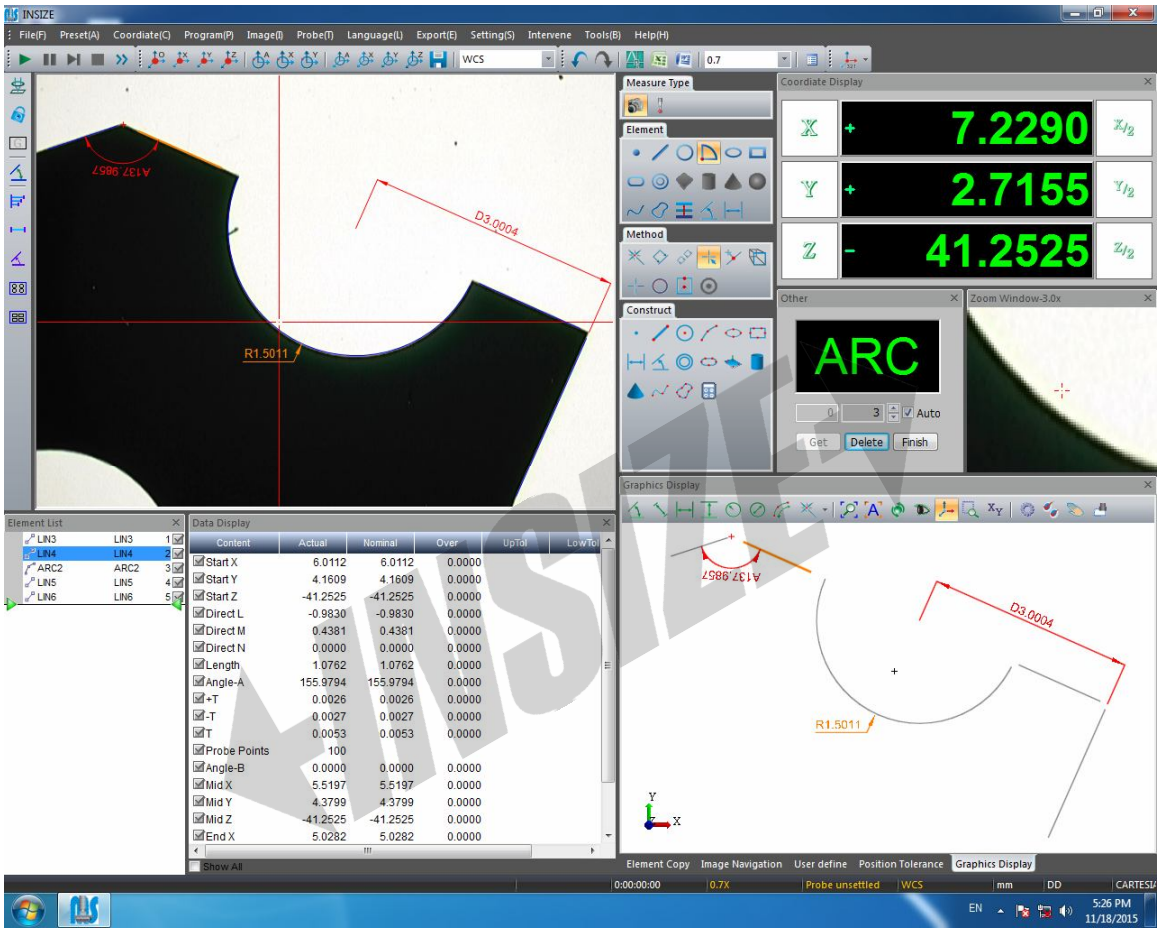
ISD-V150/V250/V300
MEASURING SOFTWARE
OPERATION MANUAL



Version: 2.1.2

Precautions

1. Turn on and turn off Sequence

1) Turn on sequence

(1): Turn on the power of the computer and the monitor

(2): Ensure the travel of X and Y axis is in good order and there is no obstacle to the axes.

(3): The system will appear standard Windows 7 menu.

(4): Turn on the switch of power supply and illumination source.

(5): Press twice 

on the screen, INSIZE v2.1.2 will start.

2) Turn off sequence

(1): Save the measuring file and click the close button on the main menu of the software.

(2): Turn off the power switch and illumination switch.

(3): Click turn off button on the lower left part of Windos 7 system.

(4): Turn off the power of the computer and the monitor.

2. Essential conditons for operation of INSIZE v2.1.2 software

1). Requirements on computer:

Requirements on software: Windows7 32 bits operational system

Requirements on hardware:

Precessor: Intel(R) Celeron(R) CPU G550@2.60GHz
Internal memory: 2.00GB
Video card: 1GB indepent video memory card
Hard disk: 500GB revolution: 7200RPM
Monitor: Wide screen supporting 1440*900 resolution
CD-ROM: For installing software
Mouse: Three button mouse
Keyboard: 104- Standard keyboard
PCI slot: At least two
USB port: At least four
COM port: Subject to specific requirement

2). USB303 interface device supplied by the manufacturer

3). Encryption card supplied by the manufacturer

3. The pixel and the probe must be calibrated prior to measuring

Chapter 1: Summary of INSIZE V2.1.2 software

INSIZE V2.1.2 software, a manual measuring machine software and probe measuring application software. It can not only be used to analyze, process and measure the workpiece in the two- coordinate visually but also be used in three-coordinate measuring when a probe is equipped. This software is widely used in various precision manufacturing industries such as mobile phone, tooling, electronics, telecommunication, machinery, hardware, plastic, instrument, meter, PCB, LCD, etc. Material can be measured involve in metal, plastic, rubber, glass, PCB, ceramic, etc.

1. Geometric elements measuring

Altogether 15 geometric elements can be measured (point, line, plane, circle, arc, ellipse, rectangle, key slot, ring, cylinder, cone, sphere, open curve, closed curve, focal surface), height can be measured as well. Basic geometric elements can be preset.

Features:

(1) Contact measuring—probe measuring or non-contact measuring—video measuring can be selected according to specific requirement.

(2) Multiple measuring methods: intelligent automatic edge detecting, selecting points in a whole object, selecting points from multiple parts, selecting points via mouse, selecting adjacent points, selecting points via cross line, magnifying and selecting points, comparatively selecting points, selecting points via probe.

2. Geometric elements construction

Strong ability to fabricate two-dimension and three-dimension geometric elements,

Features:

(1) Ability to fabricate multiple elements: point, line, circle, arc, ellipse, rectangle, distance, angle, ring, key slot, plane, cylinder, cone and sphere.

(2) Multiple construction methods: extracting, intersecting, perpendicular, paralleling, tangency, mirroring, etc.

3. Coordinate system

It is conveniently to establish coordinate for both the machine and the workpiece. Exchange between different coordinate including exchange between Cartesian coordinate and polar coordinate can be achieved. Coordinate of various workpieces can be saved and used. Both two coordinate and three coordinate can be established.

4. User’s procedure

Unlimited user’s procedure can be recorded, edited, saved and output. INSIZE V2.1.2 user’s procedure can record and edit all the actions by the user,

copy previous measuring, thus improving greatly measuring efficiency.
Simple and plain user's procedure instruction mode can copy instruction procedure. Strong visualized editing function facilitates measuring of workpiece in large batch.
INSIZE V2.1.2 instruction procedure can record user's procedure. The system can automatically record user's procedure of the first time measuring of the workpiece. Recorded procedure can be saved for next use.

5. Auxiliary focusing

Better image quality can be obtained by auxiliary focusing.

6. Graphic function

Perfect graphic processing and display function (zoom, translation, display window, local zoom, and full screen) contribute to vivid and intuitive measuring result and easy operation.

7. Annotation function

Angle, distance, X direction, Y direction, circle (arc) radius, circle (arc) diameter, length of arc can be directly marked in the drawing area and image area.

8. Error compensation

The software possesses systematic error compensation and lens central error compensation as well. So far coordinate positioning systematic error and perpendicularity systematic error can be compensated. In terms of coordinate positioning systematic error compensation, there are linear compensation and section compensation for selection. Lens central compensation means lens off-centre compensation under different magnification.

9. Tolerance

Perfect dimension tolerance computing ability.
Geometric tolerance conforms to national standard, straightness of the line, roundness of the circle and arc can be illustrated.
Position tolerance computing covers position accuracy, degree of parallelism, perpendicularity, skewness, concentricity, coaxiality and degree of symmetry.

10. Report function

Measured data can be output into default Excel, custom Excel, Word, SPC form.

11. Probe management system

Probe management system includes establishment of standard, probe calibration, probe management and probe system management.

12. Sensor synchronization

Sensor synchronization includes synchronization of probe image and, synchronization of shifter and image.

13. Language conversion

The software has three convertible languages, namely, simplified Chinese, traditional Chinese and English.

Chapter 2: System Installation

1. Hardware installation

1) Turn off the computer and unplug the power cord.
2) Uncover the shell of the computer.
3) Put the video card on the PCI slot.
4) Mount the shell of the computer, and connect the computer to the power supply.
5) Insert the encryption card into the USB port of the computer.

2. Software installation

Put the installation disc into the CD-ROM, the disc will operate and below picture will popup (Fig2-1). (This picture can also popup if the disc is opened and "SETUPQIM.exe" is clicked twice.)

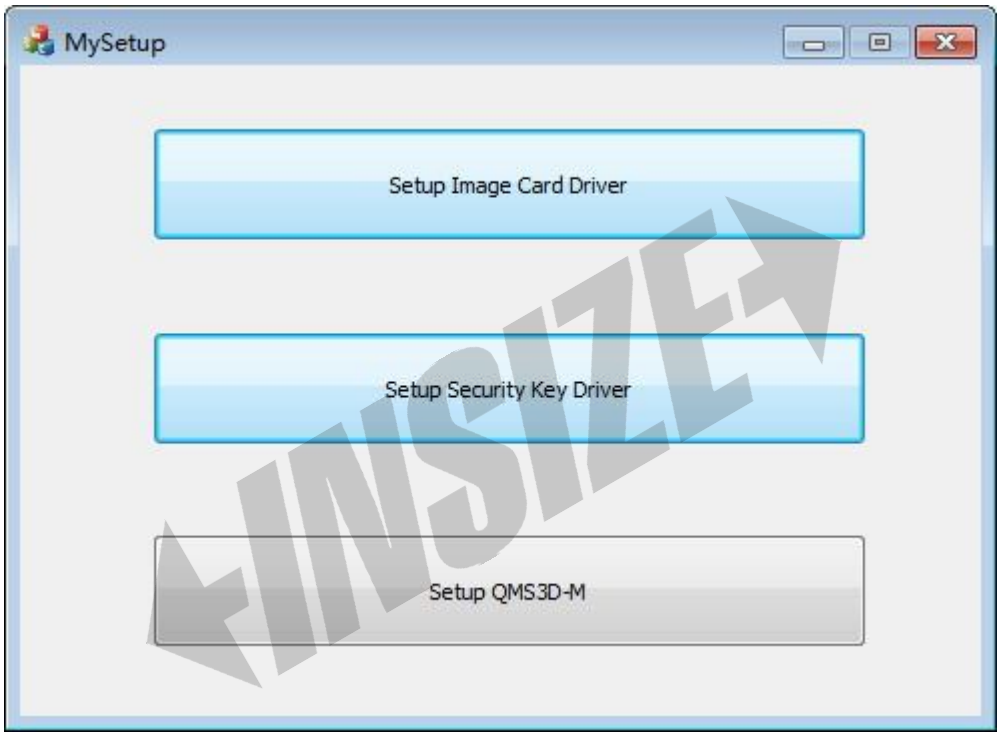


Fig. 2-1

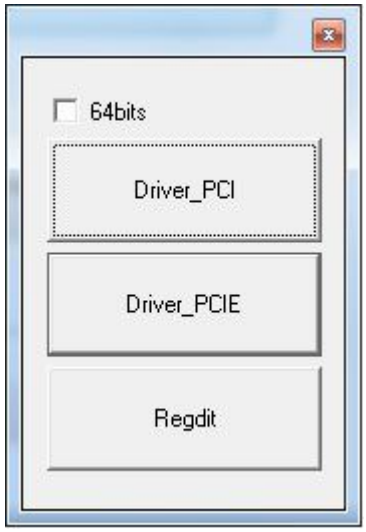
Follow below three steps to install the software:

1. Setup Image Card driver;
2. Setup Security Key (encryption card) driver
3. Setup QMS3D-M.

Below are the detailed installation steps:

Step one: setup image card driver

Click <Setup Image Card driver>, below picture (Fig.2-2) will popup.



Click twice the “Driver_PCIE” button in Fig.2-2, below window will appear:

Fig. 2-3

Click twice Regedit button in Fig.2-2 below window will appear (Fig.2-4). After installation is completed, click Close button.

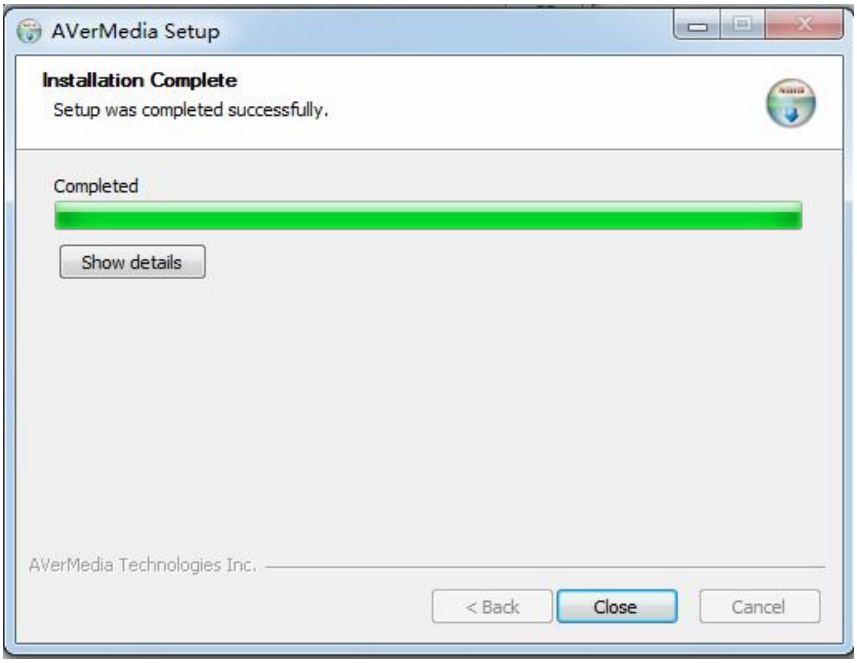


Fig. 2-4

Close the window shown in Fig.2-2.

So far, image card driver has been successfully installed.

Click Device Manger, Fig.2-5 will popup, indicating image card drive installation is completed.

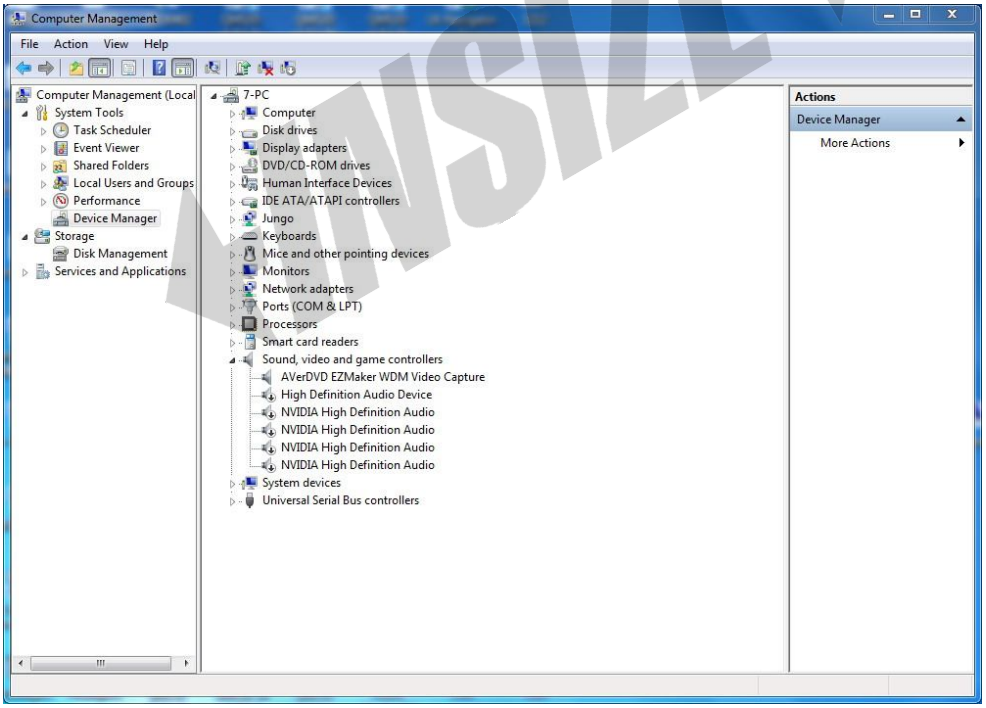


Fig. 2-5

When the image card driver is installed, security Key (encryption card) driver installation can be started.

Step 2: Encryption card driver installation.

Click <Setup Security Key driver>but to setup encryption card, Fig. 2-6 will popup.

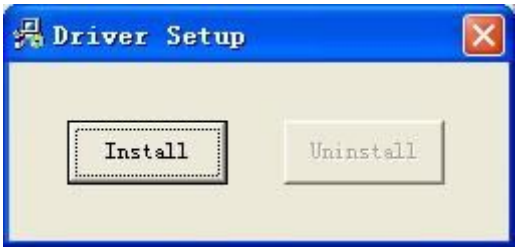


图 2-6

Click <Install> button to install encryption card driver, Fig. 2-7 will popup. Click <continue >。

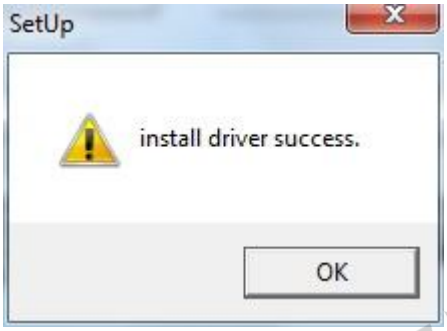


Fig. 2-7

When the encryption card driver is setup, it is time to set up the software.

Step 3: Software installation

Click ＜Setup QMS3D-M＞ button to set up the software, Fig2-8 will appear.

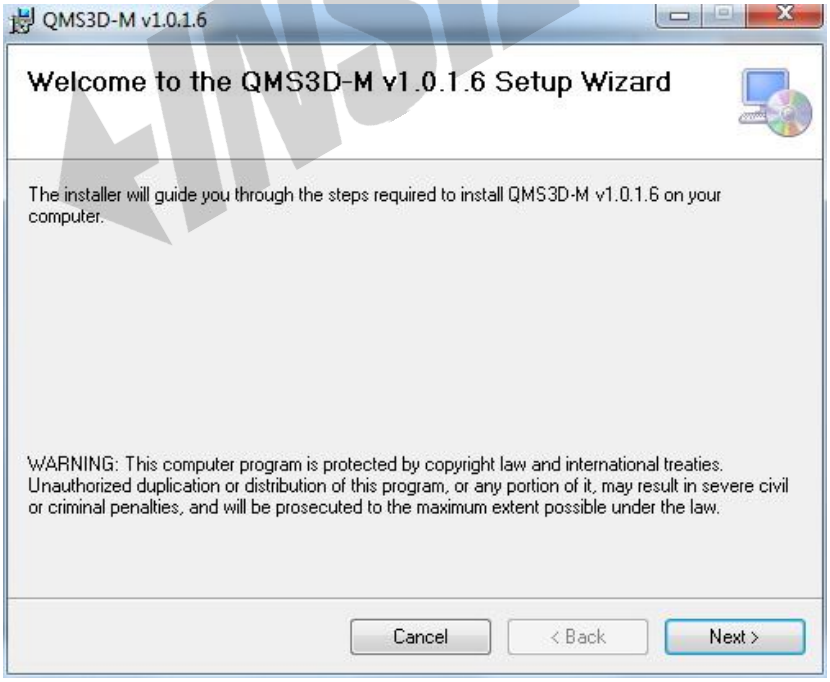


Fig. 2-8

Select <next> to install the software, Fig. 2-9 will appear.

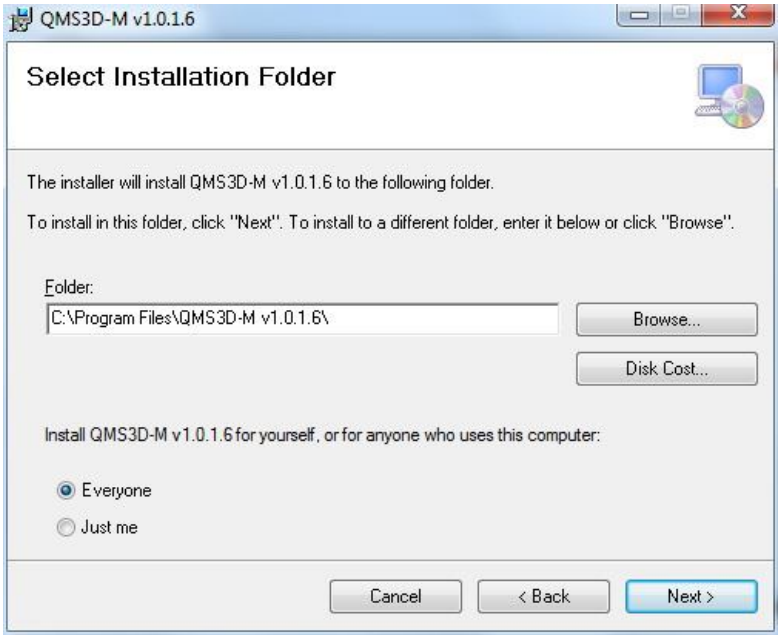


Fig. 2-9

The user can select software installation path and user. If the default installation path is to be used, click "Next" to continue installation. If different installation path is preferred, click Browse and select intended installation path, then click "Next" to continue installation. Fig. 2-10 will appear, click Next to install the software.

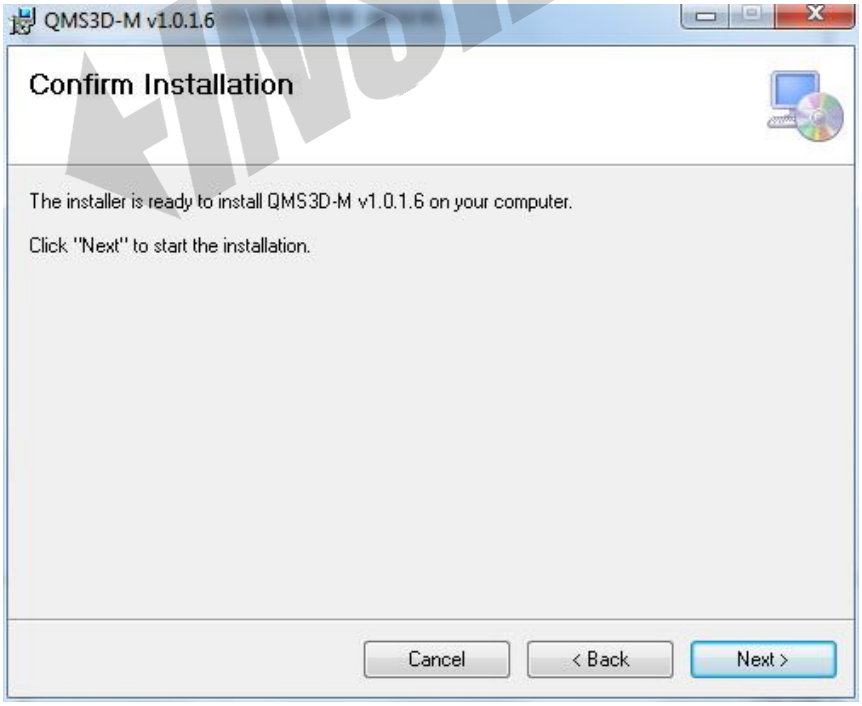


Fig. 2-10

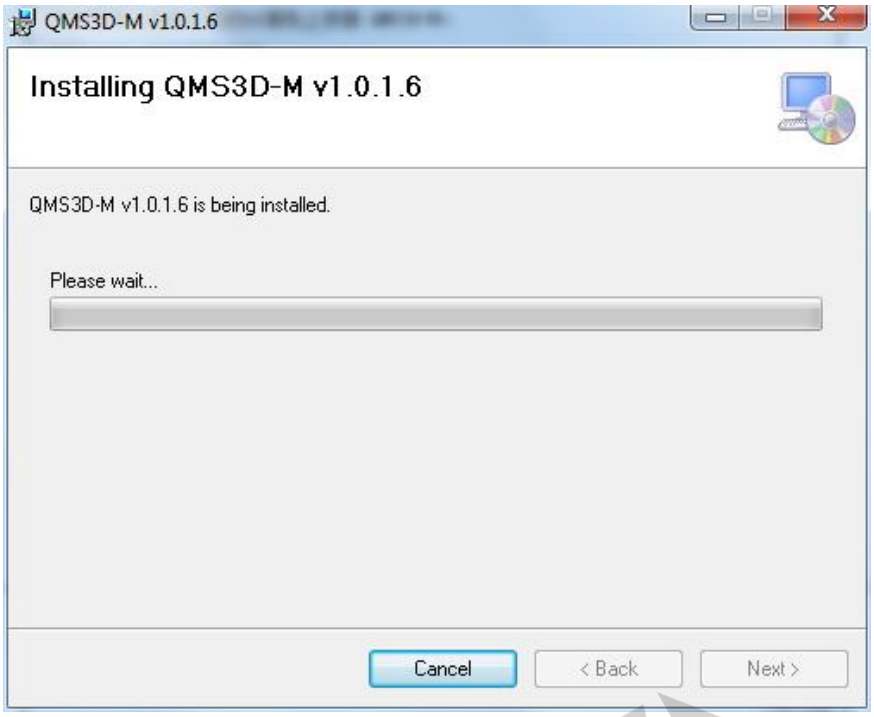


Fig. 2-11

When the software is installed, Fig.2-12 will popup, click Close to complete installation of the software.

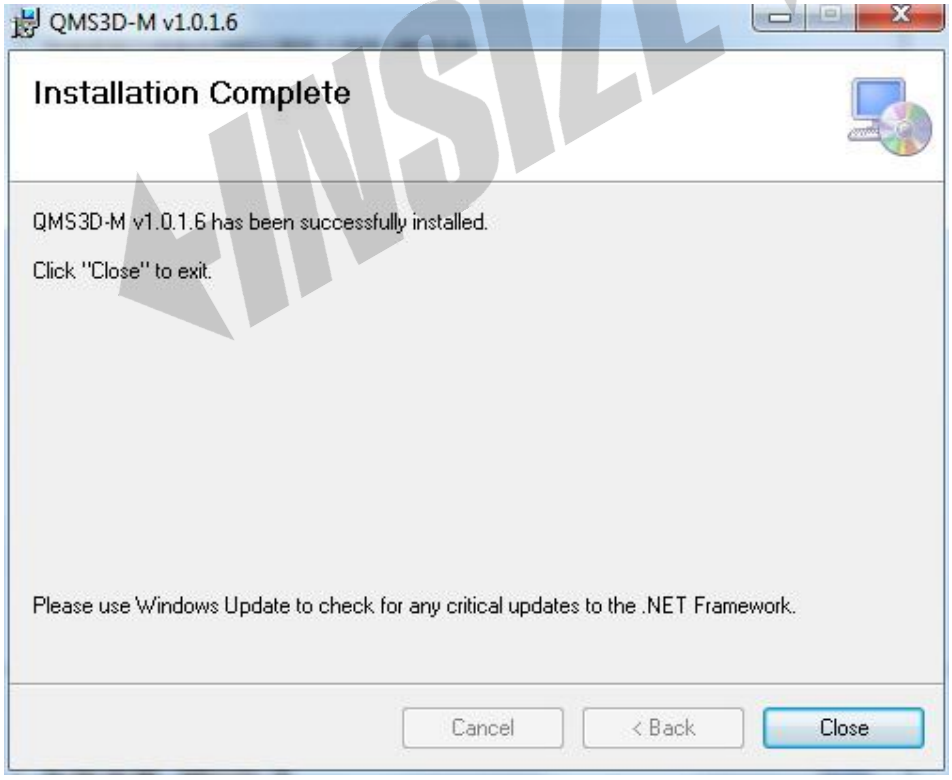


Fig.2-12

Chapter 3: Software Operation Interface Introduction

Main operation interface shows as Fig.3-1.

Annotation Main menu Tool bar Image area Measuring and Construtions
Coordinate window Illumination control area Moving window

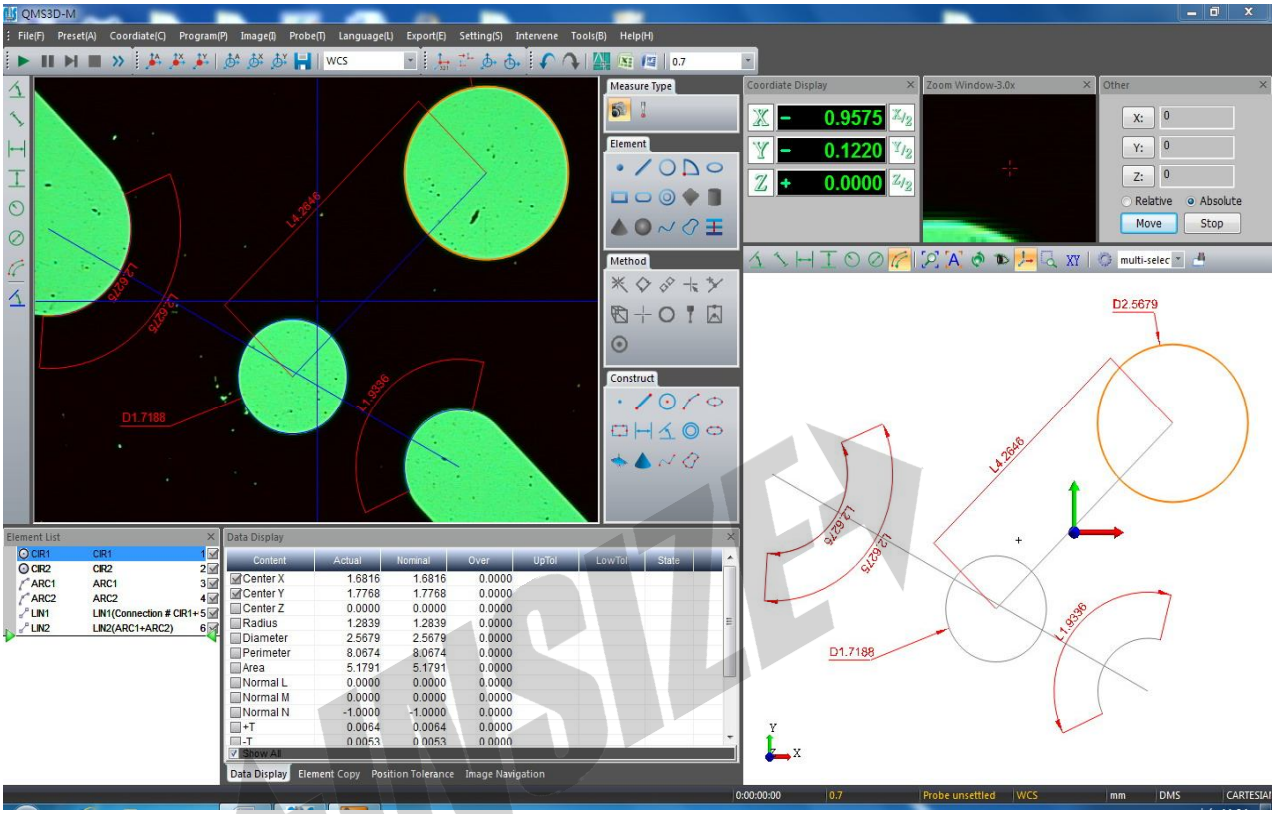


Fig. 3-1

3.1 Coordinate window

Two display methods in coordinate area: Cartesian coordinate system and polar coordinate system.

1. Cartesian coordinate:

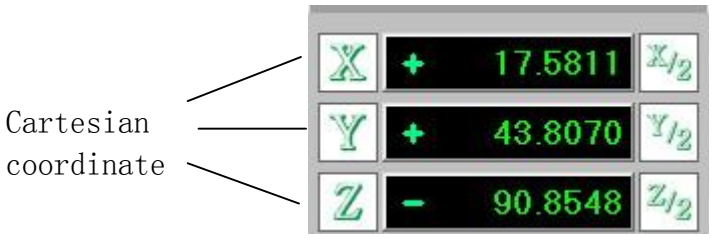


Fig. 3-2

2. Polar coordinate:

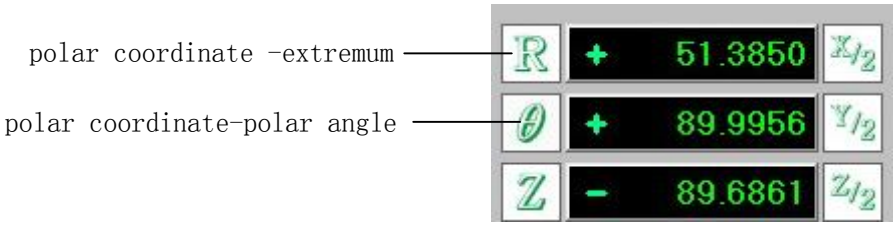


Fig. 3-3

3. Click twice Cartesian coordinate in Status bar, then the coordinate value will convert into polar coordinate value, the Cartesian coordinate will convert into polar coordinate as well.

