as right direction of operation handle.

Column upward move, the icon is , long press button will keep moving upward, release button will stop moving, equivalent as upward direction of operation handle.

Column downward move, the icon is , long press button will keep moving downward, release button will stop moving, equivalent as downward direction of operation handle.



The arrows on both sides correspond to fast movement, corresponding to the 4th gear in speed regulation. The middle arrows correspond to slow movement, corresponding to the 1st gear in speed regulation. Column movement and horizontal movement are synchronous.

Adjust motion speed: the icon is , divide into 4 gears, 1st gear is lowest speed, 4th gear is highest speed, the speed of each gear can be seen in “System Set”.

7.2.4 Stylus Motion



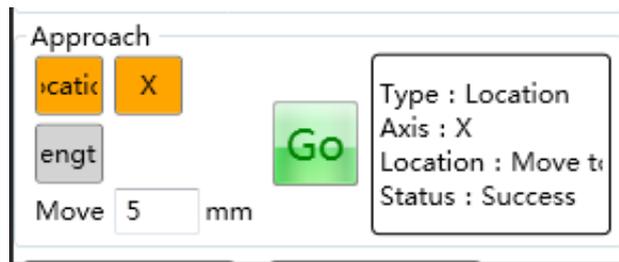
Stylus motion control: adjust by filling the lift amount or dragging bar. Click “Stylus Lift”, the stylus is lifted to the set position. Click “Stylus Fall”, the stylus is fallen to lowest position.

7.2.5 Automatic Contact



Automatic contact control: adjust by entering the lift amount or dragging bar. Click automatic contact, the stylus contact the set position of measured parts.

7.2.6 Fixed Point/Fixed Distance Movement



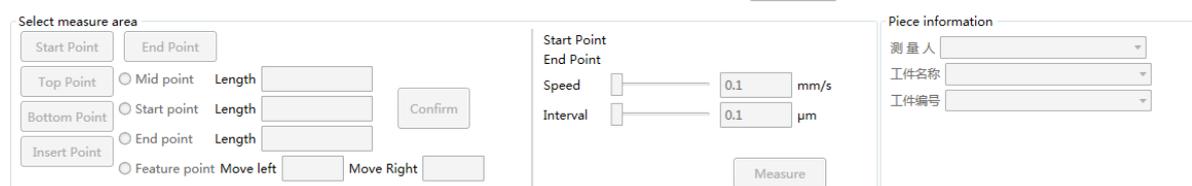
1. Fixed Point Movement: refers to horizontal direction move to designated position (X axis)
 Motion Axis: horizontal direction of X axis.
 Motion Direction: motion direction movement.

Position Move: **Move 5 mm** refer to move to the position of 5mm.

2. Fixed Distance Movement: refer to move a certain distance relative to the current position.
 Axis of Motion: horizontal direction of X axis, movement direction.
 Motion Direction: horizontal direction of X axis move to left or right direction.

Motion Point: **Move 5 mm** refers moves 5mm to the selected direction, based on current position.

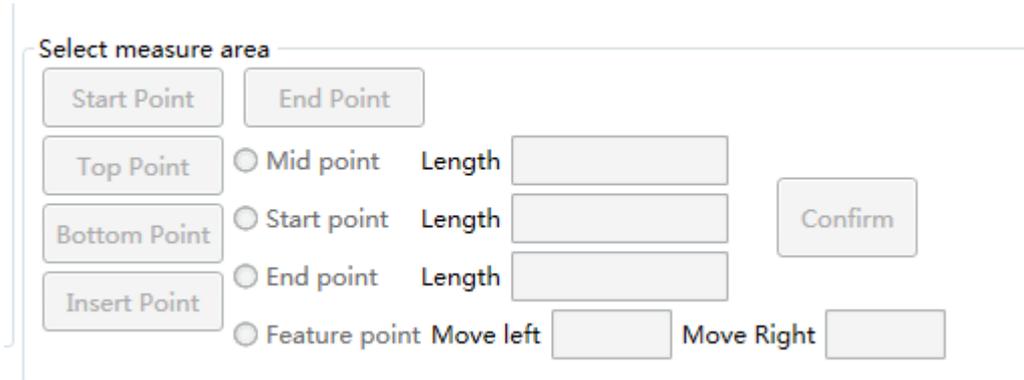
7.3 Measurement Area Set



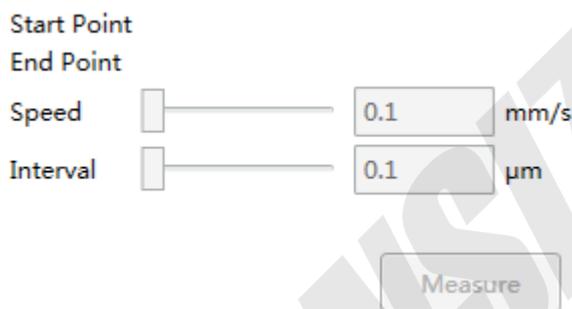
Area set before measurement is for setting more accurate measurement area. After this area set can click **Start Measur** for measurement, it is a separated order button with **Start Measur** in control area.

The preliminary measurement can be made after the measured parts is fixed, and then return to the data collection page for area selection

7.3.1 Measurement Area Choose



1、 Click can select desired start point and end point on the track of measured parts surface contour. Click OK, the measurement area is between the selected start point and end point. At the same time, the right side of measurement bar will display the X-axis coordinates of the start point and end point.



2、 Click can select the highest point on the graph in the display area. The highest point can be used as the midpoint, starting point or end point.

If select highest point as midpoint, enter 5mm in measurement length, the measurement area is 10mm from the highest point as the midpoint.

If select highest point as start point, enter 5mm in measurement length, the measurement area is 5mm from the highest point as the start point.

If select highest point as end point, enter 5mm in measurement length, the measurement area is 5mm from the highest point as the end point

Click OK after selection, the measurement bar will display the X-axis coordinates of the start point and end point.

3、 The operation way is same as

7.3.2 Measurement Set

Start Point
End Point

Speed mm/s

Interval μm

After the measurement start point and end point confirmed, select measurement speed, unit is mm. Suggested normal measurement speed is 0.2mm/s or 0.3mm/s, it can be entered manually or adjust sampling speed by dragging bar. Set sampling interval, unit is μm , it can be entered manually or adjust sampling interval by dragging bar.

After set is finished, click to start measurement.

7.3.3 Workpiece Information

工件信息

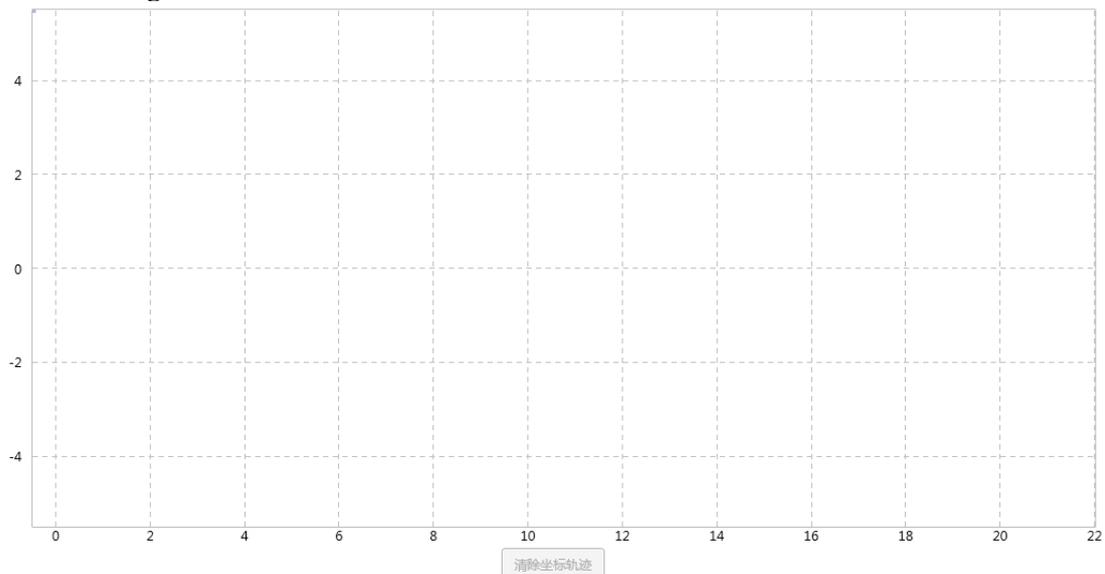
工件名称

工件编号

图纸编号

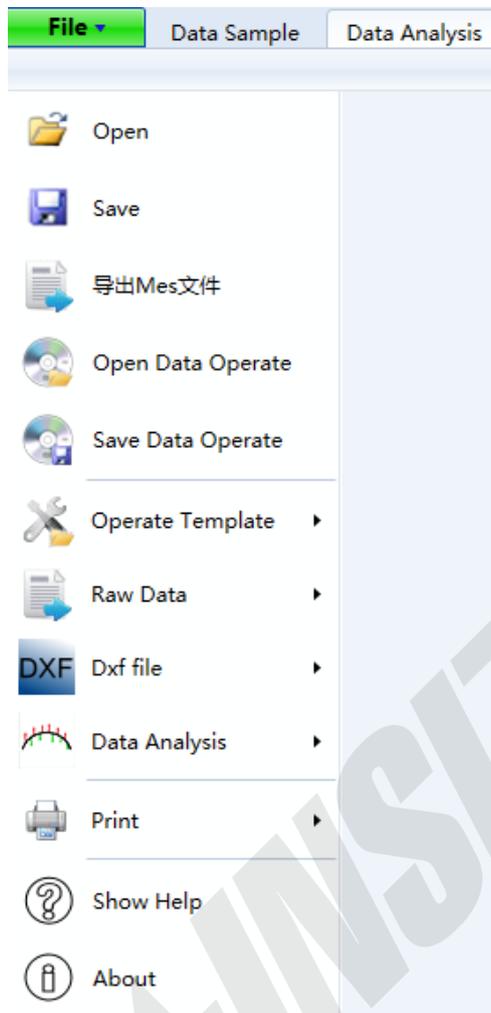
The measured parts name, serial number and drawing number can be edited in this area.

7.3.4 Drawing Area



This area can display the track of stylus motion.

7.4 File Menu

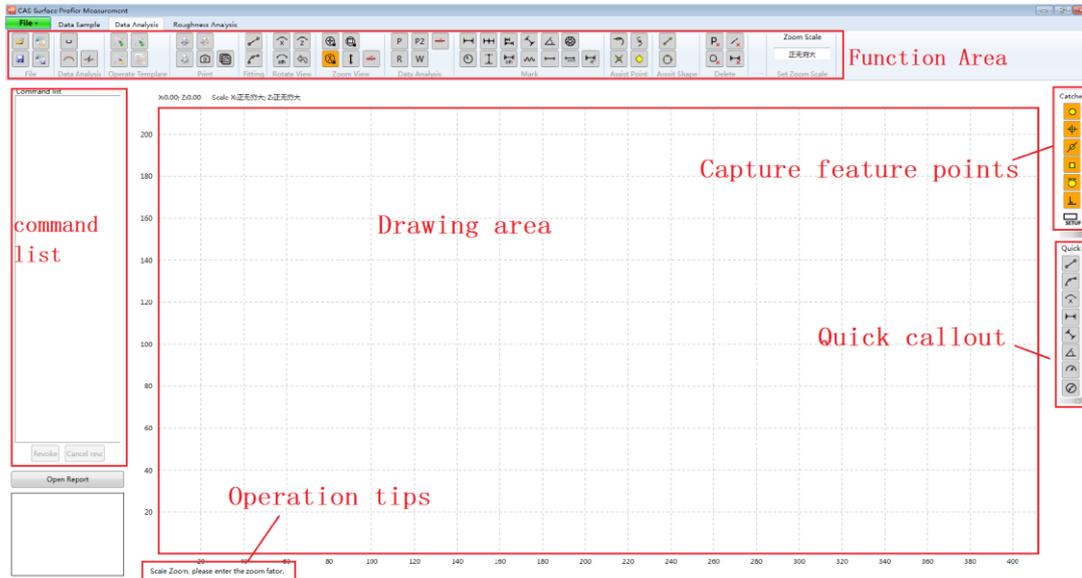


Help, click it can see the manual.

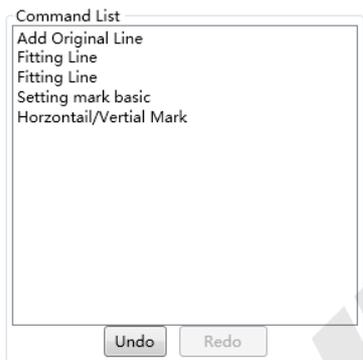
About, can check the software information.

VIII. Contour Analysis

8.1 Contour Analysis Area Interface Introduction



The Command Set include all command tracking during graphics processing.



“Undo” will cancel all the executed commands one by one, “Redo” will restore commands which are canceled.

“Open Report” can open the annotated data for graphics, reedit data according to technical request, or export data from Excel file.

8.2 File

 : Open file, can only open the graphics of original data, the unmarked size data is not included.

 : Data save can only save the original graphics.

 : Open ISO file, can open the saved ISO file, includes original data and fitting annotations operations.

 : Save ISO file is saving original data and fitting annotations operations.

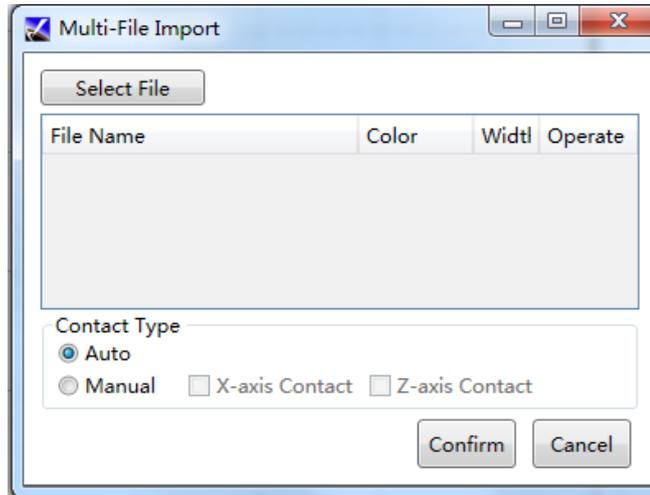
8.3 Data Processing

8.3.1 Multi-image Import

NOTE: This function is optional, some model do not have this function.



Multi-image Import: import two sets data into the software at the same time for splicing calculation annotation. Click this icon will see following interface.



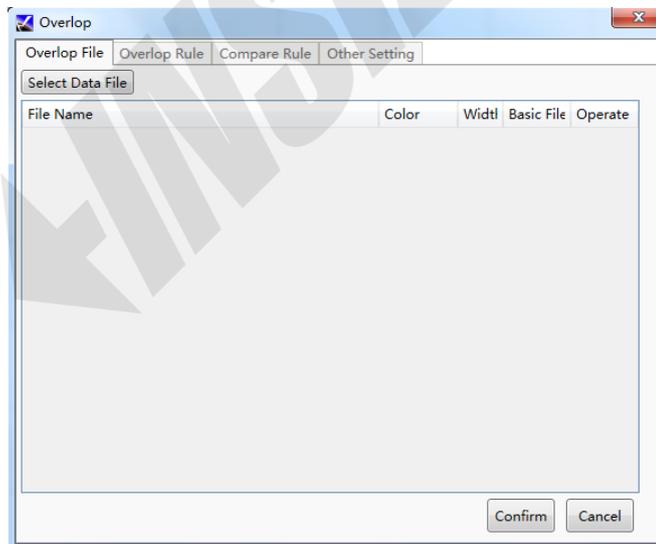
Click “Select File”, choose two sets data.

8.3.2 Matching Function

NOTE: This function is optional, some model do not have this function.



Match: comparing and matching two sets data.

