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TTCJAN2021

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CHAPTER 1
FEATURES

TOLTEC V7.0

- **Perform General Measurement Function**

POINT

LINE

SQUARE

CIRCLE

ARC

ANGLE

HORIZONTAL DISTANCE

VERTICAL DISTANCE

DPP

DPL

- **Definite the axes**

  Of a point, a line (two ends), the centers of a circle, an arc and an angle.

- **Circle comparison and Square comparison**

  Draw wanted circle or square to compare with the measuring piece.

- ## CAD Comparison

  Determine the works by comparing with its CAD image

- ## Measuring Range

  As the applied machine's full travel range.

- ## Crosshair Rotation

  Rotating the crosshairs to parallel with workpiece.

- ## Fine Tune

  Use the arrow keys of a keyboard to make fine movements of the cursor crosshair, allow the user to select the target precisely and can avoid the mistakes by hand.

- ## Data Save and Export

  The measuring data can be saved as the 5 formats of .dxf (CAD), .jpg and .xls (Excel).

- ## Position Sync

  Synchronizing the position data from the machine control vi network or monitoring.

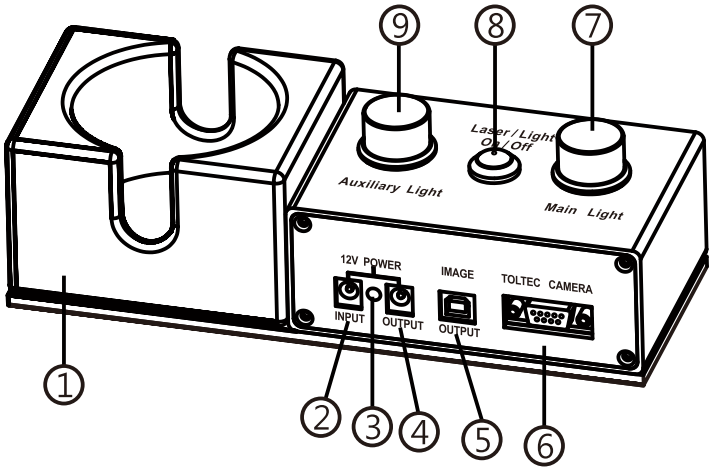
- ## Short-Cut

  Restrict the measuring tools to certain keyboards, the measuring operations can operate only by keyboard.

CHAPTER 2
INSTALLATIONS

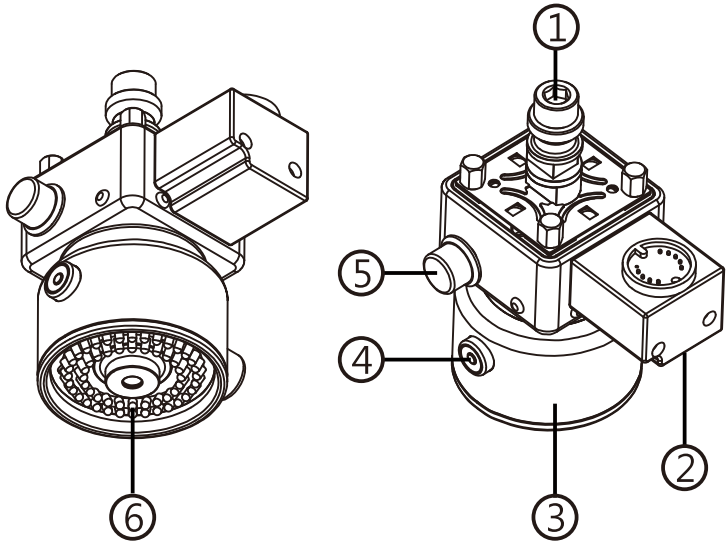
A. INTRODUCTION OF HARDWARE

1. ADAPTER BOX



1.Camera Mount
2.DC12V Input
3.Power Indicator Light
4.DC12V Output
5.USB Interface
6.Camera Signal Cable Interface
7.Main Light Knob
8. Main Light/Laser Switch
9.Auxiliary Light Knob

2. CAMERA DESCRIPTION



1.Fixture (EROWA or 3R or NB or Customization)

2.Signal Output

3.Body

4.Main Light/Laser Switch

5.Main Light Knob

6.Main Light

CAMERA SPECIFICATION SHEET

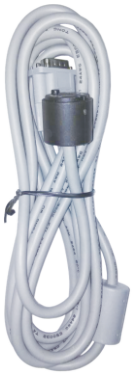
ADVANCED SET/ PROFESSIONAL SET SPECIFICATION

Sensor	AR0134
Shutter	Global Shutter
Max. Image Circle	1/3"
Sensor Type	CMOS
Sensor Size	4.8mm x 3.6mm
Resolution (HxV)	1280px x 960px
Resolution	1.2MP
Pixel Size(HxV)	3.75µm x 3.75µm
Frame Rate	54 fps
Mono/Color	Mono

Camare Date

Interface	USB 3.0
Pixel Bit Depth	8, 12 bits
Synchronization	▪ hardware trigger ▪ free-run ▪ software trigger
Exposure Control	▪ programmable via the camera API
Digital Input	1
Digital Output	2
General Purpose I/O	3
Power Requirements	▪ Via USB 3.0 interface
Power Consumption (typical)	1.2W
Operating	0-50°C

3.Camera Signal Cable



4. USB Image Signal Cable

5. DC12V Power Supply

6. Network Cable

SPECIFICATION

INPUT : 10-240VAC 50/60HZ 1.4A

OUPUT : 12V 5A 60W

B. INSTALLATION OF SOFTWARE

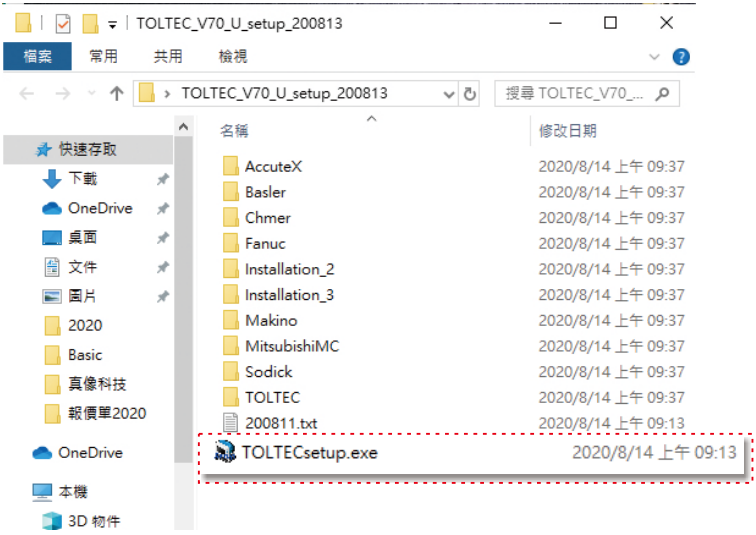
1. SPECIFICATION OF COMPUTER

a. WINDOWS System WIN 7,WIN8,WIN10

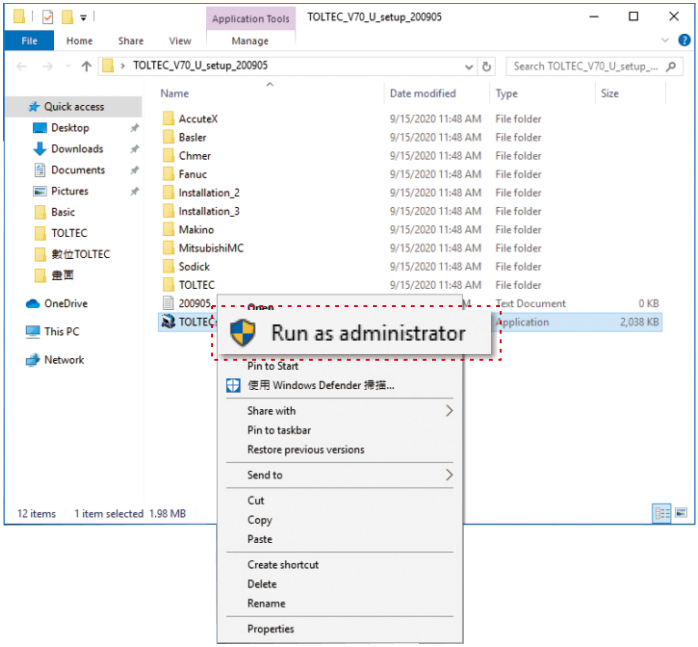
b. Desktop with 15-inchor above monitor, or 15-inch or above notebook, or 15-inch or above tablet

2. INSTALLATION

1. Load the TOLTECV7.0 software into computer and open the folder.



2. Select"TOLTEC setup" and right-click, and select "Run as a system administrator(A)"

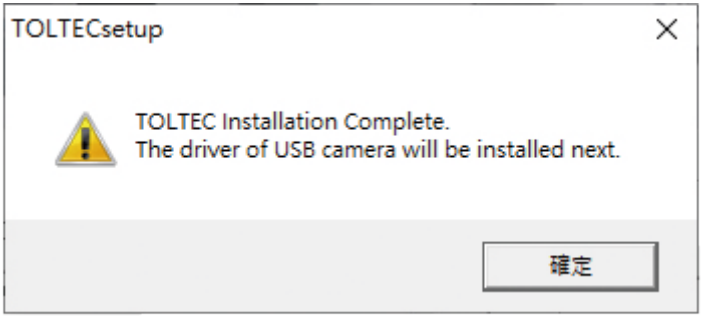


3. "Windows has protected your PC"is displayed, select "other information".

4.Select"Run anyway".

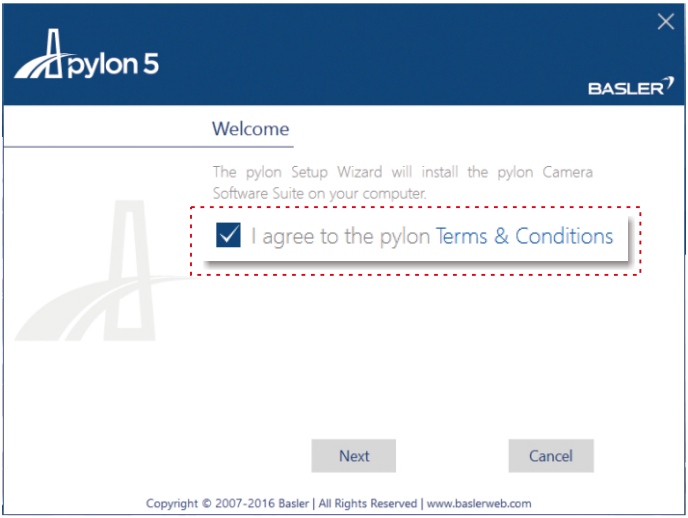
5. Select the installation directory and language, then click "Install"

6. The installation is complete, select "OK".



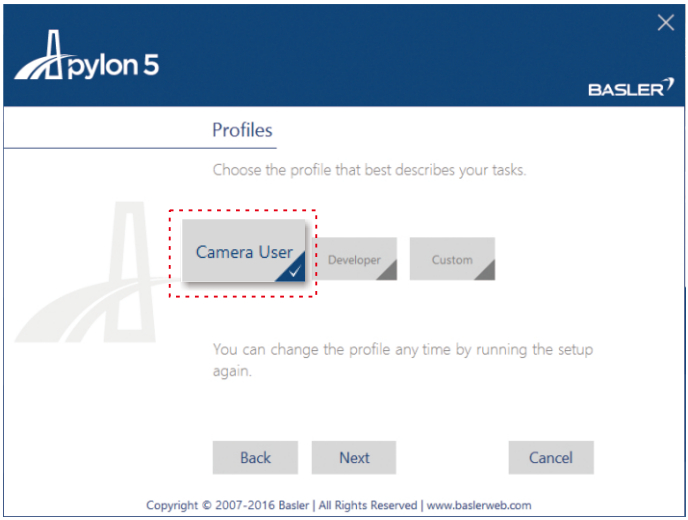
7. Install the camera driver.

8. Select "I agree to the pylon Terms&Conditions" .



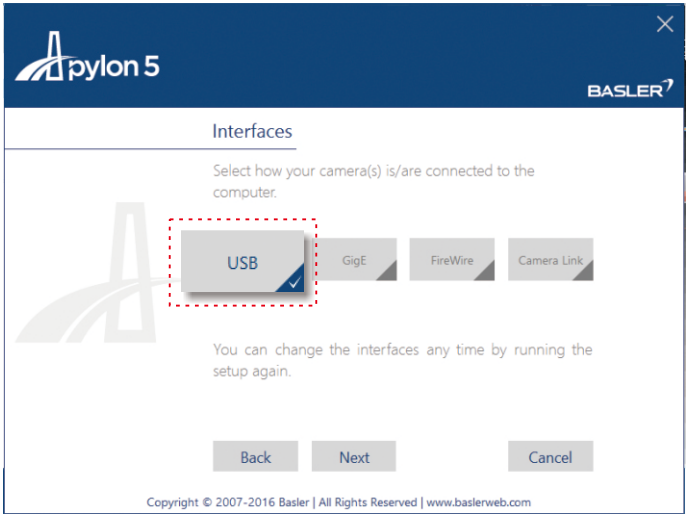
9.Select "Next".

10. Select "Camera User".

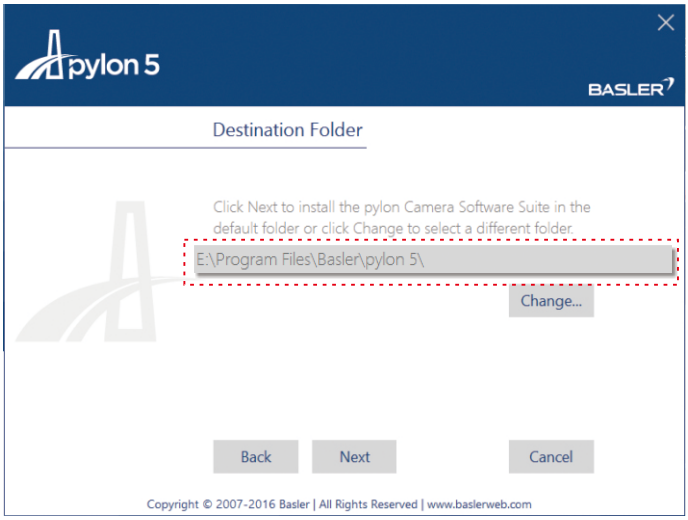


11.Select "Next".

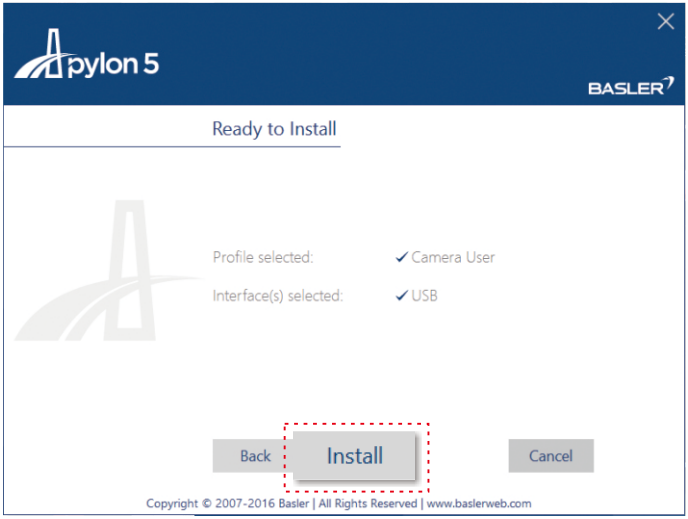
12.Select "USB".



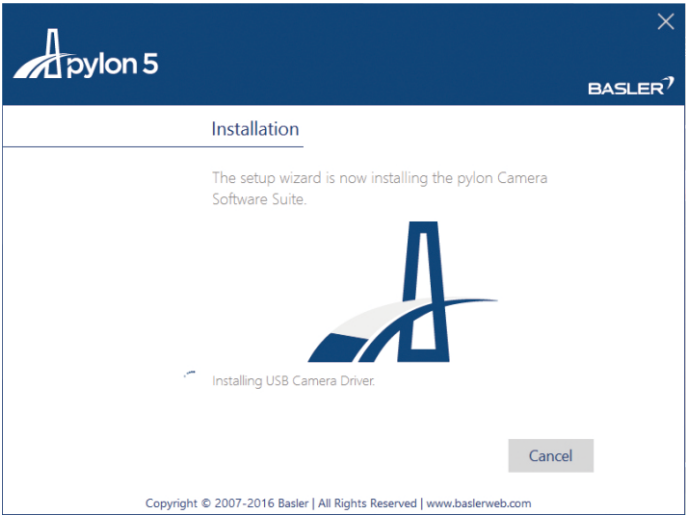
13. Select"Next" .
14. Installation directory.