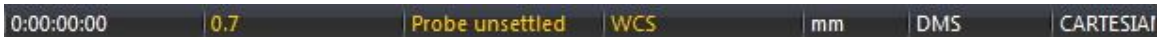


Fig. 3-4

4. Conversion between Cartesian coordinate and polar coordinate can be achieved in two settings: 1. Parameter setup in the main menu—user's parameter setup—basic parameter; 2.Follow procedures in Step 3.

5. Click X/2,Y/2, and Z/2, the coordinate value can be divided equally.

3.2 Measuring tool window

Measuring tool window, which includes camera, probe and laser shifter, covers the sensor used to select workpiece during the process of measuring

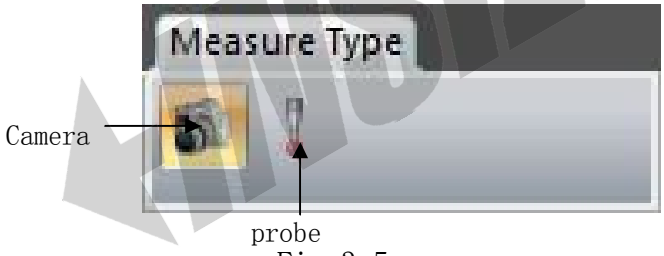


Fig. 3-5

3.3 Measuring method window

Measuring method window covers the order to measure the workpiece.

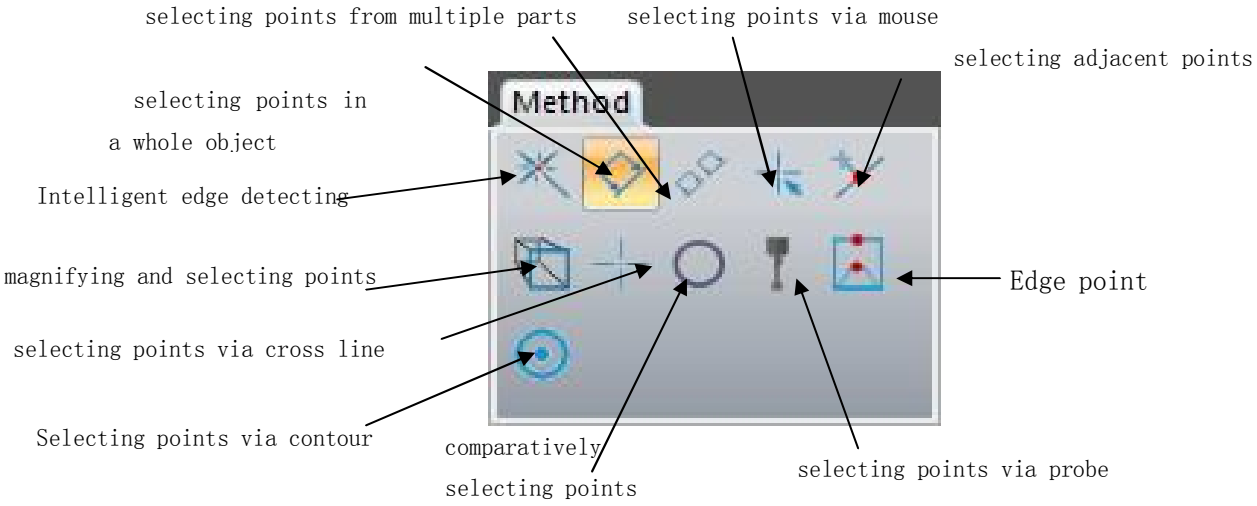


Fig. 3-6

3.4 Measuring element window

Measuring element window shown below covers the order for the user to choose the intended geometrical elements.

Measuring elements are:

Point, line, circle, arc, ellipse, rectangle, key slot, ring, plane, cone, sphere, open curve, close curve and focal surface in sequence in below picture.

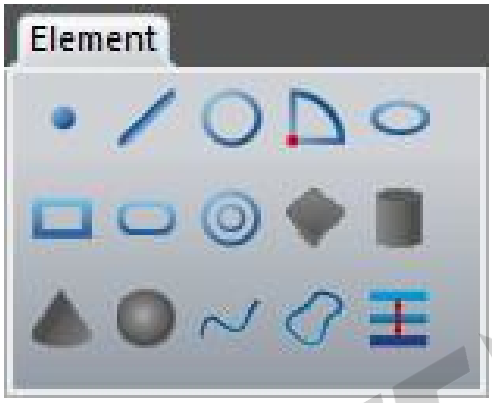


Fig. 3-7

3.5 Element Construction window

Element Construction window covers orders that can use measured element to fabricate middle or transitional elements.

Construction elements shown in below picture in sequence are:

Point, line, circle, arc, ellipse, rectangle, distance, angle, ring, key slot, plane, cylinder, cone and sphere.

Fig. 3-8

3.6 Drawing window

Graphs of measuring elements, which can be operated and marked, are shown in this window. Click once the right key in the mouse, a menu will popup. Main function of this menu is to show different views.

3.7 Annotation window

Orders are shown below：

Fig. 3-9

1.  Angle annotation order. Target the intended angle with the left key in the mouse, then click this key, value of the angle will be marked. (If the angle between two lines are to be measured, press Ctrl button and select the two lines, or click the left key in the mouse to draw a rectangle covering the two lines and click the key, the angle value will be marked.)

2.  Distance order.

Distance between two parallel lines, distance between two ends of a line (length), distance between the center of two elements (point, circle, arc, ellipse, rectangle, groove, and O ring.) can be marked.

3.  X direction order.

4.  Y direction order.

5.  Radius order.

6.  。Diameter order.

7.  Arc order. Target the intended arc with the left key in the mouse, then click it, the length of the arc will be marked.

3.8 Graph operation window

Orders in graph operation window are shown below:

Fig. 3-10

1.  Local zoom order.

2.  Full screen zoom order. When this order is clicked, the entire targeted graph will display in the drawing area.

3.  When this order is clicked, the name of the element will appear in the drawing area.

4.  Rotary order. Target the intended graph with this button, then press the left key in the mouse, the graph will rotate.

5.  Click this order to view selected geometrical elements.

6.  Click this order to show or disappear the coordinate.

7.  Click this button to set up parameter and color.

Remark: click the right key, below menu will appear:

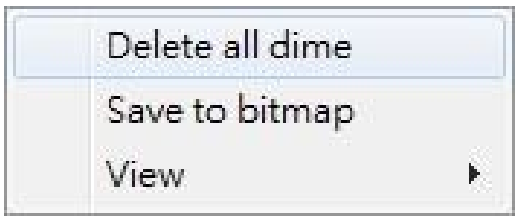


Fig. 3-11

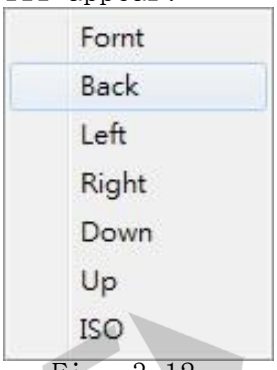


Fig. 3-12

3.9 Procedure instruction window

Fig. 3-13

1.  Procedure on button

When user's procedure is in process, other procedure will be prohibited. The system indicates the status of ongoing procedure. If an element will be re-measured, select the target elements in the list and the measuring elements will be shown in a specific color in the drawing area. After measuring, red alarm will occur for the element out of tolerance.

When user's procedure is on, every element will be selected from the list in sequence. The selected elements will be re-measured, fabricated, preset and set up coordinate. The re-measured value will replace the original one.

When in comparative measuring and magnifying selecting measuring, the target elements should be measured manually. When in edge detecting measuring, breaking point can be applied to change the measuring method.

If there is no element in user's procedure, all butons in this window are prohibited. This button becomes light if an element is being measured

or user’ s procedure is on.

2. Pause button

Stop temporarily user’ s procedure and record the completed process.

3. Continuing button

Start user’ s procedure from the paused process.

4. Stop button

Stop user’ s procedure.

5. Repetition button

Fixed cycle: Preset measuring cycle, user’ s procedure will repeat. When measuring cycle reaches preset cycle,user’ s procedure will stop.

Unlimited cycle: User’ s procedure will repeat until it is stopped manually.

At present, only fixed cycle is available.

3.10 Coordinate window

This window is used to set up coordinate and save it for later use.

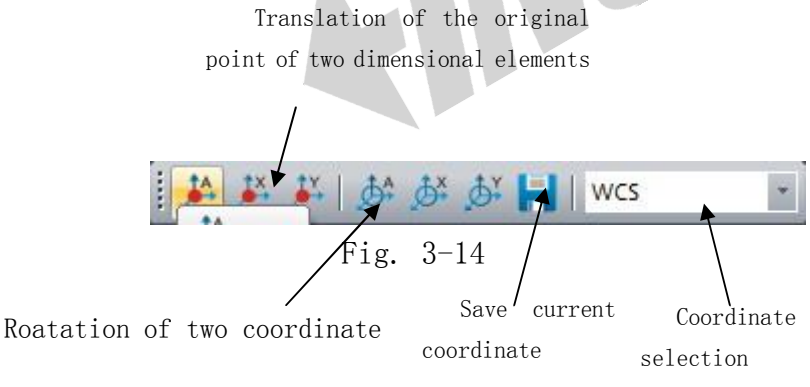


Fig. 3-14

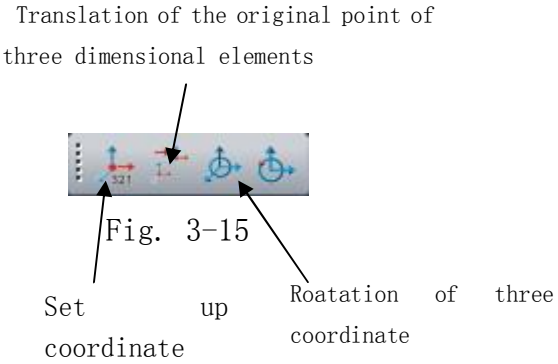


Fig. 3-15

3.11 Other windows

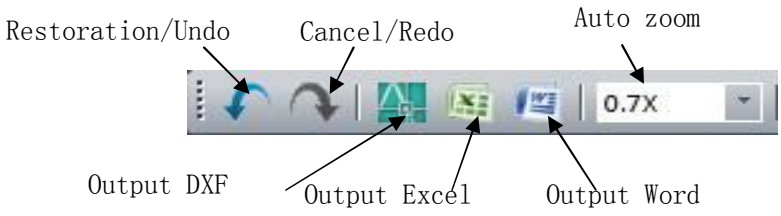


Fig. 3-16

Chapter 4: Element Measuring

Process of element measuring

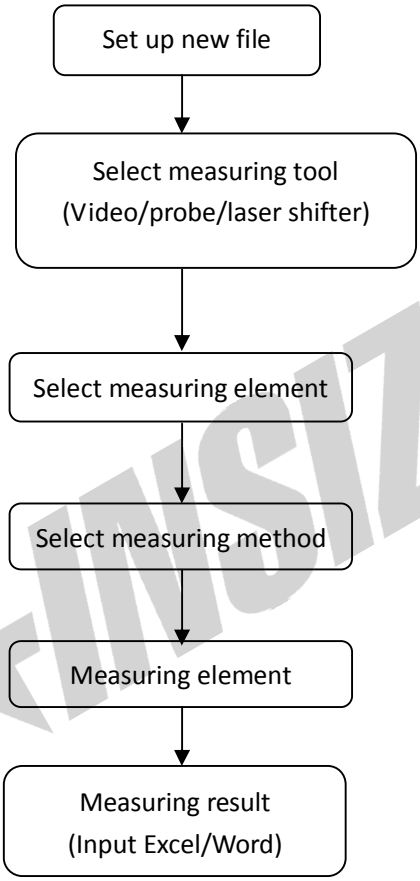


Fig. 4-1

4.1 Image measuring

Image measuring means to get measuring element of an image via camera. Elements of image measuring are: point, line, circle, arc, key slot, rectangle, cylinder, open curve, closed curve and focal surface.
Image measuring method: intelligent automatic edge detecting, selecting points in a whole object, selecting points from multiple parts, selecting points via mouse, selecting adjacent points, selecting points via cross line, magnifying and selecting points, comparatively selecting points, selecting points via probe.

Remark: Ensure pixel has been calibrated before measuring otherwise measured data might be incorrect.

4.1.1 Intelligent automatic edge detecting measuring

Take a circle for instance, below are the procedure of measuring.

1. Select image tool in Tool bar window;
2. Select a circle in measuring element window;
3. Select intelligent edge detecting button in measuring method window;
4. Put the mouse near the circle and click the left key, the intelligent edge detecting button will appear (Fig.4-2).

Fig.4-2

5. Click the left key twice, sampling points and the target circle will show as below:

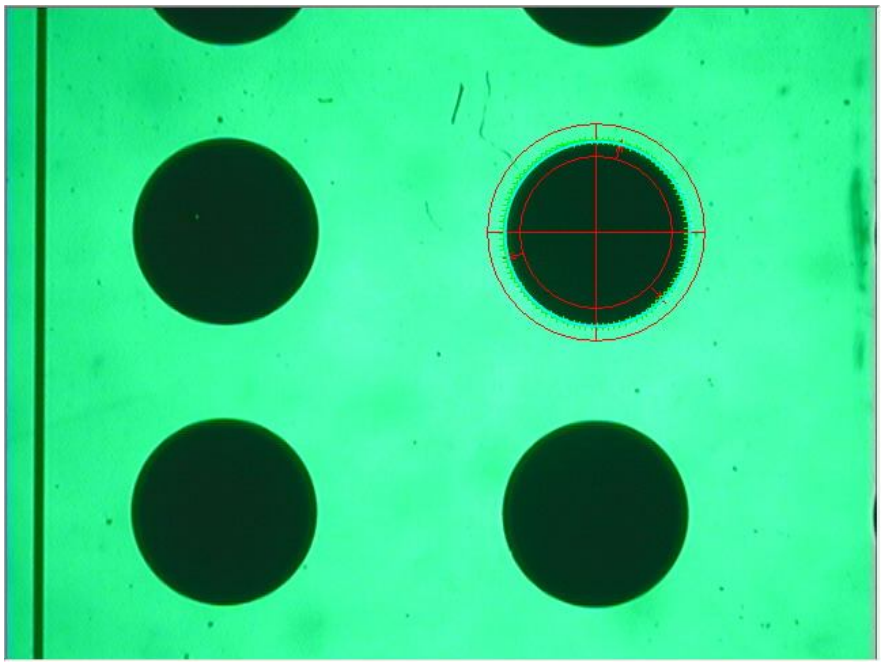


Fig.4-3

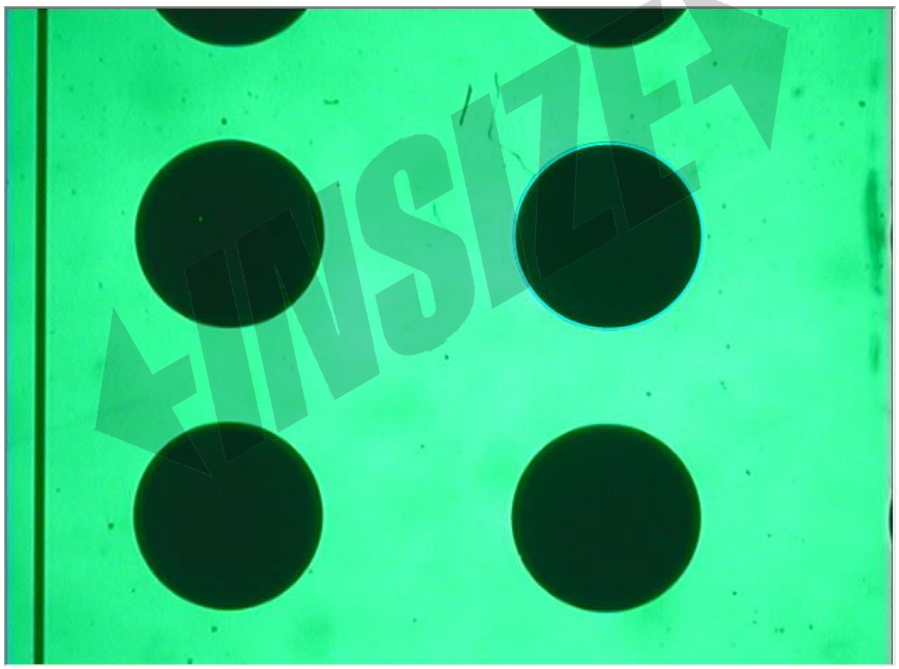


Fig. 4-4

4.1.2 Selecting points in a whole object

1: Measuring a point

Measuring method: Click , press on the left key in the image area, move the mouse and draw a line exceeding the point, then click the left key to determine the length of the arrow, retain the mouse on the arrow and double click the left key or press Enter button on the keyboard, the data of this line and its intersecting point of its edge will be collected and display the measured point in the image area.

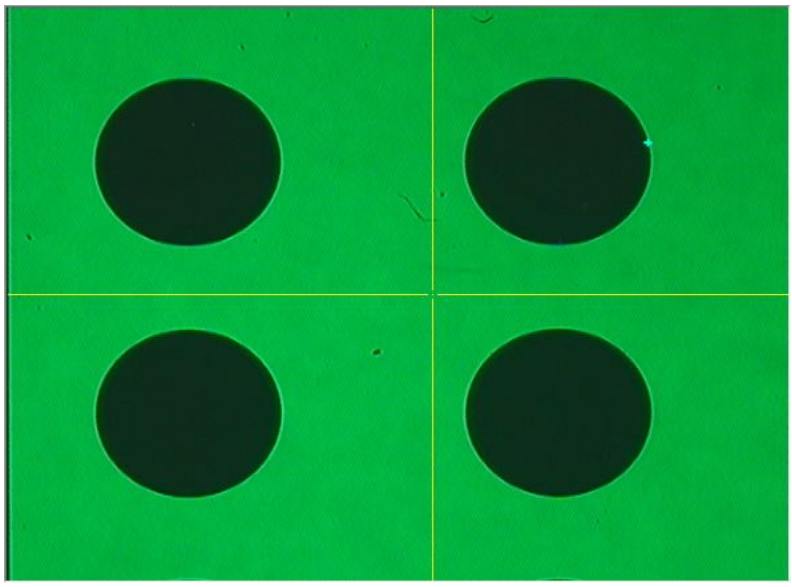


Fig. 4-5

2: Measuring a line

Measuring method: Click , then click the left key near one end of the target line in the measuring area, move the mouse to the other end of the line and a rectangle can be drawn. Click twice the left key or press Enter button and data of the target line can be gotten.

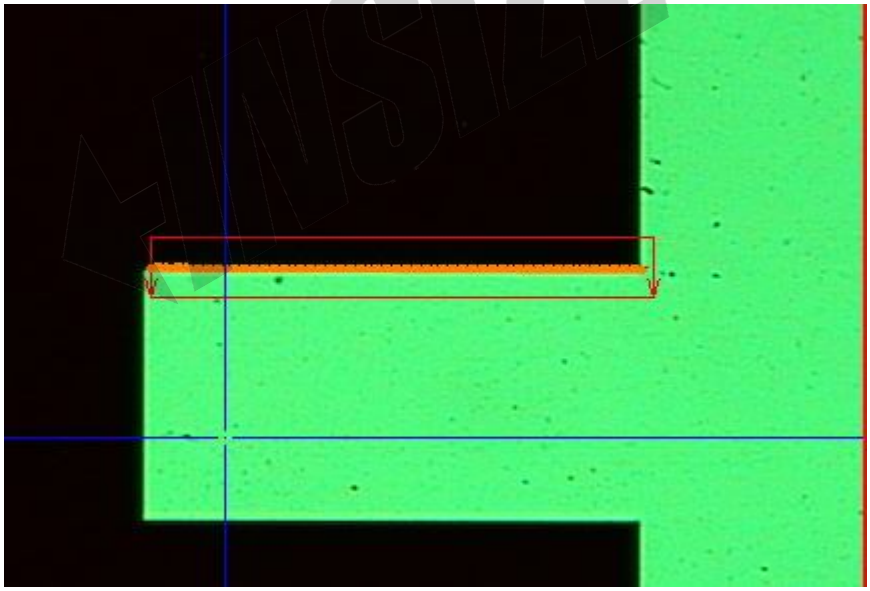


Fig. 4-6

3: Measuring a circle

Measuring method: Click , then click and press on the left key inside the target circle, move the mouse and a circle can be drawn in the image area. Click twice the left key or press Enter button and data of the circle can be gotten.

Remark: The target circle must be fully covered by the drawn circle otherwise the measured data might be incorrect.

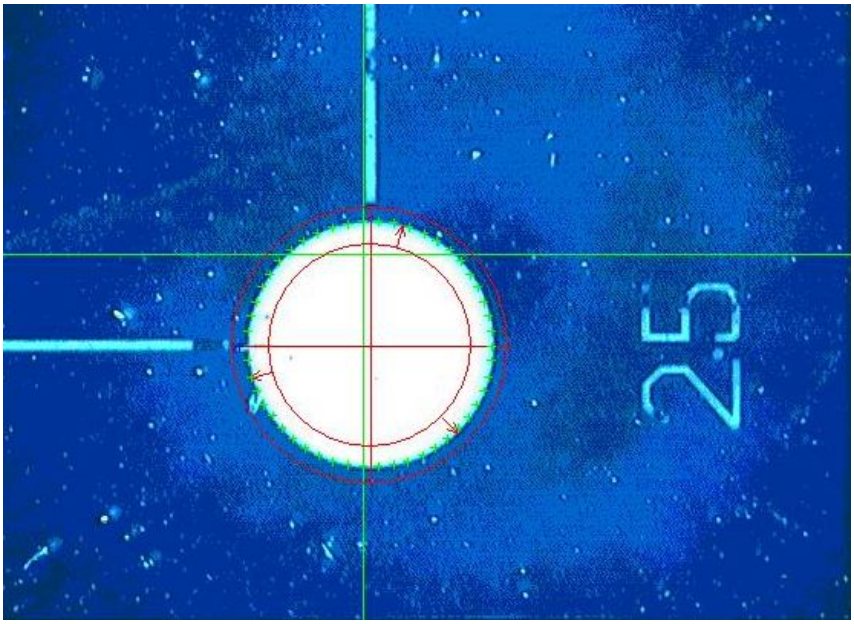


Fig. 4-7

4: Measuring an arc

Measuring method: Click , then click three times on different location of the target arc, a arc edge detecting tool will be generated. Click different places on the tool and press on the left key, move the mouse the radius and angle of the arc can be enlongated, shortened, drawn. Click twice the left key or press Enter button, relevant data of the arc can be gotten.

Remark: The target arc must be fully covered by the tool otherwise measured data might be incorrect.

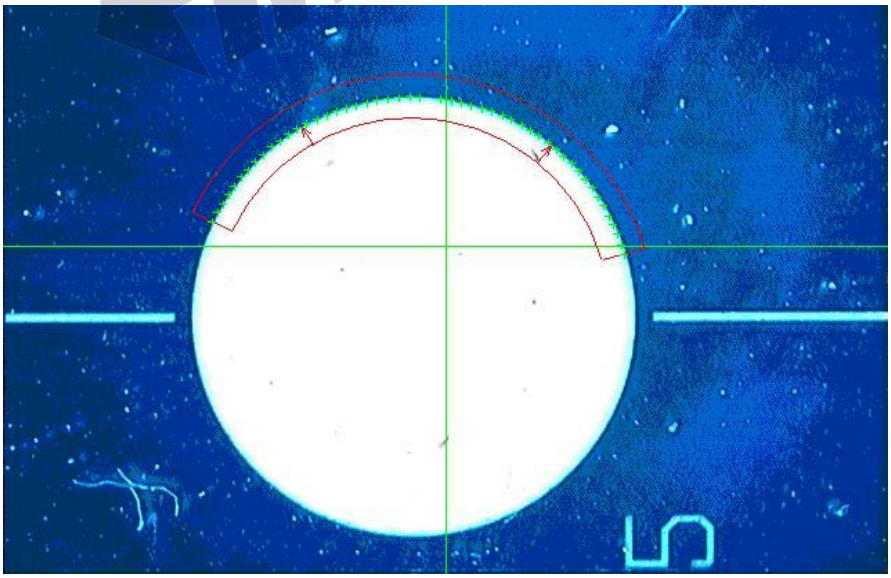


Fig. 4-8

5: Measuring a rectangle

Measuring method: Click , then select a point on one end of any line of

the rectangle and click the left key, move the mouse to the other end of this line and select a point, then move the mouse to its parallel line and click the left key to select any point, a rectangle can be drawn.
Remark: The target rectangle must be covered by the drawn rectangle otherwise the measured data might be incorrect.

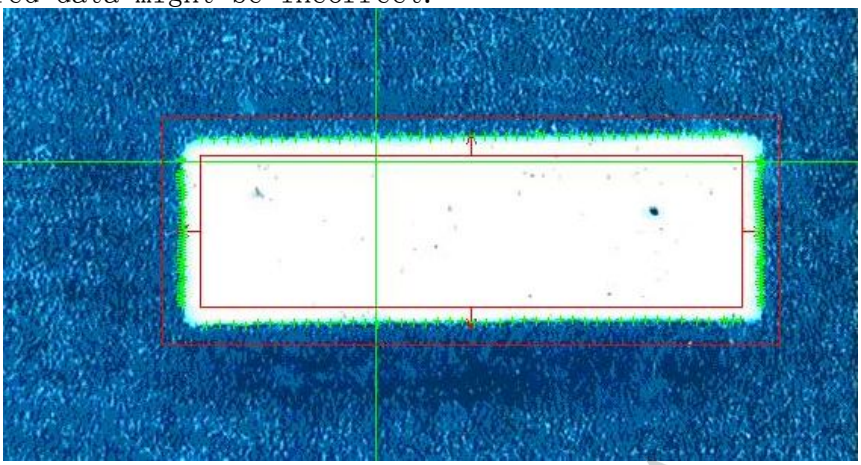


Fig. 4-9

6: Measuring a circle
Measuring method: Click , then press the left key in the image area, move the mouse and three concentric circles can be drawn. Ensure the three circles cover the target circle. Click twice the left key or press Enter key and data of the target circle can be obtained.

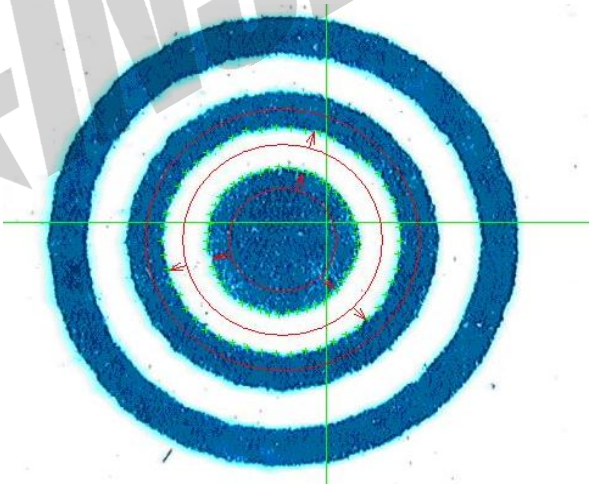


Fig. 4-10

7: Measuring a key slot

Measuring method: Click , select three point on the edge of the arc by clicking the left key, move the mouse and key slot edge detecting tool will appear. When the target key slot is fully covered, double click the left key or press Enter button and data of the key slot can be obtained.

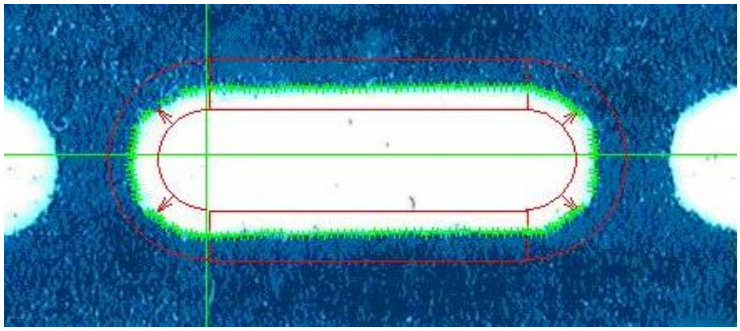


Fig. 4-11

8: Measuring ellipse

Measuring method: Click , then click respectively both ends of the ellipse, ellipse edge detecting tool will appear. Move the mouse and click the left key when the ellipse is fully covered. Double click the left key or press Enter button and data of the ellipse can be obtained.

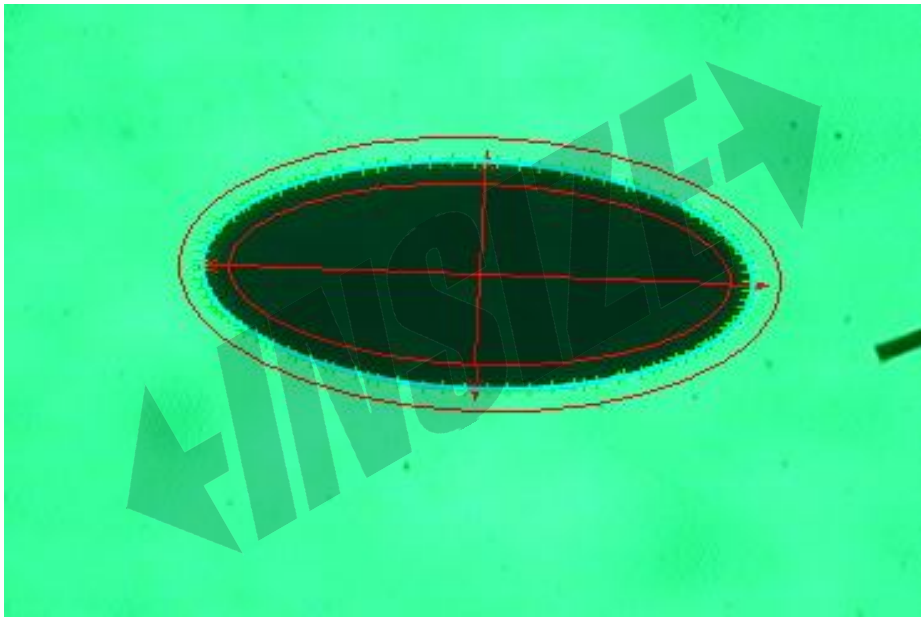


Fig. 4-12

9: Measuring focal surface

Focal surface measuring is to measure the Z axis location of the target focal surface, to auto-focus the target surface and read the coordinate value of Z axis.

Measuring method: Click , then draw a rectangle in the image area, double click the left key in the rectangle, the software will search the focal surface automatically.

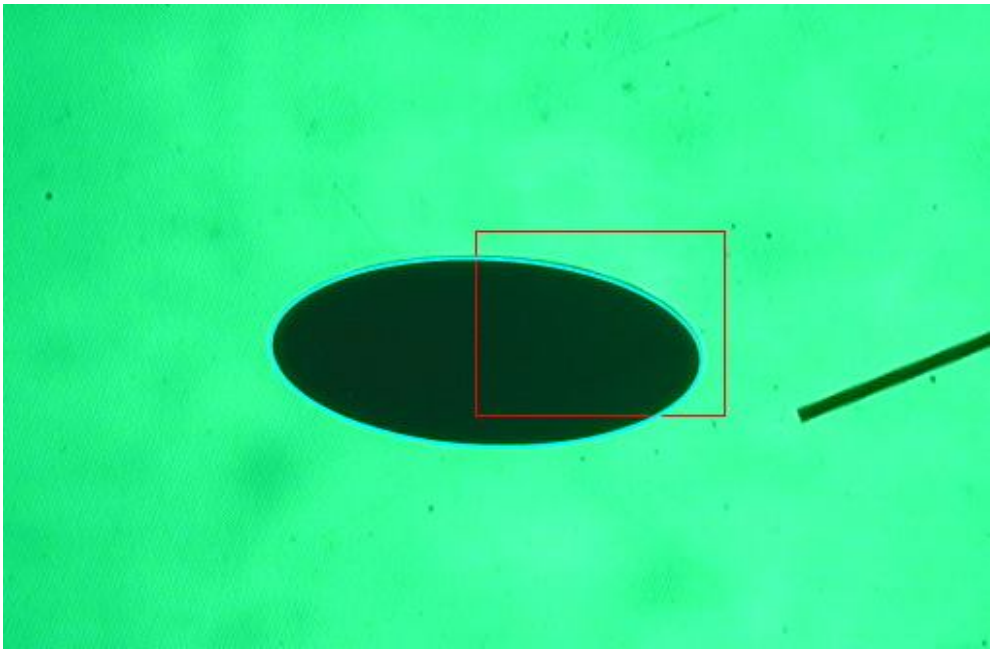


Fig. 4-13

4.1.3 Selecting points from multiple parts

This measuring method is suitable for long line, big circle, big arc and big ellipse.