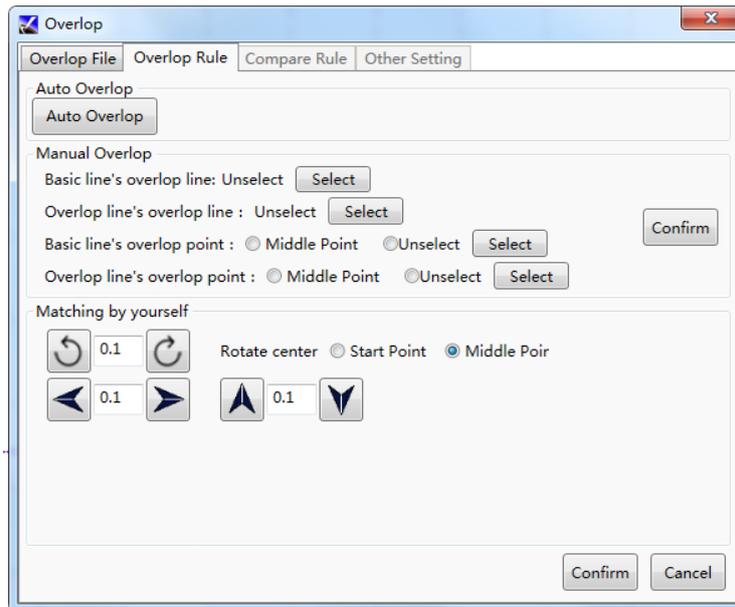


Click “Select Data File”, choose benchmark file and matching file, configure the color and width of the benchmark file and matching file in the list after file choose.

NOTE: The matching file can only be the contour instrument measurement file, the benchmark file can be measurement file or Dxf file (Dxf file currently only supports two elements: straight line and arc).

Click “Confirm”, finish the file addition.

After the matching file addition, the interface will turn to matching rules set interface as below.



The matching rules set of two file can be edited on this interface.

Automatic Match,

Maximum and minimum rotation angle value: During the automatic matching process, the matching file should be rotated for a better match with the benchmark file. The set here is rotation angle.

Feature point: During the automatic matching process, the matching file should be parallel moved for a better match with the benchmark file. The set here is which point is the parallel movement feature point.

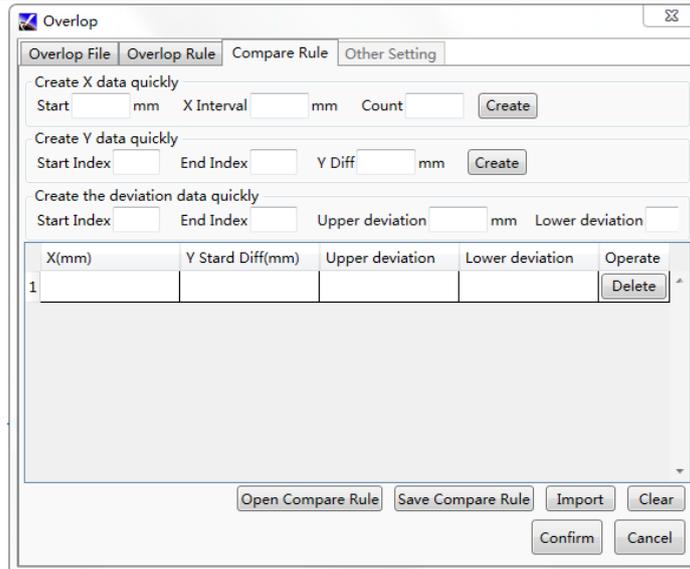
Resolution: The calculated scale during the matching process. The higher resolution, the calculation work is bigger.

Manual match: Matching and comparing the matching lines and matching points of the benchmark file and matching data.

Autonomous matching: rotate manually and parallel moved the benchmark file, matching and comparing with the matching file.

After set work completed, click “Confirm” finish the matching rules set.

After the matching rules set finished, the interface will turn to comparison rules set interface, as below



This interface is for comparison rules set, set the number of X intervals from the reference point and the standard difference value of Y.

If X intervals is regular, the X data will be generated quickly.

“Start”: the start value generating X data

“X Interval”: interval of generated X data

“Count”: the number of generated X data

“Create”: click this button to generate X axis data

For example, the start point is 1, the X intervals is 0.5 and the generated number is 5, the X data will be 1, 1.5, 2, 2.5, 3

If Y value is regular, the Y data will be generated quickly.

“Start Index”: change the start position of Y value, the entered serial number is the front part of each line data.

“End Index”: Change the end position of Y value, the entered serial number is the front part of each line data.

“Y Diff”: set the Y value of the data between the set indexes to the specified value.

Deviation: set the tolerance range of the difference.

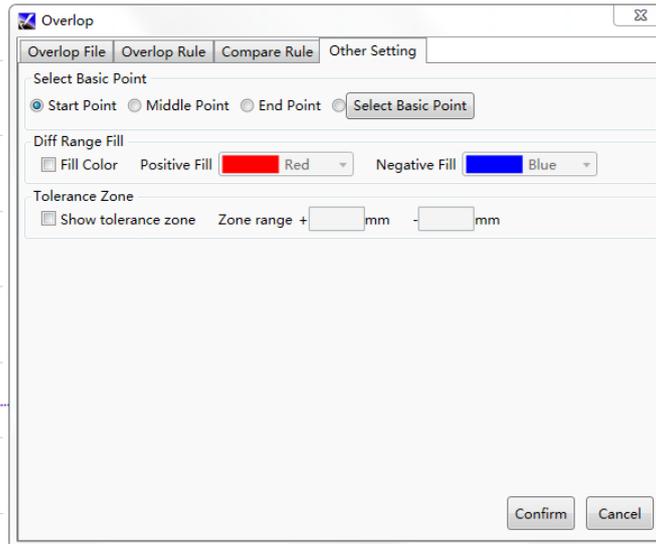
“Open Compare Rules”, click this button will open previously saved comparison rules.

“Save Compare Rules”, click this button will save the comparison rules set this time for following reuse.

“Clear”, clear all set comparison rules.

After set is completed, click “Confirm” to finish comparison rules set.

After comparison rules set is completed, the interface will turn to “Other Setting” interface automatically, as below,



This page is an auxiliary set page for reports and drawings.
 “Select Basic Point”: click this button, will request choose a point as reference point in drawing area. After the reference point is chosen, the comparison rules will start calculation from the chosen point.

8.3.3 Data Merge

NOTE: This function is optional, some model don't have this function.

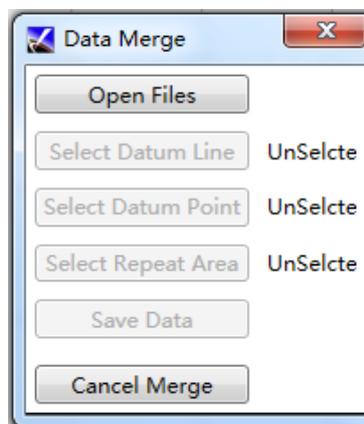


: Data Merge

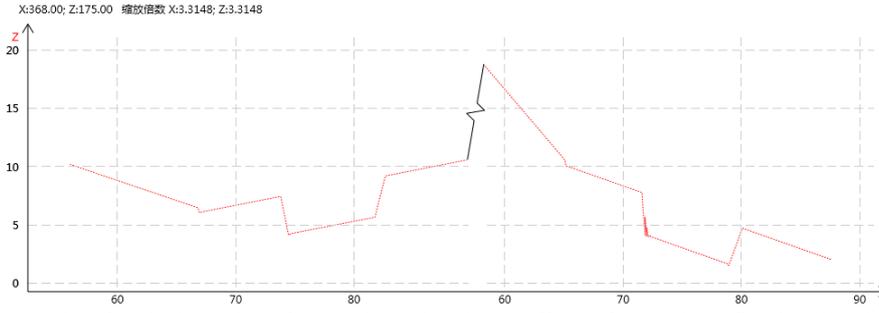
Function overview: For some workpiece (such as straight grooved type), the surface of the workpiece cannot be completely measured at one time measurement, so it is necessary to place the measured parts at different angles for measurement, and then combine the two measurement results to obtain the actual workpiece surface data.

NOTE: This function is optional.

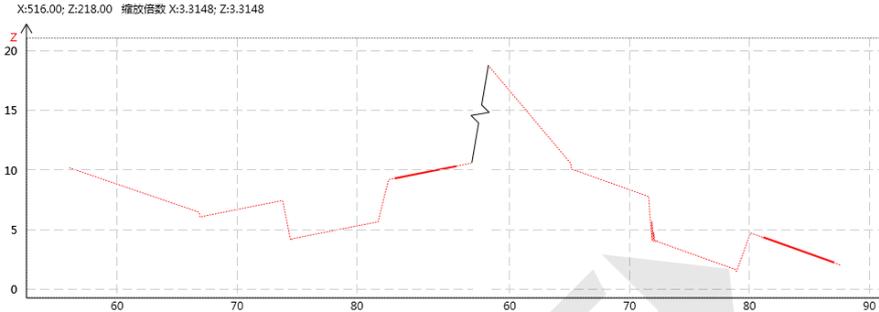
Click “Data Merge”, the new data merge function operation interface will be popup at the right corner of the interface as below picture. The file browser will be opened automatically, it need to select the data file need to be merged and two files can be selected at one time.



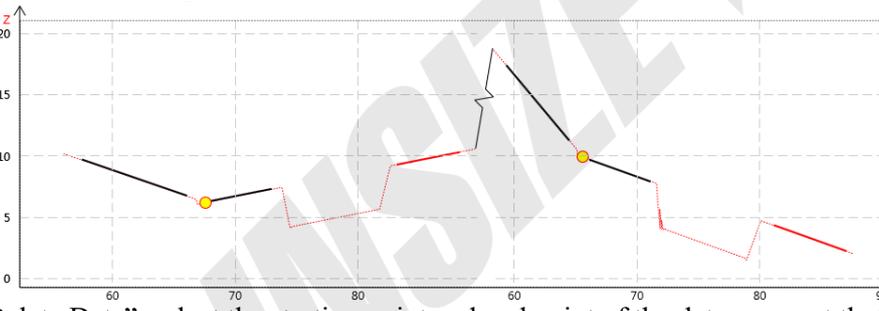
After the file selection finished, the selected data will be shown in the drawing area.



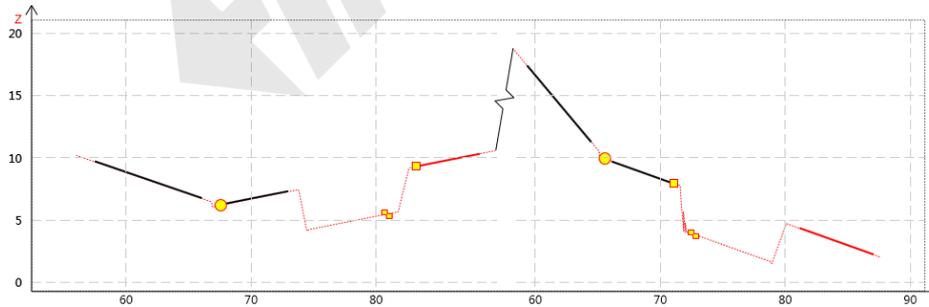
According to the tips below drawing, select the datum line of two data firstly, that is, all the lines measured at different angles are a straight line.



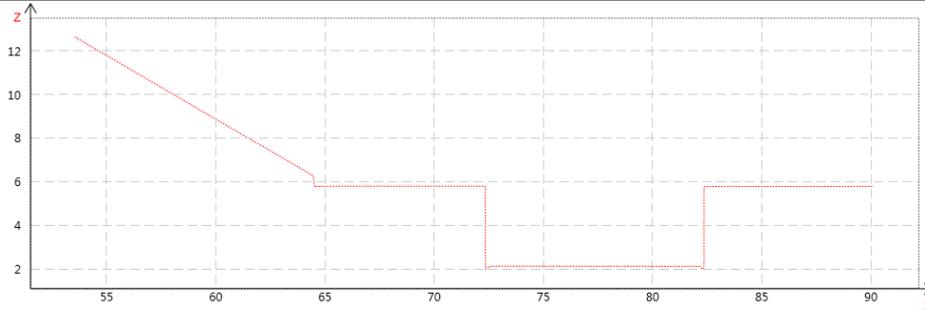
Then select another datum point. The selection of the datum point is very important, try not to be in the place to be merged, and the points that can be generated in both data.



“Select Delete Data”, select the starting point and end point of the data segment that is not the real workpiece surface data from the two data.



After all selection is completed, the "Save Data" button on the data merge page is enable. Click this button can save the merged and processed data. The program will open the merged data automatically and the merged data can be annotated. The merged data show as below picture.



8.4 Operation Template

NOTE: This function is optional, some model don't have this function.



: Export Template, export all operation as template to the file.



: Import Template, import template file into the software. According to the operation process in the template for the currently opened file, that is, fit the annotation automatically, etc.

NOTE: Because the corresponding files of the template and the open files must be matched, if the matching degree is not enough, some line segments or arcs may not be fitted, so that the labeling and other operations related to the unfitted line segments and arcs cannot be generated.



: View Template, view the saved template.



: Set Default Template, choose a template as the system default template,

Select a template as the system default template, then the template will be automatically imported after the next time measurement, and the graphics will be fitted, marked and made some other operations .

8.5 Print

8.5.1 Print Preview



: Print and preview the current data results according to the preset default printing template.

8.5.2 Print



: Print the current data results according to the preset default printing template.

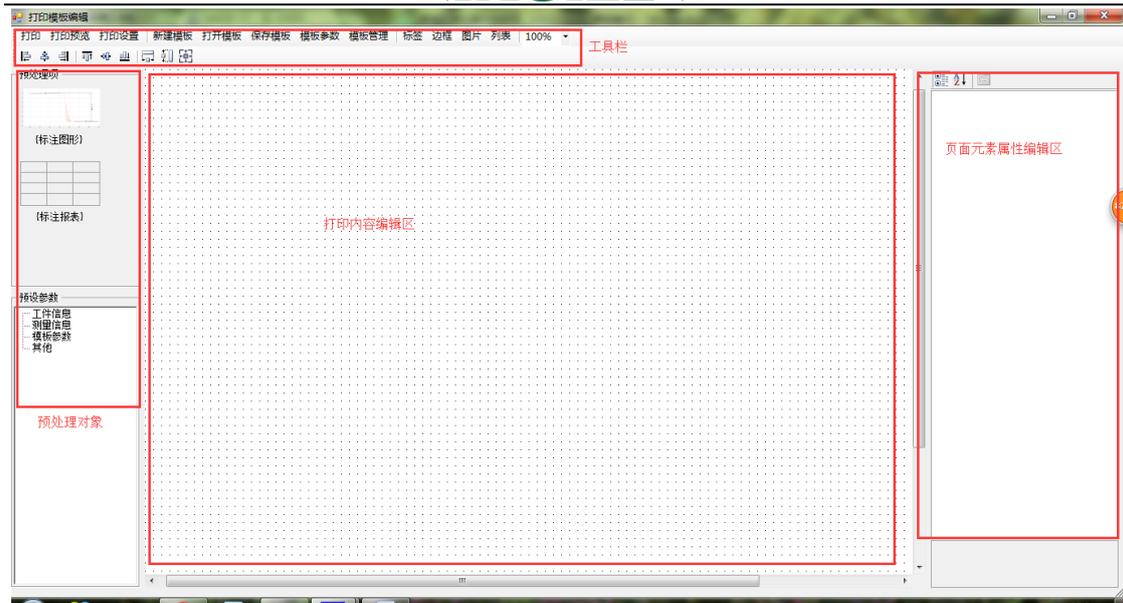
8.5.3 Print Edition

NOTE: This function is optional, some model are available.



: Edit Print Template

Click "Print Edit" will popup below page.



Tools bar introduction



Print: print current template

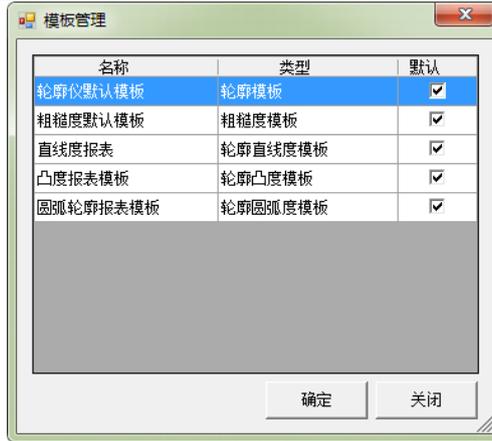
Print Preview: preview current template

Print Set: open page print set as below, set paper direction, paper size and page margins.



