KEYENCE

96M14113

Your First Choice in Coordination Measurement

Handheld Probe Coordinate Measuring Machine
XM Series
Quick Start Guide

Thank you for choosing the XM Series Handheld Probe Coordinate Measuring Machine !
The purpose of this Quick Start Guide is to introduce a user to basic programming methods.
You can begin to master programming by following the instruction in this guide.
To complete the Program Mode basics, use the measurement plate provided.
Once you have mastered the basics, you can easily use them for various applications.
Let's begin!

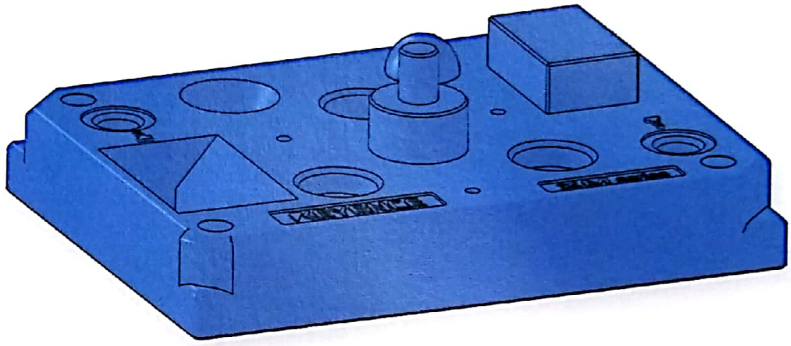


Table of Contents

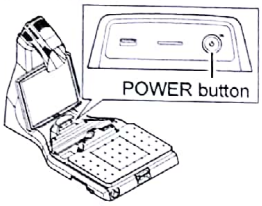
CHAPTER 1

Before Measuring

1-1 Understanding the Program Mode Flow

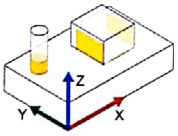
"Program Mode" is used to set measurement points and tolerances.
Once you register measurement details in Program Mode, you can use "Run Mode" at anytime by simply selecting the desired program.
You can save many programs in Program Mode, so you can create programs for each part you need to measure.

● **Start-up**
To turn the system on, press the POWER button on the main unit.

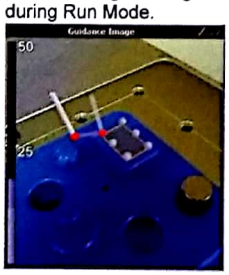


● **Fixing a target**
You need to fixture the measurement target from the start to the end of measurement.
If you are using your own measurement target, fixture it with a clamp or other fixture.

● **Coordination**
If you set a coordination on the measurement target, you can measure the distance from the coordinate origin point and the positionality.
You can also accurately guide the measurement position during Run Mode.

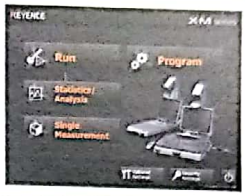


● **Guidance Image**
The guidance image serves two purposes:
- Guides the measurement position using an image during Run Mode.

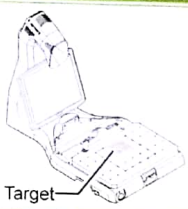


- You can insert the measurement point as an image into single object reports or result reports.

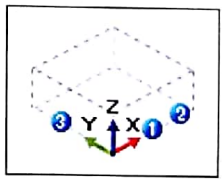
Step 1
Click the [Program Mode] button.



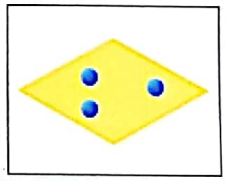
Step 2
Fixture the measurement target to the stage.



Step 3
Set a coordination.

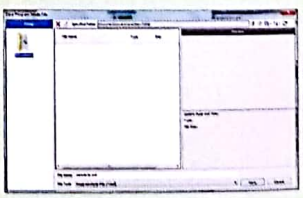


Step 4
Measure the measurement elements.



Step 5
Capture a guidance image.

Step 6
Save the Program.

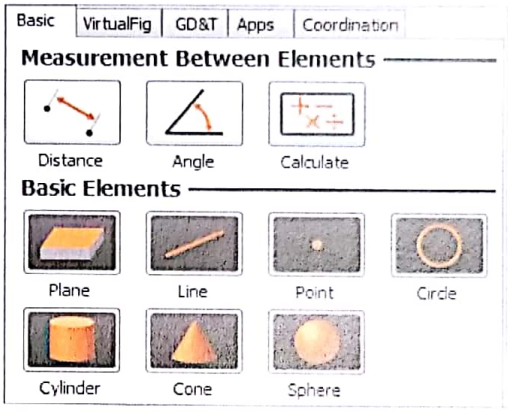


CHAPTER 2

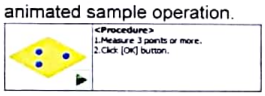
Measurement Using the Basic Measurement Menu

2-1 What is the Basic Measurement Menu?

The Basic Measurement tab contains tools used to specify measurement points. It consists of "Basic Elements" to generate elements, such as planes and circles, and "Measurement Between Elements" that measures the distance or angle between two elements.



● **Measurement guide**
Click the Basic Measurement icon to open the corresponding edit screen.
The edit screen provides a measurement guide that describes the operation procedure for the applicable tool.
Click the ▶ button to see an animated sample operation.