1. Measuring a long line

Long line edge detecting tool is suitable for long lines which can not fully display in the measuring area. Long line edge detecting tool can divide a long line into several sections.

Measuring method: Divide the target line into to several sections, ensure each section can be fully displayed in the image area. Long line edge detecting tool can find edge of every section of the long line. The operational method is similar to that of line edge decting except the right key is used to click “Fitting” order to complete the edge detecting of the long line.

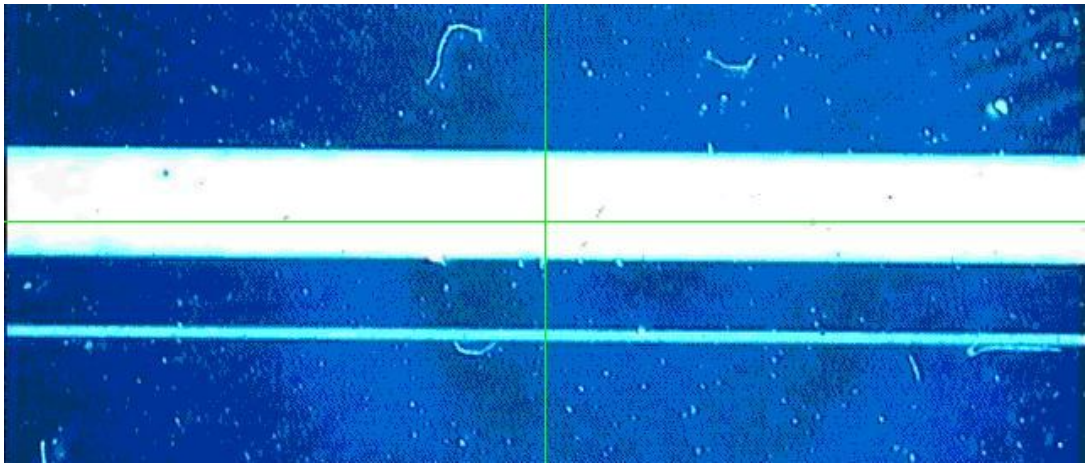


Fig. 4-14

Divide a long line into three sections.

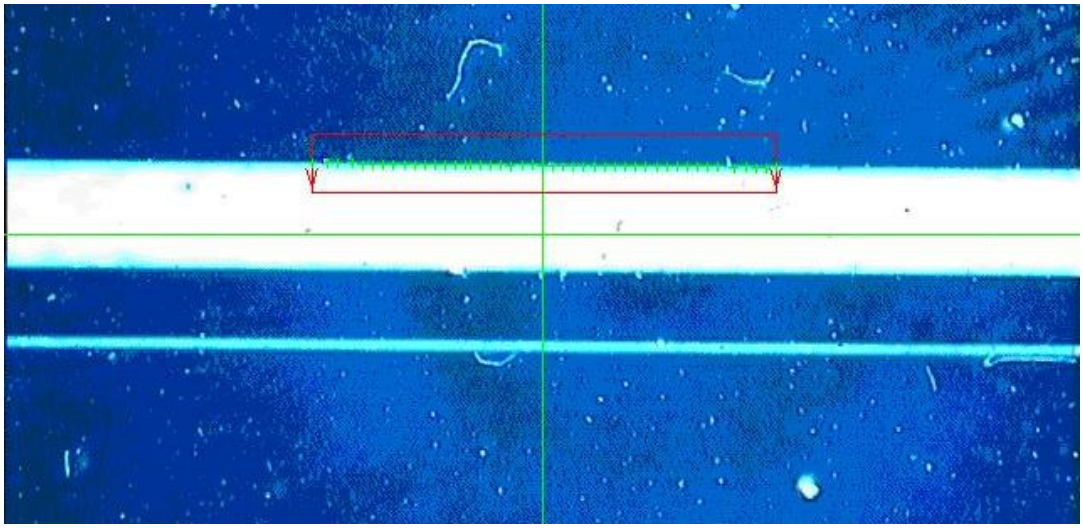


Fig. 4-15

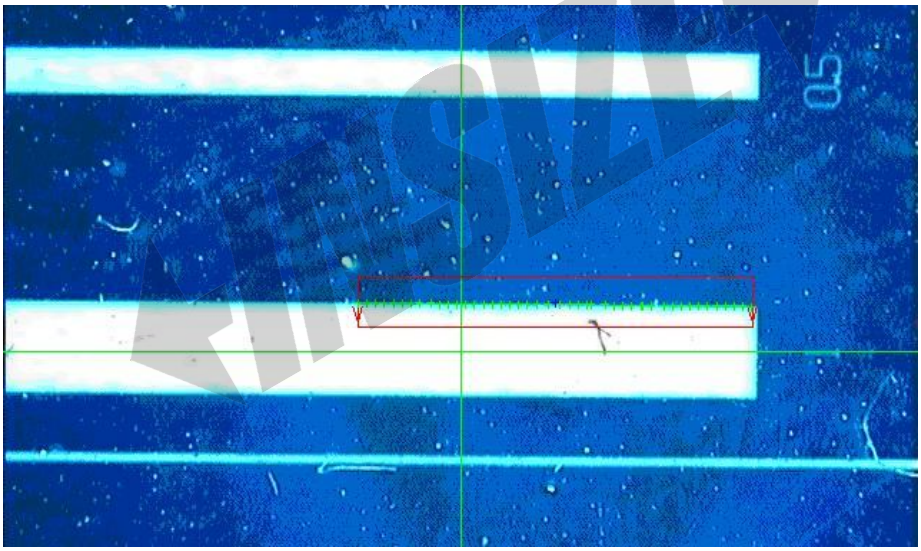


Fig. 4-16

2. Measuring a big circle

Big circle tool is suitable for a big circle that cannot display in the image area. Big cirle edge detecting tool use the arc edge detecting tool to divide a big circle into different sections and detect the edge of the sections. Measuring method: Divide the target circle into several sections, make sure each section can fully display in the image area. Big circle edge detecting tool can detect the edge of every section. The operational method is similar

to that of the arc edge detecting except the right key is used to seclect “ Fitting” order to complete the edge detecting of the big circle.

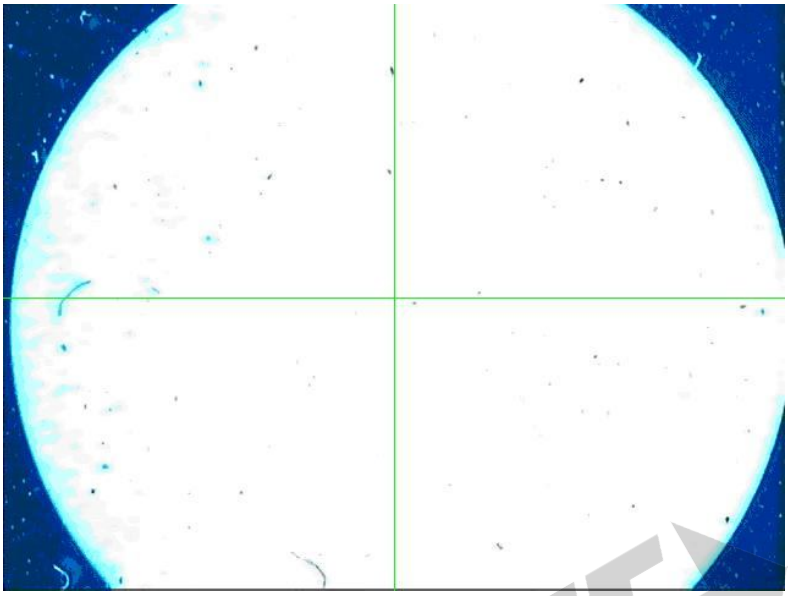


Fig. 4-17

Divide the big circle into three sections.

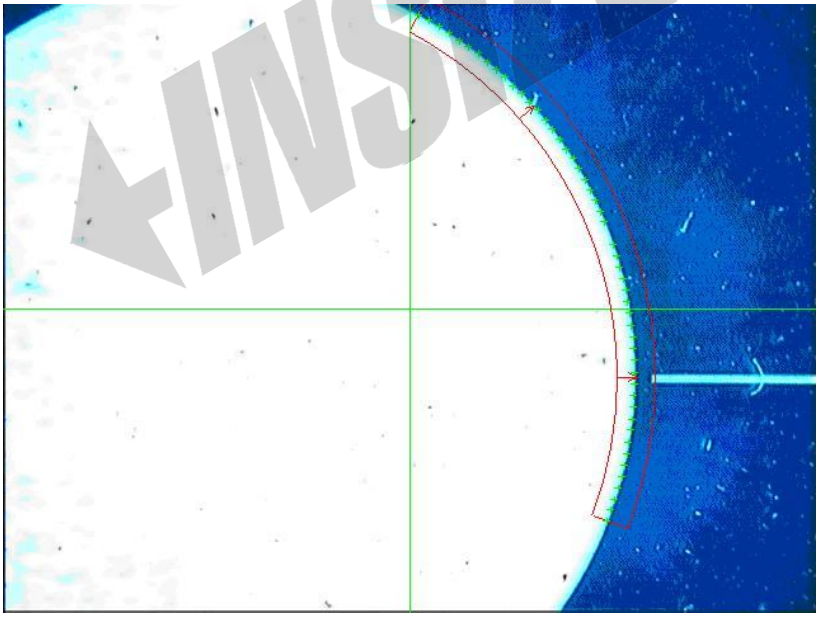


Fig. 4-18

3. Measuring big arc

Big arc edge detecting tool is suitable for a big arc that cannot fully display in the image area.

Measuring method: Divide the target big arc into several sections, make sure every section can fully display in the image area. Big arc edge detecting tool can dectect the edge of every section. Operational method is similar

to that of the arc edge detecting except the the right key is used to select “Fitting” order to complete edge detecting of the big arc.

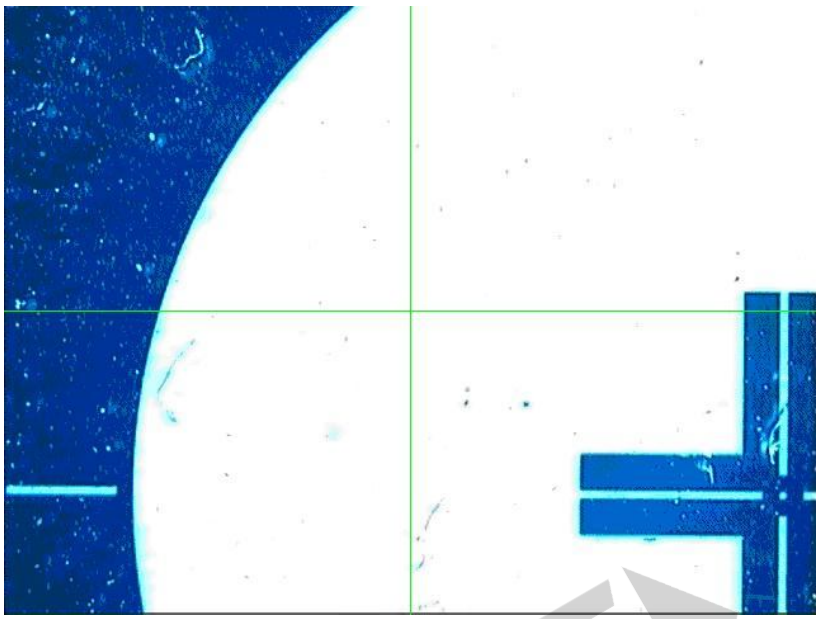


Fig. 4-19

Divide a big arc into three sections.

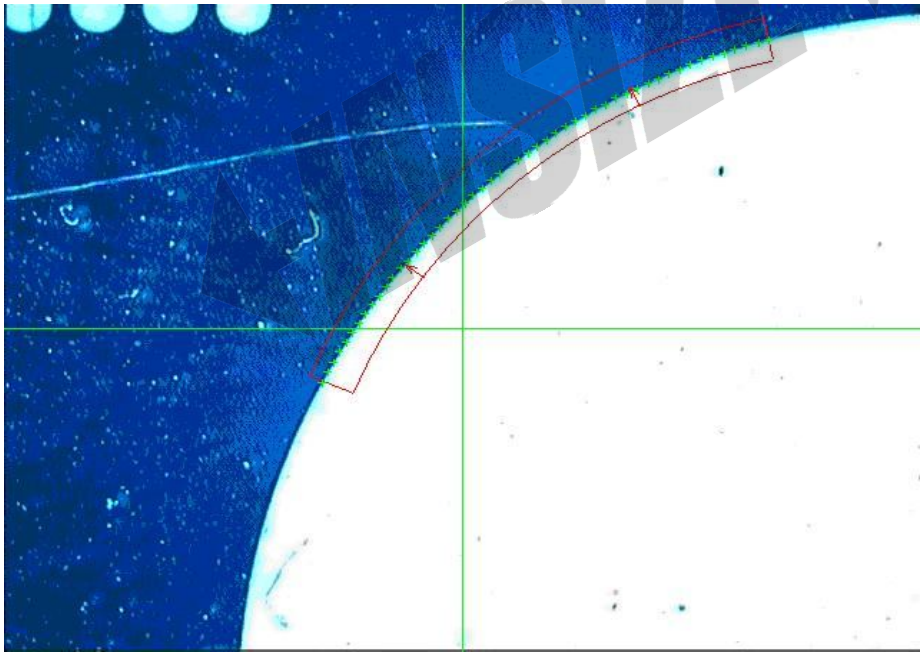


Fig. 4-20

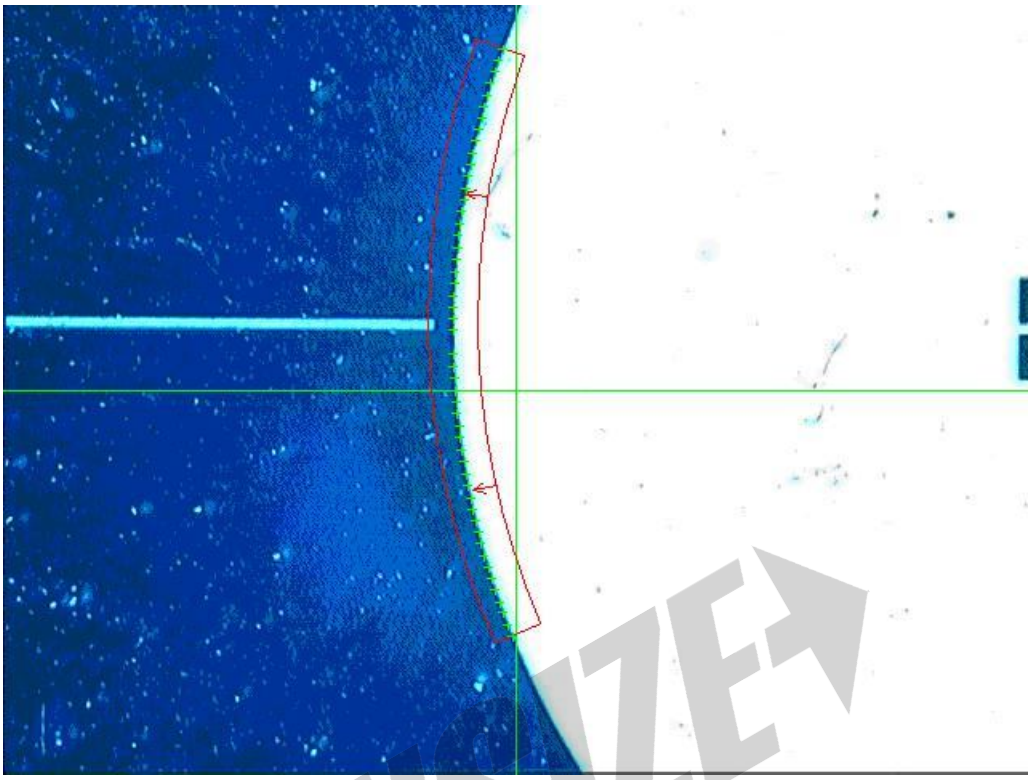


Fig. 4-21

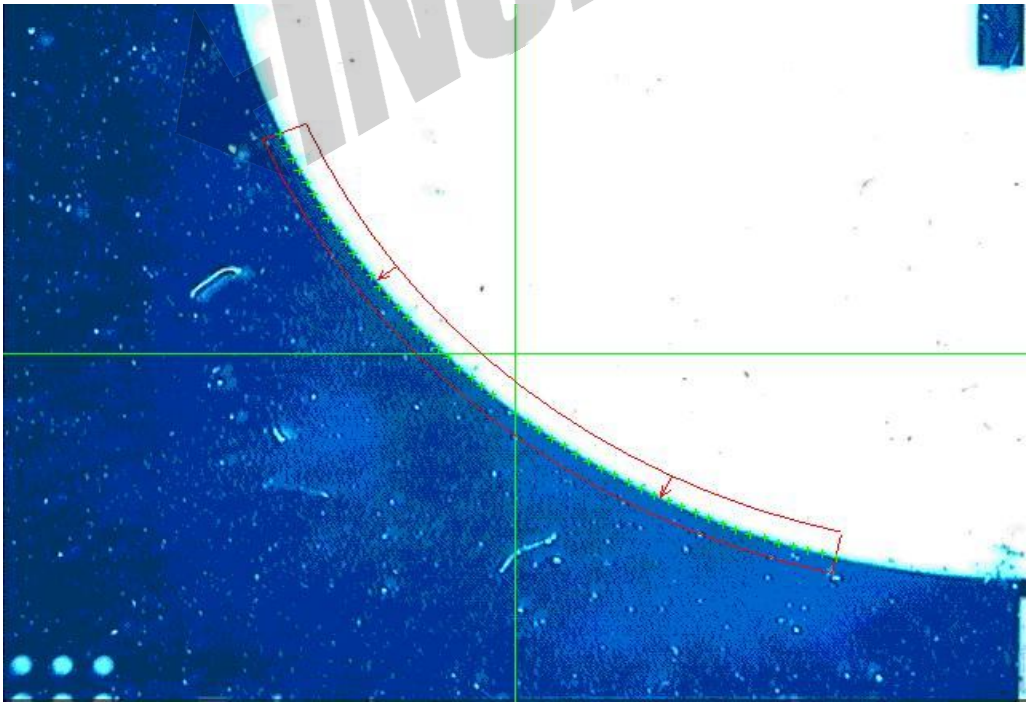


Fig. 4-22

4.1.4 Selecting points via mouse

This method is suitable for indistinct image or image of low resolution.

Take a line for instance:

Step 1: Select image tool in tool bar window;

Step 2: Select the “Line” order in measuring element window;

Step 3: Select “selecting points via mouse” order in measuring method window;

Step 4: Below window will popup.

Fig.4-23

Move the mouse on the target line, click the left key to measure a point, move the mouse to another position and click the left key. When the number of the selected points equal that of the preset points, the target line will be fitted and displayed in the measuring area.The target line can also be measured by clicking the Fitting button after two points have been selected.

Remark:Click“▲”to increase measuring points,click “▼”to reduce measuring points, click Delete button to cancel selected points.When the number of seected points equals that of the preset number, the measuring is completed. Or when selected points reach the minimum required points, click “Fitting” button, the measuring can be completed as well.

4.1.5 Selecting points via cross line

This method is suitable for point, line, circle, arc, ellipse, rectangle, key slot, ring, open curve, closed curve, images with many burrs.

Take a line for instance.

1. Select “image” tool in tool bar window;
2. Select “line” order in measuring element window;
3. Select “cross line” order in measuring method window;
4. Below window will popup.

Fig. 4-24

Move the cross line on the target line, click the left key to measure a point, move the cross line to another position and click the left key. When the number of the selected points equal that of the preset points, the target line will be fitted and displayed in the measuring area

Remark:Click“▲”to increase measuring points,click “▼”to reduce measuring points, click Delete button to cancel selected points.When the number of seected points equals that of the preset number, the measuring is completed. Or when selected points reach the minimum required points, click “Fitting” button, the measuring can be completed as well.

4.1.6 Magnifying and selecting points

If an image with indistinct edge, which causes difficulty in detecting edge and results in big deviation, selecting points manually can improve measuring precision. But if the image is not enlarged, the deviation in measuring will be out of tolerance.Therefore, it is necessary to magnify the image.

This method is suitable for point, line, circle, arc, ellipse, rectangle, key slot, ring, open curve, closed curve.

Below steps are to be followed in operation:

1. Select the target element in the tool bar window;
2. Select “magnifying” order in the measuring method windw, a red rectangle (Fig. 4-28) will apprear in the image area,a sub-window will popup within the red rectangle at the same time (called magnified window shown as Fig.4-29).The target element will be enlarged three times in a full sreen.

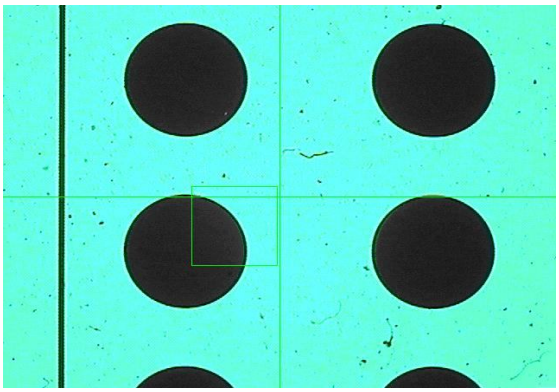


Fig. 4-25

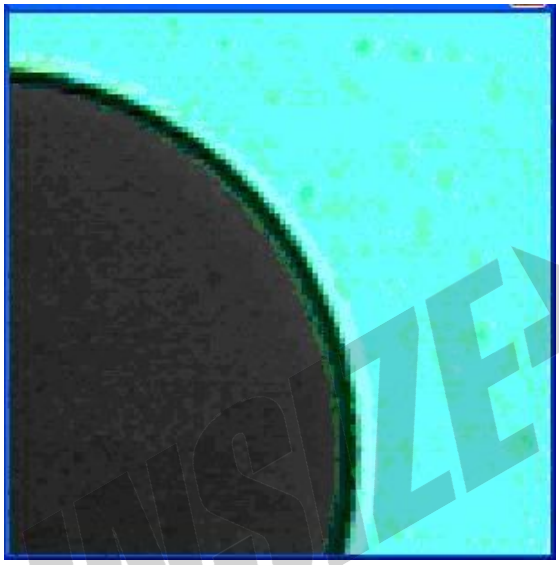


Fig. 4-26

3. Move the mouse within the red rectangle, press on the left key and move it, then release left key when the size of the rectangle is ideal.
4. When the magnifying area is determined, click the left key in the magnified window to select points which are to be used in fitting element.
5. The size or the location of the magnifying area can be changed according to specific requirement. Repeat step 3 and 4 until all the necessary points are selected.

Click the left key in the “cross line magnifying window,” then press the Ctrl key and roll the middle key in the mouse, the magnification of the “cross line magnifying window” can be varied in size.

When the selected points reach the preset points, the measuring is completed. Or when the minimum points are selected, press “fitting” button, the measuring can be completed as well.

4.1.7 Comparatively selecting points

Comparative selecting points measuring is suitable for line, circle, arc. Measuring method: Select “comparative selecting” order in the measuring method window,if the “status bar”indicates it is on, then the target element can be measured in the image area. Operation method is the same as edge detecting of line, circle and arc.

Comparatively measuring a line: Click the left key on both ends of the target line, a line will be generated, press Enter button or double click the left key to complete the measuring. The generated line the target line.

Comparatively measuring a circle: Click the left key on the target circle and select three points which will form a circle, press Enter key or double click the left key to complete the measuring. The generated circle is the target circle.

Comparatively measuring an arc: Click the left key on both ends of the target arc and any other point in the arc, the three points will form an arc, press “Enter” button or double click the left key to complete the measuring. The generated arc is the target arc.

4.1.8 Selecting adjacent points

Selecting neighboring points is suitable for point, line, circle, arc, rectangle, ellipse, key slot, ring, open curve, and closed curve.

Take a line for instance:

1. Select “image tool” in tool bar window;
2. Select “line” order in measuring element window;
3. Select “adjacent selecting points” order in measuring method window;
4. Below wind will popup.

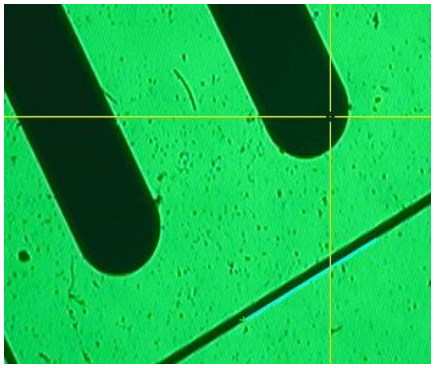


Fig. 4-27

Fig. 4-28

Move the mouse on the target line, click the left key to measure a point, move the mouse to another position and click the left key. When the number of the selected points equal that of the preset points, the target line will be fitted and displayed in the measuring area

Remark:Click“▲”to increase measuring points,click “▼”to reduce measuring points, click Delete button to cancel selected points.When the number of seected points equals that of the preset number, the measuring is completed. Or when selected points reach the minimum required points, click “Fitting” button, the measuring can be completed as well.

4.1.9 Measuring edge points

This measuring is suitable for point, line, circle, arc, ellipse, rectangle, key slot, open curve, closed curve.

Take a closed curve for instance.

1. Select “image tool” in tool bar window;
2. Select “closed curve” order in measuring element window;
3. Select “edge points” order in measuring method window;
4. Select edge points in the image area with “edge detecting tool” as shown in below picture.

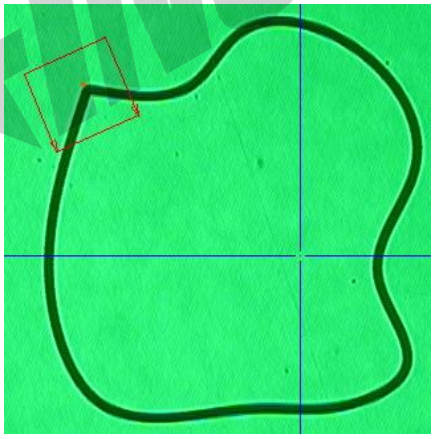


Fig.4-31

4.1.10 Contour measuring

This method is suitable for measuring circles, esp.small circle.

Take a closed curve for instance.

1. Select “image tool” in tool bar window;
2. Select “circle” order in measuring element window;
3. Select “contour” order in measuring method window;

4. Measure the target circle in the image area with “contour edge detecting tool” as shown in below picture.

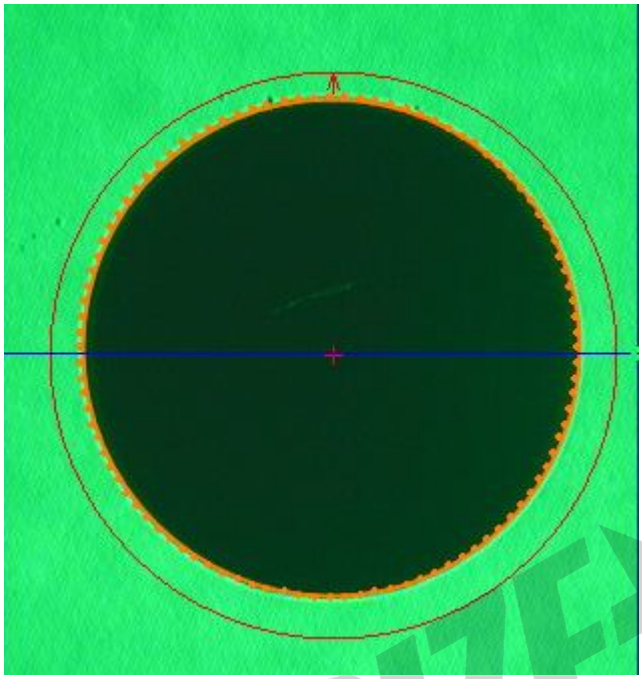


Fig. 4-32

4.1.11 Multiple points measuring for edge of elements.

This method is suitable for line, circle, arc, open curve and closed curve. Take a circle for instance.

1. Select “image tool” in tool bar window;
2. Select “circle” order in measuring element window;
3. Select “edge of multiple sections” order in measuring method window;

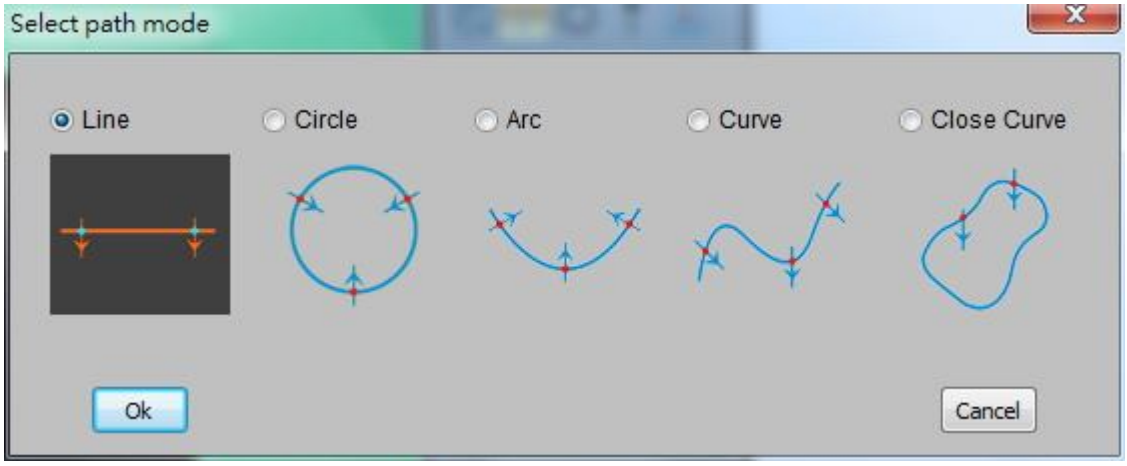


Fig. 4-33

4. Select three points in the edge of the circle in the image area, input selected number shown below :

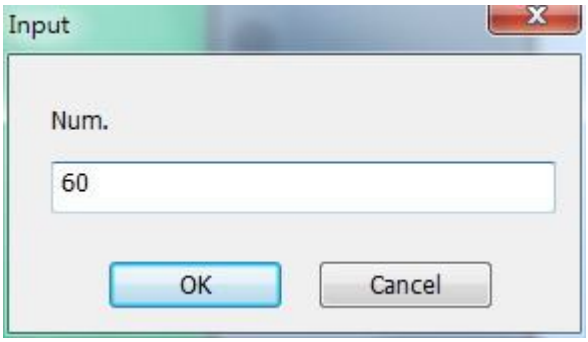


Fig. 4-34

Then the software will automatically measuring 60 points in the edge of the circle shown below:

Fig. 4-35

Element list shows as blow:

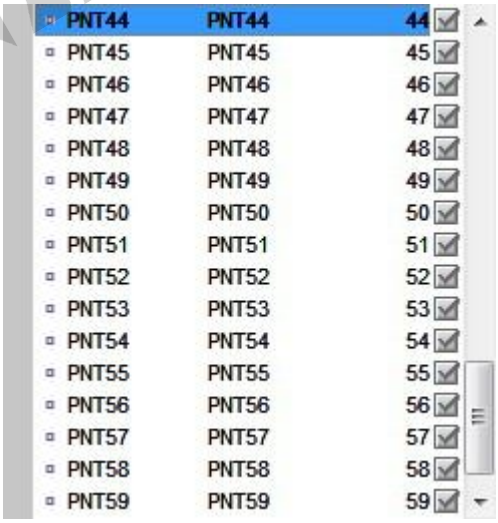


Fig. 4-36

Drawing ares shows as below:

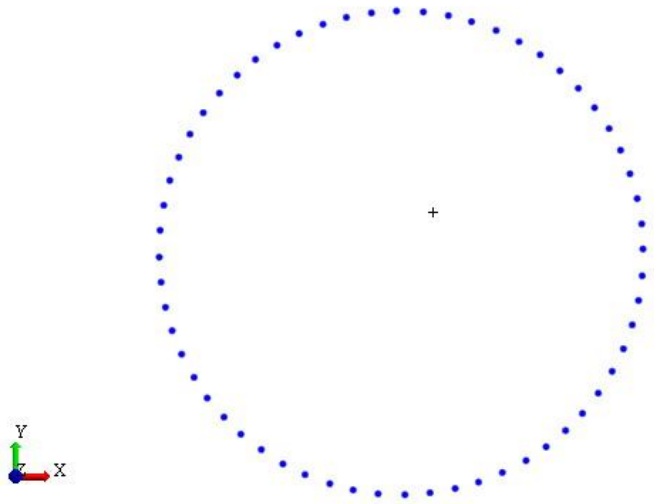


Fig.4-37

Multiple edge points measuring show as below:

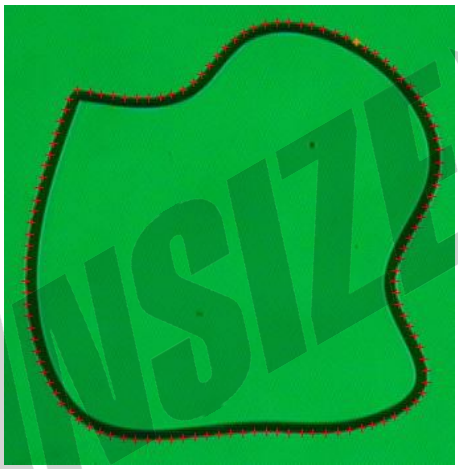


Fig.4-38

4.2 Probe measuring

The probe is applied to select points, which are fitted to measuring element. Elements suitable for probe measuring include point, line, circle, arc, ellipse, key slot, ring, plane, cylinder, cone and sphere.

