

ISD-P SERIES MEASURING SOFTWARE OPERATION MANUAL



Note

To ensure your safely and effective use of the ISD-P Series automatic video measuring machine. Please read the manual patiently before operating it. And note the follows:

Safety Precautions

Transportation security

In the process of transporting and handling, the products can not be subjected to external impact, compression, and vibration;

In the process of transporting and handling, ensure the products is always kept level, without tilt, side or upside down;

The measuring lens is precise components, although it is protected by enclosure, it still requires very careful treatment in the process of transportation and handling, to avoid squeezing and vibration;

Because of the heavy base of the machine, please move it carefully to prevent unnecessary personnel injury and products damage.

If product damage or accuracy decrease is caused by transportation handling, INSIZE takes no responsibility.

Unpacking

After opening the package, at first, please check whether there is mechanical damage of the items, then follow the packing list (see the appendix) or check carefully purchase contract whether the items are available. If any items are damaged or the product does not comply, please do not use, and immediate contact with the company;

After opening the box, please first remove the fixing angle block from the machine;

Place the product in the safe flat place, and adjust the measuring machine with a level meter to keep it level.

The use of safety

Keep the product in the safe flat place, do not place it uneven or the risk of falling objects

Do not use non- original factory supplied accessories, such as bad power cord and USB signal lines;

Do not adjust or disassemble the product components;

Do not place the instrument in too much dust, too much vibration, temperature swings and other environments;

Do not place any other items on the platform to prevent moving platform accidental collision.

The operators' requirements

Operators need to have some experience in computer operations and basic knowledge of measuring, and receive corresponding operating training from INSIZE.

Maintenance

Request to environment

Anti-vibration

If the video measuring machine surround additional vibration, the measuring accuracy will be reduced. When the frequency is less than 10Hz, The amplitude of surrounding vibration should not exceed 2μm (peak - peak difference); when the frequency is between 10Hz to 50Hz, then the acceleration should not exceed 0.4Gal. If the vibration exceeds these restrictions, you should use anti-vibration measures (such as, install the vibration damper).

No dust

The components of the video measuring machine must be no dust. Although the video measuring machine can be effective protected by the dust cover, the measurement machine should be cleaned periodically.

Power

Supply With the stable power supply 90~264VAC, 47-63Hz, 10Amp ensuring the machine normally operating.

Temperature

Try to keep the ambient temperature at 20 °C ±1 °C. Please do not adjust the machine precision at the high or low temperatures. Otherwise, that Cannot ensure the accuracy of this machine at 20 °C.

Humidity

For the measuring accuracy, the humidity is no direct adverse effects. However, high humidity will make rust on the mechanical surface, obstruct the sliding Axial movement. Therefore, the recommended humidity maintained will be between 30% and 80%.

Illumination

The video measuring machine cannot be placed in the bright light or direct sunlight. Otherwise, the measuring accuracy of the measurement will be greatly affected.

The maintenance for the parts:

Measurement platform

Be careful at the glass platform when loading or uploading the working pieces, sometimes, the measurement platform will be attached to the layer of water vapor and oil mist, please clean the dirty off with the detergents

Fuselage shell

When the video measuring machine does not work, please cover it with dust cover. Once the fuselage shell has been contaminated, please clean it with a piece of soft cloth. Because the fuselage shell has been contaminated, although the measurement accuracy will be not directly affected, the contamination maybe spread to the linear slide, platform or other parts that will impact accuracy.

Chapter 1 Introduction

INSIZE ISD-P Series automatic video measuring machine is a high precision measuring machine completely independently developed by INSIZE, which can non-contact measurement geometry by the image analysis processing technology. And it is high precision, high efficiency, high stability, multi-function video measuring machine products.

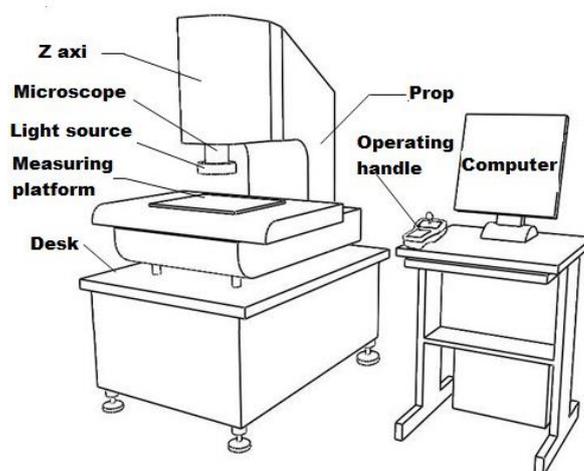
Through the machine, light, electricity, software and other major areas of integrated design, the products adopt the non-contact optical measurement method, Automatic measurement of the work pieces geometry, such as length, height, depth, contour, surface shape, angle and locations. In particular to subject to a variety of precision parts for the accurate measurement and quality control, such as electronic parts, precision tooling, stamping parts, plastic parts, PCB, LCD, screw, gear, forming tools and so on.

INSIZE ISD-P Series automatic video measuring machine widely apply in electronics, machinery, machines, watches and clocks, light industry, military, aircraft Days of aviation and other industries, universities, research institutes, metrology department laboratories, measuring rooms and workshops, but also can be used in reverse engineering, three-dimensional scanner.

1.1 Working Principle

INSIZE automatic video measuring machine structure includes: measurement platform, Z-axis, microscope, CCD, light resource, electrical control system and the computer.

Computer receive the data from microscope and CCD image; light resource ensure the computer access to high-quality image data in different parts, different measuring requirements; the computer send a command to move the measurement platform and Z axis via the network interface to the electronic control system, moving the measuring area to the microscope's viewing area; the precision measuring software on the installed computer deal with the image processing technology to the achieved the data , so that it can measure the working pieces. The basic structure of INSIZE automatic video measuring machine as follows:



1.2 Vispec Measurement software

Vispec is a full-featured precision measurement software designed and developed specially for INSIZE video measuring machine. The main functions are as follows:

Offers a variety of basic geometric measurement: point, line, circle, arc, ellipse, rectangle, Groove , distance, spacing(Pin pitch), angle, R angle, plane, coordinate system, calculator, spine , square, circle (ring O-Ring),set of points;

Offers a variety of geometric tolerance measurement: straightness, roundness, parallelism, perpendicularity, tilt, concentricity, Position, flatness, etc.

Offers a variety of image extraction methods: segmentation mode, drawing point, nearest edge point, focus point, circle frame point, nearest point, square frame extraction point, nearest point, line extraction point, overall extraction, texture extraction, caliper extraction, overall extraction (old), texture segmentation, barcode, QR code, fast drawing an overall circle, open contour, maximum closed contour, nearest closed contour, contour scan, etc.;

Offers a variety of constructive functions: take endpoints, center points, extreme points, connecting lines, intersections, perpendiculars, parallel lines, bisectors, tangent lines, merge fits, split fits, drawing circles by radius, three-line tangent circles, two lines and radius determining circles, scripts, baselines determining hexahedron, region segmentation, dot matrix combination, etc.

Offers a variety of ways to establish coordinate systems: machine coordinate system, coordinate system determined by points and lines, X axis determined by two points, Y axis determined by two points, coordinate system determined by three points, coordinate system determined by two lines, coordinate system determined by a plane, line and point, Plane Alignment coordinate system, Point Alignment coordinate system, sample matching coordinate system, translation coordinate system, rotating coordinate system, manually adjusted coordinate system, etc., along with multi-coordinate system functions;

Quickly establish measurement tasks (measurement programs): primitive copy (translation copy, rotate copy, cross-coordinate copy) and loading from DXF drawings (CAD loading);

Offers offline programming of measurement tasks (measurement programs) and other functions;

Tolerance setting: global tolerance setting, single primitive tolerance setting;

Fully automatic batch inspection supports automatic and manual interactive operation;

Flexible machine control functions, including XYZ three-axis motion, lens zoom, light source control, auto-focus, etc. to control XYZ three-axis motion in various ways;

It can output Word, Excel, HTML, TXT reports and DXF files;

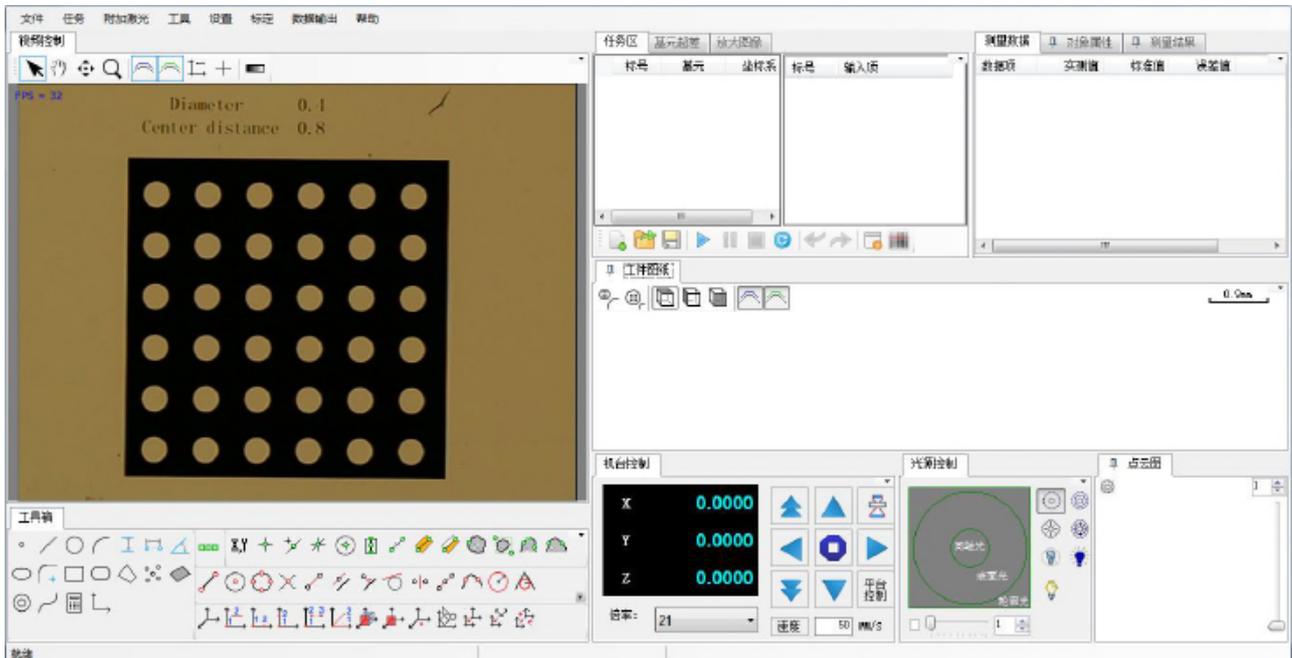
Powerful customized report output function, compatible with any report formats of customers;

SPC statistics function, to support effective quality control.

Equipped with multiple enhancing tools and plug-in, such as paper comparison, panoramic scanning, test sieve, focus

height measurement, display edge map, cable insulation thickness measurement, etc.

Interfaces are designed with six languages including Simplified Chinese, Traditional Chinese, English, Japanese, Korean, and Vietnamese.



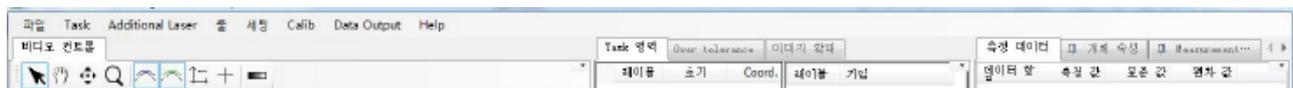
Software Main Interface



Traditional Chinese Interface



English Interface



Korean Interface



Vietnamese Interface



Japanese Interface

Chapter 3 Operation Flow

3.1 Before Use

Firstly, please make sure the fixing angle block which on the platform has been removed. Otherwise it will lead to serious consequences.

Examine whether the power cord, video data line, controller data line is connected properly.

Turn on the computer, start Windows 10.

Remove all the artifacts and other items on working platform of Video Measuring Machine. (Avoid collision when self-testing)

Open the power, start self-testing.

After the self-testing, start Vispec software, input user name and password to enter main window.

Description: the default user name is INSIZE or Admin, password is null

3.2 Calibration

The product has been calibrated before you receive it, in general, the product calibrate once a year. If the measurement error is too large, please contact technical staff to re-calibrate.

3.3 Measurement

Place the workpiece to be measured on measuring platform.

Move working platform so that the workpiece imaging in visible range. Adjust the light source, Z-axis position, camera magnification to make imaging clear and sizeable.

Set measurement parameters and display parameters in the software. Refer to the details of 4.2.4 "set menu" in Chapter 4.2 "Main Menu Bar".

According to the actual shape of workpiece, choose different measuring tools to drawings.

Primitive tools: Select primitive type to be measured and the generative pattern of primitive.

Extraction tools: the generative pattern of primitive, through find edges and focus or other operations in images to generate new primitives.

Building tools: the generative pattern of primitive, generate new primitive from the existing

Primitives.

Coordinate tool: the generative pattern of primitive, establish the coordinate, and the coordinate is adjustable.

Output drawings: After finish all the primitive measurements, you can use "output DXF" function to outputs the drawings as DXF file which is re-editable in other softwares such as AutoCAD.

3.4 Establish Task

3.4.1 Establish Manual Measurement Task

Establish manual measurement task is similar to basic steps of chapter 3.3, the differences are:

Set workpiece coordinate system, task start measuring from the first workpiece coordinate system automatically, primitive before establish the first coordinate system requires user to measure manually.

Can insert empty operations to plan the machine measurement path.

Some text can be inserted in the steps to prompt user;

Task can be edited and modified, and the primitive of task can be modified or deleted, set tolerances. Refer to the description of "Task menu" in chapter 4.2.7.

Set primitive measurement as focus mode, used for the auto-focus before measurement in the task.

Primitive attributes can be set as "manual primitive," then in the process of tasks running automatically, when measure the primitive, the program pauses, waiting for the user measure manually, enter the automatic running after the primitive measurement finished.

Save the task: the current task can be saved as .Tsk file to complete the task of generating.

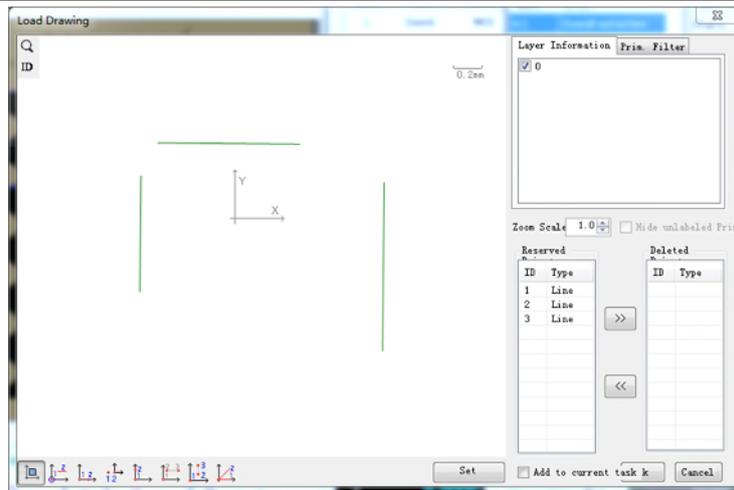
3.4.2 DXF drawing imported into task

1. Open the drawing files

Execute the menu item "Tasks -> Open DXF Drawings" and select and open a DXF drawing. It is recommended to use the version above drawings of AutoCAD 2004. When the drawing is lower than the version of AutoCAD 2004, a prompt box will pop up, as shown on the right:



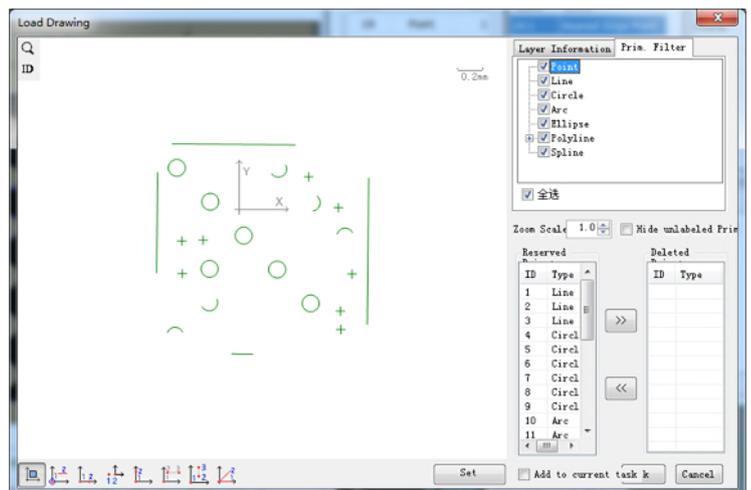
2. Select the layer of extracted



Select specific layers" option box in pop-up window "layer information list", to extract the corresponding layer information.

3. Delete and reduce primitive

If there includes unwanted primitives in the extracted layer information, then select the primitive which want to delete in the "reserved primitive" list, click the "Delete" button, the primitive shifted into the "deleted primitive" list. If you need to reduce the primitive, then select the primitives in the "deleted primitive" list, and click on "reduce" button. After delete the extra primitives, only retained primitive pattern showed in the left window.



4. Scaling factor

The ratio of actual part and drawings, For example, if the length of line is 1 mm on the drawing, practical part are 2 mm, then the scaling factor is 2. Scaling is 1 in default.

5. Primitive filter

In the opened "edit standard drawing" interface, after clicking the primitive filtering option, the primitive types that can be filtered are displayed, so as to filter primitives as needed. There are 3 states of primitive filtering, which will appear separately when clicked with the mouse: "Tick" means that the selected primitive type is displayed and measured, "blank" means that the primitive of that type is not displayed or measured, and "square" means that the selected primitive is displayed but not measured. The "hide primitives without label" operation is also the same as the three states in primitive filtering. It should be noted that primitives and labels may not work without being associated in CAD. After the primitive filtering operation is completed, click "refresh" on the interface, and the drawing display will refresh the display. After clicking "clear all", all primitives will not be displayed and measured. At this time, "clear all" will become "select all". After clicking "select all", all primitives will be displayed and measured.

6. Set the reference coordinate system and working light source

To enable the software to automatically measure, workpiece coordinate system must be established to associate the actual part in running tasks while setting the appropriate light source for part measurement.

3.4.3 Import measurement by gerber drawing

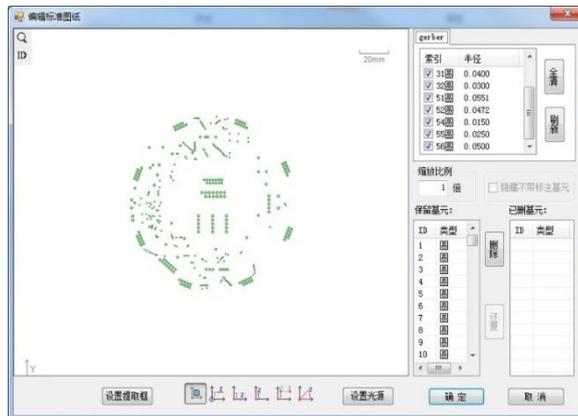
1. Open gerber drawings

Execute the menu item "Task -> Open gerber drawing", select and open the corresponding drawing, as shown in the interface below:



2. Edit gerber drawings

The editing of gerber drawings is basically the same as the editing of DXF drawings, except that there is no primitive filtering option, as shown below:



3.5 Batch automatic measurement

When you need to measure a lot of samples of the same type, using this batch automatic measurement method.

First, establish the measurement task, and then, run this task on other workpiece in batch measurement.

Steps as follows:

Generate task: refer to chapter 3.4 " Establish task".

Load task: load task from task file, or use the new task.

Set workpiece coordinate system: the first primitive is fixture coordinate system, not need to extract manually. Other primitives require the user to extract and set the first coordinate system, program automatically alignment the workpiece and measurement drawings according to the coordinate system extracted by user, measure automatically.

Set tolerance data according to accuracy requirements. Set task cycle number based on actual need.

Set task cycle number based on actual need.

Set output, software will generate .Rst files automatically after measurement, rst files can be opened by SPC. If user need to output data directly, setting the task parameters, and through the primitive right-click menu item "output setting "to set output data.

Click to run the task: After running the task, measurement software will control the machine and camera automatically, measure primitive and all relevant characteristics according to the order of task list.

3.6 Output

1. Output through SPC

Measurement data will be saved automatically by computer while task is running. The data will be saved at "system setting-task setting-output path", use current date for file name and .rst for Extension. The saved data can be used as sample data to open when use SPC function. After SPC loaded, user can export data to Excel or TXT file by setting output attribute, in order to use by other software or report

2. Output task

Set the task output file and primitive output attribute before run the task. While the task is running, system will output the data to user-specified file.

3. Output main window

Output the measurement data as Word, Excel, TXT or HTML file, also as DXF file.

3.7 Shutdown Steps

Save data of Vispec software

Close Vispec software

Turn off Video Measuring Machine;

Turn off computer.

Chapter 4 Software Function

Description of Measurement Terminology

Primitive:

Geometric elements measured by the software, including point, line segment, circle, arc, ellipse, rectangle, slot, spacing, distance, angle, R angle, plane, coordinate system, calculator, quadrangle, point group, ring, spline, etc.

Task:

The user's operations are recorded in the form of primitives, forming a sequence of primitives and being saved as files. In the measurement of large quantities of the same type of workpiece, batch automatic detection can be completed to improve work efficiency by establishing tasks.

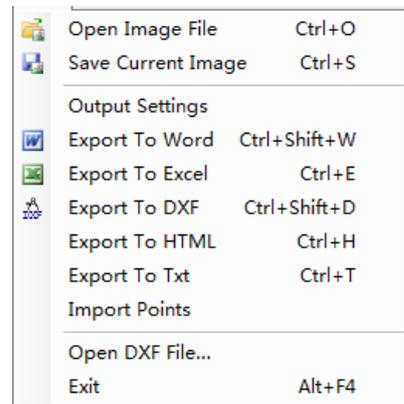
4.1 Menu Bar

4.1.1 File menu

Open Image File: Load the image for measurement. The default picture is in BMP format with a size of 640*480.

Save Current Image: Save the current images on the image window. The default is BMP format image file. It may choose whether to save the primitive with the label or the extraction box.

Output Settings: Preset the sample number, part number, operator, title, output data item name and other information of the tested product. When the measurement result is exported to various files (Word, Excel, HTML, txt), it will be displayed as setting information in the corresponding files.



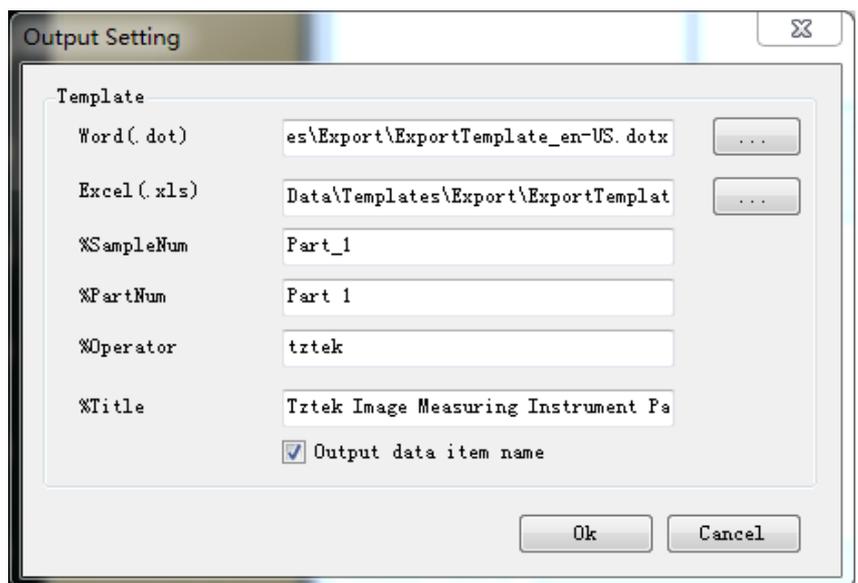
Export To Word: Output current measurement data to a Word document, and set the output type, output template, and definite output format in the system settings.

Export To Excel: Output current measurement data to an Excel sheet, and set output type, output template, and definite output format in the system settings.

Export To DXF: Output current measurement data as a DXF file, and operate again in software such as AutoCAD.

Note: Only the measured values are output (only line segments, arcs, circles, ellipses, point groups can be output).

Export To TXT text: Output current measurement data as a TXT text file. **Note:** only data can be output; no graph is



output.

Export To HTML: Output current measurement data as an HTML hypertext file.

Batch import points: import multiple point primitives in batches. The input items of imported points support drawing points, nearest edge points, focus points, circular frame selecting points, line extraction points, square frame selecting points, nearest points, manual laser points, turntable laser points and laser thickness measurement. The supported file formats include: txt, excel, and csv.

Note:

File format: record x, y, z, i, j, k per line. For example:

If it encounters a blank line, ignore it;

If there is a seventh digit, the first six digits make up the point, ignoring the seventh and subsequent digits;

If only 3 digits are read, assign xyz respectively, and ijk defaults to 0.

If only 2 digits are read, ignore it;

If only 1 digit is read, ignore it;

If there are non-digits in the first three digits, ignore them; (if there are non-digits in the first six digits, ignore them);

If there are non-digits in the third, fourth or fifth digits, ignore them; (if there are non-digits in the first six digits, ignore them);

```
1, 1, 2, 0, 0, 0
1, 1, 3, 0, 0, 0
1, 1, 4, 0, 1, 0
1, 1, 5, 0, 1, 0

1, 1, 5, 0, 1, 0, 2
0, 1, 1
0, 1
1
OP, 1, 2, 0, 0, 0
0, 1, 2, 0, P1, 0
0, 1, 2, 0, 0, 0, P1
```

Open DXF drawings: Create a task from DXF drawings. For details, see [3.4.2 Importing Tasks from DXF Drawings](#)

Open the gerber drawing: Create a task from the gerber drawing. For details, see [3.4.3 Importing Tasks from Gerber Drawings](#)

Exit: Exit the entire software.

4.1.2 Task Menu

Open (Measurement) Task: load a task (this will clear the current task list, overlay).

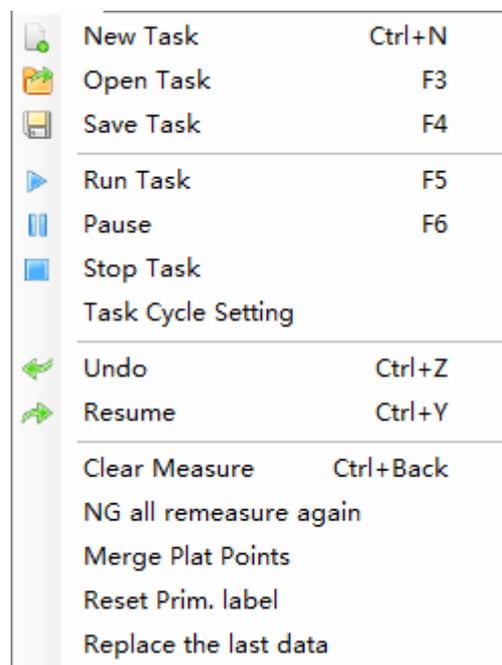
Save (Measurement) Task: save the current task as a .tsk5 format file and record the information of the task runtime for multiple loading and use.

New (Measurement) Task: Create a new task and be prompted whether to save the current task.

Task Cycle Setting: set the number of task cycles, and the delay between each task.

Run Task: Click the Run button to start the task of running the primitive list.

Pause: Pauses the task run. At this point, it allows to edit the suspended primitive and the primitives that are not



running later and resume running by continuing to run the task.

Stop Task: Stop current running task, including the tasks in circular running.

Undo: Undo the last operation on the task.

Resume: Restore the last undo operation.

Clear Measured Value: Clear the measured value in each primitive data item.

Clear Standard Value: Clear the standard value in each primitive data item.

NG all remeasure again: Measure all the NG primitives again.

Reset Prim. Label: Reset the labels of the first column in the primitive list. It allows to reset numbers only.

Task data output setting: Set the output directory address of the file that the task automatically outputs.

Replace the last data: Replace the last data of the file that the task automatically outputs.

4.1.3 Tools Menu

4.1.3.1 SPC

Each time the measurement task runs normally, at the end the Vispec software saves the measurement data of this time as a data file (.rst), and the SPC can perform statistical analysis on the saved data.

I. Load Data

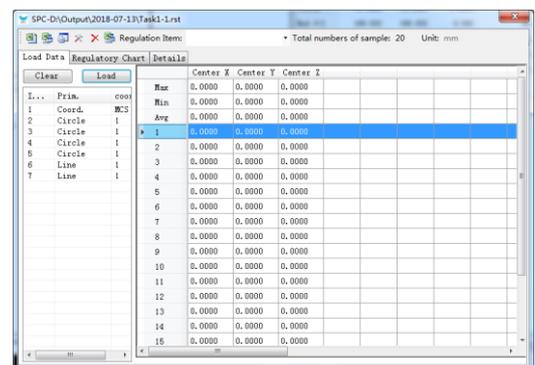
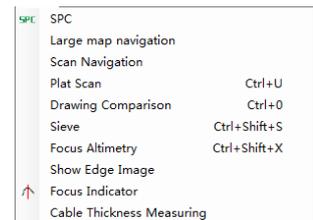
1. Load sample data:

Load Sample: Select the directory where the measurement data is located, and select the data file to be viewed by multiple options.

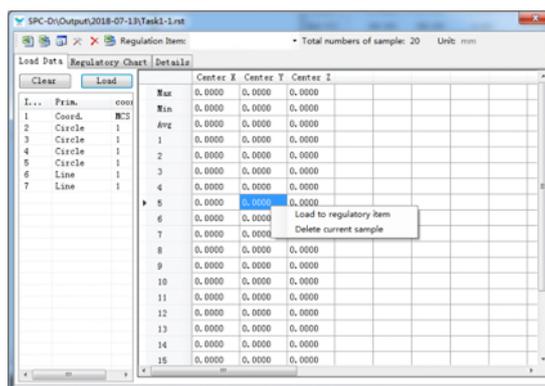
Clear Sample: When a new SPC analysis is required, the sample data that has already been loaded needs to be cleared first, otherwise the original sample data will also exist when a new sample is loaded.

2. Regulatory Items

Click on any of the primitives in the list of primitives on the left, and the right side displays the individual attribute data for that primitive in each file.



Double-click on the Regulatory Attributes column and the “Setting Regulatory Items” dialog box will appear; or click the right-hand button, the menu as below will appear; click the “Load to Regulatory Item” menu item, and the “Setting Regulatory Items” dialog box will also pop up.



In the “Setting Regulatory Item” dialog box, standard values and tolerance values can be set. Click OK after setting to complete the setting of a regulatory item. At this point, on the Charts and Data pages, all the attribute values and statistical result for this primitives can be seen. When there are multiple regulatory items, the current regulatory item may be switched through the Regulatory Items drop-down box.

II. Regulatory Chart

Click on “Regulatory Chart” to view the various regulatory charts for the current regulatory item. The interface is shown below:

1. Average and full-range regulatory chart (XBar-R)

When the quality data can be grouped reasonably, the X regulatory chart is used for the analysis or regulation process, and the R regulatory chart is used for the process variation.

2. Average and standard deviation regulatory chart (XBar-S)

Same as the X-R regulatory chart, the S regulatory chart detection power is larger than the R regulatory chart, but with troublesome calculation.

The general sample size n is less than 10 using the R regulatory chart, and n is greater than 10 using the S regulatory chart.

3. Median and full-range regulatory chart (XMed-R)

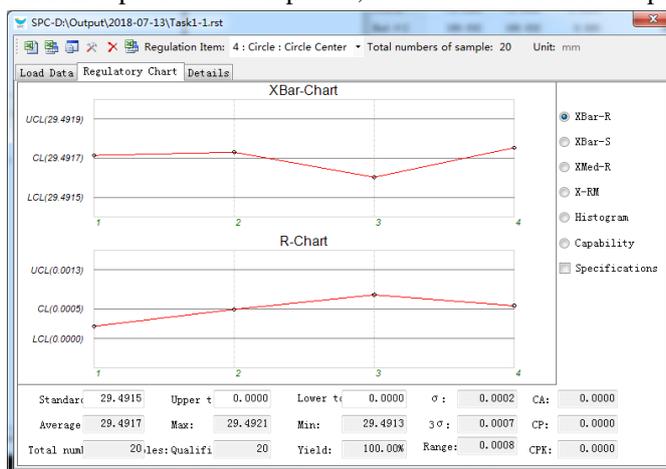
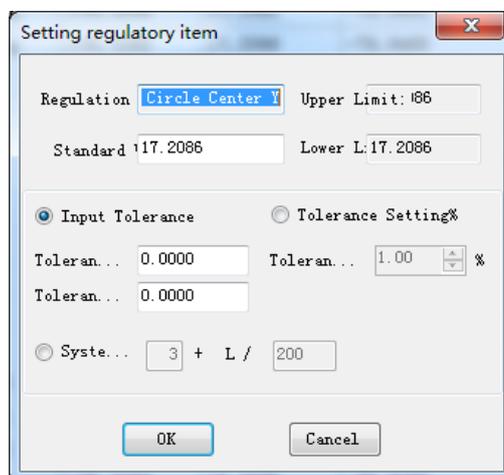
Same as the X-R regulatory chart, the X regulatory chart has poor detection power, but the calculation is simple.

4. Individual value and moving full-range regulatory chart (X-RM)

1) When quality data cannot be grouped reasonably, use the X-Rm regulatory chart, as follows:

- Only one data can be collected at a time, such as production efficiency and coefficient of losses.
- The process quality is extremely uniform and it does not require multiple samples, e.g. liquid concentration.
- Obtaining measured values is time consuming and costly, such as complex chemical analysis and destructive testing.

2) When the quality data can be grouped reasonably, in order to improve the detection power, please use the X-R regulatory chart as much as possible.