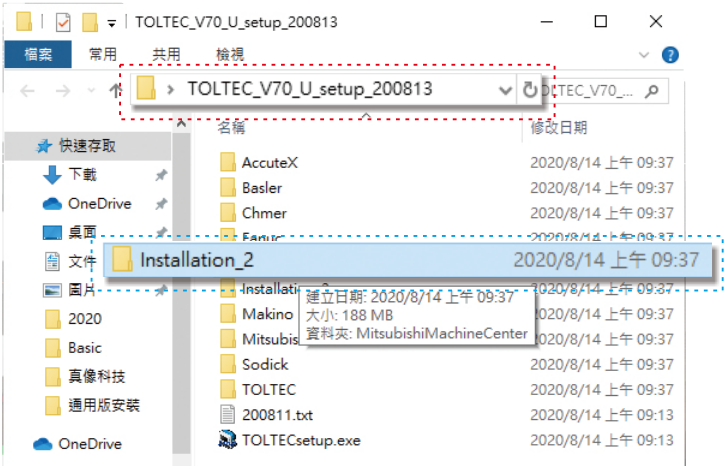
15. Check the installation object, select "Install" after confirmation.



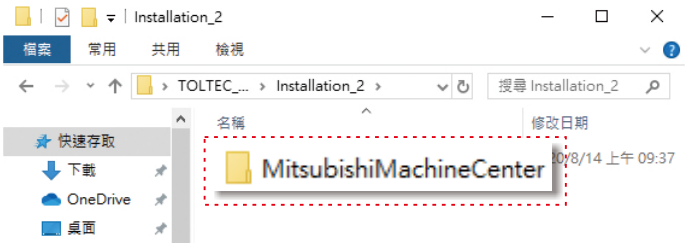
16. Start to install the camera driver.



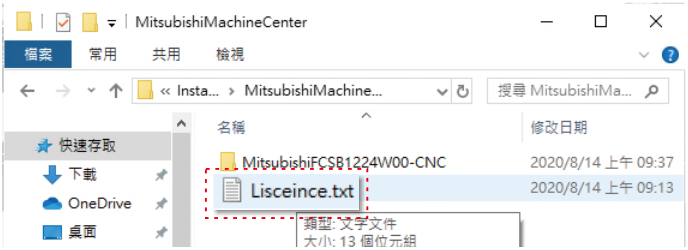
17. After completing installation, go back to "TOLTECV70_SETUP" folder, select Installation_2,and install Mitsubishicontroller driver.



18. Select "MitsubishiMachineCenter".

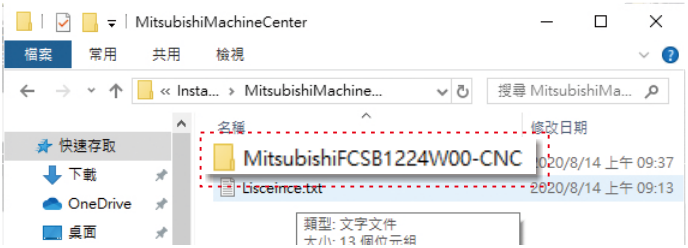


19. Select"Lisceince.txt"

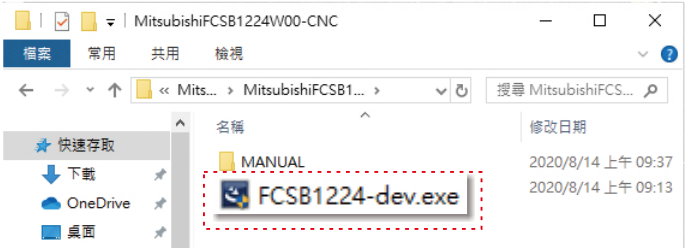


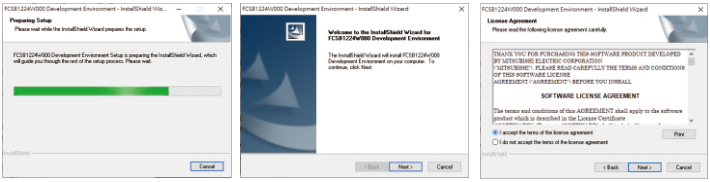
20. The version serial number is displayed, please copy it.

21. Select"MitsubishiFCSB1224W00-CNC".

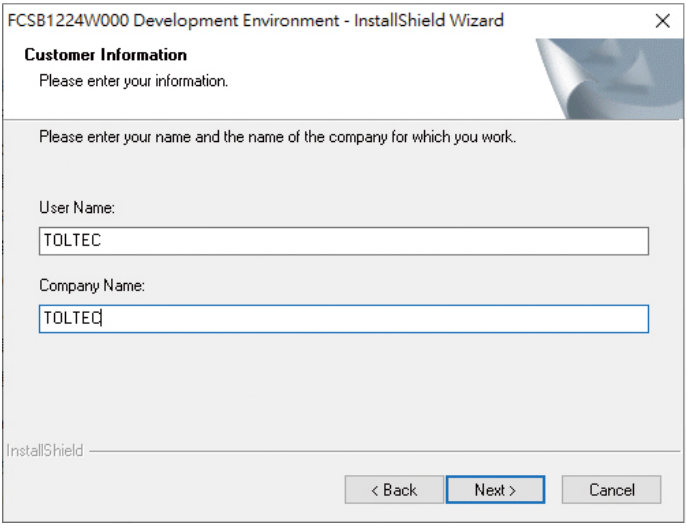


22. Select"FCSB1224-dev.exe", install execution program.

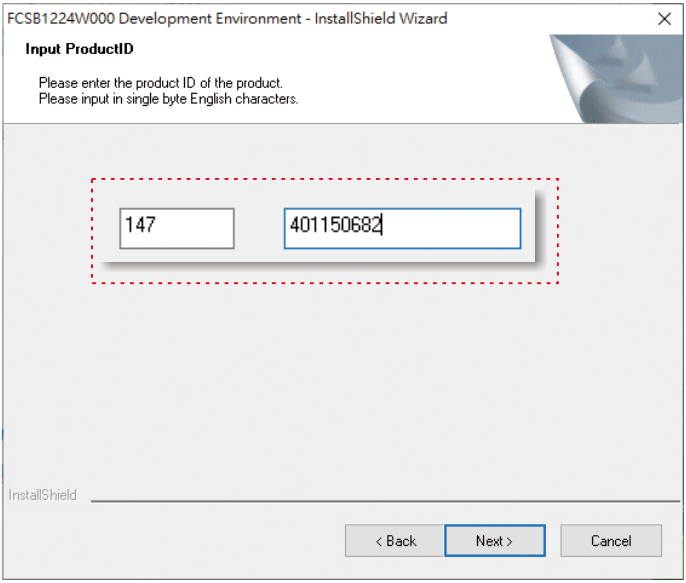


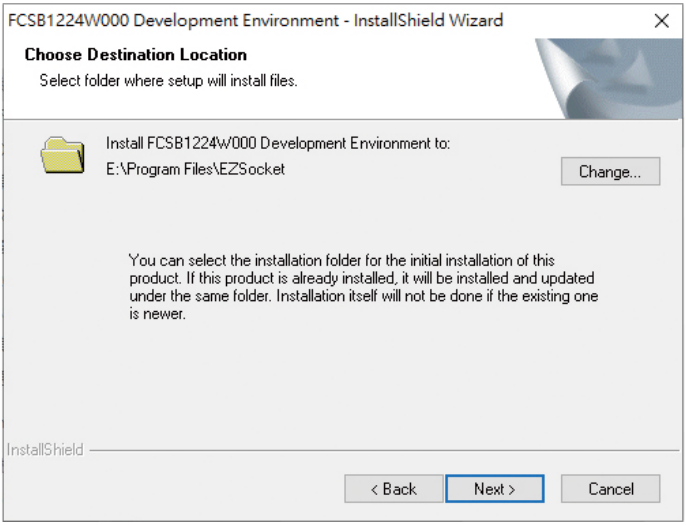


23. Enter name.

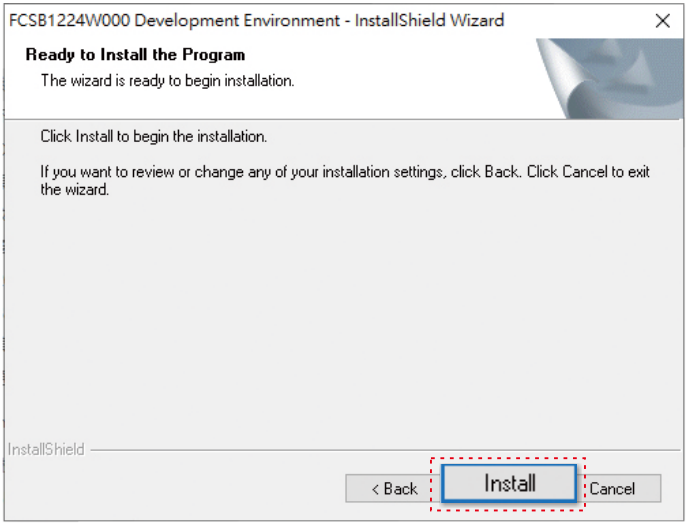


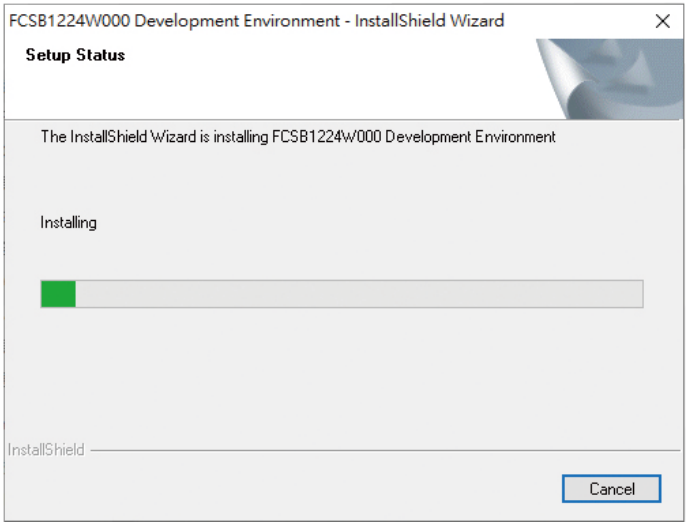
24. Paste the serial number.



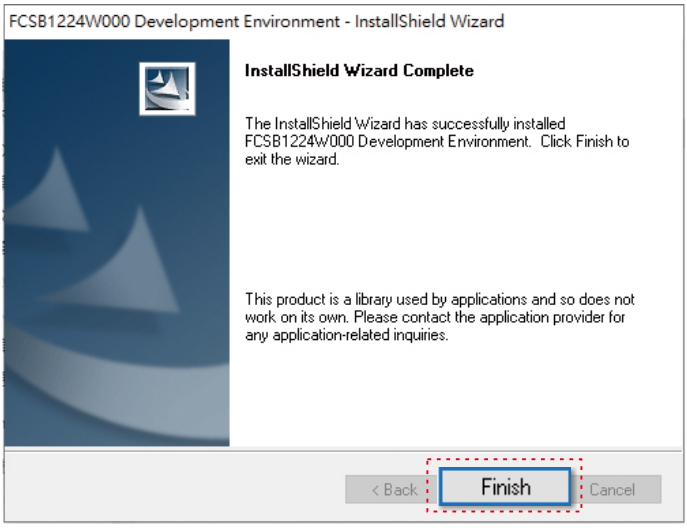


25. Select “Install”, start the installation.

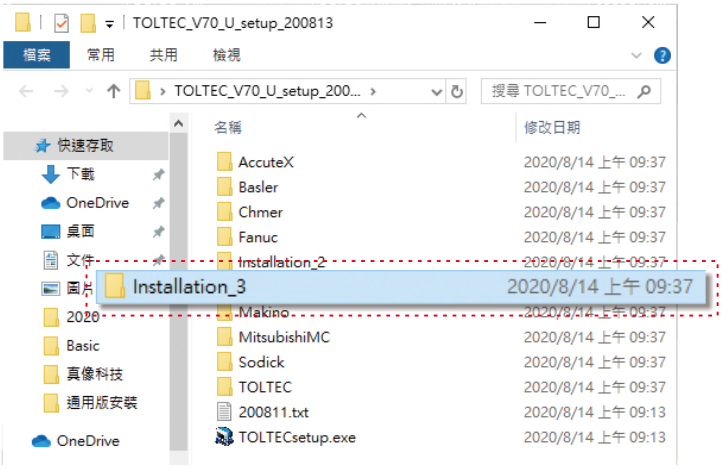




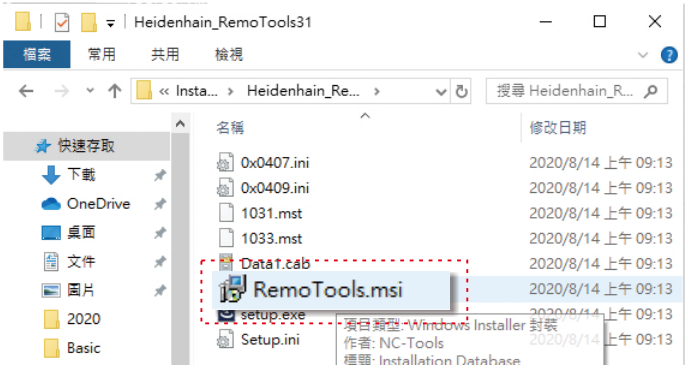
26. The installation is completed.



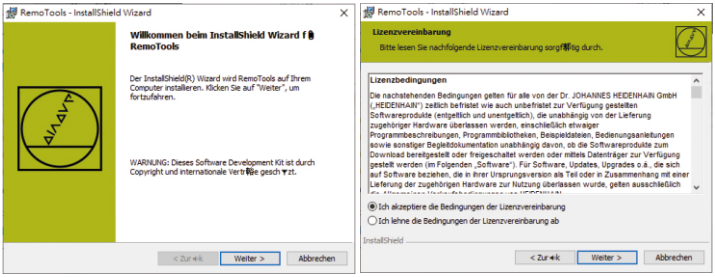
27. Go back to "TOLTECV70_SETUP" folder, select Installation_3, install Heidenhain controller driver.



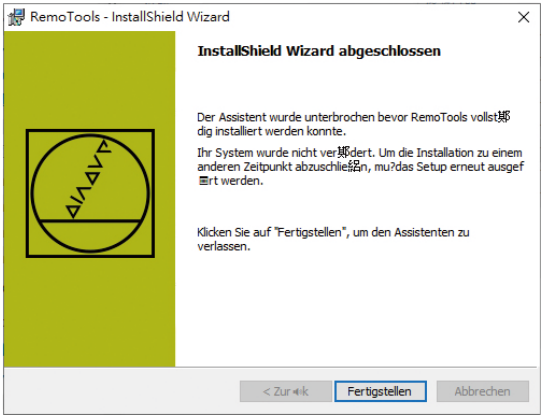
28. Select "RemoTools.msi"。



29. Start the installation.

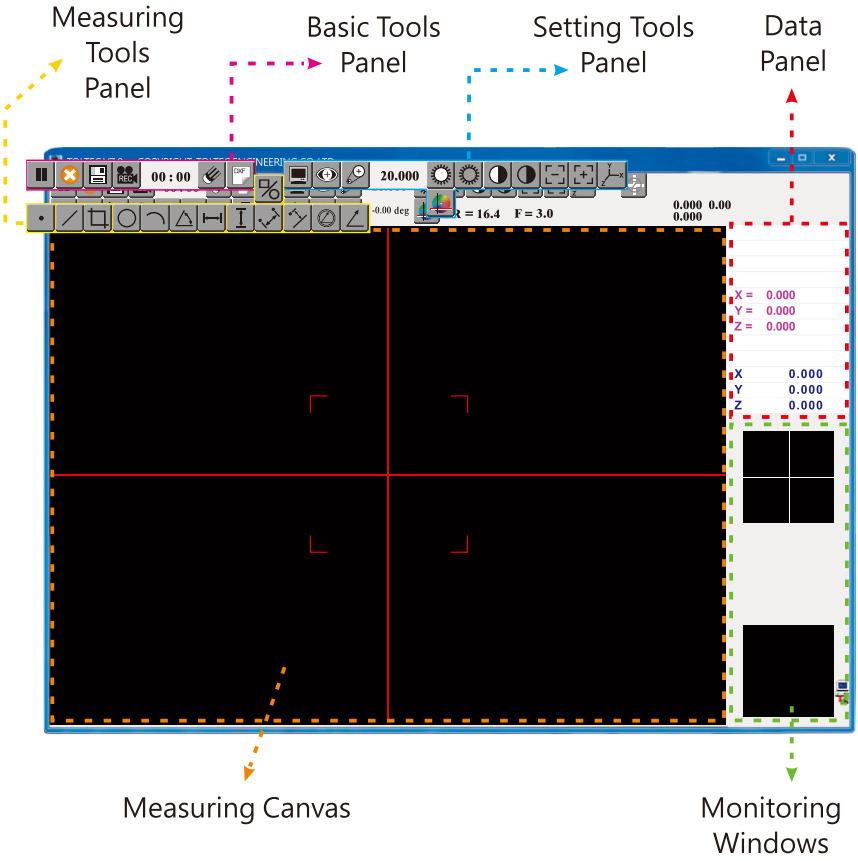


30. The Installation is completed.



CHAPTER 3
GET A GLANCE

OVERVIEW



BASIC TOOLS BUTTONS

Activator (page 6-1)
When the program is started or paused, click Activator to active the program.