Remark: Ensure the probe has been calibrated before measuring otherwise the measured data might be incorrect.

Projection plane: For two dimension elements such as line, circle, key slot, etc. the selected points shall be first projected on a plane, after that the selected points can be fitted. This can be completed by choosing default procedure.

Compensation direction: The compensation direction of the radius of a sphere. It is only related to measuring points.

4.2.1 Measuring a circle

Measuring procedure:

1. Select “probe” order in tool bar window;

2. Select “circle” order in measuring element window, select default “probe selecting points” button in measuring method;

3. Select points via the probe and set up parameters in the window shown below:

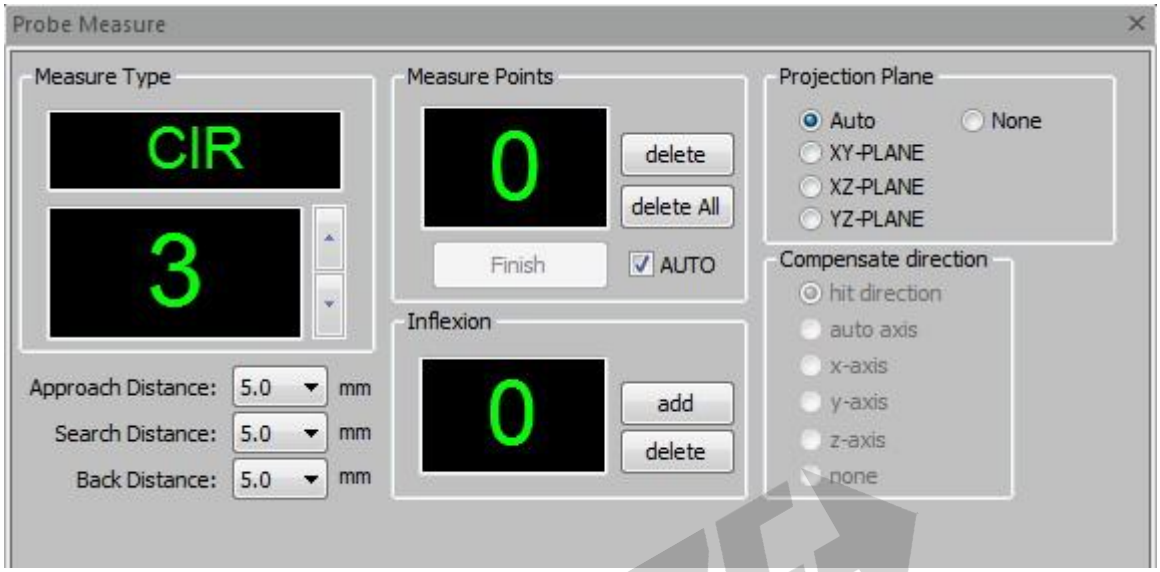


Fig. 4-29

4. A remote-control is used to control selected points via probe and increasing of inflection points. When the selected points reach to 4, the color of the wording “completion” changes from gray to dark as below:

Fig. 4-30

5. Click the “completion” button in Fig. 4-31, INSIZE V2.1.2 software will fit the selected points into a circle, displaying the name of the circle in the emelemt list and its drawing in the drawing area shown below :

Fig.4-31

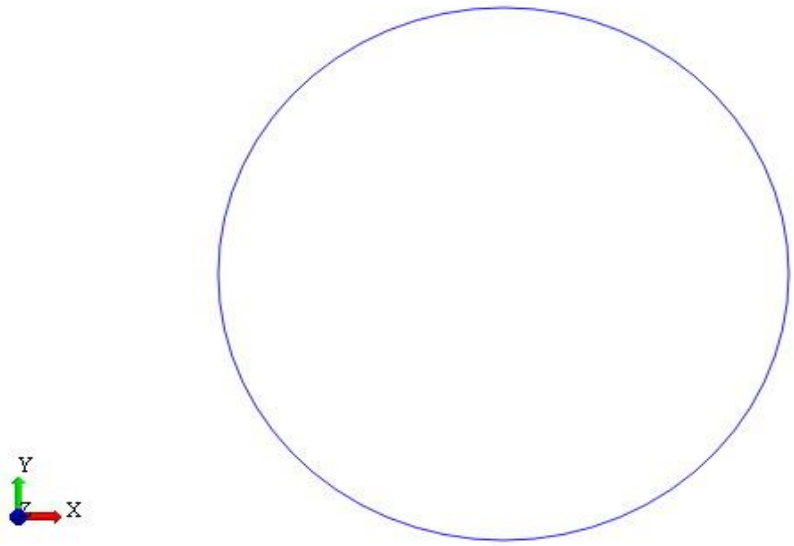


Fig.4-32

4.2.1 Measuring a sphere

Measuring procedure:

1. Select “probe” order in tool bar window;

2. Select “sphere” order in measuring element window, select default “probe selecting points” button in measuring method;

3. Select points via the probe and set up parameters in the window shown below:

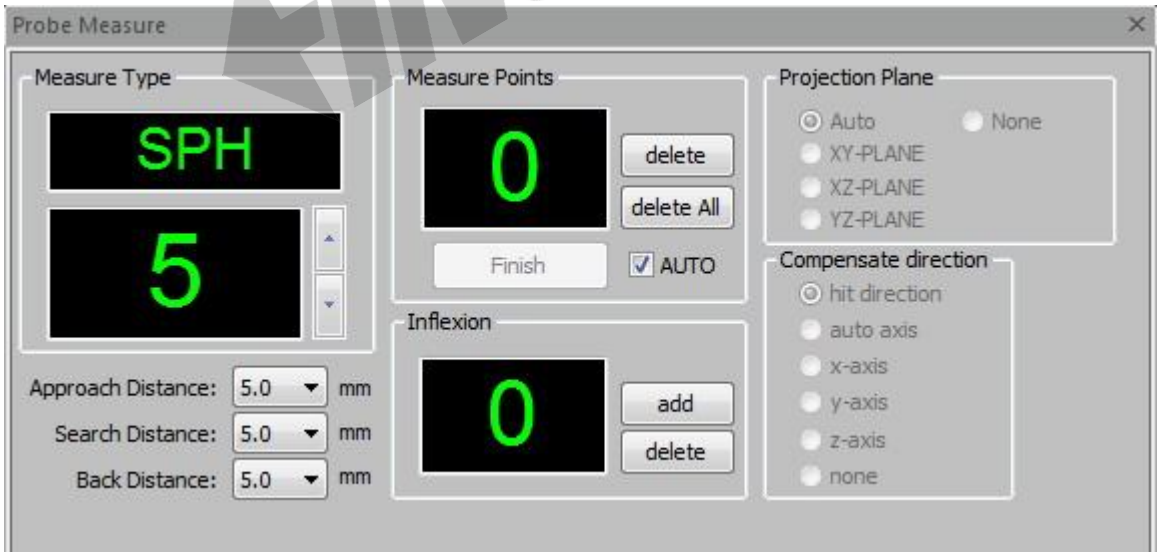


图 4-33

4. A remote-control is used to control selected points via probe and increasing of inflection points. When the selected points reach to 5, the color of the wording “completion” changes from gray to dark as below:

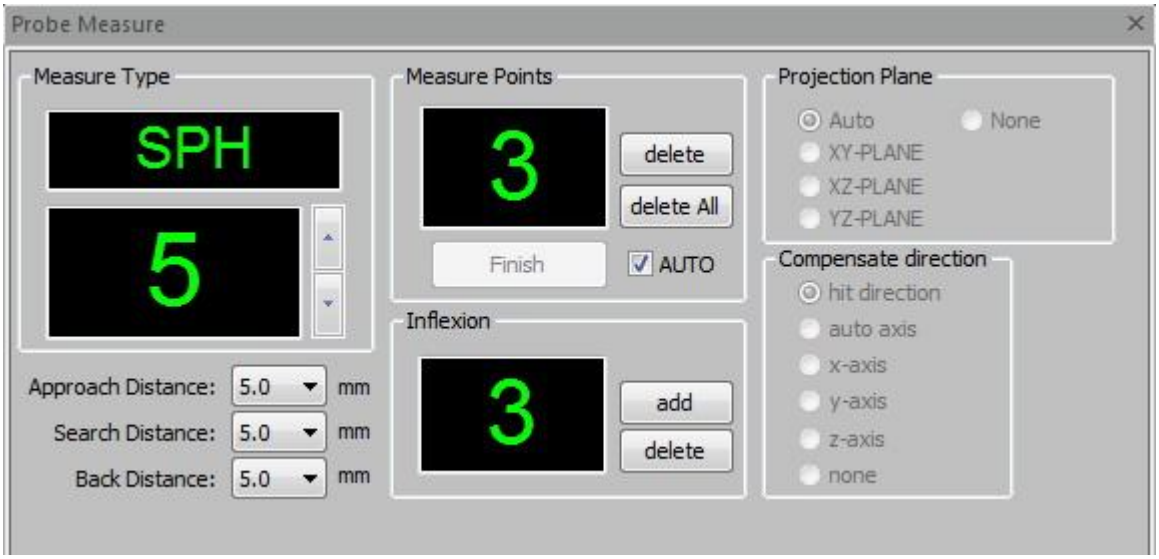


Fig. 4-34

5. Click the “completion” button in Fig. 4-35, QMS3D-M software will fit the selected points into a sphere, displaying the name of the circle in the emelemt list and its drawing in the drawing area shown below :

Fig. 4-35

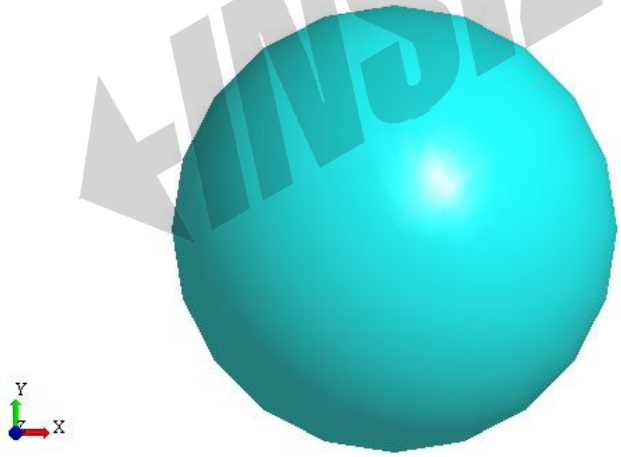


Fig. 4-36

Remark:

1. Set up probe approaching distance, searching distance and retreating distance according to the actual size of the workpiece;
2. Set up inflection point according to actual measuring condition of the workpiece to avoid interference or collision of user’ s procedure.
3. In measuring two-dimension elements, such as line, circle, arc, rectangle and key slot, select projection plane accoriding to actual measuring conditions.

Chapter 5: Emelement Preset

INSIZE V2.1.2 software can generate directly seven theoretical geometrical elements—point, line, circle, plane, cylinder, cone, and sphere, which are generally called preset elements.

Operation: Select “preset element” menu, then click the target preset element, below drawing will popup:

Fig.5-1

Preset element	Preset parameter
Point	point coordinate
Line	Origin,direction, length
Circle	Coordinate of the center of the circle,radius,vector
Plane	Length,width,coordinate of the center of the plane, vector, direction of the longer side
Sphere	Coordinate of the sphere, diameter
Cylinder	Diameter, height, coordinate of the center of the bottom,direction of the axis
Cone	Semiangle of the cone angle,height of circular cone, total height, center of the bottom, direction of the axis.

5.1 Preset a point

Operation procedure: Select “preset element” menu, then select “point” order, a window will popup shown as Fig.5-1.

Input the coordinate value of the point, and then click Add to complete preset of a point.

5.2 Preset a line

Operation procedure: Select “preset element” menu, then select “line” order, a window will popup shown as Fig.5-2.

Input the coordinate value of the origin of the line, direction, and length, then click Add to complete preset of a line.

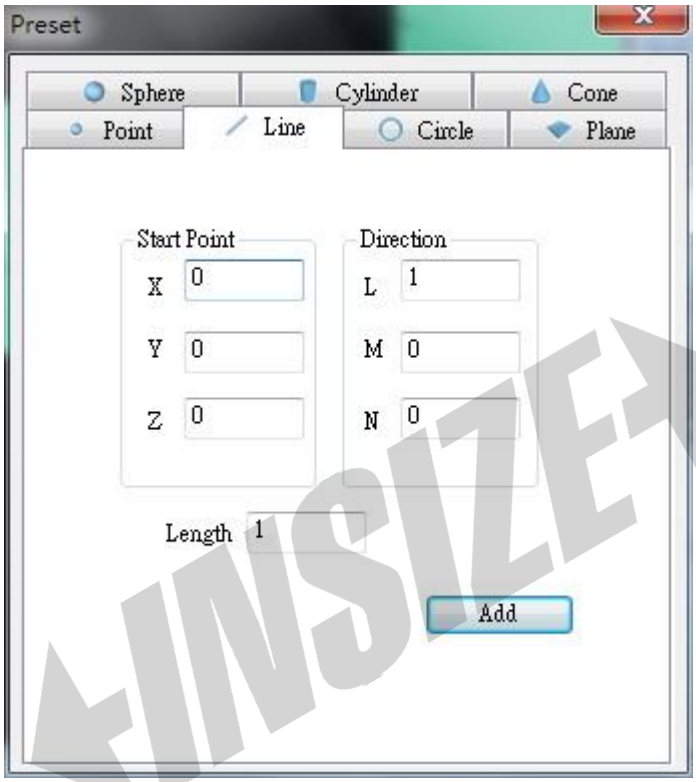


Fig.5-2

5.3 Preset a circle

Operation procedure: Select “preset element” menu, then select “circle” order, a window will popup shown as Fig.5-3.

Input the coordinate value of the center of the circle, vector direction, and radius, then click Add to complete preset of a circle.

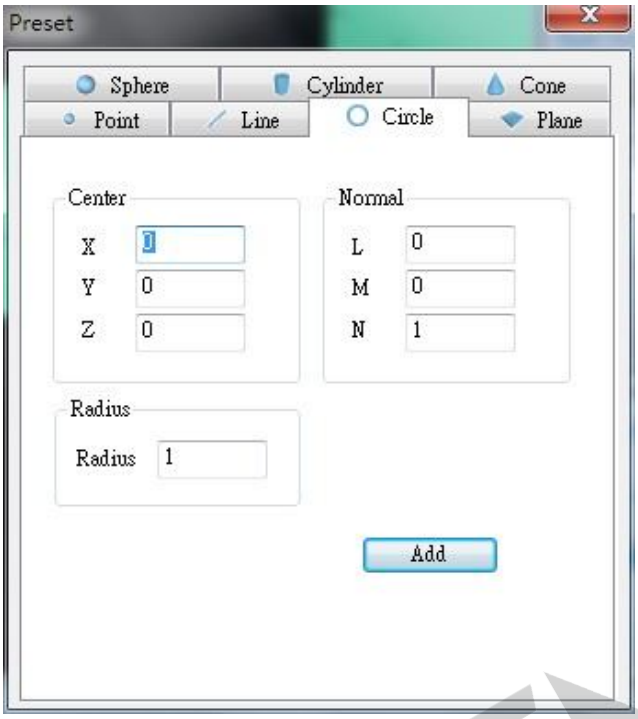


Fig.5-3

5.4 Preset a plane

Operation procedure: Select “preset element” menu, then select “plane” order, a window will popup shown as Fig.5-4.

Input the coordinate value of the center of the plane, vector direction, length, width and direction of the longer side, then click Add to complete preset of a plane.

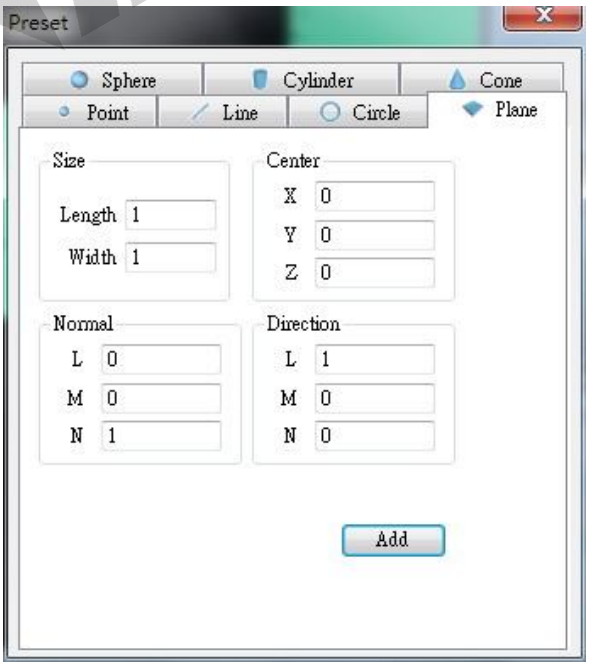


Fig. 5-4

5.5 Preset a sphere

Operation procedure: Select “preset element” menu, then select “sphere” order, a window will popup shown as Fig.5-5.

Input the coordinate value of the center of the sphere and diameter, and then click Add to complete preset of a sphere.

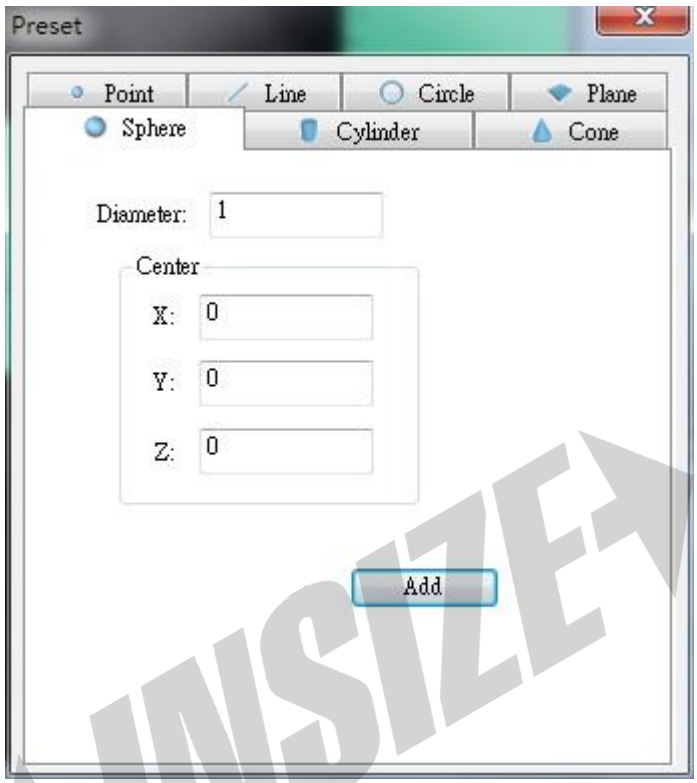


Fig.5-5

5.6 Preset a cylinder

Operation procedure: Select “preset element” menu, then select “cylinder” order, a window will popup shown as Fig.5-6.

Input the coordinate value of the center of the bottom of the cylinder, diameter, height and vetor direction, then click Add to complete preset of a cylinder.

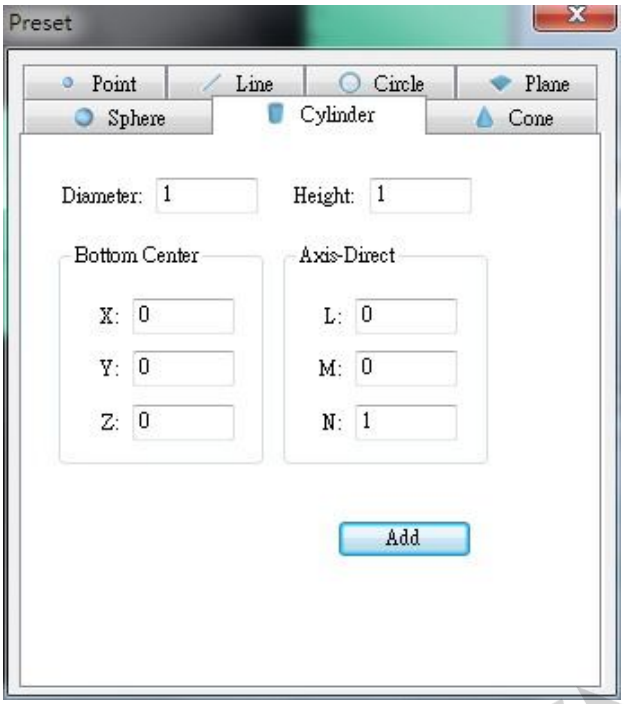


Fig. 5-6

5.7 Preset a cone

Operation procedure: Select “preset element” menu, then select “cone” order, a window will popup shown as Fig. 5-7.

Input the coordinate value of the center of the bottom of the cone, semiangle of the cone angle, height of the circular cone, total height, and direction of the axis , then click Add to complete preset of a cone.

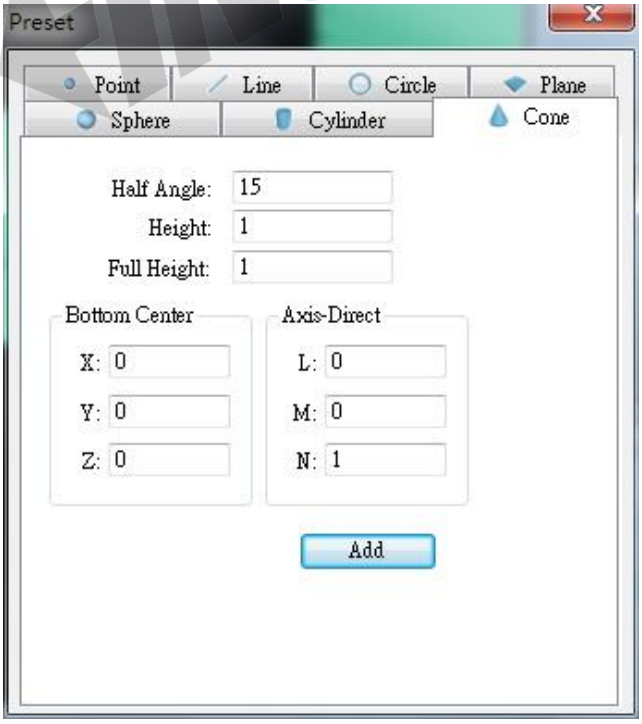


Fig. 5-7

Chapter 6: Element Construction

INSIZE V2.1.2 elemnent constrution flow is as follows:

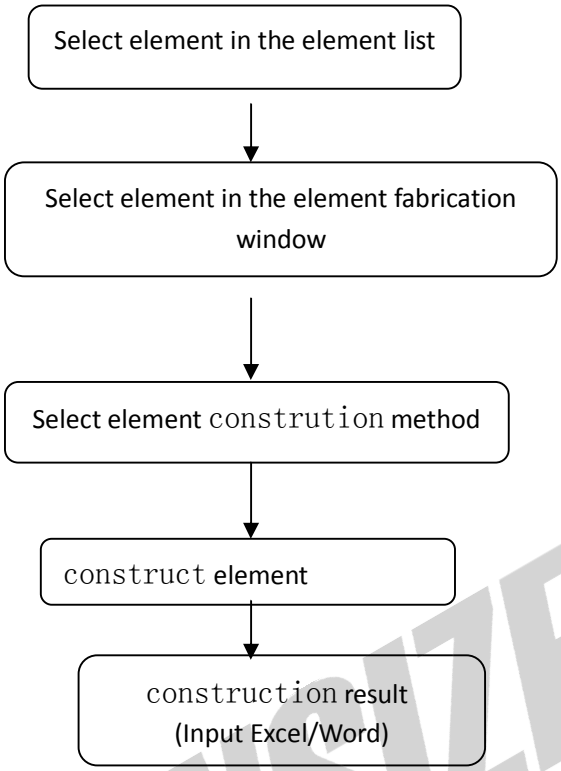


图 6-1

6.1 Point

Operation procedure:

1. Select element in the element list or drawing area;
2. Select in element constrution window;
3. Select constrution method, such as intersecting, extracting, mirroring, symmetry, perpendicularity, etc.

Constrution element	Constrution method	Precondition	Result
Line	Center		Center of a line
	Perpendicularity		The vertical point between the original point and a line
	Ends		Both ends of a line
Circle	Extracting		The center of a circle
Arc			The center of an arc
Ellipse			The center of an ellipse
Rectangle			The center of a rectangle
Ring			The center of a ring
Groove			The center of a groove

Sphere			The center of a sphere

Construtionelements	Construtionmethod	Precondition	Result
Point ＋point	Symmetry		The center between two points
	Mirroring		The mirroring point of one point against the second point.
point＋line	Perpendicularity		The vertical point between a point and a line
	Mirroring		The mirroring point of a point against a line
point＋circle	Tangency		The point of tangency between a point and a circle
Point ＋plane	Projection		The projection point of a point to a plane
line＋line	Intersecting	Two lines that are not parallel or coincide	If two lines are in the same plane, the result is the intersecting point of the two lines.If the two lines are in different planes, the result is the common center of the two lines.
line＋circle	Intersecting		If the line and the circle are in the same plane, the intersecting point can be directly obtained. If the line and the circle are in different planes, project the line onto the plane which houses the circle, then get the intersecting point of the projected line and the circle.
circle＋arc	Intersecting		If the line and the arc are in the same plane, the intersecting point can be directly obtained. If the line and the arc are in different planes, project the line onto the plane which houses the arc, then get the intersecting point of the projected line and the arc.
line＋ellipse	Intersecting		If the line and the ellipse are in the same plane, the intersecting point can be directly obtained. If the line and the ellipse are in different planes, project the line onto the plane which houses the ellipse, then get the intersecting point of the projected

			line and the ellipse.
circle＋circle	Intersecting		If the two circles are in the same plane, the intersecting point can be directly obtained. If the two circles are in different planes, project the two circles to their besector plane respectively and get the intersecting points of the two projected circles.
circle＋arc	Intersecting		If the circle and the arc are in the same plane, the intersecting point can be directly obtained. If the two are in different planes, project the circle and arc to their besector plane respectively and get the intersecting points of the projected circle and arc.
arc＋arc	Intersecting		If the two arcs are in the same plane, the intersecting point can be directly obtained. If the two arcs are in different planes, project the two arcs to their besector plane respectively and get the intersecting points of the two projected arcs.

6.2 Line

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as intersecting, extracting, mirroring, symmetry, perpendicularity, parallelism, compounding, etc.

Element	Constrution method	Precondition	Result
Ellipse	Extracting		Longer and short axis of the ellipse
Rectangle			Diagonal of the rectangle
Groove			Axle wire of the groove
Cylinder			Axle wire of the cylinder
Cone			Axle wire of the one
Point＋point	Compounding	Two points that cannot coincide	A line connecting the two points

	Symmetry	Two points that cannot coincide	Take the midpoint of the two points as the center to make symmetrical line of the two points. The length of the symmetrical line equals that of the line connecting the two points.
Point＋Line	Parallelism		Take the target point as the center to make the parallel line of the target line.
	Perpendicularity		To make a vertical line from the target point to the target line. If the point is in the line, the center of the vertical line is the target point, and the length of the vertical line equals to that of the target line.
	Mirroring		The mirror image of the the target line will be made against the target point
Point＋circle	Coupounding	The point and the center of the circle cannot coincide	Connect the point and the center of the circle
	Tangency	The point is outside the circle	Make a tangency line through the point
Circle＋circle	Compounding	The center of two circles cannot coincide	Connect the center of two circles
	Symmetry		Make a symmetrical line of the center of two circles
	Tangency	Two circles are separated	Make the common tangency line of the two circles
Line＋line	Mirroring		Make the mirror image of line 1 against line 2
	Symmetry		If the two lines are parallel, a line can be obtained that shares the same plane with the two lines and lies in the middle of them; If the two lines are intersected in the same plane, the result is the angular bisector of the two lines; If the two lines are in different planes, an angular bisector can be obtained that goes through the middle of the common vertical line of the two lines.
Line＋circle	Parallelism		Make a parallel line of the target line through the center of the circle.

	Mirroring		Make the mirror image of the line against the center of the circle
	Perpendicularity	The line goes through the center of the circle	Make a vertical line of the target line throught the center of the circle.
Line＋arc	Parallelism		Make a parallel line of the target line through the center of the arc.
	Mirroring		Make a mirror image of the target line against the center of the arc
	Perpendicularity	The line goes through the center of the arc	Make a vertical line of the target line throught the center of the arc.
Middle of two elements	Compounding	The two elements must have center point, such as point, circle,arc, ellipse,ring, groove,rectangle,etc	Connect the center of the two elements

Three points or above	Fitting	The element must be point, circle, arc, ellipse, ring, groove and rectangle	The center of the point or element is used to fit a line
Plane ＋ plane	Intersecting	Two planes are not parallel	To get the intersecting line of two planes

6.3 Circle

Operation procedure:

1. Select element in the element list or drawing area;
2. Select in element constrution window;
3. Select constrution method, such as mirroring, fitting, parallelism, tangency, etc.

Element	Constrution method	Precondition	Result
Point＋circle	Parallelism		Take the point as the center and half of radius of the circle as the radius to make a new circle
	Mirroring		Make a mirror image of the circle against the point

Line＋circle	Mirroring		Make a mirror image of the circle against the line.If the line and the circle are not in the same plane, the fabricated circle will parallel to the original circle, the center of the factricated circle is symmetrical to that of the orginal circle against the line.
Point＋Line	Tangency	The point is not in the line	Take the point as the center to make a circle that is tangent to the line.
Line ＋ line ＋ radius		The two lines must be in the same plane and intersect.	Make a circle that is tangent to both the lines.
Line ＋ Line ＋ line		All three lines must be intersected with each other but the intersecting point must not converge into a same point	Make an incircle of the three lines
Three points or above	Fitting	The points cannot coincide and cannot be in a line	The points will fit into a circle

6.4 Arc

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as mirroring, fitting, parallelism, tangency, etc.

Element	Constrution method	Precondition	Result
Point＋arc	Parallelism		Take the point as the center and half of radius of the arc as the radius to make a new arc
	Mirroring		Make a mirror image of the arc against the point

Line＋arc	Mirroring		Make a mirror image of the arc against the line.If the line and the arc are not in the same plane, the fabricated arc will parallel to the original arc, the center of the factricated arc is symmetrical to that of the orginal arc against the line.
Line＋point＋line	Tangency	The two lines and the point must be in the same plane. The point must be between the two lines.	Make a R arc of the two lines through the point
Three points or above	Fitting	The points cannot coincide and cannot be in a line	The points will fit into a circle

6.5 Ellipse

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as mirroring, fitting, parallelism, etc.

Element	Constrution method	Precondition	Result
Point＋ellipse	Parallelism		Take the point as the center to make a ellipse whose size equals to that of the original ellipse
	Mirroring		Make a mirror image of the ellipse against the point
Line＋ellipse	Mirroring		Make a mirror image of the ellipse against the line
Five points or above	Fitting	Five points or above	The points will fit into an ellipse

6.6 Rectangle

Operation procedure:

1. Select element in the element list or drawing area;

2. Select  in element constrution window;
3. Select constrution method, such as mirroring, parallelism, etc.

Element	Constrution method	Precondition	Result
Point ＋ rectangle	Parallelism		Take the point as the center of the rectangle to make a rectangle whose size equals to that of the original ellipse
	Mirroring		Make a mirror image of the rectangle against the point
Line ＋ rectangle	Mirroring		Make a mirror image of the rectangle against the line
Multiple points	Fitting		Multiple points will fit into a rectangle

6.7 Ring

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as mirroring, parallelism, etc.