5. Histogram:

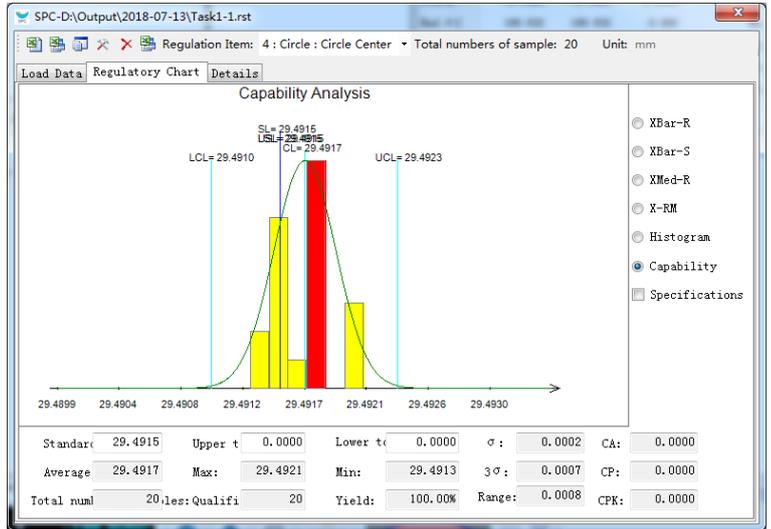
The histogram can clearly show the distribution trend of the stored data and understand the quality status.

6. Regulatory Process Chart:

The principle of normal distribution is applied for the analysis of data distribution, visually showing the quality level and the comprehensive ability of the products.

7. Data Analysis

Calculate some common process indexes such as Ca, Cp and CpK; average, standard value, number of data, number of failures and their percentage.



III. Details

Click "Details" to view the specific data, as shown on the right:

Each 5 data in the “Details” is divided into one group and it shows the average and R values of each group of data.

IV. Tool Bar

Group	Sample1	Sample2	Sample3	Sample4	Sample5	Average	R value
Group1	29.4918	29.4917	29.4917	29.4917	29.4915	29.4917	0.0002
Group2	29.4918	29.4917	29.4915	29.4920	29.4915	29.4917	0.0005
Group3	29.4921	29.4913	29.4915	29.4914	29.4917	29.4916	0.0008
Group4	29.4921	29.4917	29.4915	29.4915	29.4918	29.4917	0.0006

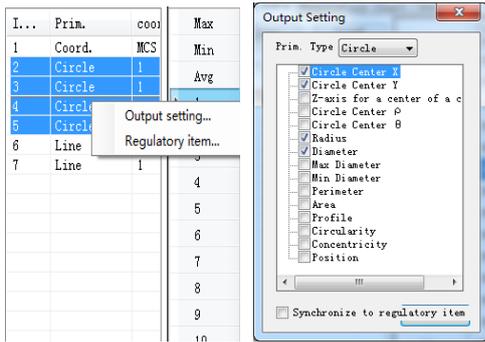


The icon description is as follows:



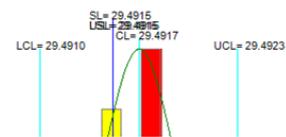
Export selected regulatory item report to Excel format: Generate SPC report of current regulatory item;

SPC Output Settings: Set the primitive attributes that need need to be exported to an external file.



	A	B	C	D	E	F	G	H	I		
1				SPC Report							
2											
3				Sample.No:							
4				Operator:							
5				Datetime:2018年7月18日							
6											
7				Project: 4 : Circle : Circle Center Y							
8				Sample.No: 20							
9											
10				Max:	29.4921	Min:	29.4913	Average:	29.4917		
11											
12				Nominal:	29.4915	tolU:	29.4915	TolL:	29.4915		
13				CA:	0	CP:	0	CPK:	0		
14											
15				Group	Sample1	Sample2	Sample3	Sample4	Sample5	Average	R value
16				Group1	29.4918	29.4917	29.4917	29.4917	29.4915	29.4917	0.0002
17				Group2	29.4918	29.4917	29.4915	29.492	29.4915	29.4917	0.0005
18				Group3	29.4921	29.4913	29.4915	29.4914	29.4917	29.4916	0.0008
19				Group4	29.4921	29.4917	29.4915	29.4915	29.4918	29.4917	0.0006
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

Capability Analysis



 Export all output items to Excel: Export the sample data output by all the current settings to Excel format for use by other software; (Figure 2)

 Export all output items to TXT: Export the sample data output by all the current settings to TXT format for use by other software; (Figure 1)

 Settings: set the content of the sample data display, and the number of display digits of the data;

 Delete current regulatory item: delete the current SPC regulatory item;

 Export selected data to the specified Excel template file: Export selected data to the specified Excel template file (Figure 3)

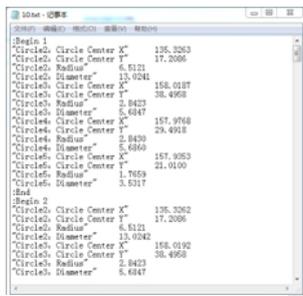


Figure 1

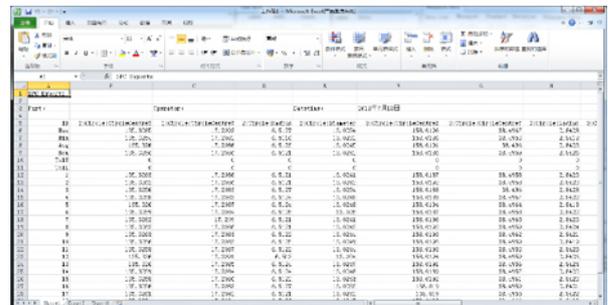


Figure 2

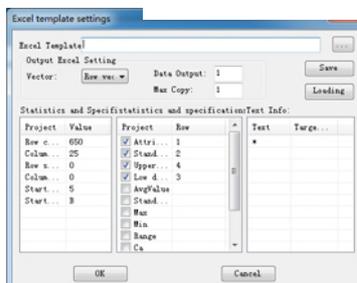


Figure 3

4.1.3.2 Full view scan

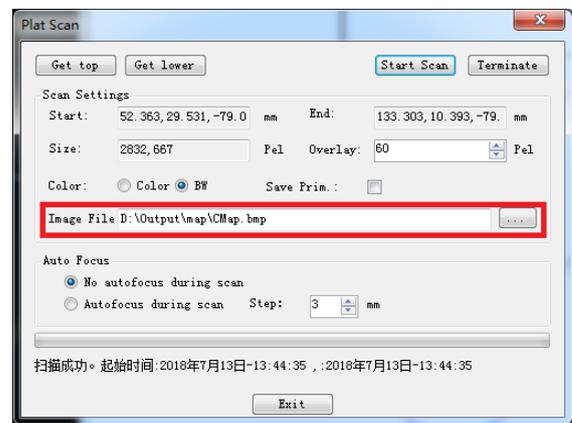
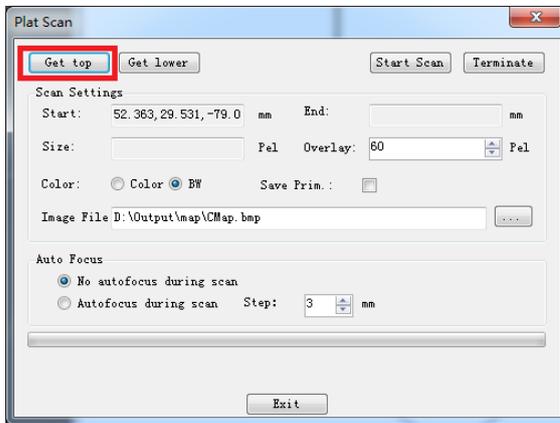
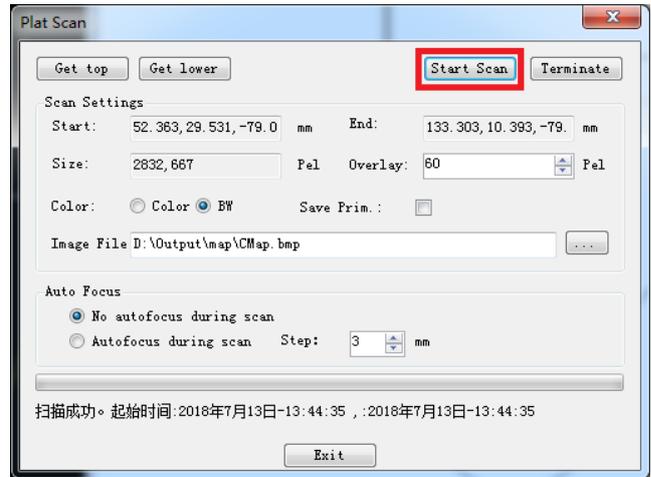
With this function, specified area of workpiece can be overall scanned, the software automatically

form the whole image for overall or partial area of the workpiece. Click the two dots of diagonal which need puzzle, the software will scan and puzzle the whole image automatically.

Operating Procedures:

- (1) Move the platform to the upper left corner of the area to be scanned and click the "Get Left Up" button:
- (2) Move the platform to the lower right corner of the area to be scanned, and click the "Get Right Down" button: Click "Start Scan", the machine will automatically move to the starting position, and scan and puzzle the image.

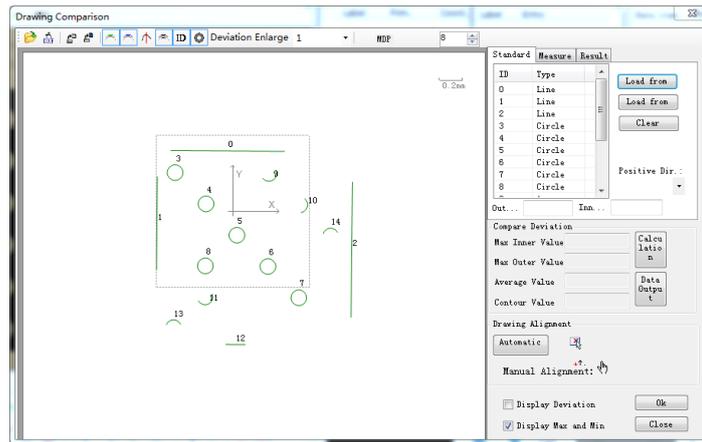
After prompting "scan completed", the successfully scanned image can be viewed under the path D:\Output\map\CMap.bmp.



Note: During the scanning process, the configuration may be changed as needed by each user. Each function can be understood literally, and will not be described in detail here.

4.1.3.3 Drawing comparison

Compare measuring drawing of workpiece with original drawing, the software figure contour difference, then finish the contour comparison.



Load Drawings

- 1) Load standard drawings from DXF
Use "Load from DXF", and the DXF import interface is the drawing loading interface.
- 2) Load standard drawings from task

Open the task file and display the primitive standard values in the task in the drawing area and standard drawing list.

- 1) Display standard drawings

The acquisition of standard drawings supports "Load from interface", "Load from RST" and "Automatic search".

- 1) Load from interface

Obtain the edge points of all primitives in the current task and display them in the drawing area and measurement data list as a point group.

- 2) Load from RST

Open the SPC data file with the expanded name of rst, and display the edge points of all primitives of the file in the drawing area and measurement data list as a point group.

- 3) Automatic search

Find the most recently closed contour point group in the current image vision and load it into the drawing area and measurement data list.

- 2) Drawing display

The standard line is displayed in the drawing area, and the color of the line is the same as the standard line color in the image area setting of the main interface.

- 3) Display primitive ID

If "Display Primitive ID" is checked, the primitive label is drawn at the center of the standard line. If the standard line is not displayed, the primitive ID is not displayed.

- 4) Display tolerance zone

If "Display tolerance zone" is checked and the upper and lower tolerances are set in the standard line, the tolerance zone will be displayed in the drawing area.

- 5) Calculate the deviation

Calculate the maximum internal deviation, the maximum external deviation, the average deviation, the contour deviation, and display the deviation line in the drawing area.

- 6) Display deviation line

If "Display deviation line" is checked, the deviation line is displayed in the drawing area. The deviation lines sequentially links two adjacent points in the point cloud, and each point is displayed as a vertical line to the standard line.

- 7) Maximum deviation pixel

Ignore the deviation if it exceeds the set deviation pixel.

- 8) Deviation amplification

When drawing the deviation line of a vertical line, the length is extended based on the standard line and the magnification is a selected number.

9) Automatic alignment

Adopt the best fit alignment based on point clouds and standard lines.

10) Manual alignment

Click to select the small hand icon; drag and drop the drawing area with mouse. If the mouse is inside the rectangle, it means translation; if it is outside the rectangle, it means rotation.

11) Display error

After turning on the function, when the mouse moves to the vertical deviation line, the deviation value is displayed on the right side of the mouse.

12) Display the maximum and minimum errors

After turning on the function, the points of maximum and minimum deviation are displayed in bold. The maximum is red; the minimum is green; the deviation line is blue, and the deviation value is displayed on the right side of the point.

13) Data output

The save dialog box pops up, and the save type is csv. The save format is maximum internal deviation, maximum external deviation, average deviation, contour deviation and drawing.

4.1.3.4 Sieve

Clear Data: Clear all data from the test sieve module and all data in the main interface task list.

Obtain Sampling Position: Set the sampling part when testing the sieve. The calibration specification requires two sampling positions, and the software can set multiple positions. The sieve takes each part as the starting point to launch horizontal and vertical detection.

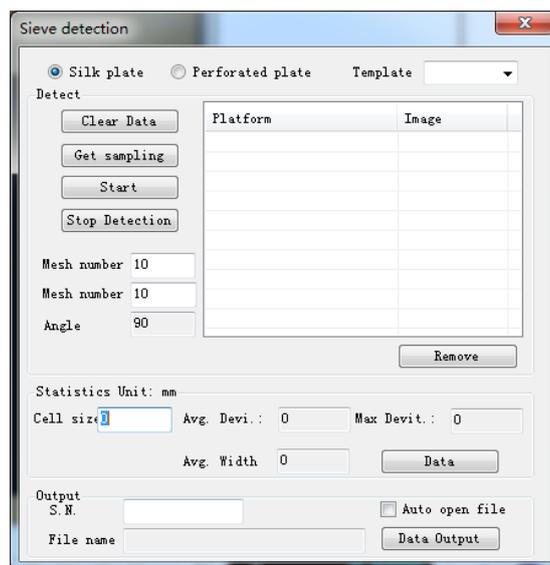
Delete Sampling Position: Delete the currently selected sampling position.

Start Detection: Detect according to the set sampling position sequence; each sampling part is detected horizontally and vertically, and the lower status bar will prompt the detection progress. If the standard size of the mesh is set before the detection, the software will automatically calculate and count the sieve test data.

Stop Detection: Terminate the test sieve detection process.

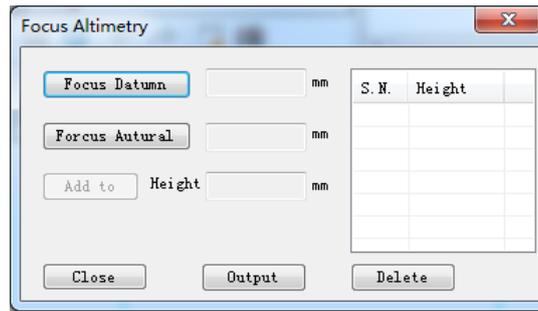
Data Statistics: Calculate and count the test sieve data that has been detected. Note that the standard size of the mesh should be set first. After counting, the average wire diameter, average deviation of mesh size, and maximum deviation of mesh size are displayed.

Output data: Output the sieve test data to a preset Excel report. The default Excel report template is sieving.xlt.



4.1.3.5 Focus height measurement

1. Click on the menu "Tools" -> "Focus height measurement" to enter the focus height measurement window, as shown below:
2. Move the work platform to the datum and click on "Focus to Datum Plane", then the software will automatically focus and record the z-axis data of the datum plane.
3. Move the work platform to the measured plane and click on "Focus to Measurement Plane", then the software will automatically focus and display the z-axis data of the measurement plane, and automatically calculate the height difference of the measurement plane relative to the datum plane. At this point, click on the "Add to List" button to save the calculated height values in the list for comparison.



4.1.3.6 Probe height measurement

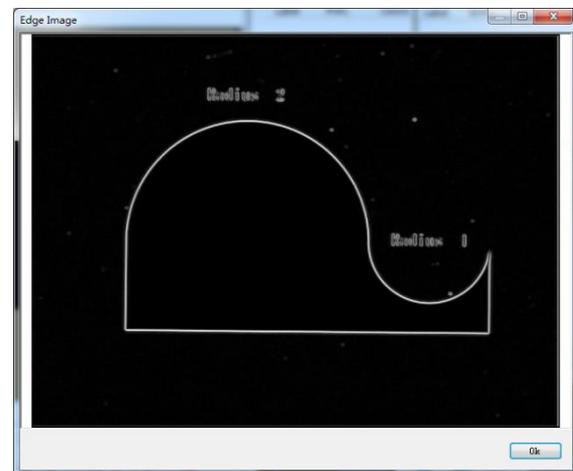
If equipped with contacting probe, click the function, the system will start the function of probe height measurement to measure the height with similar procedure to that of focusing height measurement



4.1.3.7 Show border drawing.

Displays the current image obtained after scanning the edge of the edge intensity, the stronger the edge where the higher the extraction accuracy.

Below is a precision gear edge strength map.

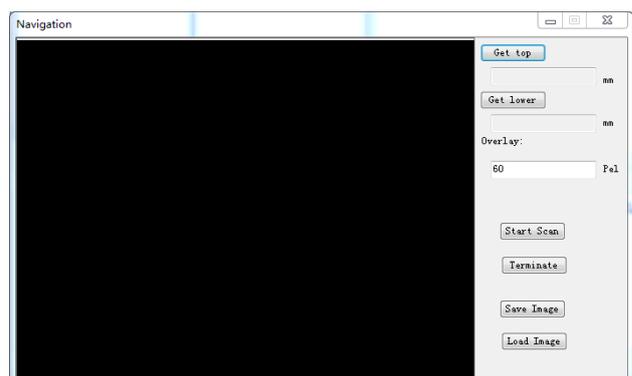


4.1.3.8 Scanning Navigation

The navigation function enables fast positioning. By setting the image area, the navigation function can be used to quickly move the machine lens to the image area that needs to be set.

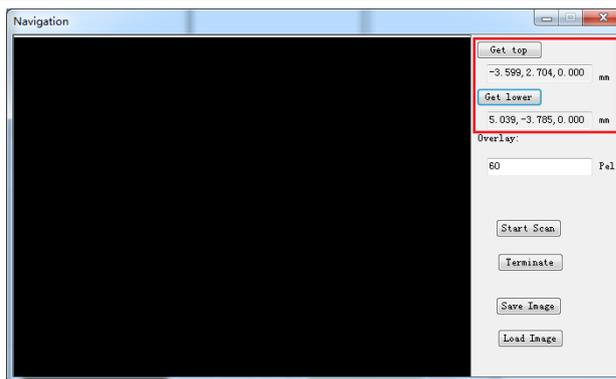
Set measurement tasks with navigation

1. Turn on the Vispec software, adjust the light source and auto focus to make the image clear.
2. Select the navigation option under the toolbar and the navigation window will automatically open:



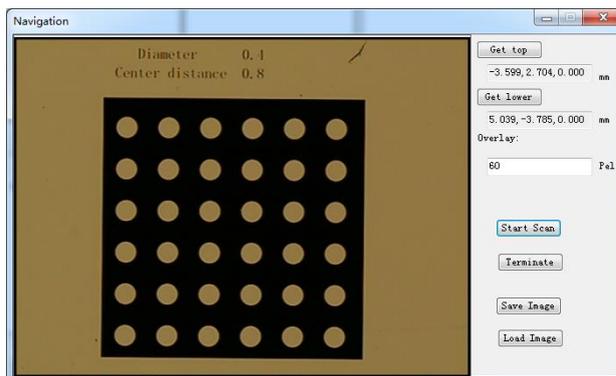
3. Move the platform to the upper left and lower right points of the area to be scanned respectively and obtain the corresponding coordinates. Set the pixels of the overlapping size, generally using the default 60 pixels.

4. After completing the acquisition and setting, click to start scanning, and the machine will automatically scan the selected area. If it needs to stop scanning, click the Stop Scan, stop button or emergency stop button, and the machine will stop moving to terminate the scanning. It is shown in the figure after the scan is completed:



5. Double-click on any position of the scanned image with mouse, and the machine will move to this area accordingly. Double-click in the center of the image area and the area we need to measure can be displayed when quickly moving the machine lens using navigation.

6. The scanned image can be saved. Click the Save Image in the navigation interface to save the image to the specified path. It allows loading the image directly whenever it is needed, but if the position of the workpiece on the machine has changed, the machine cannot move to the corresponding place accurately and it may require rescanning.

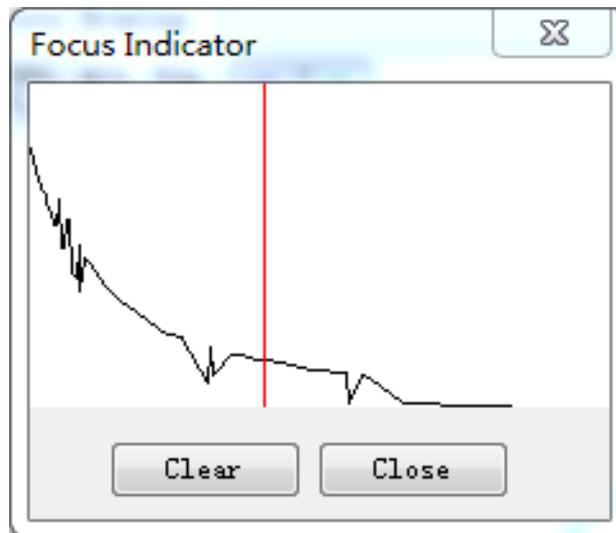


4.1.3.9 Focus Indicator

Focus indicator (this function is available in the VMQ series): Indicate the definition of the current image when adjusting Z axis.

The initial interface has no data and is displayed as a blank image.

Adjust the Z axis to slowly move up and down from one limit to another, enabling the indicator interface to slowly draw the definition curve, with a red vertical line indicating the current location. When the red line intersects the highest point of the curve, the image is in the clearest optimal position.



4.1.3.10 Cable insulation thickness measurement

Get Picture: Display the picture of the current image area in the picture area, and clear all the labels.

Dispose: Display the label in the image area according to the parameter settings.

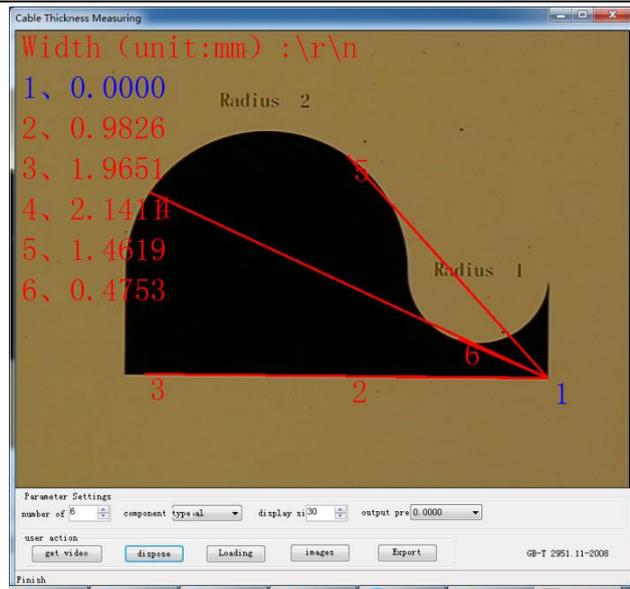
Picture loading: Display the picture file in the image area, and clear all the labels.

Image Save: Save the picture in the image area as a file.

Data Export: Output distance data to Excel.

Calculation method:

1. Search for a ring in the picture
2. Calculate the thickness of the thinnest part and mark it with blue lines and serial numbers
3. Find the thickness of other positions based on the number of divisions, and mark them with red lines and serial numbers
4. Display all thickness data in the upper left corner of the picture area according to the font size and output precision.



4.1.4 Settings Menu

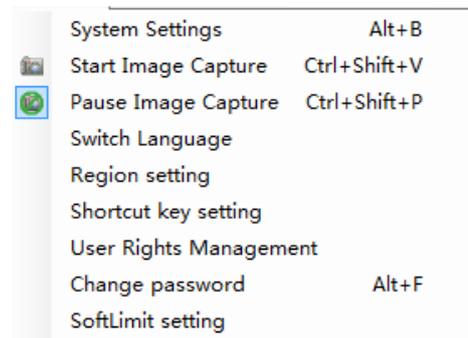
Start Image Capture: Start image capture, and the image of the workpiece will be displayed in the image measurement area.

Pause Image Capture: Click “Pause Image Capture” to pause the capture and get a still image of the workpiece.

4.1.3.1 System Settings

Length display mode: Set the current data unit and decimal digits.

Angle display mode: Set the current angle display mode and output accuracy.

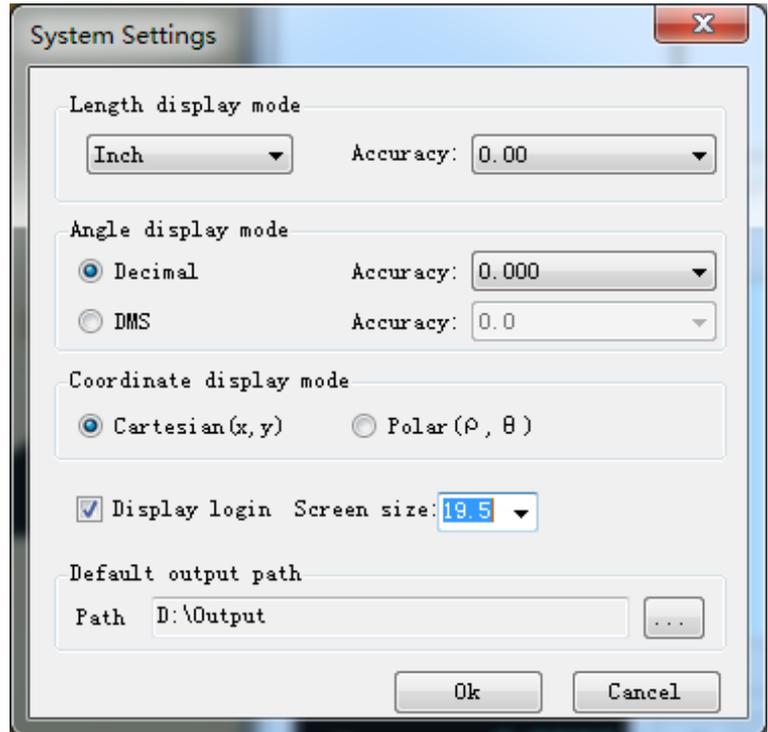


Coordinate display mode: Set the current coordinate mode for better observation of images and data.

Screen size selection: Set the image area size at different resolutions. This setting affects the display of the multiplying power value.

Display login box: Whether to display the login interface when starting the software.

Sound prompt: Whether there is an operation sound when the primitive extracting is completed.



4.1.3.2 Switch language

It allows switching between different languages, and the set language will be executed next time when starting the software.

The software currently supports Simplified Chinese, English, Japanese, Korean, Vietnamese, and Traditional Chinese.



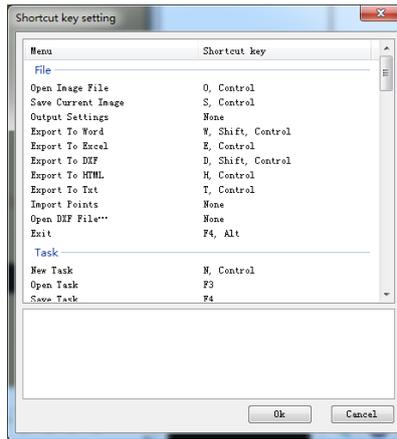
4.1.3.3 Region set

Different regions are displayed distinguishably by LOGO; it adds the Taiwan's LOGO, and the default is the mainland LOGO.

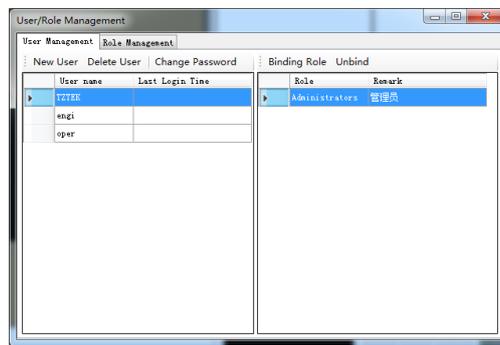
Set different areas, and the LOGO in the corresponding position of the software changes and it will take effect the next time it is turned on.

4.1.3.4 Shortcut key setting

It is used to set shortcut keys for each sub-item in the menu bar.



4.1.3.5 User/Role Management



User Management: Add, delete, or modify the user's password, display the user's login information, and set the user's role through Binding Role, but only one role can be bound. When a user's role is selected, the role can be unbundled through the Unbind button.

Role Management: Add or delete roles, and modify the role's name and view the role's permission points. The permissions of each role can be set through the Binding Permissions Point button.

Note: The user refers to the account name at login, and the role refers to the user group of the user, which is used to manage the permissions of different roles. Only administrator users can open this interface.

4.1.3.6 Change Password

This function supports modifying the login password but is only available if the login box is displayed. (Figure 1)

4.1.3.7 Soft limit setting

Set the limit function of the machine in the software to prevent the machine and workpiece from colliding.



Figure 1

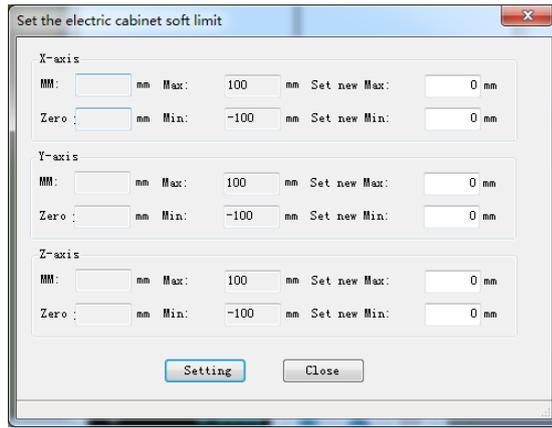


Figure 2

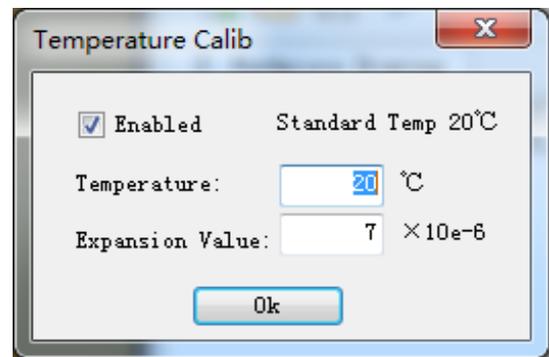
4.1.5 Calibration Menu

4.1.2.1 Temperature compensation

"Enabled (Compensation)" check button defaults to be unchecked. The current temperature defaults to 20°C and the expansion value defaults to 7×10^{-6} .

Check "Enabled (Compensation)" and the current temperature and expansion value text box becomes available.

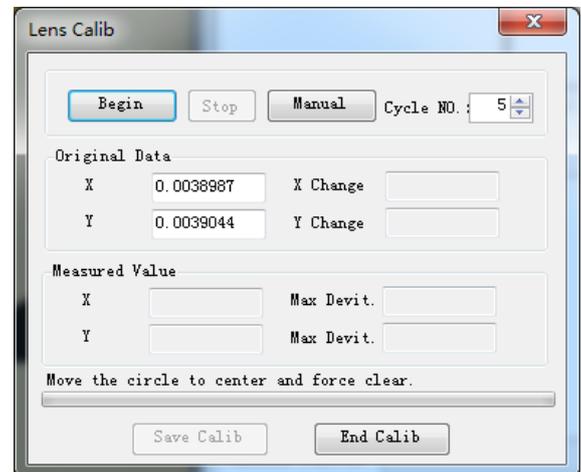
Click OK to complete the setup.



4.1.2.2 Lens calibration

Open Interface: It displays the X ratio and Y ratio at the current multiplying power value.

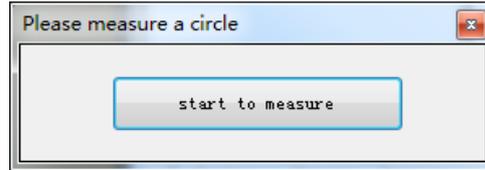
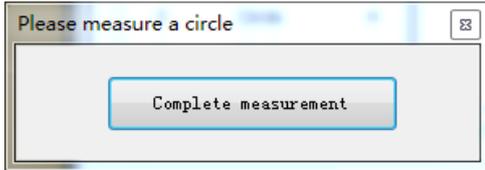
Start calibration, extract the largest circle in the video area, and move the circle to the lower left corner to record the center of the circle, then the circle moves to the upper right corner to record the center of the circle and rotates for the set times, and the progress bar is updated. After completion, the measured X ratio and maximum deviation, Y ratio and maximum deviation are displayed, and the X ratio change and the Y ratio change are calculated.



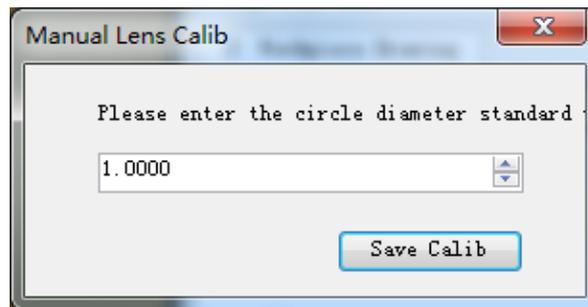
Manual Settings: To modify the X ratio and Y ratio in the original data, click the Manual button, and the X ratio and Y ratio value of the measured data are consistent with the original data.

Save Calibration Data: The dialog box "Are you sure to save the calibration data? Note that this operation cannot be resumed" pops up, and click OK to update the calibration data.

Manual lens calibration

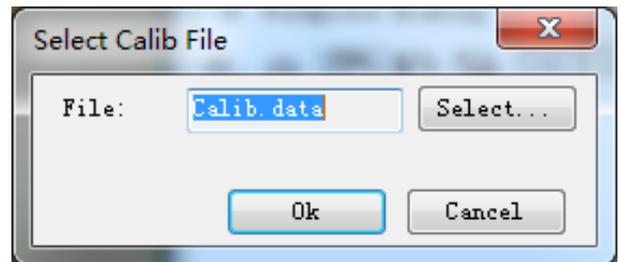


A guide box pops up; click “Start to measure” to extract a circle in the entire image area. Click “Complete measurement” to check whether the first primitive in the task is a circle. If not, the error dialog box “Fail to get the data of the measured circle”; if yes, the standard interface of input circle diameter pops up, the default is 1. Click to save the calibration data, the dialog box "Binding Completed" pops up, and the dialog box closes.