Pause (Page 6-1)
Freeze the Measuring Canvas and the Measuring Tools Buttons.

Quit (Page 6-2)
Close the program and all datathat are not saved will be lost.

Save (Page 6-2)
Save the results in 5 forms

Delete (Page 6-4)
Delete the data and drawing on the Measuring Operation Area.

Import CAD File
(Page 6-6)

Recorder
(Page 6-3)

Stop Recorder

SETTING TOOLS BUTTONS

Display

(Page 4-1)

Position

(Page 4-7)

Calibration

(Page 5-1)

Increase Brightness

for Perimeter Light of TTC Camera

Reduce Brightness

for Perimeter Light of TTC Camera

Colour Setting

(Page 4-18)

High contrast

for Perimeter Light of TTC Camera

Low contrast

for Perimeter Light of TTC Camera

Reduce Focus Ref.

(Page 5-5)

Range

Enlarge Focus Ref.

(Page 5-5)

Numbers Definition

(Page 4-14)

For position sync

MEASURING TOOLS BUTTONS

Point (Page 7-2)

X and Y axes of a point

Line (Page 7-3)

Distance
between two points

Square (Page 7-4)

The Axes and Diameter of a Circle

Circle (Page 7-5)

The Axes and Diameter of a Circle

Arc (Page 7-6)

The Axes, Radius and arc of an Arc

Angle (Page 7-7)

The Axes and angle of an Angle

Horizontal Distance
(Page 7-8)

between twopoints

VerticalDistance
(Page 7-9)

between two points

Square and Circle
(Page 7-10/7-12)

Comparison

DPP (Page 7-14)

Distance between existing or new points

DPL (Page 7-15)

Distance between a point or a line

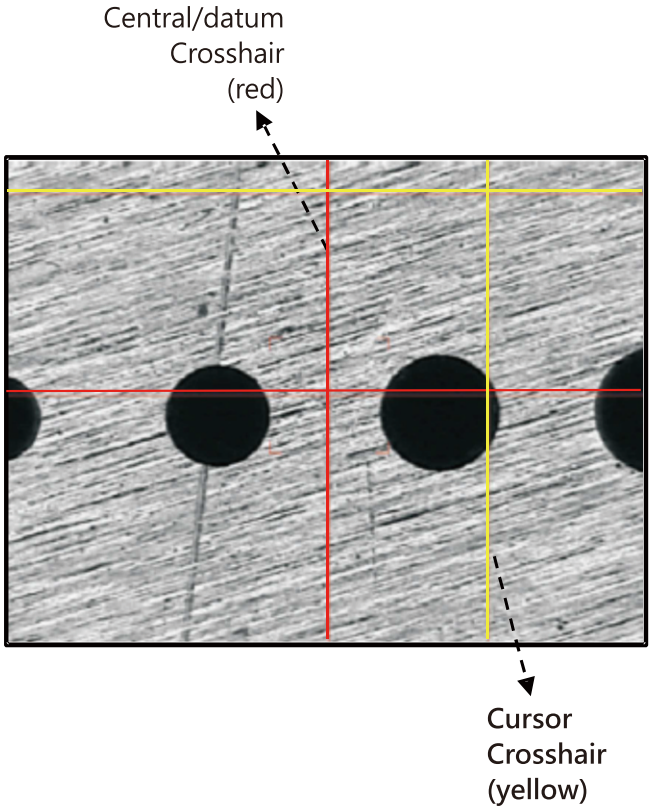
Crosshairs Rotation
(Page 7-16)

Rotated Crosshairs
(Page 7-17)

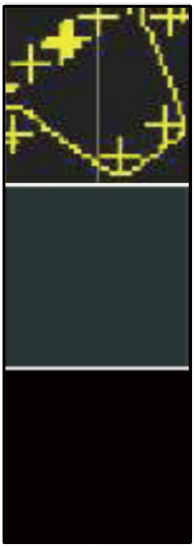
Reversion

MEASURINGCANVAS

The measurements can only be operated on this area, if you wish to measure beyond the scene, then you need to move the camera to the target area, and then continue the operation.

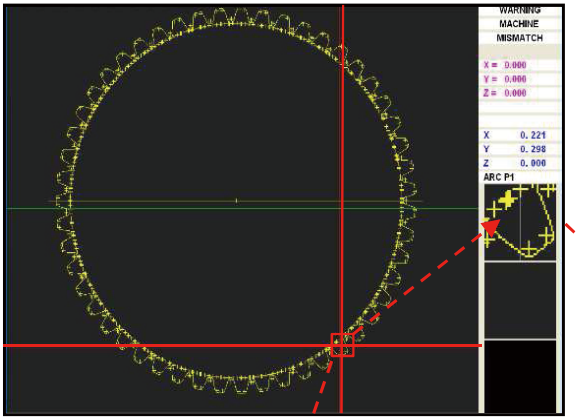


MONITORING WINDOWS



The double enlarged image of cursor crosshair focal area

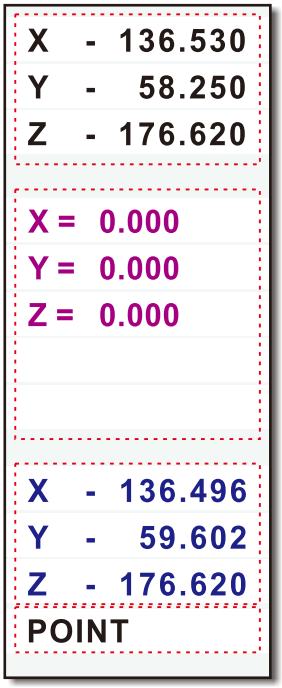
The image via TTC Position Reader (Full range)



The double enlarged image of cursor crosshair

The focus of cursor crosshair for enlarging

DATA PANEL



Synchro Position datafrom machine (XYZ)

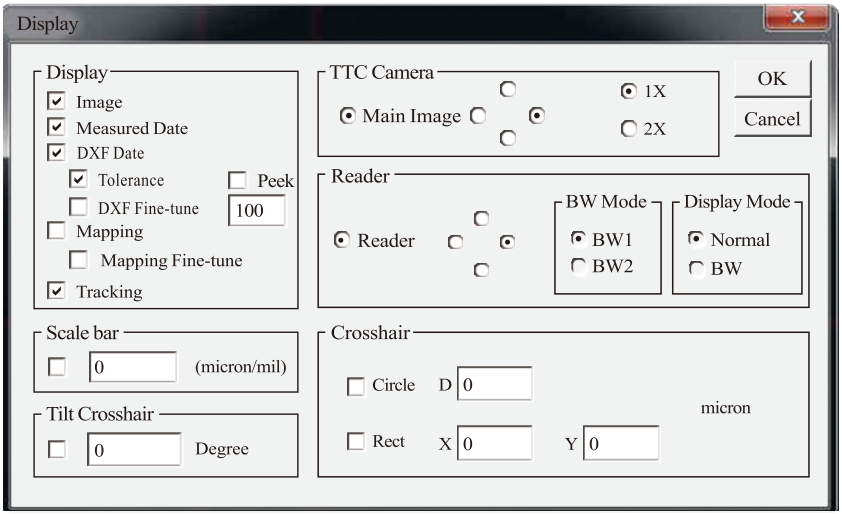
Data of the last measurement

Position of the cursor crosshair

Current Measurement

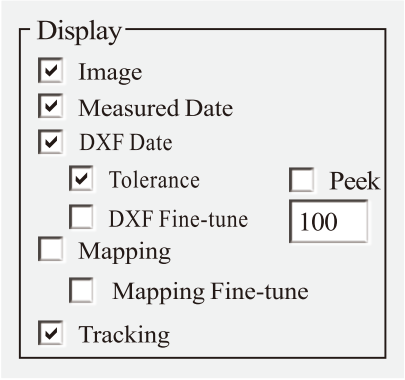
CHAPTER 4
SETTINGS

DISPLAY



DISPLAY RESOLUTION

Checkthe figures you wish to display on the Measuring Canvas. Or check again to deselect.

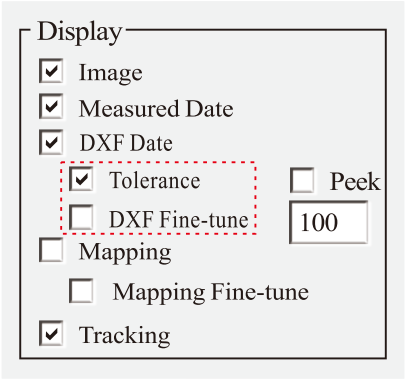


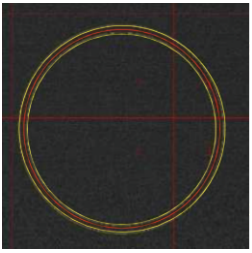
- **Image**
  The images shot via Toltec Camera

- **Measured Data**
  The measured results on the Measuring Area

- **DXF DATA**
  The imported CAD image (see page 6-9)

  - **Tolerance**
    Indicate the Tolerances with CAD lines (see page 6-9) in order to quick determine the error of work.(see page 6-11)





1. The tolerance lines show in yellow.
2. The CAD line shows in red.

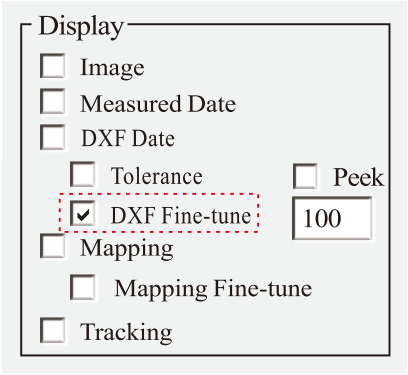
- **DXF Fine-tune**
  Fine-tune to adjust the tolerance range.
  To fine-tune the range by using the arrows on keyboard, the range will show on the top-rightpanel of screen.

FINE-TUNEAND ROTATE CAD IMAGE

1 Import a CAD image.

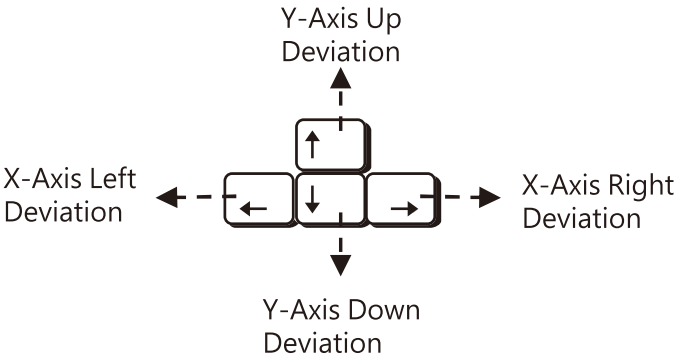
2 Click Display button.

3 Check **DXF Fine-tune.**



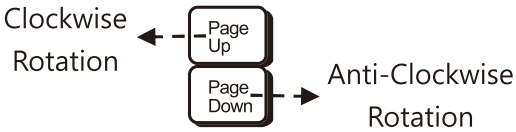
4 Make X-axis Deviation by pressing LEFT/RIGH Tarrow keys on the keyboard.

5 Make Y-axis Deviation by pressing UP/DOWN arrow keys on the keyboard.

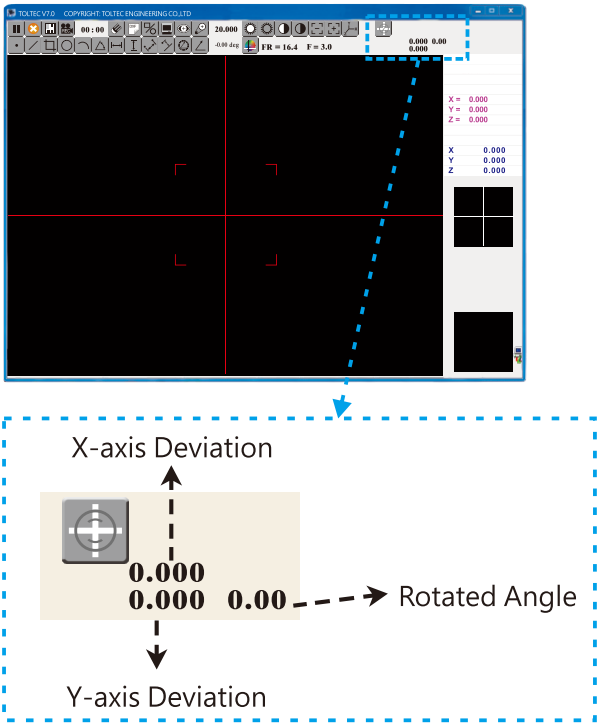


6 Clockwise rotate the CAD image by pressing **Page Up** key.

7 Anti-clockwise rotate the CAD image by pressing **Page Down** key. 1 press = 0.01°



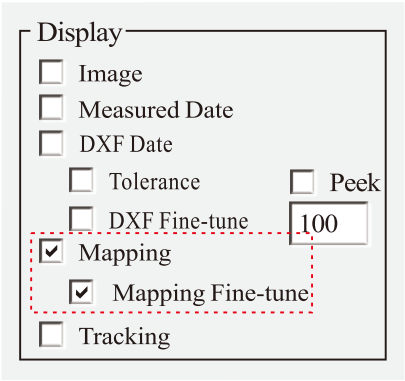
8 Check the deviation and rotation states.



9 Tick off the Fine-tune function when finish the adjustment.

- **Mapping**

  Check to show the Circle and Square comparisons figures.
  (Page7-14 / 7-16)

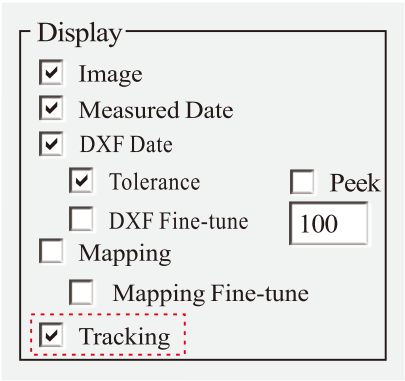


  - **Mapping Fine-tune**

    To fine-tune the circle/square position on Measuring Canvas by using the arrows on keyboard. The movement will show on the Circle / Square comparison popup window.
    (page 7-15 / 7-17 / 7-18)

OBJECT SNAP MODE (Tracking)

This mode is available for the measurements of Point, Line, Arc, Circle and Angle; allows the user to specify the snap points.



HOW-TO

1 Click **Display** button

2 Check **Tracking**

3 Click **OK**

4 Move the cursor on the figureson Measuring Operation Area.

THE SNAP POINTS

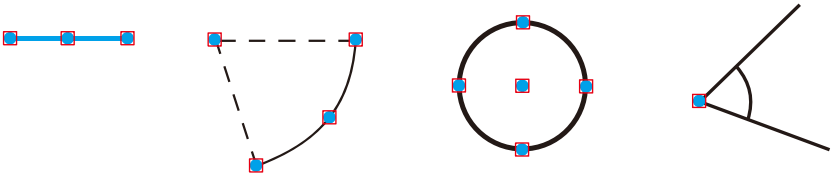
Point： 1 point (node).

Line： 3 points –two endpoints and one midpoint.

Arc： 4 points –two endpoints, one midpoint and node.

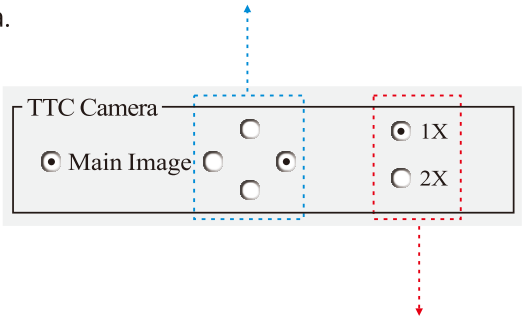
Circle： 5 points –quadrant (0, 90, 180 and 270) and center.

Angle： 1 points –node.



MAIN SCREEN

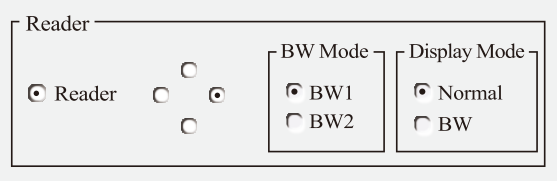
Cameradevice can be placed at0/90/180/270-degreesposition on the machine tool, where the software can display position,select the current direction and position of the camera, so as not to cause the movement direction of machine to be opposite to thedirection of camera.