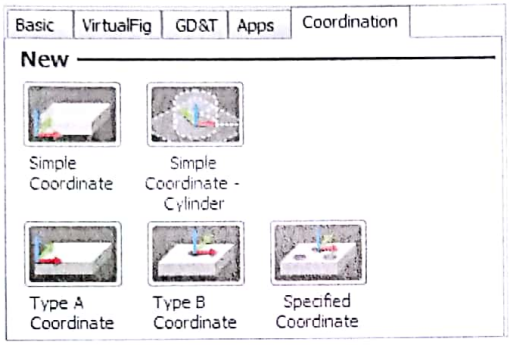


Icon	Category	Name	Measuring item
	Measurement Between Elements	Distance	Measures the distance between any two specified elements.
		Angle	Measures the angle between any two specified elements.
		Calculation	Calculate by using the measurement result.
	Basic Elements	Plane	Creates a "Plane" from any 3 or more specified measurement points.
		Line	Creates a "Line" from any 2 or more specified measurement points.
		Point	Creates a "Point" from any 1 or more specified measurement points.
		Circle	Creates a "Circle" from any 3 or more specified measurement points.
		Cylinder	Creates a "Cylinder" from six measurement points taken from two separate axis cross-sections.
		Cone	Creates a "Cone" from six measurement points taken from two separate axis cross-sections.
		Sphere	Creates a "Sphere" from any 4 or more measured points.

2-2 What is Coordination?

The "Coordination" tab contains tools to measure the X, Y, and Z axes that serve as references on the measurement target and set coordination.

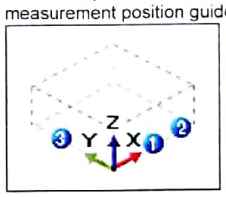
- If a reference coordinate system is specified in the part's drawing and measurements are referenced to these coordinates, you must set a coordination.
- When measuring in run mode and fixturing parts in different stage positions, coordination must be set to "align" measurement points and guidance images to the part.



Icon	Name	Measuring item
	Simple Coordinate	Measures three points and sets the base coordination.
	Simple Coordinate - Cylinder	Measures four points on the cylinder, and set the base coordination.
	Type A Coordinate	Measures a plane, line, and a point to set the base coordination.
	Type B Coordinate	Sets the base coordination where the center coordinate of a circle forms the origin.
	Specified Coordinate	Select elements which become the reference plane, references the axis and origin, and sets the base coordination.

● **Measurement position guide**
This function shows how to measure the same position as the measured point in Program Mode.
By determining the measurement point, measurement reproducibility increases, and anyone can measure with the same conditions.

● **Simple Coordinate**
Measures three points to easily create a coordination.
We recommend that you first set it up to correct the measurement position guide.

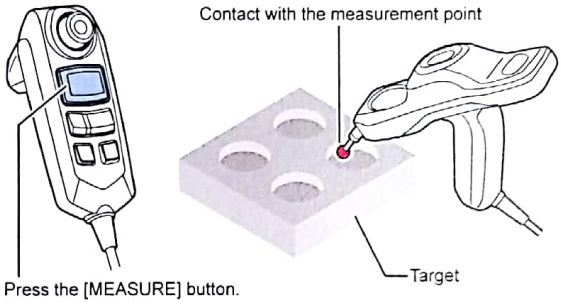


If the measurement value is the reference, set the appropriate coordinate from [Type A Coordination], [Type B Coordination], and [Coordination specified by elements].

2-3 Understanding How to Execute Measurements

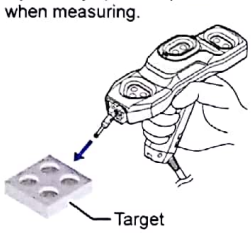
In the XM Series, the process of touching the measurement target with the stylus ruby tip of the probe and obtaining that point's XYZ coordinate is called "measurement".
The coordinate of the point obtained through measurement is called the "measurement point".
First, let's figure out how to execute "measurements".

1. Make the stylus ruby tip of the probe come into contact with the measurement point, and press the [MEASURE] button on the console.



When you press the [MEASURE] button on the console, an activation sound will sound twice.
Do not move the probe until you hear both activation sounds.

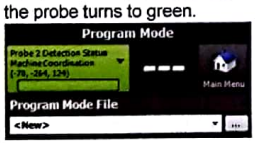
● **Probe**
Hold the probe with your dominant hand and measure the target.
Do not forcefully press the stylus ruby tip of the probe when measuring.

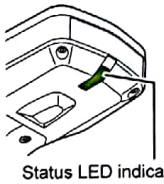


● **Cancel**
You can cancel measurement if the probe moves during measurement or measures an undesired point.
Press the [CANCEL] button on the console. The previous measurement is canceled.


[CANCEL] Button

● **Status display area/ Status LED indicator**
When the probe is in measurement range, the "status display area" on the screen and the "Status LED indicator" on the probe turns to green.

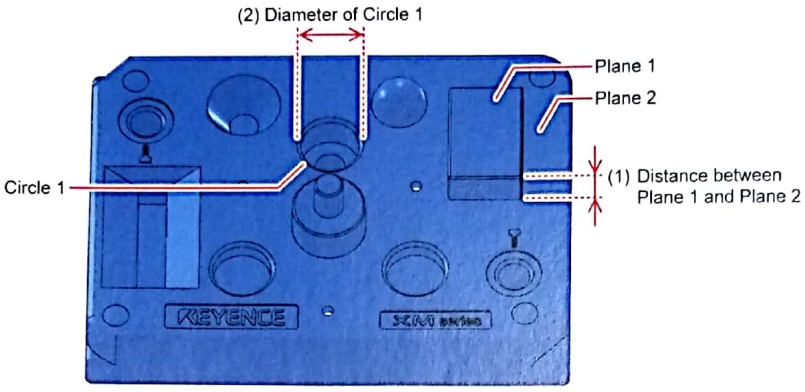



Status LED indicator

You cannot measure when the display is red or yellow.

2-4 Creating a Program Using Basic Measurements

In this example, a "Program File" that measures the target shown in the figure below is created.