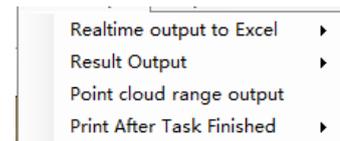


4.1.2.3 Switch calibration file

The calibration file defaults to Calib.data. Click the Select button to bring up the Open File dialog box. The file type is “Calib File (*.data)”. Click the Punch button and the calibration file will be displayed as the selected file name. Click OK and the calibration file will take effect in real time.



4.1.6 Data output Menu



Real-time output to Excel: When the task is running, the output results are exported to an excel file in real time and automatically opened. It can be checked in the file menu or be set in the System Settings.

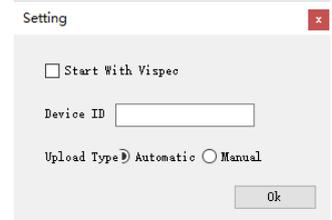
Result Output: Set the task data output path.

Point cloud range output: After checking, the form and location tolerance result will be output to an Excel file and automatically opened after the task is finished.

Print After Task Finished: After checking, the print dialog box will pop up automatically after the task is finished, and the print function will be executed.

Data upload:The data upload function is used to upload the customer's required database to the database server,which can be called by the customer.

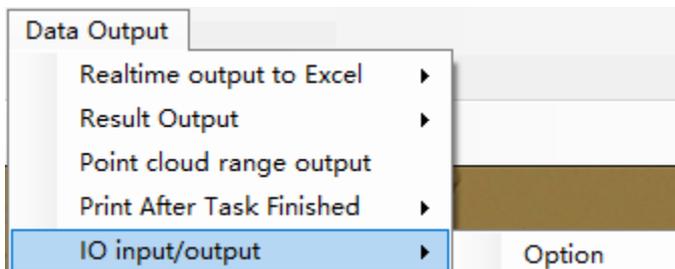
1. In Vispecset, we can open the data upload and option functions in Product Management.
2. Check the data upload-option to pop up the Settings box.
 - 1) Start with Vispec: It is unchecked by default. If checking, the data upload service starts with reopening Vispec.
 - 2) Device ID: It's the computer number that connects the imager.
 - 3) Upload Type: Upload type is divided into automatic and manual. Automatic: it is automatically uploaded to the sqlite file in the UserData directory after the task is completed. Manual: After the task is completed, the settings box pops up and you can choose whether to upload or not.
3. Data upload service: You can tick "Start with Vispec" and re-open the software to startup function; It can also be started in DataUpload\INSIZE\DataUpload.exe; You can right click on the data upload service and select "Measurement Record" to check whether the data of the running task needs to be uploaded, and whether it has been uploaded; If you right click and select to exit, the function will exit.



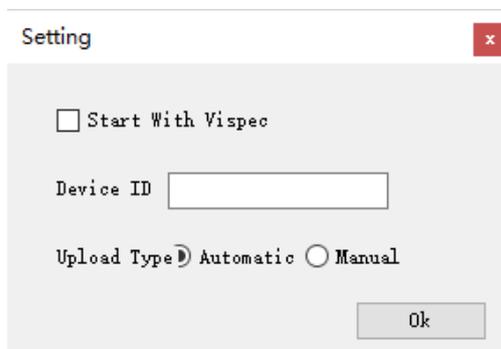
IO input/output

IO module communication rules:

- a. IN1: Start; IN2: Suspended; IN3: Emergency Stop; IN4-IN7: Vacant;
 - b. OUT1: When the device is idle, the measurement task is not executed, and when it is occupied, the measurement is in progress; OUT2: OK; OUT3: It indicates that the task is successfully loaded. (It's 1 if the load task fails); OUT4: It indicates that the device is abnormal, including pressing the emergency button; OUT5: Feeding signal; OUT6: NG signal; OUT7-OUT8: Sorting, binary coding;
1. Enable IO function module: Open this module in VispecSet product model management and display this menu in the menu bar. Check the menu to make the function take effect.



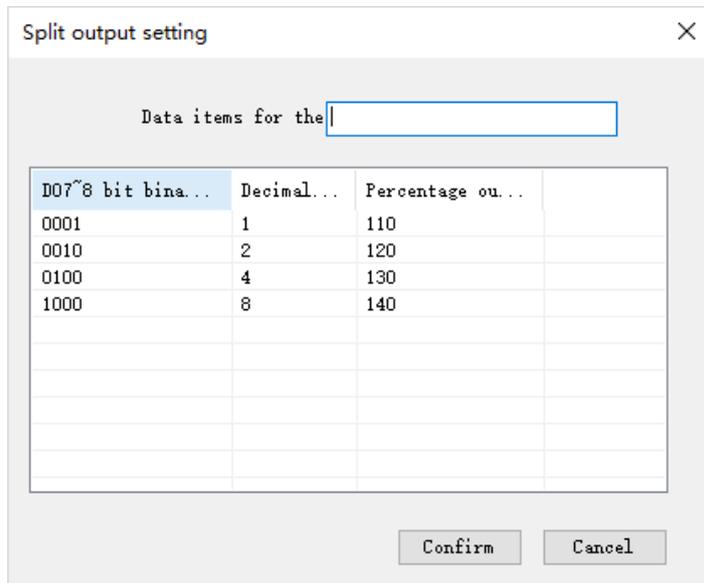
2. Option:
 - 1) Click on the option to bring up the option interface.



- 2) Serial port number: We can enter the serial port number in the option interface. The number needs to match the port number in the Computer Device Manager.
- 3) The Task setting: (This function requires another IO card to take effect and needs to be expanded.)

4) Output Binning Setting:

I: We can click the "Output Binning Settings" button to pop up the binning output setting interface. After setting this item, save the task again, and when you import the task again, it will automatically load the corresponding bin output settings.



II: Data items for the classified primitives: Format: "Primitive Label"+" ":"Data Item"; For example, if you want to bin the radius of a circle with a primitive label of 2 in the task, fill in with "2: Radius".

III: The Percentage Setting Out of Tolerance: The out-of-tolerance percentage item can be set, one file at a time, for a total of four files.

Gear Position	Set Tolerance Percentage	The gear position corresponding to the percentage of actual error and tolerance
1	110	110<Percentage of actual error<120
2	120	120<Percentage of actual error<130
3	130	130<Percentage of actual error<140
4	140	Percentage of actual error>140

For example, if the percentage of actual error and tolerance is 115, it corresponds to one gear, and so on.

5) IO Debugging Tools: (This function requires another IO card to take effect and needs to be expanded.)

IO input/output (16bit)

1. IO card function module enabled

1.1 This module is opened in VispecSet product model management, and this menu is displayed in the menu bar. Check the checkbox for the function to take effect. Select the IO card input and output (16-bit) [Do not check the remaining IO card functions]

1.2 Set in Vispec-User Rights Management, the function of this module is also open [Other IO card functions should not be checked]

2. IO communication rules

2.1 IO module 1:

IN1: start measuring;

IN2: measurement pause;

IN3: measuring emergency stop;

IN4-IN7: Vacant

OUT1: device status, idle-measurement task is not executed, occupied-measurement is in progress; (idle 0, occupied 1)

OUT2: OK; (On when the task runs successfully, Off when the task is run again)

OUT3: The task was successfully loaded; (1 if the task failed to load)

OUT4: The device is abnormal, including pressing the emergency button;

OUT5: feeding signal;

OUT6: NG signal; (On when the task fails, Off when the task is run again)

OUT7-OUT8: binning, binary encoding;

2.2 IO module 2:

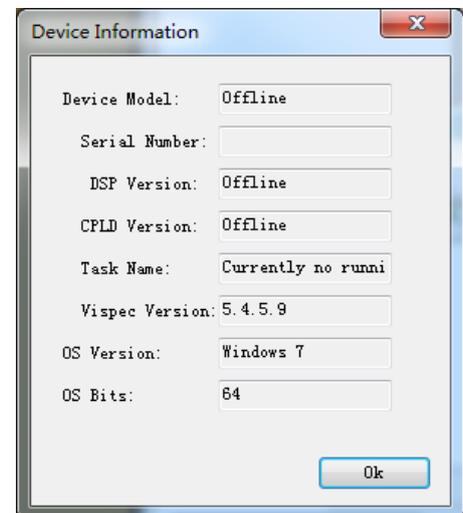
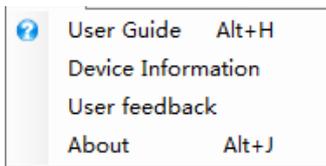
IN1-IN7: task encoding, binary.

OUT1-OUT8: Vacant

4.1.7 Help Menu

User Guide: Open the user guide file for the corresponding language version.

Device Information: Display current device information, as shown in the figure. If offline, the hardware information shows Offline.



Customer Feedback:

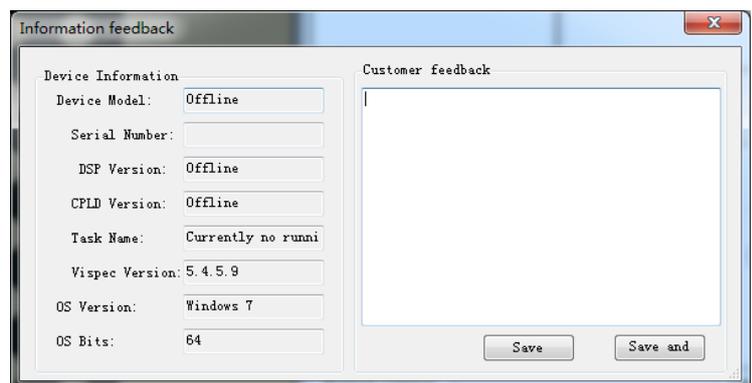
In the following two cases, the exception error interface will open.

In the first case, when the software goes wrong and fails to recover, the exception error reporting interface pops up for recording the exception information. In the second case, the customer clicks on the help menu - problem feedback.

Exception Details: If an exception information exists, the exception information will be displayed in the bottom text box.

Save: The save dialog box pops up. The default file is Log.zip and the save type is compressed file (*.zip).

The compressed package includes information on hardware and others.



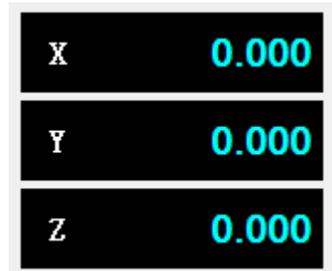
About INSIZE:

When the mouse hovers over the version number, the prompt label "Double-click to copy version information" pops up, and the version will be copied to the clipboard after double-clicking.

Click any area of the panel (except the version number), and the interface closes.

Machine Control Area

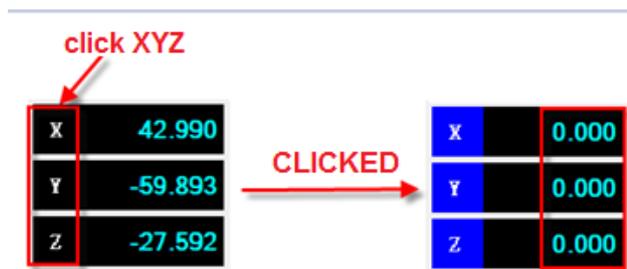
Motion control area distinguishes two parts: the raster data area and the platform control area.



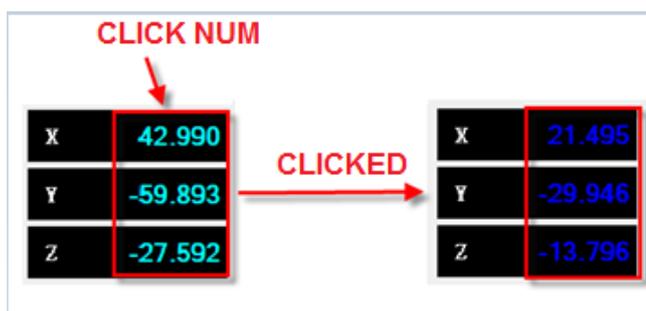
4.2.1 Raster data area

The raster data area displays the reading of the current grating scale, i.e. the platform coordinate of the current image center point.

In the raster data area, when left-clicking on X, Y, Z respectively, X, Y, Z letters are selected, the background color turns blue, and the corresponding X, Y, Z raster readings all become 0. Then right-click on X, Y, Z, X, Y, Z letters are unchecked, the background color returns to black and the raster reading resumes.



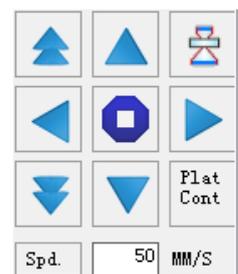
In the raster data area, left-click on the X, Y, Z raster readings, the values are selected and turns to blue, and the corresponding X, Y, Z raster readings become 1/2 of the original values. Then right-click on X, Y, Z, X, Y, Z letters are unchecked, the value returns to cyan, and the raster reading is restored.



4.2.2 Platform control area

The platform control area is used to control the movement of the mechanical platform (the handle can also be used to control the movement of the machine).

The following functions are included in the platform control area, and all functions are mutually excluded.



Classification	Icon	Function description
Platform movement		To control the movement in the X direction, the movement mode is classified into the step length mode and the speed mode. The step length or speed of movement can be output by the input box to the right of the step length/speed button.
		To control the movement in the Y direction, the movement mode is classified into the step length mode and the speed mode. The step length or speed of movement can be output by the input box to the right of the step length/speed button.

		To control the movement in the Z direction, the movement mode is classified into the step length mode and the speed mode. The step length or speed of movement can be output by the input box to the right of the step length/speed button.
Movement mode		In the step length mode, the platform immediately moves the specified step length each time the move button is clicked.
		In the speed mode, the move button is always in pressed status and the platform moves at the specified speed in the specified direction. Note: In the speed mode, the machine moves based on the actual upper and lower limits.
Auto focus		By clicking the Auto Focus button, the program controls the lens up and down to find the best focus until the image is clear and a focus point is generated in the task list. Note: This auto focus process is repeated when the task is running automatically. When the workpiece heights is not much different between the actual measured and the programming values, the focus point in the task list can be deleted to improve the task running speed.
Emergency stop		If any abnormality, the platform movement should be stopped urgently, and the operations such as task running, auto focus, automatic contour extraction, etc. can also be stopped by the emergency stop button.

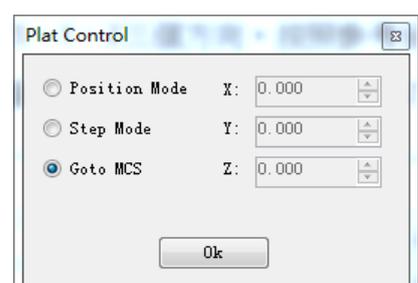
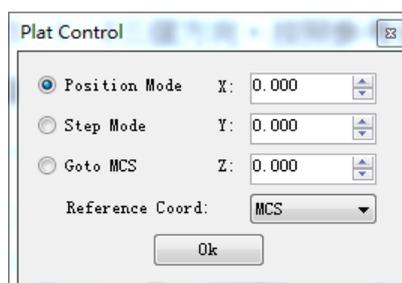
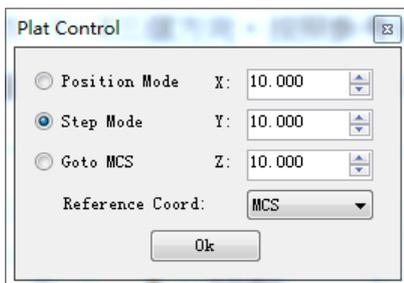


Platform Control : The entire platform can be moved in all the directions of X, Y and Z, including the following functions:

Position Mode: It may select the reference coordinate to set the specified positions for the X, Y, and Z directions of the platform. After clicking the OK button, the X, Y, and Z directions of the platform move to the specified position according to the reference coordinate.

Step Length Mode: It may select the reference coordinate to set the specified step lengths for the X, Y, and Z directions of the platform. After clicking the OK button, the X, Y, and Z directions of the platform move in the specified step lengths according to the reference coordinate.

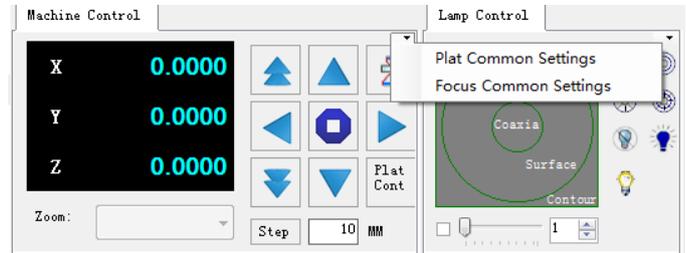
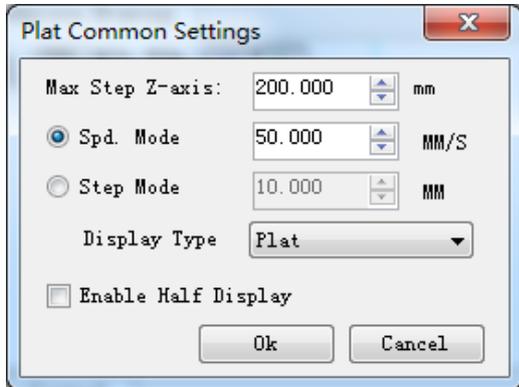
Back to Machine Zero Point: After clicking the OK button, the X, Y, and Z directions of the platform all return to



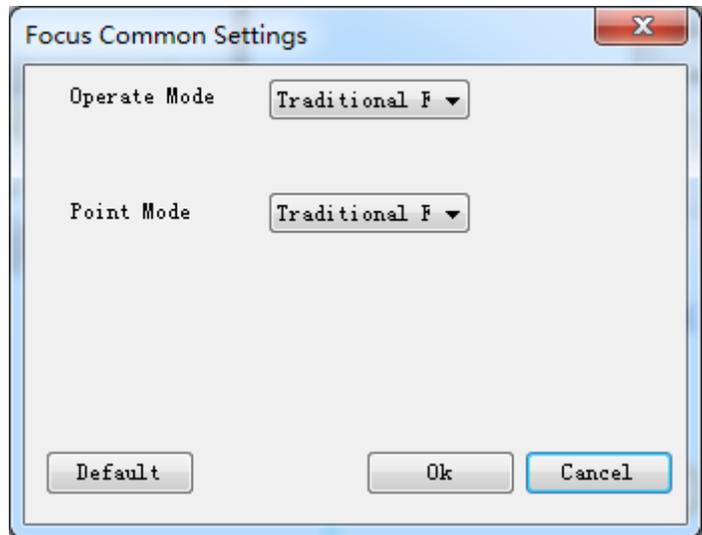
the machine zero point of the platform.

4.2.3 Machine common settings

Platform common settings Set the Z axis maximum moving distance, movement mode and digital display instrument display of the platform.

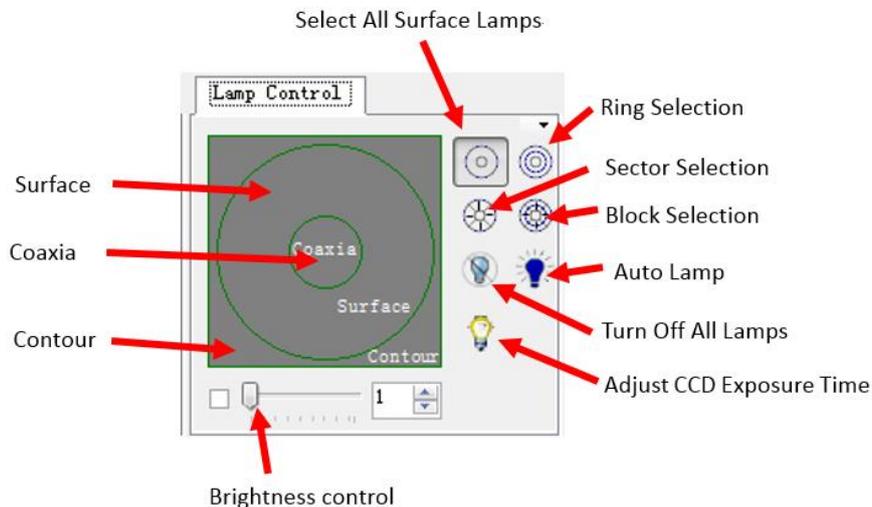


Focus Common Settings: Set the device's Operate Mode, Point Mode, or restore the default settings. Both under the Operate Mode and Point Mode can be selected the Traditional Focus Mode and Fast Focus Mode. The Fast Focus Mode has a fast focusing speed and is suitable for situations where the image is relatively clear; the Traditional Focus Mode has a moderate speed and is suitable for situations where the image is roughly clear.



4.3 Lamp Control Area

4.3.1 Light source control area



The light sources used by the ISD-P series of image measuring instrument include: surface light, contour light and coaxial light. The light shows a dark color when it is off, and it turns bright after being turned on.

The brightness of coaxial light, surface light and contour light can be adjusted at an integer ranging from 1 to 255.

Brightness control method: the brightness of lights is controlled by the slider or is changed by entering a value in the box:

- 1) Move the slider to adjust the selected light source
- 2) When dragging the slider to change the brightness, the value in the box will change accordingly.
- 3) When changing the value in the box, the position of the slider will also change.
- 4) Click on the multi-select box on the left, select to turn on the light, and turn off the light when unchecked.

When an unreasonable value is entered, the control will automatically correct it; when the input value is greater than 255, it will be automatically changed to 255; when the input value is less than 1, it will be automatically changed to 1; when the decimal value is entered, only the integer part will be retained.

Switch light operation: Select the corresponding light source area, click the left mouse button to turn on the light source, and click the right mouse button to turn off the light source.

Surface light is primarily used to measure the surface characteristics of a workpiece. According to the machine configuration, there are light sources for 1 ring & 8 areas, 1 ring & 4 areas or 6 rings & 8 areas. The Vispec software interface varies with the configuration.

1-ring & 8-area surface light has 8 partitions to independently control brightness and switch; 6-ring & 8-area surface light has 48 partitions to independently control LED brightness and switch. Drag the mouse over the surface light area to continuously turn the surface light on or off.

By selecting the control mode on the right side of the light source control area, the intensity and switching of the surface light can be quickly and conveniently controlled. The functions of various buttons are as follows:

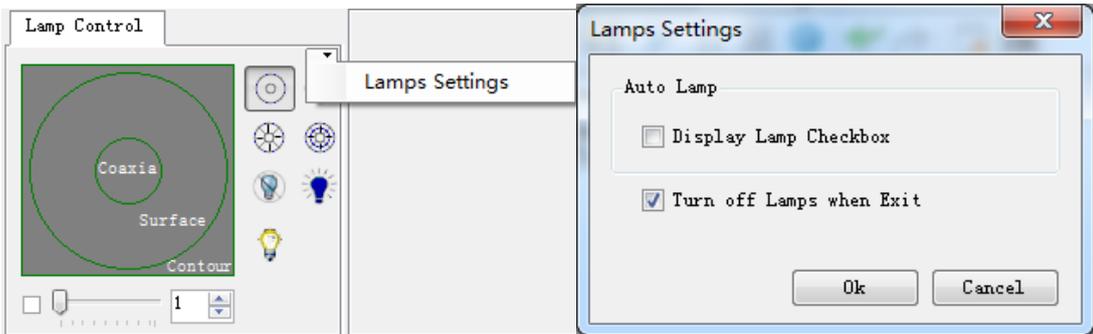
Classification	Icon	Function description
Control mode		Simultaneously control the intensity and switching of all surface light partitions. Contour light is mainly used to measure the

		outer contour of parts; coaxial light is mainly used for the measurement of some high reflectivity surfaces, such as glass, and also for the measurement of deep holes or grooves.
		Each ring has unified control of intensity and switch. The minimum control unit is one ring, and each ring has 8 partitions (valid in 6 rings and 8 partitions)
		Each partition has unified control of intensity and switch. The minimum control unit is a sector partition, and each sector partition includes 6 partitions (valid in 6 rings and 8 partitions)
		Each block controls intensity and switch independently
Source switch		Turn off all light sources
Automatic lighting		Click to automatically adjust the brightness of current selected light source to achieve the best illumination brightness
Adjust CCD exposure time		Adjust the camera exposure time to adjust the brightness of the light
Adjust light source brightness		Adjust light source brightness

Lamp common settings: Check Turn off Lamps when Exit under Auto Lamp.

Auto Lamp: Check the Display Lamp Checkbox; Auto Lamp means the area of the light frame is automatically lighted.

Turn off Lamps when Exit: if checking it, the lights will be off after exiting the software; if un-checking, the lights will not be off after exiting the software.



4.3.2 Control area of the surface light can be set up and down

The interface includes a light source up button, a light source down button, a speed/step length switch button, and a speed/step length switch text box.

Click on the liftable surface light setting to check the reset button.

The ISD-P turn on the surface light by default.

(Figure 1)

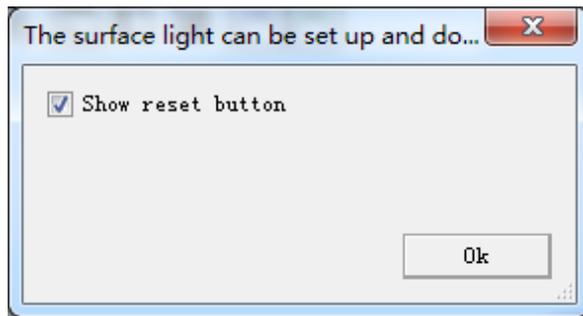


Figure 1

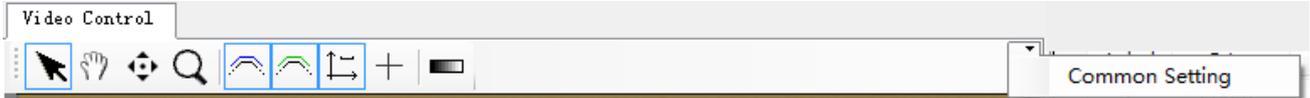
4.4 Video Control Area

Display the live image captured by the current lens. Primitive extraction operations can be performed on images to extract primitives such as points, lines, circles, arcs, and ellipses.

The toolbar in video control area covers the following functions, and the functions in the category with a "★" sign are mutually excluded.

Classification	Icon	Function description
★Operation mode		In this mode, primitives can be extracted directly in the image area, or the extracted primitives can be selected.
		In this mode, it may move the machine by dragging the left mouse button in the image area; or click the middle wheel of the mouse, and then move the machine by moving the mouse to control the direction. The farther the mouse is from the center point, the faster the machine moves.
		In this mode, it may press and hold the left mouse button in the image area to move the machine through the mouse direction. The farther the mouse is from the center point, the faster the moving speed, release the left button to stop moving.
		In the zoom mode, click the left button to zoom in the image in the image enlargement window at the top right of the interface; click by Ctrl + Left to zoom out.
Measuring line and scale		Display all actual measurement lines in the video control window
		Display all standard measurement lines in the video control window

		Display measuring scale and mechanical coordinate system in video control window
Auxiliary line		Display crosshairs in the video control window



The functions in the common settings are as follows:

1. Style:

The color can be set after clicking the drop-down menu; click , and a dialog box will pop up to customize the color settings.

Actual measured line: The actual measurement line of the primitive will be displayed in the video control area after running the task.

Standard line: the standard line when constructing the primitive. By default, the actual measured line of the first running task is used as the standard line.

Extract point: the point used to fit when constructing primitives

Label: the dimension line and value of the primitive

Selected status: the status of selected primitive

Out of tolerance: when the primitive is out of tolerance

2. Cross Line:

Type: crosshair, crosshatched line, round line, grid line.

Cross line mode: (Figure 1)

Check "Rotation" and click the OK button to rotate the crosshair in the video control area; when the checkmark is removed, the crosshair returns to the default status.

Check the "Extract Mode" and click the OK button to extract the primitives by crosshair in the video control area; after removing the checkmark, the crosshair is no longer available to extract the primitives.

Scan range: The scan range under the crosshair extraction mode is 0.1 to 10 pixels

Crosshatched line mode: (Figure 2)

Set the X and Y spacing in the # line, and the minimum is 6 pixels.

Round line mode: (Figure 3)

In the round line mode, the circle size can be adjusted by dragging the round frame in the image area.

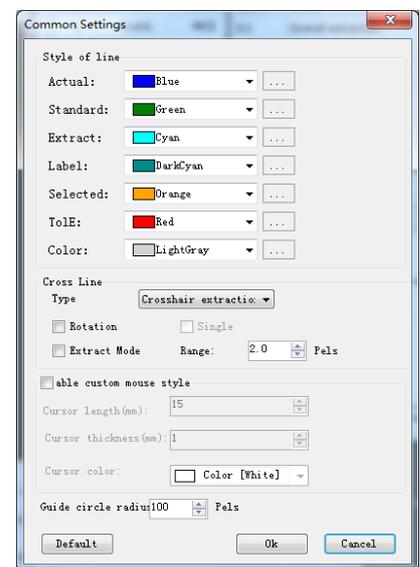
Grid line mode: (Figure 4)

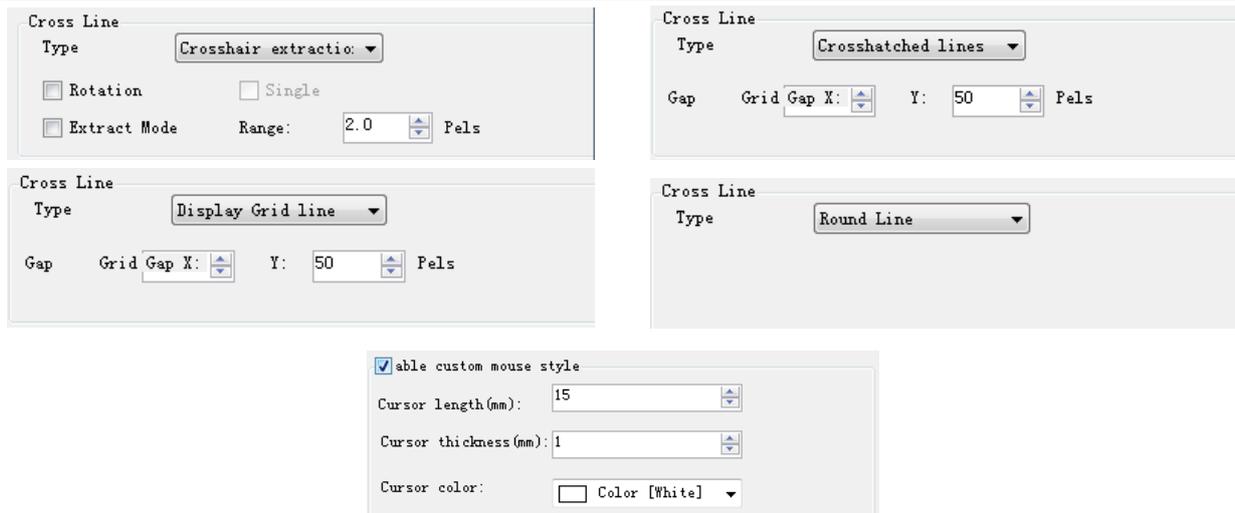
In the setting interface, the grid spacing can be adjusted, and the X and Y spacing is at least 6 pixels.

3. Customize the mouse style: After checking the "able custom mouse style" button, the cursor length, thickness and color can be set. (Figure 5)

4. Guide circle radius: When running tasks manually, the manual guide circle radius appears from 0 to 1000 pixels.

5. Restore default: restore the default settings after clicking





4.5 Workpiece Drawing Area



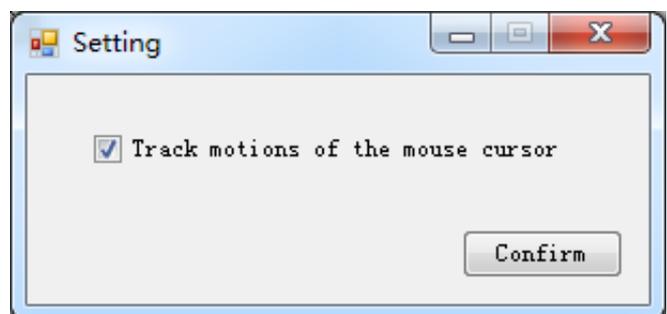
The 3D display drawing can zoom in, rotate and translate the measurement data, making it easy for the user to see all the data of the current task.

Hold down the "Workpiece Drawing" tab and drag the mouse to change the window to a floating form, further to adjust the size and position of the window freely to make it easier to view.

The style settings page is shown on the right:

Check "Track motions of the mouse cursor", when the mouse slides over the primitive in the workpiece drawing area, the primitive is highlighted in the format: the selected status color, bold.

When the workpiece drawing area only displays actual measured line or standard line, the primitive can select the primitive by selecting actual measured line or standard line, and highlight the actual measured line or standard line. When the actual measured line and the standard line are displayed at the same time, only the actual measured line is highlighted.



4.5.1 Vision shortcut

1) Image vision

The vision of the drawing area is switched to the vision of the current image area and centered. Switch the view to the top view.

2) Primitive vision

The minimum external rectangle area composed of primitives excluding the mechanical coordinate system is centered in the drawing area. Switch the view to the top view.

4.5.2 View shortcut

1) Top view

In the current view, the view is switched to a top view.

2) Left view

In the current view, the view is switched to the left view.

3) Front view

In the current view, the view is switched to the front view.

4.5.3 Measured line and standard line

For angle, distance and spacing, when only the measured line and the standard line are set to open, only the measured line tag is displayed. The display of the image area is consistent with the workpiece drawing area

4.5.4 Mouse interaction

1) Translation: Drag the mouse to translate the drawing area.

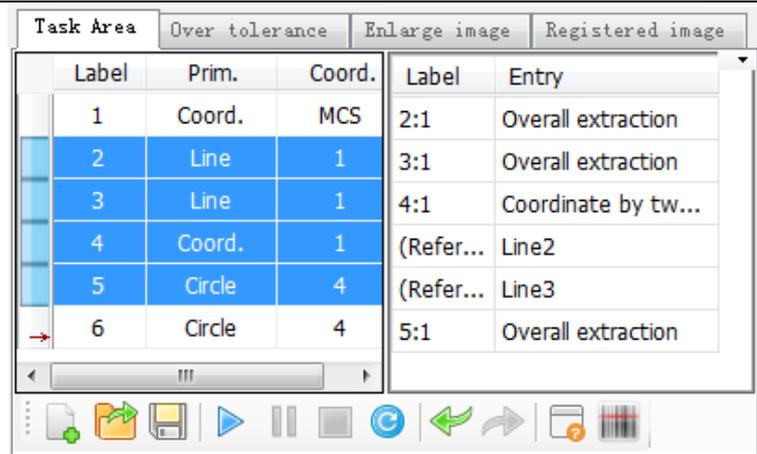
2) Select: Left click on a primitive to select it;

Left click on primitives continuously by holding down Ctrl to choose more than one primitive. If the primitive is already selected, click again to exclude the selected list.