Element	Constrution method	Precondition	Result
Point＋ring	Parallelism		Take the point as the center to make a ring whose size equals to that of the original ring
	Mirroring		Make a mirror image of the ring against the point
Line＋ring	Mirroring		Make a mirror image of the ring against the line. If the line and the ring are not in the same plane, the fabricated ring and the original ring are parallel, and the center of the fabricated ring and the original ring are symmetrical against the line.
Multiple points	Fitting		Multiple points will fit into a ring.

6.8 Slot

Operation procedure:

1. Select element in the element list or drawing area;

2. Select  in element constrution window;
3. Select constrution method, such as mirroring, parallelism, etc.

Element	Constrution method	Precondition	Result
Point ＋ key slot	Parallelism		Take the point as the center of the target key slot to make a key slot whose size equals to that of the target one
	Mirroring		Make a mirror image of the key slot against the point
Line＋key slot	Mirroring		Make a mirror image of the key slot against the line
Multiple points	Fitting		Multiple points will fit into a key slot

6.9 Plane

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as extractingk, compounding, symmetry, perpendicularity, parallelism, fitting, etc.

Element	Constrution method	Precondition	Result
Circle	Extracting		The plane houses the circle
Arc			The plane houses the arc
Ellipse			The plane houses the ellipse
Ring			The plane houses the ring
Rectangle			The plane houses the rectangle
Point＋line	Compounding	The point cannot be in the line	The plane houses both the point and the line
	Perpendicularity		Make a plane through the point, the plane is perpendicular to the line
Point＋point	Symmetry		A plane which is symmetrical to the two points
Line＋plane	Perpendicularity	The line cannot be perpendicular to the plane	A plane which goes through the line and is perpendicular to the target plane

Point ＋ plane ＋plane	Perpendicularity	交 The two planes must intersect	A plane goes through the point and is perpendicular to both the planes
Point＋plane	Parallelism		A plane goes through the point and is parallel to the target plane
Three points or above	Fitting		The points will fit into a plane

6.9 Distance

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as distance, maximum distance, middle distance, minimum distance, etc.

Element	Constrution method	Precondition	Result
Point in broadsense ＋ Point in broadsense		The point can be points in broad sense, circle, arc, ellipse,rectangle, groove,and ring	Distance between two points
Circle＋circle	Maximum distance		The maximum distance between the connecting line of the two circles and the intersecting point of the two circles
	Middle distance		Distance between the center of the two circles
	Minimum distance		The minimum distance between the connecting line of the two circles and the intersecting point of the two circles
Line＋line	Minimum distance	Intersection angle of the two lines must be less than 30 degree	If the two lines share the same plane, the distance is the minimum between the two lines; If the two lines are in different planes, the distance equals that of the common vertical line of the two lines
	Middle distance	Intersection angle of the two lines must be less than 30 degree	If the two lines share the same plane, the distance is the middle distance between the two lines; If the two lines are in different planes, the distance equals that of the common

			vertical line of the two lines
	Maximum distance	Intersection angle of the two lines must be less than 30 degree	If the two lines share the same plane, the distance is the maximum between the two lines; If the two lines are in different planes, the distance equals that of the common vertical line of the two lines
Line＋circle	Minimum distance	The line cannot intercross the circle	The minimum distance between the circle and the line
	Middle distance		The middle distance between the center of the circle and the line
	Maximum distance	The line cannot intercross the circle	The maximum distance between the center of the circle and the line
Point＋Plane			Distance between the point and the plane
Line＋plane		The intersection angle between the line and the plane cannot be bigger than 15 degree	Distance between the line and the plane
Plane＋plane		The intersection angle between the two lines cannot be bigger than 15 degree	Distance between the two planes

6.10 Angle

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method, such as angle method.

Element	Constrution method	Precondition	Result
Line＋line			Intersection angle between two lines.
Line＋Plane			Intersection angle between the line and the plane
Plane＋plane			Intersection angle between two

			planes.
Point ＋ point ＋point			Make an angle, taking the second point as the starting point, the connecting line between the second and first point as one side, the connecting line between the second point and the third point as another side.

6.11 Cone

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method.

Element	Constrution method	Precondition	Result
Circle ＋ circle	Compounding	The two circles are not of the same altitude	The two circles form a cone

6.12 Open curve

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method.

Element	Constrution method	Precondition	Result
Multiple points	Compounding	Points shall be selected on the edge of the open curve	A open curve composed of multiple points

6.13 Closed curve

Operation procedure:

1. Select element in the element list or drawing area;
2. Select  in element constrution window;
3. Select constrution method.

Element	Constrution method	Point	Result
Multiple points	Compounding	Points shall be selected on the edge of the closed curve	A closed curve composed of multiple points

Chapter 7: File

INSIZE V2.1.2 software's "File" menu included below function: N (new),O (open), S (save), Save as,etc.

Fig. 7-1

7.1 New (N)

New file: To set up a new user's procedure.

7.2 Open (O)

Open file: To open a saved user's procedure. Suitable file includes Qim3d, dxf, drl.

7.3 Save (S)

Save a file: To save current user's procedure. The procedure can be saved in qim3d、dxf,drl 。

qim3d: User's procedure can be saved by the default form of the software.

The data of all elements can be saved in dxf form.

7.4 Save as

Save the file in another archive: Save current user's procedure. The procedure can be saved in qim3d、dxf and drl form.

7.5 Recently opened user's procedure

This function will facilitate the user to open previous procedures.

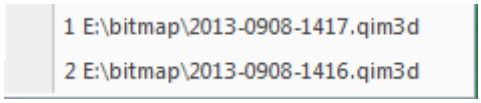


Fig. 7-2

Chapter 8: Coordinate system

Coordinate system consists of establishing, saving and using, translating, rotating, exchange and switch of coordinate.

Coordinate system is categorized into mechanical coordinate system and workpiece coordinate system.

(1)Mechanical coordinate system: a coordinate whose original point is that of the measuring machine when the machine is turned on.

(2) Workpiece coordinate system: a right-angle coordinate established by translating, and rotating the mechanical coordinate or workpiece coordinate according to specific measuring procedure of a element. Workpiece coordinate helps improve measuring efficiency.

8.1 Set up coordinate system

Fig.8-1

Fig.8-2

8.1.1 Set up two dimension coordinate (Fig.8-1)

1 Translation of original point

(1) Function: Translate the original point to a specific point.

(2) Operation procedure:

Select an element --point or an element that can derive a point in broad sense such as circle, arc, ellipse, rectangle, groove, and ring, then select "origin translation" order in Fig.8-1.

* Order "A": Translation of the original point—move the origin of the coordinate to coincide with that point.

*Order "X": To translate the X axis of the origin to coincide with that of that point.

*Order "Y": To translate the Y axis of the origin to coincide with that of that point.

2: Rotation of the axis

(1). Function: To rotate an axis of the coordinate system to coincide with the datum line of a specific element.

(2) Operation procedure:

Select an element -line, and then select "coordinate rotatation" order in Fig.8-1.

*Order “A”: If the intersection angle of the line between X axis is smaller than that of the line between Y axis, then rotate X axis of the coordinate to coincide with the line. If the intersection angle of the line between X axis is bigger than that of the line between Y axis, and then rotate Y axis of the coordinate to coincide with the line.

*Order “X” : To rotate X axis of the coordinate to coincide with the line

*Order “Y”: To rotate Y axis of the coordinate to coincide with the line.

8.1.2 Set up three dimension coordinate (Fig.8-3)

1 Rotation in space

(1)Function: To determine the positive direction of the first axis of new workpiece.

(2)Operation procedure:

There are two ways to determine which of the three axes should be the first axis of new workpiece:

a. **To determine the first axis automatically:** Calculate the intersection angle of the three axis of the coordinate between the positive direction of the first axis of the new workpiece. Select the axis with smallest intersection angle as the first axis. If the three intersection angles are equal, then select Z, Y, X in priority sequence.

b. **To determnine manually:** The operator will decide one of the three axes as the the first axis of new workpiece.

(3)Operation procedure:

Select  in Fig.8-2, below window will popup:

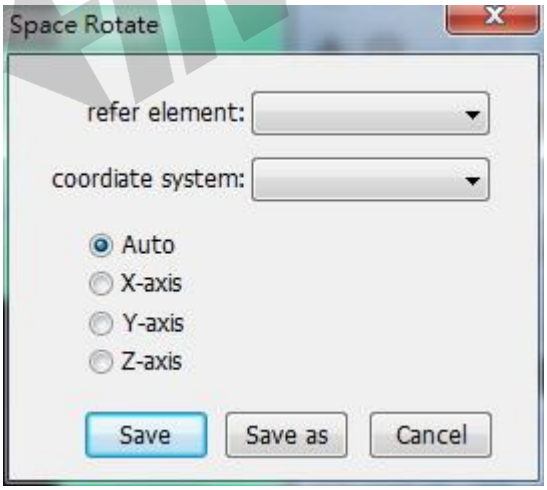


Fig.8-3

2 Rotate a plane

(1).Function: To determine the positive direction of the second axis of new workpiece based on rotation in space.

(2).Operation procedure:

There are two ways to determine which of the three axes should be the second axis of the coordinate:

a. **To determine the second axis automatically：** Calculate the intersection angle of the target line between the positive direction of the second axis of the second axis of the original coordinate. If the intersection angle is less than 45° or bigger than 135°, then the target line is the second axis of the coordinate, otherwise it shall be the third axis. If the three intersection angles are equal, then select Z, Y, X in priority sequence.

b. **To determnine manually：** The operator will choose one axis from the second and the third axis from the original coordinate as the second axis of new workpiece.

(3).Operation procedure：

Select  in Fig. 8-2, below window will popup:

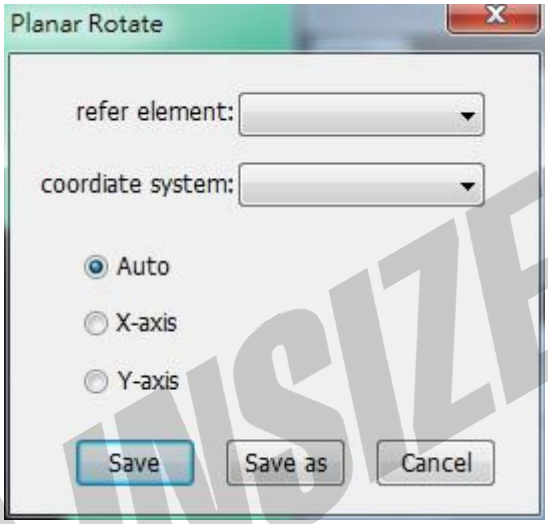


Fig. 8-4

3 Translate original point

(1)Function：To translate the origin of coordinate into a specific fixed point in the space.

(2)Operation procedure：

Select  in Fig. 8-2, below window will popup:

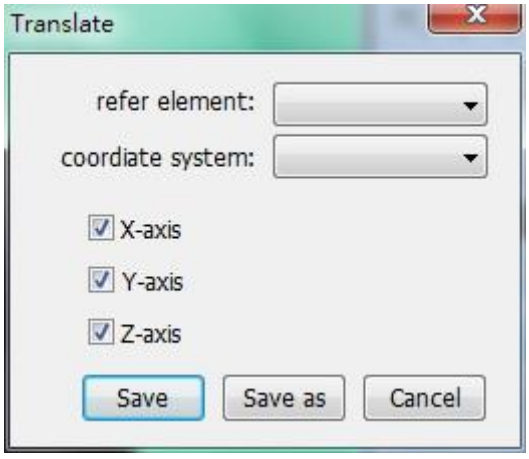


Fig. 8-5

8.1.3 3-2-1 Set up coordinate()

This is the general method to set up coordinate for a workpiece which has three datum planes perpendicular to each other. Follow below steps to set up coordinate for a workpiece:

1: Measure three points and determine a coordinate plane:

Measure at least three points in the first selected datum plane, the vector direction of the plane derived or fitted from the measured points shall be taken the direction of the first axis of the workpiece coordinate (This is equivalent to determine the direction of the first axis by ratating in space). When this procedure is finished, INSIZE V2.1.2 software has translated the origin of the coordinate to the measured datum plane, which becomes one coordinate plane of new coordinate.

2: Measure two points to determine a axis:

Measure at least two points in the second datum plane, derive or fit a line by the projected points of the measured points on the first datum plane. This line will be the second axis for the workpiece (This is equivalent to decide the second axis by rotating the plane).The direction of the third axis of the workpiece can be gotten by right-hand rule. This procedure includes translating the origin of the coordinate for a second time along the third axis--- moving the origin of the coordinate to the second axis.

3: Meaure one point to determine the original point of coordinate :

Meaure a point in the third datum plane, take its projected point on the second axis as the original point of coordinate.

8.2 Saving and using of workpiece coordinate

8.2.1 Save workpiece coordinate

(1)Function: To allot specific serier number for the workpiece coordinate and save it in coordinate archives for later use.

(2)Operation procedure:

Set up new workpiece coordinate and click  , then the software will generate coordinate serial number automatically 

。

8.2.2 Use workpiece coordinate

(1)Function: To transfer a workpiece coordinate with specific serial number into stored work unit according requirement of measuring.

(2)Operation procedure:

Click 

in the tool bar, select the ID number of saved workpiece

coordinate in the list.

8.3 Switch the coordinate

(1)Function: To switch the coordinate between mechanical coordinate and workpiece coordinate.

(2)Operation procedure:

Click the right button of 

in the tool bar to achieve switch between mechanical and workpiece coordinate. If the current is mechanical coordinate, then it will switch to workpiece coordinate, and vice versa.

8.4 Exchange the coordinate

(1).Function: To exchange the coordinate between Cartesian coordinate and polar coordinate.

(2) Operation procedure:

Double click "Cartesian coordinate," then the polar coordinate vale will change to polar coordinate value. The icon of coordinate in the "status bar" will change from polar coordinate to polar coordinate icon as well. The coordinate window will display corresponding icon of coordinate.

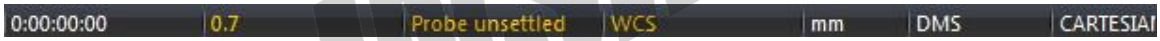


Fig. 8-6

Cartesian coordinate: If the current coordinate is polar coordinate, the polar coordinate will change to Cartesian coordinate.

Polar coordinate: If the current coordinate is angle coordinate, the angle coordinate will change to polar coordinate.

8.5 Translate and rotate the coordinate

8.5.1 Translate the coordinate

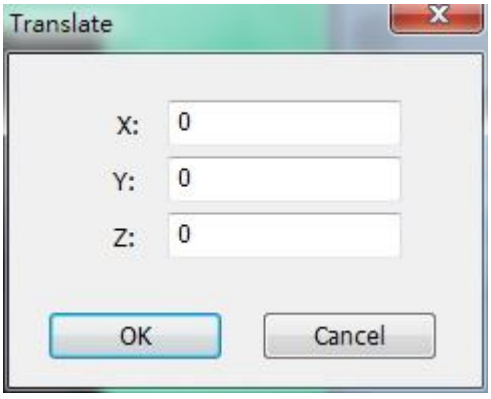


Fig.8-7

(1)Function: To move the original point of the coordinate by inputting number into the window shown in Fig.8-7

(2)Operation procedure:

Select "coordinate→translate coordinate" order in the menu, below window (Fig.8-7) will popup. Input the intended number in the window, then click "confirm" button to move the coordinate.

(3)Remark: The coordinate can translate along one axis or along three axes as well in light of the input number by the user.

8.5.2 Rotate the coordinate

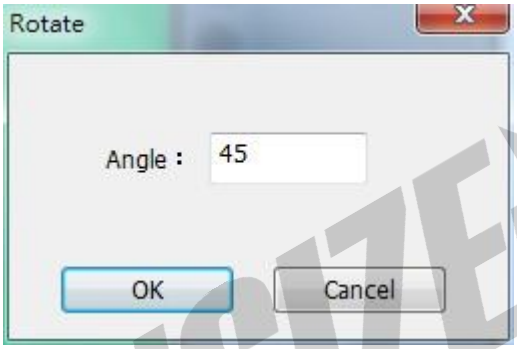


Fig.8-8

(1)Function: To rotate the coordinate along the original point clockwise or anti-clockwise to a specific angle to get a new coordinate.

(2)Operation:

Select "coordinate→translate coordinate" order in the menu, a window (Fig.8-7) will popup. Input the intended number in the window, then click "confirm" button to rotate the coordinate.

Chapter 9: User’s procedure

User’s procedure consists of functions such as On, Pause, Stop, Continue, Repeat （details please refer to 3.10）and coordinate set up method shown below :

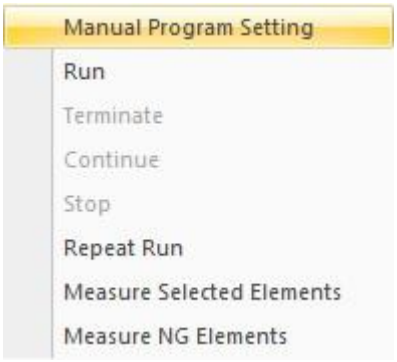


Fig.9-1

(1) Function : To set up three kinds of method to establish coordinate—manually, semi-automatically and automatically.

(2) Operation procedure:

Set up coordinate manually: When user’s procedure is on, the coordinate must be set up manually.

Set up coordinate semi-automatically: When user’s procedure is on, the software will automatically move to the place where the workpiece coordinate will be established, waiting for setting up the workpiece coordinate manually.

Set up coordinate automatically: When user's procedure is on, the workpiece coordinate will be established automatically. This is only suitable for fixed workpiece. (For the first operation, workpiece coordinate shall be set up manually.)

Chapter 10: Image processing

Click “image processing” menu and below window will popup:

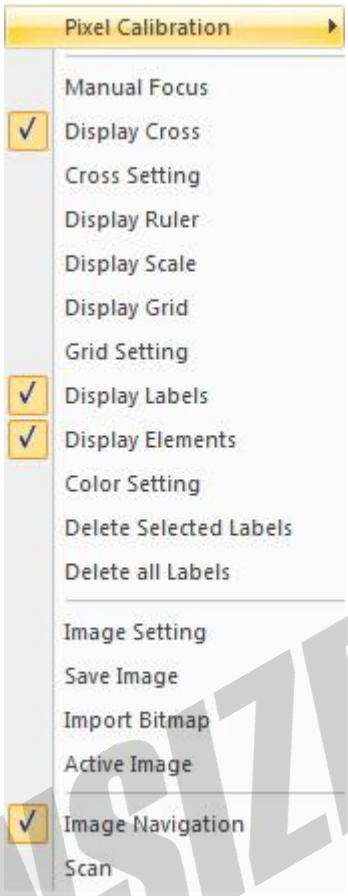


Fig. 10-1

10.1 Pixel calibration

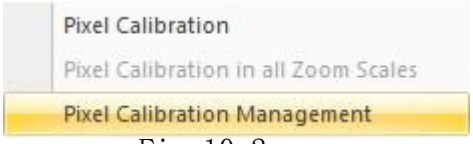


Fig. 10-2

10.1.1 Calibrate the pixel

When the magnification of zoom lens varies, the pixel must be calibrated to get correct measuring result. When cross line is used to select points for measuring, the pixel is unnecessary to calibrate regardless whether the magnification of the zoom lens has changed.

Below requirements must be met for pixel calibration: 1. The magnification of the zoom lens remains unchanged; 2. Round element must be used to calibrate the pixel; 3.Sequence in calibration is: the four corners of the image area, calibrate it clockwise or anti-clockwise.

Below are the steps for calibration:

Take the sequence—lower right, upper right, upper left, lower left, for instance.

A. Put the calibration plate on the worktable and focus it, move X and Y axis to locate a specific circle on the calibration plate, select order “Pixel calibration” and press on the left key to draw a ring, then release the left key, move the ring to change its size until the ring covers fully the circle, press Enter button to collect data.

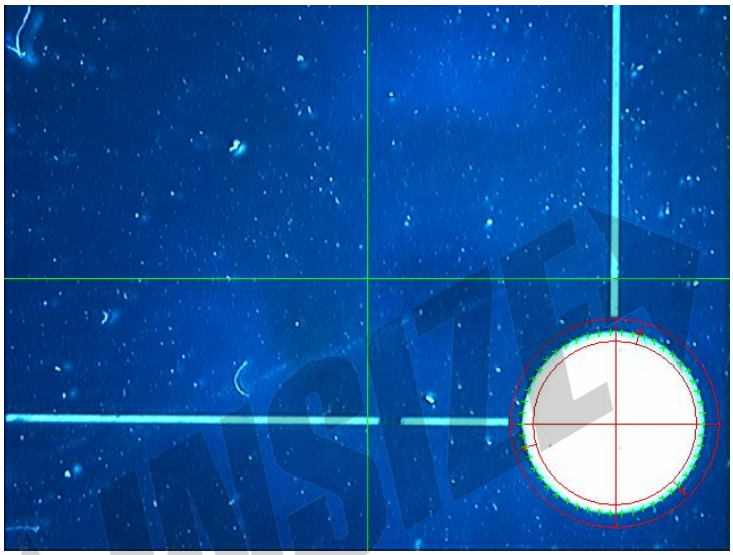


Fig. 10-3

B: The status bar will indicate—2nd edge detecting. Move Y axis, move the circle to upper right of the image area, then follow steps in step 1 to complete step 2.

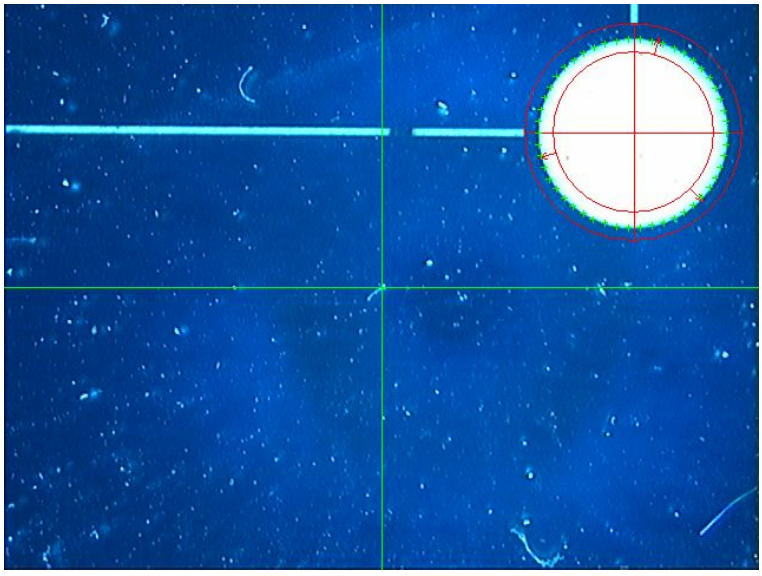


Fig. 10-4

C: The status bar will indicate—3rd edge detecting. Move Y axis, move the circle to upper right of the image area, then follow steps in step 1 to complete step 3.

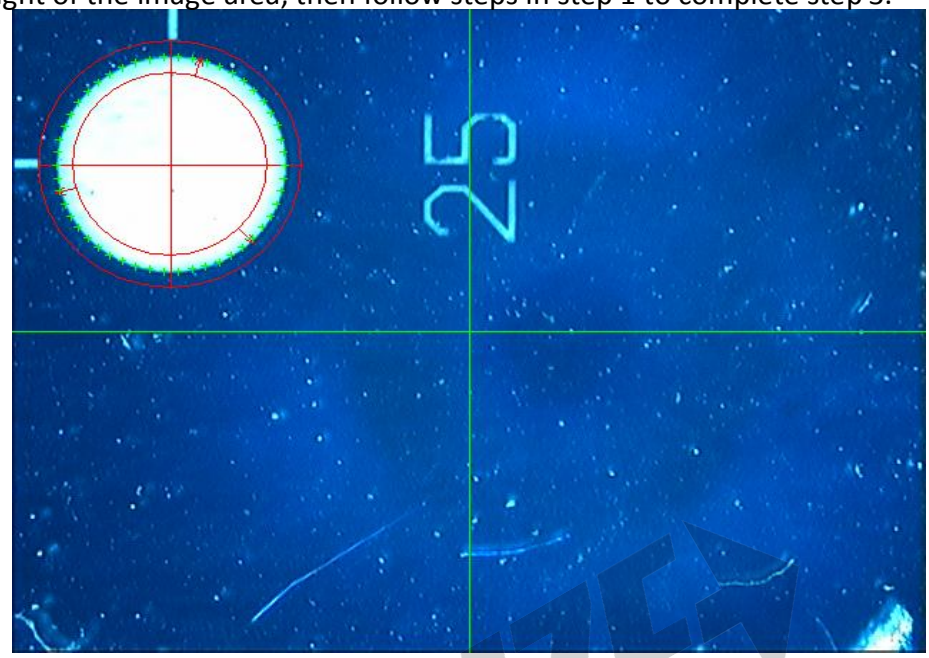


Fig.10-5

D: The status bar will indicate—4th edge detecting. Move Y axis, move the circle to lower left of the image area, then follow steps in step 1 to complete step 4.

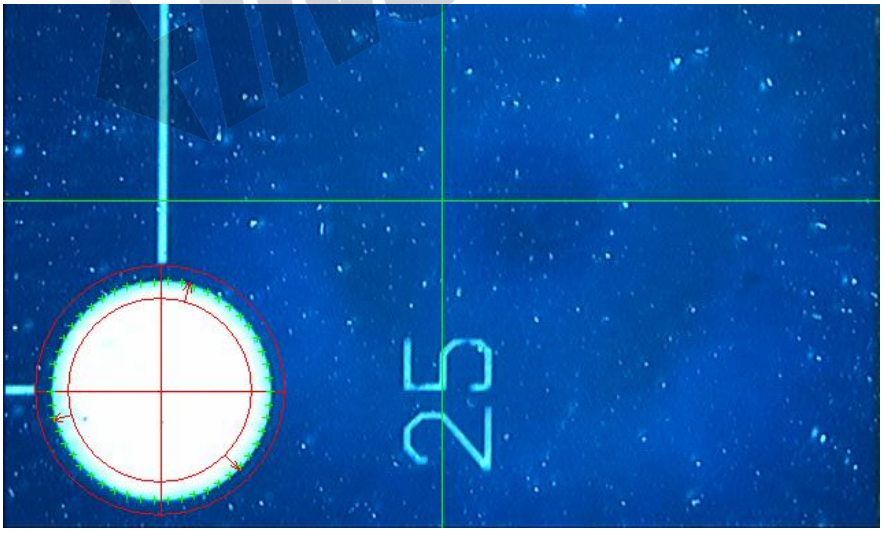


Fig.10-6

So far, pixel calibration is completed and saved in the file.

Remark: As longas the magnification of zoom lens is not changed, it is unnecessary to calibrate the pixel.

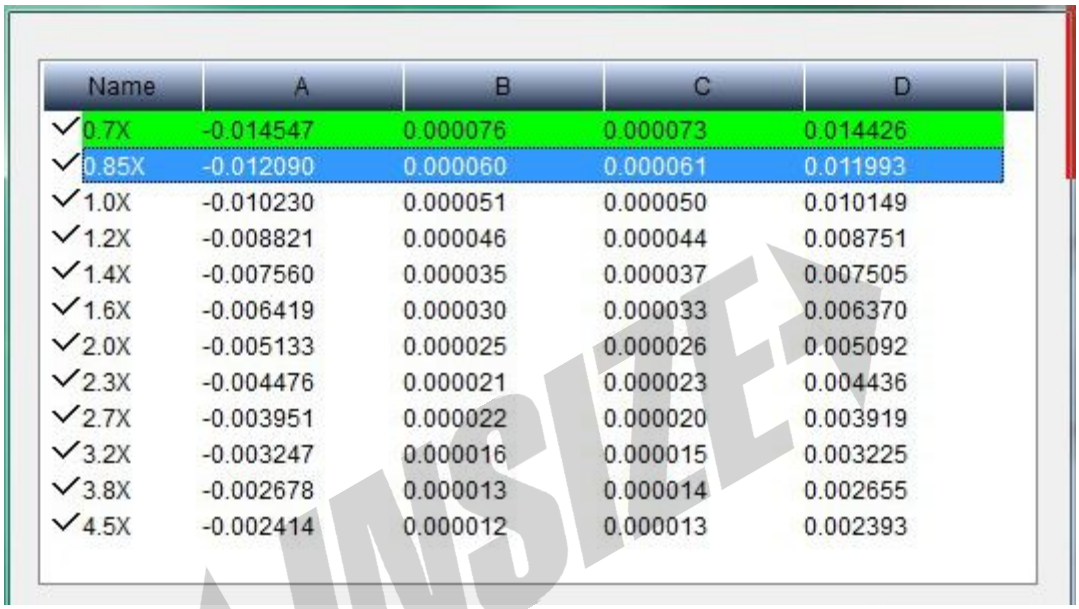
10.1.2 Pixel calibration under various magnifications.

Pixel calibration ranges from 0.7X to 4.5X. If auto zoom of a specific

magnification is inexistent, the corresponding list in the "pixel calibration window" is in gray color.

10.1.3 Pixel calibration management under condition of auto zoom.

Pixel calibration management under condition of auto zoom is to manage calibration of pixel of various magnifications. A specific magnification can be selected for calibrating, activating and cancelling. If auto zoom of a specific magnification is inexistent, the corresponding list in the "pixel calibration window" is in gray color.



Name	A	B	C	D
✓0.7X	-0.014547	0.000076	0.000073	0.014426
✓0.85X	-0.012090	0.000060	0.000061	0.011993
✓1.0X	-0.010230	0.000051	0.000050	0.010149
✓1.2X	-0.008821	0.000046	0.000044	0.008751
✓1.4X	-0.007560	0.000035	0.000037	0.007505
✓1.6X	-0.006419	0.000030	0.000033	0.006370
✓2.0X	-0.005133	0.000025	0.000026	0.005092
✓2.3X	-0.004476	0.000021	0.000023	0.004436
✓2.7X	-0.003951	0.000022	0.000020	0.003919
✓3.2X	-0.003247	0.000016	0.000015	0.003225
✓3.8X	-0.002678	0.000013	0.000014	0.002655
✓4.5X	-0.002414	0.000012	0.000013	0.002393

Fig. 10-7

1. "√" in Fig. 10-7 indicates this magnification is calibrated; "×" indicates this magnification is not calibrated.;
2. The list in green color in Fig. 10-7 indicates this magnification is activated.
3. Move the mouse on a magnification in Fig 10-7 and click the right key, below window will appear:

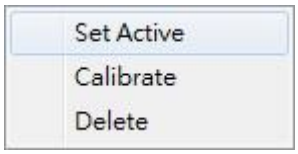


Fig. 10-8

10.2 Auxiliary focusing

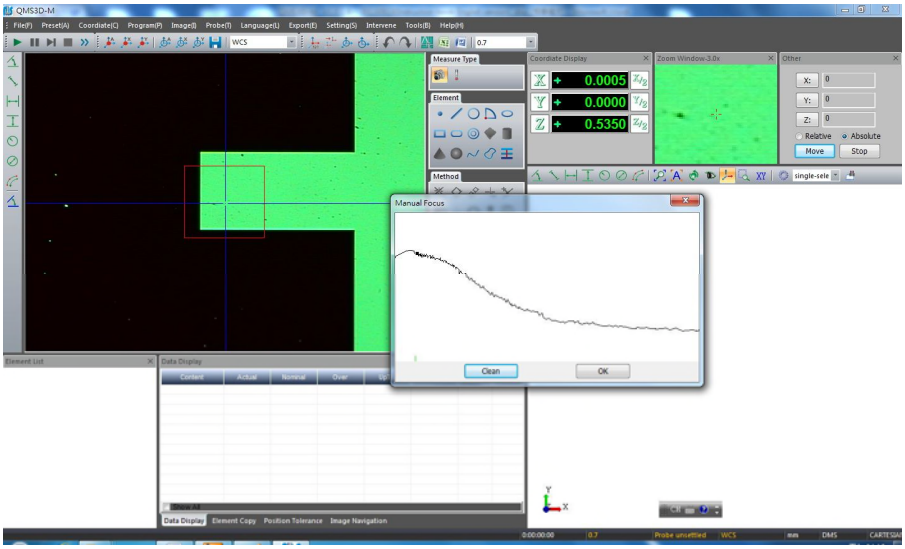


Fig. 10-9

Operation procedure:

Select "auxiliary focusing" order, a red rectangle (the focusing area) will appear in the image area. When the mouse is within the rectangle, the rectangle can be moved; When the mouse is on the edge of the rectangle, the size of the rectangle can be changed. Locate the rectangle in an appropriate position.