Step 1
Set a "Simple Coordinate".
Page 10

Step 2
Measure the "Plane 1" and "Plane 2".
Page 14

Step 3
Measure the distance between "Plane 1" and "Plane 2".
Page 16

Step 4
Set the tolerance for the distance of "Plane 1" and "Plane 2".
Page 17

Step 5
Measure the diameter of "Circle 1".
Page 18

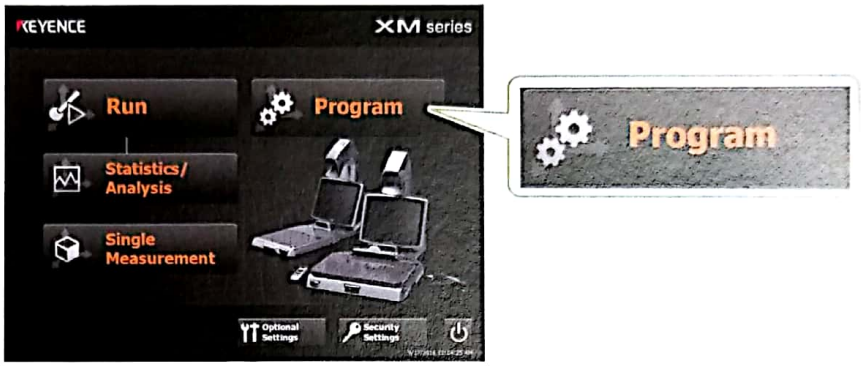
Step 6
Save the Program mode file.
Page 20

2-5 Setting a Simple Coordinate

● **Probe registration**
After you purchase this system and before you use it for the first time, you need to register the probe information.
For details, refer to "Probe Registration" in the User's Manual.

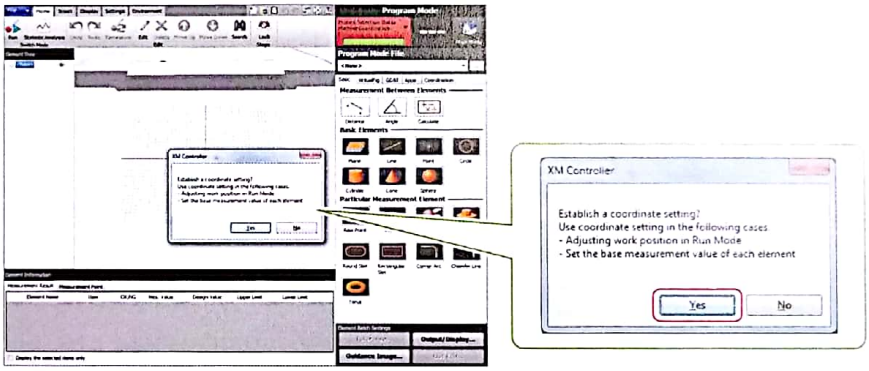
Set a "Simple Coordinate".

1. Click the [Program] button on the main screen.



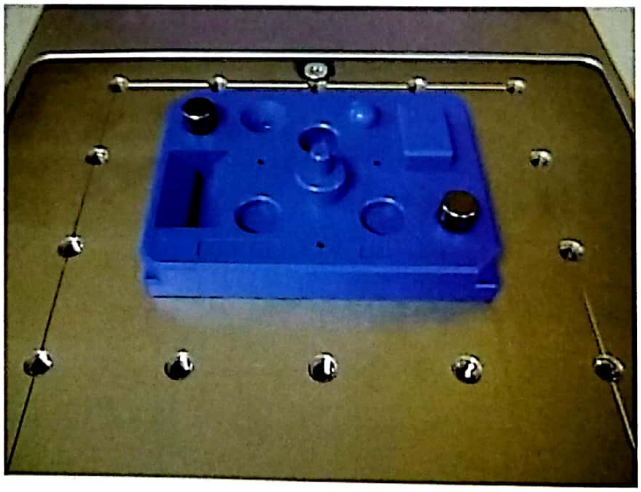
The "Program Mode" screen is displayed.

2. A message box appears. Click the [Yes] button.

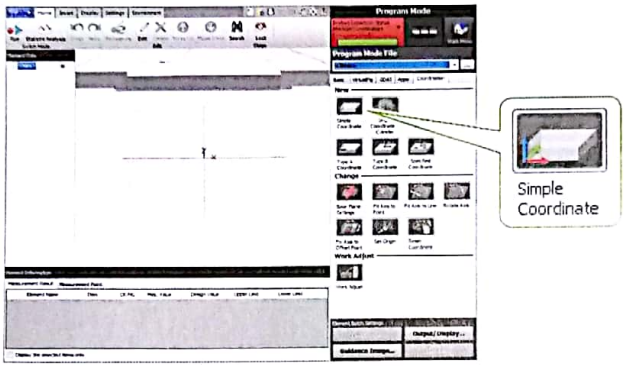


The [Coordination] tab opens.

3. As shown in the figure below, fix the measurement target onto the stage with the provided bolts.

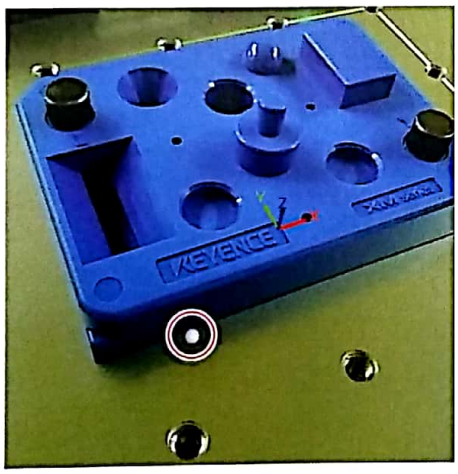


4. **Click [Simple Coordinate] button.**

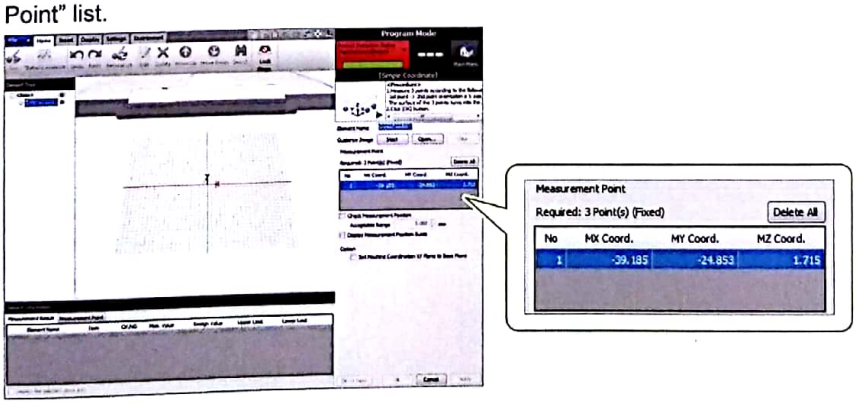


The edit screen of "Simple Coordinate" is displayed.