Drag the left mouse button to form a rectangular frame. The primitives in the rectangular frame are selected. Release the mouse and the rectangular frame disappears.

4.6 Task Area

The task is divided into three parts, the primitive list area, the input item list area, and the task toolbar, as shown on the right:



4.6.1 Task toolbar

The task toolbar controls the running, pause, stop of tasks and primitive creation guide.

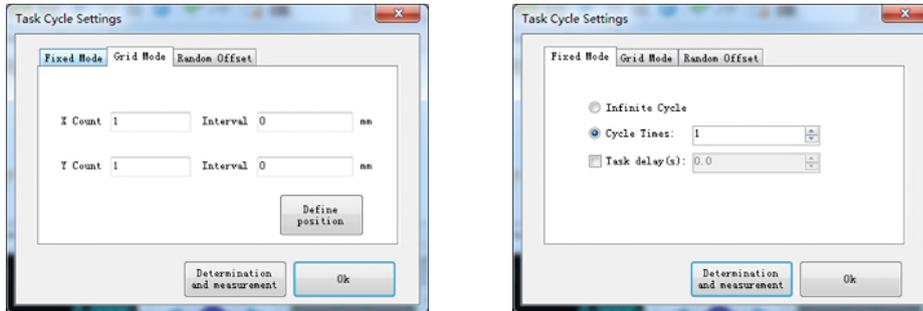
Icon	Function description
	Build a new measurement task
	Open a previously saved measurement task
	Save the current measurement task
	Run the current task, and the icon will be gray after running
	Pause the currently running task, and the button icon will turn blue after the task run
	Stop the currently running task, and the button icon will turn blue after the task run
	Undo the operation taken by the user
	Cancel the change made by the undo operation and return to the status before the undo
	Task cycle settings, to set task cycle mode, number of times and delay time
	The demo animation shows that after selecting the primitive and extraction method in the toolbox, click this button to demonstrate the primitive extraction.
	Scan the barcode or enter the task name to automatically load the task in the global directory. The global directory refers to the path set in the system settings. The default is



Instructions on task cycle settings

1) Fixed mode circle

In fixed mode, it includes cycle settings and task delay settings.

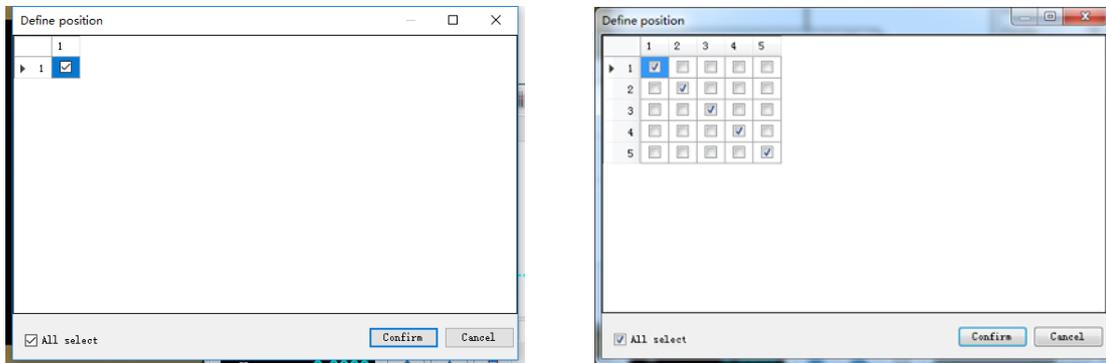


By default, the cycle times is 1, and the task delay(s) is not checked. The unit is second, and there is one effective fraction.

2) Grid measurement mode

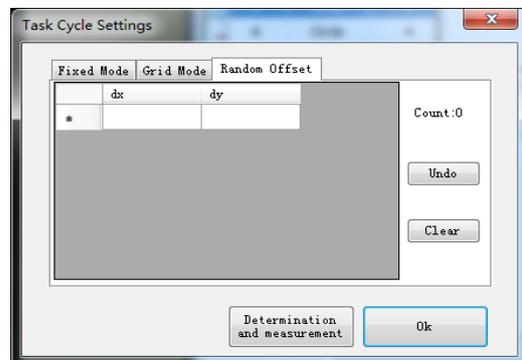
Number of repetitions and offset interval in X and Y directions can be set.

The task run logic runs the logic according to the task cycle. When the task is running, the cycle times is the total number of X times * Y times. The starting position of each cycle is calculated as the number of times and the interval.



Click the "Define Position" button to pop up the position definition window. The number of rows and columns is X times and Y times, and the content checkboxes are all checked by default. If any checkbox for a row or column is removed, this position will be skipped during the measurement.

The task is finished running, and the corresponding position measurement result is viewed through the grid measurement result display panel.



3) Random offset measurement mode

Add a random offset point: Click on the image area.

Edit: Add and edit in the form.

Undo: Delete the offset point that was added last time.

Clear: Clear all offset points.

4.6.2 Primitive list

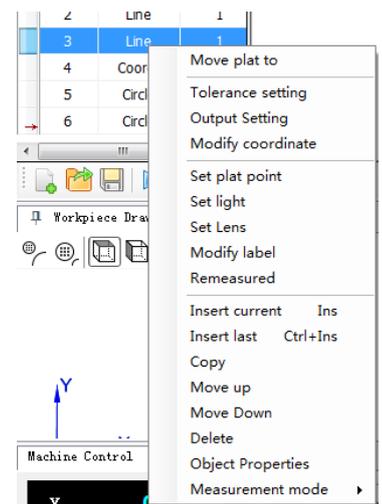
The primitives in the current task are displayed in order in the Primitives list box.

Select the primitive in the primitive list and click the right mouse button to pop up the context menu as shown on the right:

The function description of the menu is as follows:

4.6.2.1 Move platform to

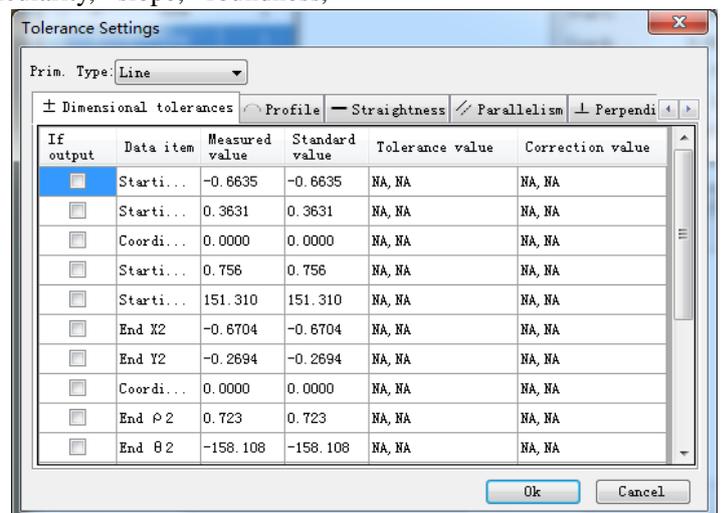
Zoom the X, Y & Z axes and lens to the position at which the primitive was extracted.



4.6.2.2 Tolerance setting

Set and check primitive tolerances and geometric tolerances. Supported geometric tolerances include straightness, perpendicularity, slope, roundness, concentricity, position and flatness.

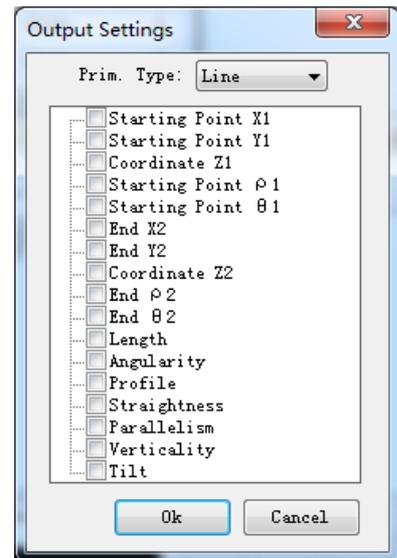
To modify the tolerance or standard value, it may directly select the corresponding cell and enter the value, or double-click on the cell to be modified and enter the value to modify it.



4.6.2.3 Output settings

Set and check a measurement value that the primitive needs to output. The data output of the primitive can be set individually or in groups.

Different primitives correspond to different measured values, and primitives can be switched in the primitive type.



4.6.2.4 Modify the coordinate system

Modify the relative coordinate system in which the current primitive is located. (Figure 1 on this page)

4.6.2.5 Set platform point

To specify the primitive to be extracted at a certain position on the machine, select and move the primitive to the target position and right click to set the platform point, so that the machine will move to the set position to extract it when running to the primitive again, which means, the position where the locking primitive is extracted is a fixed value.

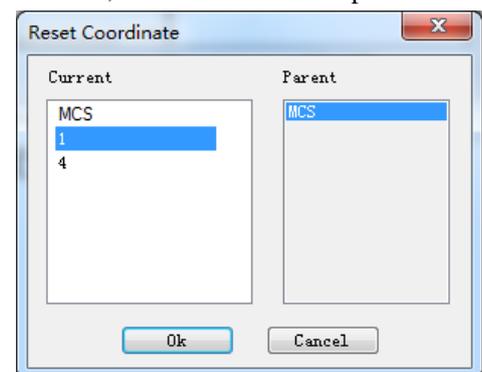


Figure 1

4.6.2.6 Set light source

To set that the light source of primitive is taken from the machine.

Firstly adjust the light source, select the primitive to be set, and right click to set the light source, so that the light source can be obtained from the machine.

4.6.2.7 Set lens

To set that the magnification or Z value of primitive is obtained from the machine. Firstly adjust the light source, select the primitive to be set, right click on the setting lens, and select the magnification or Z axis, so that the current magnification or Z raster value can be obtained from the machine.

4.6.2.8 Modify label

Custom label. A label is a mark that appears before the list of primitives and is used to identify primitives. It can be texts, letters, numbers, etc.

4.6.2.9 Remeasure

It only requires re-measuring one or several selected primitives separately and there is no need to rerun the entire task.

4.6.2.10 Insert to the current

Set the insertion position of the task primitives, and all newly added primitives are inserted in front of the current selected primitive.

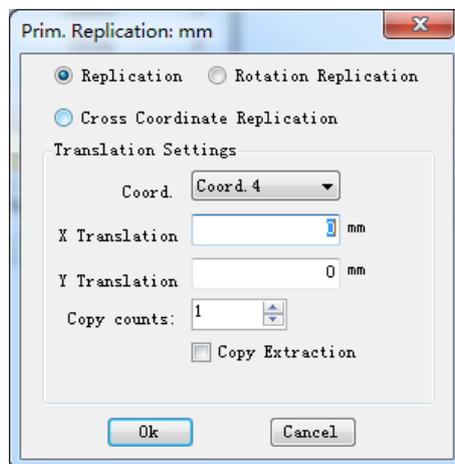
4.6.2.11 Insert to the end

Set the insertion position of the task primitive, and all newly added primitives are inserted at the end of the task.

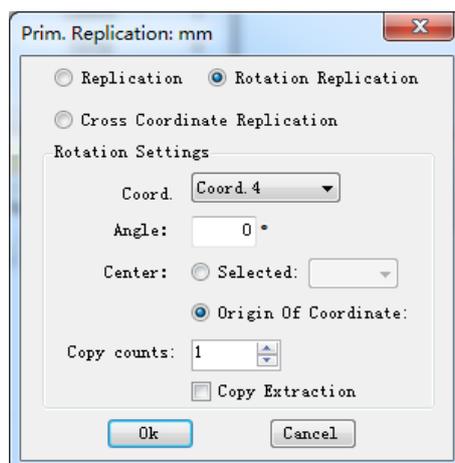
4.6.2.12 Replication

Translation, rotation, mirror and cross coordinate replication of primitives are allowed.

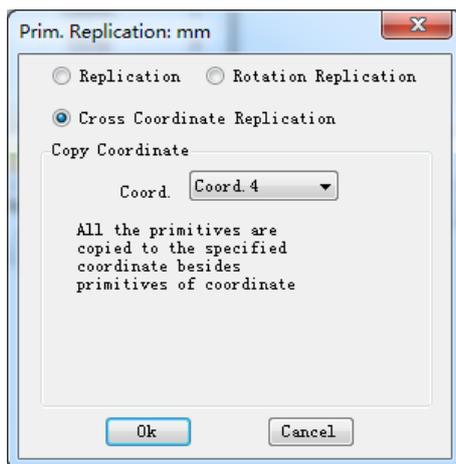
Translation Replication: Replicate N primitives by moving a certain value on the X and Y axes with respect to a certain coordinate system.



Rotation Replication: Rotate an angle with the current primitive relative to a coordinate system or replicate N primitives by the specified center.



Cross Coordinate Replication: Replicate the current primitive to the specified coordinate system.



4.6.2.13 Move up:

Move the current primitive up to the position of the previous primitive.

4.6.2.14 Move down:

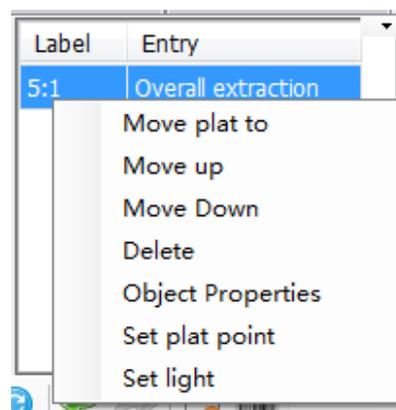
Move the current primitive down to the position of the next primitive.

4.6.2.15 Delete

Delete the current primitive, which cannot be restored, or directly delete by pressing the Delete key on the keyboard, and it supports single-select and multi-select delete.

4.6.2.16 Display object properties

Display the object properties of the current primitive, which switches to the label window of the object properties. It is convenient to adjust primitive related attributes.

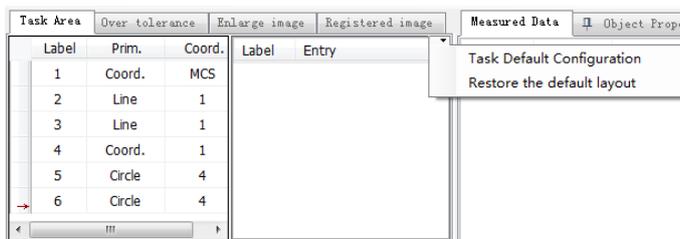


4.6.3 Entry list

The entry list is a collection of the operation modes and their order in the primitive measurement process, and is also a collection of measurements during the actual task operation. The user can re-add, edit and delete the measurement process of the primitive by adjusting the input to control the operation of the entire task.

Select the input item in the entry list and click the right mouse button to pop up the context menu as shown below:

The menu function is the same as the function in the primitive right-click menu.



4.6.4 Task default configuration

The task default settings include the following:

1、Preset primitive output:

The output of the unified primitive is the default output of the new primitive; the output of the new primitive can be modified separately, and the default output does not affect this output. (Figure 1)

2、Preset primitive tolerances:

A data item tolerance of a certain primitive uniformly set is the default tolerance of the new primitive; the primitive tolerance of the new primitive can be modified separately, and the default tolerance does not affect this tolerance. Besides, it may set whether to display the tolerance warning color and the upper and lower tolerance percentage. (Figure 2)

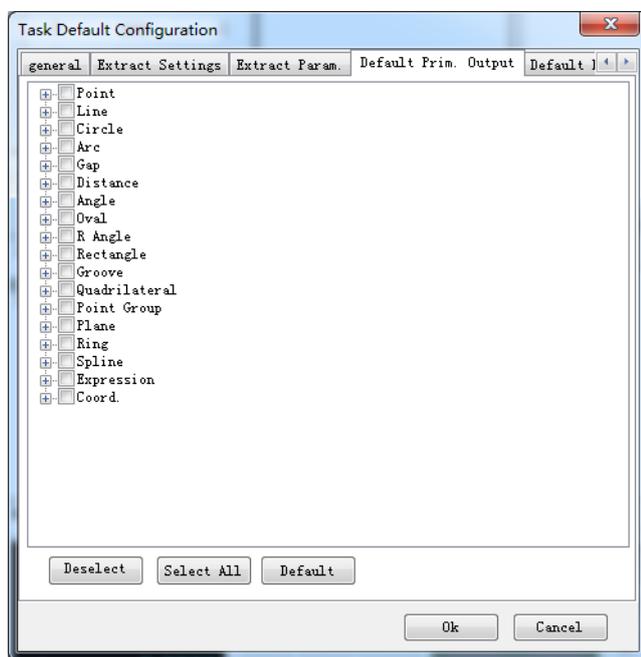


Figure 1

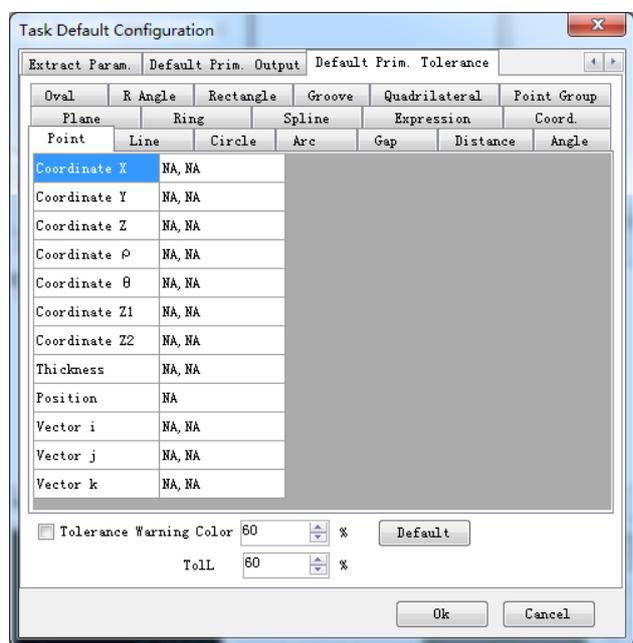
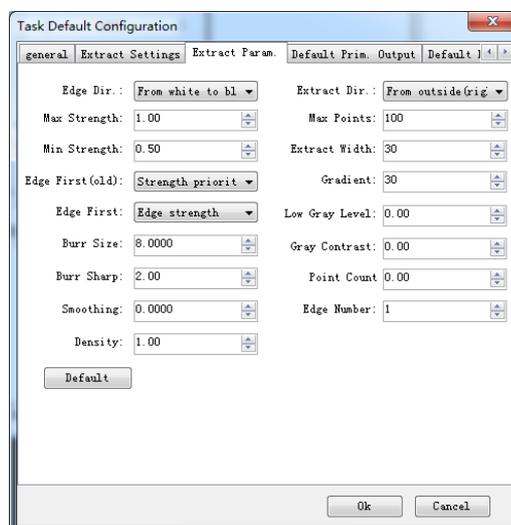


Figure 2

3、Preset extraction parameters:



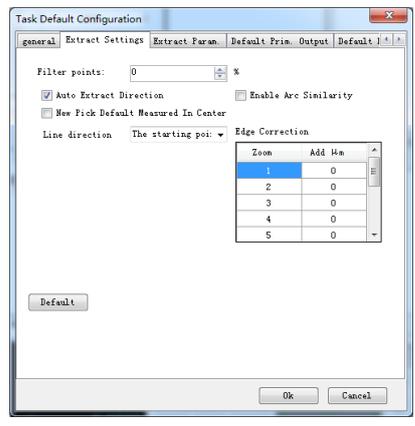
Set the relevant parameters of the primitive extraction. The items at the time of extraction can be customized to achieve the effect of controlling the extraction to meet the measurement needs in different situations.

Classification	Function description
Edge direction	Bi-direction scanning: The direction of extraction can be from shallow to deep, or from deep to shallow.
	From white to black: Scan from the light side to the dark side.
	From black to white: Scan from the dark side to the light side.
Extraction direction	From the inside (left) outward (to right)
	From the outside (right) inward (to left)
Edge priority	Strength priority: select the edge with strong contrast between black and white for extraction
	Center priority: select the edge closest to the center line of the extraction box for extraction
	Nearest edge: Select the edge closest to the direction of the arrow in the extraction box to extract
	Farthest edge: Select the edge farthest to the direction of the arrow in the extraction box for extraction
Automatically adjust the extraction direction	The extraction direction can be automatically adjusted according to the set edge direction. After the user adjusting the reverse, it will also be corrected automatically.
Upper limit of edge strength	The edge intensity ranges from 0 to 1, with 1 being the strongest and the upper limit; 0 being the weakest and the lower limit; by lowering the upper limit, it can filter the strong edge points
Lower limit of edge strength	0 means the weakest and is the lower limit, and the lower limit can be raised to filter the weak edge points.
Maximum number of points	Take the maximum value of the point. When the number of edge points extracted is large, the points involved in the calculation are more and accurate.
Extraction box width	Set the width of extraction box, which is an integer ranging from 0 to 100.
Burr size threshold	Modify the value of the burr size to discard some points
Burr sharp threshold	Modify the value of the burr sharp
Smoothing parameter	Units in millimeters, ranging from 0 to 1000
Sampling density	The ratio of the number of samples to the maximum number of points, ranging from 0 to 1.

Reset default	All parameters are restored to their default values (default values are as shown above)
---------------	---

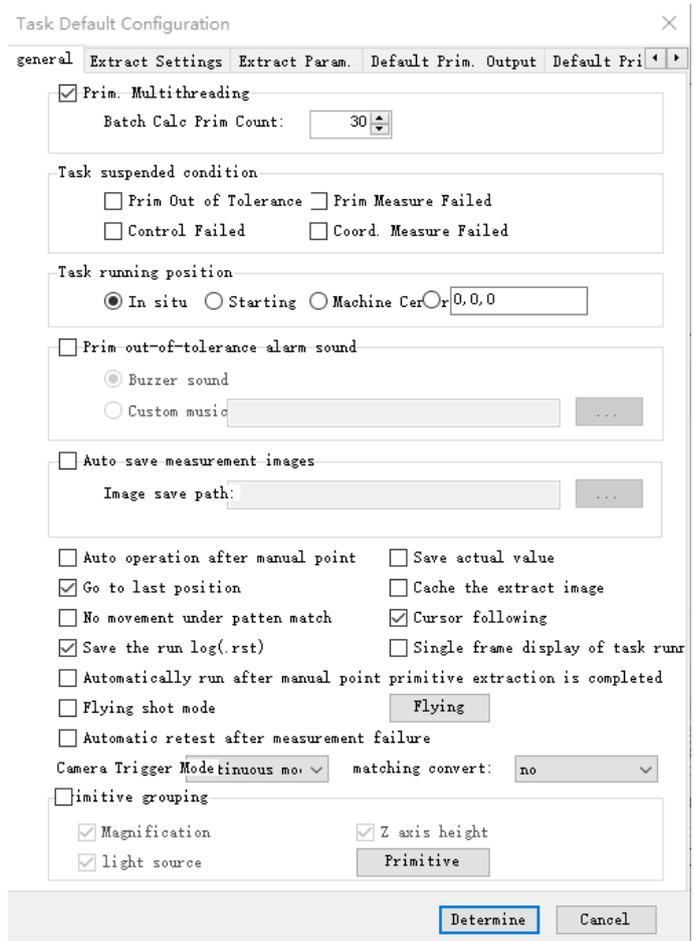
4、 Extract settings:

- Set the deviation distance;
- Set the minimum proportion of the fit point, and fit the calculation to discard;
- Set whether to enable bilateral scanning, whether to enable arc similarity limit;
- Set whether the new extraction box primitive is the default alignment measurement;
- Set whether to save detailed debugging information;
- Set the edge correction pixels.



5、 Task association:

1. Set the number of primitives that can be analyzed in batches with multiple threads of primitives;
2. Set whether the task is suspended in some cases;
3. Set the position where the task is finished;
4. Set whether to run automatically after the manual point is completed;
5. Set and save the measured value of the task to the task file, and import the measured value when importing the task;
6. Set whether the task automatically saves the measurement image;
7. The mobile platform is prohibited under the setting of sample image matching. When this check box is checked, there is no difference between matching with the original sample image; when the check box is not checked, it can support sample image matching with small magnification and multiple execution Thread extraction of primitives, while supporting large magnification and mobile platform for focusing point height measurement;
8. Task running single frame display, check this function, the image area will only display the extracted image when the task is running
9. Flying shot mode: when selected, the flying shot mode is adopted, when not selected, the original operating mode is adopted. This is the main switch for aerial photography. When the aerial photography mode is checked and the “Enable aerial photography” attribute of the input item that supports aerial photography is set to yes, the relevant input items will be measured according to the aerial photography mode. The settings are saved



with the software.

10. Automatic retest of measurement failure: After checking the task, there are primitives that failed to be measured, and the failed primitives will be run again.

11. Camera trigger mode: divided into continuous mode, trigger mode, and hard trigger mode. Trigger mode and hard trigger mode need external trigger signal to take effect. Hard trigger mode is also known as flying shot mode

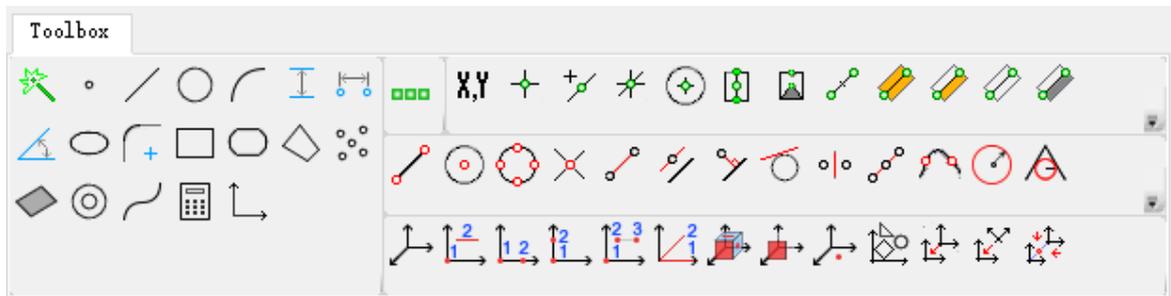
12. Sample image matching conversion type: used for conversion between CVL task and HK task.

13. Primitive grouping: When the check box is checked, the primitives will be grouped and run in the order of magnification -> Z axis height -> light source when running the task. When checking in pairs, check all three in the same order.

4.7 Toolbox

The geometric measurement area is divided into two parts: the Primitive Toolbox and the Input Toolbox.

As shown below



4.7.1 Primitive Toolbox

The primitive types currently supported include quick extraction, point, line, circle, arc, spacing, distance, angle, ellipse, R angle, rectangle, groove, quadrilateral, point group, plane, ring, spline, calculator, coordinate System, sample image matching, text description, information entry, sphere, cone, cylinder, hexahedron, lattice



Remarks:

- 1) When adding a new primitive, it's best to click on the primitive first before choosing the way to extract or construct.
- 2) First click on the required primitive, and the corresponding unavailable input item will turn gray.
- 3) It will generate a list of the primitives in the primitive toolbox, while the input item toolbox enters the list of input items, and each primitive has one or more input items.

4.7.1.1 Coordinate system

A coordinate system is used to locate the relative position of the workpiece and the measuring platform, or to locate some certain geometric quantities of the workpiece itself, for the convenience of executing tasks automatically.

Construction method:

1. Mechanical coordinate system
Directly recall a coordinate, representing the position of the mechanical zero of the imager.
A mechanical coordinate system must be established first to automatically run a task.
2. Coordinate system determined by plane, line and point
Construct a coordinate system with a point, a line and a plane.
3. Surface-correction coordinate system
Generate a new coordinate system with a plane and the last coordinate system.
4. Coordinate system determined by point and line
Build a new coordinate system with a point (origin) and a line segment (in X axis direction).

The point can be the center point of the circle (or arc) and the midpoint of the line segment.

5. Coordinate system determined by three points
Select three points to establish a new coordinate system. The first point is the origin, and the second and third points are connected in the positive direction of the X axis.
6. Coordinate system determined by two lines
Select two line segments; the intersection of the two lines is the origin, and the direction of the first line is the positive direction of the X axis.
7. Determine X axis by two points
Select two points and the first point defaults to the origin, and the two points are in the positive direction of the X axis.
8. Determine Y axis by two points
Select two points and the first point defaults to the origin, and the two points are connected in the positive direction of the Y axis.
9. Point-correction coordinate system
Origin: the center of the reference primitive
X-axis direction: The X-axis direction of the existing coordinate system is still the positive direction of the X-axis of the new coordinate system.
10. Rotating coordinate system
Origin: the origin of the reference coordinate system
X-axis direction: referenced line: direction of the line
Other primitives referenced: reference the origin of the coordinate system to the center of the reference primitive.
11. Manually adjust the coordinate system
Reference primitive can be used as coordinate system
It may input the specified amount of rotation and translation to quantitatively adjust the coordinate system.
Origin: Reference origin of coordinate system + XYZ offset
X-axis direction: reference X axis of coordinate system + counterclockwise rotation angle

Extraction method:

The coordinate system obtained by the extraction method is "sample matching coordinate system"
By selecting an image with feature of uniqueness and registering the pattern, a "sample matching coordinate system" can be generated.

Remarks: The sample matching coordinate system is mainly used on the VMQ large-view movable platform.

4.7.1.2 Point

A: Extract the points on the edge of the image directly.

Extraction method:

Plot point, nearest edge point, focus point, circle frame extraction points, square frame extraction points, nearest point, line extraction points

Construction method:

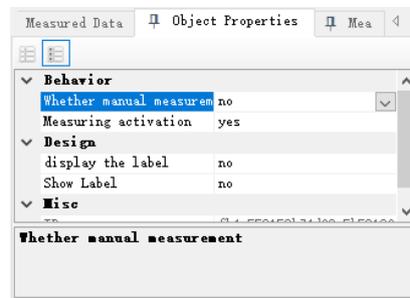
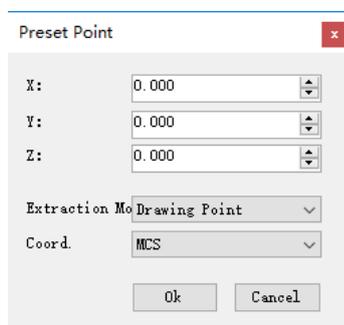
S/N	Attribute name	Primitive reference
1	End point	Line, arc, R angle
2	Center point	[Point] center point primitive

3	Extreme point	Circle, arc, R angle, ellipse
4	Intersection [point]	Line segment, circle, arc, R angle, any two primitives in a plane
5	Bisectional [point]	[Point] center point primitive
6	Vertical [point]	[Point] center point primitive, plane (There is and only is one line or one side)
7	Tangent [point]	[Point] center point primitive (including at least 1 circle, arc or R angle)

B: Preset mode: Determine the point by the coordinates of the preset point and the extraction method.

C: Detection method: manual or automatic laser point, manual or automatic probe point object properties:

By modifying some parameters of the object properties: you can modify the label and measurement methods.



4.7.1.3 Line

Extract points on the edges of the image, and fit them into a line, or reference two or more primitives to construct a line.

Extraction method:

Plot point, nearest edge point, round frame extraction point, line extraction point, square frame extraction point, nearest point

Overall extraction, texture extraction, texture segmentation, open contours.

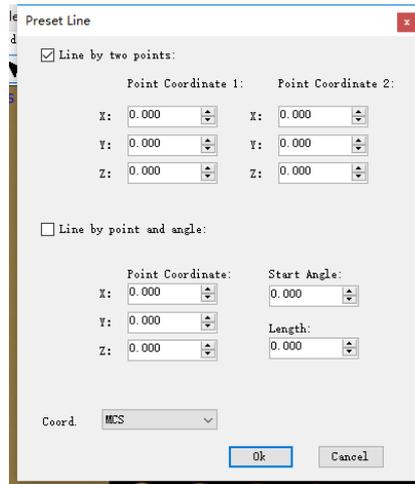
Construction method:

Center point, extreme point, connecting line, parallel line, vertical, tangent, bisection, merge, split fit

Preset method:

Preset mode:

There are two types: ① two-point mode; ② two-point angle and length mode.



Object properties:

The label and measurement mode of line segments can be modified in the object properties of the line segment.

4.7.1.4

Circle

Extract points on the edge of the image, and fit them into a circle; or reference two or more primitives to construct a circle.

Extraction method:

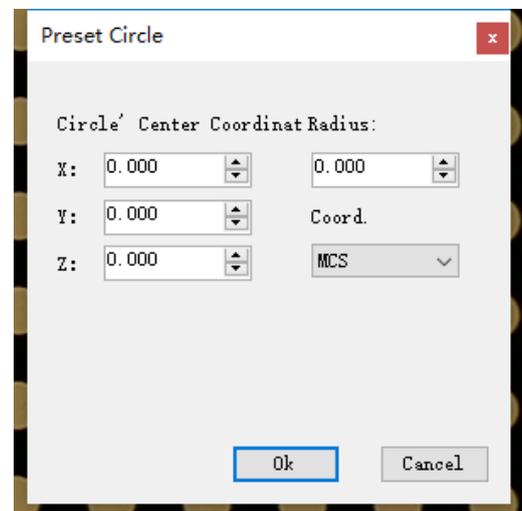
Plot points, nearest edge points, circle frame extraction points, line extraction points, square frame extraction points, nearest points, global extraction, texture extraction, texture segmentation, open contours, maximum closed contours, nearest closed contours.

Construction method:

Center point, bisection, merge fitting, segmentation fitting, circling by radius, two-line and radius determining circle, three-line tangential circle, machine positioning

Preset mode:

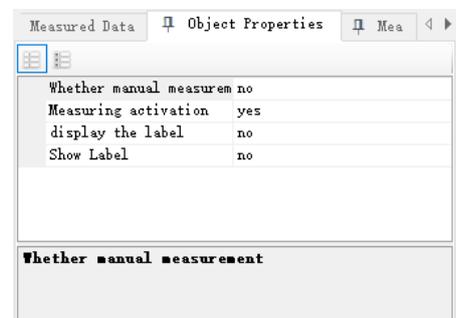
Preset the circle with the center coordinates and radius.



Object properties:

The following parameters can be modified in the object properties tab:

As: the attributes of the annotation, the measurement mode, the mode of fitting the circle (inscribed circle, circumscribed circle, average circle).