1X camera 1x imaging
2X camera 1x imaging

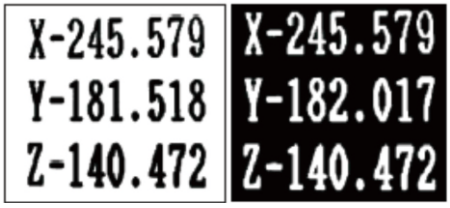
READER (Position Reader)

Check Reader to switch the image provider to Position Reader, and to select the right "BW Mode" and "Display Mode".



▪ BW Mode(BW1/BW2)

The mode for the software to identify the digitals on the control is **White text on Black back ground**, therefore if the screen displays as Black text on White background, you need to switch between **"BW1"** and **"BW2"** to get the right mode.



Black text on White background

White text on Black background

▪ Display Mode Normal:

Use this mode for adjusting the best focus for the Reader.

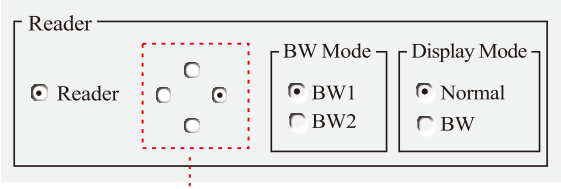
Once you get the best focus, and then change to BW.

▪ BW :

Use this mode for number identification. Display as White text on Black background or Black text on White background

DISPLAY MODE

- **Normal :**
  Use this modefor adjusting the focusfor thePosition Reader.
  Once you get the best focus, please change to BW.
- **BW :**
  Use this mode for axis number identification setting.
  The screen will display in two modes:white-on-black or black-on-white.

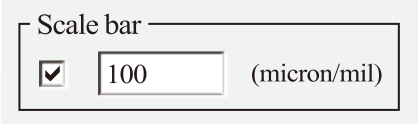


Reader screen rotation

Reader can be placed at 0/90/180/270-degrees position on the machine tool, where the software can display position, select the current direction and position of the camera, so as not to cause the movement direction of machine to be opposite to the direction of camera.

SCALE BAR

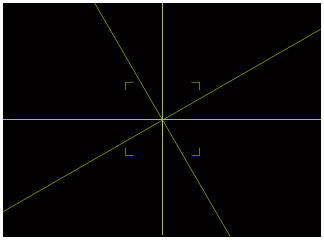
Place a Scale Bar on the Measuring Canvas in order to define the dimension of your target.



1 Click Display button.
2 Check the"Scale bar".
3 Input a value, the unit is in micron.

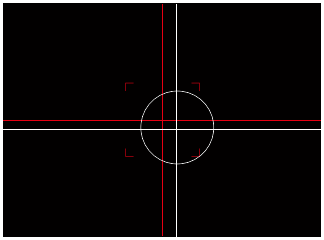
TILT CROSSHAIR

To rotate the crosshairs by checking and inputting the degree.



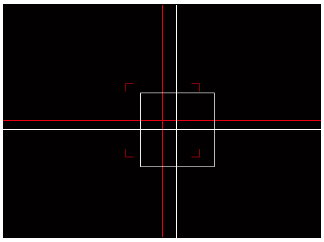
CIRCLE

If you input a value at this position, a circle with radius in micron will be generated at the cursor crosshair center, and can be used to find the point position or circle comparison within the screen range.

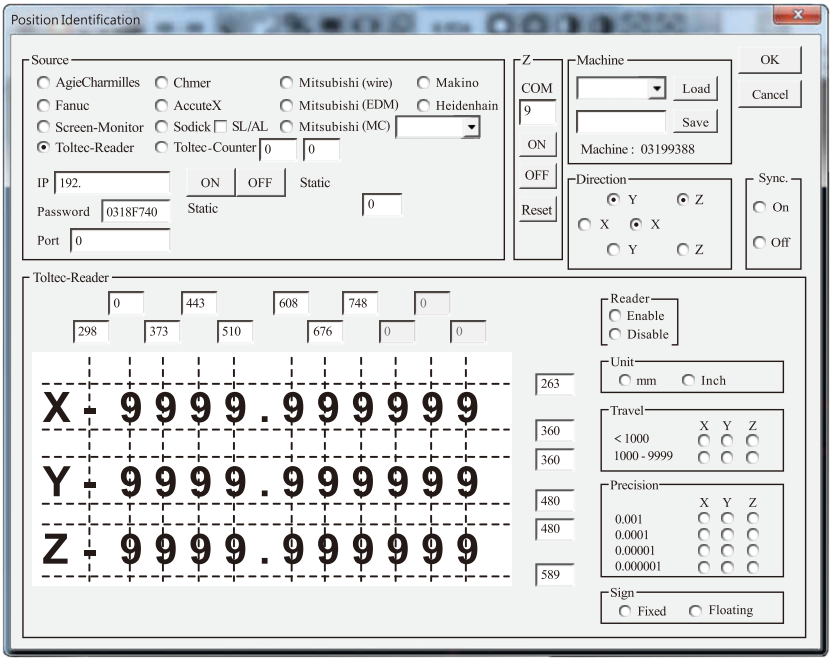


RECT

If you input a value at this position, a rectangle with length and width in micron will be generated at the cursor crosshair center, and can be used to find the point position or square comparison coordinate synchronization within the screen range.

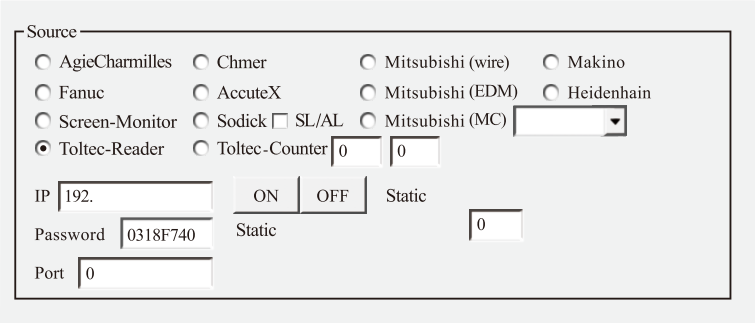


POSITION IDENTIFICATION



SOURCE

The sources ofposition data synchronization.



COORDINATE SYNC. SOURCE DESCRIPTION

1. AgieCharmilles

   AgieCharmilles Machine.It capturesthe coordinates via LAN, and you have to purchase Licence from AgieCharmillesin order to connect the machine.

2. Fanuc

   Fanuc Controller. It requires fucas2 feature, and captures the coordinates via LAN. This is an optional feature of Fanuc, and you have to purchase Lincence from Fanuc.

3. Software capture

   SETTINGSScreenMonitor. This is a feature developed by TOLTEC, which is for machine and is an applet developed by the system after Windows XP, and can be installed in Windows to perform the coordinate capture function.

4. ○ Reader capture

TOLTEC-Reader. This is a CCDcoordinate capture feature developed by TOLTEC and is an option for machine which can't capture coordinates via LAN.

5. ○ Chmer

Chmer Machine.It captures the coordinates via LAN.

6. ○ AccuteX

AecuteX Machine.It captures the coordinates via LAN.

7. ○ Sodick □ SL/AL

SodickMachine.It is universally applicable for EDM WirecutMachineCenter, butWirecut has SL and AL types and must be selected separately.It captures the coordinates via LAN, and it isa standard feature.

8. ○ Mitsubishi(wire)

Mitsubishi WireCut. It captures the coordinates via LAN, MitsubishiWireCutDNC is an option, and you have to purchase Lincence fromMitsubishi.

9. ○ Mitsubishi(EDM)

Mitsubishi EDM. It captures the coordinates via LAN, but Mitsubishi EDMDNC is a standard feature.

10. ○ Mitsubishi(MC)

Mitsubishi MachineCenter Controller. It captures the coordinates via LAN, and isa standard featur

11. ○ Makino

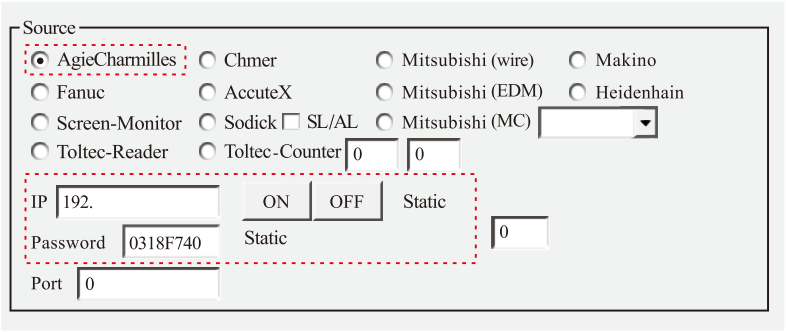
MAKINO EDM WireCut. It captures the coordinates via LAN, andis an option.You have to purchase Lincence fromMAKINO.

12. ○ Heidenhain

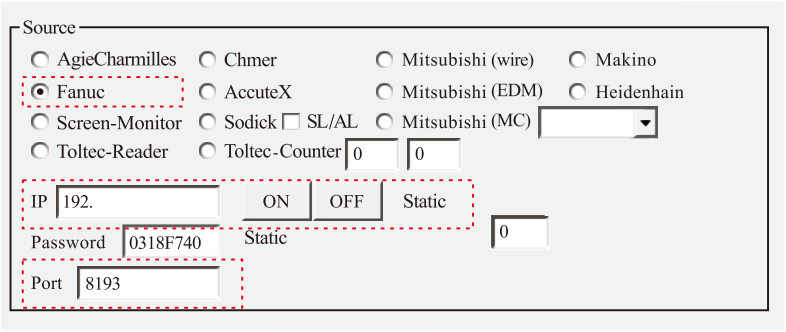
Heidenhain Machine Center Controller.It captures the coordinates via LAN, and is an option.You have to purchase Lincence fromHeidenhain.

COORDINATE SYNC. CONNECTION DETAILS

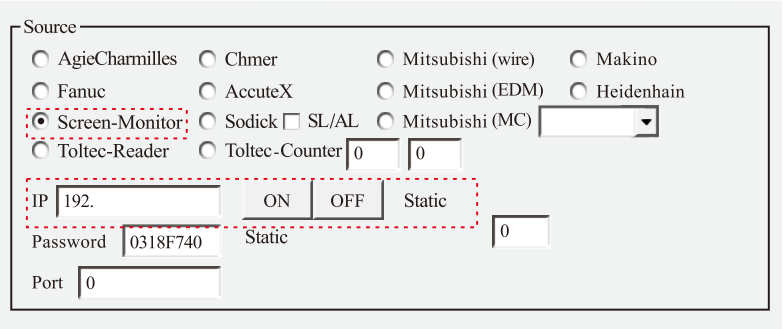
1 AgieChermilles



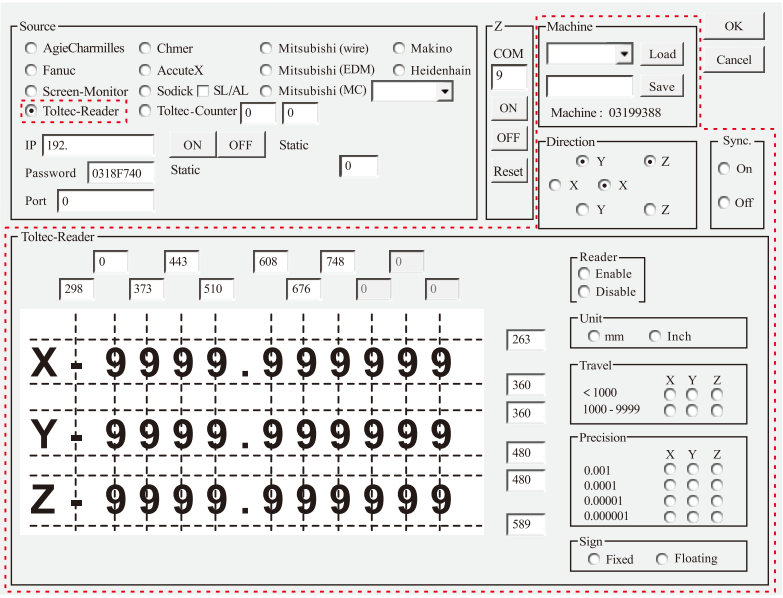
2 Fanuc



3 ScreenMonitor

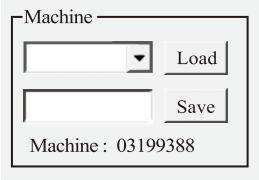


4 TOLTEC-Reader



MACHINE

Save the setting for different Position Readers, it is convenient as you have several Position Readers sharing one Toltec V7.0 Program.



▪ Loading Setting

When your Toltec V7.0 program is used by different machine, you can easily get the setting parameter by giving the code to the "Machine" cell and then click **Load**

▪ Saving Setting

Once you finish the position Reader setting, you can save it by inputting a code to the cell and then click Save.

Machine: indicating the machine setting in use

DIRECTION

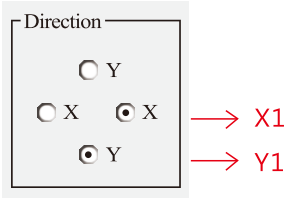
The Direction setting is according to the X / Y axis movements of a machine.

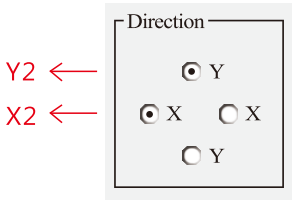
➤ **X1:**
X axis movement by Machine Work Table.

➤ **X2:**
X axis movement by Machine Head.

➤ **Y1:**
Y axis movement by Machine Work Table.

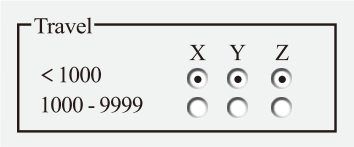
➤ **Y2:**
Y axis movement by Machine Head.





TRAVEL

The travel distance setting is for the Position dentification.



< 1000 :

Apply to the machine's travel distances less than 1000mm

1000-9999 :

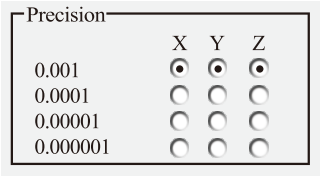
Apply to the machine's travel distances between 1000 and 9999mm.

PRECISION

The selection is according to the machine's data.

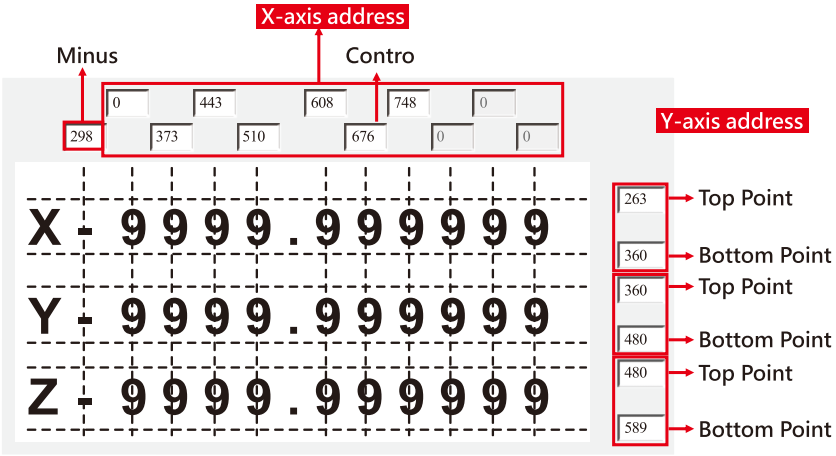
If the machine's position data shows thousandths, select only 0.001. Likewise ten thousandths should select only 0.0001.

- Metric Unit: 3 or 4 decimal places (0.001 or 0.0001)
- Imperial unit: 5 or 6 decimal places (0.00001 or 0.000001)



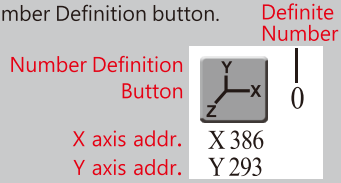
NUMBERS ADDRESS

Define the scope of the axes by giving the addresses to each number.



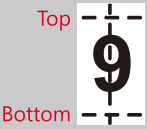
Cursor Axis Address

The addresses of the cursor on the screen can be found under the Number Definition button.



Number Addresses

Three addresses are needed for defining the scope of a number, including the centre, top and bottom points.



SIGN (Minus Sign)

Select the position of axis's minus sign as Fixed or Floating according to the machine control.

TTC POSITION READER

- With the TTC Position Reader the Software can synchronize the position datafromthe machines.
- Reader's stand is varied due to the variable machine models. Magnetic Base is used in this demonstration.