Create New Template: create an empty print template

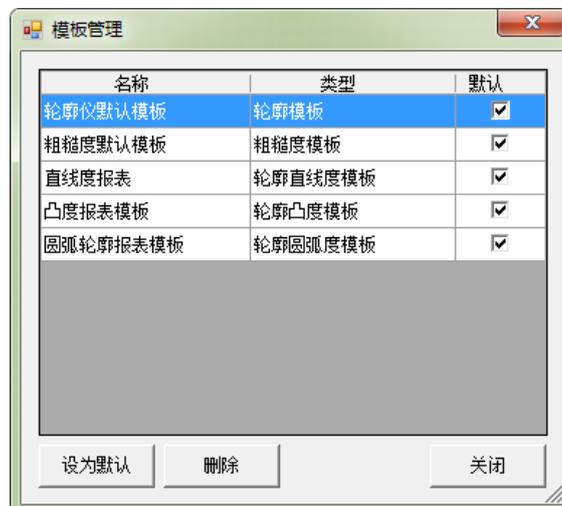
Open Template: open a saved template as below, select a template, click "Confirm" is OK.



Save Template: save the template being edited, if it is a new template, the template name is needed to be entered; if the edited template is an existing one, it can be saved directly.
Template Parameters: set the parameters required by the current template, as show below, the maximum defined number of the parameters can be up to 10. When using the template, if there are parameters, the parameter value need to be entered before printing.



Template Management: set the default template for each type, as below.





Label: Drag the "label" icon to the drawing area, a label can be added to the drawing area.
 Border: Drag the "Border" icon to the drawing area, a box can be added to the drawing area.
 Picture: Drag the "Picture" icon to the drawing area, a picture can be added to the drawing area.
 List: Drag the "list" icon to the drawing area, a list can be added to the drawing area



- : Selected multiple controls are left aligned
- : Selected multiple controls are center aligned vertically
- : Selected multiple controls are right aligned
- : Selected multiple controls are top aligned
- : Selected multiple controls are center aligned horizontally
- : Selected multiple controls are down aligned
- : Selected multiple controls have same width
- : Selected multiple controls have same height
- : Selected multiple controls have same width and height

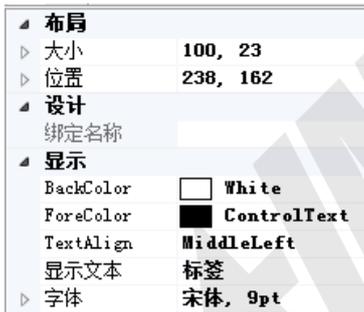
Drawing Area Introduction

1. Controls Introduction

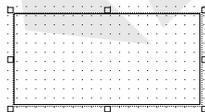
1.1 Label Control



Parameters Area: the display text, position, size, font, foreground color and background color of the label can be set.



1.2 Border Control



Parameters Area: the position, size, line style, width and color of the border can be set.



1.3 Picture Control



Parameters Area: the size, position of the picture, the picture to be displayed and the layout of the picture can be set.



1.4 List Control

Parameters Area: the size, position, number of columns, number of rows and other information of the list can be set.



2. 绘图区操作介绍: Drawing Area Instructions

2.1 Add Control: in the toolbar, drag the control to the drawing area

2.2 Edit Control: click on the control to edit the control on the right side of parameter area.

2.3 Multi-control Operation: select a control, press the Ctrl key and select other controls, then the controls can be selected at one time. All selected controls can be batch operated quickly.

8.6 Pretreatment

8.6.1 Straight Line Fit

The icon is , click or frame-select the area, to fit the point cloud in the area into a straight line.

The secondary menu is



1. Pretreatment Select Instructions

Click Fit, the icon is , click one point on the graphic to fit the line segment or arc according to the type of fit automatically.

Frame Select Fit, the icon is , frame select the area on the graphic to fit the selected points into line segments or arcs according to the type of fitting.



Two Point Fit, the icon is  , select two points to fit the data between the two selected points to the line segment or arc according to the fitting type.

Multipoint Fit, the icon is  , select several points to fit the data of the selected points to the line segment or arc according to the fitting type.

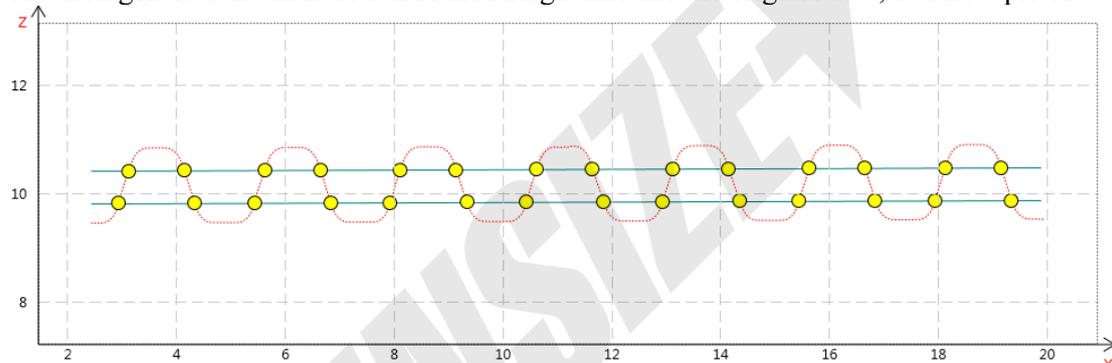
Multi-segment Fit, the icon is  .

For line segment fitting, select two or more line segments and end with the right key of the mouse to fit the data of each selected line segment into a large line segment.

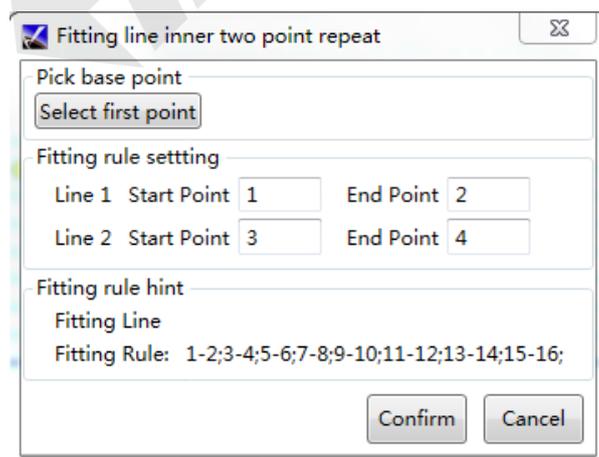
For arc fitting, select two or more arc and end with the right key of the mouse to fit the data of each selected arc into a large arc.

Repeat Fitting between Two Points, the icon is  , this function is optional, usually for repetitive measured parts surfaces standard measurement.

Make the intersection of the straight line and the original data on the data, generate fitted lines between several two points according to certain rules by the sequence of intersection points, and then generate the intersection of the straight line and the original data, as below picture.



Click  will popup below interface.

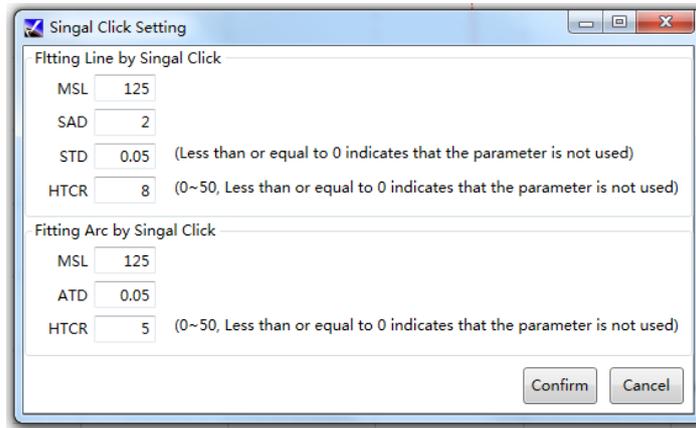


Click “Select First Point”, select first point on the drawing and set fit rules.

As shown in the figure, the first point and the second point are fitted to “Line 1”, the third point and the fourth point are fitted to the “Line 2”, and the following operation will follow same rules.

Click “Confirm”, the straight lines between several two point will be fit according to the rules and the other operation will following same rules.

Click “Fit Set”, the icon is , will popup below interface.



MSL: Minimum search length

SAD: Slope angle tolerance

STD: Straightness tolerance

HTCR: Head and tail cut range, the entered number 8 refers to cut 8% for both head and tail

ATD: 圆弧度容差 (英文缩写有疑问) Arc tolerance

2. Pretreatment Option

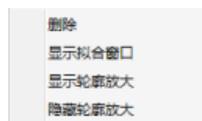


No Filtering: not make data filtering processing

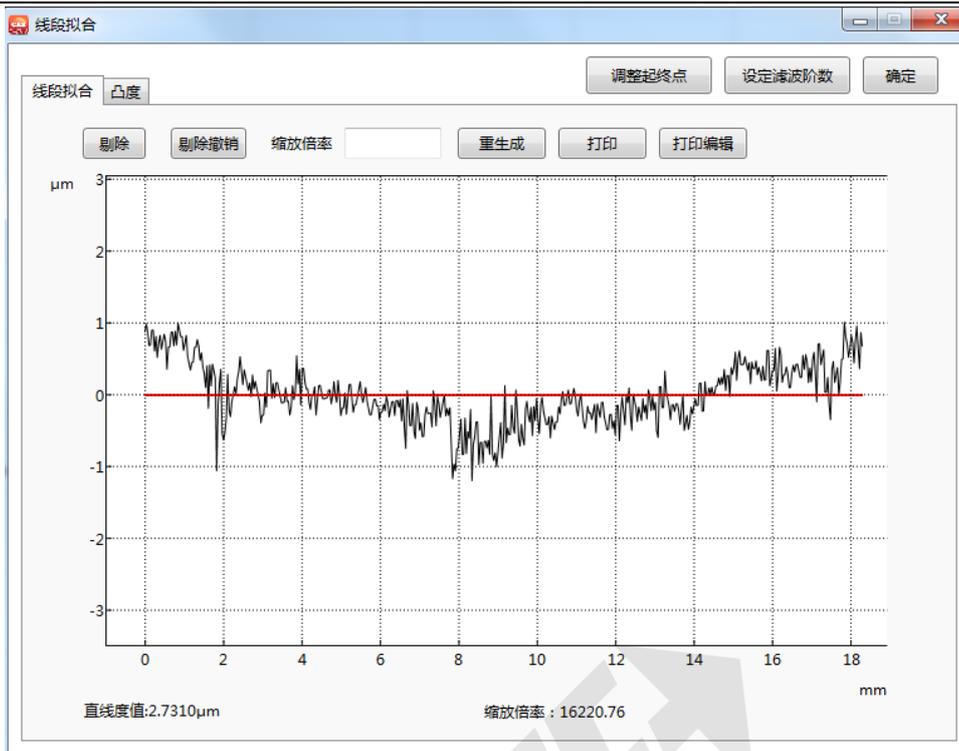
Gaussian Filtering: perform Gaussian filtering on the data, the parameter is the cutoff wavelength of the Gaussian filtering.

FIR Filtering: Fir filtering the data, the parameter is the cutoff frequency of the Fir filter.

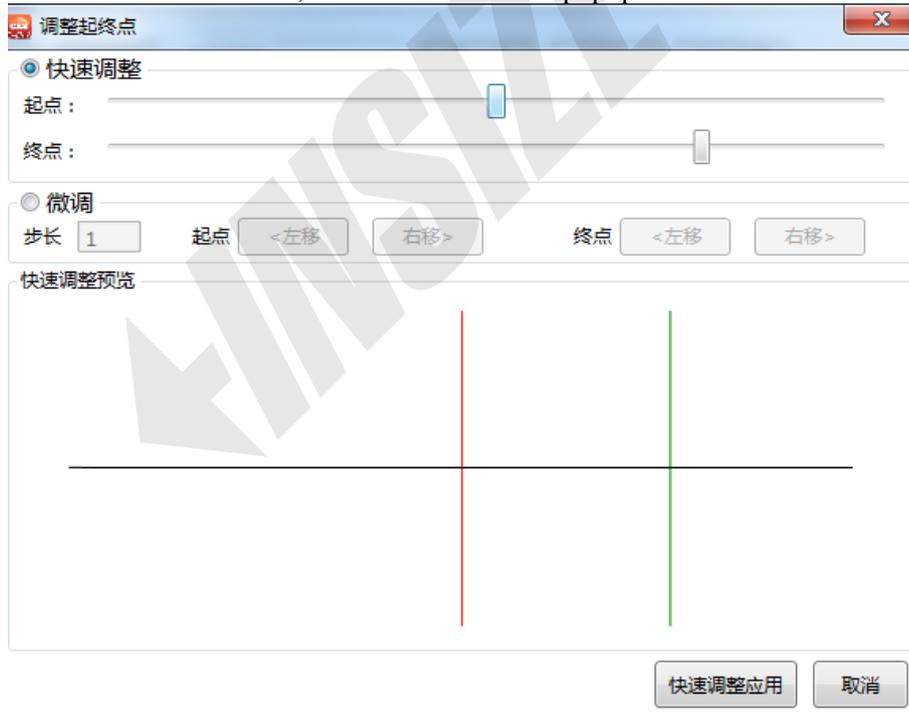
Perform straightness, convexity, or arc contour processing for the fitted point cloud, counting line segments and circle in the framed area.



(Show Contour Zoon” is used for the function )



“Adjust Start/End Point”, click this button will popup below interface.

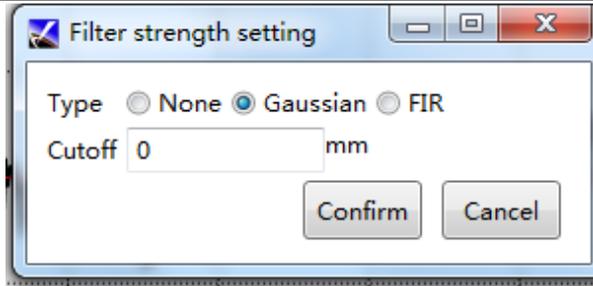


“Quick Adjust”, adjust start point and end point position by dragging bar.

“Fine Adjust”, enter the step length, make adjustment by click move left and move right of the start point and end point.

The adjustment confirms and works after adjustment set finished and click “Quick Adjust Apply”

Click “Set Filter Order” will popup below interface



Here can set or revise filter strength value

8.6.2 Arc Fit

The icon is , click or frame the area to fit the point cloud in the area into an arc.



Pretreatment option is same as straight line fitting.

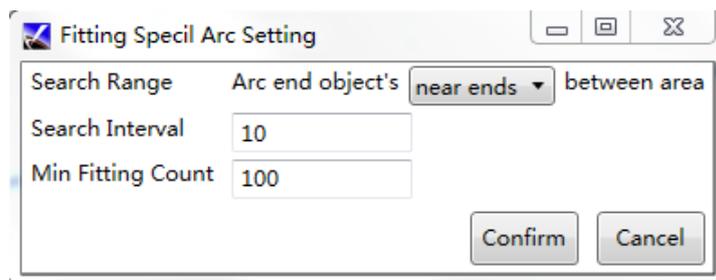
Arc special fitting , used for transition arc fitting.

Fit the arc between two line segment, the icon is , select two line segment, find an arc between the two selected line segments, and make the pre-generated arc is as tangent as possible to the two selected line segment.

Fit the arc between the line segment and arc, the icon is , select one line segment and an arc, find an arc between the selected line segment and arc, and make the pre-generated arc is as tangent as possible to the selected line segment and arc.

Fit the arc between two arc, the icon is , select two arc, find an arc between the selected two arc, and make the pre-generated arc is as tangent as possible to the tow selected arc.

Special Fit Set, the icon is , click this button will popup below interface.



Search Range: set arc search range

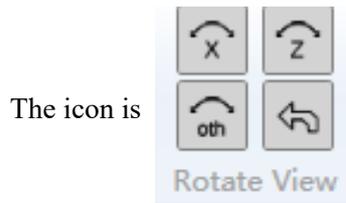
Search Interval: the data interval during searching, the value is bigger, the search is faster. This value needs to be set according to the length of the pre-fitted arc and the sampling interval.

Min. Fitting Count: the minimum point of fitted arc, the value is bigger, the fit is faster. This value needs to be set according to the length of the pre-fitted arc and the sampling interval.

点击【确定】按钮，开始拟合；点击【取消】按钮，取消拟合并关闭该窗口。

Click “Confirm” to start fitting, click “Cancel”, will cancel fitting and close this interface.