4.7.1.5

Arc

Extract points on the edges of the image, and fit them into an arc, or reference two or more primitives

to construct an arc.

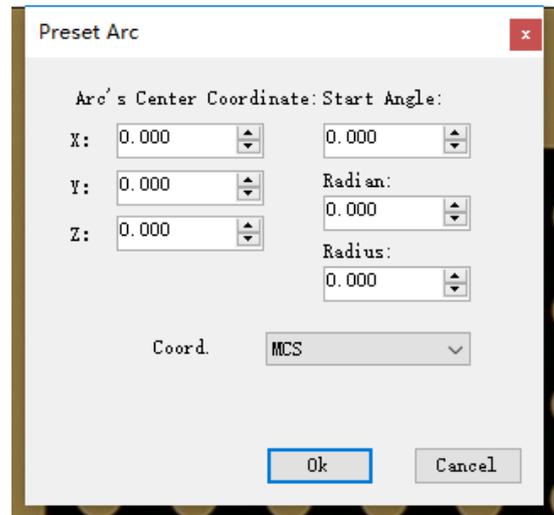
Extraction method:

Plot points, nearest edge points, circle frame extraction points, line extraction points, square frame extraction points, nearest points, global extraction, texture segmentation, texture extraction, open contours.

Construction method:

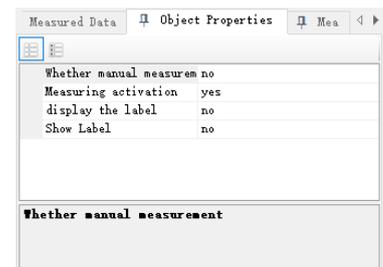
Merger or division fitting

Preset method: See the right figure



Object properties: See the right figure

Set the labeling parameters and modify the measurement mode.

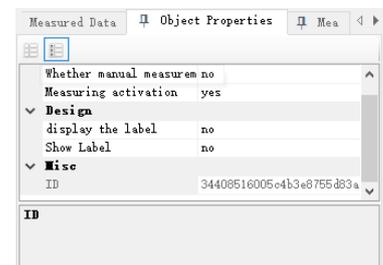


4.7.1.6 Ellipse

Make an ellipse with five points. The edge points of the image are directly extracted and fitted into an ellipse.

Extraction method: plot point, nearest edge point, circle frame extraction points, line extraction points, square frame extraction points, nearest point.

Object properties



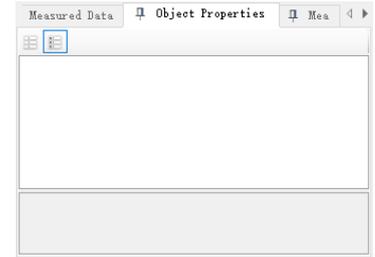
4.7.1.7 R angle

Extract points on the edge of the image, and fit them into an R angle or reference multiple primitives to construct an R angle.

Extraction:

Overall extraction, texture extraction, texture segmentation, open contours.

Object properties: See the right figure

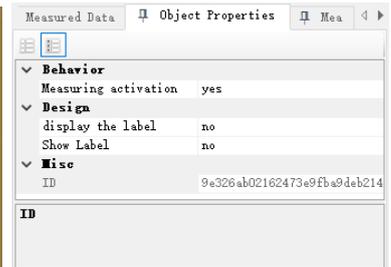
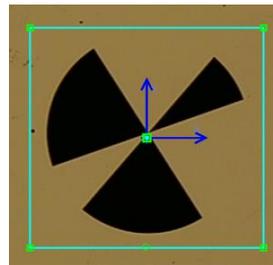


4.7.1.8 Sample matching

Register an image to uniquely identify a workpiece image.

Extraction:

Select an iconic image to extract the sample matching primitives.



Object properties: See the right figure

Note: There must not be any other primitives before the sample matching primitives, including the mechanical coordinate system.

4.7.1.9 Plane

Three points at least to fit a plane.

Extraction method:

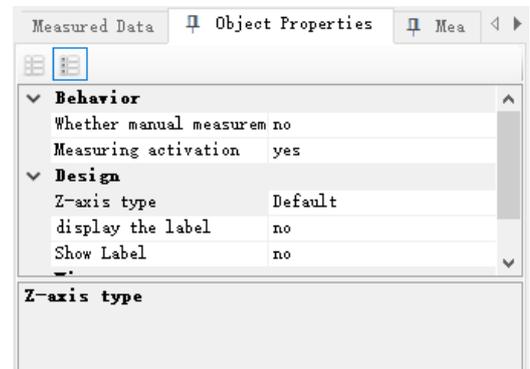
A plane can be extracted by drawing points and focusing points.

Construction method:

“Points” or other primitives can be merged into a plane.

Object properties: See the right figure

The measurement mode can be modified.

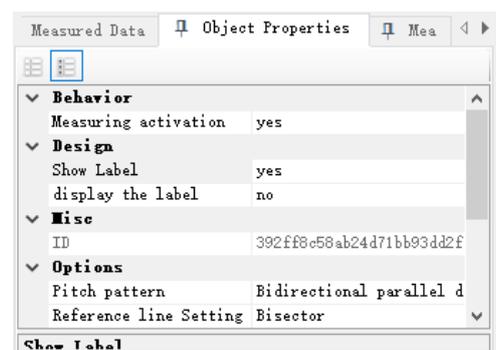


4.7.1.10 Distance

Get the distance between two primitives. The calculation mode of the distance is divided into vertical distance and center distance.

Construction method:

Get the distance of any two primitives of point, line, circle, arc, R angle, quadrilateral, rectangle, slot, ellipse, ring, plane.



Object properties: See the right figure

Modify the labeling parameters and the distance mode, etc.

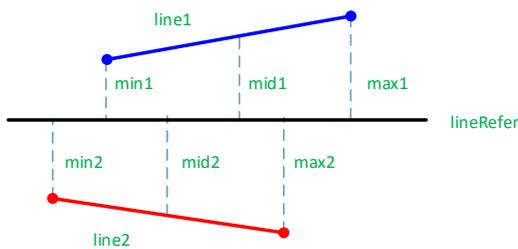
4.7.1.11 Spacing

The spacing between two line segments.

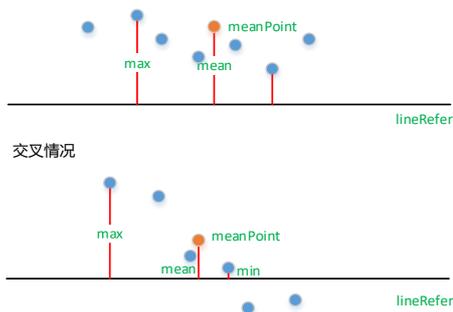
Construction method:

Options: bidirectional parallel distance, unidirectional point spacing, bidirectional point spacing.

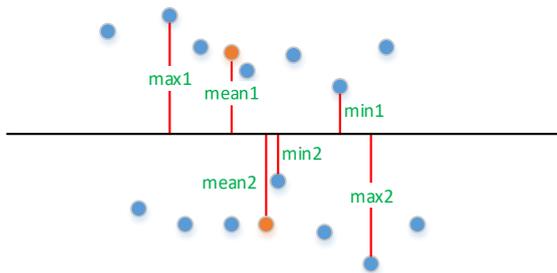
A: Bidirectional parallel distance: $\text{width} = \text{mid1} + \text{mid2} = (\text{min1} + \text{max1} + \text{min2} + \text{max2}) / 2$



B: Unidirectional point spacing: $\text{width} = \text{mean}$

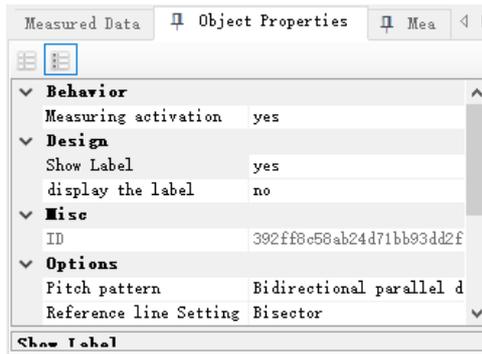


C: Bidirectional point spacing: $\text{width} = \text{mean1} + \text{mean2}$



Object properties:

The details are shown in the appendix below:

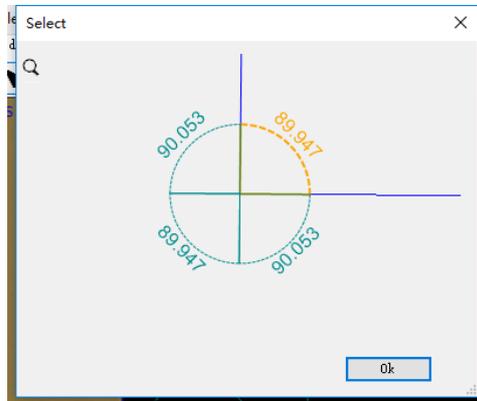


4.7.1.12 Angle

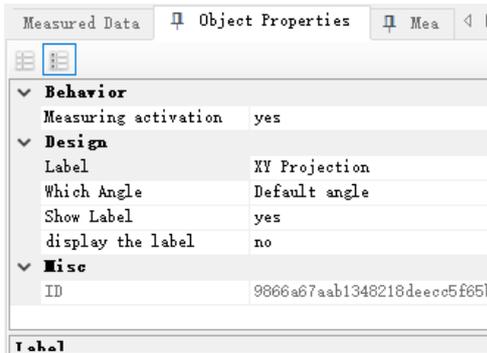
Construct an angle primitive with two line segments (planes).

Construction method:

Construct an angle primitive with two line segments.



Object properties: It may modify the label parameters or change the angle to be displayed.



4.7.1.13 Rectangle

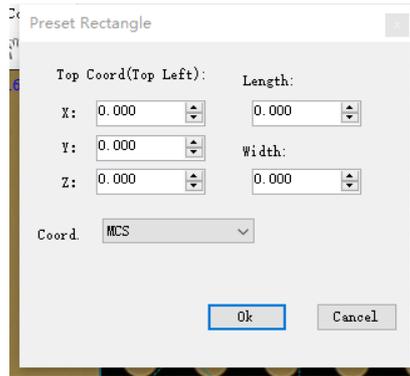
Based on a rectangle or a square, extract edge points by a variety of extraction methods and fit it into a rectangle.

Extraction method:

Plot points, nearest edge points, circle frame points, line extraction points, square frame points, nearest points, global extraction, texture extraction, texture segmentation, maximum closed contour, nearest closed contour.

Preset method:

Preset a rectangle based on the coordinates on the top left, and the length and width.



Object properties: it may set manual or automatic measurement.

4.7.1.14 Quadrilateral

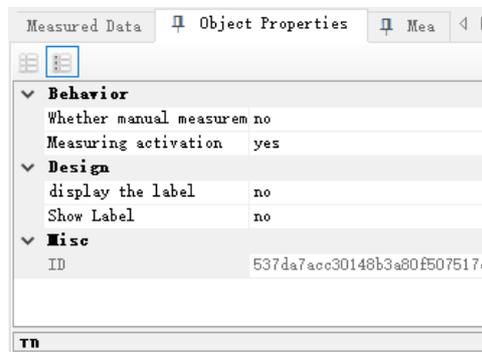
The extracted image edges are fitted to a quadrilateral, and this requires at least four points.

Extraction method:

Plot points, nearest edge points, global extraction, texture extraction, texture segmentation, maximum closed contour, nearest closed contour.

Object properties:

Set whether to measure primitives and the measurement mode.



4.7.1.15 Slot

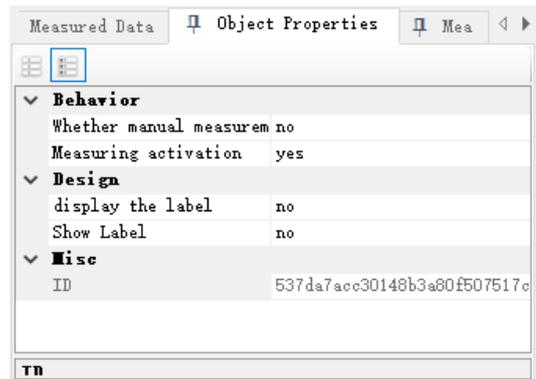
The extracted image edges are fitted to the groove shape and this requires at least five points.

Extraction method:

Plot points, nearest edge points, circle frame points, line extraction points, square frame points, nearest points, global extraction, texture extraction, texture segmentation

Object properties:

Whether to measure the slot primitive may be modified, manually or automatically.



4.7.1.16 Ring

Extraction method:

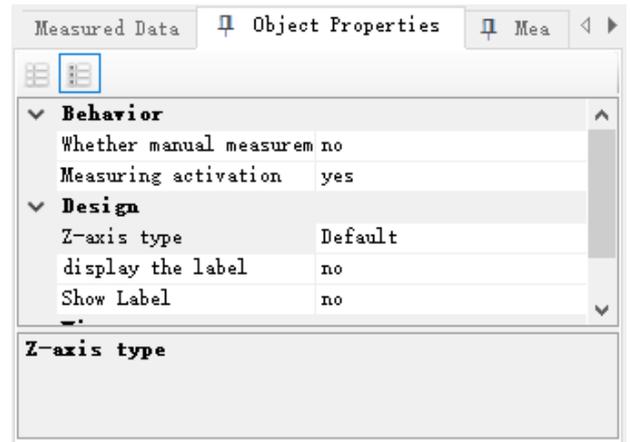
The nearest closed contour.

In the area between the two circles, left click to complete the extraction.

Construction method:

Merger: The two circles are merged into a ring: the center data of the ring is just the center of the outer circle and the center of the inner circle.

Scripts



Object properties:

Whether to measure the ring primitive can be modified, either manually or automatically.

4.7.1.17 Point group

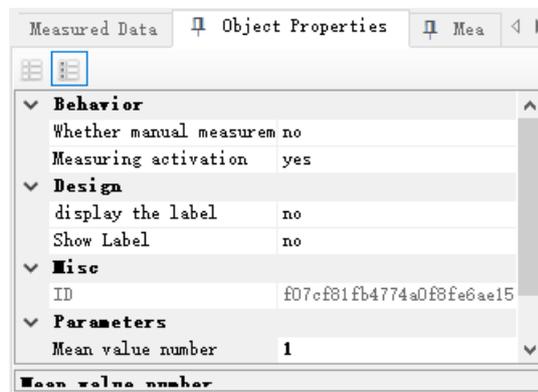
Extraction method:

Caliper extraction, open contour, maximum closed contour, nearest closed contour, contour scanning

Construction method:

Merge fitting, split fitting, script

Object properties:



4.7.1.18 Spline

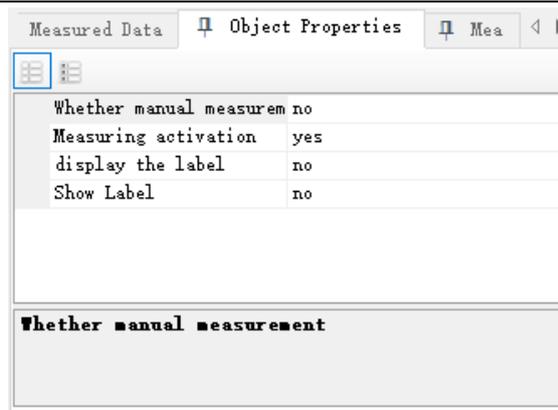
A curve consisting of numerous points.

Extraction method:

Plot point, nearest edge point, round frame fetch point, square frame fetch point, nearest point, line extract point

Object properties:

Set whether to measure, and measure manually or automatically.



4.7.1.19 Calculator

Get the primitive data item in the current primitive list, and then get the operation result after editing the algorithm.

1) Usage mode:

- A. Click on the toolbox primitive "Calculator" and the following box will pop up: (Figure 1)
- B. Click on the output of the primitive in the primitive list and double-click on the measured value, and then the measured value will jump to the expression box (Figure 2).
- C. Select the operator in the operation area of the lower left corner, etc., and it will be displayed in the expression box (Figure 3).
- D. Click OK (Figure 4)

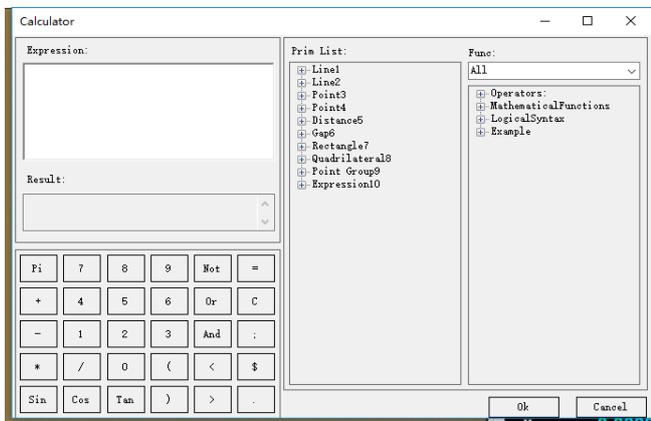


Figure 1

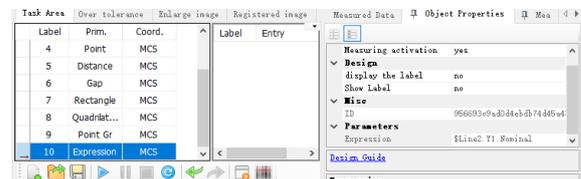


Figure 2

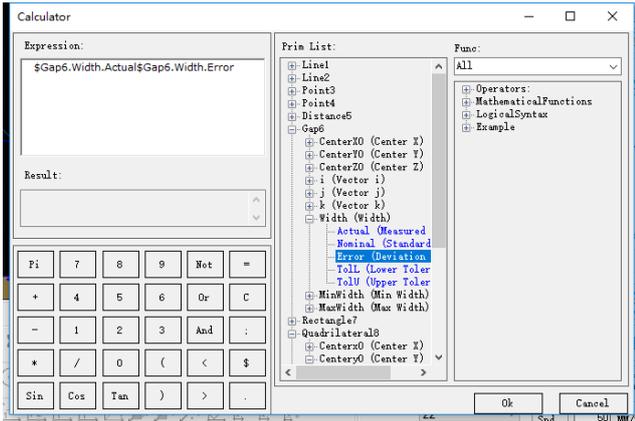


Figure 3

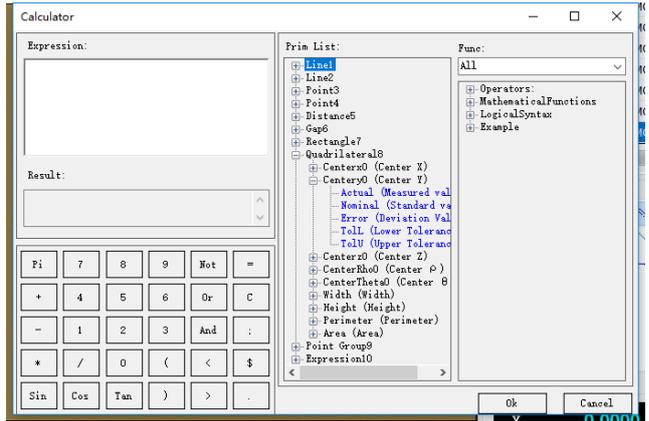
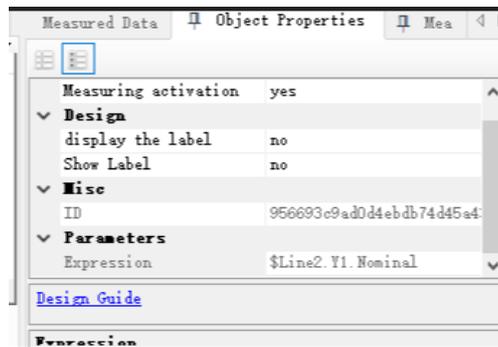


Figure 4

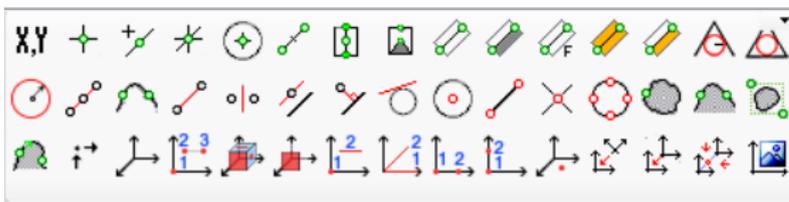
(2) Object properties:

After selecting the expression primitive, it may view the expression parameters from the Object Properties page. Click the Design Guide button to pop up the expression editing dialog box again to modify the expression.



4.7.2 Input toolbox

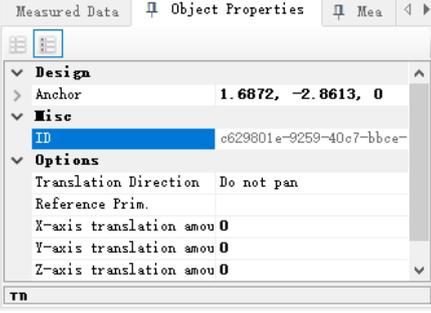
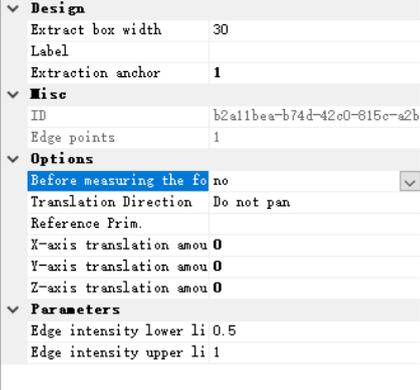
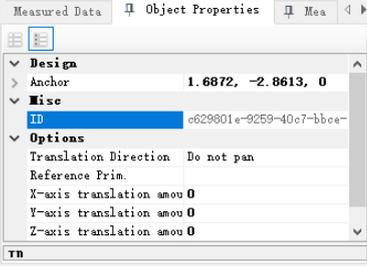
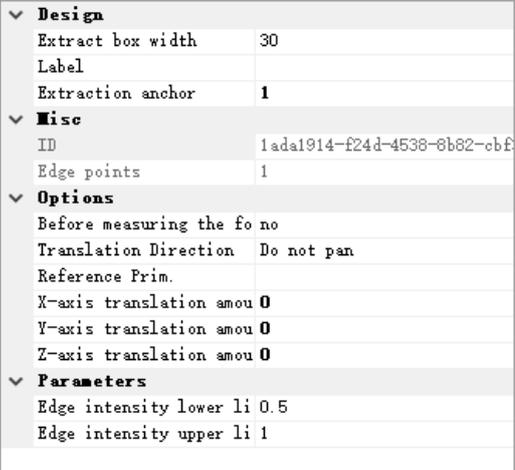
The input toolbox includes: extraction items, construction items, configuration items, and coordinate items.



4.7.2.1 Extraction item

A variety of extraction methods are included for extracting edge points on the contour of the workpiece from the video control area.

Icon	Name	Function description	Object property

	<p>Drawing point</p>	<p>Drawing points are used to draw various primitives, which are generally used when pictures are not taken in an offline status.</p>	
	<p>The nearest point</p>	<p>Find the nearest picture edge point of the mouse position.</p>	 <p>Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p>
	<p>Focus point</p>	<p>Getting the point of picture center by focusing automatically. Mainly on the use of Z-axis testing.</p>	
	<p>Circle box point</p>	<p>Choose a nearest point of figure in the area of circle box.</p>	 <p>Note: For the specific meaning of the parameters in the object</p>

			properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.																																																						
	Extracting points within a square box	Find the best point within the extraction box.	<p>properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p> <table border="1" data-bbox="694 286 1316 1176"> <tr><td colspan="2">Advanced parameters</td></tr> <tr><td>Edge intensity lower li</td><td>0.5</td></tr> <tr><td>Edge intensity upper li</td><td>1</td></tr> <tr><td>Glitch Size Threshold</td><td>8</td></tr> <tr><td>Glitch Sharp Threshold</td><td>2</td></tr> <tr><td>Smoothing Parameter</td><td>0</td></tr> <tr><td>Sampling density</td><td>1</td></tr> <tr><td>Maximum number of point</td><td>100</td></tr> <tr><td>Fine Edge</td><td>no</td></tr> <tr><td colspan="2">Design</td></tr> <tr><td>Extract box width</td><td>30</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>2</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>7fe0f318-baeb-44a3-b539-6fb</td></tr> <tr><td>Edge points</td><td>1</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo</td><td>no</td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> <tr><td colspan="2">Parameters</td></tr> <tr><td>Extract direction</td><td>From inside(left) to ou</td></tr> <tr><td>Edge Direction</td><td>From white to black</td></tr> <tr><td>Edge Priority</td><td>Strength priority</td></tr> </table> <p>Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p>	Advanced parameters		Edge intensity lower li	0.5	Edge intensity upper li	1	Glitch Size Threshold	8	Glitch Sharp Threshold	2	Smoothing Parameter	0	Sampling density	1	Maximum number of point	100	Fine Edge	no	Design		Extract box width	30	Label		Extraction anchor	2	Misc		ID	7fe0f318-baeb-44a3-b539-6fb	Edge points	1	Options		Before measuring the fo	no	Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0	Parameters		Extract direction	From inside(left) to ou	Edge Direction	From white to black	Edge Priority	Strength priority
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	<p>The nearest point</p>	<p>Find the nearest picture point of mouse position.</p>	<table border="1"> <tr><td colspan="2">Advanced parameters</td></tr> <tr><td>Edge intensity lower li</td><td>0.5</td></tr> <tr><td>Edge intensity upper li</td><td>1</td></tr> <tr><td>Glitch Size Threshold</td><td>8</td></tr> <tr><td>Glitch Sharp Threshold</td><td>2</td></tr> <tr><td>Smoothing Parameter</td><td>0</td></tr> <tr><td>Sampling density</td><td>1</td></tr> <tr><td>Maximum number of point</td><td>100</td></tr> <tr><td>Fine Edge</td><td>no</td></tr> <tr><td colspan="2">Design</td></tr> <tr><td>Extract box width</td><td>30</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>2</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>b588f4a8-6dbc-4f4b-8b66-477</td></tr> <tr><td>Edge points</td><td>1</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo</td><td>no</td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> <tr><td colspan="2">Parameters</td></tr> <tr><td>Extract direction</td><td>From outside(right) to insi</td></tr> <tr><td>Edge Direction</td><td>From white to black</td></tr> <tr><td>Edge Priority</td><td>Strength priority</td></tr> </table> <p>Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p>	Advanced parameters		Edge intensity lower li	0.5	Edge intensity upper li	1	Glitch Size Threshold	8	Glitch Sharp Threshold	2	Smoothing Parameter	0	Sampling density	1	Maximum number of point	100	Fine Edge	no	Design		Extract box width	30	Label		Extraction anchor	2	Misc		ID	b588f4a8-6dbc-4f4b-8b66-477	Edge points	1	Options		Before measuring the fo	no	Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0	Parameters		Extract direction	From outside(right) to insi	Edge Direction	From white to black	Edge Priority	Strength priority
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	<p>Line points</p>	<p>Sketch a line through two anchor points to find the intersection of the line and the edge line of the workpiece</p>	<table border="1"> <tr><td colspan="2">Design</td></tr> <tr><td>Extract box width</td><td>30</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>2</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>fe0cb79d-765b-4d6d-a26f-8a5f</td></tr> <tr><td>Edge points</td><td>1</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo</td><td>no</td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> <tr><td colspan="2">Parameters</td></tr> <tr><td>Edge intensity lower li</td><td>0.5</td></tr> <tr><td>Edge intensity upper li</td><td>1</td></tr> </table> <p>Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p>	Design		Extract box width	30	Label		Extraction anchor	2	Misc		ID	fe0cb79d-765b-4d6d-a26f-8a5f	Edge points	1	Options		Before measuring the fo	no	Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0	Parameters		Edge intensity lower li	0.5	Edge intensity upper li	1																				
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Overall extraction (old)

If the accuracy and stability are high, and the overall pattern is visible in sight, it is recommended to use the overall extraction (old).

Advanced parameters	
Edge intensity lower li	0.5
Edge intensity upper li	1
Glitch Size Threshold	8
Glitch Sharp Threshold	2
Smoothing Parameter	0
Sampling density	1
Maximum number of point	100
Fine Edge	no
Design	
Extract box width	30
Label	
Extraction anchor	2
Misc	
ID	10e2e221-523b-4388-a69f-3e68
Edge points	79
Options	
Before measuring the fo	no
Translation Direction	Do not pan
Reference Prim.	
X-axis translation amou	0
Y-axis translation amou	0
Z-axis translation amou	0
Parameters	
Extract direction	From inside(left) to ou
Edge Direction	From white to black
Edge Priority	Strength priority

Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.



Texture segmentation

It is mainly used to extract images with many textures, such as printing plates, and the extraction direction is not distinguished in the extraction box.

Advanced parameters	
Edge intensity lower li	0.5
Edge intensity upper li	1
Glitch Size Threshold	8
Glitch Sharp Threshold	2
Smoothing Parameter	0
Sampling density	1
Maximum number of point	100
Fine Edge	no
Design	
Extract box width	30
Label	
Extraction anchor	2
Misc	
ID	8d08941e-2788-4911-bce2-cbd
Edge points	72
Options	
Before measuring the fo	no
Translation Direction	Do not pan
Reference Prim.	
X-axis translation amou	0
Y-axis translation amou	0
Z-axis translation amou	0
Parameters	
Extract direction	From inside(left) to ou
Edge Direction	From white to black
Edge Priority	Strength priority

Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters”

			of Section 4.6.4.																																																						
	Overall extraction	<p>It is mainly used when the both edges of the whole image to be extracted are relatively smooth.</p>	<table border="1" data-bbox="810 250 1436 1124"> <tr><td colspan="2">Advanced parameters</td></tr> <tr><td>Edge intensity lower li</td><td>0.5</td></tr> <tr><td>Edge intensity upper li</td><td>1</td></tr> <tr><td>Glitch Size Threshold</td><td>8</td></tr> <tr><td>Glitch Sharp Threshold</td><td>2</td></tr> <tr><td>Smoothing Parameter</td><td>0</td></tr> <tr><td>Sampling density</td><td>1</td></tr> <tr><td>Maximum number of point</td><td>100</td></tr> <tr><td>Fine Edge</td><td>no</td></tr> <tr><td colspan="2">Design</td></tr> <tr><td>Extract box width</td><td>30</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>2</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>66441391-fd52-4552-8b32-2091</td></tr> <tr><td>Edge points</td><td>100</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo</td><td>no</td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> <tr><td colspan="2">Parameters</td></tr> <tr><td>Extract direction</td><td>From inside(left) to ou</td></tr> <tr><td>Edge Direction</td><td>From white to black</td></tr> <tr><td>Edge Priority</td><td>Strength priority</td></tr> </table> <p>Grayscale contrast threshold: the primitive is retained when the grayscale contrast value is greater than this value</p> <p>Edge point number contrast threshold: the primitive is retained when the edge point number comparison value is greater than this value;</p> <p>Lower limit of grayscale contrast value: the primitive is filtered out when the grayscale contrast value is smaller than this value.</p> <p>Gradient direction threshold: gradient difference will be filtered out when exceeding the specified range</p> <p>Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p>	Advanced parameters		Edge intensity lower li	0.5	Edge intensity upper li	1	Glitch Size Threshold	8	Glitch Sharp Threshold	2	Smoothing Parameter	0	Sampling density	1	Maximum number of point	100	Fine Edge	no	Design		Extract box width	30	Label		Extraction anchor	2	Misc		ID	66441391-fd52-4552-8b32-2091	Edge points	100	Options		Before measuring the fo	no	Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0	Parameters		Extract direction	From inside(left) to ou	Edge Direction	From white to black	Edge Priority	Strength priority
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Edge Priority	Strength priority																																																								



Texture extraction

It is mainly used when the image has a strong texture on the edge to be extracted and the other side tends to be smooth.

Advanced parameters	
Edge intensity lower li	0.5
Edge intensity upper li	1
Glitch Size Threshold	8
Glitch Sharp Threshold	2
Smoothing Parameter	0
Sampling density	1
Maximum number of point	100
Fine Edge	no
Design	
Extract box width	30
Label	
Extraction anchor	2
Misc	
ID	c35ad395-34f0-4d9e-811f-be3
Edge points	100
Options	
Before measuring the fo	no
Translation Direction	Do not pan
Reference Prim.	
X-axis translation amou	0
Y-axis translation amou	0
Z-axis translation amou	0
Parameters	
Extract direction	From inside(left) to ou
Edge Direction	From white to black
Edge Priority	Strength priority

Grayscale Threshold: The larger the value is, the stricter the extraction edge is, but it is easy to miss the desired edge if the value is too large.

Image link size: The larger the value is, the better the edge continuity is, but fake edges may be included if the value is too large.



Quick overall rounding

The calculation during the running is faster but the accuracy is relatively poor.

Advanced parameters	
Edge intensity lower li	0.5
Edge intensity upper li	1
Glitch Size Threshold	8
Glitch Sharp Threshold	2
Smoothing Parameter	0
Sampling density	1
Maximum number of point	100
Fine Edge	no
Design	
Extract box width	30
Label	
Extraction anchor	3
Misc	
ID	c2906a94-221a-4591-6195-b51
Edge points	100
Options	
Before measuring the fo	no
Translation Direction	Do not pan
Reference Prim.	
X-axis translation amou	0
Y-axis translation amou	0
Z-axis translation amou	0
Parameters	
Extract direction	From inside(left) to ou
Edge Direction	From white to black
Edge Priority	Strength priority

Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.



Contour line scanning

On the contour to be extracted, click the left mouse button twice to set the start point and end point respectively. The primitive starts to be extracted after clicking "Start Run" or right-click menu "Re-measure".