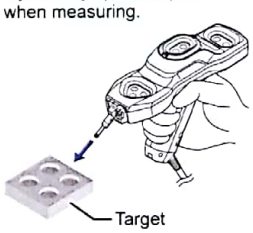
5. **Near the point indicated by the red circle in the image below, make the stylus ruby tip come into contact with both the measurement target and stage plate, and press the [MEASURE] button on the console.**



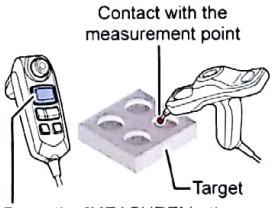
The first point is measured, and the coordinate is displayed on the "Measurement Point" list.



● **Probe**
Hold the probe with a dominant hand and measure the target. Do not forcefully press the stylus ruby tip of the probe when measuring.



● **Measure**
Make the stylus ruby tip of the probe come into contact with the measurement point, and press the [MEASURE] button on the console.



Press the [MEASURE] button.

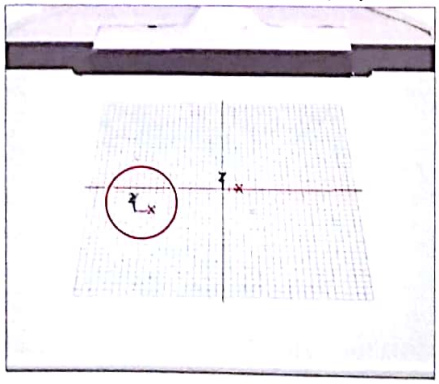
When you press the [MEASURE] button on the console, an activation sound will sound twice.
Do not move the probe until the activation sound sounds for the second time.
"2-3 Understanding How to Execute Measurements" (Page 8)

6. **Using the same procedure as Step 5, measure near the point indicated by the red circle in the image below.**

The second point is measured.

7. **Next, measure near the point indicated by the red circle in the image below.**

In the graphic display area, the "origin" and the arrow indicating the directions of the "Simple Coordinate" are displayed.

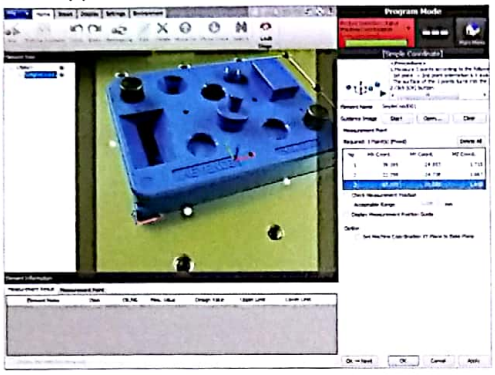


● **Coordinates set by "Simple Coordinate"**
Coordinates are determined in the following way with "Simple Coordinate".

- **XY Plane**
  The plane that passes through the three measured points is the "XY Plane".
- **X-Axis**
  The line that connects 1st and 2nd points is the "X-Axis". The direction from the 1st point to the 2nd point is the positive direction.
- **Origin point**
  The point that intersects the perpendicular line drawn in the direction of the X-Axis from the 3rd point is set the "origin point".

8. **In order to capture the "Guidance Image", press the [DISPLAY] button on the console.**

The graphic display area switches to the probe camera live display.
On the measurement target, the points measured with "Simple Coordinate" are overlapped and displayed.

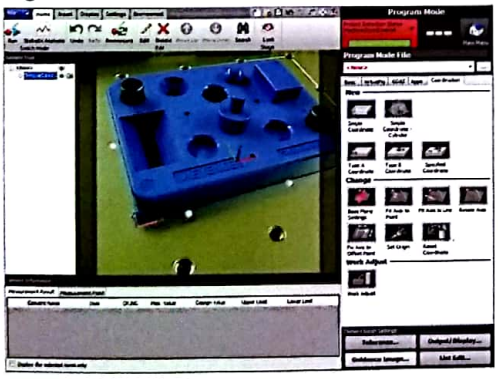


9. **Adjust the display so that you can recognize the measurement target and measurement points, and press the [CAPTURE] button on the console.**

The guidance image is captured.

10. **Press the [OK] button of the console.**

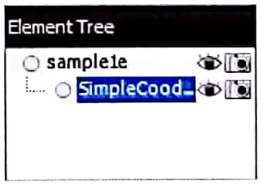
The edit screen of "Simple Coordinate" closes and the "Simple Coordinate" is registered in the Element Tree.



● **Guidance Image**
The image captured here is the "Guidance Image".
It is the reference image in "Run Mode", so make sure to capture an image that is easy to see where the position of the measurement point is in relation to the measurement target.

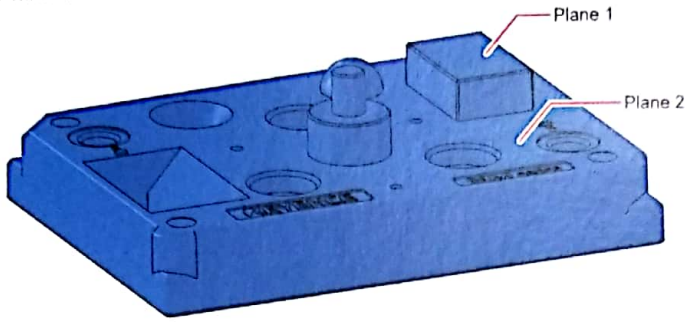
● Capture range for the Guidance Image
The range indicated by the red frame in the image below is saved as the guidance image. The gray area is not included in the saved guidance image.