8.7 Graphic Rotation



Parallel rotation with X axis, the icon is , select one line segment, the entire graphics will be rotated according to the selected line segment and the midpoint of the line segment, until the selected line segment is parallel to the X axis.

Parallel rotation with Z axis, the icon is , select one line segment, the entire graphics will be rotated according to the selected line segment and the midpoint of the line segment, until the selected line segment is parallel to the Z axis.

Rotation at any angle, the icon is , select the rotation direction and rotation angle in the graphics rotation options, and select the rotation reference line segment and point in the graphics area.

Cancel rotation: the icon is , cancel the last step rotation operation.

8.8 Graphic Zoom



Full Screen Display: the icon is , display all graphics and data in drawing area.

Window Zoom: the icon is , frame specific area and zoom this area on full screen.

Proportional Zoom: the icon is , the zoom proportion of X axis and Z axis are same. The zoom proportion can be set in the graphics zoom options, or roll the mouse ball to adjust the zoom proportion.

Non-proportional Zoom: the icon is , the zoom proportion of X axis and Z axis are different. The zoom proportion can be set in the graphics zoom options, rolling the mouse ball can only adjust the zoom proportion of Z axis.

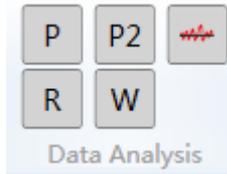
Contour Zoom: the icon is , firstly construct a straight line or an arc on the contour graphic, right-click to select display contour, the contour can be magnified on the graphic.

Actual Parallel Movement: long press the mouse ball at the drawing area can move the measured graphics.

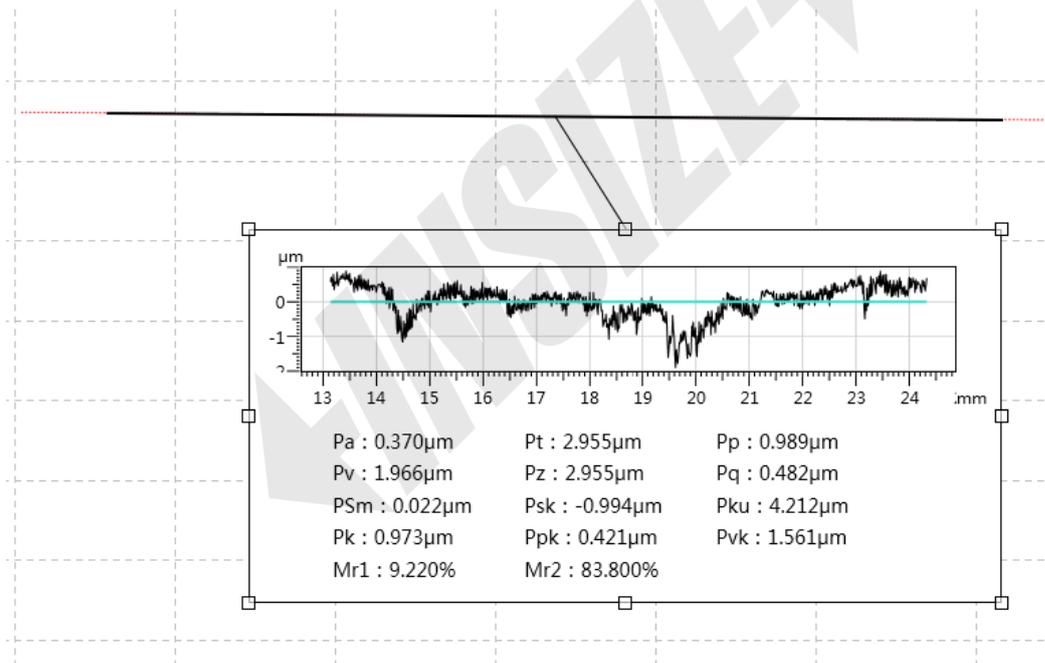
8.9 Data Analysis

NOTE: this function is optional, some model don't have this function.

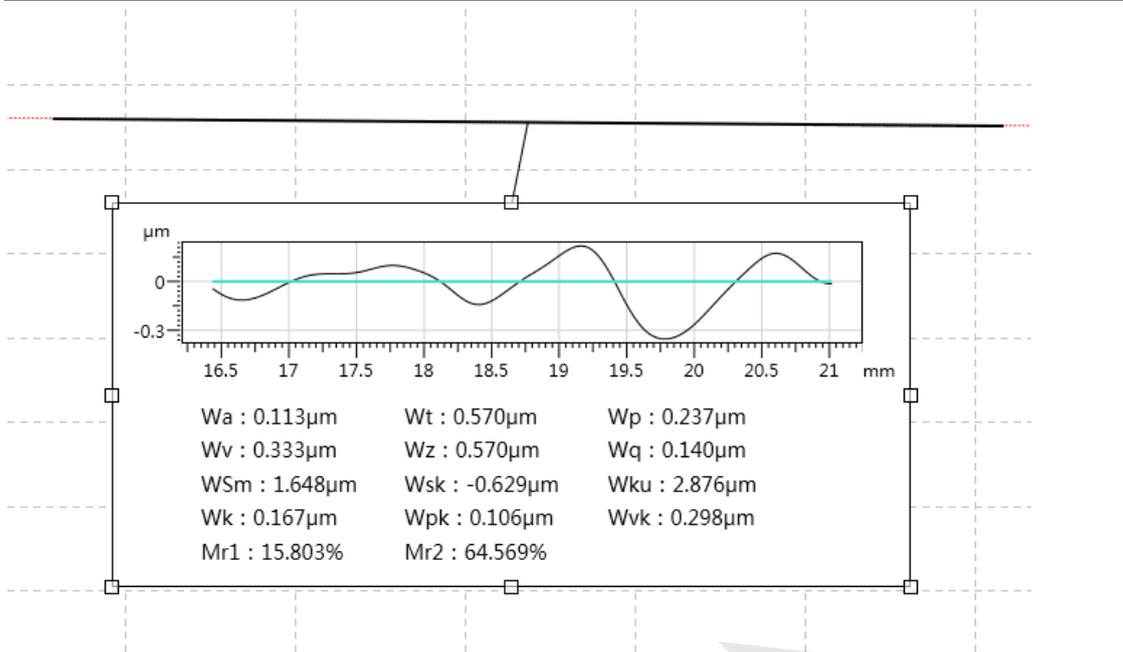
This function mainly realizes the dimensional tolerance, contour tolerance, waviness, roughness, contour magnification can be annotated at the same time only by one time measurement.



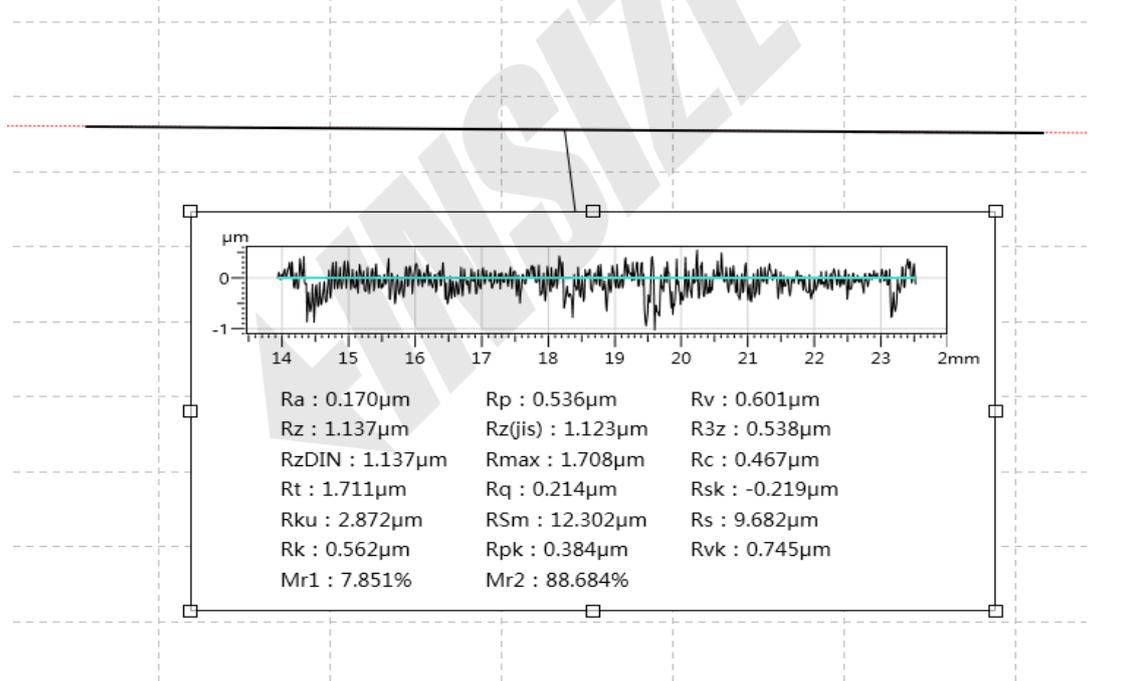
P : Analysis contour parameter, mainly used for analysis the contour value of the data, as below picture.



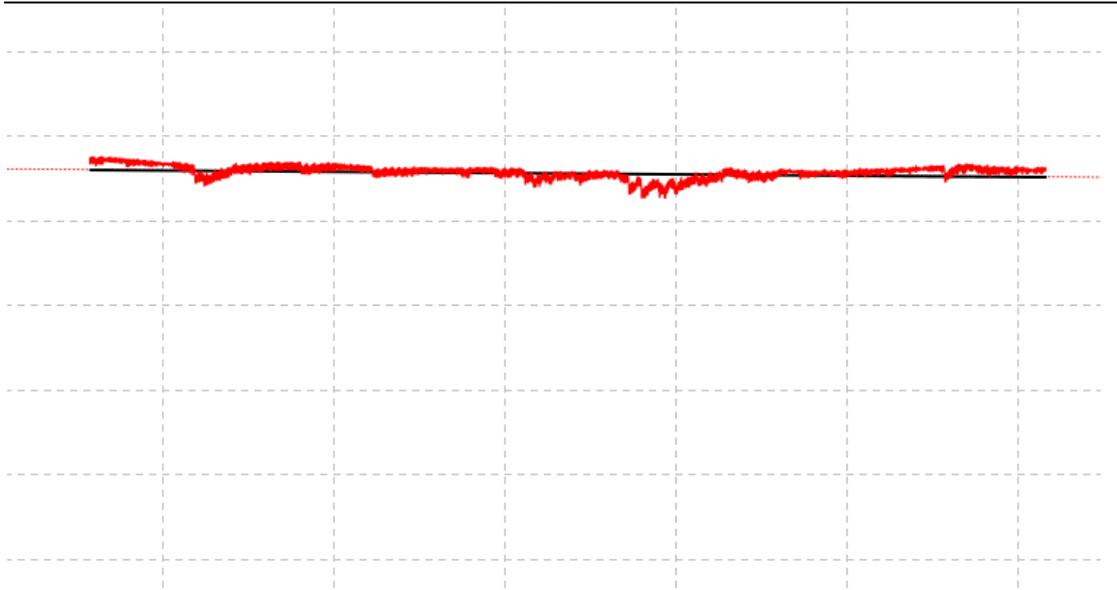
W : Analysis waviness parameter, mainly used for analysis the waviness of the data, as below picture.



R : Analysis roughness parameter, mainly used for analysis the roughness of the data, as below picture.



 : Display contour magnification, display the contour graphics of the data on the annotated page, as below picture.



8.10 Annotation



Name format of the annotation result: “annotation prefix + serial number: annotation value”

Annotation prefix: Each annotation has its own prefix

Serial number: from number 1, every time add one same type annotation, the annotation number is increased by 1.

Annotation value: actual annotation result.

8.10.1 Horizontal/Vertical Annotation

The icon is , the annotated targets are two points, annotate the distance of parallel/perpendicular to the reference line between these two points.

The annotation prefix for horizontal annotation is "X". The annotation prefix for vertical annotation is "Z"



 : The annotated targets are generated points.

 : The annotated target is the midpoint of the line segment, the midpoint of the line segment will be selected automatically as annotation point after the line segment is selected.

 : The annotation target is the intersection of two line segments, the intersection point of the two line segments will be selected automatically as annotation point after two line segment are selected.

 : Align, align and display the selected annotation lines which are horizontal/vertical annotated.

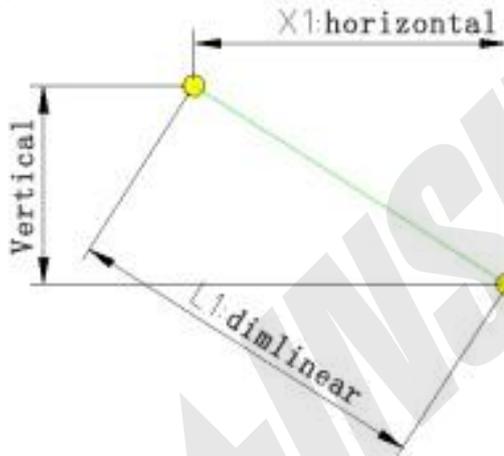
 : Isometric, isometric displays the selected annotation lines which are horizontal/vertical annotated.

8.10.2 Linear Annotation

The icon is  , the annotated targets are two points, the shortest distance between selected annotation points. The annotation prefix is “L”.

The secondary menu are same as the horizontal/vertical annotation, but not aligned.

The style of horizontal/vertical annotation and linear annotation are as below picture.

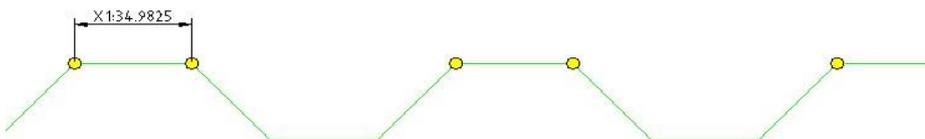


8.10.3 Continuous Annotation

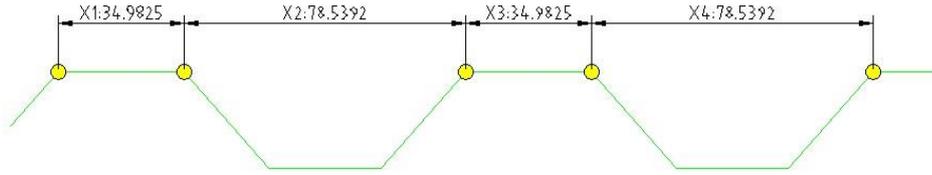
The icon is  , the annotated targets are points. It is used for quick annotation for some spare parts in engineering applications.

In essence, it is the extension of the horizontal annotation, that is, the start point of the second annotation recognizes the end point of the first annotation automatically, the start point of the third annotation recognizes the end point of the second annotation automatically while the second horizontal dimension is annotated. The following annotation will follow the same way. The mouse right click can stop continuous annotation. The operation as below,

Firstly make a horizontal annotation.



Then click “Continuous Annotate”, the start point of second annotation recognizes the end point of previous horizontal annotation.



The secondary menu are same as the horizontal/vertical annotation.

8.10.4 Reference Line Annotation

The icon is . After make a parallel/vertical annotation, click this function, the first point selected in the previous parallel/vertical annotation will be used as the first point of the current annotation. The annotation can be realized only need to select another point. The secondary menu are same as the horizontal/vertical annotation.

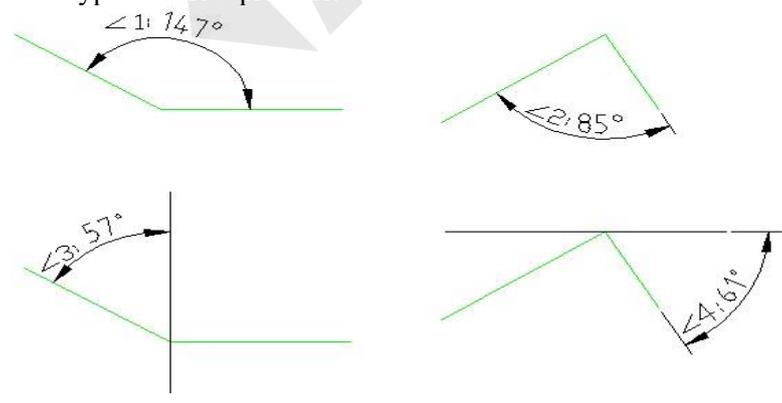
8.10.5 Angle Annotation

The icon is , the annotated targets are lines, annotate the angle between two line segments. The annotation prefix is “∠”.