When the location of the rectangle is confirmed, click the outer side of the rectangle to start auxiliary focusing shown below :

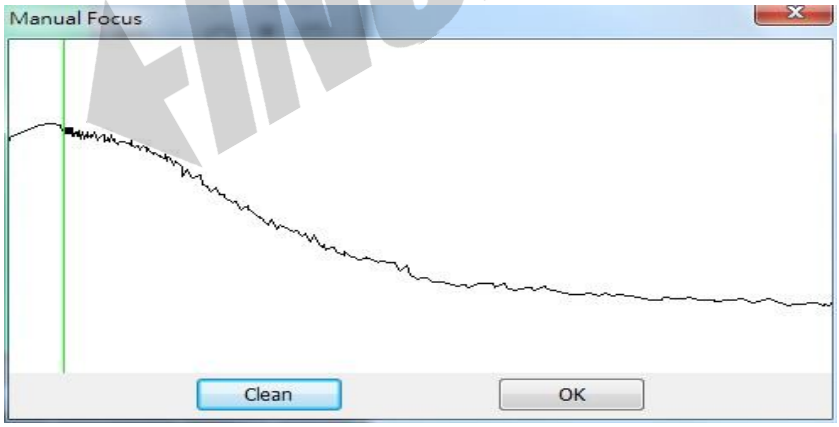


Fig. 10-10

10.3 Set up cross line

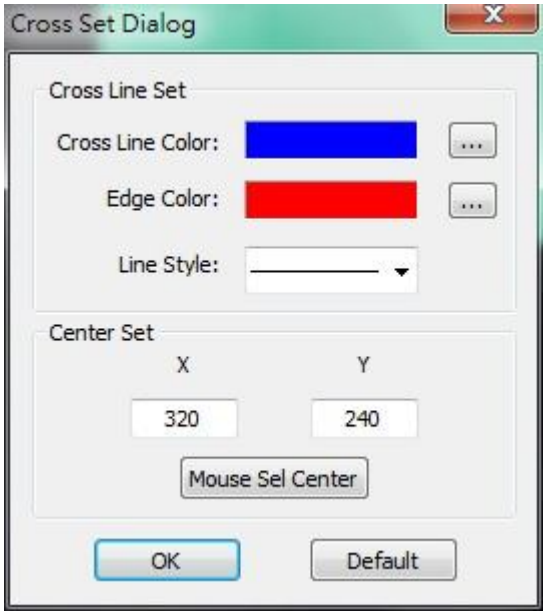


Fig. 10-11

Display the cross line: When the "cross line" order is selected, the cross line will apprear in the image area, if not, the cross line will not display in the image area.

Set up color of the cross line: Set up the color of the cross line, style of the line, and edge detecting color.

Set up center of the cross line: The default value is half of the dimension of the image area, that is to say, X is 320 and Y 240. The center of cross line can also be set up via the mouse in the image area.

10.4 Set up grid line

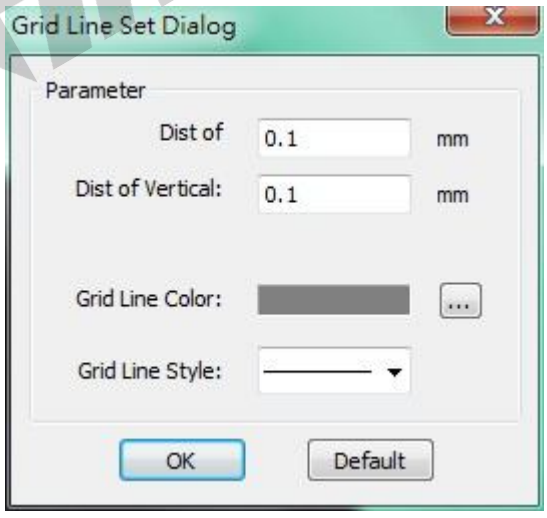


Fig. 10-12

To display the grid line: If the "grid line" order is selected, the grid line will display in the image area. If not, the grid line will not display in the image area.

Set up parameter of the grid line: Set up the horizontal distance and

vertical distance of the grid line.
Set up color of the grid line: Set up the color and style of the grid line.

10.5 Set up element color and annotation color

Fig. 10-13

Display element and annotation: When "element color" order and "annotation color" order are selected, element and annotation will display in the image area. If not, element and annotation will not display in the image area.
Set up color: Color can be set up, annotated and selected in the window shown in Fig. 10-13

10.6 Set up image

Set up parameters of the image: brightness, chromaticity, contrast ratio, saturation level shown below :

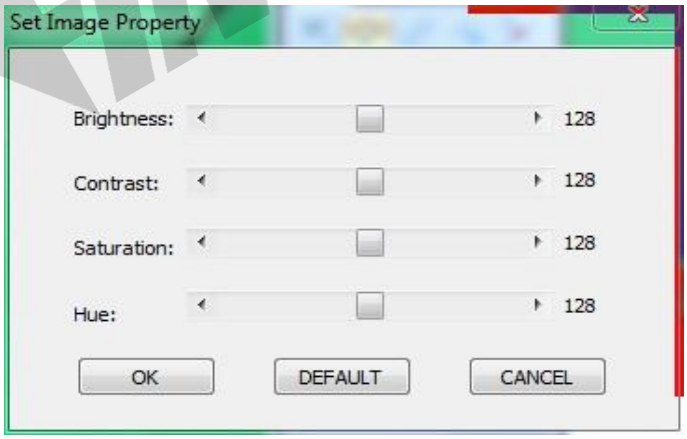


Fig. 10-14

10.7 Save image, input image and activate image

Save image: To save image of the image area in bmp form.
Input image: To input bmp form file into the image area for measuring.
Activate image: When the bitmap is input, the image should be activated

to active status.

10.8 Image navigation

Fig. 10-15

Suitable size of the window of the image

: Actual size of the image

: Image zoom in

: Image zoom out

: Save the bitmap, to save scanned image, which covers size of the element and annotation information, in bmp/jpg form.

: Input annotation: To input the element annotation of image area or drawing area.

28 : Set up the size of the annotation wording in navigation area.

: Set up color of the annotation in navigation area.

: Set up image navigation including inputting bitmap and deleting image.

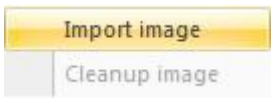


Fig. 10-16

1: Input bitmap

Input bitmap in bmp form to the image navigation window shown below:

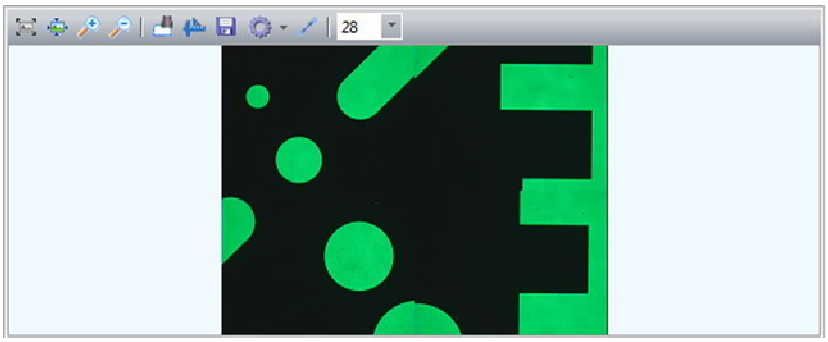


Fig. 10-17

2: Scan workpiece

Scan workpiece is to scan the shape of the workpiece into bitmap for later measuring.

Operation procedure

(1) Select “scan workpiece” order in Fig. 10-15, below window will appear:

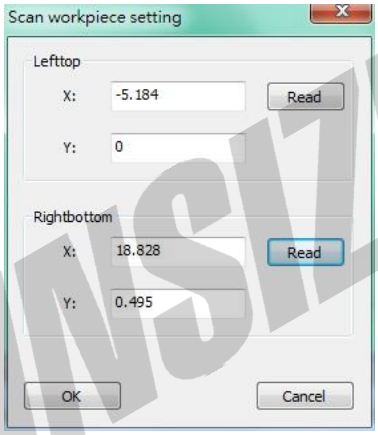


Fig. 10-18

Move the cross line to the upper left of the target workpiece and click “Read” button in Fig. 10-18

(2) Move the cross line to the lower right of the workpiece and click “Read” button in Fig. 10-18 to get scanning area of the workpiece.

(3) Click the “confirm” button in Fig. 10-19 to start scanning shown below:

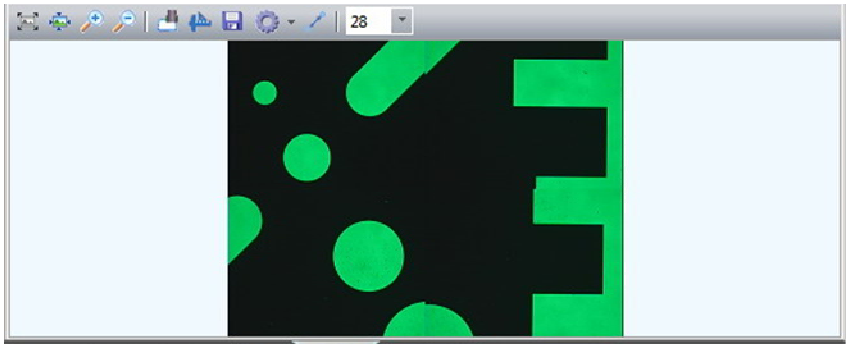


Fig. 10-19

3: Cabliration

When the workpiece is moved, it is necessary to calibrate the workpiece to make sure the image and the workpiece are aligned.

Operation procedure:

(1) Select “input bitmap” order in Fig.10-15 to input the bitmap of the workpiece to image navigation window.

(2) Select “calibration” order in Fig 10-15, move the cross line to a specific location, then double click the left key on the place where the bitmap in the mage navigation window corresponds with the cross line.

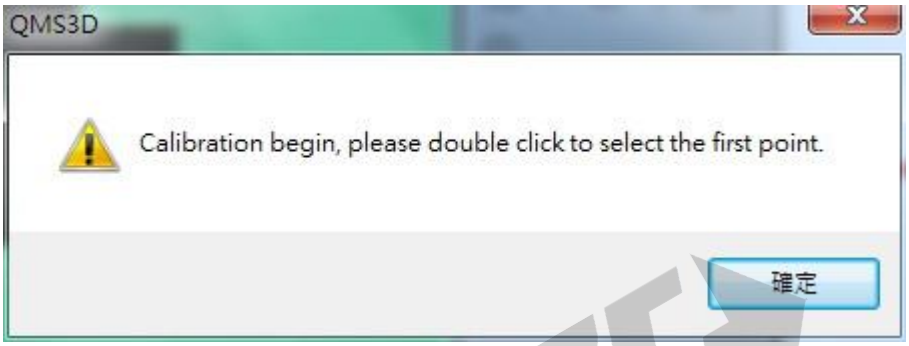


Fig.10-20

(3) Move the cross line on a specific position, then double click the left key on the bitmap in the mage navigation window corresponds with the cross line to complet calibration.

Fig.10-21

10.9 Scanning

To scan the outside frame of the workpiece and save in point form in dxf file.

Click the “scanning” order in image processing menu, the drwawing window will switch to scanning window as below:

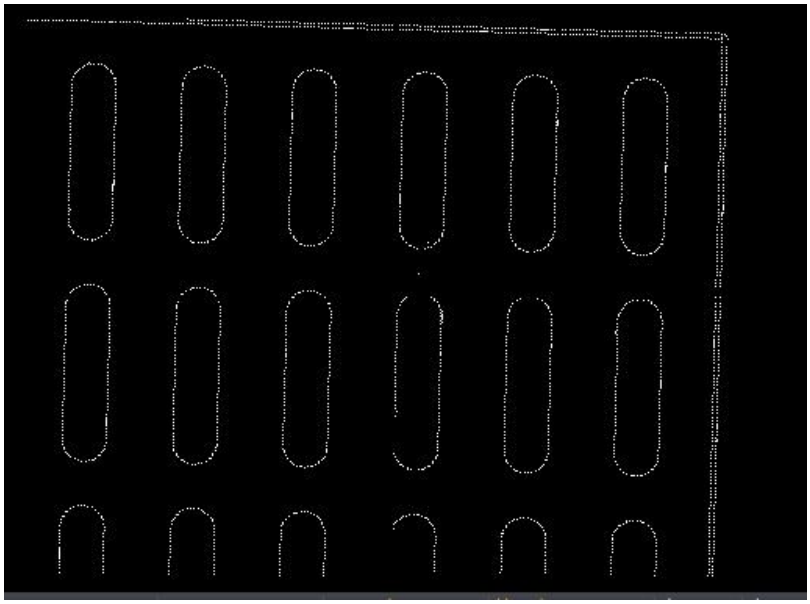


Fig. 10-20

Click the right key in scanning window and below menu will popup:

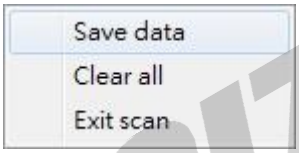


Fig. 10-21

Start scanning order and below window will appear:

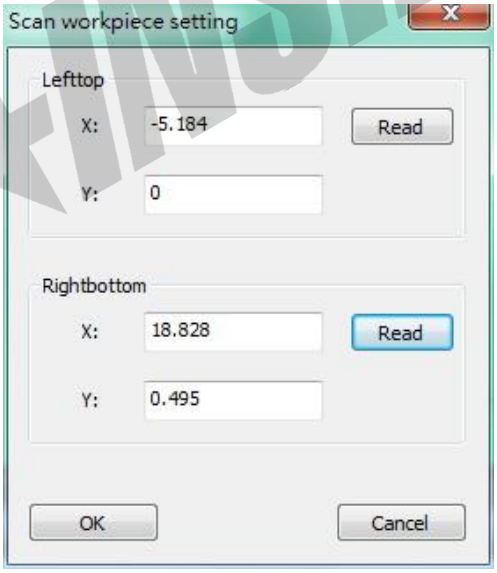


Fig. 10-22

Set up scanning scope, click “confirm” button to start scanning the workpiece. The scanning pocess will display in scanning area.

Save data: Save the scanned point in dxf file.

Delete: To delete all the images in scanning window.

Quit scanning: Switch the scanning window to drawing window.

Chapter 11: Probe management system

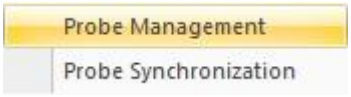


Fig. 11-1

Probe measuring system consists of probe management and probe synchronization.

Probe system management means management of probe, probe calibration and, standard establishment.

Probe synchronization means coordination of the relation between probe measuring and image measuring.

11.1 Probe system management

Select "probe system management" in Fig. 11-1, and below window will popup:

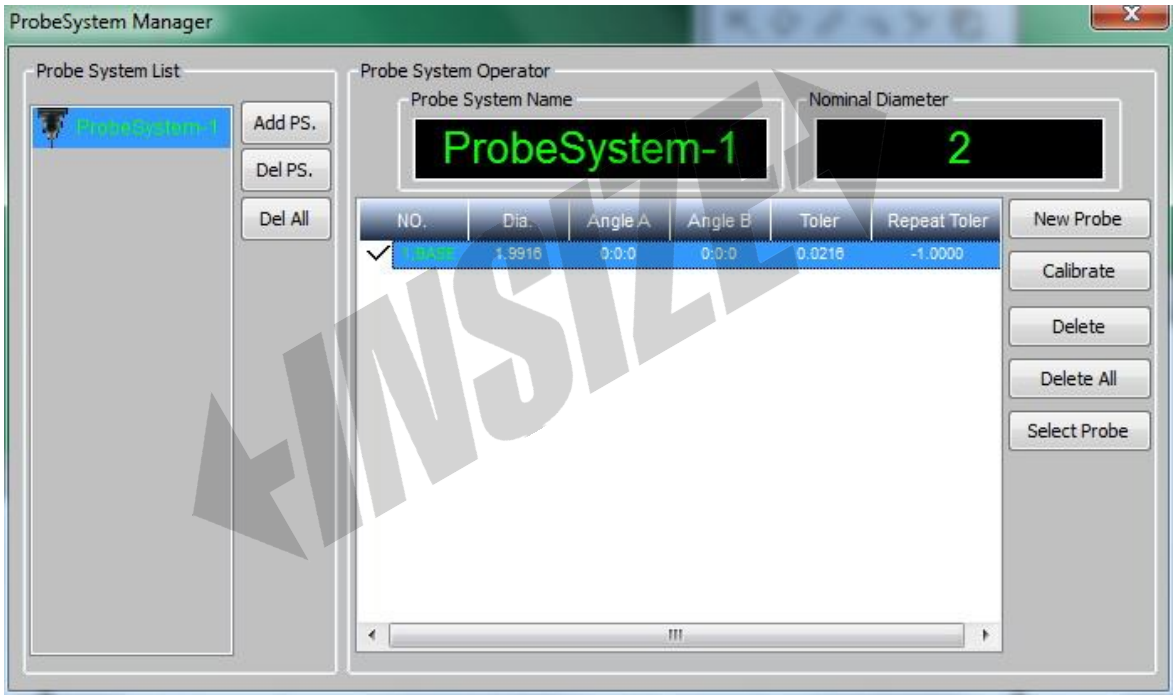


Fig. 11-2

1 Probe system list

The probe system used in current system includes adding a specific probe system, cancelling a specific probe system and all probe systems shown as Fig. 11-2:

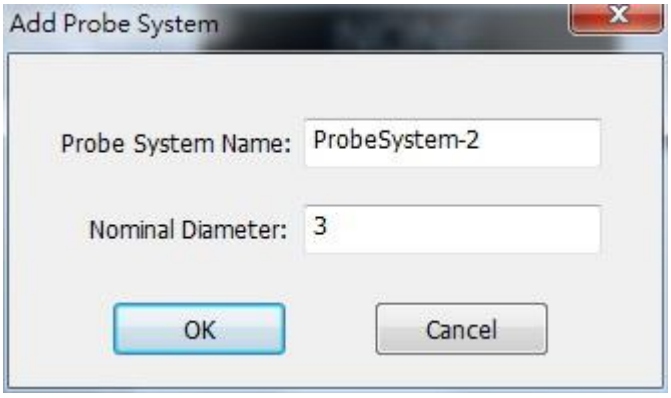


Fig. 11-3

2 Operation of probe system

A probe system includes the name of the probe system, nominal diameter of the probe, probes with various angles, take, A0C0, A15C30, for instance, and operation of probes with various angle, such as probe calibration and cancellation. Select a specific probe as the current probe and add a probe with a specific angle.

3 Add probe is to add a a probe with a specific angle in probe system shown below:

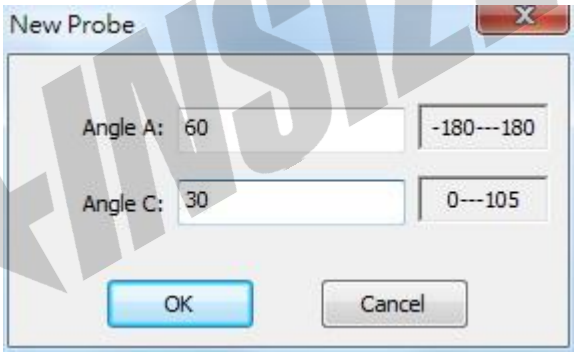


Fig. 11-4

4 Probe calibration:

Calibration means to calibrate a probe with a standard to get the equivalent diameter of various detecting sphere in the target measuring system and, the relative spacial position of the center of various non-standard detecting sphere against the center of the standard detecting sphere.

Display of the form tolerance of standard obtained during the process of calibrating the probe is only to help the operator to estimate whether the measured data is correct. The form tolerance of the standard can almostly be ignored because the form tolerance obtained is in fact the measuring deviation of measuring system.

The measuring accuracy of the measuring machine is already known. If the form tolerance is too big, that means measuring of some selected points is incorrect.

This is often true for a novice in manual measuring machine.

If this happens, the measured data should be deleted for remeasurement. Therefore, to calibrate the probe is not to get the form tolerance of the standard, the derived data is not the form tolerance of the standard.

Operation procedure:

(1) Select a probe in a specific probe system (The premise is that the standard probe A0C0 has been calibrated ,if not,calibrate the standard probe first)

(2) Select "calibration" order in Fig.11-2, and below window will popup:

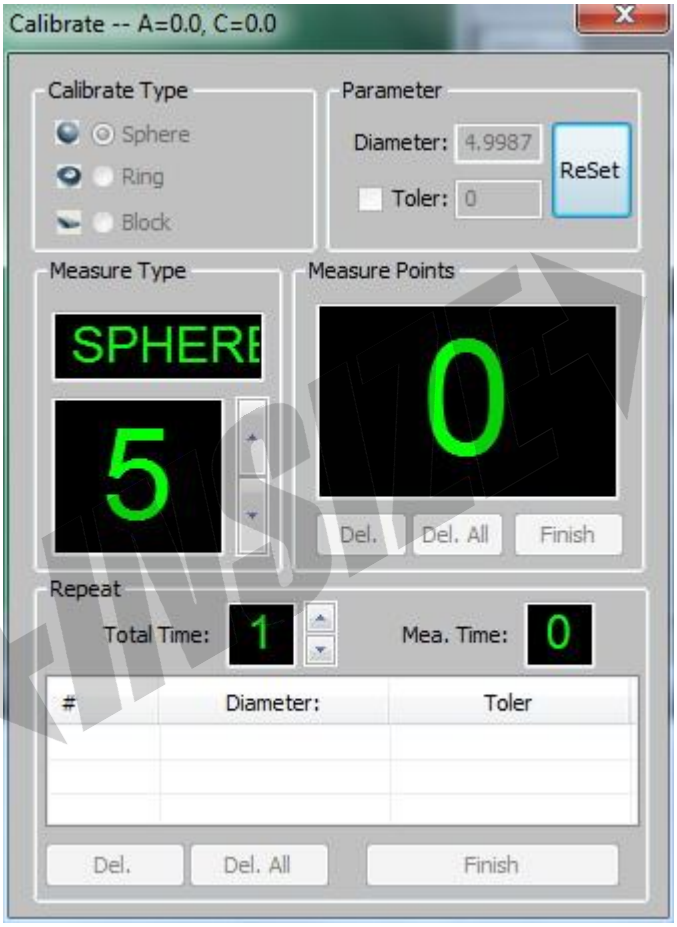


Fig.11-5

Type of standard: Standard sphere, ring gauge and standard block.

Usage of standard: To calibrate the equivalent diameter of various detecting sphere and, relative spacial position of various non-standard detecting sphere against standard sphere

Parameter of standard:

Parameter of standard sphere:Diameter and tolerance;

Parameter of ring gauge: Diameter and tolerance;

Parameter of standard block: length and tolerane.

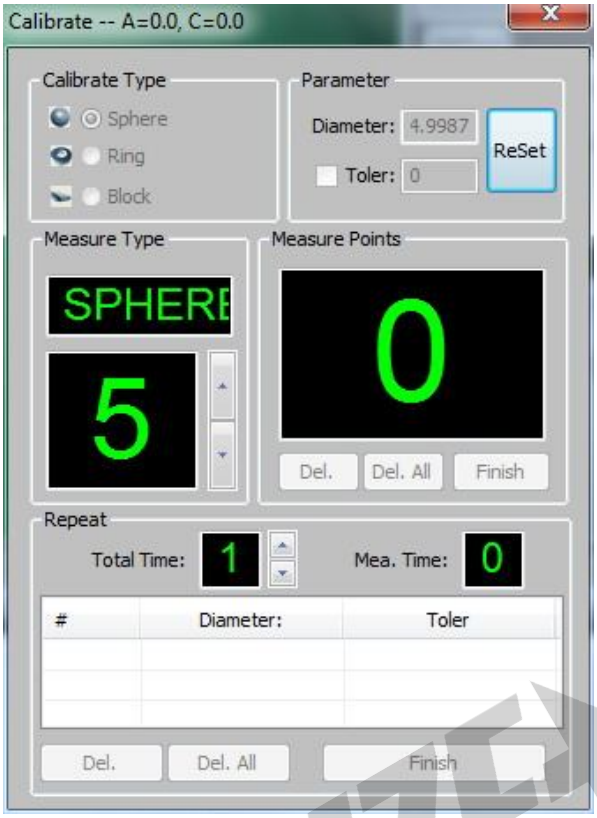


Fig. 11-6

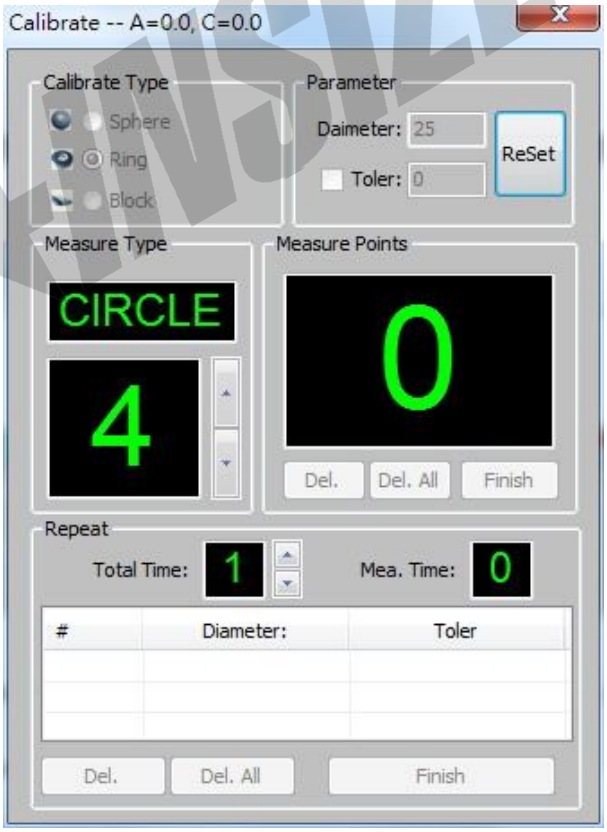


Fig. 11-7

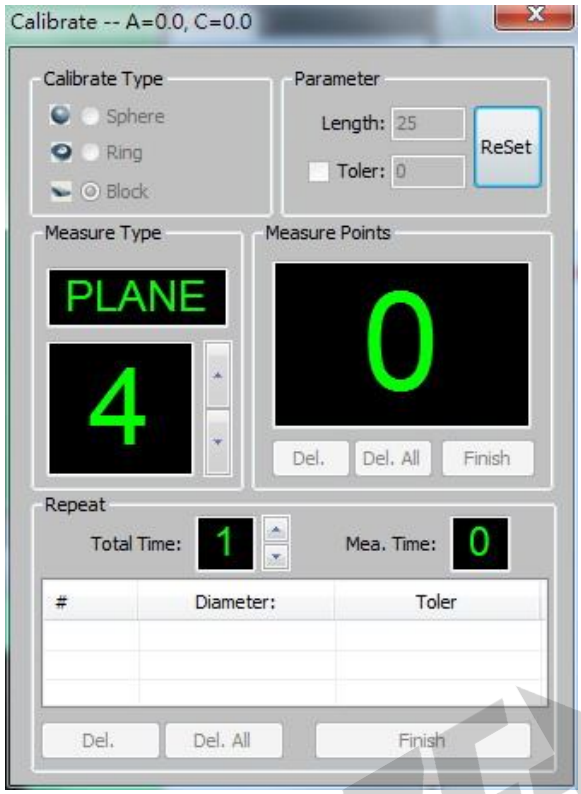


Fig. 11-8

(3) Take the standard sphere for instance to illustrate the process of calibration:

First, set up manually measuring points (5 points for instance) to determine position of the standard sphere.

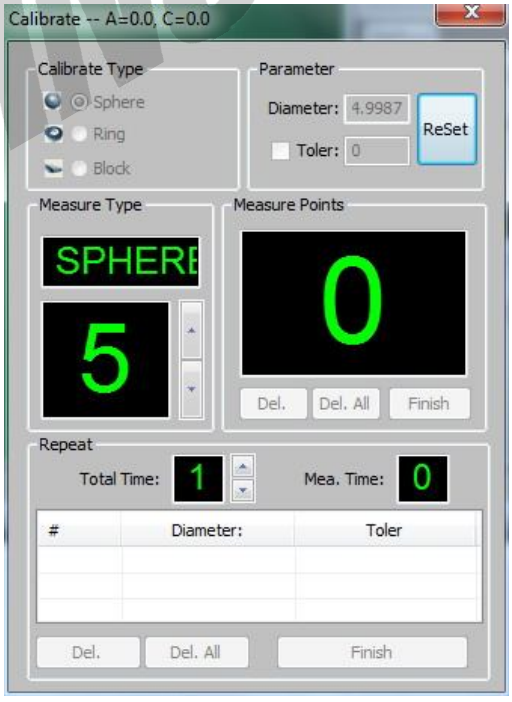


Fig. 11-9

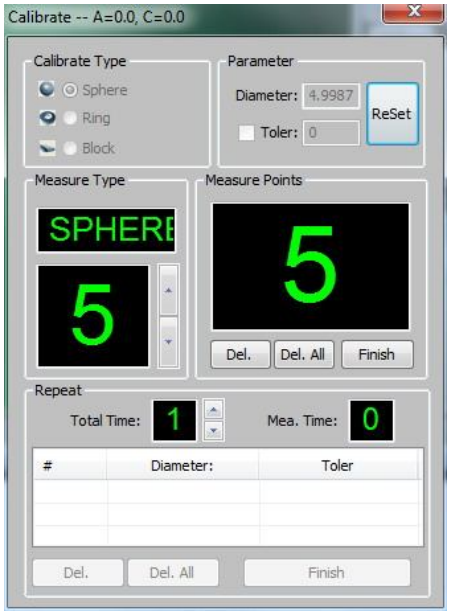


Fig. 11-10

11.2 Probe synchronization

To coordinate the relation between probe measuring and image measuring.

Operation procedure:

1 To measure a circle via a probe, such as CIR1;

2 To measure a plane via a probe, such as PLN1;

3 To measure a circle via image, such as CIR2;

4 To meaure a focal surface via image and to measure the same plane via a probe , such as FPN1;

5 Select “probe synchronization” order in Fig 11-1, and below window will popup.

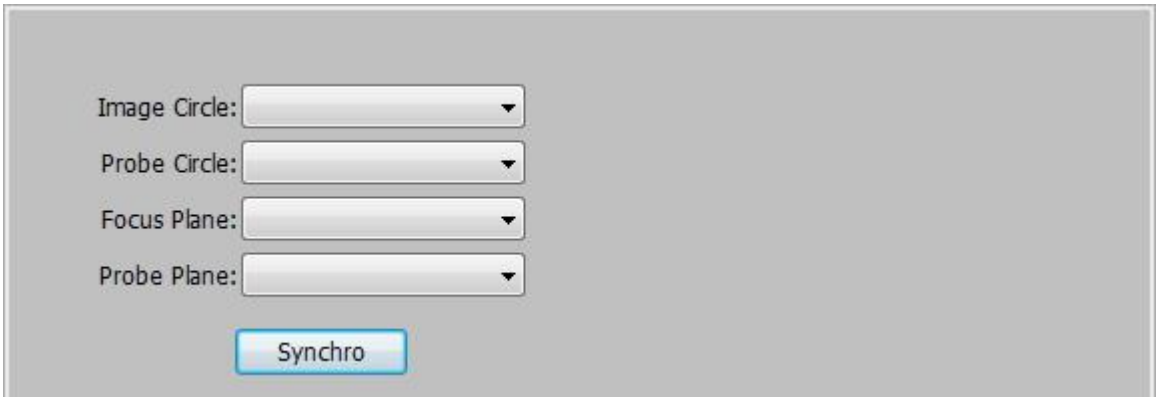


Fig. 11-11

6 Select corresponding element from the pull-down list in Fig. 11-13 and click “synchronization” button, the software will calculate the relation between the elements, when the calculation is completed.

Chapter 12: Selecting Langauge

Fig. 12-1

Simplified Chinese, traditional Chinese, English and other languages are available in INSIZE V2.1.2 software.

Select the language and reopen the software, the language setting up becomes valid.