● **Element Tree**
The registered measurement elements are displayed in order. In Run Mode, the measurement elements are measured in the order that they are registered in the Element Tree.



2-6 Measuring a Plane

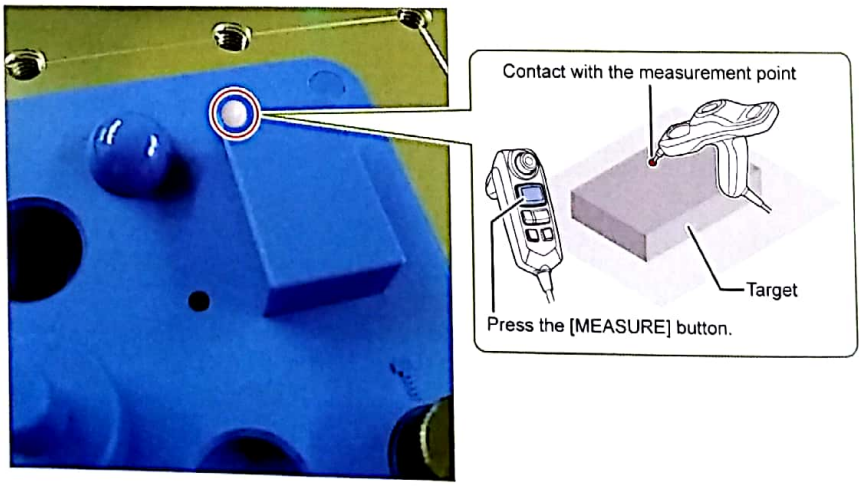
Measure "Plane 1" and "Plane 2".



1. **Select the [Basic] tab and click the [Plane] button under the "Basic Elements".**

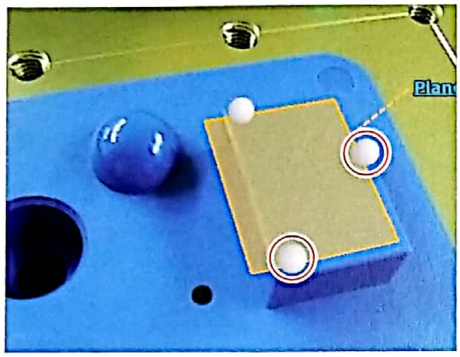
The edit screen of "Plane" opens.

2. **Measure the first point for "Plane 1" by using the probe and console.**



● **Measure**
Refer to 📖 Page 8.

3. **With the same procedure, measure the second and third points on the plane.**

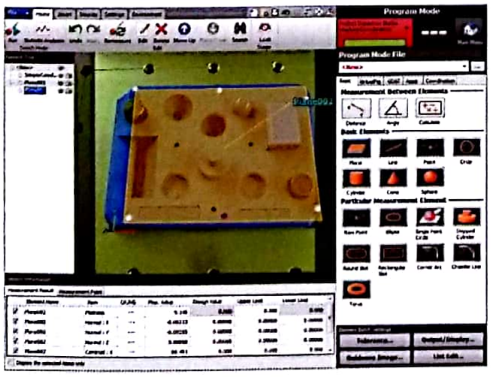


4. **Capture a "Guidance Image".**

5. **Press the [OK] button on the console.**

The edit screen closes and the "Plane" is added to the Element Tree.

6. **Repeat Steps 1 to 5 to measure Plane 2.**



● **Number of measurement points**
For plane measurement, at least three measurement points are necessary.
The measurement result is more stable with many points, so we recommend six points or more.
The number of recommended points for each element and the minimum necessary points are shown on the edit screen.

Capturing the Guidance Image
Refer to Page 13.

● **Switch between still images and live display**
After capturing the guidance image with the measured elements, the graphic display area becomes a still image.
When recapturing a guidance image, press the [CAPTURE] button on the console and you can switch to the live display.

Switch the "Play" and "Stationary" by [CAPTURE] button

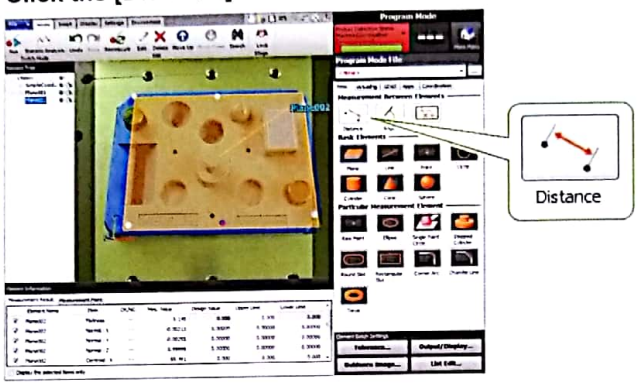
● **Measurement point range**
When measuring a plane, measure the measurement points so that they are distributed within a wide range across the target plane.

● **OK → Next**
When you want to repeatedly measure with the same element, hold down the [OK] button on the console.
The measured element is registered and the same element is used as a new element.

2-7 Measuring the Distance Between Planes

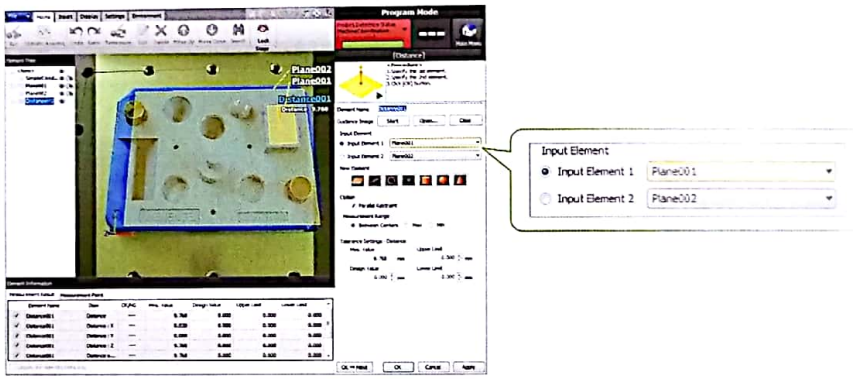
Measures the distance between two planes measured in section "2-6".