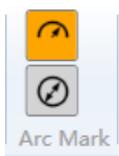
The secondary Menu: 

-  : Regular Annotation, the annotated targets are two line segments, annotate the angle between two selected line segments.
-  : Horizontal Annotation, the annotated target is one line segment, annotate the angle between the selected line segment and horizontal direction.
-  : Vertical Annotation, the annotated target is one line segment, annotate the angle between the selected line segment and vertical direction.

Annotation type as below pictures.



8.10.6 Arc Annotation

The icon is , annotate the radius or diameter of arc, the secondary menu is 

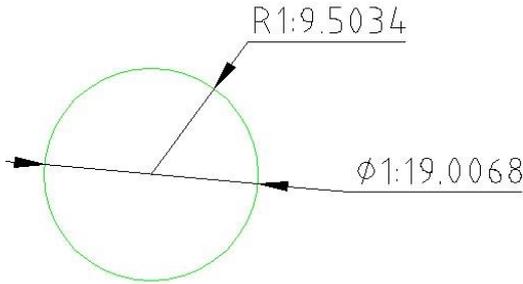
Radius Annotation

The icon is , the annotated target is arc, annotate the radius of the arc. The annotation prefix is “R”.

Diameter Annotation

The icon is , the annotated target is arc, annotate the diameter of the arc. The annotation prefix is “Φ”.

The annotation type of radius annotation and diameter annotation are as below.



8.10.7 Other Annotation

This icon is , the secondary menu is



Coordinate Point Annotation

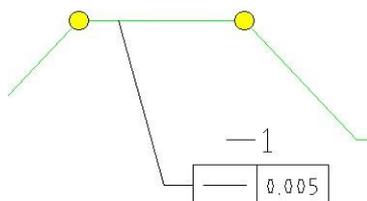
The icon is , the annotated targets are points, annotate the selection points which are based on the X and Z coordinate values of the preset reference point. The annotation prefix is “P”.

Straightness Annotation

The icon is , the annotated targets are fitted segments (auxiliary lines cannot be annotated), annotate the straightness value of the selected line segment. The annotation prefix is “-”.

Definition of straightness: after the area of fitted straight line is selected, the least square center line is obtained. In the selected area of the original contour line, the algebraic sum between the highest point P and the lowest point V relative to the least square center line is the straightness value.

Annotation type as below.

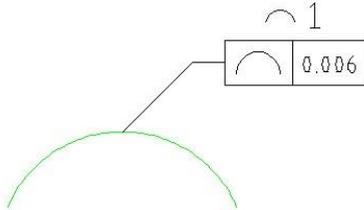


Arc Contour Annotation

The icon is , the annotated targets are fitted arc (auxiliary arc cannot be annotated), annotate the arc contour value of the selected arc.
The annotation prefix is “ \frown ”.

Definition of arc contour: after the arc fit area is selected, find the least square circle. In the selected area of the original contour arc, the algebraic sum before the highest point P and the lowest point V relative to the least square circle is Value of arc contour.

Annotation type as below.



Convexity Annotation

The icon is , the annotated targets are fitted line segment, annotate the convexity value of the selected segments.
The annotation prefix is “ \frown ”.

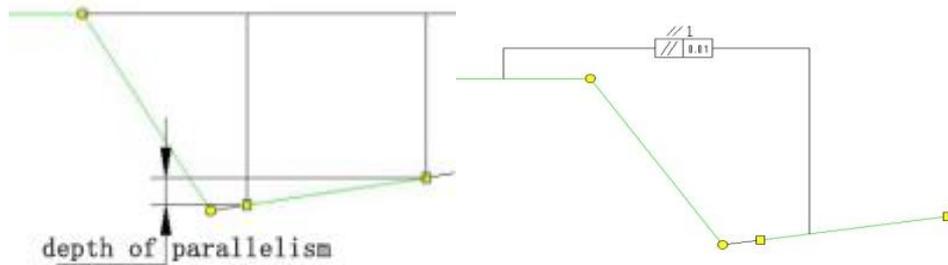
Definition of convexity: In the selected fitted line segment area, the start points and end points of the original contour point are connected as a straight line. The maximum vertical distance from this straight line in the original contour points is the convexity value.

Parallelism Annotation

The icon is , the annotated targets are two fitted line segment (can not be auxiliary line), annotate the parallelism value of two selected line segment.
The annotation prefix is “//”.

Definition of parallelism: Pick two fitted line segments, take the first picked line as a reference, make a vertical line, and the vertical distance difference from the second line is the parallelism value.

Annotation type as below.

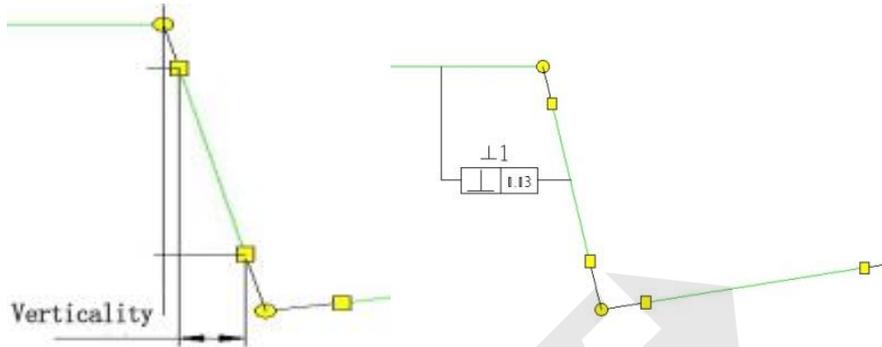


Verticality Annotation

The icon is , the annotated targets are two fitted line segment, annotate the verticality value of two selected line segment.
The annotation prefix is “ \perp ”

Definition of verticality: make a vertical line to the first picked line segment, and the vertical distance difference between the second line segment and the vertical line is the verticality value.

Annotation type as below.



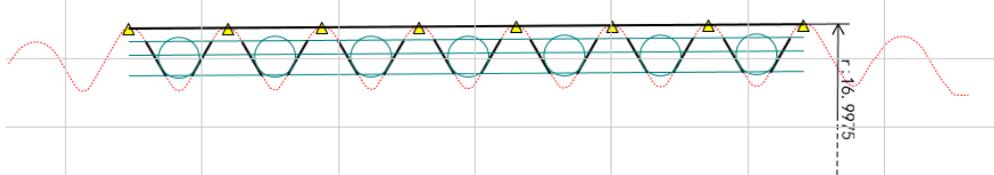
Large, Medium and Small Radius of Thread Annotation

NOTE: this function is optional, some model don't have this function.

Click , select the line segment need to be annotated will popup below interface.



Enter tag value, Enter the label value, click OK, the radius value between the selected line segment and the set virtual reference line will be annotated, annotation as below.



Annotate the diameter value between the selected line segment and the set virtual reference line.



The operation is same as the annotation way of radius.

NOTE: large radius is “d”, small radius is “d1”, medium radius is “d2”.

8.10.8 Coordinate and Coordinate Origin Annotation Set

The icon is , the secondary menu is



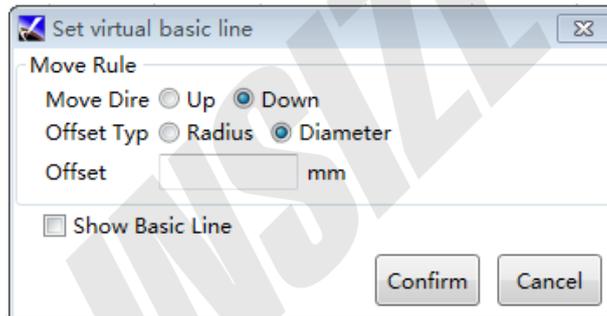
 : Pick the reference line, the picked reference line will be used for parallel/vertical annotation.

 : Restore the coordinates and cancel the selection of the reference line. In the parallel/vertical annotation, the horizontal direction of the coordinate system will be used as the reference.

 : Pick the base point, the picked base point will be used in coordinate annotation.

 : Restore the base point and cancel the selection of the base point. In the coordinate annotation, the origin of the coordinate system will be used as the reference.

 : Set the virtual reference line, set the reference line of the thread annotation, click this function, and select the line to be set as the reference line, the following interface will popup.



Set the relation of reference line and selected line on this interface, click “Confirm” after set finished.

For example, the large diameter of the thread can be known by other ways, then select the line corresponding to the large diameter in the measured graphics.

The move direction select downward, the offset method select diameter, the offset is set to the value of the measured parts large diameter, so that it will be annotated with the revised reference while the middle diameter and small diameter of the thread are annotated.

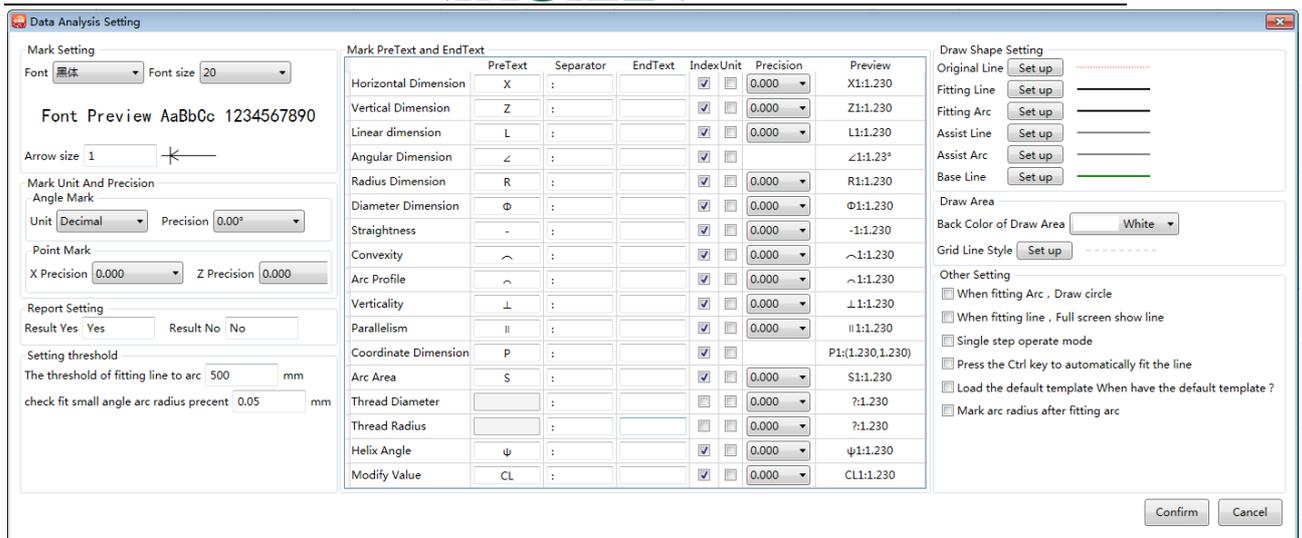
(NOTE: this function is optional, the software with thread annotation function have this function)

 : Reset virtual reference line, delete virtual reference line settings.

(NOTE: this function is optional, the software with thread annotation function have this function)

8.10.9 Annotate Font and Arrow Type Annotation Set

The icon is , click it will popup below interface.



Font: set the font and size

Arrow size: set the arrow size

Unit: set the precision of the annotation value and the display format of the angle annotation.

Report Setting: set the characters displayed when the conclusion is correct and wrong in the report.

Confirm: click it and save set.

Cancel: click it, cancel set and close this interface.

8.11 Feature Point Generation Menu



The icon is

8.11.1 Intersection Point of Line Segment and Arc

The icon is , the secondary menu is



 : The intersection of the line segment and the arc form the midpoint of the line segment.

 : The point near the line segment at the intersection of the line segment and the arc.

 : The left intersection of the line segment and the arc.

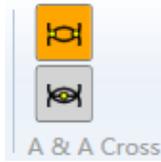
 : NOTE: The positional relationship between the line segment and the arc is separated, tangent, and intersect. In practical applications, the tangent is the ideal position, it will not appear, there will only be disjoint and intersected.

If the line segments are separated, the intersection point is the midpoint of the line segment between the vertical line from the center of the arc to the line segment and the intersection of the arc and the line segment, the icon is .

If the line segments intersect, the corresponding point is generated according to the position of the selected point.

8.11.2 Arcs Intersection

The icon is , the secondary menu is



 : Arc intersection point, select two arcs to generate the intersection point of the selected arc.

 : The midpoint of the intersection of the arcs, select two arcs to generate the midpoint of the line segment formed by the intersection of the two arcs.

8.11.3 Intersection Point

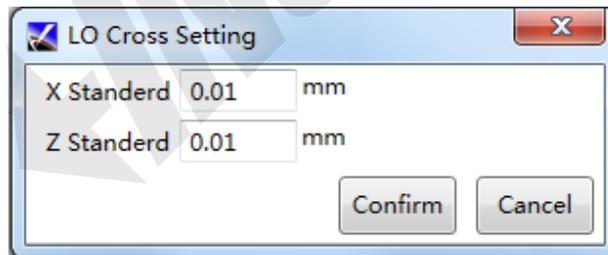
The icon is , the secondary menu is



 : Straight line intersection point, select two line segments to generate the intersection point of the selected line segment.

 : The intersection of the straight line and the original data line, select a line segment to generate the intersection point of the line segment and the original data line.

 : The parameter of the straight line and the original data line function set, click it will popup below interface.



X-direction Judgment Standard: refers to the X-direction distance between two intersection points in the founded intersections points need to be is bigger than the set value.

Z-direction Judgment Standard: refers to find closest point to the line segment as the intersection point of the straight line and the original data during the data of the distance from the point in the original data to the straight line is less than the set value.

8.11.4 Change Feature Point

The icon is , the secondary menu is

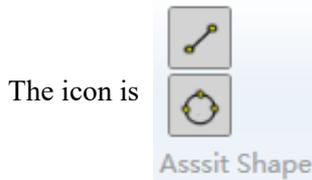


 : Frame select the highest point in the area, refers to the point of the maximum Z value relative to the X axis. The annotation in area is .

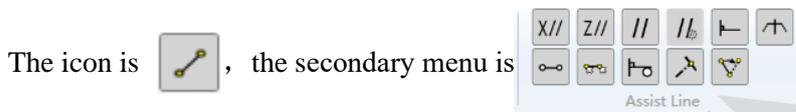
 : Frame select the lowest point in the area, refers to the point of the minimum Z value relative to the X axis. The annotation in area is .

 : With mouse left-click anywhere in the drawing area, the intersect point where the contour is intersected with X axis or Z axis. The annotation in drawing area is .

8.12 Assist Menu Generation

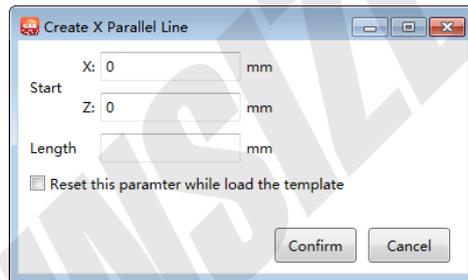


8.12.1 Auxiliary Line Object



Cross Point to Generate Parallel Line of X Axis

The icon is , with mouse left-click any featured points in the drawing area will popup below interface.



Start: refers to the offset of the start point of the generated line segment relative to the selected feature point. X and Z both support double direction.

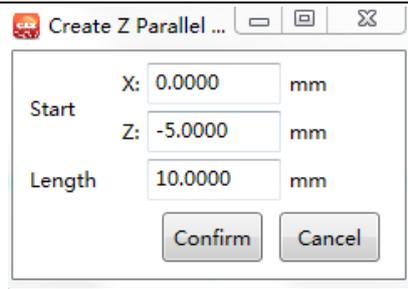
The input value is bigger than 0, the start point is offset in the positive direction of the coordinate axis, the input value is small than 0, the start point is offset in the negative direction of the coordinate axis.

Line Segment Length: refers to the length of the pre-generated line segment.

The length value of the line segment is positive number, the auxiliary line is from the start/end point to the positive direction of the X-axis coordinate axis. When it is negative number, the auxiliary line is from the start/end point to the negative direction of the X-axis coordinate axis.