Chapter 13: Output Setting

Fig. 13-1

Select the main menu "output setting up" and the Excel will output setting up window. Select one output mode out of "default""custom " and "special" as shown in Fig.13-2:

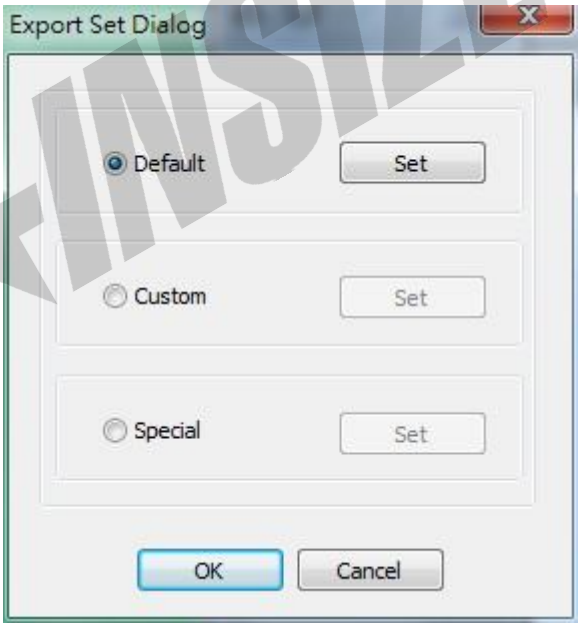


Fig.13-2

1. Default mode

The data will be output according to default mode. The target output elements can be set up in the default setting up window shown below:

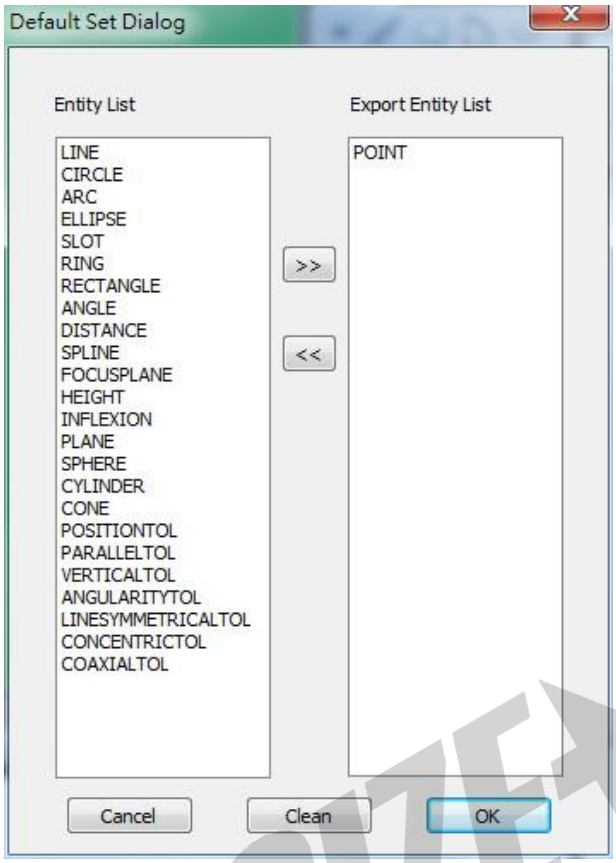


Fig.13-3

Select the target element in the elemetnlist, press >> button to move the target element into the "output element list." Press << button in the "output element list" and the target element will be remove out of the list. Output form is shown in Fig.13-4:

A1 Company

	A	B	C	D	E	F	G	H	I	J	K
1	Company			Workpiece Name							
2	rkpiece serial			Operator							
3											
4											
5											
6	1	Content	Actual	Nominal	Over	UpTol	LowTol	State			
7		Center X	0.4848	0.4845	0.0002						
8	CIR1	Center Y	1.1804	1.1806	-0.0001						
9		robe Point	100								
10		Start X	1.4743	1.4743	0						
11		Start Y	1.8518	1.8517	0						
12		Start Z	0	0	0						
13		Direct L	-2.7691	-2.7691	0						
14		Direct M	0.0471	0.0473	-0.0001						
15	LIN1	Direct N	0	0	0						
16		Length	2.7695	2.7695	0						
17		Angle	179:01:26	179:01:12	00:00:14						
18		+T	0.004	0.0041	-0.0001						
19		-T	0.0036	0.0042	-0.0005						
20		T	0.0076	0.0084	-0.0007						
21		robe Point	100								
22											

Fig.13-4

2. Custom mode

The output content, direction and the bitmap can be set up by custom mode. Output setting up window shows as below:

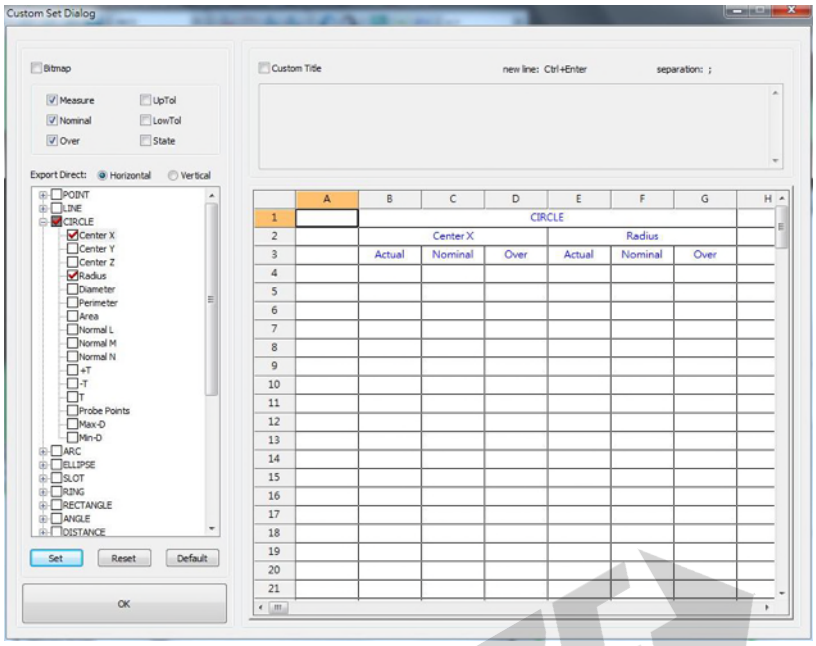


Fig. 13-5

When the bitmap is selected, the current image in the drawing area can be output.

"Horizontal" or "Vertical" order can set up the output direction of the data.

Select the target data in the element list on the left, press "set up" button, the set up form can previewed in the area on the right.

"Reset" button will empty the current setting; "Default" button will fix the the setting. Click the "confirm" button after setting and the current setting will take effect.

Fig. 13-5 is the output result of Fig. 13-6. Repeat the measuring output , the data will be added to the current list and be given a sequence number.

	A	B	C	D	E	F	G	H	I
1	Company			Workpiece Name					
2	orkpiece serial			Operator					
3									
4									
5									
6									
7			CIR1						
8			Center X			Radius			
9		Actual	Nominal	Over	Actual	Nominal	Over		
10	1	0.4845	0.4845	0					
11									

Fig. 13-6

3. Special mode

Special mode can output the data to the user's own Excel file, which can be designed by the user, preset formula computing, conditional format and

other functions of Excel. The user can output the measured data to specific location and set up the output direction and allot sequence number for the data automatically. Output setting up window is shown as Fig.13-7.

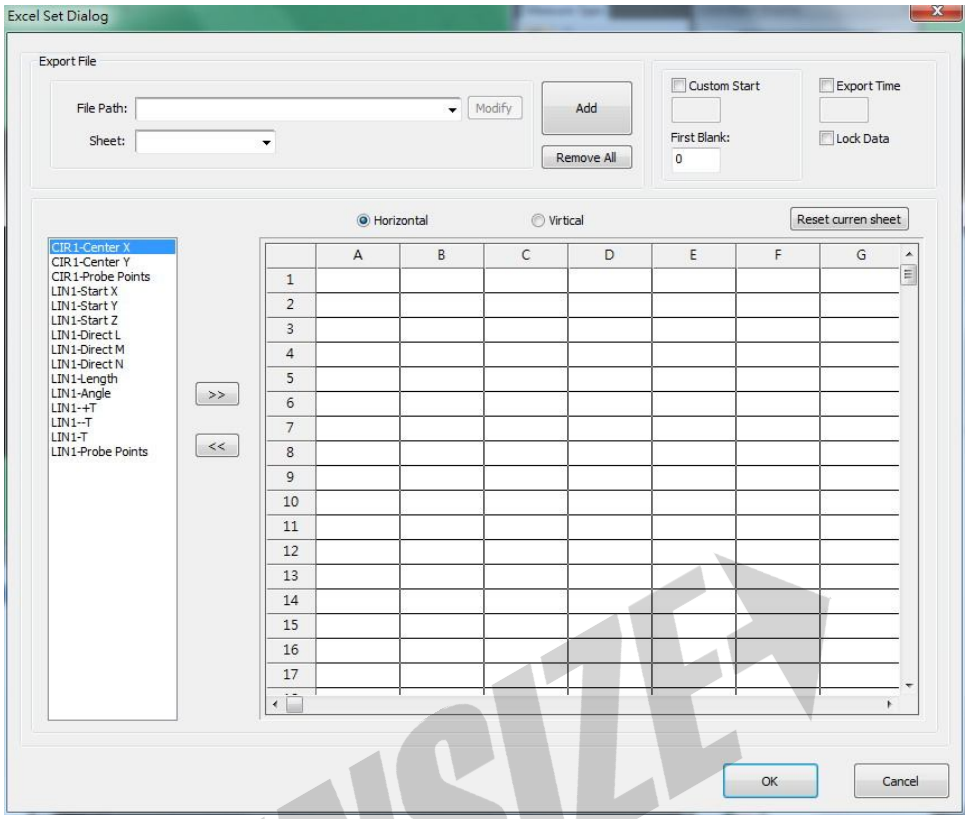


Fig. 13-7

Set up output path, then select the target output page. The starting output line or column can be designated and, whether the first output line or column shall be empty can be set up according to actual requirement. Move the target output data on the left to the designated position in the sheet on the right, the data can be output according to the preset output path. Follow below procedures to designate an output position:

1. Selet target data from the sheet on the left;
2. Click the mouse to select the target cell in the sheet on the right;
3. Move the selected data to the sheet by “>>” button;

The set up data can also be selected from the sheet on the right, then press “<<” button to delete the data and designate new output position. When “horizontal” output is selected, the coordinate of the ouput column can be designated from any line in the sheet on the right. When the data is being output, the procedure can find the coordinate of the line automatically, or output the data from the designated line.

When “vertical” output is selected, the coordinate of the ouput line can be designated from any column in the sheet on the right. When the data is being output, the procedure can find the coordinate of the column automatically, or output the data from the designated column.

Chapter 14: Parameter Setting

Parameter setting up includes software language, basic parameter, default measuring point, data display, user's procedure parameter, edge detecting parameter, systematic error compensation, Excel ouput, USB communication function shown as below:

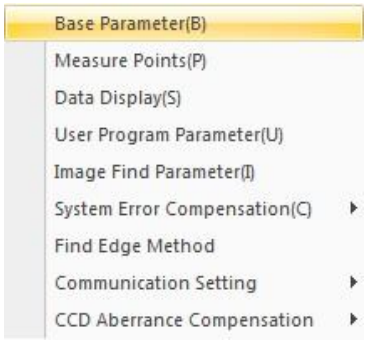


Fig. 14-1

14.1 Set up basic parameter

Fig. 14-2

1. Coordinate display: Cartesian coordinate /polar coordinate
2. Length unit display: mm/inch
3. Angular unit display: degree/ radian/ degree, minute, second
4. Number of decimal point of the data: 1 / 2 / 3 / 4

14.2 Set up default measuring point

Necessary measuring points needed in measuring an element via selecting points.

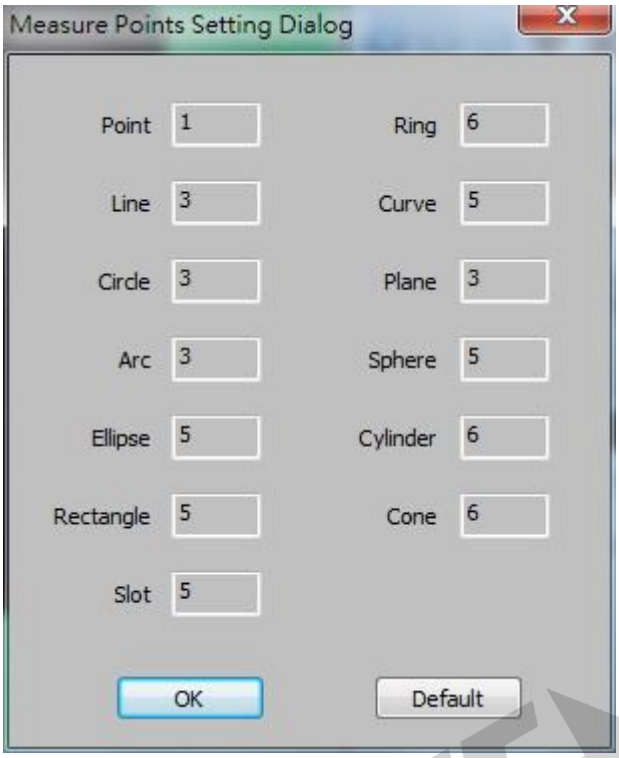


Fig.14-3

Set up number of points:

Point:1 Line:2 Circle:4 Arc:3 Ellipse:5 Rectangle:5 Key slot: 5 Ring : 6

Curve: 9 Plane: 4 Sphere: 5 Cylinder: 8 Cone: 8

14.3 Set up data display

To set up display of features of the elements and tolerance items. While displaying information of the element and outputting the report, specific information can be chosen to display or hide. Take a circle for instance:

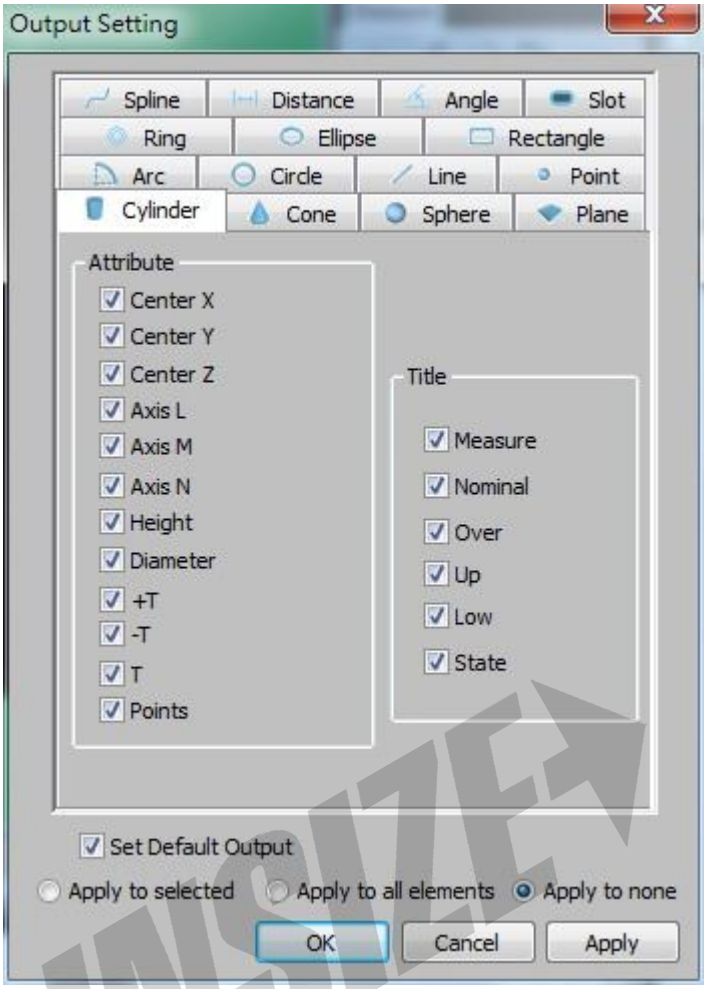


Fig.14-4

All the basic characteristic parameters are displayed in above window. There are ticked a “√” in the left frame before every characteristic parameter. The initial status of “measuring relut window” will display all the information of the measuring elements. The user can choose the target element by deleting the “√” tick. The user also can apply the setting to current elements or all the elements of that category.

Display of the deviation of every element includes measured value, nominal value, deviation value, upper deviation, lower deviation, and status.

Select “set up as default output” and the setting will be applied to the target element.

Select “apply to selected” and the setting will be applied to selected elements of a category.

Select “apply to all” and the setting will be applied to all elements of a category.

14.4 Set up parameter of user’s procedure

User’s procedure parameter setting up includes operation speed, whether Excel shall be output, whether to pause the function when deviation is out of tolerance.

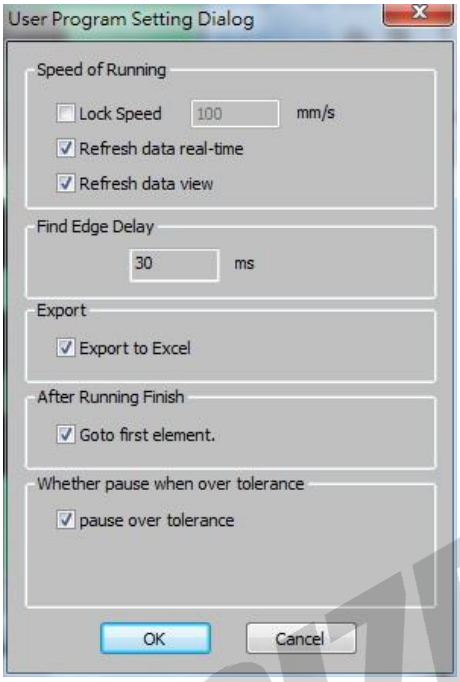


Fig.14-5

Remark: Operation speed setting is unavailable in the sfotware

14.5 Set up edge detecting parameter

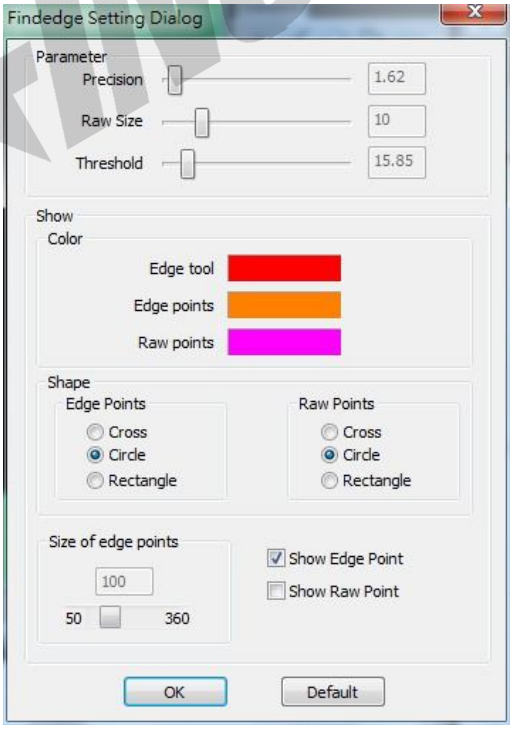


Fig.14-6

1 Set up edge detecting parameter:

Edge detecting accuracy, size of the burr, edge detecting threshold value (unit is pixel)

2. Color display

Set color for edge detector, edge point detector, and the burr.

3 Image display:

Image of edge point detector: cross line, circle, and rectangle.

Image of the burr: cross line, circle, and rectangle.

Set up the number of edge detecting point, and determine whether to display edge detecting point and the burr.

14.6 Systematic error compensation

14.6.1 Systematic error

Deviation is inevitable in measuring. The deviation can be categorized into systematic error, random error and gross error according to the relative relation between deviation measuring value and nominal value. Systematic error is the inherent error results from structural precision of the measuring machine (including maching accuracy, and calibration accuracy of the components and the whole machine), manufacturing accuracy of length sensor, and installation and calibration accuracy.

In terms of measuring result, if continuous measuring of an object in a same workpiece under the same condition with sufficient cycles leads to normal distribution of measuring result, it can be proven that average measuring result of various cycle approaches infinitely close to the expectancy value of that normal distribution. The difference between the expectancy value and the true value is the measuring systematic error.

Random error is the deviation between every measuring relut and expectancy value. Deviation of every measuring is random, but the random errors of many cycles of measuring are in a normal distribution, taking the expectancy value (true value and systematic error) as symcenter with discernible rule. The bigger the discreetness of multiple measuring results, the bigger the random deviation.

Gross error is the deviation caused by random unstable factors such as sudden electromagnetic interference, sudden shock of ground foundation, misoperation, etc. Gross erros is infrequent and easy to discover. If it happens, remeasurment of the workpiece is necessary.

14.6.2 Kinds of systematic error

INSIZE V2.1.2 systematic error compensation includes linear compensation, section compensation, perpendicularity compensation, lens center compensation, etc.

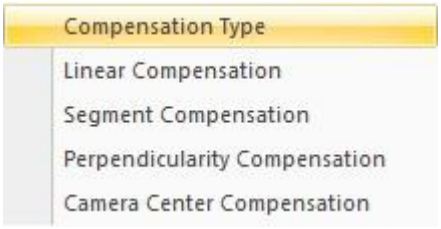


Fig. 14-7

Click “ Parameter setting up—systematic error compensation—select compensation type” in the main menum below window will popup, input the password, click “confirm” button, then select the specific type of systematic error compensation.

Fig. 14-8

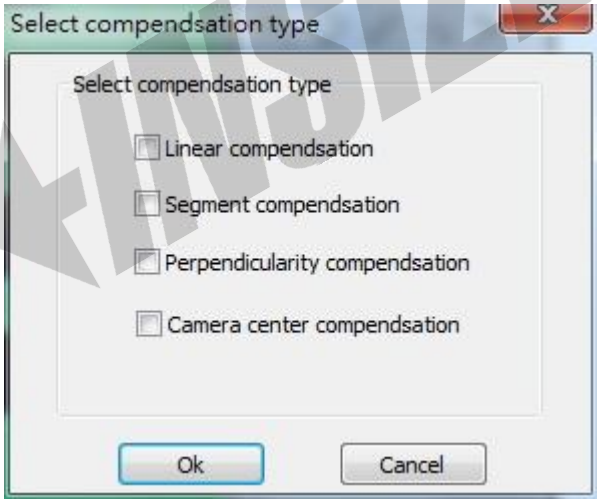


Fig. 14-9

1 Coordinate positioning deviation

Definition: When the workpiece moves along X axis, the difference between the displayed value of displacement system and the true value D_{XX} is coordinate positioning deviation ;

Similarly, when the workpiece moves along Y axis, there is also coordinate positioning deviation D_{YY}、D_{ZZ};

Type: linear compensation or section compensation.

(1). Linear compensation

Operation procedure: Click “Parameter setting up—systematic error compensation—linear compensation” in the main menum below window will popup Fig.14-10.

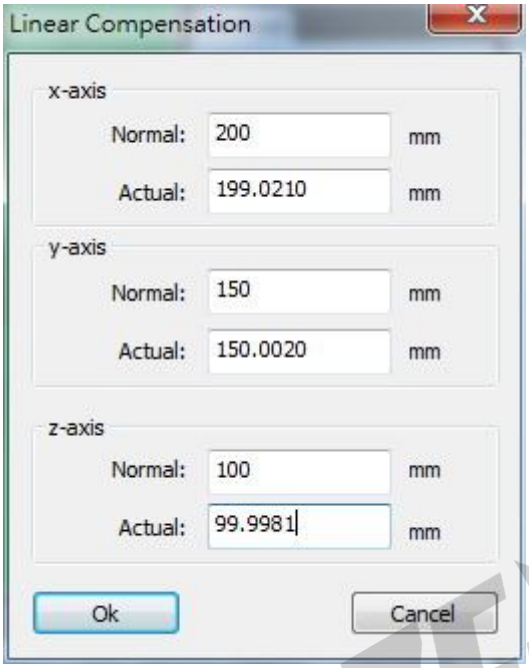


Fig.14-10

(2) Section compensation

Section compensation is piecewise linear compensation—to divide the travel of the coordinate into several sections, and make linear compensation within every section. Any error curve can be approached by multiple sections of polygonal line. Theoretically, the more sections, the better approaching effect.Section error compensation can eradicate non-linear error of positioning of the coordinate, and its effect is better than that of the linear compensation.

Section compensation can not only be done independently, but also be done after linear compensation.

Click “Parameter setting up—systematic error compensation—section compensation” in the main menum below window will popup(Fig.14-11):

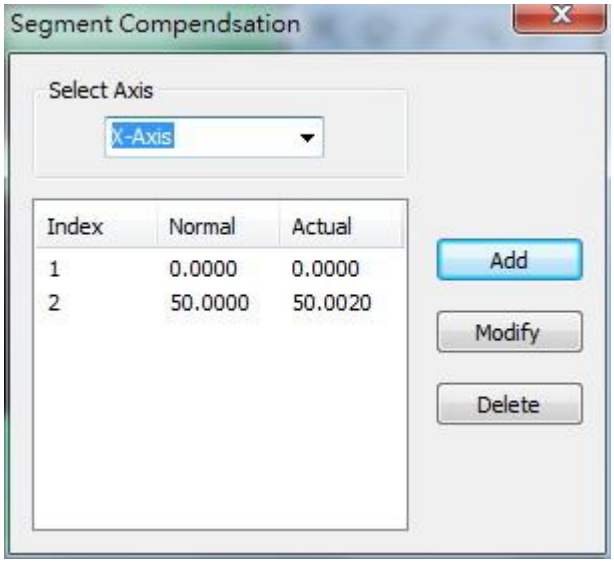


Fig. 14-11

Operation of node:

A: Add node

Select "add" button in Fig. 14-11, below window will popup. Input the number of new node (standard value and measuring value), click "confirm" button, the tail number of the node in the section compensation list will increase by 1 automatically against the input number, a new node is thus generated.

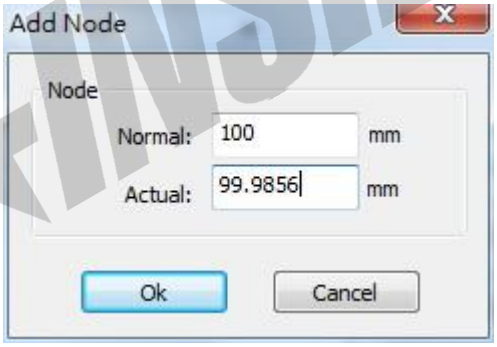


Fig. 14-12

B: Modify node

Select the target node in Fig. 14-11, then click "modify" button, below window will popup shown below. Modify the corresponding data in the window (standard value or measuring value), click "confirm" button, the data in section compensation list will update.

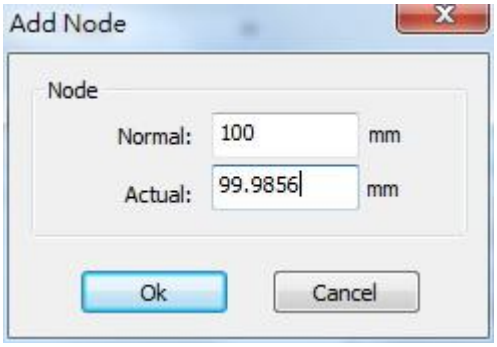


Fig. 14-13

C: Delete node

Select the target node, click "delete" button in Fig. 14-11, the target node will be deleted.

2: Perpendicularity compensation

Objective: To eradicate additional deviated caused by two moving parts whose moving axes are not totally perpendicular. By availing of perpendicularity compensation, the measuring results of the same workpiece in the machine from various directions can be consistent.

Operation procedure: Click "Parameter setting up—systematic error compensation—perpendicularity compensation" in the main menum, below window (Fig. 14-14) will popup:

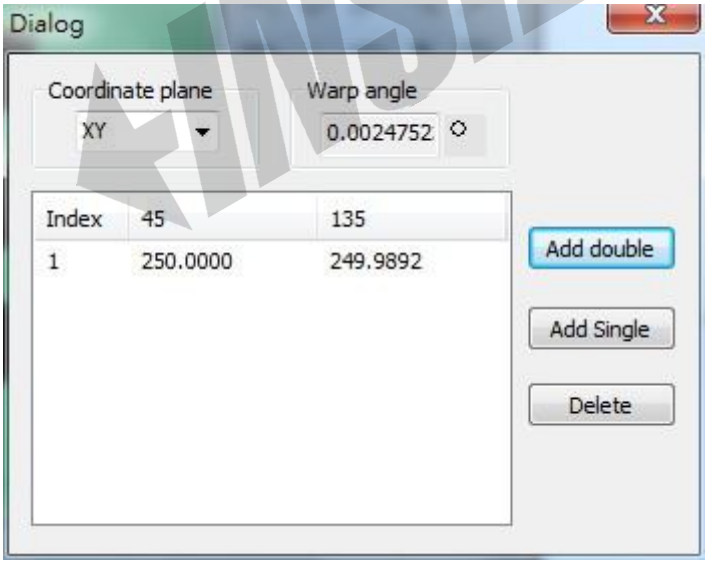


Fig. 14-14

(1) Add two values

Click "add two values" button in perpendicularity compensation window (Fig. 14-14), below window (Fig. 14-15) will popup. Input the measuring value of two directions (two values must be input) ,click "confirm" button, the data will be added to perpendicularity compensation list.

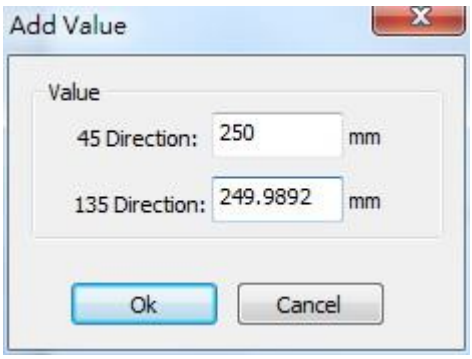


Fig.14-15

(2) Add a value

Click “add a value” button in perpendicularity compensation window (Fig.14-14), below window (Fig.14-16) will popup.Input the measuring value,click “confirm” button, the data will be added to perpendicularity compensation list.

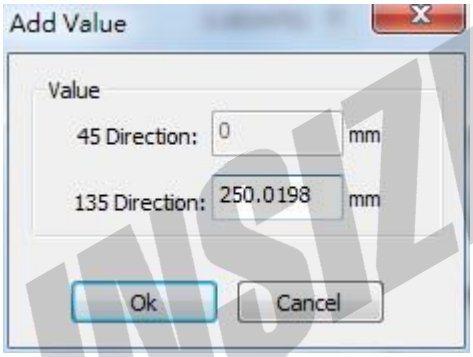


Fig.14-16

(3) Delete

Delete the last set of data in perpendicularity compensation list.Click “delete” button in perpendicularity compensation window (Fig.14-14),below window (Fig.14-17) will popup.Click “Y”button,the data will be deleted,click “N”button the data will not be deleted.

Fig.14-17

3 Lens center compensation

Measure a standard circle under 0.7X magnification, take the center of the circle as cardinal point of the coordinate. Change the magnification to 0.85X, adjust the illumination source and focus to measure this circle and so on. When the coordinate of the center of this standard circle under various magnifications are obtained, click "confirm" button, lens center will be compensated.

SCALE	OFFSET-X	OFFSET-Y
0.7X	0.0000	0.0000
0.85X	-0.0121	0.0060
1.0X	-0.0124	0.0070
1.2X	-0.0104	0.0050
1.4X	-0.0092	0.0078
1.6X	-0.0079	0.0065
2.0X	-0.0054	0.0065
2.3X	-0.0034	0.0035
2.7X	-0.0040	0.0043
3.2X	-0.0042	0.0016
3.8X	-0.0058	0.0003
4.5X	-0.0065	0.0007

Fig. 14-18

14.7 Set up edge detecting method

Different edge detecting methods should be set up according to different measuring elements of the workpiece.

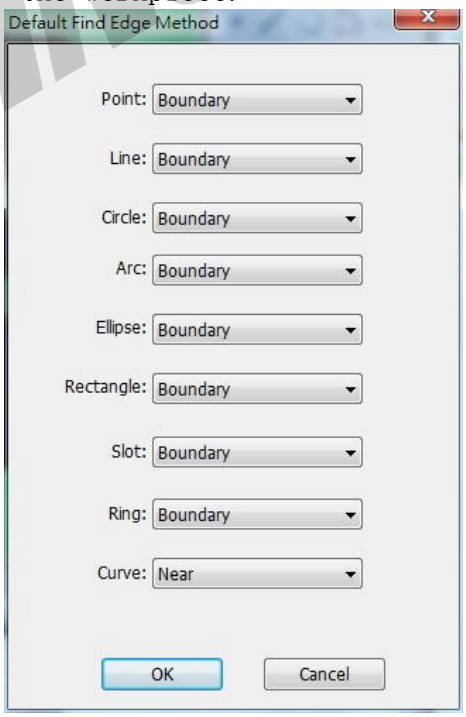


Fig. 14-19

14.8 Set up communication

Fig. 14-20

14.8.1 Select communication port

Communication ports are USB302, USB303, DC3000/DC200.

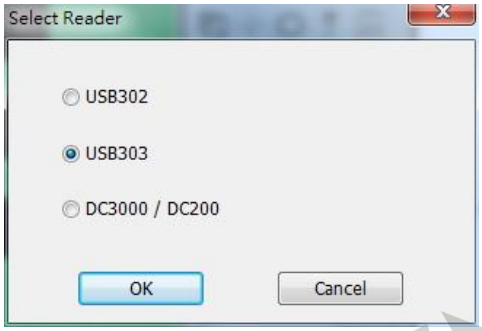


Fig. 14-21

14.8.2 Set USB port

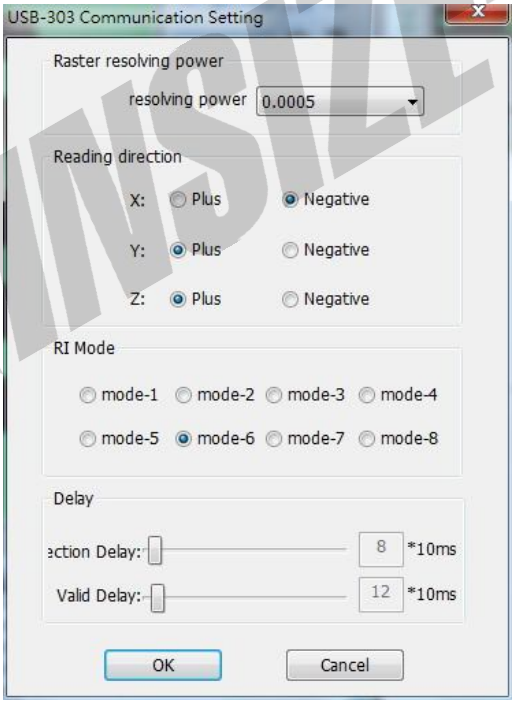


Fig. 14-22

(1) Set up resolution： Set up pulse equivalent of the linear scale

(2) Set up count direction： Set up positive count direction of the instrument. The positive direction of three axes should meet right-hand rule.