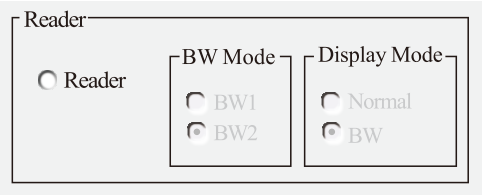
1. HOW-TO

1 Insert the Toltec V6.0 Protector and start the program.

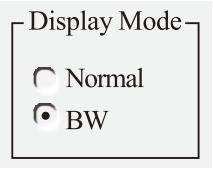
2 Tune on the Position Reader function

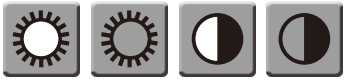
I. Click **Display** button

II. Check **Reader**



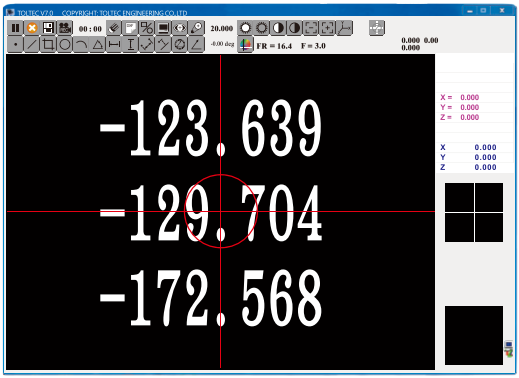
III. Check **Normal**



IV. Adjust Brightness and Contrast 

V. Click **OK** to return to the main screen.

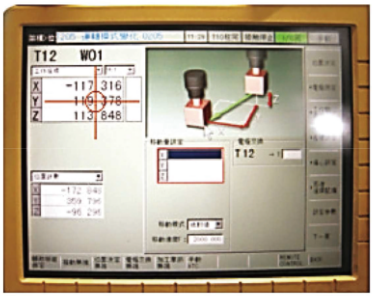
3 Find the **Best Reading Area** * on the control.



Best Reading Area:

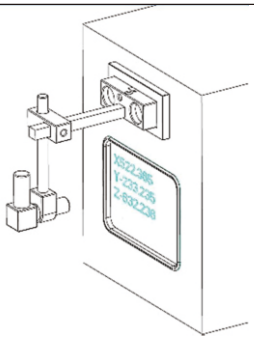
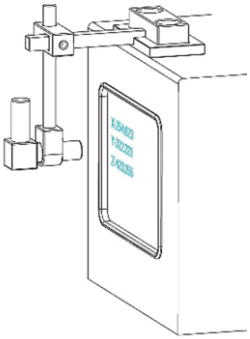
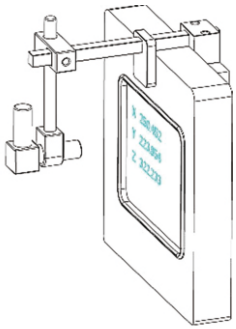
The centre of the crosshair should locate at the decimal point of Y axis. However the presentation of XYZ axes vary on different control, please find the central point on the position section accordingly.

The red crosshair (above) indicates the focus of TTC Reader (below).

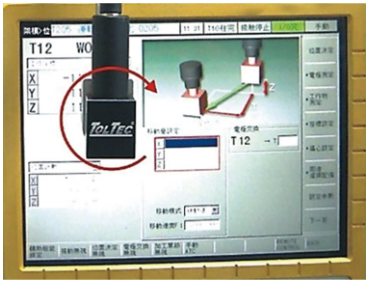


4 Place the Magnetic Kit on the controller according to the Best Reading Area.

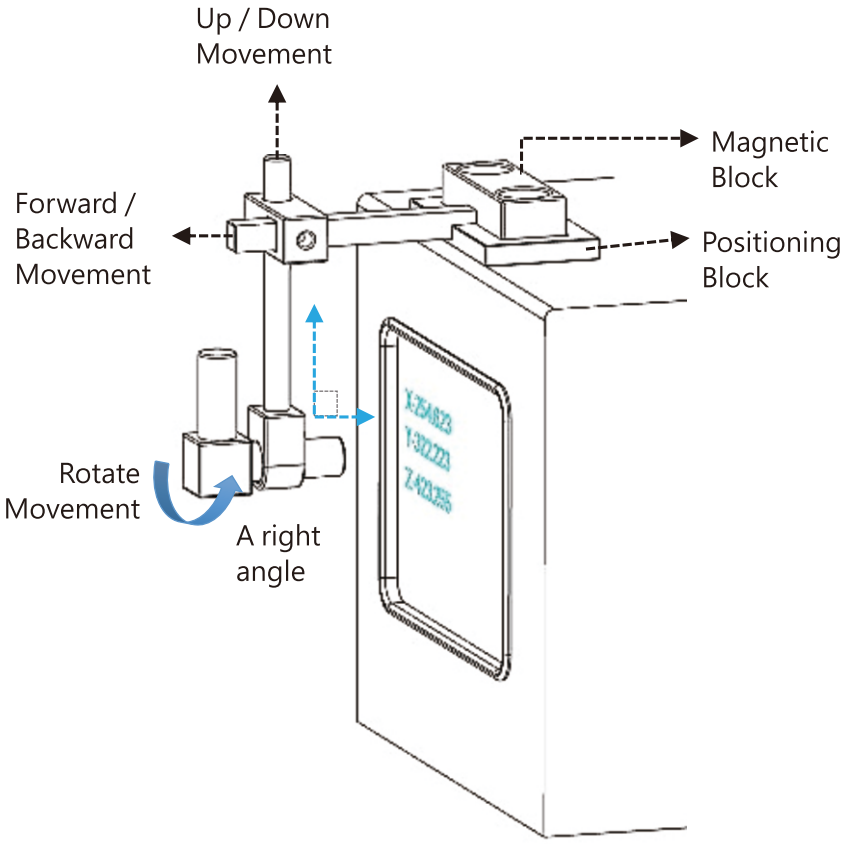
The Magnetic Block will be on the same vertical line as the Best Reading Area.

		
On Front	On Top	Clamping

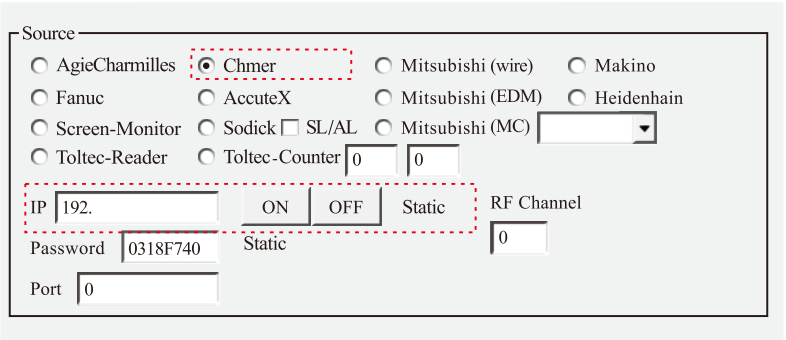
5 Adjust the Position Reader's angles by a Hex Key in order to get a right angle (90°) between the Reader and the control.



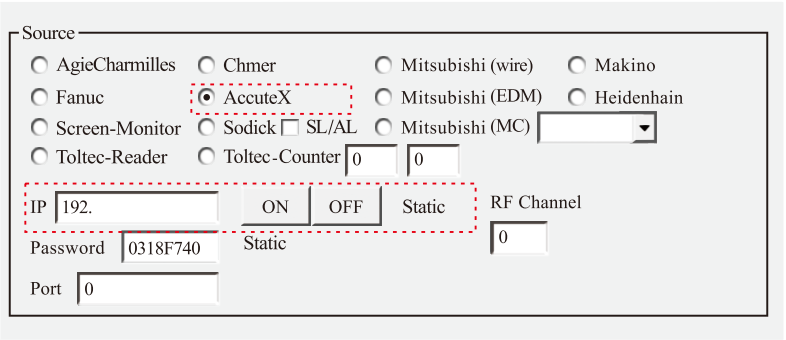
2. ADJUSTMENTS / MOVEMENTS



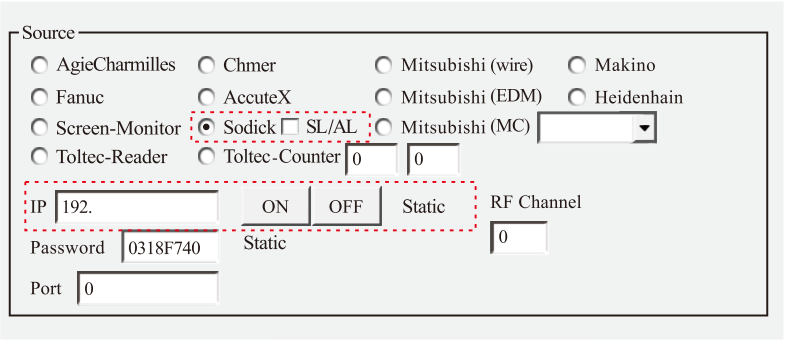
5 Chmer



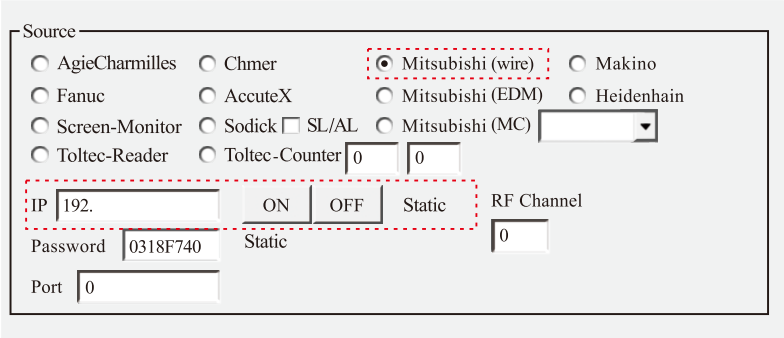
6 AecuteX



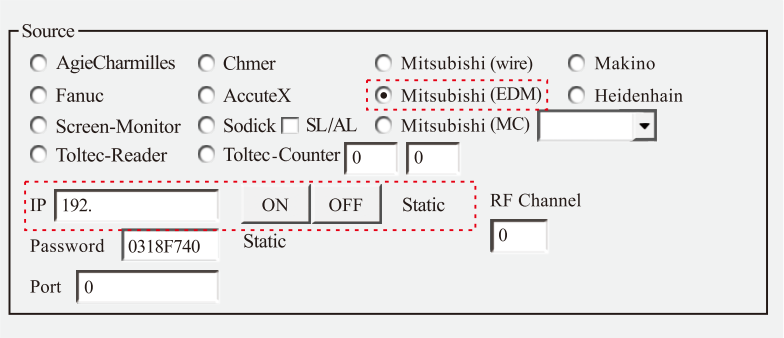
7 Sodick



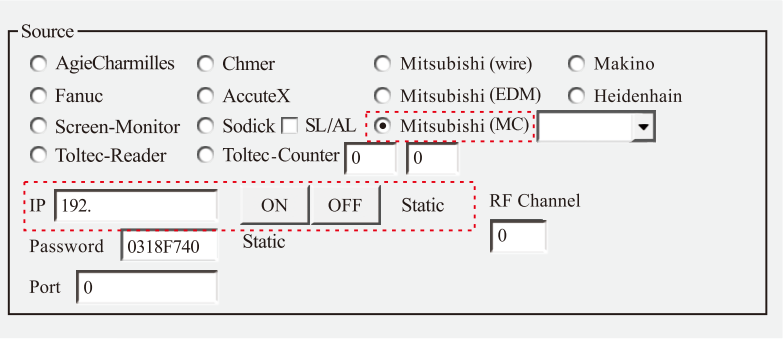
8 Mitsubishi WireCut



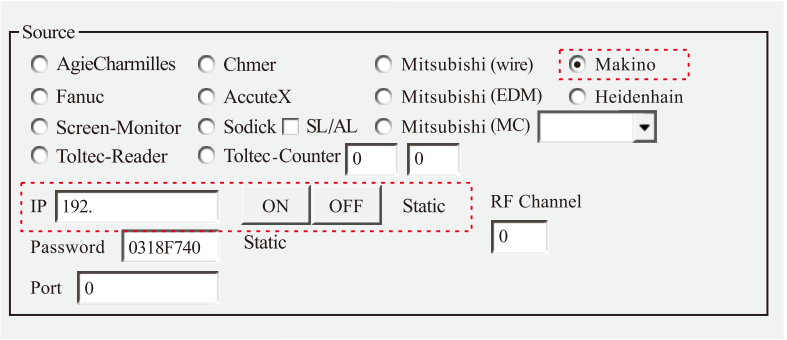
9 Mitsubishi EDM



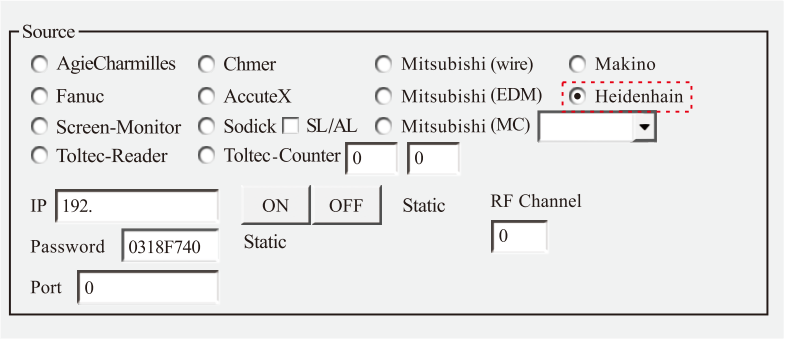
10 Mitsubishi Machine Center



11 MAKINO EDM WireCut

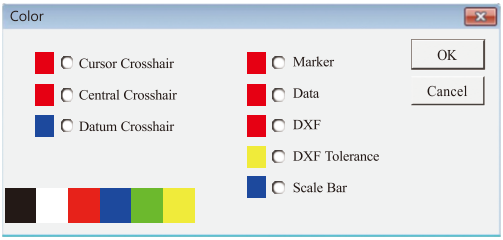


12 Heidenhain Machine Center

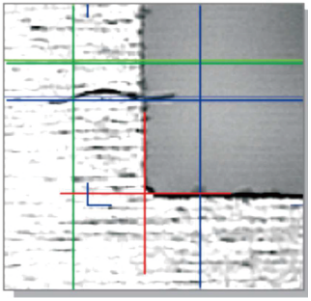


COLOR

Six colours are available for the crosshairs, Marker, Data, .DXF lines and Scale bar.



- **Cursor Crosshair**
  The crosshair is as a cursor
- **Central Crosshair**
  On the centre of the Measuring Canvas.
- **Datum Crosshair**
  Datum (Zero) Point on the Measuring Canvas

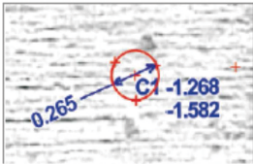


- Green: Cursor Crosshair
- Blue: Crntral Crosshair
- Red: Datum Crosshair

- **Marker**
  The Measuring figure on the Measuring Canvas
- **Data**
  The data of measuring results on the Measuring Canvas
- **DXF**
  The imported CAD file
- **DXF Tolerance**
  CAD Deviation Lines

Scale Bar

Place on the bottom-right of the Measuring Canvas



- Red: Marker
- Blue: Data

CHAPTER 5
CALIBRATOINS

ADJUST THE BEST FOCUSFOR TTC CAMERA

Each camera has its own focus; moreover the surface of a workpiece is not always evenflat, therefore to get a better image, user can use the F value and Focus Reference Range to adjust the TTC Camera's focus.

- **F Value**

  F value indicates the focus value; it helps the user to adjust the amera to its best focus. The greater the value, the better focus the camera will get. So user can refer to the value to find the best focus.

- **Focus Reference Range**

  The reference range is for calculating the F value, when the surface of aworkpiece within the reference range is uneven; you can reduce the focus reference range in order to get a high F value.

HOW-TO

1 Adjust the Focus Reference Range

Click **Reduce Focus Reference Range** button to reduce the reference range,or click **Enlarge Focus Reference Range** button to enlarge the referencerange.

2 Adjust the Focus for TTC Camera

First adjust the best focus by sight.
Then adjust the focus according to the F value.

CALIBRATION OF TTC CAMERA

Calibrate each TTC Camera for the first time use and check regularly.