Design	
Label	
Extraction anchor	2
Misc	
ID	c620a2c1-2f8b-4e7a-b2e6-aaa
Edge points	82
Options	
Whether close way to ex	no
Before measuring the fo	no
Translation Direction	Do not pan
Reference Prim.	
X-axis translation amou	0
Y-axis translation amou	0
Z-axis translation amou	0

	<p>Open contour</p>	<p>With an open contour, it can extract line segments, circles, arcs, R angles, point groups and the like.</p>	<table border="1"> <tr><td colspan="2">Design</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>3</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>471b5de1-e378-4ecf-8ffe-c13</td></tr> <tr><td>Edge points</td><td>96</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo no</td><td></td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> </table>	Design		Label		Extraction anchor	3	Misc		ID	471b5de1-e378-4ecf-8ffe-c13	Edge points	96	Options		Before measuring the fo no		Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0		
Design																															
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Z-axis translation amou	0																														
	<p>Maximum closed contour</p>	<p>Click on the upper left and the lower right, respectively, and the maximum closed contour in the box will appear.</p>	<table border="1"> <tr><td colspan="2">Design</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>2</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>1d3b72ce-2adc-4700-9a1a-cae</td></tr> <tr><td>Edge points</td><td>1737</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo no</td><td></td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> </table>	Design		Label		Extraction anchor	2	Misc		ID	1d3b72ce-2adc-4700-9a1a-cae	Edge points	1737	Options		Before measuring the fo no		Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0		
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Z-axis translation amou	0																														
	<p>Nearest closed contour</p>	<p>Click on the edge of the desired closed contour to find the nearest closed contour.</p>	<table border="1"> <tr><td colspan="2">Design</td></tr> <tr><td>Extract box width</td><td>240</td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>1</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>9a3e08af-a40c-4403-6186-7ce</td></tr> <tr><td>Edge points</td><td>1757</td></tr> <tr><td colspan="2">Options</td></tr> <tr><td>Before measuring the fo no</td><td></td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> </table> <p>Note: For the specific meaning of the parameters in the object properties, refer to the content in “3. Preset Extraction Parameters” of Section 4.6.4.</p>	Design		Extract box width	240	Label		Extraction anchor	1	Misc		ID	9a3e08af-a40c-4403-6186-7ce	Edge points	1757	Options		Before measuring the fo no		Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0
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Reference Prim.																															
X-axis translation amou	0																														
Y-axis translation amou	0																														
Z-axis translation amou	0																														
	<p>Laser module data source</p>	<p>It is used for the acquisition of laser module data but is only valid for the primitive lattice</p>	<table border="1"> <tr><td colspan="2">Behavior</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td colspan="2">Design</td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td colspan="2">Misc</td></tr> <tr><td>ID</td><td>c5bec7c0c437468999f8461c3fc</td></tr> </table>	Behavior		Measuring activation	yes	Design		display the label	no	Show Label	no	Misc		ID	c5bec7c0c437468999f8461c3fc														
Behavior																															
Measuring activation	yes																														
Design																															
display the label	no																														
Show Label	no																														
Misc																															
ID	c5bec7c0c437468999f8461c3fc																														



Multi-segment extraction: After clicking the multi-segment button to make it be highlighted, it can be combined with the “whole extraction” or “texture segmentation” button to realize the functions of “multiple selection overall extraction” and “multiple texture segmentation” and to be used together with other extraction

and construction methods, so as to meet the usage requirements of a primitive using multiple extraction and construction methods.

When a multi-segment extraction primitive adds a segmentation item, it can continuously add segmentation extraction items on the basis of the primitive by selecting the primitive in the task area and "multi-segment extraction" in the toolbox.

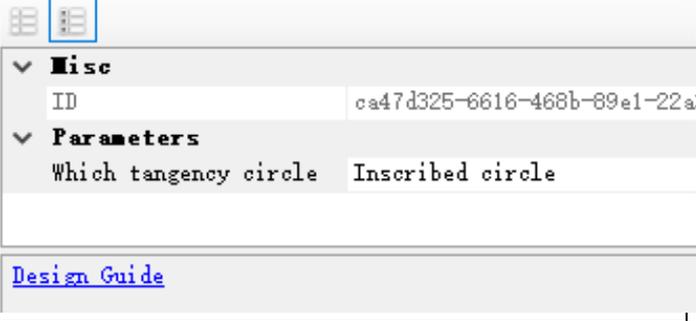
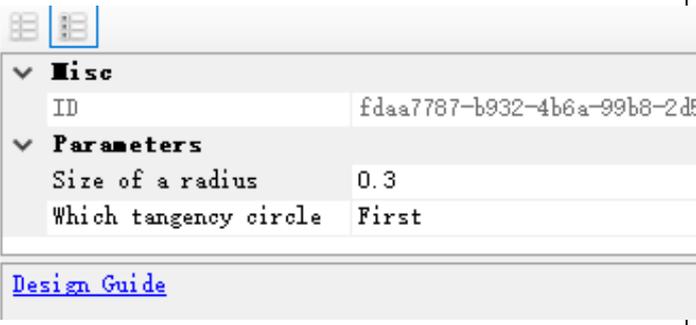
4.7.2.2 Structure item

Structure items include endpoints, center points, extreme points, intersection points, connecting lines, parallel lines, verticality, tangency, bisection, merger, contour segmentation, circling by radius, three inscribed lines constituting a circle, determining a circle with two lines and a radius and point group merger.

Icon	Name	Function description	Object properties
	The end point	Click to select a line or an arc, then can create line or the two end point of arc.	<ul style="list-style-type: none"> ▼ Behavior <ul style="list-style-type: none"> Whether manual measurement no Measuring activation yes ▼ Design <ul style="list-style-type: none"> display the label no Show Label no ▼ Misc <ul style="list-style-type: none"> ID 51d810f3c5684f5eba30c3914
	The center of circle	Click to select a base element, then can create the center point of base element, the circle center point, the center point of line.	<ul style="list-style-type: none"> ▼ Behavior <ul style="list-style-type: none"> Whether manual measurement no Measuring activation yes ▼ Design <ul style="list-style-type: none"> display the label no Show Label no ▼ Misc <ul style="list-style-type: none"> ID ebc55770fc144ee39b7f5bd82d9c
	Extreme point	Click to select a circle, arc, etc. to display the extreme points of the primitive for selection.	<ul style="list-style-type: none"> ▼ Behavior <ul style="list-style-type: none"> Whether manual measurement no Measuring activation yes ▼ Design <ul style="list-style-type: none"> display the label no Show Label no ▼ Misc <ul style="list-style-type: none"> ID cd97070ad6d349978622670e0ac
	The point of intersection	Click to select line, circle or arc, then can create the point of intersection of line, circle or arc.	<ul style="list-style-type: none"> ▼ Behavior <ul style="list-style-type: none"> Whether manual measurement no Measuring activation yes ▼ Design <ul style="list-style-type: none"> display the label no Show Label no ▼ Misc <ul style="list-style-type: none"> ID 79e85452bac24a3db35fb3f9990

	<p>Two points connection</p>	<p>Click to select two points, then can create line which take the two points as end points.</p>	<table border="1"> <tr><td>▼ Behavior</td></tr> <tr><td>Whether manual measurement</td><td>no</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td>▼ Design</td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td>▼ Misc</td></tr> <tr><td>ID</td><td>9d4235f774b248ee9114cc180cc</td></tr> <tr><td>▼ Options</td></tr> <tr><td>Reverse Direction</td><td>no</td></tr> </table>	▼ Behavior	Whether manual measurement	no	Measuring activation	yes	▼ Design	display the label	no	Show Label	no	▼ Misc	ID	9d4235f774b248ee9114cc180cc	▼ Options	Reverse Direction	no
▼ Behavior																			
Whether manual measurement	no																		
Measuring activation	yes																		
▼ Design																			
display the label	no																		
Show Label	no																		
▼ Misc																			
ID	9d4235f774b248ee9114cc180cc																		
▼ Options																			
Reverse Direction	no																		
	<p>Parallel line</p>	<p>Can create parallel line.</p>	<table border="1"> <tr><td>▼ Behavior</td></tr> <tr><td>Whether manual measurement</td><td>no</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td>▼ Design</td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td>▼ Misc</td></tr> <tr><td>ID</td><td>57ba3c3c762144ab90a250c8106</td></tr> <tr><td>▼ Options</td></tr> <tr><td>Reverse Direction</td><td>no</td></tr> </table>	▼ Behavior	Whether manual measurement	no	Measuring activation	yes	▼ Design	display the label	no	Show Label	no	▼ Misc	ID	57ba3c3c762144ab90a250c8106	▼ Options	Reverse Direction	no
▼ Behavior																			
Whether manual measurement	no																		
Measuring activation	yes																		
▼ Design																			
display the label	no																		
Show Label	no																		
▼ Misc																			
ID	57ba3c3c762144ab90a250c8106																		
▼ Options																			
Reverse Direction	no																		
	<p>Vertical line</p>	<p>Can create vertical line.</p>	<table border="1"> <tr><td>▼ Behavior</td></tr> <tr><td>Whether manual measurement</td><td>no</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td>▼ Design</td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td>▼ Misc</td></tr> <tr><td>ID</td><td>8c4514382f3b4ca7bc32a2996bd</td></tr> <tr><td>▼ Options</td></tr> <tr><td>Reverse Direction</td><td>no</td></tr> </table>	▼ Behavior	Whether manual measurement	no	Measuring activation	yes	▼ Design	display the label	no	Show Label	no	▼ Misc	ID	8c4514382f3b4ca7bc32a2996bd	▼ Options	Reverse Direction	no
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display the label	no																		
Show Label	no																		
▼ Misc																			
ID	8c4514382f3b4ca7bc32a2996bd																		
▼ Options																			
Reverse Direction	no																		
	<p>Tangent</p>	<p>Can create point, line, and circle. Arc and circle or circle arc's tangent or cut of point.</p>	<table border="1"> <tr><td>▼ Behavior</td></tr> <tr><td>Whether manual measurement</td><td>no</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td>▼ Design</td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td>▼ Misc</td></tr> <tr><td>ID</td><td>22f0733b2f5f4c43acbbcd3990</td></tr> <tr><td>▼ Options</td></tr> <tr><td>Reverse Direction</td><td>no</td></tr> </table>	▼ Behavior	Whether manual measurement	no	Measuring activation	yes	▼ Design	display the label	no	Show Label	no	▼ Misc	ID	22f0733b2f5f4c43acbbcd3990	▼ Options	Reverse Direction	no
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Whether manual measurement	no																		
Measuring activation	yes																		
▼ Design																			
display the label	no																		
Show Label	no																		
▼ Misc																			
ID	22f0733b2f5f4c43acbbcd3990																		
▼ Options																			
Reverse Direction	no																		

	<p>Bisection</p>	<p>It can generate center lines, angle bisectors, axes of symmetry and so on.</p>	<table border="1"> <tr><td>Behavior</td><td></td></tr> <tr><td>Whether manual measurement</td><td>no</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td>Design</td><td></td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td>Misc</td><td></td></tr> <tr><td>ID</td><td>aa990f4ecd1c4cb48b95852ec18</td></tr> <tr><td>Options</td><td></td></tr> <tr><td>Reverse Direction</td><td>no</td></tr> </table>	Behavior		Whether manual measurement	no	Measuring activation	yes	Design		display the label	no	Show Label	no	Misc		ID	aa990f4ecd1c4cb48b95852ec18	Options		Reverse Direction	no												
Behavior																																			
Whether manual measurement	no																																		
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Misc																																			
ID	aa990f4ecd1c4cb48b95852ec18																																		
Options																																			
Reverse Direction	no																																		
	<p>Merger</p>	<p>Merge points into a line, or arcs to a circle or a new arc, or points to a point group, or points to a plane, etc.</p>	<table border="1"> <tr><td>Behavior</td><td></td></tr> <tr><td>Whether manual measurement</td><td>no</td></tr> <tr><td>Measuring activation</td><td>yes</td></tr> <tr><td>Design</td><td></td></tr> <tr><td>display the label</td><td>no</td></tr> <tr><td>Show Label</td><td>no</td></tr> <tr><td>Misc</td><td></td></tr> <tr><td>ID</td><td>92fa6b5cd3054f74a2cea73c75c</td></tr> <tr><td>Options</td><td></td></tr> <tr><td>Reverse Direction</td><td>no</td></tr> </table>	Behavior		Whether manual measurement	no	Measuring activation	yes	Design		display the label	no	Show Label	no	Misc		ID	92fa6b5cd3054f74a2cea73c75c	Options		Reverse Direction	no												
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Misc																																			
ID	92fa6b5cd3054f74a2cea73c75c																																		
Options																																			
Reverse Direction	no																																		
	<p>Separation</p>	<p>separate point and combine, select base element first, and select button, then choose points base element that need to separate, it will appear dialog window, choose points that need to combine and it will combine base element automatically</p>	<table border="1"> <tr><td colspan="2">Object Properties</td></tr> <tr><td>Design</td><td></td></tr> <tr><td>Label</td><td></td></tr> <tr><td>Extraction anchor</td><td>2</td></tr> <tr><td>Misc</td><td></td></tr> <tr><td>ID</td><td>f6a7584a-d766-49d8-81b4-</td></tr> <tr><td>Edge points</td><td>35</td></tr> <tr><td>Options</td><td></td></tr> <tr><td>Whether close way to ex</td><td>no</td></tr> <tr><td>Before measuring the fo</td><td>no</td></tr> <tr><td>Translation Direction</td><td>Do not pan</td></tr> <tr><td>Reference Prim.</td><td></td></tr> <tr><td>X-axis translation amou</td><td>0</td></tr> <tr><td>Y-axis translation amou</td><td>0</td></tr> <tr><td>Z-axis translation amou</td><td>0</td></tr> <tr><td colspan="2">Design Guide</td></tr> </table>	Object Properties		Design		Label		Extraction anchor	2	Misc		ID	f6a7584a-d766-49d8-81b4-	Edge points	35	Options		Whether close way to ex	no	Before measuring the fo	no	Translation Direction	Do not pan	Reference Prim.		X-axis translation amou	0	Y-axis translation amou	0	Z-axis translation amou	0	Design Guide	
Object Properties																																			
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X-axis translation amou	0																																		
Y-axis translation amou	0																																		
Z-axis translation amou	0																																		
Design Guide																																			
	<p>Circling by radius</p>	<p>Select any primitive and take the center of the primitive as a center and input any radius value to generate a circle.</p>	<table border="1"> <tr><td>Misc</td><td></td></tr> <tr><td>ID</td><td>fdaa7787-b932-4b6a-99b8-2d5</td></tr> <tr><td>Parameters</td><td></td></tr> <tr><td>Size of a radius</td><td>0.3</td></tr> <tr><td>Which tangency circle</td><td>First</td></tr> <tr><td colspan="2">Design Guide</td></tr> </table>	Misc		ID	fdaa7787-b932-4b6a-99b8-2d5	Parameters		Size of a radius	0.3	Which tangency circle	First	Design Guide																					
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Which tangency circle	First																																		
Design Guide																																			

	<p>Three inscribed lines constituting a circle</p>	<p>Construct an incircle of three lines.</p>	
	<p>Determine a circle with two lines and a radius</p>	<p>Get a circle of contact with two line segments and a radius.</p>	

4.7.2.3 Configuration item

 Preset primitives; select the pre-built primitives and click on the preset icon, then the preset mode dialog box pops up.

4.7.2.4 Coordinate item

It allows establishing different coordinate systems or creating multiple coordinate systems in a single task, or adjusting existing coordinate systems. To automatically run a task, the first is usually to add a mechanical coordinate system.

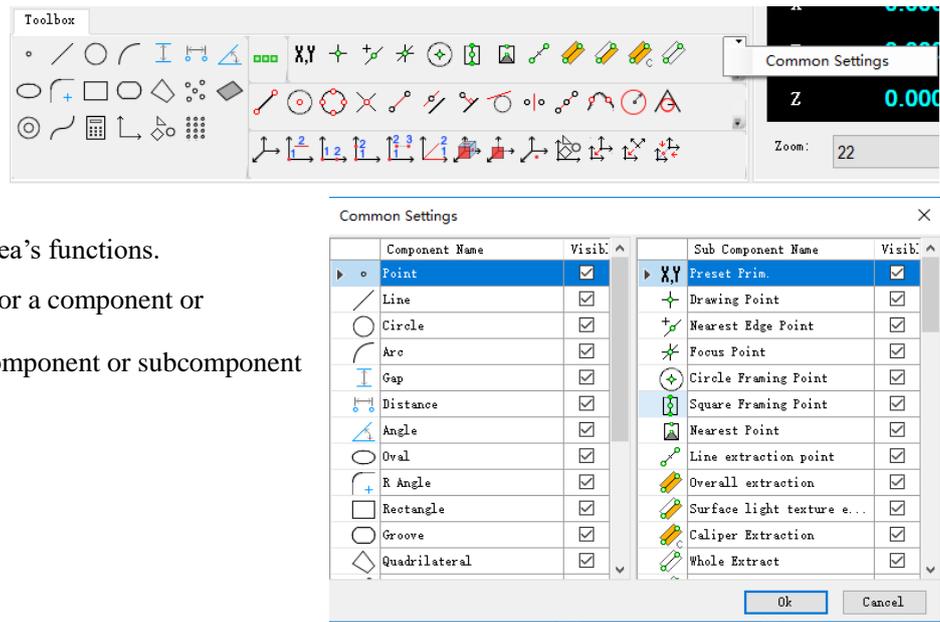
Icon	Name	Function description
	<p>Mechanical coordinate system</p>	<p>A coordinate system of the mechanical zero position of the imager.</p>
	<p>Coordinate system determined by plane, line and point</p>	<p>Construct a new coordinate system with three primitives -plane, line and point.</p>
	<p>Coordinate system determined by point and line</p>	<p>Use a point as the origin of the coordinate system and a line segment as the positive direction of X-axis.</p>
	<p>Coordinate system determined by three points</p>	<p>Select three points, the first point is the origin, and the second and third points are connected in the X-axis positive direction.</p>
	<p>Coordinate system</p>	<p>Select two line segments, then the intersection of the two lines is</p>

	determined by two lines	as the origin, and the first line is in the positive direction of the X-axis.
	X-axis determined by two points	Select two points, then the first point is the origin, and the two points are connected in the positive direction of the X-axis.
	Y-axis determined by two points	Select two points, then the first point is the origin, and the two points are connected in the positive direction of the Y-axis.
	Coordinate system by point correction	Reference a non-coordinate system primitive with a center point (which can be a primitive in space), and move the origin of the superior coordinate system to the center point of the reference primitive to form a new coordinate system.
	Coordinate system by plane correction	Reference a plane primitive, and move the origin of the superior coordinate system to the center point of the plane primitive to form a new coordinate system.
	Rotating coordinate system	Select a point in the existing coordinate system, and the direction of the line between the coordinate system origin and this point is the positive direction of X-axis of the new coordinate system.
	Translational coordinate system	Reference a coordinate system primitive and a non-coordinate system primitive with a center point (which can be a primitive in space), and move the origin of the reference coordinate system to the center point of the non-coordinate system primitive to form a new coordinate system.
	Manually adjusted coordinate system	The coordinate system can be quantitatively adjusted by entering a specified amount of rotating or shifting.
	Sample matching coordinate system	The selected image (preferably the only marker in the image) is used as the identifier of the coordinate system position. When the task is run to the coordinate system primitive, the selected image is automatically recognized in the visible range of the image area and the coordinate system is generated.

4.7.3 Common settings

Click the small arrow in the upper right corner of the Toolbox page to bring up the settings related to the area's functions.

When the "visible" checkbox for a component or subcomponent is selected, the component or subcomponent is displayed in the toolbox.



4.7.4 Point Laser/Line Laser file trigger

4.7.4.1 Point Laser scanning:

1. We can open the "list scan" permission in the sub-component of the toolbox in vispecset.
2. Point table has two modes: point mode and trigger mode.

Label	Trigger type	X	Y	Z	Scanning direction	Speed	Scanning points	Scanning distance
A	0	0	10	10				
B	1	10	10	10	[1, 0, 0]	5	100	0.5
C	1	10	10	10	[0, -1, 0]	5	100	0.5
D	1	10	10	10	[1, 1, 0]	5	100	0.5

Trigger type:0 is for dotting and 1 is for scanning.X, Y, Z are values relative to the current coordinate system.

Scanning direction:[l,j,k] is defined as a unit normal vector.

For example:A is a single dot hit,and is marked at (0, 10, 10) position,consistent with the manual laser spot;

B is the scanning trigger, starting from (10,10,10),scanning 100 points along the positive X direction of 5mm/s,with a spacing of 0.05mm;

C is the scanning trigger, starting from (10,10,10),scanning 100 points along the negative Y direction of 5mm/s,with a spacing of 0.05mm;

D is the scanning trigger, starting from (10,10,10),scanning 100 points along the angle of 45° with X direction of 5mm/s,with a spacing of 0.05mm.

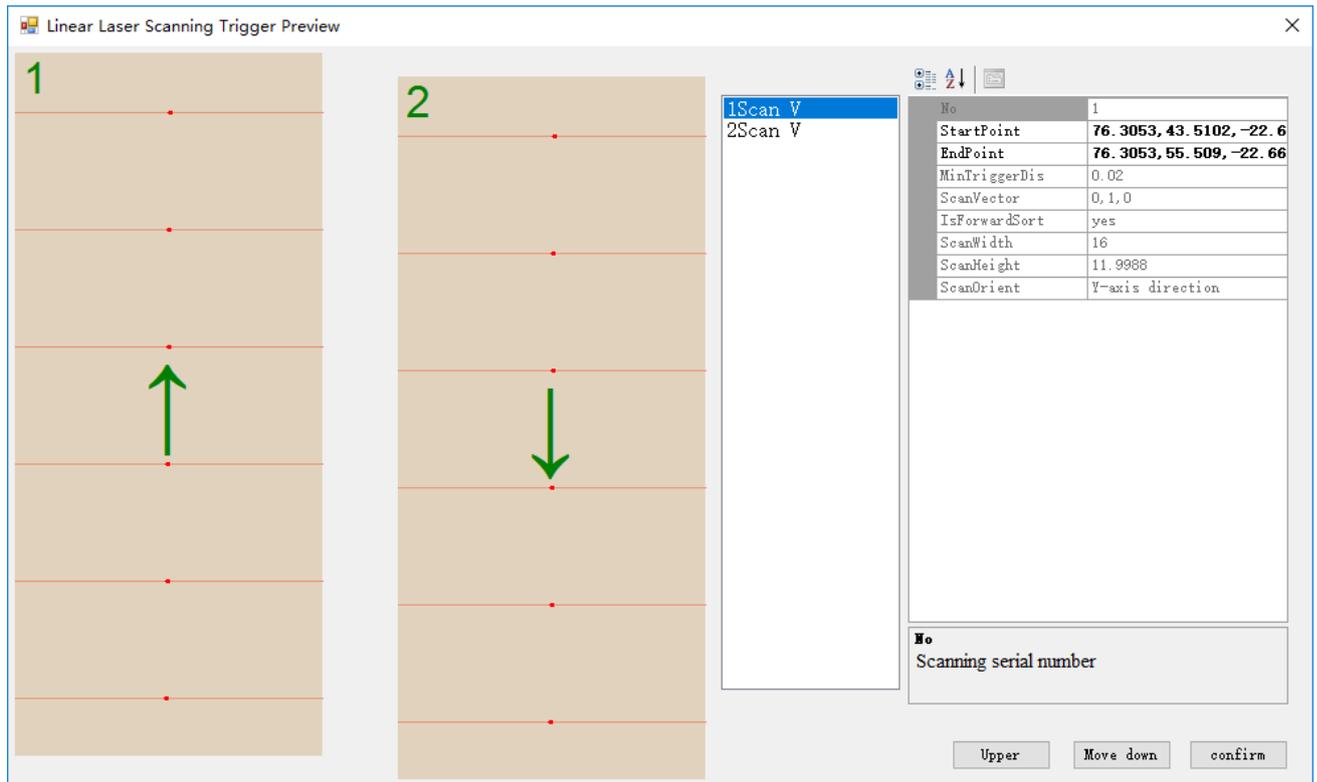
3. Create the point group primitive,click "list scanning",and import the point location table in CSV format.For example:

Label	Trigger type	X	Y	Z	i	j	k	speed	points	distance
A	0	0	1	0						
B	1	0	1	0	1	0	0	5	100	0.05
C	1	0	1	0	0	1	0	2	200	0.05

4.7.4.2 Line laser point trigger:

1. We can open the "line laser trigger" permission in the sub-component of the toolbox in vispecset.
2. In the object properties of the extracted item,there is a hyperlink that can be clicked for the "Scan Information

Path Preview".As follows:

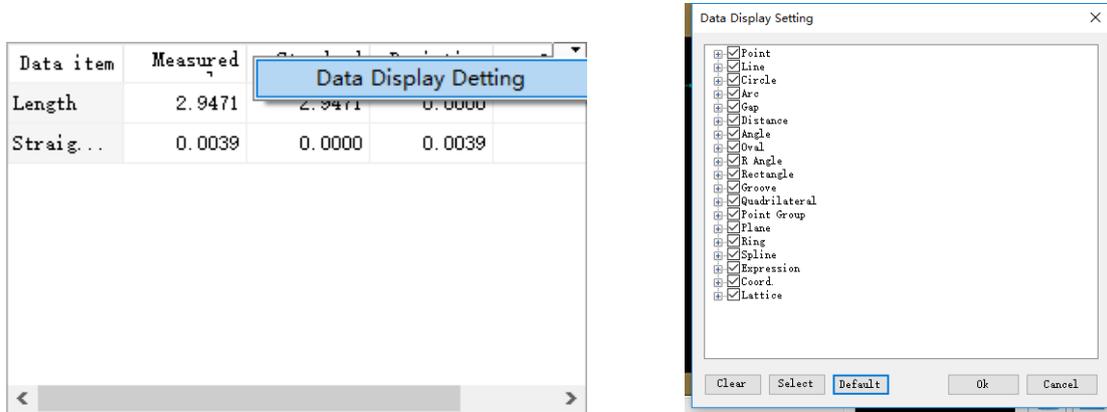


3. Read the scan point information in the external file and plan the path(Support text files: .txt, .csv).The template format for reading coordinate values and label information is as follows:

Label	X	Y	Z	Window size	Baseline group number	Highly dependent plane	Flatness
1	1	1	0	2	1	1	
2	1	2	0	3	1		1
3	1	3	0	2		1	
4	8	4	0	3		1	1
5	8	5	0	2	2	1	1
6	8	6	0	3	2	1	1
7	8	7	0	2	2	1	1
8	8	1	0	3		1	1
9	12	15	0	2		1	1
10	12	0.5	0	3	1	1	1
11	12	3.5	0	2		1	1
12	12	4.5	0	3		1	1
13	12	5.5	0	2		1	1
14	12	6.5	0	3	1	1	1
15	12	7.5	0	2		1	1
16	13	8.5	0	3	4	1	1
17	13	9.5	0	2		1	1
18	13	10.5	0	3	2	1	
19	16	5	0	3		2	
20	16	6	0	2		2	
21	16	7	0	3	2	2	
22	16	1	0	3		2	
23	23	2	0	2		2	2
24	23	3	0	3	1	2	2
25	23	4	0	2		2	2
26	23	5	0	3	3	2	2
27	23	6	0	2	3	2	2
28	23	7	0	3	3	2	2
29	23	1	0	2	3	2	2

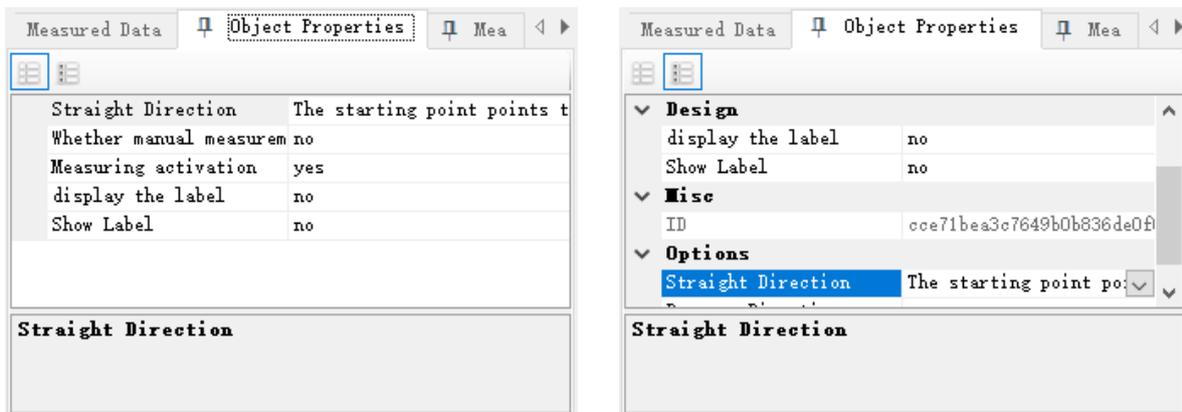
4.8 Measure Data

Select a primitive in the primitive list, and the Measure Data window will display the measured value, standard value, error value and tolerance value of each data item of the primitive, as shown in the figure below.



The displayed data item can be adjusted in the pop-up "Data Display Setting" by clicking the small arrow in the upper right corner of the Measure Data page. By default, the most commonly used data items of each primitive are selected.

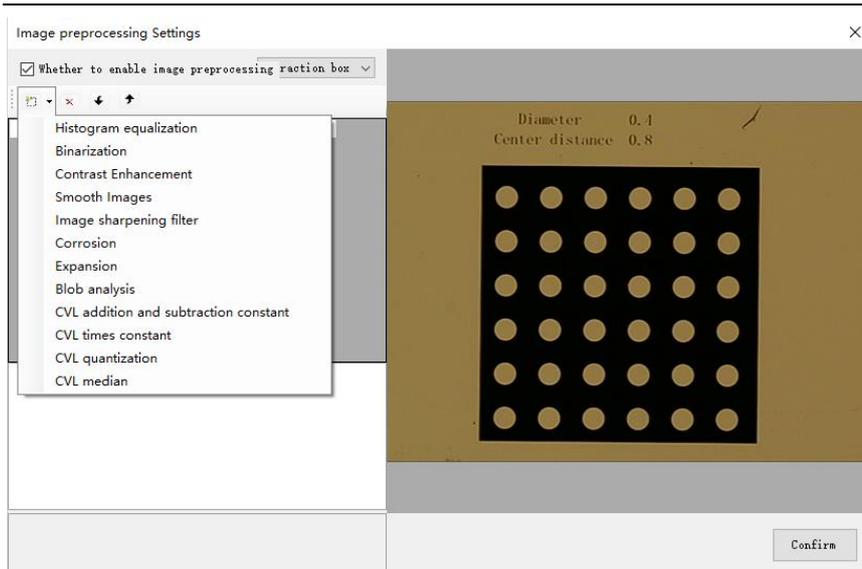
4.9 Object Properties



Select a primitive from the primitive list, and right-click to display the object properties or directly switch to the object properties window to view the object properties of the primitive or to set each property of the primitive separately. Similarly, by selecting an extraction method or a construction method in the input item list, it can view and modify the related parameters in the object properties page to meet different measurement and calculation needs. By holding the "object properties" label and dragging the cursor, the object properties page will pop up and turn into a floating box, so that its position and size can be adjusted at will to facilitate use in different situations.

Currently, the object properties area is divided into two modules: common used properties and all properties.

Image pre-handle: Image preprocessing is to eliminate irrelevant information in images, restore useful real information, enhance the detectability of relevant information and simplify data to the maximum extent, so as to improve the reliability of feature extraction, image segmentation, matching and recognition.



Whether to enable image preprocessing:If enabled, the preprocessing command takes effect.

Image preprocessing area:It is divided into full graph and extraction box area.The default is the extraction box area.The extraction box area is an external rectangle of the extract box.

Add:A drop-down box pops up to select a pre-processing item.After clicking,a new selection is added to the pre-processing list,and whether image pre-processing is enabled is automatically checked.

Delete:The selected pre-processed item can be deleted,and if no pre-processing item is enabled,the image pre-processing is automatically unchecked.

Notes:

1. Histogram equalization:If the pixels of an image occupy a lot of gray levels and are evenly distributed,such images tend to have high contrast and variable gray tones.Histogram equalization is a transformation function that automatically achieves this effect only by simply inputting histogram information.Its basic idea is to broaden the gray level of the number of pixels in the image,and compress the gray level with a small number of pixels in the image,so as to expanding the dynamic range of the pixel value and improve the contrast and gray tone. The changes make the image clearer.
2. Binarization:All pixels whose gray level is greater than or equal to the threshold value are determined to belong to a specific object, and their gray value is 255.Otherwise,these pixels are excluded from the object area,and the gray value is 0,indicating the background or the exceptional object area.
3. Contrast enhancement:It is to enhance the image contrast and highlight the edges of the image.It will also highlight the clutter.
4. Smooth images:It is to reduce the sharpness of the image and also remove some of the noise,which will result in blurred image after processing.The differential operation is used to obtain the signal change rate,and the high-frequency component is enhanced to make the outline of the image clear.
The Range of smoothing parameters:Odd number of 3~10.
5. Image sharpening filter:In order to enhance the outline and detail of the image and make the image clear,the noise will be enhanced after processing.Also known as edge enhancement.
The range of Sharpening parameters:0~2.The higher the number, the higher the sharpening intensity.
6. Corrosion:Corrosion is simply that white is corroded,that is,the pixel value is low (black direction) and the white color is reduced.
7. Expansion:The expansion is the pixel value (white direction) becomes more (expanded)
8. Blob analysis:Blob analysis is actually a fast process to binarize the image,segment the foreground and

background, and then perform connected region detection to get the Blob. Simply put, blob analysis is to find a small area of "gray mutation" in a "smooth" area. It is suitable for 2d target images and high contrast images.

9. CVL addition and subtraction constant: A gray value is added to each pixel gray value to make the image brighter or darker.

The range of additions and subtractions: -256~256

10. CVL times constant: Multiply the gray value of each pixel by a gray value to make the image brighter or darker.

The range of multiplied by constant: Constants greater than 0.

11. CVL quantization: Classify 0 to 255 by N. The 0~N-1 class takes the lower boundary value, and the Nth class takes the upper boundary value. If N is 2, 0~127 becomes 0, and 128~255 becomes 255, which is the binarization effect.