Crossing points to generate parallel lines of Z axis

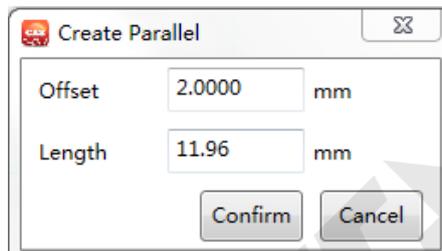
The icon is , with mouse left-click any featured points in the drawing area will popup below interface.



The set operation of this interface is same as X// Generation interface.

Generate parallel lines of known line segments

The icon is , select fitted line segment will popup below interface.



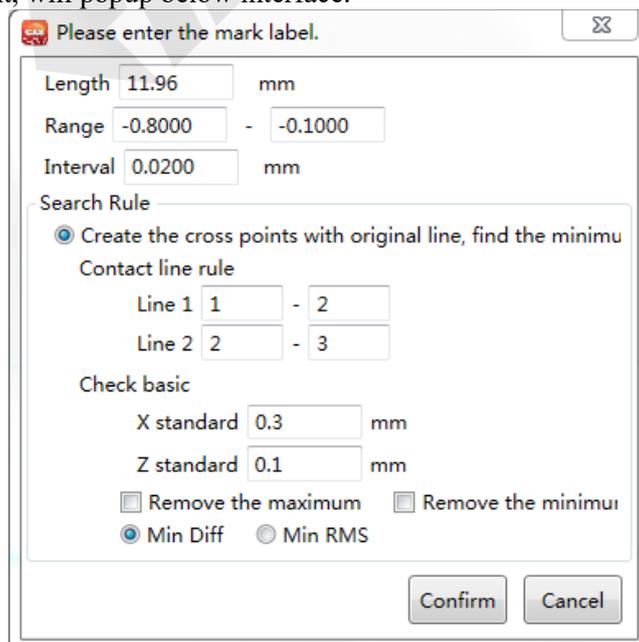
Offset: refers to the distance that the pre-generated line segment deviates from the selected line segment. The value is a positive number, the deviation direction is the positive direction of the coordinate axis Z axis.

When it is a negative number, the deviation direction is the negative direction of the coordinate axis Z axis.

Line Segment Length: refers to the length of pre-generated line segment.

Generate parallel lines of known line segments according to rules

The icon is , find the parallel line of the line segment closest to the set rule, select the known line segment, will popup below interface.



Length: the length of line segment which need to be fitted.

Range: the range of the straight line to be searched, moving downward is negative value moving upward is positive value.

Interval: set the movement interval within the movement range, limited number of line segments will be generated, comparing the generated line segments with the rules and find the closest one.

Search Rule: currently support “generate the intersection with the original data and determine the distance difference value between the intersections are the minimum”. It is used for find the midline of the thread.

Click “Confirm”, start parallel line searching.

(NOTE: this function is optional, only the software with thread annotation function have this function.)

The perpendicular from generated point to line segment

The icon is , select a fitted line segment, and then select a generated feature point, making a perpendicular line from the point to the line segment.

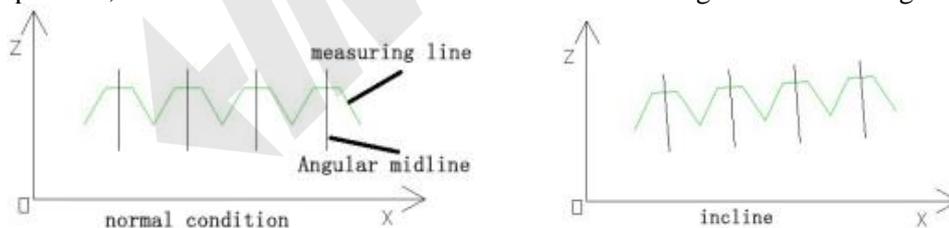
The mark of perpendicular line intersection from the point to the line segment are .

Generate Angle Midline

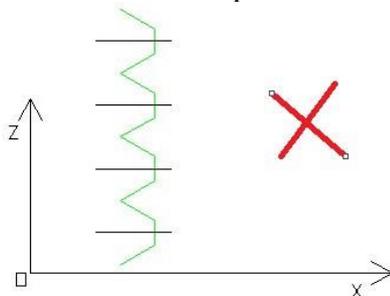
The icon is , select two fitted line segments to generate the angle midline of the angle between the two line segments. The direction of the generated line segment is determined by the angle of the selected two line segments.

During project application, the angle midline is generally in the Z axis direction, it is not needed for use in the X direction. So it only need to confirm the start/end point of Z axis during set operation. The position on the X axis is determined by the selected contour line.

As below pictures, it needs to make normal condition or slant for angle midline during use.



During project application, the below picture condition will not be appeared. (the angle midline is close to parallel with X axis)



So it only need to confirm coordinate position of Z axis during set operation.

This coordinate position does not need to be positioned accurately. For convenience, the "mouse select" function is added.

Click "mouse select", setting the window is hidden, left-click the mouse on the start point of

the displayed midline in the drawing area to confirm the start point of the midline. Set the window is displayed again and length of line segment can finish the set.

The setting content in the setting interface are valid for all angle midlines. (it is different from the parallel line of X axis and Z axis)

Connect Line between Two Points

The icon is , left-click mouse to select the two generated feature points, and generate a line segment with this two points as the start point and end point.

Connect Line between Any Two Points

The icon is , select any two points in the drawing area and generate the line between this two points. Press and hold the shift key on the keyboard while selecting the second point, the parallel lines to the X or Z axis will be generated according to the angle of the line connecting the two points.

Generate line perpendicular to the line segment and tangent to the circle

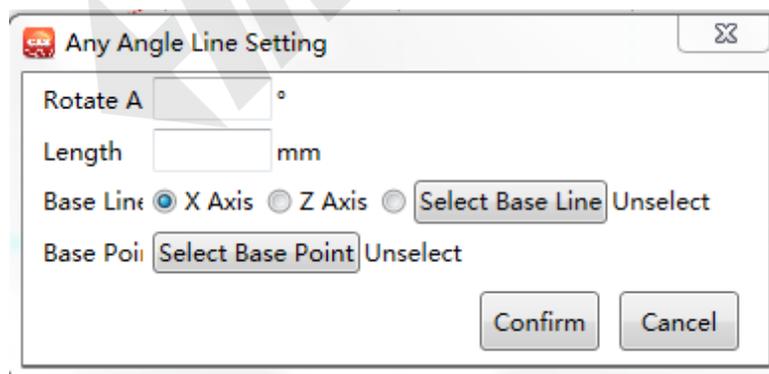
The icon is , click to select the known line segment and circle, a line segment perpendicular to the selected line segment and tangent to the selected circle will be generated.

Extension Line

The icon is , select two fitted line segments, the extension line from the selected two line segments to their intersection point will be generated.

Auxiliary line at any angle

The icon is , click it will popup setting interface of any angle auxiliary line, as below interface



Rotation Angle: refers to the rotation angle of the reference line, positive numbers are counterclockwise, negative numbers are clockwise.

Length: length of auxiliary line.

Base Line: choose the reference line need to be rotated.

Base Point: rotation based on the selected point;

After set operation, click “Confirm” to generate auxiliary line, click “Cancel” to cancel the auxiliary line generation.

8.12.2 Assist Round Object

The icon is , the secondary menu is



2 points to generate a circle

The icon is , selected two featured points to create a circle that passes this two points. That is the circle is generated by the diameter between this two pints.

3 points to generate a circle

The icon is , selected three featured points to create a circle that passes these three points.

Tangent point, tangent point radius generate circle

The icon is , select two fitted line segment will popup the interface which need to enter the radius value. Enter the value and click YES will generate a circle which is tangent to the two fitted line segments and the radius is the input radius value.

Fitted arc generate circle

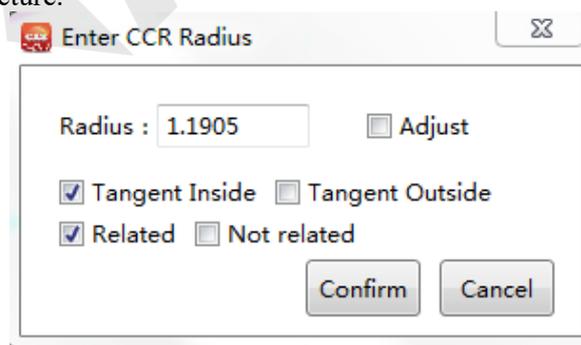
The icon is , select a fitted arc, the whole circle corresponding to this fitted arc will be drawn.

Circle center radius to generate a circle

The icon is , select one feature point will popup the interface which need to enter the radius value. Enter the value and click YES will generate a circle which the circle center is the feature point and the radius is the input radius value.

Generate tangent circles of two circles

The icon is , click it and choose two arc will popup tangent circle generation set interface, as below picture.



Radius: the radius of generated circle.

Adjust: if the fitted arc is selected, it refers to whether to adjust the circle according to the original data of the fitted arc.

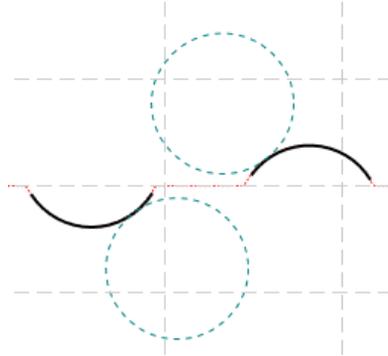
Tangent Inside / Tangent Outside: refers to the tangent mode of the generated circle and the selected fitted arc.

Related / Not Related: refers to the generated circle is close to or far from the selected fitted arc.

After collection finished, click “Confirm” will generate tangent circles based on setting. It

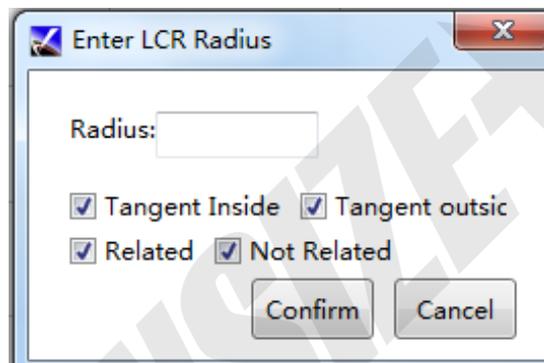


may generate multiple circles represented by dotted lines as below picture. Click the required circle by left-click mouse, the superfluous circle will be deleted automatically.



Generate tangent circles for line segments and arcs

The icon is , click it, selecting a fitted line segment and a fitted arc will popup below interface,



Radius: the radius of generated circle.

Tangent Inside / Tangent Outside: refers to the tangent mode of the generated circle and the selected fitted arc.

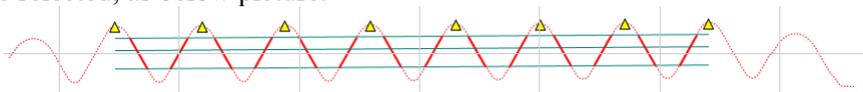
Related / Not Related: refers to the generated circle is close to or far from the selected fitted arc.

After collection finished, click “Confirm” will generate tangent circles based on setting. It may generate multiple circles represented by dotted lines as below picture. Click the required circle by left-click mouse, the superfluous circle will be deleted automatically.

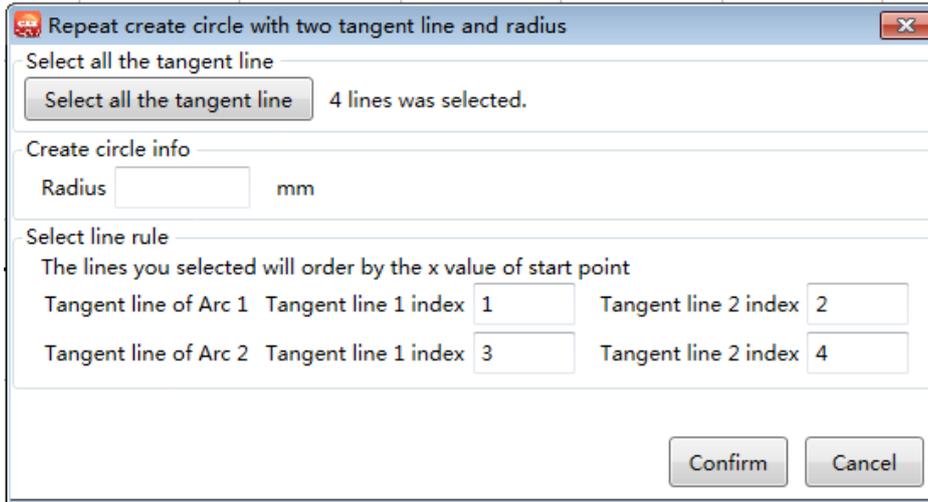
This function is to select all the tangent line to be used, getting the two tangent line of the circle to be generated according to the set rules, and generate the circle according to the set radius.

Generate circle with the radius of the repeated tangent line

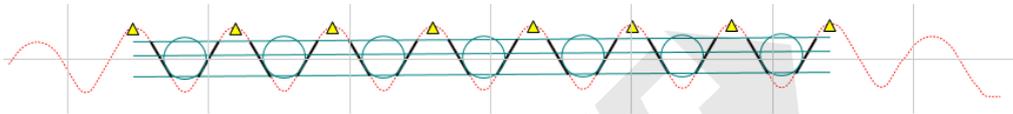
Click , selecting all the line segments to be tangent line on the page which can be frame selected, as below picture.



Right-click mouse will popup below setting interface.



After setting finished, click “Confirm” will generate circle according to the set rules, as below picture.



8.13 Delete Object



8.13.1 Delete Point Object

The icon is , click featured points will delete selected the featured points.

8.13.2 Delete Line Object

The icon is , click fitted line segment or auxiliary line will delete selected the line object.

8.13.3 Delete Round Object

The icon is , click fitted arc or auxiliary circle will delete selected the round object.

8.13.4 Delete Annotation

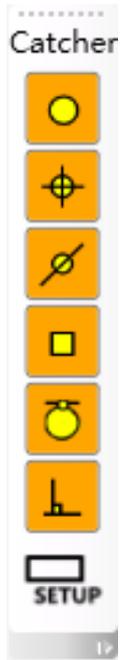
The icon is , click the annotation will delete the selected annotation object.

NOTE: For all generated objects, right-click the generated object and click Delete to delete the object.

8.14 Capture and Quick Annotation

The capture and the quick annotation toolbar are on the right side of the drawing area.

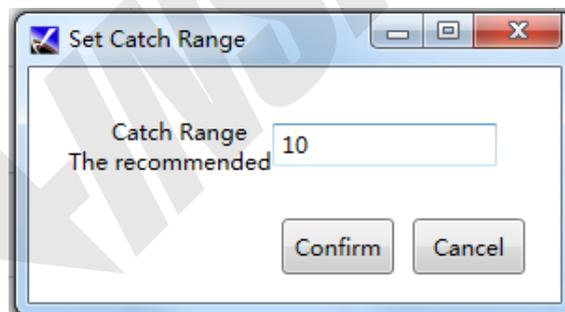
8.14.1 Capture Set



- : Intersection
- : Center of mind
- : Midpoint of line segment
- : End point
- : Round cut point
- : Foot

Catch the feature points automatically. Light them up will catch the points of this type automatically. Turn off will not perform catch automatically.

Click capture area set will popup below interface.



After catch range set, click "Confirm", the system will use the new capture range to capture feature points. Click "Cancel" will cancel set edition and close this interface.

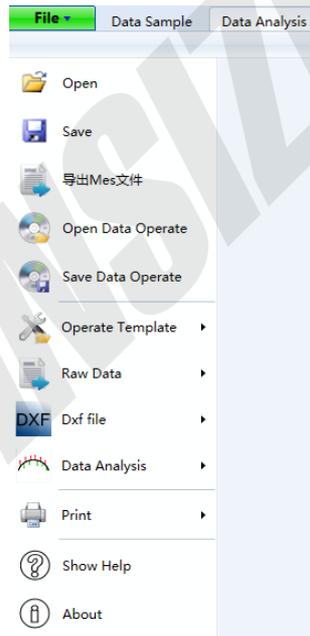
8.14.2 Quick Annotation



Quick operation: sync with start, commonly used tools as below.