1. **Click the [Distance] button under the "Measurement Between Elements".**

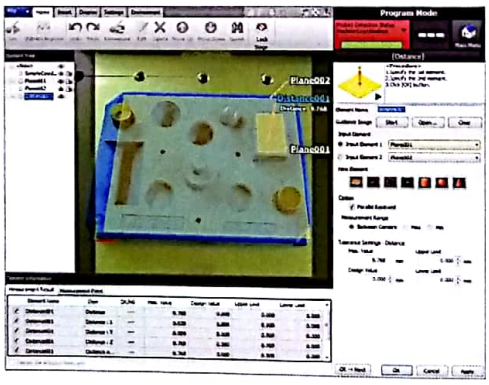


The edit screen of "Distance" opens.

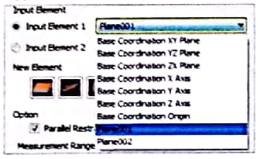
2. **Check that [Plane 001] and [Plane 002] are selected for [Input Element].**



3. **Capture a "Guidance Image".**

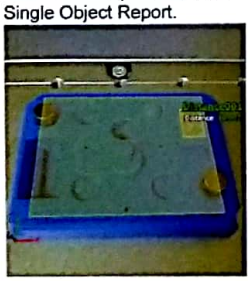


● **Input element**
The "input element" is the geometric feature used to reference the measurement. (here, it is "Distance"). You can select from measured elements.
The most recently measured element is selected as the initial value.
You can change it by selecting elements from the displayed list.



● **New Element**
You can create new input elements from [New Element] on the edit screen.
When you click the element icon, the edit screen of the selected element opens.
After measurement, if you click the [OK] button, you will return to the edit screen of [Distance].

● **Guidance image for [Distance]**
A Guidance Image captured with [Distance] measurement is used when displaying measurement points on the Single Object Report.



2-8 Setting a Dimensional Tolerance

When you set a tolerance, the XM can judge measurement result.
Enter the design value and the upper and lower tolerance limit.

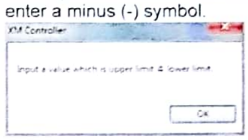
1. Enter the [Design Value], [Upper Limit], and [Lower Limit] in the "Tolerance Settings" area.

Tolerance settings of 10 mm with ±0.3 mm

2. Press the [OK] button of the console.

The edit screen closes and the "Distance" is added to the Element Tree.
When the tolerance result is "OK", a ● mark is displayed on the element name in the Element Tree.

● **Values that you can enter for the tolerance**
You can only enter a value for the upper limit that is greater than the lower limit. For negative tolerance values, enter a minus (-) symbol.

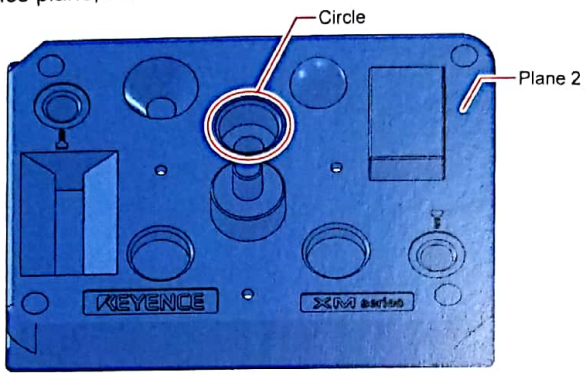


You can also set tolerances to be both positive or negative if necessary.

● **Batch Tolerance Settings**
It is also possible to set batch tolerance rules to be applied to all the measurements in the program.
For details, refer to "Batch Tolerance Settings" in the User's Manual.

2-9 Measuring the Diameter of a Circle

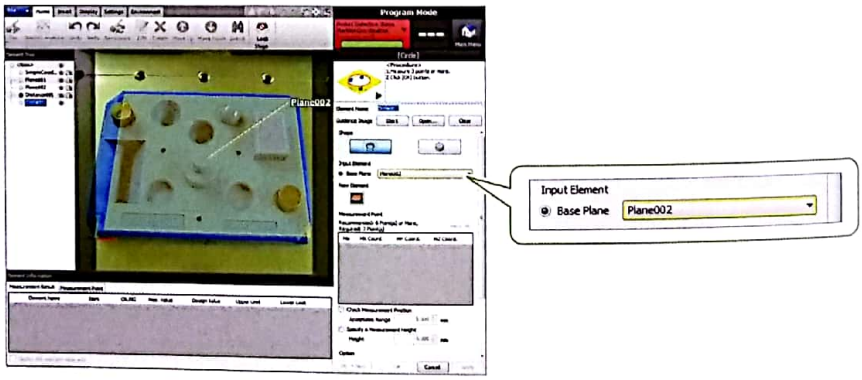
Measure the diameter of a circle.
When you measure a circle: specify a reference plane, project the measurement point onto the reference plane, and measure it.



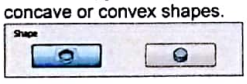
1. **Click the [Circle] button under the "Basic Elements".**

The edit screen of "Circle" opens.