(3) Set up RI mode：Set up zero mode of the instrument. The default value is mode 8.

(4) Set up delay time:

Direction delay time--- The interval between selecting two data from the same

point (The default value is 8)

Valid delay time—— The minimum time of valid collision (The default value is 12).

14.8.3 Set up RS232

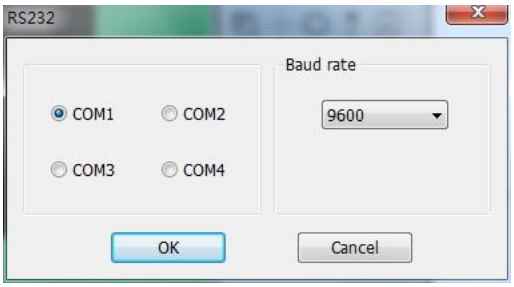


Fig. 14-23

14.9 CCD distortion compensation

Fig. 14-24

14.9.1: CCD distortion compensation

1 Align the mesh Put the mesh, which comes with the machine, on the work table, align the mesh with the worktable as far as possible. Draw lines—edge detecting tool, intersection angle between current mesh and horizontal direction will real-time display on the upper left corner of the image area. Fine-tune the mesh, when the intersection angle is less than 0.3 degree, a prompt will indicate the mesh is already aligned for next step.

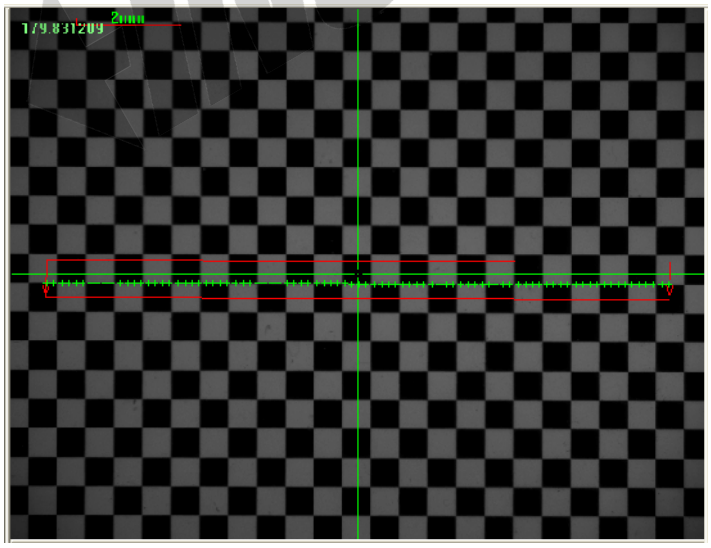


Fig. 14-25

2 Generate compensation table。

Click “Config”button on the window, information of the mesh will prompt, click “Table” button, compensation table will start. When “Config” indicates error information, it is necessary to check compensation file or adjust the mesh.

14.9.2 Start distortion compensation

Chapter 15: Interference measuring

Interference measuring is to measure the thickness of coating film point to point, surface to face by a white light interferometer shown as below:

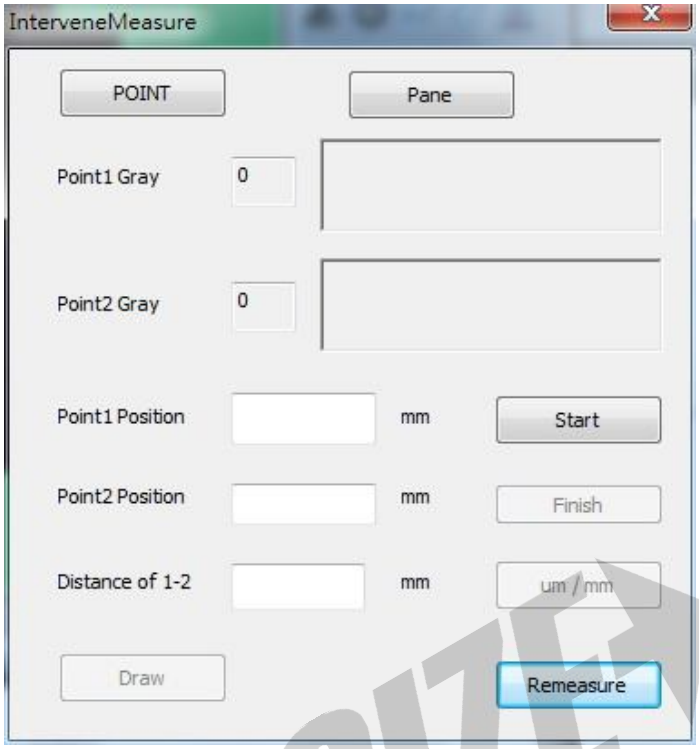


Fig. 15-1

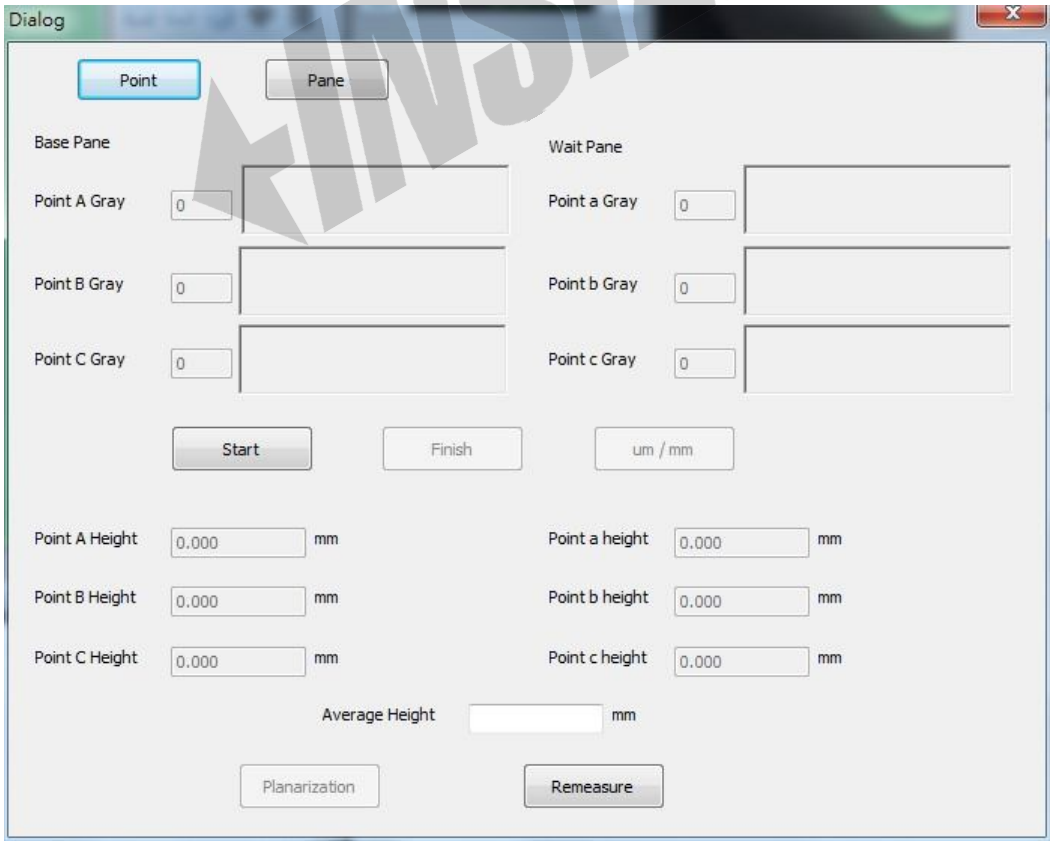


Fig. 15-2

Chapter 16: Professional Tool

Fig. 16-1

Statistical Process Control

SPC (Statistical Process Control) is an effective way to improve enterprise management. By using mathematic statistics principle, data can be collected and analyzed to achieve preventive effect, thus the production process can be effectively controlled and quality of the product can be continuously improved.

SPC(Statistical Process Control), developed by our company, is mainly used in our measuring machine. When the measured data is input into SPC, various frequently used control chart can be generated. The control charts include average range control chart, standard deviation control chart, median range control chart, individual and moving range control chart, histogram, CPK transition diagram, specification and processing standard deviation control chart, processing analysis chart, processing proposal and analysis chart, etc. The generated charts can be judged by eight decision rules, therefore, the user can have a timely understanding of the product quality.

1. Start SPC: Click this menu and SPC software can be opened. Set up name of the target product, number, name of the checkpoint, name and number of the inspector (Details please refer to "SPC help"). Select output element and below window will popup:

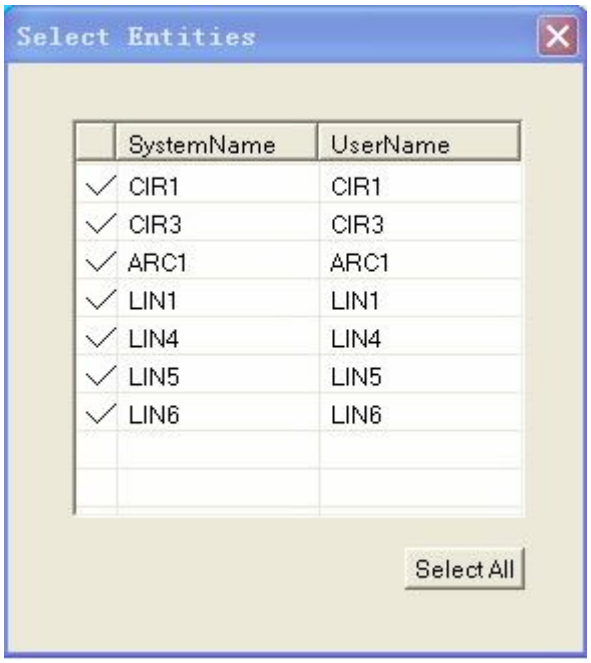


Fig. 16-2

2. Select the target output elements to SPC. Click √ (Yes), or ×(No). If "Select all" button is pressed, all the elements will be output to SPC.

3. Output data: If this menu is selected, every measured data will be automatically input into SPC. If this menu is not selected, the data will not be input into SPC.

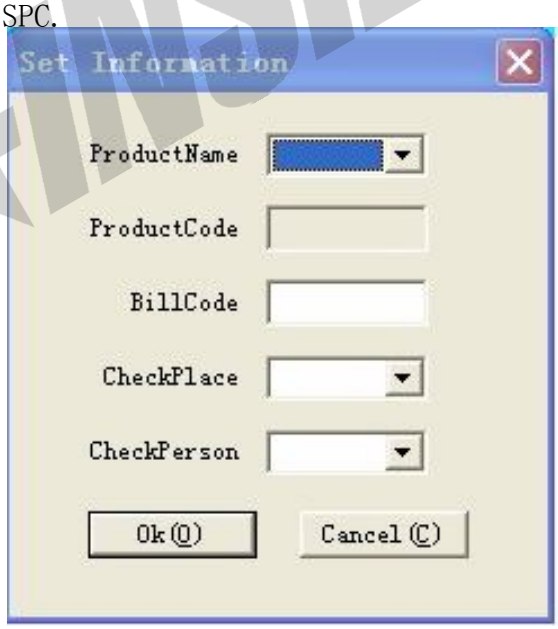


Fig. 16-3

When "output data" menu is selected, the output information should be set up, which includes name of the product, number (must be sole), checkpoint, inspector.

4. Output data of current user's procedure: This menu is used to output

the data of current user’s procedure. If the “output data” menu is not selected, or output information is not set up, the data of current user’s procedure will not be input into SPC. If this is the case, set up “output data” menu and input the data to SPC in case it will lose.
Specific function and operation of SPC software please refer to SPC instruction book.

Chapter 17: Operation of machine

17.1 Find zero position of linear scale

If “find zero position” software is to be set up, below windows will popup for the user to find zero position of X, Y, and Z axis. Click “start” button, the user can move X, Y, and Z axis to find their zero position.

Fig.17-1

Fig.17-2

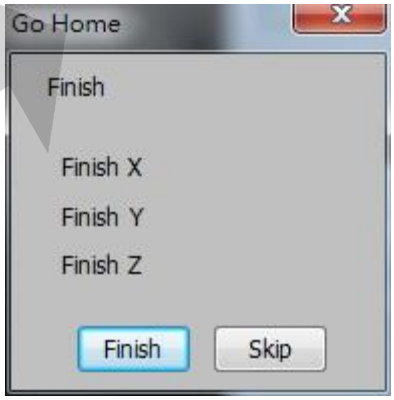


Fig.17-3

Remark:

1. Ensure there is no object on the worktable in case the object might be damaged during operation of the machine.
2. Until zero positions of X, Y, and Z axis have been found can this window be closed.
3. When zero position has been found, the software starts properly, and then the machine can be operated.

Chapter 18: Tolerance

Geometrical tolerance can be divided into position tolerance and form tolerance.

Position tolerance:

Position tolerance is the maximum allowable change of position of relevant geometrical elements against the standard elements. Two dimension position tolerance includes orientation tolerance and location tolerance. The software can provide parallelism, perpendicularity, skewness, concentricity, and position accuracy.

Location tolerance is the maximum allowable change of position of relevant geometrical elements against the standard elements. It includes position accuracy, concentricity and degree of symmetry.

Form tolerance:

Form tolerance is the maximum allowable change of the form of a single element. It includes straightness, planeness, roundness, sphericity, cylindricity.

18.1 Form tolerance

While measuring a line, circle, plane, cylinder, and sphere, if measuring points exceed 2, 3, 3, 6, 4 respectively, the form tolerance of corresponding element will display in "element information list." Accuracy and rationality of the measured data can be judged by form tolerance value. If the measured form tolerance value is tremendous, the set of data might have gross error. Therefore, it is necessary to remeasure a set of data or delete abnormal selected points from form tolerance list to improve measuring accuracy.

Nominal value of form tolerance:

Operation procedure: Form tolerance value can be viewed in Fig.18-1. Form tolerance value can also be modified (In default setting, nominal value of form tolerance equals measuring value).

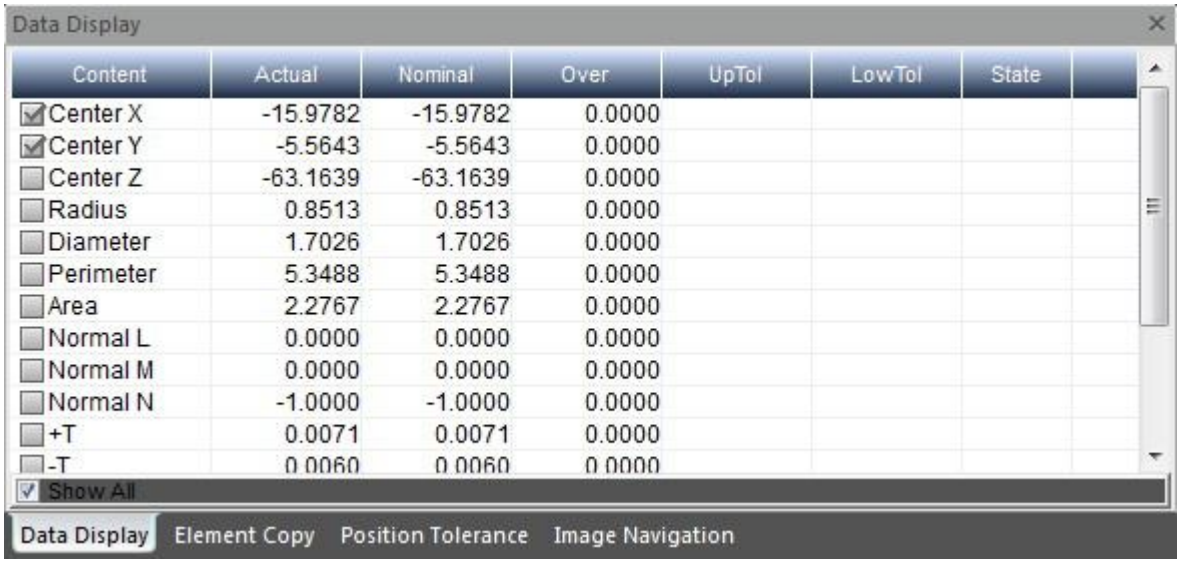


Fig. 18-1

Form tolerance chart:

Points with big deviation in the form tolerance chart, which is used to measure line, circle, plane, cylinder and sphere, can be deleted according to requirement. Form tolerance chart of an element can be printed, property of form tolerance can be viewed as well.

Operation procedure: Select target line, circle, plane, cylinder, and sphere in “element display area” or drawing eara, click the right key, select “form tolerance chart” in the appeared menu, below window will popup (Fig. 18-2):

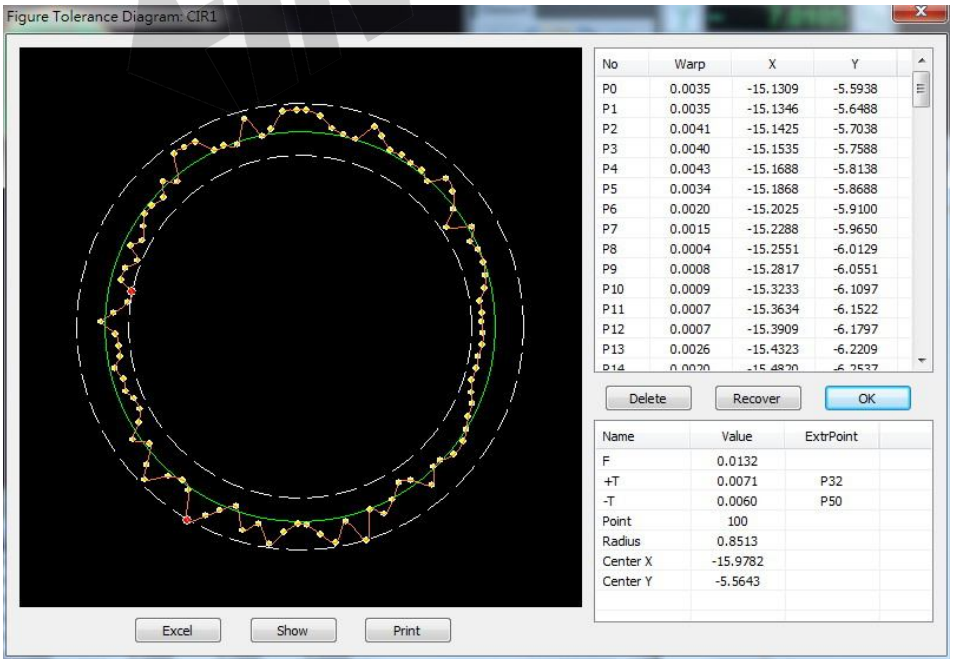


Fig. 18-2

Delete: Click “delete” button to delete selected points in image area

or list.

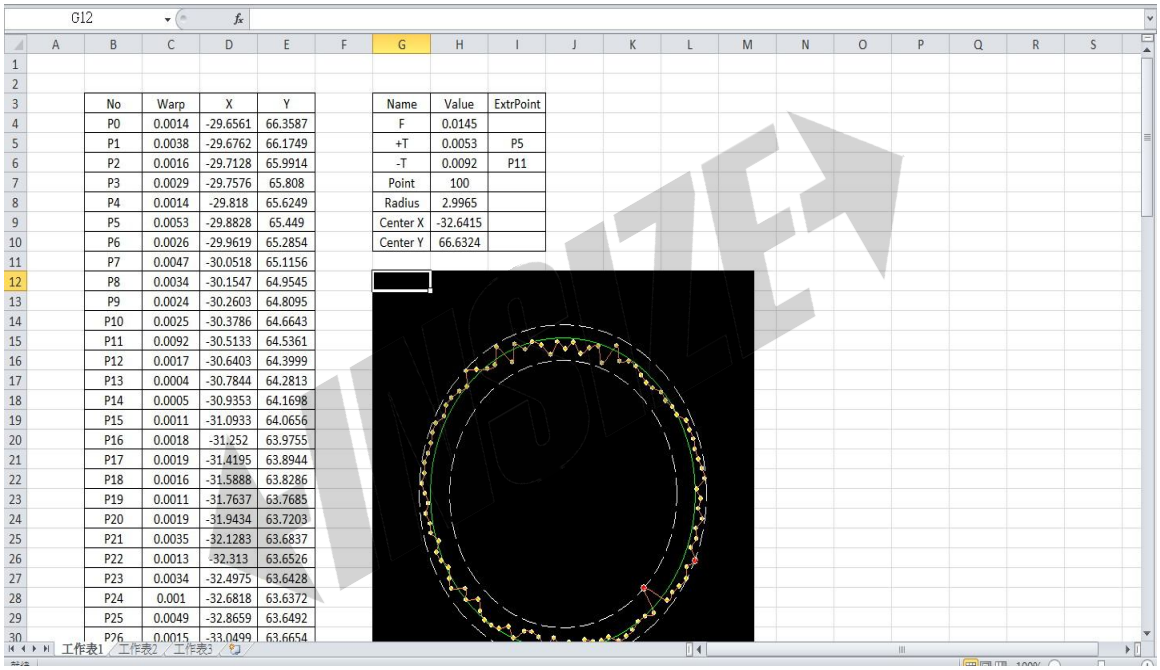
Restore: Click “restore” button and the deleted points will be restored.

Display: Click “display” button and name of the selected point will displayed in the image area. After clicking “display” button, the name of the button will change to “Blank”. Click “Blank” button, the name of the selected points will not be displayed in the image area.

Print: Click “print” button and the current chart can be printed.

Property: Form tolerance properties of current elements include form tolerance value, plus-minus tolerance, points, maximum and minimum deviation point.

Excel: Output Excel file as below:



No	Warp	X	Y
P0	0.0014	-29.6561	66.3587
P1	0.0038	-29.6762	66.1749
P2	0.0016	-29.7128	65.9914
P3	0.0029	-29.7576	65.808
P4	0.0014	-29.818	65.6249
P5	0.0053	-29.8828	65.449
P6	0.0026	-29.9619	65.2854
P7	0.0047	-30.0518	65.1156
P8	0.0034	-30.1547	64.9545
P9	0.0024	-30.2603	64.8095
P10	0.0025	-30.3786	64.6643
P11	0.0092	-30.5133	64.5361
P12	0.0017	-30.6403	64.3999
P13	0.0004	-30.7844	64.2813
P14	0.0005	-30.9353	64.1698
P15	0.0011	-31.0933	64.0656
P16	0.0018	-31.252	63.9755
P17	0.0019	-31.4195	63.8944
P18	0.0016	-31.5888	63.8286
P19	0.0011	-31.7637	63.7685
P20	0.0019	-31.9434	63.7203
P21	0.0035	-32.1283	63.6837
P22	0.0013	-32.313	63.6526
P23	0.0034	-32.4975	63.6428
P24	0.001	-32.6818	63.6372
P25	0.0049	-32.8659	63.6492
P26	0.0015	-33.0499	63.6654

Name	Value	ExtrPoint
F	0.0145	
+T	0.0053	P5
-T	0.0092	P11
Point	100	
Radius	2.9965	
Center X	-32.6415	
Center Y	66.6324	

Fig.18-3

18.2 Position tolerance

Positon tolerance in INSIZE V2.1.2 software includes two dimension geometrical element and three dimension geometrical element tolerance as shown below:

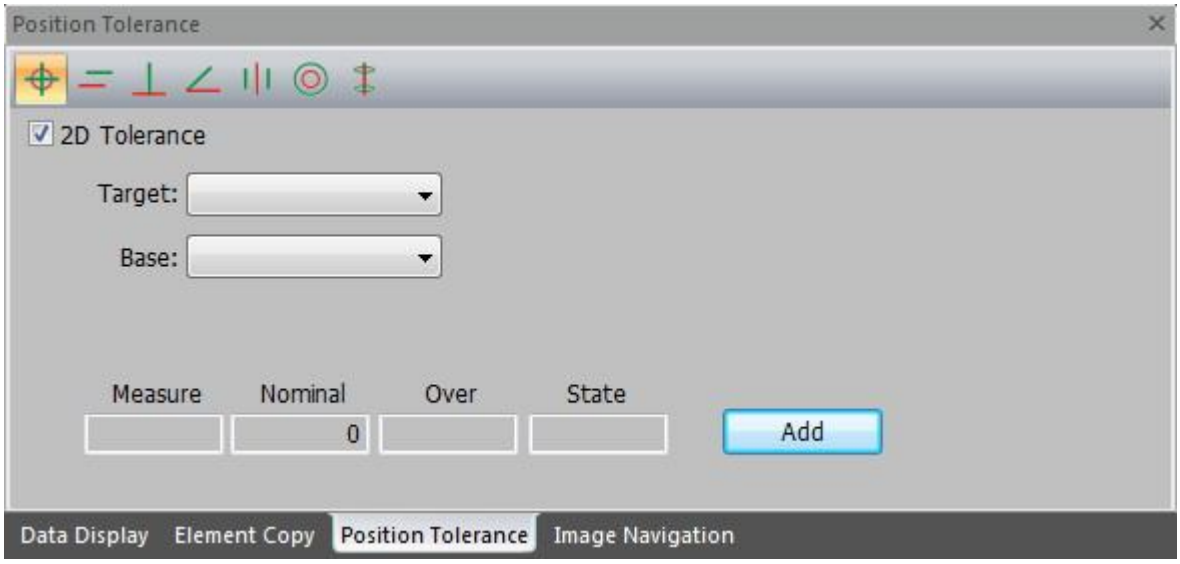


Fig. 18-4

As shown above, tick two dimension tolerance, three dimension tolerance is not ticked.

Operation method: Take measuring concentricity of two circles for instance.

1. Select “position tolerance” menu on the right of element list window.

2. Select  and below window will popup:

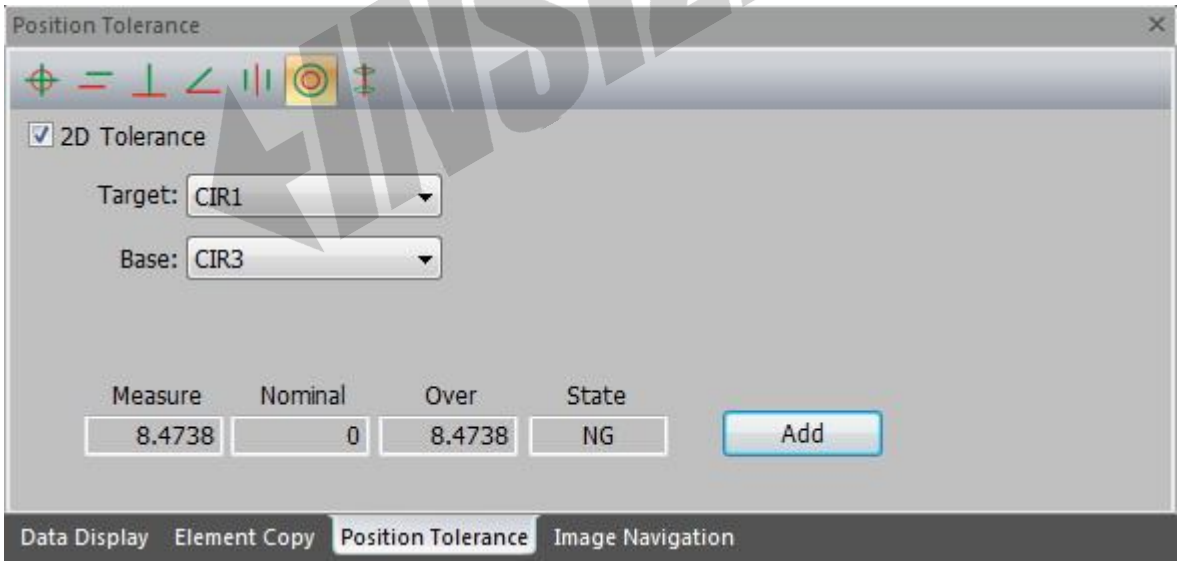


Fig. 18-5

3. Tick two dimension element in Fig. 18-5, click pull-down list to select tolerance element and basic elemetn, the software will calculate concentricity (measuring value) of the cirle, calculate exceeding tolerance value and judge whether the status is OK or NG.

4. Click “add” button, the name of concentricity will be added into the element list.

Operation of other position tolerances is smilar to above procedure.

Type of position tolerance	Tolerance element	basic elemetn	Two dimension tolerance	Tree dimension tolerance
Position accuracy	Point in broad sense	Point in broad sense	√	√
	Line	Line	√	√
	Plane	Plane	×	√
Parallelism	Line	Line	√	√
	Line	Plane	×	√
	Plane	Line	×	√
	Plane	Plane	×	√
Perpendicularity	Line	Line	√	√
	Line	Plane	×	√
	Plane	Line	×	√
	Plane	Plane	×	√
Skewness	Line	Line	√	√
	Line	Plane	×	√
	Plane	Line	×	√
	Plane	Plane	×	√

Type of position tolerane	Tolerance element1	Tolerance element2	Standard element 1	Standard element 2	Two dimension tolerance
Position accuracy	Line	Line	Line	Line	√

Type of position tolerane	Tolerance element	standard element	Two dimension tolerance	Three dimension tolerance
Concentricity	Point in broad sense	Point in broad sense	√	√
Coaxility	Cylinder	Cylinder	×	√
	Cylinder	Cone	×	√
	Cone	Cylinder	×	√
	Cone	Cone	×	√

Remark: In measuring two dimension tolerance, elements and selected points will be projected onto XY plane prior to corresponding calculation.

Chapter 19: Help

Fig. 19-1

19.1 Review documentation

No such function available at the time being.

19.2 Interface layout

According to customer’s requirement, operation port of the software can be redesigned.

19.3 Set up function

Seldom used functions can be closed according to customer’s requirement.

Fig. 19-2

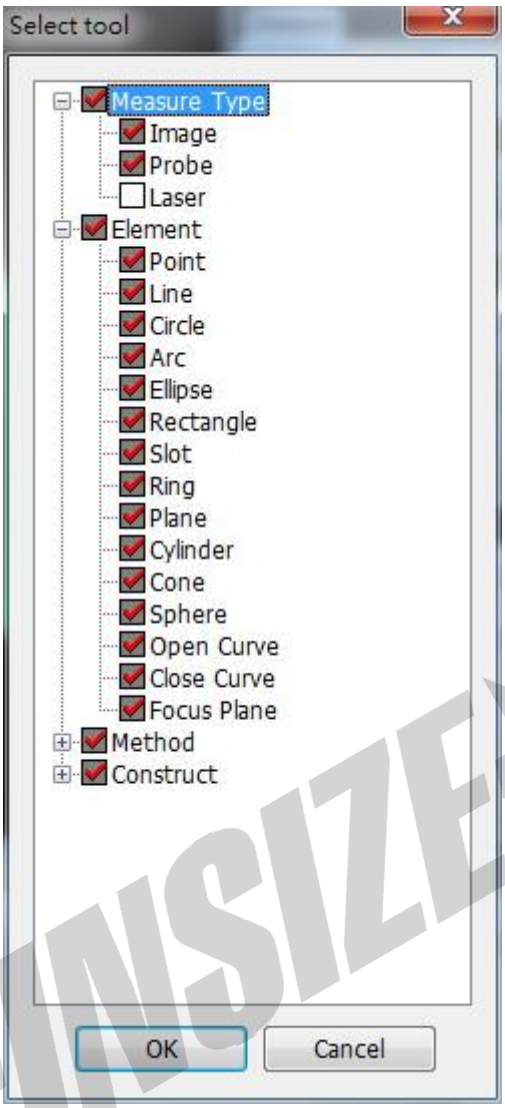


Fig. 19-3

19.4 User permission

INSIZE V2.1.2 can define user's right to operate the software. User permission can be divided into general user permission and administrator permission. General user can only execute user's procedure. The administrator can execute all functions of the software.

Fig. 18-4

19.5 Check parameter

To calibrate seven measuring parameters in video measuring machine calibration criterion shown as below:

19.6 Reference

INSIZE V2.1.2 software version and encryption card ID number can be reviewed shown as below:

Fig.19-5