-  : Fit straight line  : Fit the arc
-  : Parallel rotation with X axis
-  : Parallel / vertical with basic annotation
-  : Annotation, parallel with connect line between two points
-  : The angle annotation between two line segments
-  : Arc radius annotation  : Arc diameter annotation

8.15 File Menu



- Open, Save, Open ISO File, Save ISO File are same as file menu function in the menu bar.
- Operation Template is same as the operation template function in the menu bar.
- Data Processing is same as the data processing function in the menu bar.
- Print is same as the print function in the menu bar.
- View Help: bring up this manual
- About: open the software information

8.15.1 Data Calibration

 : Export data for calibration, export the measured data as data that can be used for calibration.



: Import data for calibration, import the data used for calibration into the program.

8.15.2 DXF File



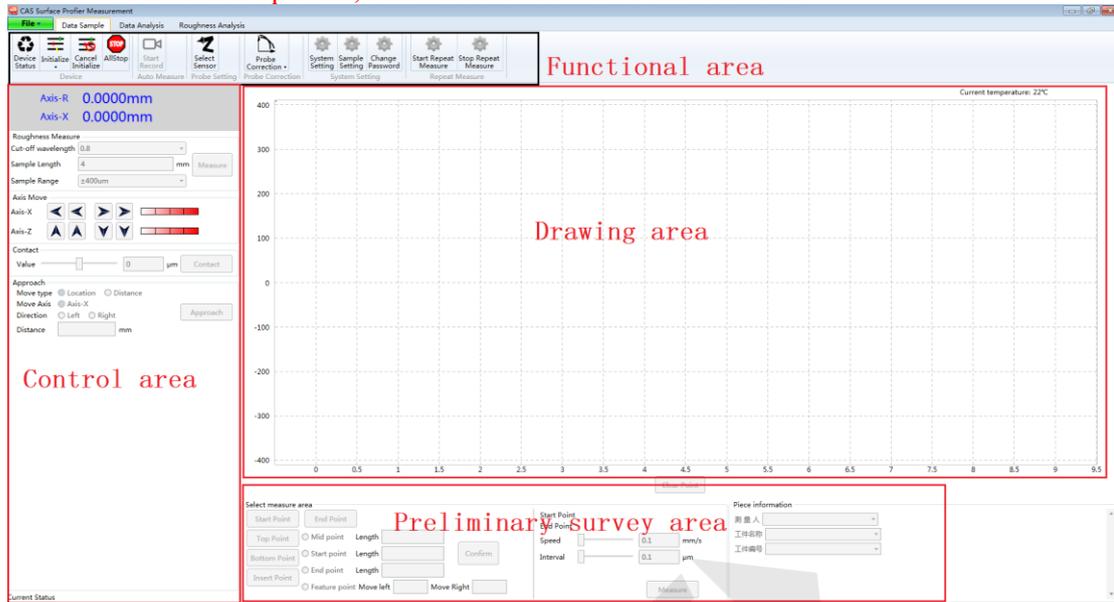
Export DXF graphics: export fitted straight lines and arcs as DXF files which can be opened in CAD.

Export DXF points cloud, export original data as DXF files which can be opened in CAD.



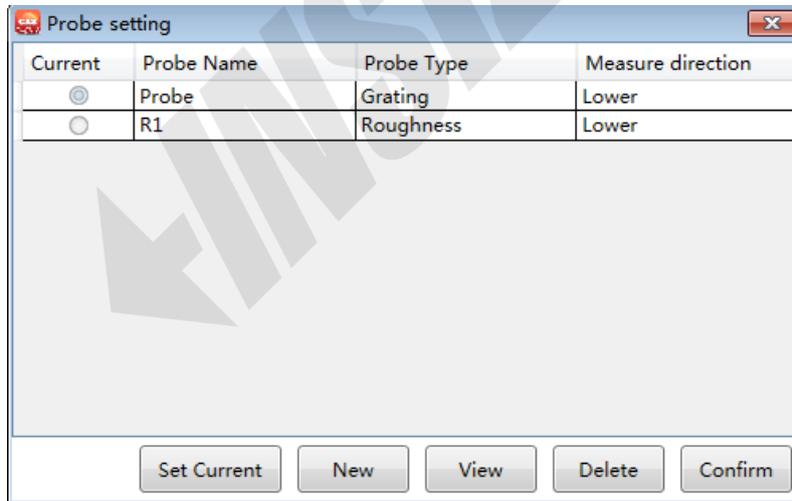
IX. Roughness Measurement

NOTE: this function is optional, some model don't have this function.

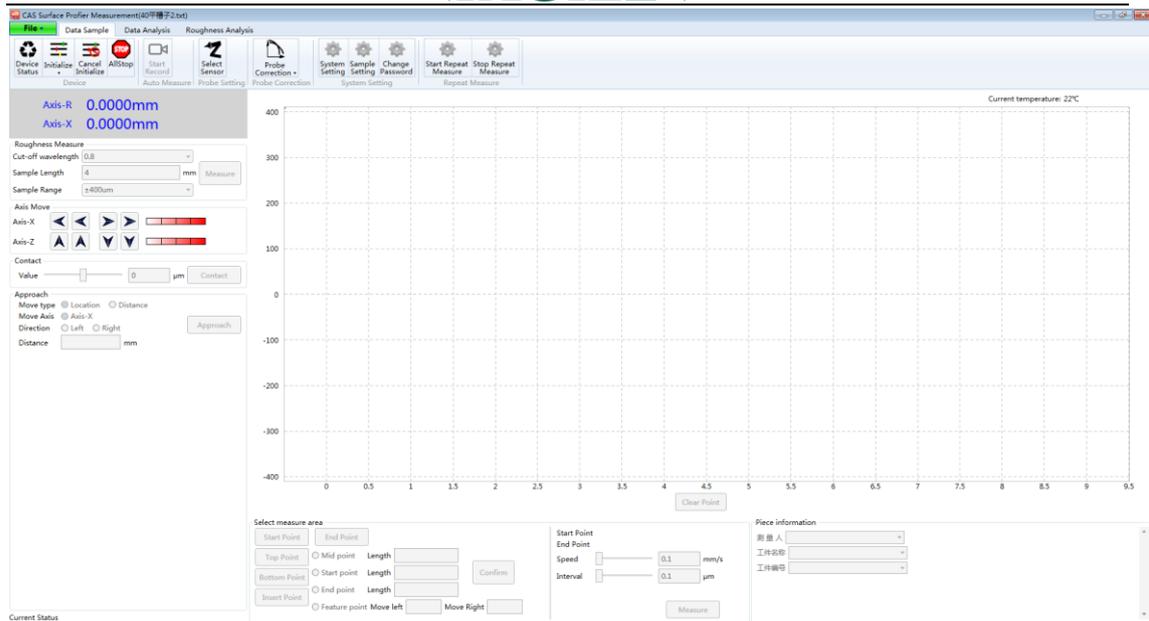


9.1 Switch Roughness Module

Click  under the data acquisition module will popup below interface.

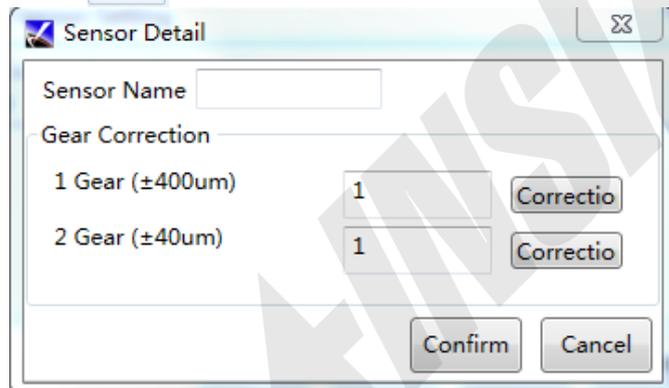


Select the roughness stylus, click “Set Current”, click “Confirm”, the data acquisition is converted to below interface.

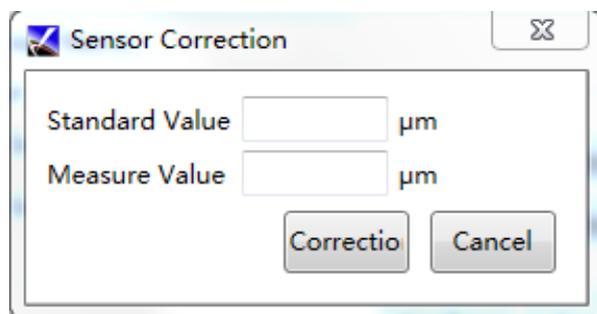


9.2 Stylus Calibration

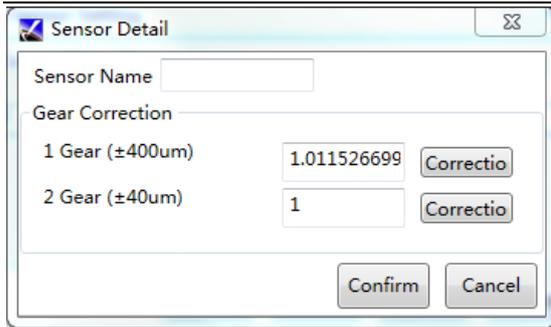
Click  will popup below interface.



Click “Calibration” on the right side of “Gear 1 Factor” will popup below interface.

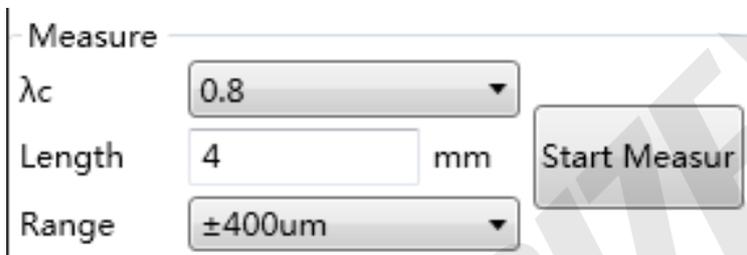


Enter the standard value of the measured part in the “Standard Value”. Enter the value of the standard measured part “Measured Value”, in the case the gear 1 value is 1. Click “Calibration”, the “Gear 1 Factor” will be calculated automatically and click “Confirm” as below interface.



“Gear 2 Factor” calibration are with same operation way.

9.3 Data Collection



Select the cut-off wave length and sampling length according to the range of the Ra value of the measured parts.

Cut-off Wave Length	Ra Value Range
0.08	0.008-0.02
0.25	0.02-0.1
0.8	0.1-2
2.5	2-10
8	10-80

The collection range is to enter different values according to the actual measurement condition of the measured parts.

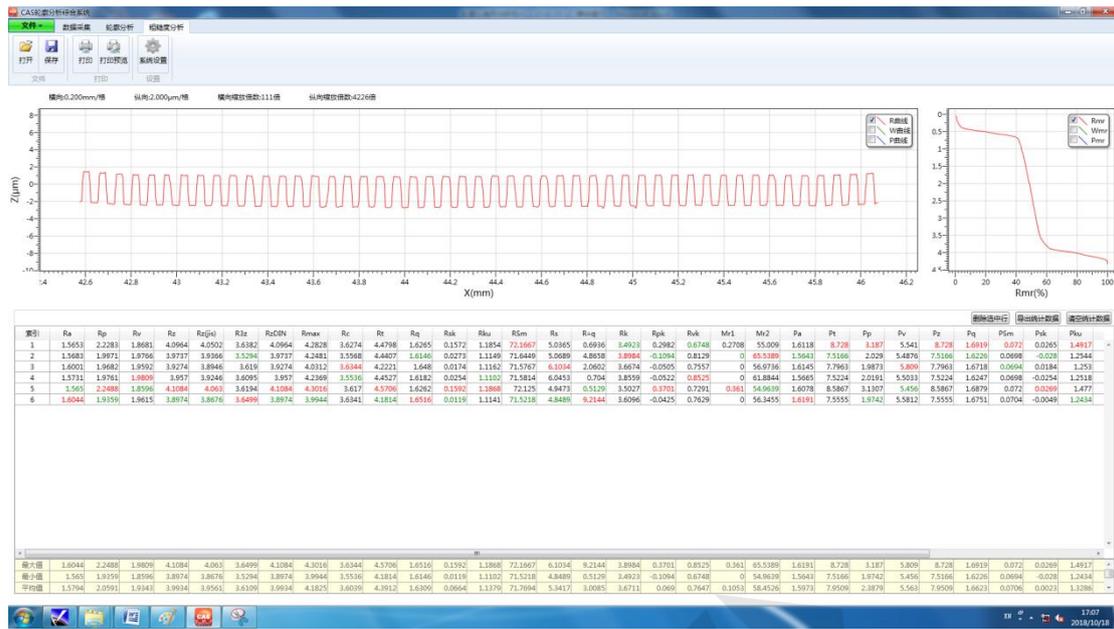
Start measurement, click **Start Measur** after measurement rules set finished. The measurement is started and finished automatically.

Automatic Contact

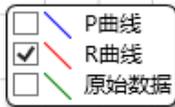


Enter the value of “Contact Amount”, click **Auto Contact**, the stylus will contact with the measured parts automatically until the Z1 axis reading (detector lift amount) is bigger than or equal to the value set by the contact amount.

9.4 Roughness Analysis



9.4.1 Curve Display Set



P Curve, display contour curve in drawing area.

R Curve, display roughness curve in drawing area.

Original Data, display collected original data curve in drawing area.

9.4.2 Featured Data Reprocessing

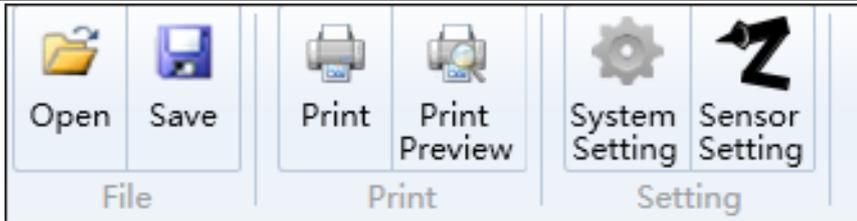
The measurement data needs to be reprocessed while there is a problem with the actual measurement part and the part need to be measured.

- 1、 According to the contour curve of the drawing area, find the roughness curve of the part that needs to be processed, drag the mouse to select this part roughness curve.



According to the actual demand, cut out this curve part to re-process and analysis or delete it.

9.5 Menu Bar Introduction



9.5.1 File Menu



9.5.2 Print Menu



9.5.3 System Set



The pin name already exists

Report Setting **Current Report Setting** Statistics Report Setting

Show report Current results Statistics report

Standard ISO DIN JIS

Filter

Filter Type Gaussian

Pre-Travel λc $\lambda c/2$ None Post-Travel λc $\lambda c/2$ None

Contour compensation Setting

Contour compensation Line

Waviness Setting

λf 4 mm

Rmr Setting

Calculate Rmr Parameter CO 0 % Cut Depth 0.5 um Cut Count 1 1-10

Draw rmr point in the rmr chart

Other Setting

Date display format 2016-12-20

Date Time display format 2016-12-20 15:23:40

Current Result Report Parameter Format 0.0000

Statistics report parameter format 0.0000

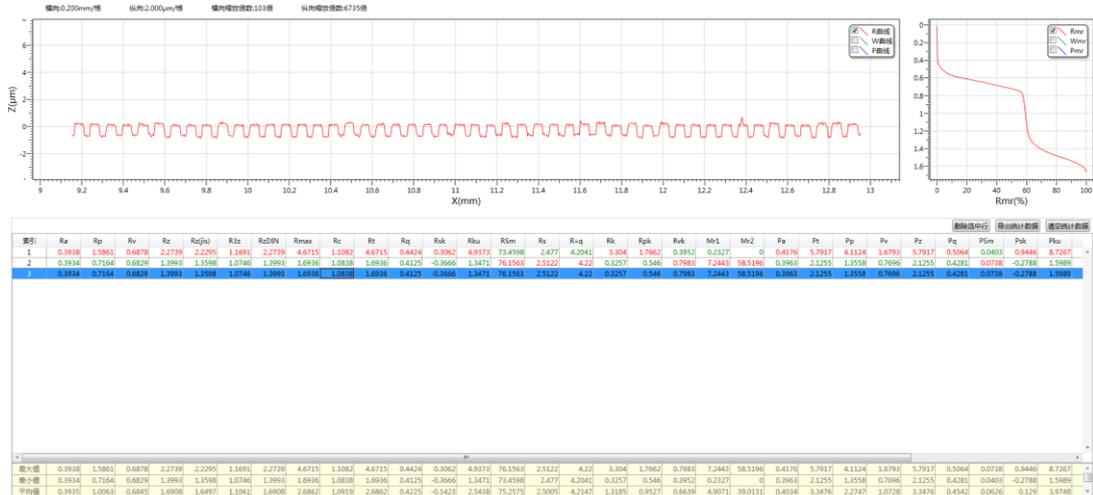
Roughness Curve Draw Point Count 2000 Point

Confirm Cancel

Show Report, Select “Current results” or “Statistics report”
The “Current Results” can only show one group data.