The range of quantitative series: Even number of 2~256

12. CVL median: The gray value of each pixel is replaced by the gray average of the points of the surrounding M*N.

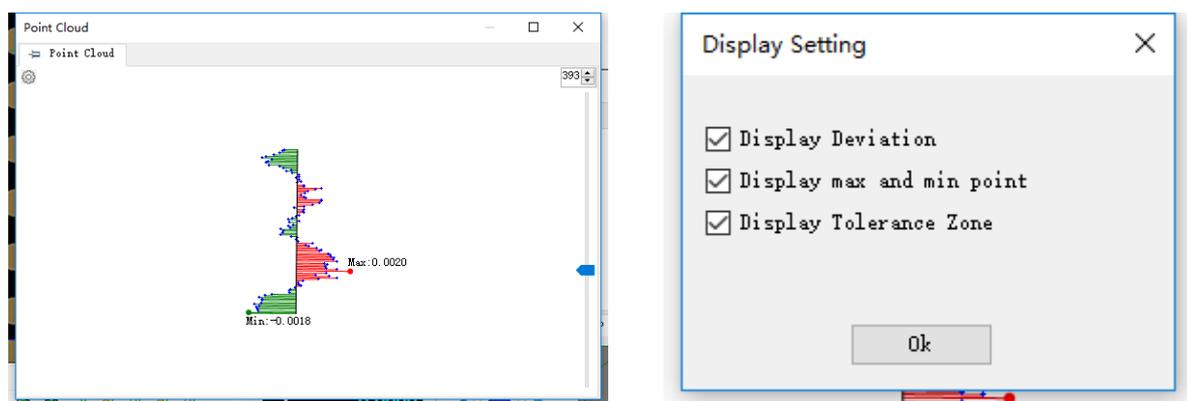
Height: M. The range of the height: An odd number is greater than or equal to 3.

Width: N. The range of the width: An odd number is greater than or equal to 3.

4.10 Point Cloud Map

Select a primitive and switch to the point cloud interface to view the deviation map between the standard value and the measured value of all points in the primitive. The point cloud map can be zoomed in and out by rolling the mouse wheel. The deviation multiple can be viewed within 1 to 999; the red point indicates positive deviation and the green indicates negative deviation. The positive or negative of a deviation can be changed by setting the reference point.

There is a setting button in the upper left corner of the point cloud map; click to open it and there are three options: "Display deviation value", "Display max and min point" and "Display Tolerance Zone".



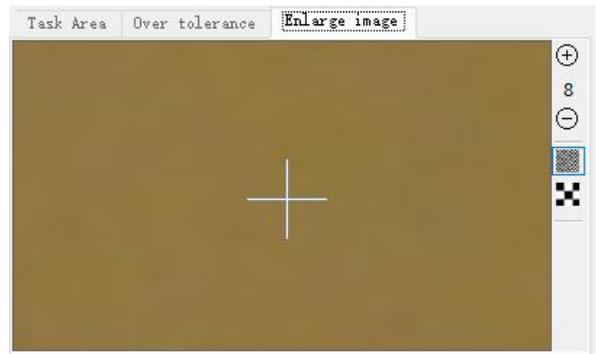
Hold the "point cloud map" label and drag the cursor to change the window to a floating form, and adjust the size and position of the window at will to make it easy to view the data.

4.11 Enlarge image area

Enlarge image window: is used for displaying the partial enlarged details of the workpiece being measured for easy observation and measurement. The toolbar is on the right.

This window has the following 3 parameters for setting:

- ① Enlarging button: the ratio greater than 1 can be set to: 2, 4, 8, 16 and 32 through the "+" or "-" button. This default value is 8 in the software.
- ② Linear magnification: the image is indistinct by linear magnification, with smoother edges.
- ③ Scale up: the scale-up image is clear, with the edge sharpness being the same as the original image.



4.12 Registered Image

A sample image successfully registered is displayed in the registered image window. This window is used for both sample matching primitive and sample matching coordinate system.



4.13 Data package surface plate

See the screenshot for the interface layout, the column width can be adjusted, and the row height is fixed. The first row is the serial number, the second row is the standard value, the third row is upper tolerance, the fourth row is lower tolerance, the fifth row is the maximum value, the sixth row is the minimum value, the seventh row is the average value, the eighth row is extremely poor, and the ninth row Measurement data

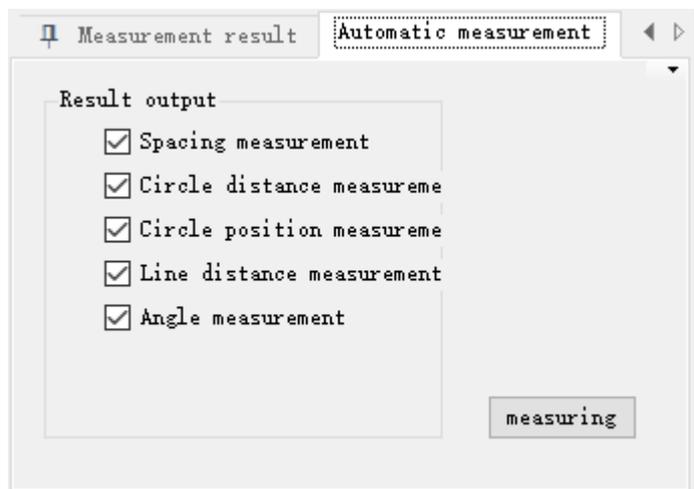
	1	2	3	4	5
Name	2:End X2	2:End Y2	2:Coordinat...	2:End P 2	2:End...
Standard value	1.9122	-3.3751	0.0000	3.8792	-60.46
Upper deviation	NA	NA	NA	NA	NA
Low deviation	NA	NA	NA	NA	NA
Max	1.9122	-3.3751	0.0000	3.8792	-60.46
Min	1.9122	-3.3751	0.0000	3.8792	-60.46
AvgValue	1.9122	-3.3751	0.0000	3.8792	-60.46
Range	0.0000	0.0000	0.0000	0.0000	0.0000
1	11:06:30	1.9122	-3.3751	0.0000	3.8792

4.14 Automatic measurement

The newly added "Automatic Measurement" panel is shown below:

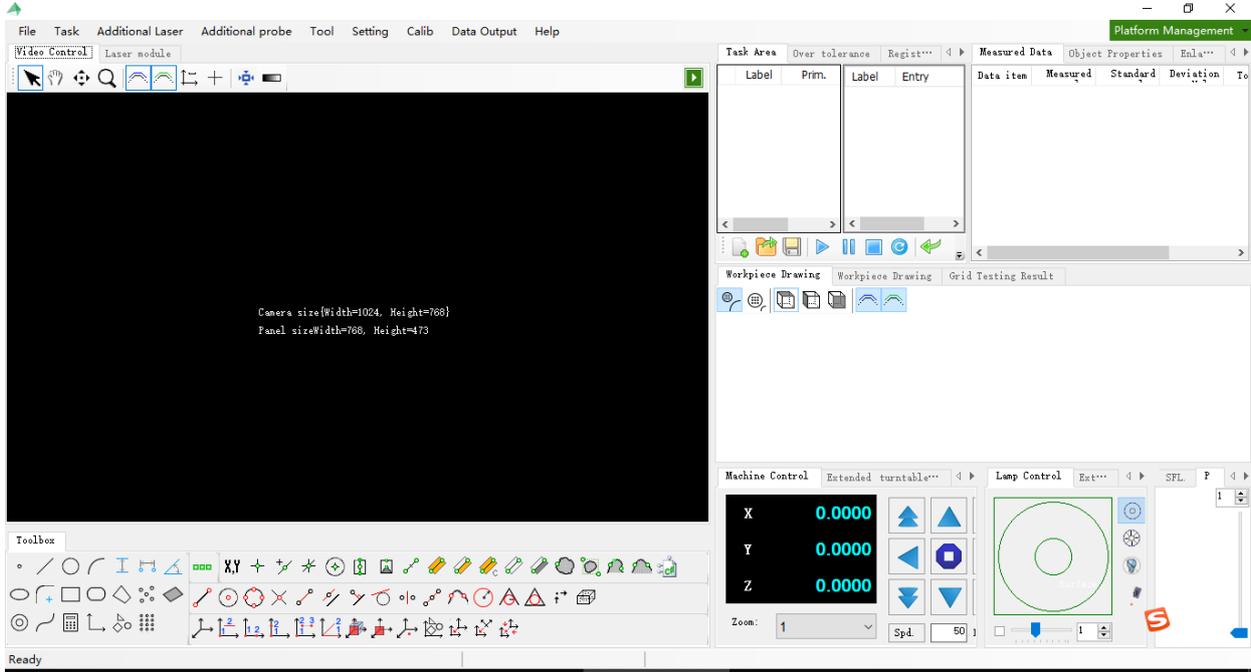
1) Result output items (checked or not will not be saved in the software, all selected by default):

- ① Spacing measurement (automatically create "spacing" primitive, the value is: the spacing of parallel lines (such as outer length, outer width))
- ② Circle distance measurement (automatically create "distance" primitive, the value is: the distance between the nearest two circle centers)
- ③ Circle position measurement (automatically create a "distance" primitive, the value is: the vertical distance from the center of the circle to the reference line)
- ④ Line distance measurement (automatically create a "distance" primitive, the value is: except for the line segment parallel or perpendicular to the reference line, other line segments are respectively the vertical distance to the reference line)
- ⑤ Angle measurement (automatically create "angle" primitives, the value is: in addition to vertical and parallel, the angle between the line segment and the line segment) Baseline: Two vertical line segments (parallel to the edge of the image area) at the extreme edge of the image area



Chapter 5 VispecSet

5.1 Interface Layout



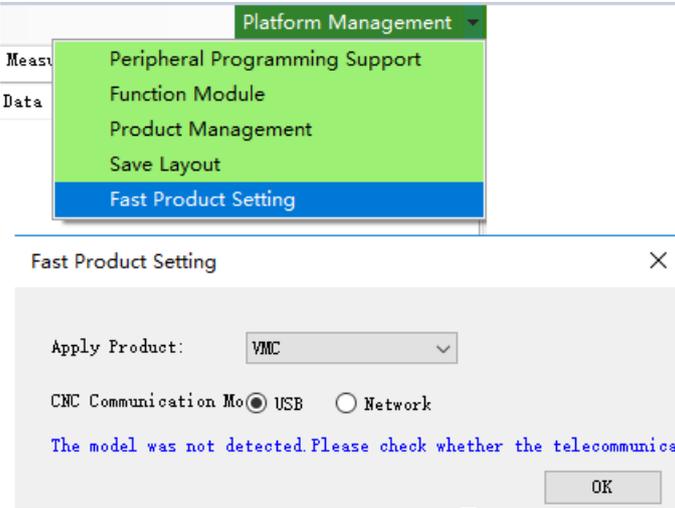
After double-clicking VispecSet, the main interface pops up, including the title bar, menu bar, function list and function setting area.

Check the dongle permissions when opening, and it can be normally opened only with VispecBase or VispecDemo permission; otherwise, the dialog box "Please insert the dongle" will pop up.

The function setting area displays the general functions by default. Click the function list area, and the function setting area displays the corresponding interface.

5.2 General Settings

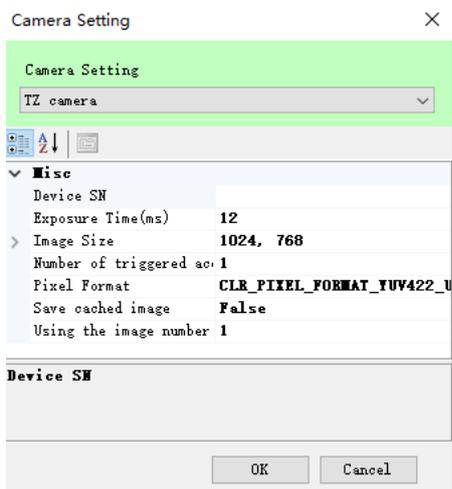
Set the current machine model and its communication method



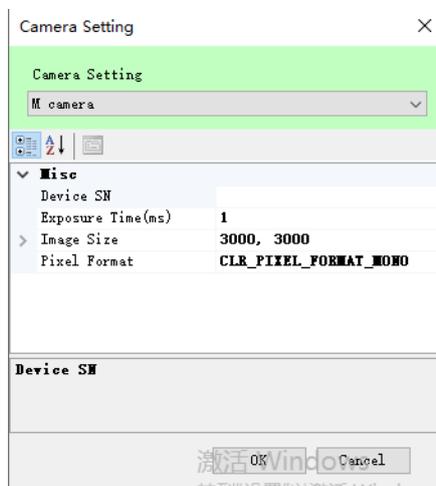
5.3 Camera

5.3.1 Digital Camera

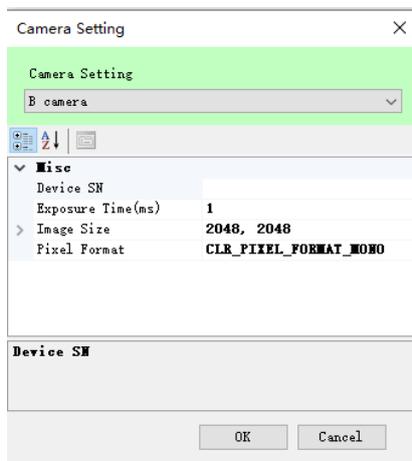
In the hard trigger mode, it supports setting the number of images acquired by trigger. It can be preset in continuous mode.



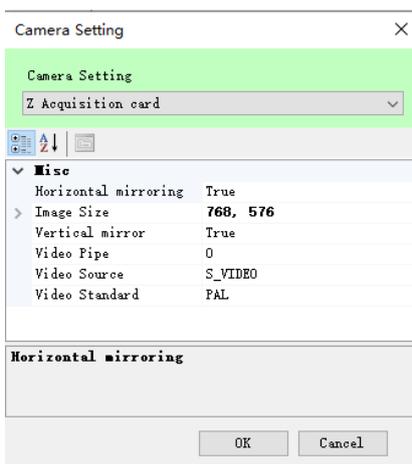
5.3.2 M Camera



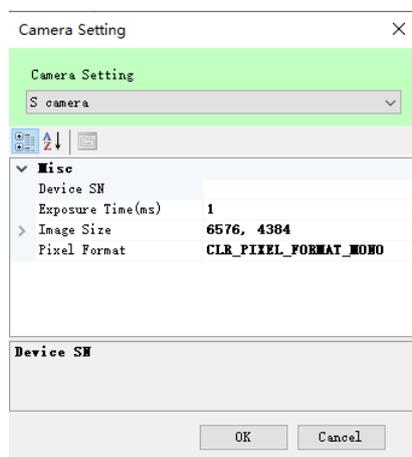
5.3.3 B Camera



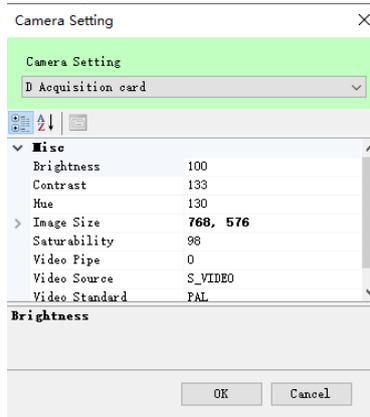
5.3.4 Z Acquisition card



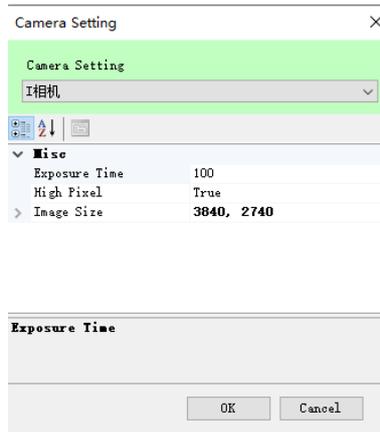
5.3.5 S Camera



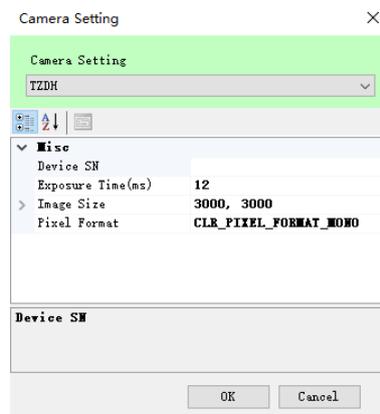
5.3.6 D Acquisition card



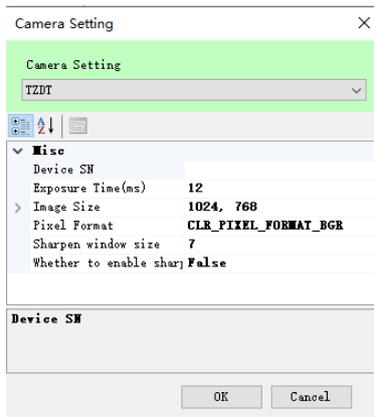
5.3.7 I Camera



5.3.8 TZDH



5.3.9 TZDT

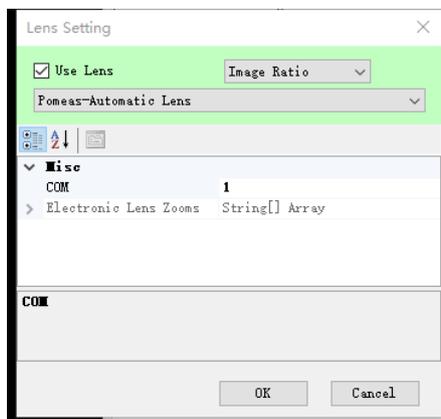


5.3.10 TZDH



5.4 Lens

5.4.1 Interface layout



5.4.2 Magnification display mode

The magnification display modes include: image magnification, index number and custom. Image magnification: the magnification value after the actual calibration displayed in the Vispec zoom-out box; Index number: the index number displayed in the Vispec zoom-out box, starting from 1; Custom: the custom value in the optical magnification list displayed in the Vispec zoom-down box.

5.4.3 List of lens

The list of lenses supported by the software: "fixed magnification lens", "automatic lens", "manual lens", INSIZE-manual zoom lens", "M binocular fixed magnification lens" and "MAZ".

5.4.4 Moritex- Binocular Fixed Magnification Lens

Optical magnification:

Key	Value
0	0.075x
1	0.14x

5.5 Light Source

5.5.1 Interface layout

5.5.2 INSIZE – Coaxial Lamp

No parameter.

5.5.3 INSIZE – Contour Lamp

No parameter.

5.5.4 INSIZE – Surface Lamp

The parameters are configured in Viset.

5.5.5 O light source

1. Add the parameter configuration interface of the OPT light source controller in VispecSet, including:
 - ① Serial port number input box: an integer value 1-10. Enter the port number corresponding to the current light source controller connected to the computer;
 - ② Baud rate input box: the number of times the carrier parameter changes within a unit time, which needs to be configured according to the instructions of the light source controller;
 - ③ Parity check bit drop-down box: to ensure the data validity in data communications, the values are 0, 1, 2, 3, 4, which need to be configured according to the instructions of the light source controller;
 - ④ Data bit drop-down box: the values are 5, 6, 7, 8, which need to be configured according to the instructions of the light source controller;
 - ⑤ Stop bit drop-down box: the values are 0, 1, 1.5, 2, which need to be configured according to the instructions of the light source controller;
 - ⑥ Channel drop-down box: the values are 1, 2, 3, 4; if one of the channels are occupied, the option will be canceled in the drop-down box;

When the current light source controller is used to control the surface light, the 6 rings and 8 areas are not distinguished on the Vispec main interface, and the button of surface light control mode will be hidden, so that the user can only control the surface light as a whole, but not control it by other means;

5.6 Laser

5.6.1 Interface layout

The interface includes the Use External Laser checkbox, the X-axis offset label and text box, the Y-axis offset label and text box, the Z-axis offset label and text box, the refractivity label and text box, the Laser Model Selection drop-down box, the Laser Model Property box, OK button, and Cancel button.

Single Output Mode/Dual Output Mode: It defaults to single output mode. If supported by a laser, the dual output mode can be set in the Laser Model Properties box.

5.6.2 K-point laser-H

The screenshot shows a dialog box titled "Configure an external laser" with a close button (X) in the top right corner. The "Use External Laser" checkbox is checked. The "Laser Brand" dropdown menu is set to "K-point laser-H". Below this, there are three input fields for X, Y, and Z axis offsets, each with a corresponding axis label and a small icon. A "Misc" section is expanded, showing a list of properties:

Fps	1000
Laser Controller IP	192.168.10.10
Max Measuring Distance	3
Min Measuring Distance	-3
Output Mode	OneOut
Probe Type	LK_H027
Refractivity	1
Thickness standard value	500
way of communication	Ethernet

Below the "Misc" section, there is a section labeled "Fps" with a text input field. At the bottom of the dialog, there are "OK" and "Cancel" buttons.

5.6.3 K-point laser-G

The screenshot shows a dialog box titled "Configure an external laser" with a close button (X) in the top right corner. The "Use External Laser" checkbox is checked. The "Laser Brand" dropdown menu is set to "K-point laser-G". Below this, there are three input fields for X, Y, and Z axis offsets, each with a corresponding axis label and a small icon. A "Misc" section is expanded, showing a list of properties:

Fps	1000
Max Measuring Distance	5
Min Measuring Distance	-5
Output Mode	OneOut
Output Number	0
Probe Type	LK_G30
Refractivity	1
Thickness standard value	500
way of communication	Ethernet

Below the "Misc" section, there is a section labeled "Fps" with a text input field. At the bottom of the dialog, there are "OK" and "Cancel" buttons.

5.6.4 P spectrum

Configure an external laser

Use External Laser

Laser Brand P spectrum

Misc

Connect Info(COM/IP)	COM1
Fps	1000
Laser Number	1
Max Measuring Distance	10
Min Measuring Distance	0
Output Mode	OneOut
Refractivity	1
Thickness standard value	500
way of communication	Ethernet

Fps

OK Cancel

5.6.5 O spectrum

Configure an external laser

Use External Laser

Laser Brand O spectrum

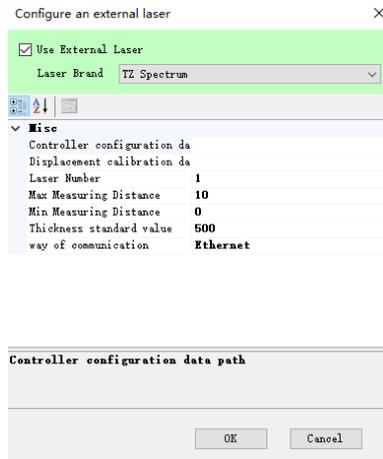
Misc

Fps	1000
Laser Controller IP	192.168.250.50
Max Measuring Distance	2
Min Measuring Distance	-2
Output Mode	OneOut
Probe Type	ZW5000
Refractivity	1
Thickness standard value	500
way of communication	Ethernet

Fps

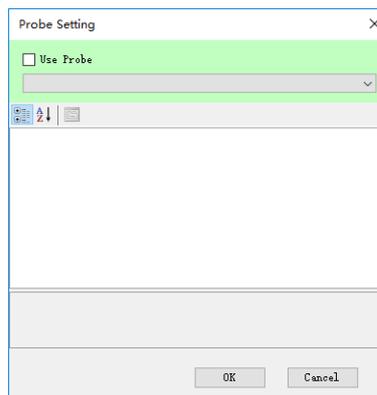
OK Cancel

5.6.6 Spectrum

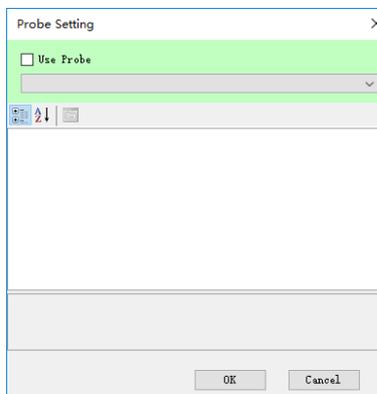


5.7 Probe

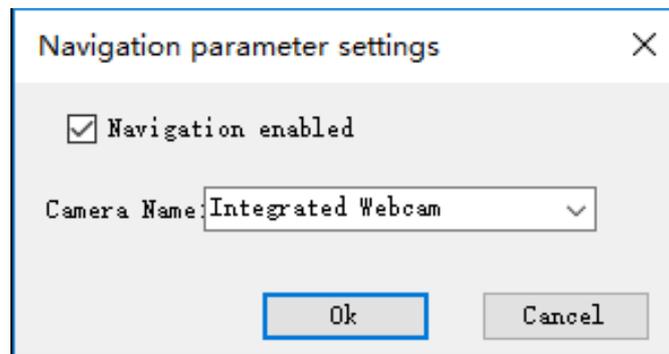
5.7.1 Interface layout



5.7.2 probe



5.8 Large Map Navigation



Chapter 6 Example Of Measurement

Application of Video Measuring Machine majorly includes: Reverse engineering scanner and workpiece measurement, Chapter 6 will give detailed measurement steps to explain operating process of Vispec software.

6.1 Mobile shell scanner (Reverse Engineering)

Using ISD-P series video measuring machine to do Reverse Engineering on workpiece and get geometry information, then output the DXF file, with the help of other CAD software to form complete data of workpiece, and in this example, running a task for scanning phone enclosure is demonstrated

1. Turn on the power of control cabinet and wait for self-inspection of the machine.



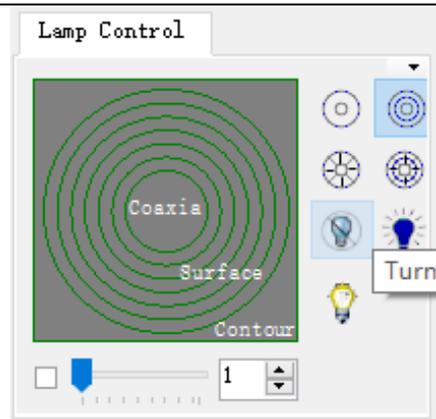
2. Turn on the computer ,double click Vispec icon to start Vispec software



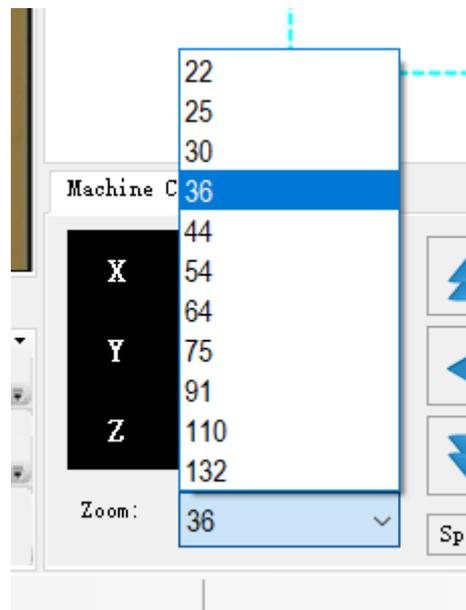
3. Put the workpiece to be measured on the work table.



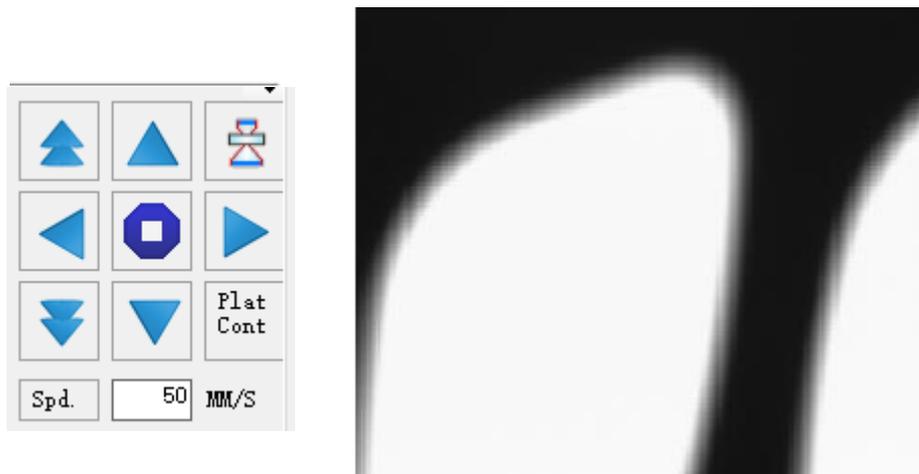
4. Turn on the lower light, adjust the lightness to suitable level



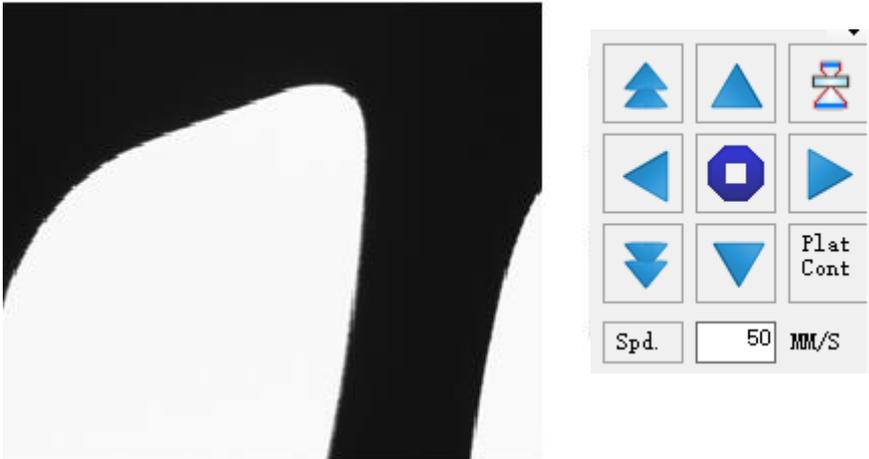
5. Zoom out lens magnification to minimum.



6. Move X-axis and Y-axis platform by platform control button, transfer the mobile phone enclosure to the visual scope.



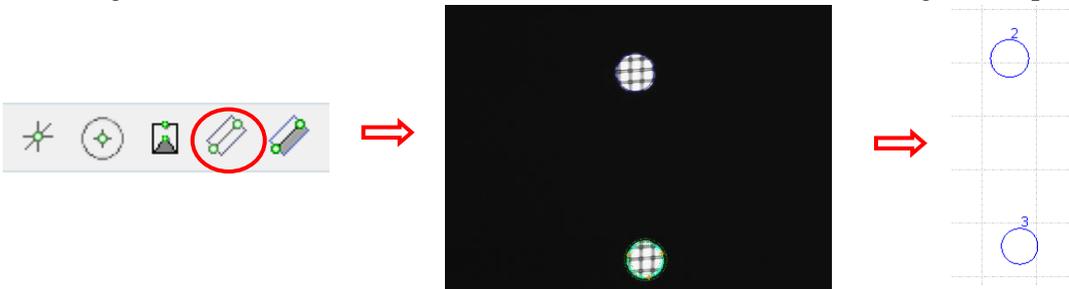
7. Move Z-axis to make mobile phone enclosure imaging distinctly, if need, use auto-focus function.



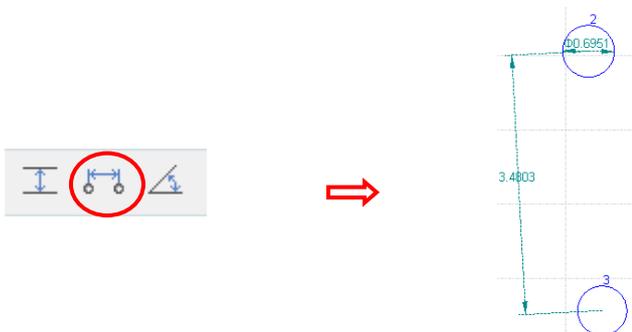
8. Using auto contour following function to search dots of contour for distinctive and bigger area's contour.



9. Using tool like search ,draw to withdraw element for small area and regular shape



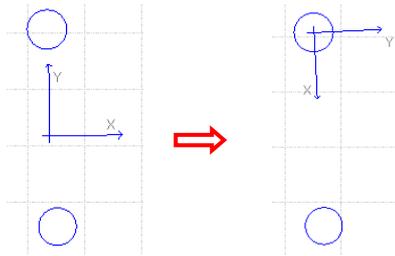
10. Using labeling tool to mark necessary data.



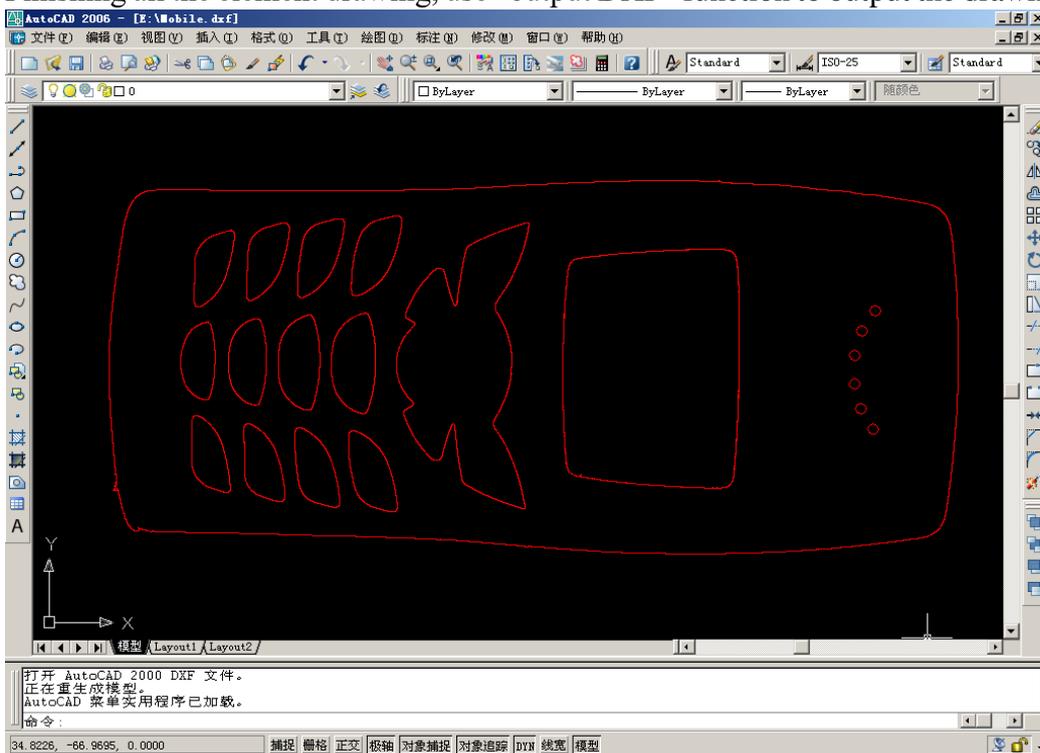
11. Using constructing tool to construct new element from already existing element.



12. Using coordinate tool to adjust current coordinate system as needed.



13. Finishing all the element drawing, use “output DXF” function to output the drawing in DXF format.



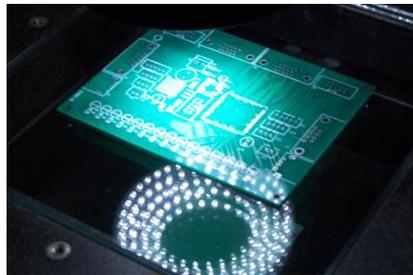
6.2 PCB inspection

Using ISD-P series video measuring machine to inspect workpiece conveniently and effectively. Build measurement task first for batch inspection, then using measurement task to do fast and automatic measurement.