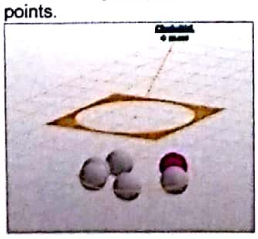
2. **Check that [Plane 002] is selected for [Base Plane].**



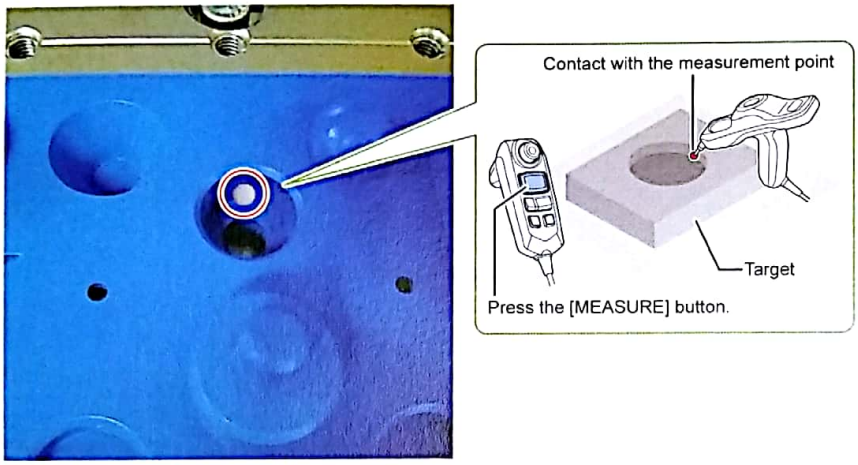
● **Shape**
For a circle, you can select concave or convex shapes.



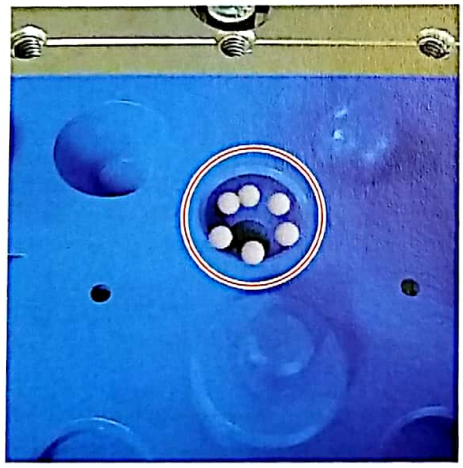
● **Base Plane**
For circle measurement, a base plane is necessary.
Project measured points onto a base plane and calculate a circle using the projected points.



3. **Measure the first point on the circle by using the probe and console.**



4. **With the same procedure, measure the second and third points on the circle.**



- **Number of circle measurement points**
  For circle measurement, at least three measurement points are necessary. We recommend 6 points or more.

5. **Capture a "Guidance Image".**

- **Capturing the Guidance Image**
  For details, refer to Page 13.

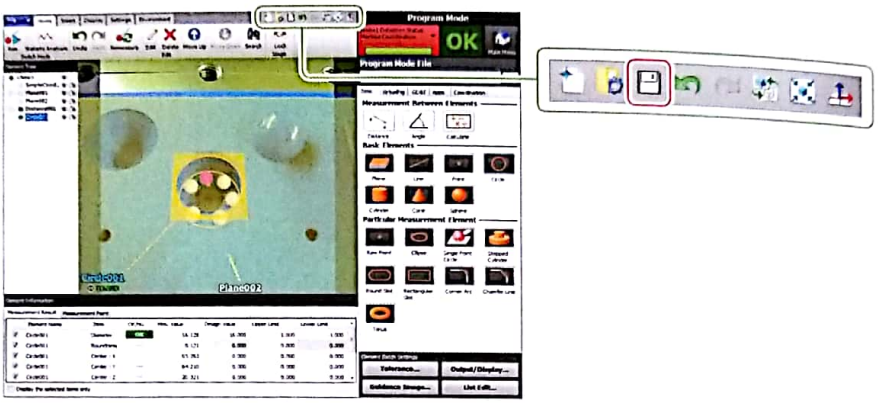
6. **Set the tolerance and press the [OK] button on the console.**

- **Tolerance Settings**
  For details, refer to Page 17.

2-10 Saving Your Program

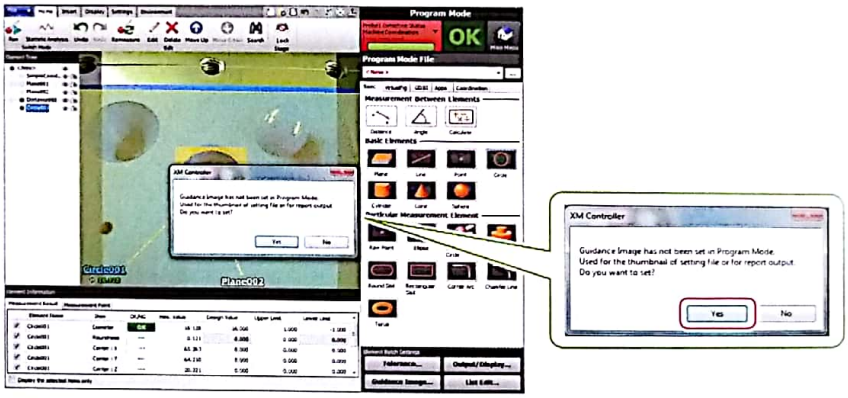
Save the settings that you have configured up to now as a "Program file".
If you save the settings, you can repeatedly measure with the same settings in the [Run Mode].

1. **Click the (Save) button on the quick access tool bar.**



A confirmation message of the Guidance Image setting appears.

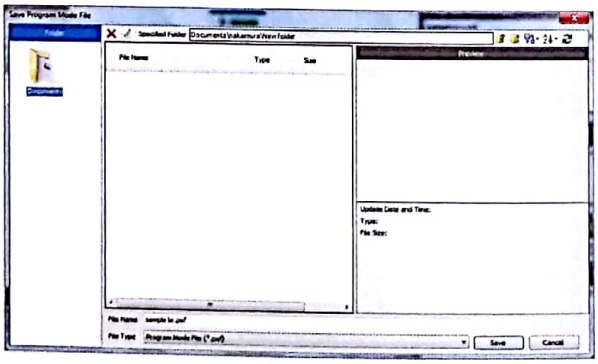
2. **Click the [Yes] button.**



3. **Capture the "Guidance Image" and press the [OK] button on the console.**

The [Save Program Mode File] dialog box is displayed.