The “Statistics” can display several group data.



“Delete Row”, select one measurement data need to be deleted, click **Delete Row** will delete the selected measurement data from report area.

“Export Statistics Data”, click **Export** will export the measurement results in the report area to an Excel file.

“Clear Statistical Data”, click **Clear** will clear all measurement results in the report area.

Automatic Statistics

最大值	0.9938	1.5861	0.6878	2.2739	2.2295	1.1891	2.2739	4.6715	1.1082	4.6715	0.4424	0.3062	4.9373	76.1563	2.5122	4.22	3.304	1.7662	0.7983	7.2443	58.5196	0.4176	5.7917	4.1124	1.6793	5.7917	0.5064	0.0738	0.9446	8.7267
最小值	0.9934	0.7164	0.6829	1.9993	1.9598	1.0746	1.9993	1.6936	1.0838	1.6936	0.4125	-0.3666	1.8471	76.1561	2.5122	4.22	0.3257	0.546	0.7983	7.2443	58.5196	0.3963	2.1255	1.3558	0.7696	2.1255	0.4281	0.0738	-0.2788	1.5989
平均值	0.9935	1.0005	0.6845	1.6908	1.6497	1.1061	1.6908	2.6862	1.0919	2.6862	0.4275	-0.1423	2.5438	75.2575	2.5005	4.2147	1.3185	0.9527	0.6639	4.9071	59.0131	0.4034	3.3476	2.2747	1.0728	3.3476	0.4542	0.0626	0.129	3.9748

After the workpiece measurement is completed, in the report area, the maximum, minimum and average values for each parameter of each measurement can be calculated automatically in the report area.

Capture Setting

粗糙度采集设置

运动设置

测量完成后是否回退到起点 回退速度 mm/s

测量完成后立柱向上移动 移动距离 mm 移动速度 mm/s

测量前先自动接触 接触量 mm

自动接触 接触速度 mm/s

采集速度设置

截止波长 0.025 0.08 0.25 0.8 2.5 8

采集速度 mm/s

采集预走设置

预走方式 预走 回退 无 预走长度 mm

采集结果设置

采集结果保存路径



Motion Setting

Speed Set: Can set the low-speed gear and high-speed gear of each gear speed of X axis and Z axis.

- 1.Can set whether to return back to the starting after the measurement, and the return speed.
- 2.Fixed-point and fixed-distance Motion: set the approach mode, approach speed and approach acceleration of the motion.

Other Setting

Date Format: set the display format of the date in the parameter report.

Date/Time Format: set the display format of the date and time in the parameter report.

Current Result Report Parameter Format: set the displayed number of decimal places in the roughness parameter in the current result report area.

Current Result Report Parameter Format: set the displayed number of decimal places in the roughness parameter in the current result report area.

Statistical Report Parameter Format: set the displayed number of decimal places in the roughness parameter in the statistical report.

Roughness Curve Drawing Points Number: set the maximum drawing points during drawing displaying the roughness curve, contour curve and original data point cloud.

9.6 Roughness Parameter Introduction

1. **lr**: Sampling length (cut-off wave length) lr

For determining the length in the X axis of irregular features of the assessed contour.

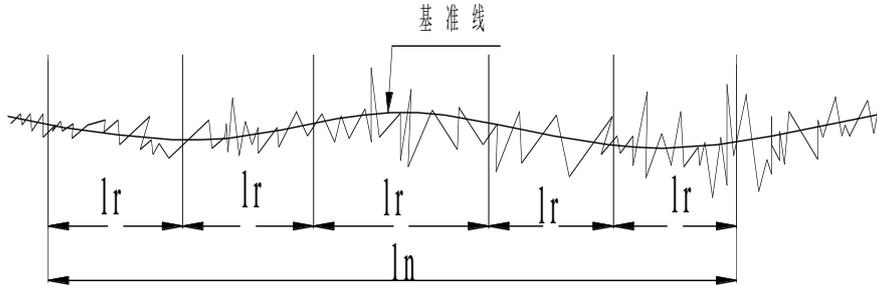
2. **ln**: Assessed length (measurement length) ln

For determining the length in the X axis of the assessed contour.

NOTE:

- Assessed length l_n include one or several sampling length l_r .
- Choosing the correct sampling length l_r is very important for roughness measurement.

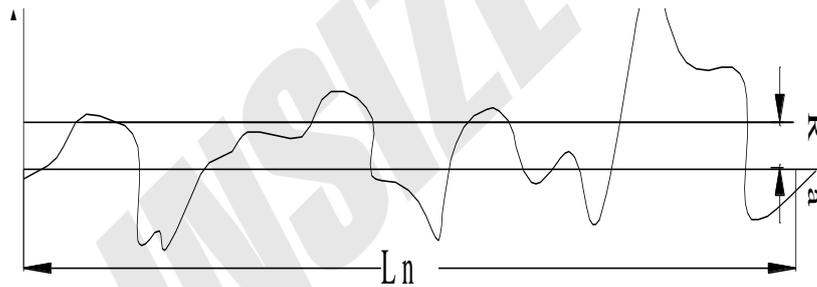
This instrument can set 5 gear, $l_r=0.08, 0.25\text{mm}, 0.8\text{mm}, 2.5\text{mm}, 8\text{mm}$.



Reference Line

3. Evaluate the arithmetic mean deviation of the contour R_a .

The arithmetic mean of the absolute value of the ordinate value $z(x)$ in a sample length.



$$R_a = 1/l_c \int_0^l |Y(X)| dx$$

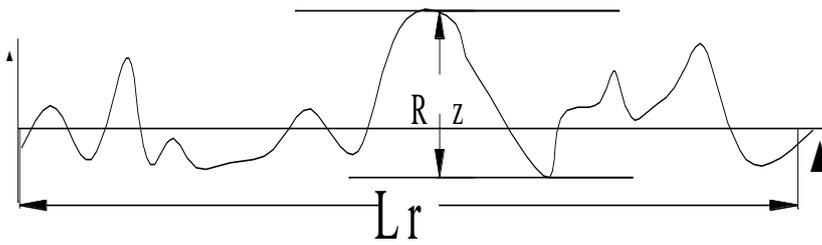
4. The maximum height of the contour R_z (Comply with standard GB/T3505-2000)

R_y (jis) (Comply with GB/T3505-1983 GB/T3505-1983)

The height of the peak height z_p and the valley depth z_v of the maximum contour within a sampling length.

NOTE: The R_z value of the evaluation length l_n should be the biggest value of the R_z values of each sampling length.

R_{max} :(DIN4768:1990) Maximum roughness depth and R_z are approximate.



5.
Ten

points height of micro unevenness $Rz(jis)$ (Comply with standard GB/T3505-1983)

The sum of the average of the five largest contour peak heights and the average of the five largest contour valley depths within the sampling length.

$$Rz = (\sum_{i=1}^5 y_{pi} + \sum_{i=1}^5 y_{vi}) / 5$$

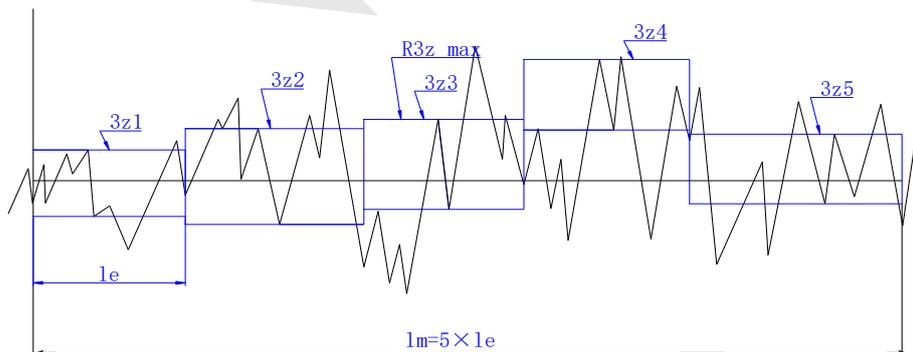
y_{pi} is the number i biggest contour peak height, y_{vi} is the number i biggest contour valley depth.

The Rz value of the evaluation length l_n is the average value of the Rz value of each sampling length.

Rz_{DIN} : is German DIN standard

It stipulates that the assessment length is 5 sampling lengths. Add 5 group data of the maximum contour peak value and the maximum contour valley height within each sampling length, and take the average value.

$R3z$: the evaluation length value of $R3z$ for the third peak top value and the third valley bottom value of each sampling length is the average of the sum of each sampling length $R3z$.



6. **Rt**: Contour total height R_t

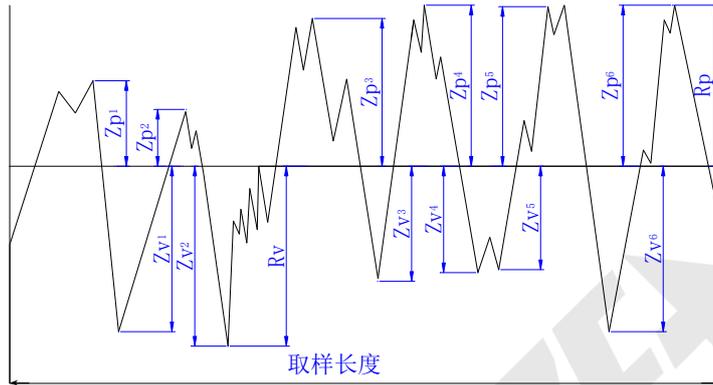
Refers to the sum of the maximum value of contour peak z_p and the maximum value contour valley depth z_v within the assessed length.

7. **Rp**: Maximum value of contour peak.

Refers to the maximum value of contour peak within one sampling length.

8. **Zv**: maximum value contour valley depth Z_v

Refers to the maximum value contour valley depth Z_v within one sampling length.



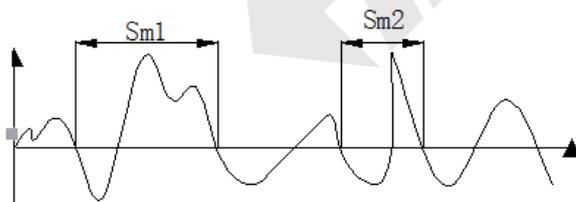
9. $R_{pm} =$

$$\frac{1}{n} \sum_{i=1}^n R_{pi}$$

10. **Rsm**: The average width of contour elements

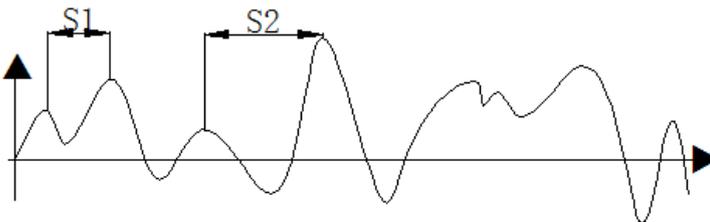
The average value of the contour element width x_s within a sampling length.

(The spacing of micro-unevenness refers to: the length of a section of the midline containing a contour peak and adjacent contour valley) (as picture 6)



11. **RS**(ISO4287-1984): The single peak average space value of the contour.

The average value of the single peak spacing of the contour within the sampling length.



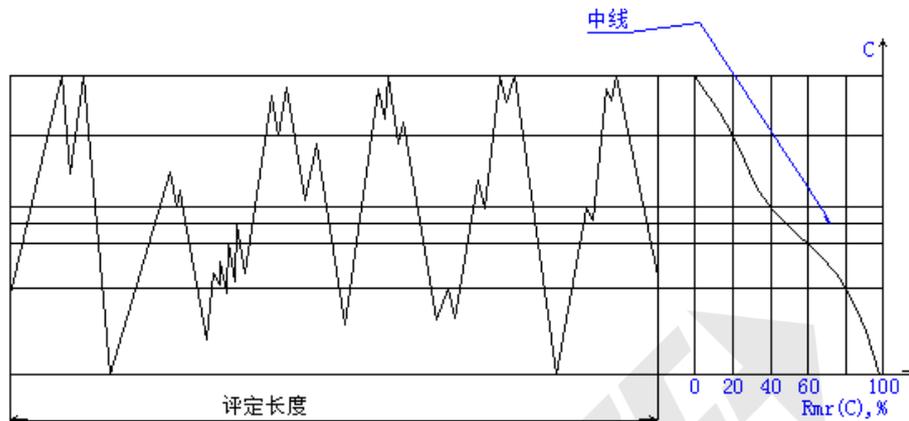
12. The supporting length rate curve of the contour.

Refers to the curve of the contour support rate varies with horizontal position change.

It shows the relationship between the length ratio of the contour support and the amplitude distribution.

At a certain point of the supporting length rate curve, the supporting length rate is the sum of the amplitude distribution accumulated to this point.

13. **Relative bearing ratio Rmr:** Rc is determinate on a horizontal section of the contour, the bearing ratio related to the starting zero position C0.



14. **Rsk:** Assess the skewness of the contour Rsk
The ratio of the mean value of the cubic value of the ordinate Z(x) to the cube value of Pq.Rq and Wq within a sampling length

$$Rsk = 1/LRq^4 \int_0^L (x) dx$$

15. **Rc:** Contour element average line height.
The average value of contour elements height Zt within a sampling length.

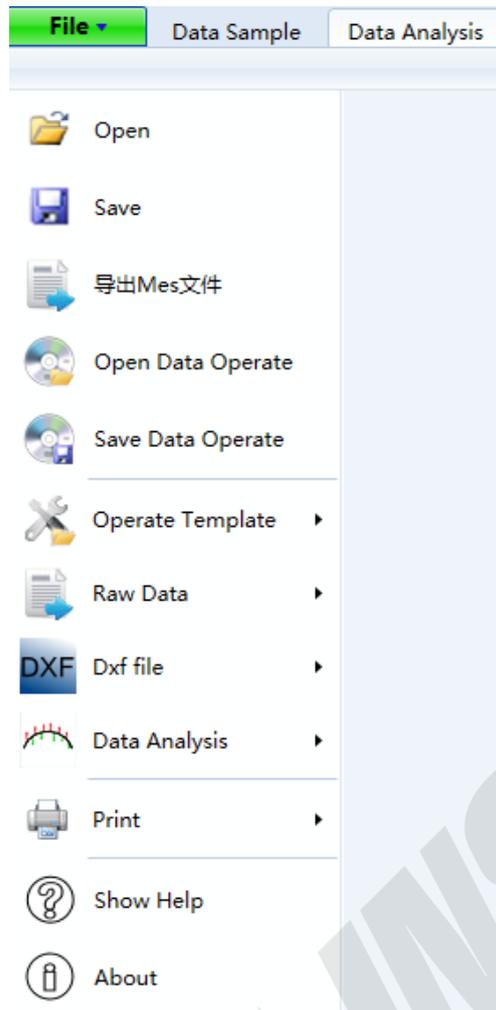
16. **Rq:** Evaluate the root mean square deviation of the contour.
Root mean square value of ordinate value Z(x) within a sampling length.

17. **Rmr(c):** Contour supporting length ratio
At a given horizontal position C, the ratio of the length of the solid material of the contour Ml(c) to the assessed length.

18. Scale parameter of Rk core roughness depth in material linear curve.

Rk、Rvk、Rvk、Mr1、Mr2;

9.7 File Menu



Help: click view help can see this manual.

About: check the software information.

X. Cautions

1. Keep the power supply at $220V \pm 5\%$, please don't shutdown in violation of operation procedures and cut off power supply suddenly.
2. Make sure the machine is not in direct sunlight range, and do not place it facing directly to the air conditioning outlet port.
3. The operating temperature of the instrument is $20 \pm 2^\circ\text{C}$
4. Before the measurement, make sure the measured parts is fixed firmly to prevent the measured parts fall down, bring damage to instrument and stylus.
5. During measurement, please be careful that the stylus and detector must not collide with other measured parts.
6. During measurement, please do not lean on the instrument, knock the marble, touch the measured parts or stylus with hands.
7. Please be cautious not connect the U disk with virus or other storage tools to the computer
8. Irrelevant personnel, please do not operate this instrument.