TOOLS

- Standard Scale
- TTC Camera(50ST used for the following demo)

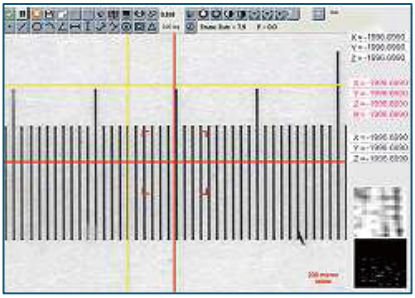
HOW-TO

1 Start Toltec V6 and click **Activator**

2 Place the **Standard Scale** under the TTC Camera.

3 Adjust the image to get the best focus.

The range is about 4mm under TTC 50ST Camera (refer to the table below)

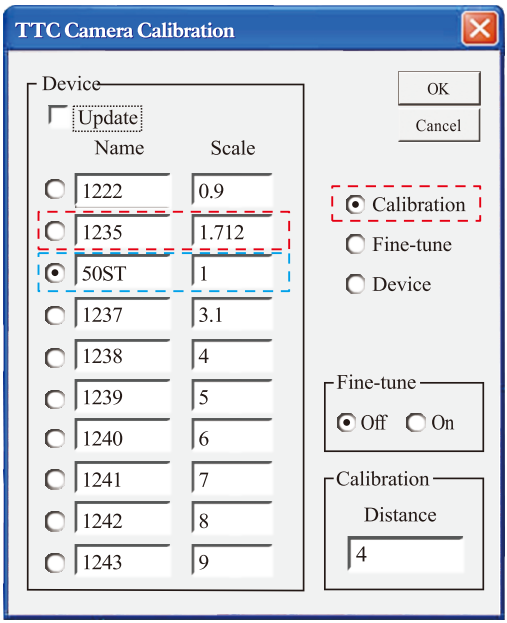


Standard Scale Ranges for TTC Cameras

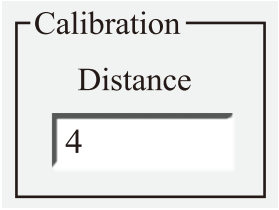
TTC Camera	Max. Range
30x	5mm
50x	4mm
120x	1.8mm
250x	0.9mm

4 Click **Calibration** button

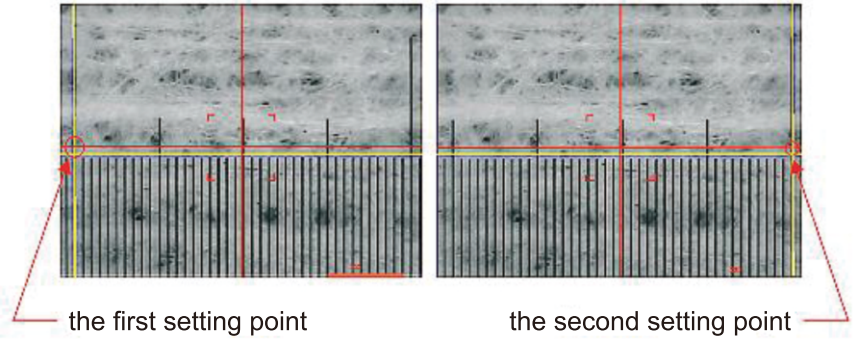
5 Check **Calibration** and one rowon the **Device** section, fill in a name.



6 Fill in the reference value (**Distance**) to the Calibration section. (Refer to the Standard scale range for TTC Camera table; 4 in this example) and then click **OK.**



7 Move the cursor crosshair to **the first calibration point** on the left of the scale (red circle) and left-click your mouse (or click **enter**).



8 Select the second calibration point (red circle) on the right of the scale.

9 Click OK and the parameter will be saved. (Scale)

10 Find the magnification parameter besides the calibration button.

11 To double-check the precision of the parameter by using "Horizontal Distance" Measurement to measure the real length through the Standard Scale.

(See HD Measurement, page 7-8)

How to make an accurate selection?

Move the cursor crosshair to the first selected point either on right edge or left edge of the line, then move the cursor to the second selected point, the same side as the first selected point (right or left).

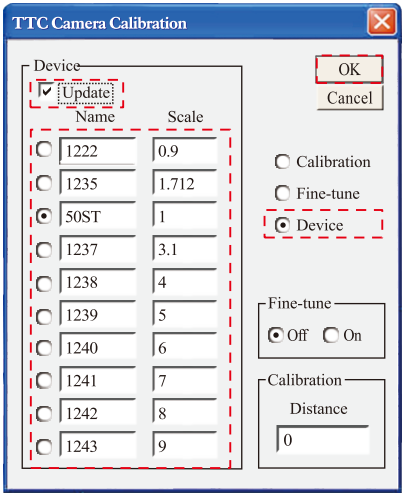
UPDATE

When one camera has been calibrated but the data (Scale section) is not saved on the Device list. Save the data by updating the calibration.

1 Click **Calibration** button

2 Check **Device** and **Update**. Check one row on the Devicesection.

3 Fill in the Scale and then click **OK**.



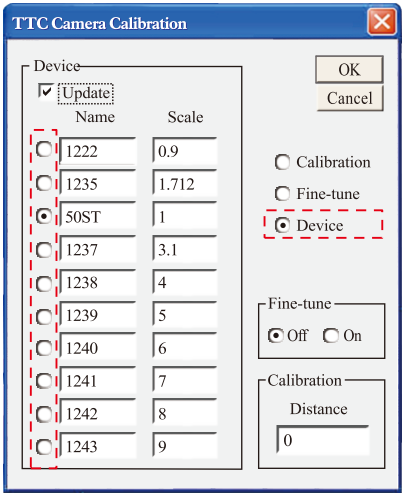
USE CORRECT CAMERA MAGNIFICATION

If more than one camera share the same program, please check the calibration every time when use in order to get the results correct.

1 Click Calibration button

2 Check Device. Select the camera by name.

3 Click OK.



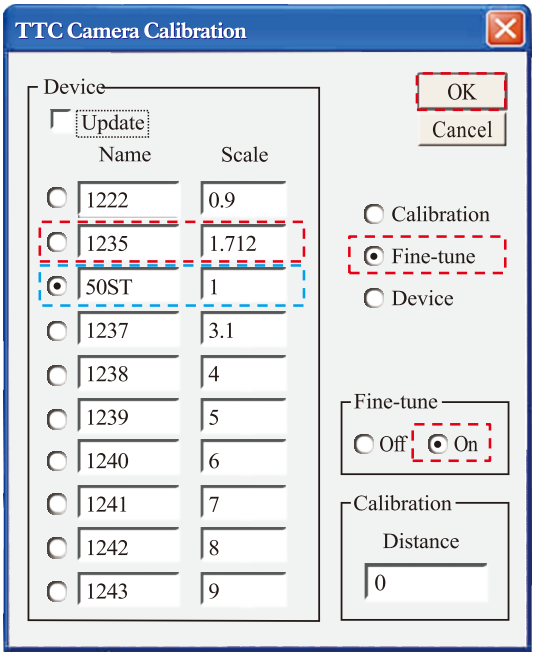
FINE-TUNING THE CALIBRATION

If the error occurs after the calibration and double-check, the fine-tuning can be applied to correct.

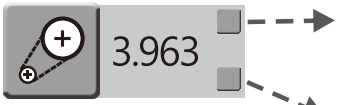
HOW-TO

1 Click **Calibration** button

2 Check **Fine-tune** and **On.**
Click **OK.**



3 Fine-tune buttons located on the calibration parameter panel Turn the value till it is correct.



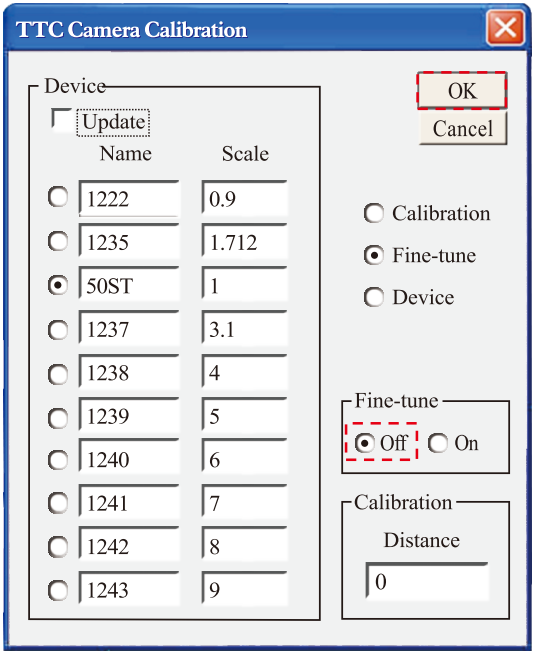
Click **up** button to increase the value.

Click **down** button to decrease the value.

4 Turn off the Fine-tune function.

Click **Calibration** button

Check **Off** and click **OK** to finish.

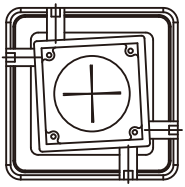


Calibration

TTC Micro Measurement System has been completely calibrated with horizontal and centre point before leave the factory.

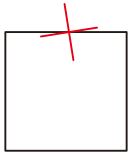
Calibration timing:

1. When camera undergoes any collision.
2. Please check the horizontal and centre point of the camera regularly to assure the accurate result of measurement.



Tools preparation:

1. One perfect square block with no chamfer and well perpendicularity
2. 2.55mm T handles Allen Wrenches



【Figure 5-1】

Preparation:

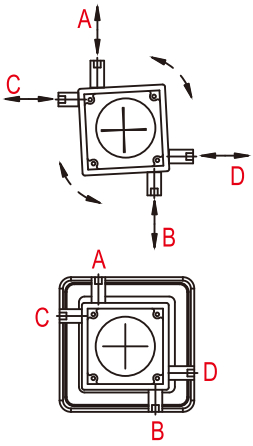
Parallel place the square block to the Machine X axis or Y axis of the machine on the platform

Camera's horizontal check:

1. Connect the camera to the machine and the TTC monitor
2. Move the crosshair to the edge of the block. (figure 5-1) Observe the crosshair and the square block, if they are not parallel, please calibrate the camera.

Horizontal calibration:

1. Before adjustment, please draw out the rubber plugs on the corners of the camera. There is a M5 stoppage screw on each corner.
2. Connect the camera to the machine.
3. Take one T handles Allen Wrench and inserts it into one M5 screw and then take the other one insert into the diagonal M5 screw.
4. Move the crosshair of the camera to the edge of the block, and calibrate the horizontal by adjusting the M5 screws. (figure 6-1)
5. Slight unwinds the screw A & B and slight winds the screw C & D to make a clockwise rotation.
6. Slight winds the screw A & B and slight unwinds the screw C & D to make anticlockwise rotation.
7. Repeat the adjustment till the crosshair paralleled the square.

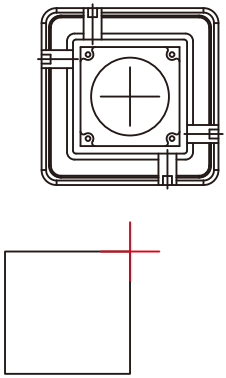


【Figure 6-1】

Please slight turn the screw to avoid destruction of the camera.

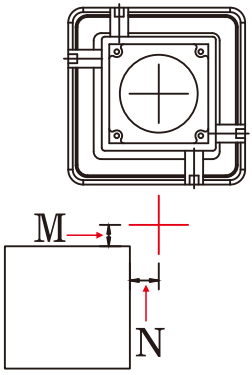
Camera's centre point check:

1. Connect the camera to the machine and the monitor
2. Overlap the centre of the crosshair and a corner of the block. (see the figure 7-1)
3. Zero the X & Y axes of the machine.



【Figure 7-1】

4. Remove the camera and rotate it 180 degrees, reinsert the camera into the machine.
5. Observe the centre of the crosshair and the corner, if they are not overlapping this indicates the centre point of the camera has deviated. (see the figure 7-2)



【Figure 7-2】

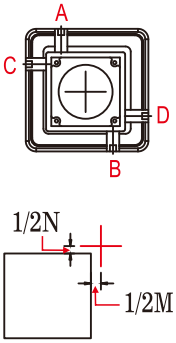
6. Again overlap the centre of the crosshair with the corner of the block, obtain the deviation by checking the values of X & Y axes of the machine.
7. Please adjust the camera when the deviation is out of the tolerance range.(Refer to the table below)

Horizontal Deviation Tolerance Ranges:

Camera models	Tolerances
TTC 30 ST	0.02mm
TTC 30 LS	
TTC 50 ST	0.01mm
TTC 50 LS	
TTC 120 LS	0.005mm
TTC 250 LS	0.003mm

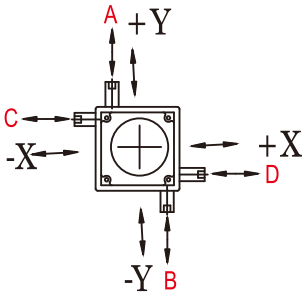
Centre point calibration:

1. Move the X & Y axes of the crosshair to the centre of the Camera and the machine, which is 1/2 of M & N. (see the figure 8-1)



【Figure 8-1】

2. Adjust the X & Y axes of the machine to zero.
3. To move the X axis of the crosshair tighten screw (A) and loosen screw (B), or loosen screw (A) and tighten screw (B). (see the left figure 8-2)
4. To move the Y axis of the crosshair tighten screw (C) and loosen screw (D), or loosen screw (C) and tighten screw (D). (see the right figure 8-2)



【Figure 8-2】

5. Again remove the camera and rotate it 180 degrees, and then reinsert the camera into the machine.
6. Observe if the crosshair overlaps the corner of the block。
7. If not, please do the centre calibration again, start with step one till the crosshair overlaps the corner of the block. Repeat the steps if necessary.

Centre Point Deviation Tolerance Ranges:

Camera models	Crosshair line	Tolerances
TTC 30 ST	0.007mm	0.014mm
TTC 30 LS	0.007mm	0.014mm
TTC 50 ST	0.005mm	0.010mm
TTC 50 LS	0.005mm	0.010mm
TTC 120 LS	0.002mm	0.004mm
TTC 250 LS	0.001mm	0.002mm

Precaution:

Please first calibrate horizontal and then centre point. When calibrating the centre point, it might cause a declination to the horizontal. If this happens, please recalibrate the horizontal.

CHAPTER 6
BASIC OPERATION

PREPARE TO START

1 Connect TTC Camera to the computer which is turned off.

2 Set the Display resolution to **1024x768**

3 Insert the TOLTEC Software Protector V7.0

ACTIVATOR

DELETE

PAUSE

IMPORT CAD FILE

QUIT

RECORDER

SAVE

STOP RECORDER

START TOLTEC V7.0

ACTIVATOR

Click **Activator** button

PAUSE

To freeze the measuring function by clicking **Pause** button

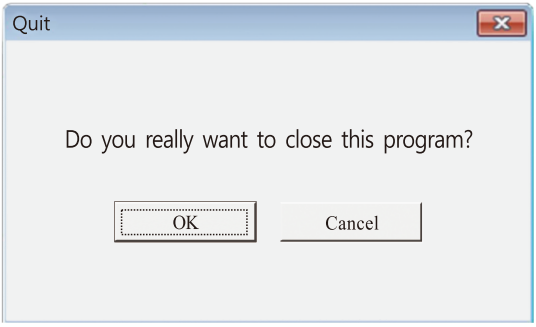
PROCEED

To proceed the measuring function after pause by clicking **Activator** button

QUIT

1 Click **Quit** button

2 Click **OK** to quitor click **Cancel** to stay.

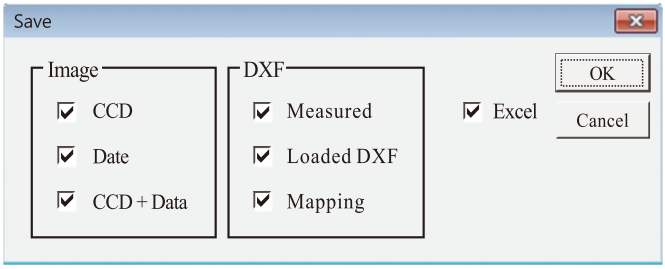


3 When quit the program, all unsaved data will be lost.

SAVE

Five files will be created when you save the data, including three image formats, a CAD format and an Excelformat .

1 Click Save button

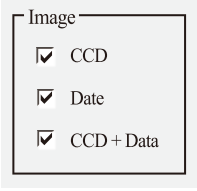


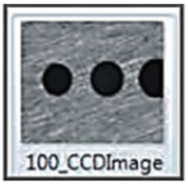
2 Select the format and click OK.

3 Give the file name and click Save.

SAVE IMAGE

Each selection will be saved as an individual file.





CCD IMAGE

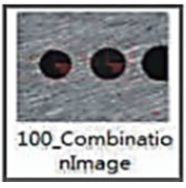


IMAGE + DATA

DATA

SAVE DXF-CAD format

On this section your selections will be exported as an individual dxf file.