Following is an example of building and running measurement task.

6.2.1 Build measurement task with sample

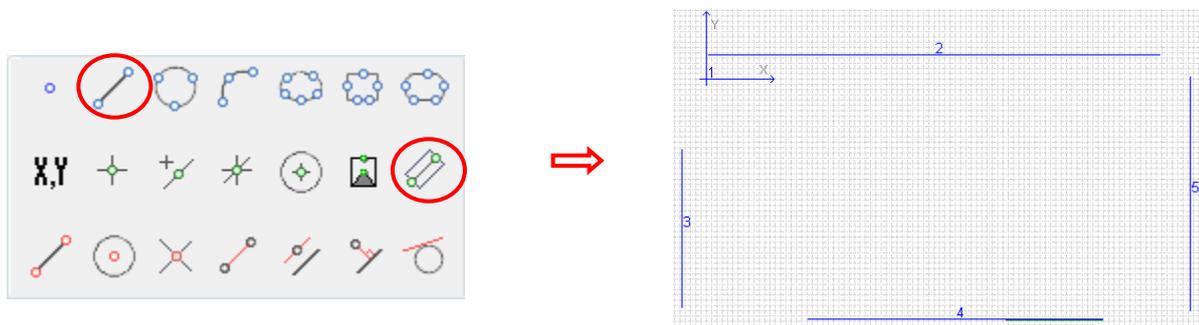
1. Put one piece of PCB on the platform ,make sure to fix the PCB with plasticine

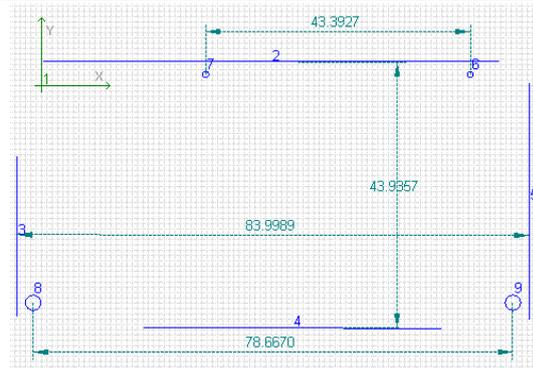


2. Move PCB to the visual area with platform control button, adjust Z-axis's height and contour lighting intensity until the image is clear
3. Using “two dots make X-axis” of “coordinate “toolbar to set up coordinate system; move platform until find the lower left hole of the PCB, then extract the first circle according to “multiple extracting circle’s method, move the platform to find lower right hole of the PCB, using the same way to extract the second circle, click “two dots make X-axis”, using the first circle to be base point ,the direction from the first circle to the second circle to be X-axis to make a coordinate system.

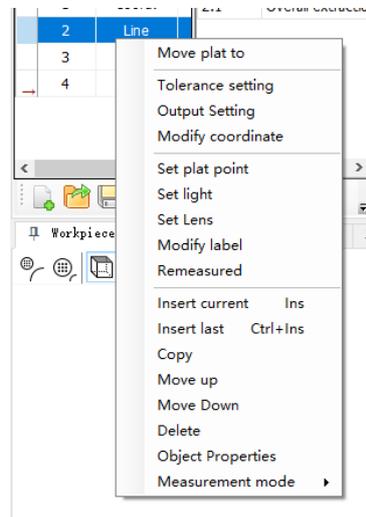


4. Using measurement tool to measure all needed primitive and mark if necessary.

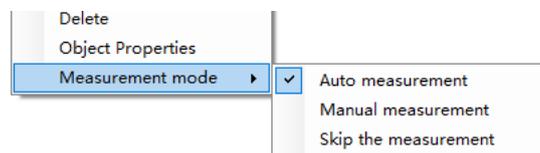




Within” primitive list”, adjusting insertion point position then adjusting measuring sequence of task running.



5. Get information per request to adjust element’s withdrawing process, furthermore set primitive to be “manual primitive”, when task is operating ,stop the primitive to the position and user withdraw the primitive with hand.



6. After finish all the measurement, click “save” button, select path and file name to save and use.



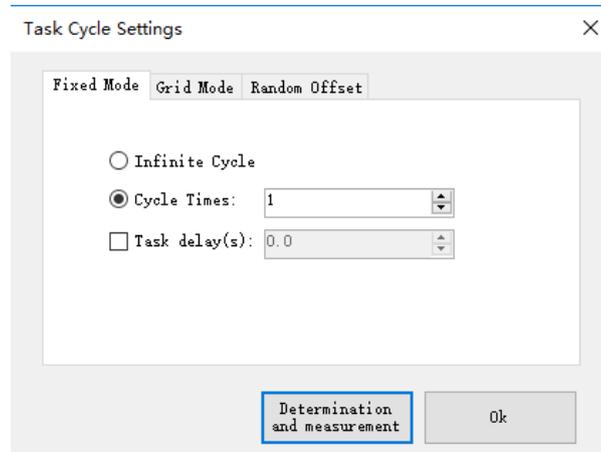
6.2.2 Automatic measurement.

1. Put the same model PCB on the platform ,fix it with plasticine

2. Click “open task”, select last step to build task files.



3. Select task cycling times per requirement.



4. Click “Task running” button, if the first element is coordinate system, the task will run automatically, or else, the element before the first coordinate system will do manual measurement.



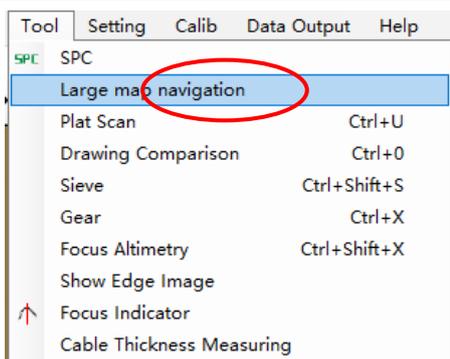
5. If the first primitive is the workpiece’s coordinate system which extracted, it needs to build coordinate system manually. Better select the same workpiece coordinate’s settings as buildings ,click “two circle heart decide coordinate system” icon, move platform to find the lower left hole of the PCB, withdraw one circle according to “Extract Circle” method ,move the platform to find the lower right hole ,using the same method to withdraw the second hole ,click right mouse button after withdraw the second hole ,then process starts running and measuring each e primitive of the task list.
6. If task has stetted withdraw element manually, the task will stop once runs to manual element and wait for user operation, user click “run task “after withdrawing ,and then the process runs again.

6.3 SPC statistics

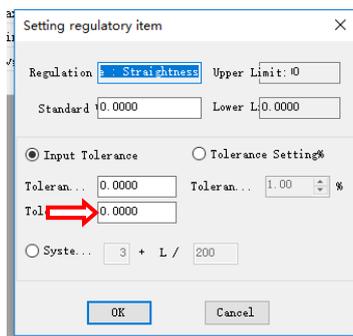
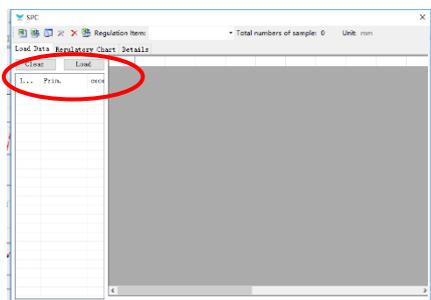
1. Click “SPC ICON” in the main tool bar, and then popup SPC main interface.



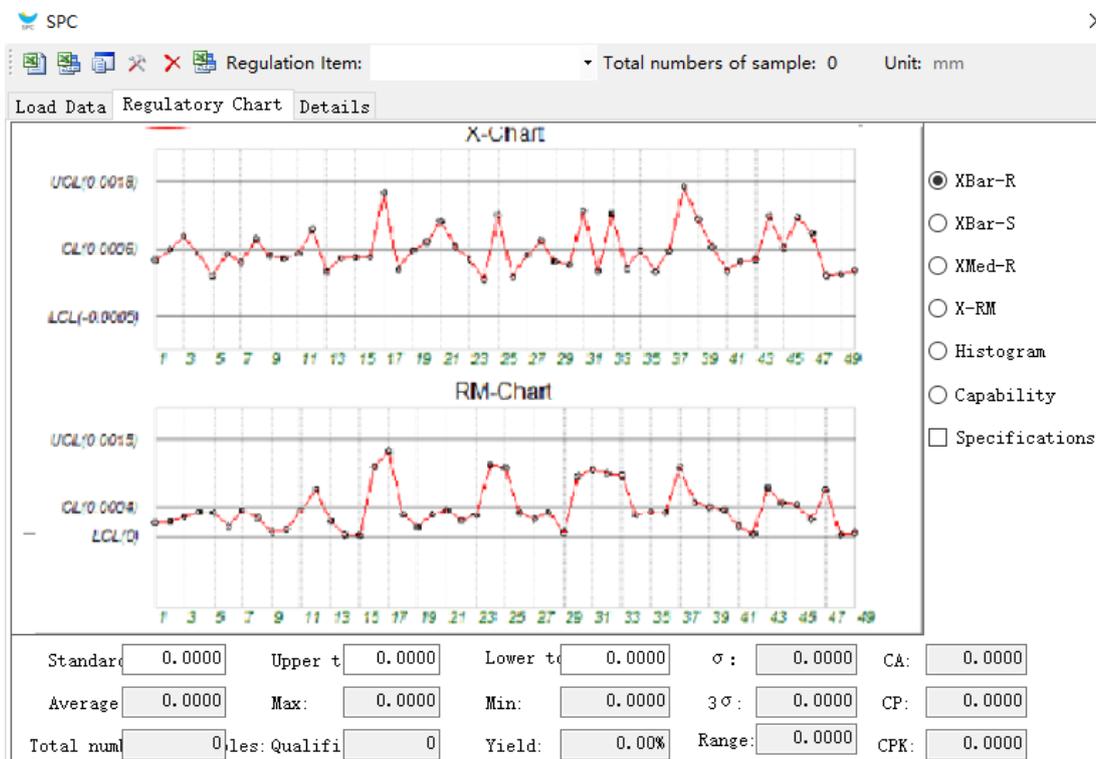
2. Click “Loading Sample”, Select output catalogue, open “2008-5-17” subcatalog and choose data file.



3. Click data that needs to control in the right data list and then popup “set control item” dialog.



4. Input standard value and tolerance range.
5. Repeat 3-4 step, add more control item.
6. Switch to “Control Chart” and check each control chart.

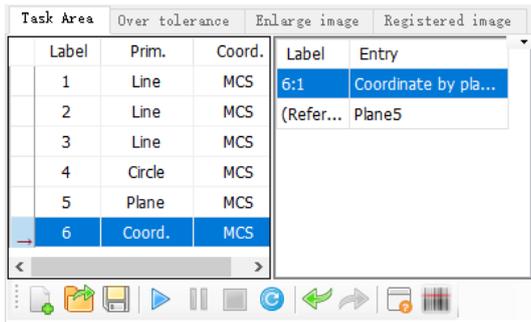


6.4 Coordinate system by Plane Correction

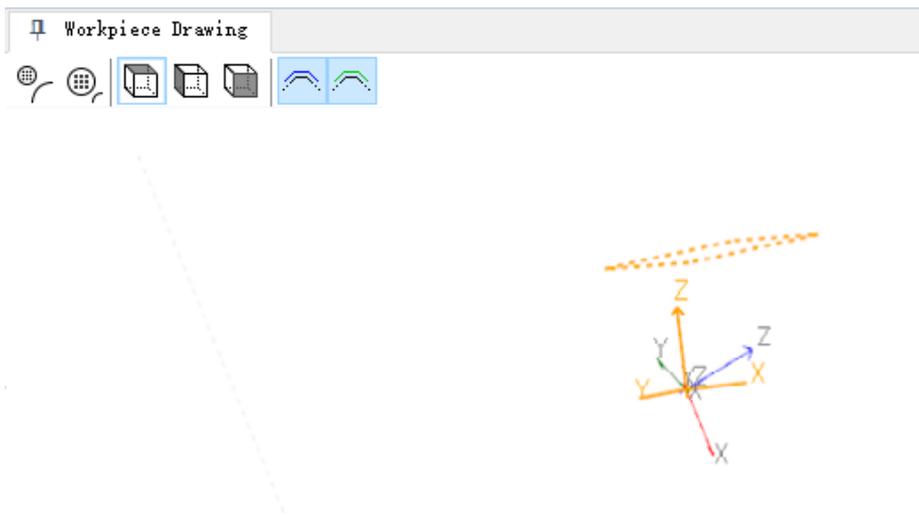
It is used for the measurement of bevel workpieces, and the calculation shall be conducted after converting the bevel into a plane by coordinate system correction.

1. If there is no coordinate system, to create a new coordinate system and hereby build a plane by plot points.

2. Select the  coordinate system; select the  coordinate system by plane correction; or choose to reference a constructed plane-coordinate system.



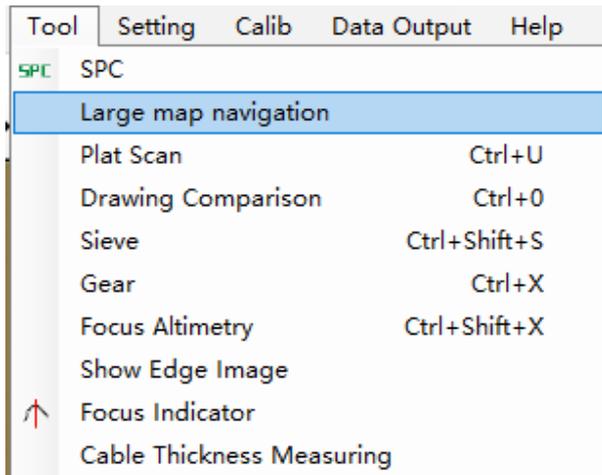
3. The coordinate system is constructed, and the yellow coordinate system displayed in the workpiece drawing is a coordinate system by plane correction.



6.5 Large Map Navigation

When the user measures the workpiece, the large map navigation allows directly locating the position where to be moved, so as to improve the measurement efficiency.

1 . Tools, select large map navigation and open the large map navigation window.

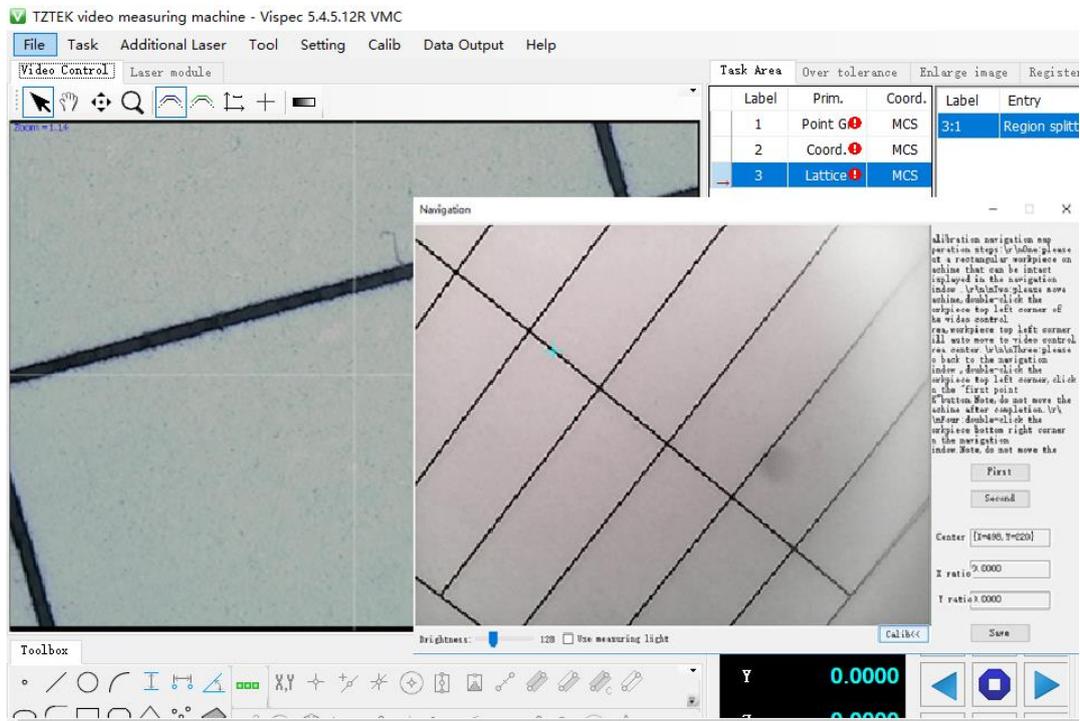


2. The large map navigation window pops up. If it is the first time to use the large map navigation, it needs to be calibrated for correct navigation.

3. In the lower left corner, it allows adjusting the brightness or directly using the measuring light in the image area.



4. Double-click the large map to navigate to the area to be positioned, and the machine automatically moves to the area corresponding to the video area.



5. Calibration method:

Click on the calibration to expand the calibration interface on the right.

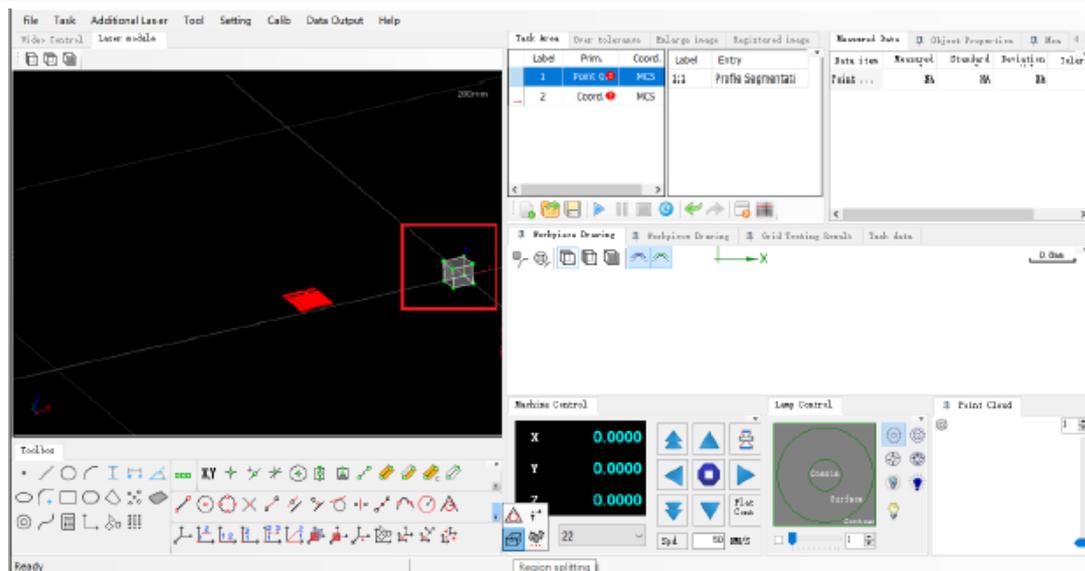


- 1) Please place a rectangular workpiece on the machine;
- 2) Please move the upper left corner of the rectangle to the image vision, and use the mouse to double-click the upper left corner of the rectangle in the image area to move it to the center of the image area;
- 3) Please double-click the upper left corner of the rectangle in the video area of the navigation map and click the **First** button; by this time, the completion of the first point is ensured;
- 4) Please double-click the lower right corner of the rectangle in the video area of the navigation map;
- 5) Please move the lower right corner of the rectangle to the image vision, and use the mouse to double-click the lower right corner of the rectangle in the image area to move it to the center of the image area;
- 6) Please click the **Second** button in the navigation map to complete the calibration.

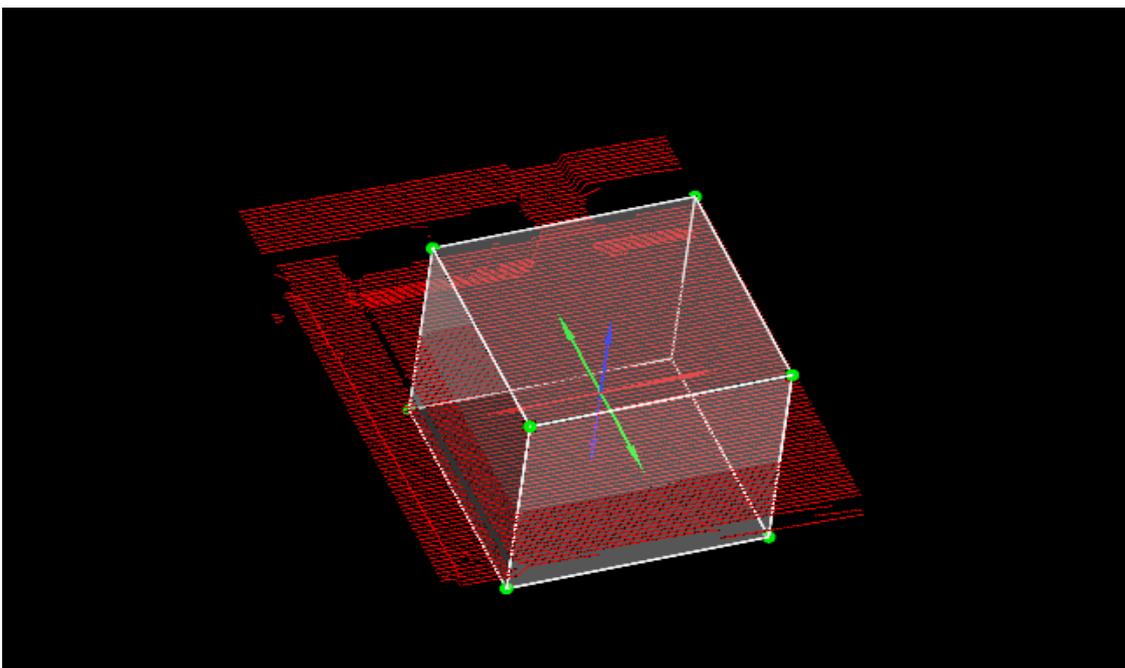
6.6 Line laser

The line laser can collect line and plane data on the hexahedral surface of the workpiece.

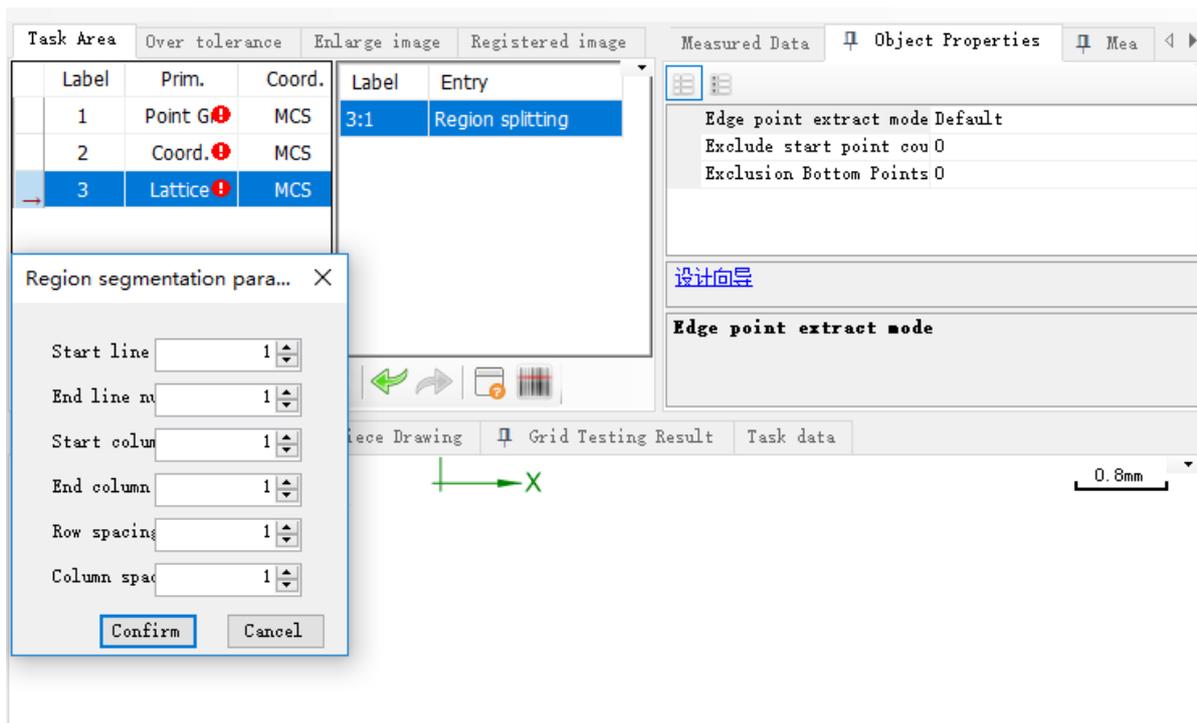
1. First establish a hexahedral primitive



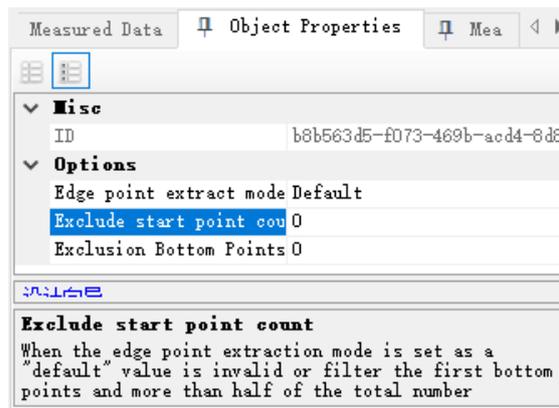
2. Use the mouse to adjust the position of the hexahedron and make it tangent to the lattice primitive. The button in the upper left corner can be used to assist in adjusting the position;



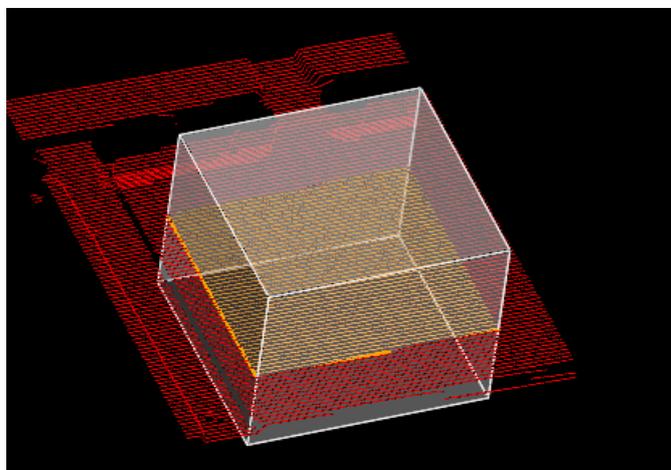
3. Use the region segmentation interception to create a new "lattice primitive" for the target location;

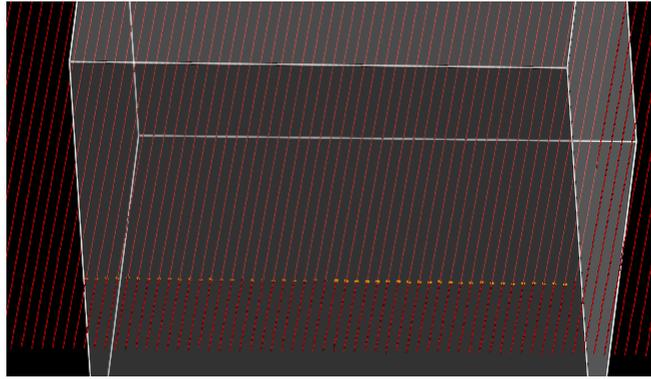


4. Region segmentation attribute description

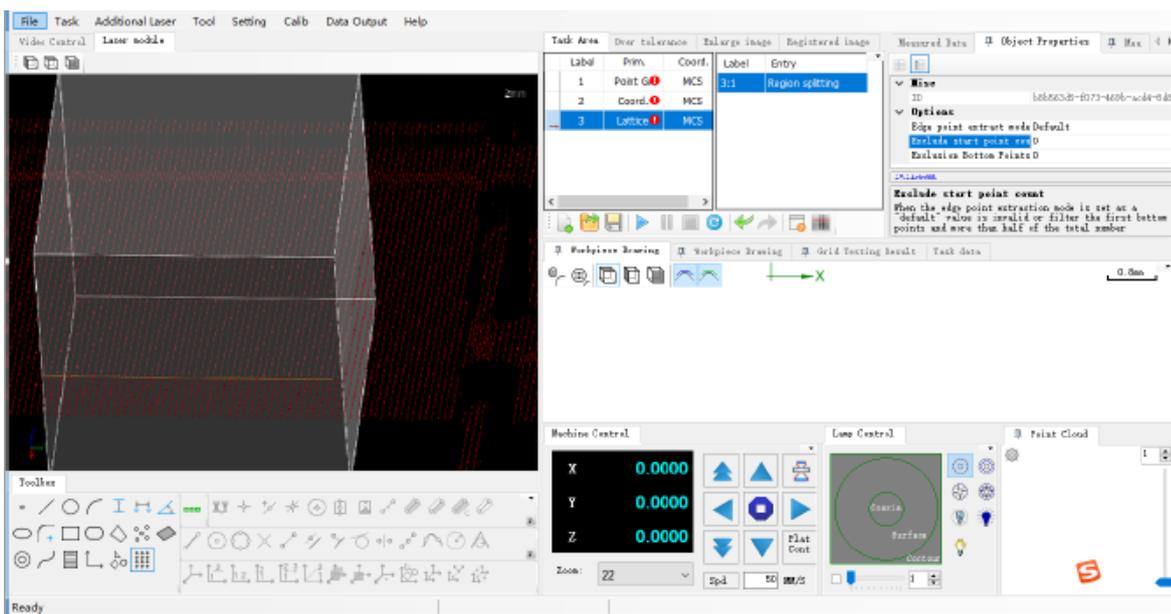
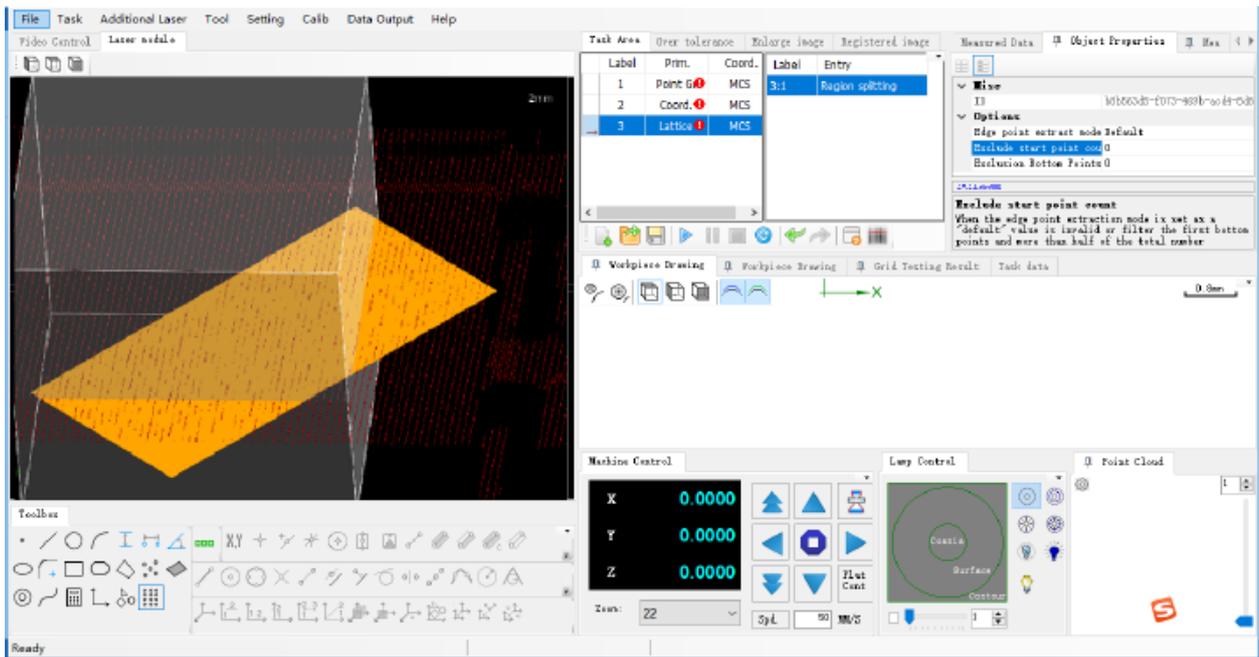


5. Edge point extract mode includes a total of 5 items, defaulting to capture all points in the hexahedron, and in addition, to select a side adjacent to the hexahedron. The effect is as follows:





6. According to the different hexahedron captured, it can be used to fit the "plane" or "line" as follows:



Chapter 7 FAQ

1. Vispec fails to start

- 1) Check whether the operation system is Microsoft® Windows® XP or Microsoft® Windows® 7, and SP2 patch is installed.
- 2) Check whether NetFramework® 2.0 is installed, the software is based on .Net frame
- 3) Check whether the computer is installed with the software running environment.
- 4) Check connection between computer and video measuring machine, and check power.

2. The software couldn't find camera when software operates.

- 1) No camera is installed, pls install the camera.
- 2) The camera has no driver installed, or the driver is damaged, pls reinstall the driver.
- 3) The software version does not match the camera driver, pls install correct driving program
- 4) The camera communication is abnormal. Please check the camera communication IP.

3. Error reported "No dongle is inserted or the current dongle has expired" when software starts

Possible causes as below:

- 1) The machine dog is not inserted.
- 2) Dongle driver not updated.
- 3) The USB expansion port is faulty.

4. No software display

If there is no prompt "CNC communication failure, please check whether THE CNC is on or the communication network is connected" when the software is started, possible reasons are as follows:

- 1) Pls check the network Settings and whether the CNC network communication IP is correct
- 2) The machine is not turned on.

3) CCD fault.

5. Why measured data has big difference to actual size?

- 1) Check the consistency of the measurement unit in the system;
- 2) Check whether the workpiece is fixed well, make sure no movement during the measurement process.
- 3) Check brightness of the light. For outer contour's size, if brightness is too strong, the data will be smaller than normal, or else the data will be bigger than normal .For inner contour's size, it's contrary.

6. Why can not conduct image measurement?

- 1) Check lighting brightness ,not too bright or too dim;
- 2) Confirm image definition.