DXF

☑ Measured	Measured Data
☑ Loaded DXF	Imported DXF
☑ Mapping	Square / Circle Comparison

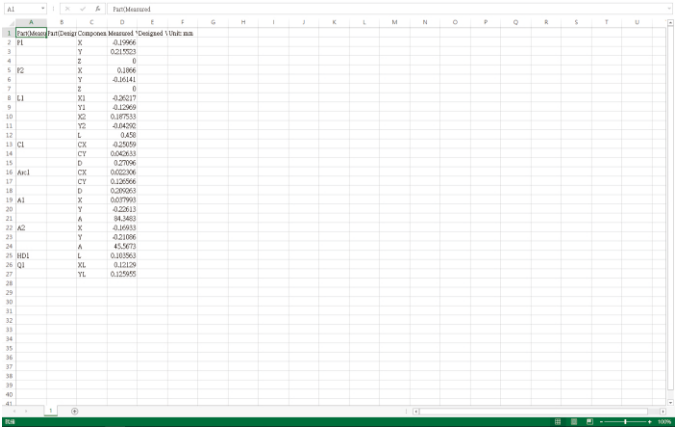
Please note

1 Only the measuringdata of Point, Line, Circle, Arc and Angle can be saved as .dxf file.

2 When save in imageformats, the image range includes the image and the data only show on the Measuring Operation Area.

SAVE EXCEL

Measurement data are exported in Excel format.



FILM RECORDING

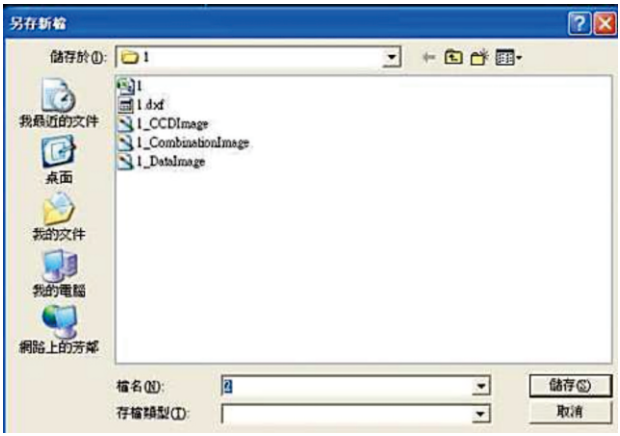
Allow users to record the operation of the programme.

1 Click **Recorder** button

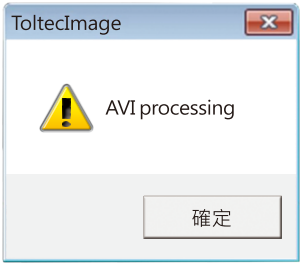
2 The recording time shows beside the **Recorder** button

3 To stop the recording by clicking the **Recorder** button again.

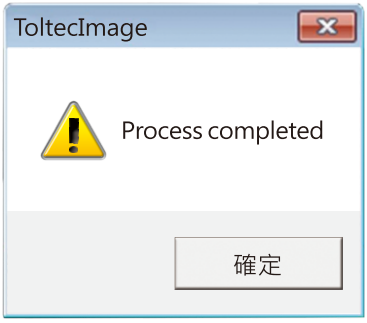
4 Givea file name and click **Save** to save the video.



5 Processing the video file as .avi format



6 Click **OK** when the process is completed



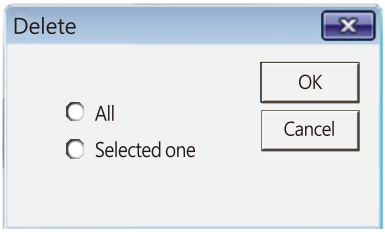
Recording Time

1 Please note that the processing time will be as long as the recording time, thereforeashort recording is advised.

DELETE

To delete the data on the Measuring Canvas.

1 Click **Delete** button



2 To delete all the data at once by checking'**All**' and click **OK**.

Click **OK** again to confirm.

3 To delete individual datum by checking"**Selected one**", and click **OK**.

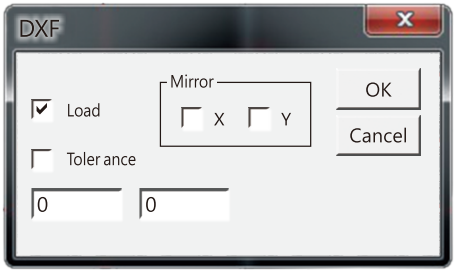
Left-click on the wanted data on Measuring Canvas, and click OK to confirm.

The data can be deleted one by one by left-clicking on the wanted data repeatedly.

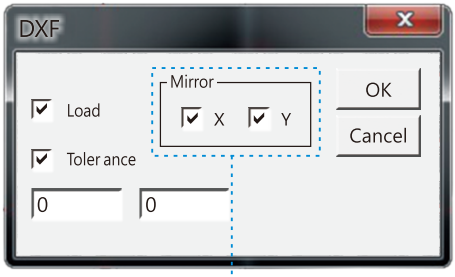
4 Once all results are deleted on Measuring Canvas, it cannot be restored.

IMPORT CAD FILE

1 Click **Import DXF** button

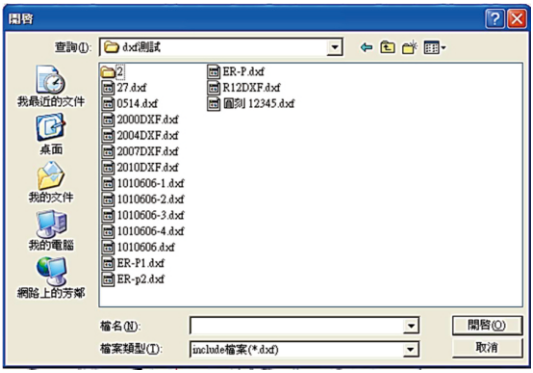


2 Check "**Load**" and click **OK.**

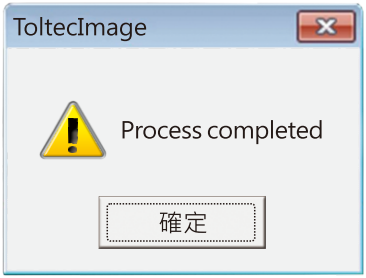


PS. Import CAD fileX Mirror /Y Mirror

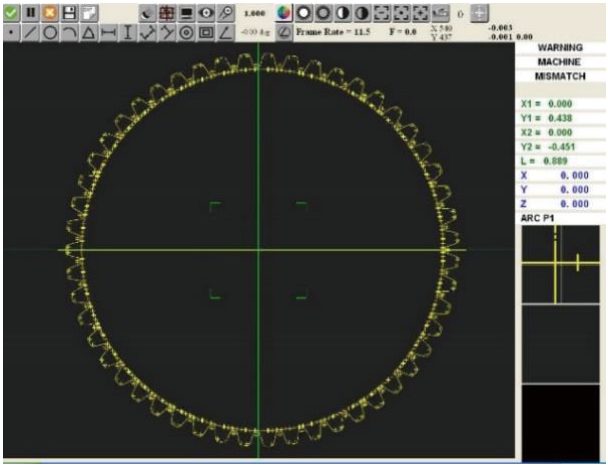
3 Select the CAD file and click **Insert.**



4 "Loading OK", click **OK.**



5 The image show on the Measuring Canvas.



Important Information

1 The CAD entities for one file are up to 10,000, or the import will be failed.

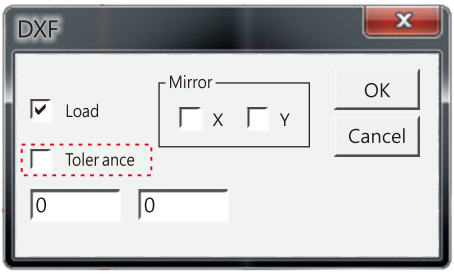
2 Before export the CAD file for measuring, set the same datum point as the workpiece on machine, so the CAD image can overlap the workpiece perfectly on the Measuring Canvas

CREATE TOLERANCE LINES FOR CAD IMAGE

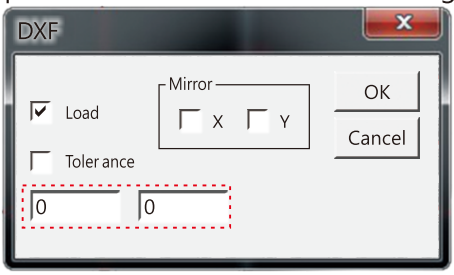
Set the tolerance lines for the CAD image on the Measuring Canvas for determining the deviation.

1 Click **DXF** button

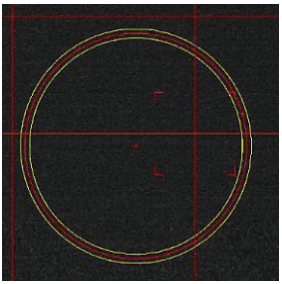
2 Select **Tolerance** and click **OK.**



3 Input the values for the deviation range and click **OK**



4 Click on any CAD line, the deviation lines will be produced for the line.



I. the deviation circle lines show as the yellow lines.

II. The CAD circle line shows in red.

CHAPTER 7
MEASUREMENTS

THE MEASUREMENTS INCLUDE

Point

Line

Square

Circle

Arc

Angle

Horizontal Distance(HD)

Vertical Distance(VD)

Circle Comparison
Square Comparison

DPP (Distance Between Two Points)

DPL (Distance Between A Point and A Line)

POINT

Define the axes X and Y of a point

HOW-TO

1 Click Point Button

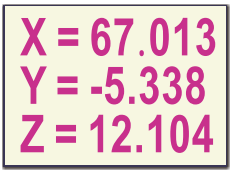
POINT will be shown on Data panel.

2 Left-click on the target on the Measuring Canvas and the axes (X, Y) of the point will be shown on the screen.

Measuring Canvas

➢ P1:The first Point measurement

Data Panel



➢ X and Y axes of P1

Unselect the target

1 Unselect the point by pressing [backspace] on the keyboard.

LINE

To measure the length between two points.

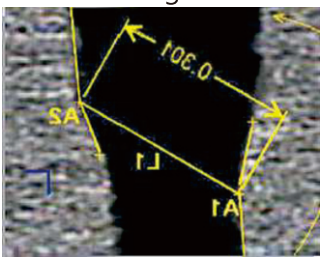
HOW-TO

1 Click **Line** Button
LINE will be shown on the Data panel.

2 Left-click on one point on the Measuring Canvas and then click another; a line will automatically be formed. Or press "**backspace**" on keyboard to unselectthe points.

3 Vertical-move the cursor from the line and left-click the distance will be shown on the Measuring Canvas and Data panel.

Measuring Canvas



➢ L1:The first Line measurement

Data Panel

X1 = 45.006
Y1 = -12.847
X2 = 45.265
Y2 = -12.694
L = 0.301

➢ X1/Y1 are the axes of the first point

➢ X2/Y2 are the axes of the second point.

➢ The length (L) is 0.301mm

SQUARE

To measure the centre's axes XY and the diameter of a square formed by 2 points.(diagonal point)

HOW-TO

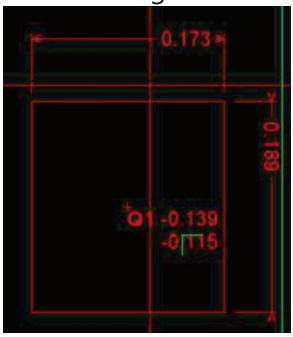
1 Click **Square** Button
RECT will be shown on the Data panel.

2 Select two points by left-clicking on the Measuring Canvas.
Or press **"backspace"** on keyboard to unselect the points.

3 Vertical move the mouseand Left-click for width.
Horizontalmoveand Left-click for length.

4 The central axes and diameter will be shown on the Measuring Canvas and Data panel.

Measuring Canvas



➢ Q1:The first Square measurement

Data Panel

➢ Width: 0.173mm

➢ Length: 0.189mm

➢ The central axes of the circle
X -0.139
Y -0.115

CIRCLE

To measure the centre XY axes and diameter of a circle which is formed by 3 to 12 points.

HOW-TO

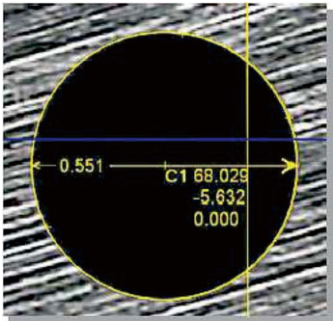
1 Click **Circle** Button
CIRCLE will be shown on the Data panel.

2 Select 3 to 12 points by left-clicking on the Measuring Operation Area.Or press **"backspace"** on keyboard to unselect the points.

3 Right-click, a circle will automatically be formed.

4 Left-click, the central axes and diameter will be shown on the Measuring Canvas and Data panel.

Measuring Canvas



➢ C1 : The first Circle measurement

Data Panel

X = 68.029
Y = -5.632
D = 0.551

➢ X and Y,the central axes of the circle.

➢ The diameter (D) is 0.551mm

ARC

To measure the Centre XY axes and radius of an arc which is formed by choosing 3 to 12 points.

HOW-TO

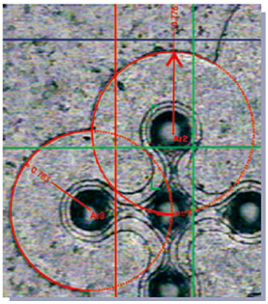
1 Click **Arc** Button
ARC will be shown on the Data Panel .

2 Select 3-12 points by left-clicking on the Measuring Operation Area. Or press **"backspace"** on keyboard to unselect the points.

3 Right-click, an arc will automatically be formed.

4 Left-click, the central axes, radius and arc will be shown on the Measuring Canvasand Data Panel.

Measuring Canvas



➢ Ar3 : The third Arc measurement

Data Panel

X = 66.498
Y = -5.735
R = 0.763
A = 146.746

➢ X andY,the central axes of the arc

➢ The Radius (R) is 0.763mm

➢ The Arc (A) is 146.746

ANGLE

To measure the XY axes of intersection and angle degree of two lines.

HOW-TO

AngleThere are three ways to measure angle.

1. the angle between two sloping lines

2.the angle between a sloping line and the horizontal line

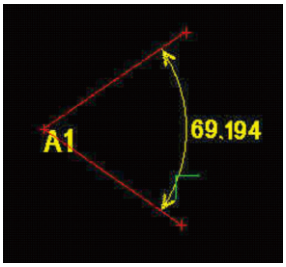
3.the angle between a sloping line and the vertical line

DESCRIPTION AS FOLLOWS

1.THE ANGLE BETWEEN TWO SLOPING LINES

Operation Steps

- Click Angle button
- Left-click separately on two points on a straight line of the Measuring Canvasto form the first line (If the selected point is not the correct one, press "backspace" on keyboard to unselectthe point).
- Then left-click the mouse separately on the other two points on the Measuring Canvas to form another straight line, and these two lines will produce an intersection.
- Left-click the mouse again, to place the mark of angle between the two lines as shown below.



X	1.183
Y	0.638
A	183.997
ANGLE P1	

2. THE ANGLE BETWEEN A SLOPING LINE AND THE HORIZONTAL LINE

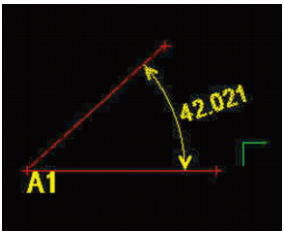
Operation Steps

- Click Angle button

- Left-click separately on two points on a straight line of the Measuring Canvas to form the first line(If the selected point position is not the correct one, press "backspace" on keyboard(to unselect the point).

- Right-click the mouse and there will be a hint of ANGLE P3 V on the right display field,and the V represents the angle between the line and the horizontal line.Choose the third point, thenmove the mouse toward the right or left to decide the desired angle direction, then click on the position where you want to place the angle.At this time, an intersection will be produced between the horizontal line and the angle line. ◦

- Left-click the mouse again, to place the mark of angle between the two lines as shown below.

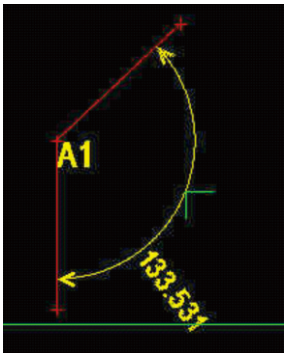


X	0.430
Y	0.394
A	183.997
ANGLE P1 V	

3. THE ANGLE BETWEEN A SLOPING LINE AND THE VERTICAL LINE

Operation Steps

- a. Click Angle button
- b. Left-click separately on two points on a straight line of the Measuring Canvas to form the first line (If the selected point position is not the correct one, press "backspace" on keyboard to unselect the point).
- c. Right-click the mouse and there will be a hint of ANGLE P3 H on the right display field,and the H represents the angle between the line and the vertical line. Choose the third point, then move the mouse upward or downward to decide the desired angle direction, then click on the position where you want to place the angle. At this time, an intersection will be produced between the vertical line and the angle line.
- d. Left-click the mouse again, to place the mark of angle between the two lines as shown below.



X	0.430
Y	0.394
A	183.997
ANGLE P1 H	

HORIZONTAL DISTANCE (HD)

To measure the horizontal length between two points.

HOW-TO

Horizontal Distance(HD) There are two ways to take the measurement.

1.the horizontal distance between two points

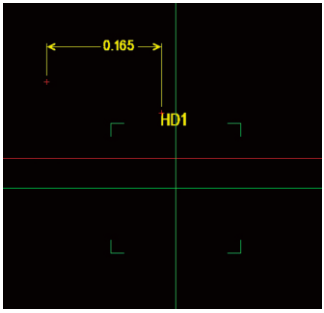
2.the horizontal distance between the target point and the datum poinT.

DESCRIPTION AS FOLLOWS

1. THE HORIZONTAL DISTANCE BETWEEN TWO POINTS

Operation Steps

- a.Click **HORIZONTAL DISTANCE** button
  b.Choose any two points on the Measuring Canvas to
- form ameasurementline(If the selected position is not correct, press "backspace" on keyboard to unselect the point).
- c.Left-click the mouse to select thesize markand place it as shown belowon the screen.



X1 =	-0.185
Y1 =	0.153
X2 =	-0.020
Y2 =	0.108
HD =	0.165
X	- 0.397
Y	0.042
Z	0.000
HD P1	

2. THE HORIZONTAL DISTANCE BETWEEN THE TARGET POINT AND THE DATUM POINT

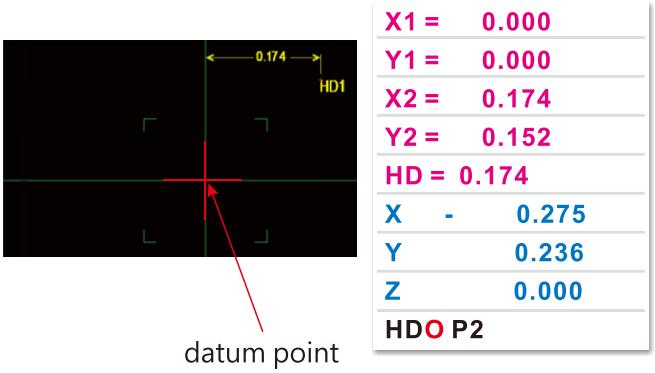
Operation Steps

- a. Click **HORIZONTAL DISTANCE** button

- b. Under theHORIZONTAL DISTANCE(HD)mode, right-click the mouse and there will be a hint of HDOP 2 on the right display field,and the O represents the datum point.

- c. Choose any point on the Measuring Canvas to form a measurementline (If the selected position is not correct, press "backspace" on keyboard to unselect the point).

- d. Left-click the mouse to select the size mark and place it as shown belowon the screen.



VERTICAL DISTANCE (VD)

To measure the vertical length between two points.

HOW-TO

Vertical Distance(VD) There aretwo ways to take the measurement

1. thevertical distance between two points
2. the vertical distance between the target point and the datum point

DESCRIPTION AS FOLLOWS

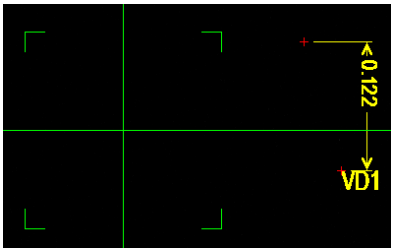
1.THE VERTICAL DISTANCE BETWEEN TWO POINTS

Operation Steps

- a. Click **VERTICALL DISTANCE** button

- b. Choose any two points on the Measuring Canvas to form a measurementline (If the selected position is not correct, press "backspace" on keyboard to unselect the point).

- c. Left-click the mouse to select the size mark and place it as shown below on the screen



X1 =	0.171
Y1 =	0.083
X2 =	0.207
Y2 =	-0.038
HD =	0.100
X	- 0.178
Y	0.152
Z	0.000
HD P1	

2. THE VERTICAL DISTANCE BETWEEN THE TARGET POINT AND THE DATUM POINT

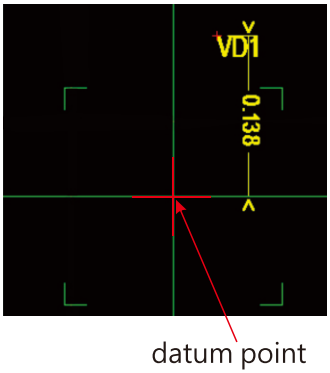
Operation Steps

- a. Click **VERTICALL DISTANCE** button

- b. Under the VERTICALDISTANCE(VD) mode, right-click the mouse and there will be a hint of VDO P1 on the right display field,and the O represents the datum point.

- c. Choose any point on the Measuring Canvas to form a measurementline (If the selected position is not correct, press "backspace" on keyboard to unselect the point).

- d. Left-click the mouse to select the size mark and place it as shown belowon the screen.



X1 =	0.000
Y1 =	0.000
X2 =	0.037
Y2 =	0.138
HD =	0.138
X	- 0.087
Y	0.064
Z	0.000
HDO P1	

CIRCLE COMPARISON

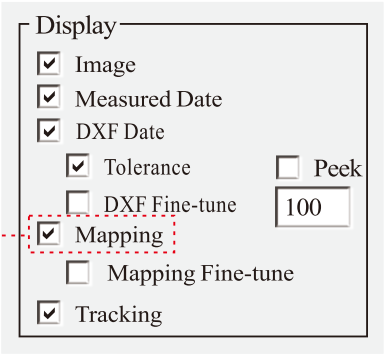
To measure actual Chamfer and the dimension and position of a circle.

HOW-TO

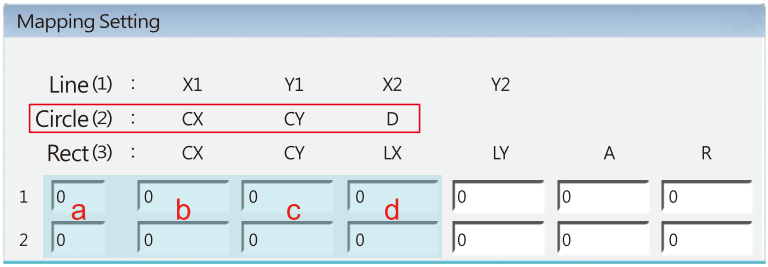
1 Click Display button

2 Check **Mapping**, and then click OK

3 Click **Circle Comparison** Button



4 Input the parameters, then click **OK.**



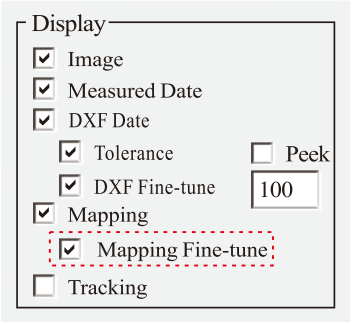
a. Input circle code : **2**
b. Input circle centre coordinate **(X)**
c. Input circle centre coordinate **(Y)**
d. Input circle **diameter** (mm)

5 The circle will be formed on the Measuring Canvas according to the parameter.

FINE MOVEMENT

1 Click **Display** button

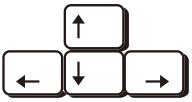
2 Tick **Mapping Fine-tune**, and then click **OK**

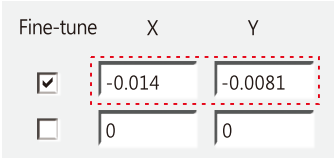


3 Fine moving the circle by using the arrow keys on the keyboard

4 Click **Circle Comparison** Button

5 Find the moving data on the Fine-tune section

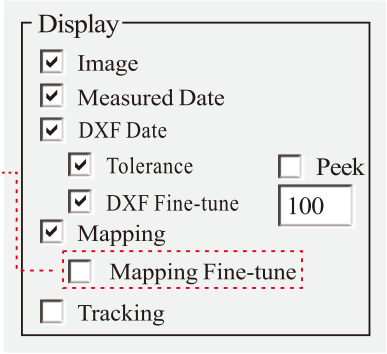




6 Turn off the fine-tune function when you finish the moving.

6-1 Click **Display** button

6-2 Tick off **Mapping Fine-tune**, and then click OK.



SQUARE COMPARISON

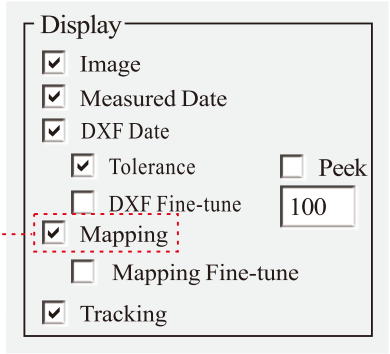
To measure the dimension and position of a square.

HOW-TO

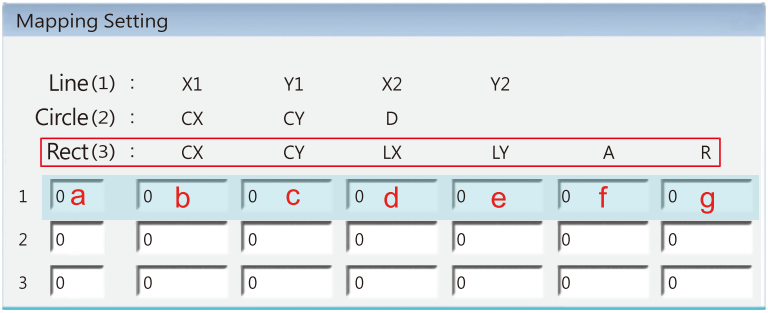
1 Click Display button

2 Check **Mapping**, and then click OK

3 Click **Square Comparison** Button



4 Input the parameters, then click **OK.**



a. Input circle code : 3
b. Input circle centre coordinate **(X)**
c. Input circle centre coordinate **(Y)**
d. Input square **width** (mm)
e. Input square length (mm)

f. Input angel of square to the datum crosshair

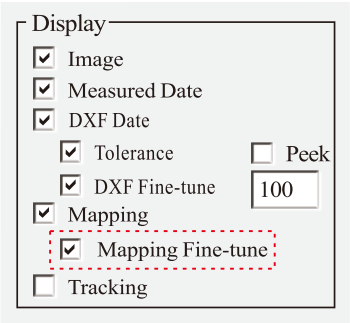
g. Input Radius

5 The circle will be formed on the Measuring Canvas according to the parameter.

FINE MOVEMENT

1 Click **Display** button

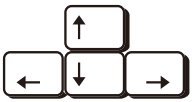
2 Tick **Mapping Fine-tune**, and then click **OK.**

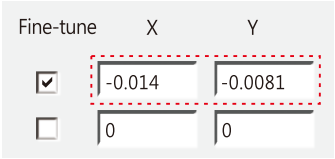


3 Fine moving the circle by using the arrow keys on the keyboard.

4 Click **Square Comparison** Button

5 Find the moving data on the Fine-tune section.

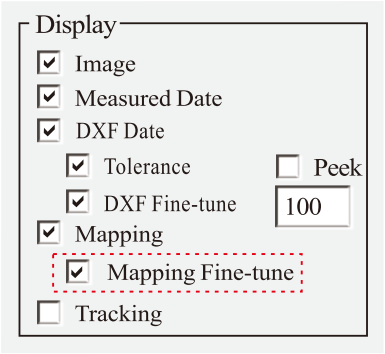




6 Turn off the fine-tune function when you finish the moving.

6-1 Click **Display** button

6-2 Tick off **Mapping Fine-tune**, and then click OK



DPP (Distance Between Two Points)

To measure the distance between two existing/new points or the centre axes of a circle, an arc or angle.

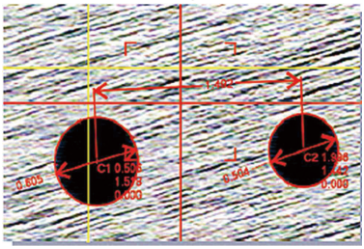
HOW-TO

1 Click **DPP** Button
DPP will be shown on the Data Panel.

2 Click on an existing or a new point on the Measuring Canvas, and then click on the other; a line will automatically be formed.

3 Vertical move the cursor from the line and then left-click, the length will be shown on the Measuring Canvas.

Measuring Canvas



➢ DPP between two circles

Data Panel

X1 = 0.506
Y1 = 1.518
X2 = 1.996
Y2 = 1.442
DPP 1.492

➢ X1/Y1 are the axes of the first point
➢ X2/Y2 are the axes of the second point.
➢ The length(DPP) is 1.492mm

Definition of an Existing Point

1 The existing points include the marked points of a point, a line, a circle, an arc and an angle.
2 Move the cursor crosshair onto an existing point and a small green square will appear on it, then you may click the point to select the point

DPL (Distance Between A Point And ALine)

To measure the distance between either an existing or a new point and an existing line.

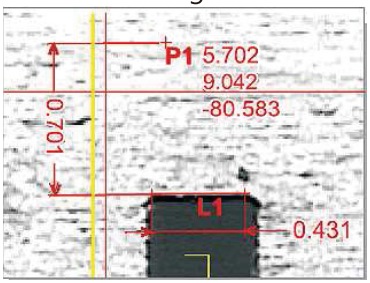
HOW-TO

1 Click **DPL** Button
DPP will be shown on the Data Panel.

2 Click on a point on the Measuring Canvas and then click on an existing line; a line will automatically be formed.

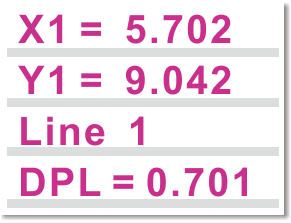
3 Vertical move the cursor from the line and then left click, the length will be shown on the Measuring Canvas.

Measuring Canvas



➢ DPL between a point and a line

Data Panel



➢ X1/Y1 are the axes of the existing points

➢ The length (DPL) is 0.701mm

Definition of an Existing Line

Move the cursor crosshair onto an existing line and the line becomes green, then you may click on the line for measuring.

POSITION ROTATION

To rotate the cursor/central/datum crosshairs. When theworkpieceis not positioning on the machine, rotate the crosshairs to be paralleled with the workpiece and measure accordingly.

HOW-TO

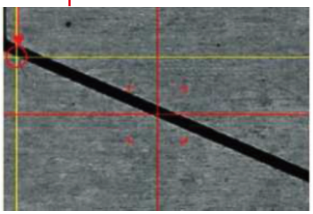
1 Click **Position Rotation** button

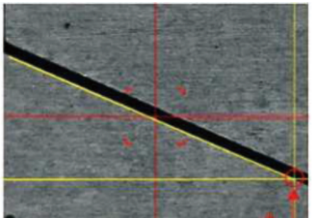
2 Left-click two points on a straight line or the edge of the workpiece.

3 The crosshairs will be rotated according to the two points gradient and parallel with the workpiece.

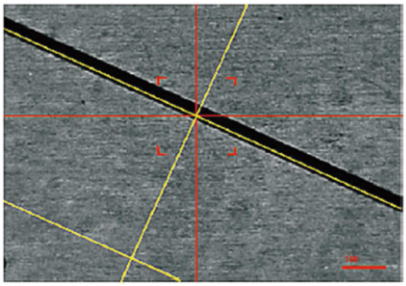
The rotated angle can be found on the panel. 13.95 deg

First point





second point



➢ The new yellow rotated crosshair is paralleled with the rotated position.

1 The farther of the two selected points, the more precise angle you will get.
2 If the target is beyond the Measuring Canvas, move theTTCcamera to get the farthest point.

MEASUREMENT UNDER THE ROTATION

When the new rotation has been made, you can perform all the measurements under this mode.

All results are obtained according to the new fiducial line.

> The measurements under this mode will be less accurate when compare with the default mode.

RESET THE ROTATION

To resetthe crosshairs to the default mode by clicking **Rotation Reset** button.

CHAPTER 8
KEYBOARD SHORTCUT

Active Keyboard Shortcut Mode(KSM)when operate the measurements without a mouse.

Under KSM, only certain keys are active and the cursor crosshair function will be ceasedsimultaneously .

The mouse only malfunctions on the Measuring Canvas, and it is still working for settings and basic operations.

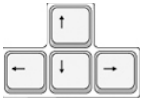
ACTIVATE SHORTCUT

To activate the Keyboard shortcutmode by clicking M button on he keyboard. M

- White areas: active keys
- Blue areas: ceased keys

SHORTCUTS AND COMMANDS

SHORTCUT	COMMAND
M	Turn ON/OFF Shortcut function
0	POINT measurement
1	LINE measurement
2	SQUARE measurement
3	CIRCLE measurement
4	ARC measurement
5	ANGLE measurement

SHORTCUT	COMMAND
6	HORIZONTAL measurement
7	VERTICAL measurement
8	DPP measurement
9	DPL measurement
+	Saved image comparison
Backpace	Deselect points
Esc	Close the toolbar window
End	As Right-click mouse (confirm the points selection) under CIRCLE and ARC measurement
Enter	Select points/confirm selection (as Left-click)
S	SAVE data
	Run theDXF file for fine-tuning To fine-tune the Square/Circle comparison figures

DEACTIVATE SHORTCUT

To deactivate thekeyboard shortcut mode by clicking M button on the keyboard.