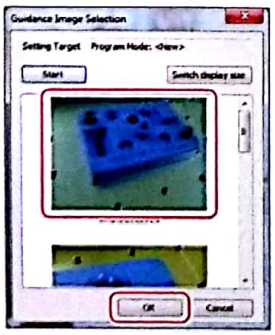
4. **Input a file name and click the [Save] button.**



The "Program File" is saved, and it goes back to Program Mode.

● **Guidance Image for Program Mode**
You can use this image to attach to reports or as the thumbnail image for the "Program file".
Make sure to capture an image for which it is easy to recognize what the characteristics of the measurement target are.

● **[Guidance Image Selection] dialog box**
You can save existing guidance images as a "Guidance Image for Program Mode".
Select an image from the list and click the [OK] button.



MEMO

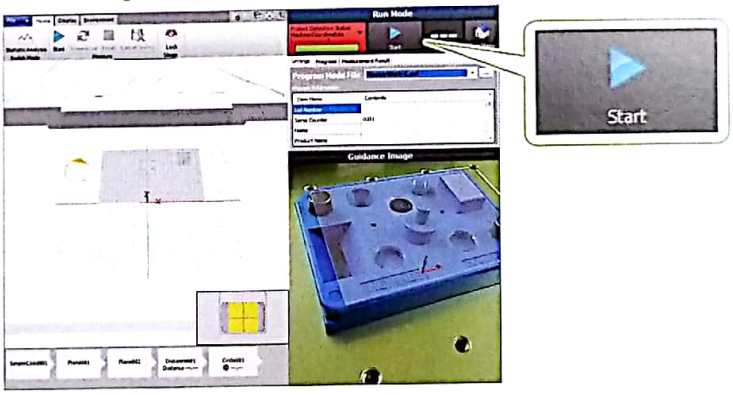
2-11 Executing Run Mode

Use "Run Mode" to perform measurements saved in the "Program File".

1. **Click the [Run Mode] button on the ribbon menu.**

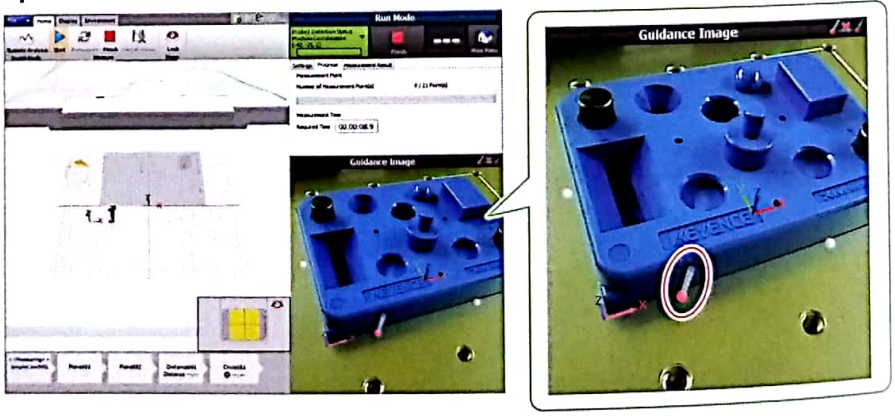
The "Run Mode" screen is displayed.

2. **Click the [Start] button.**



The "Run Mode" starts.

3. **Reference the image displayed in [Guidance Image], make the stylus ruby tip come into contact with the specified position, and measure the target.**

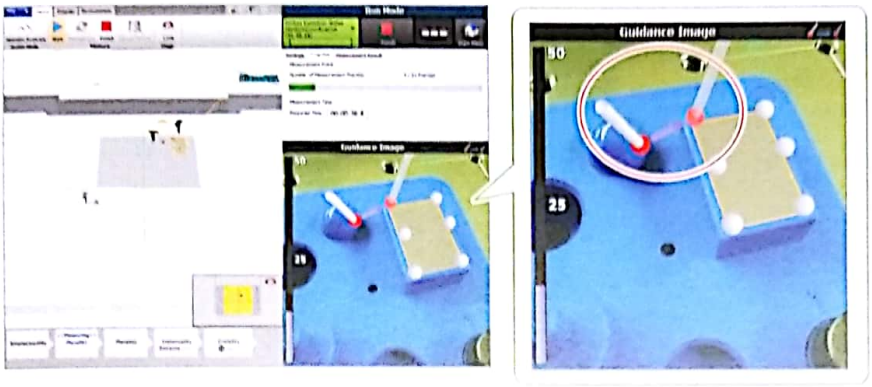


● **Run Mode**
When you start Run Mode on the main screen, click the [Run Mode] button.

● **Start**
You can also press the [OK] button on the console to start measurement.

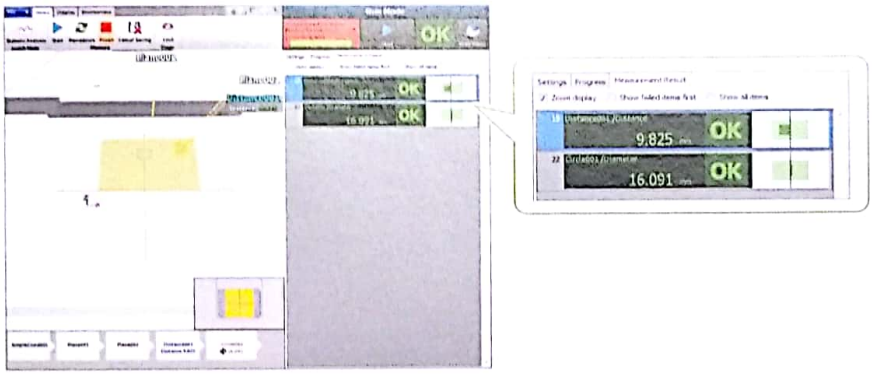
● **Reading the [Program file]**
When the "Run Mode" screen is displayed, the Program file used last is selected.
If you want to use a different file, select a name of Program file from the drop-down list, or click the [Open File] button to select a file.

4. **When the measurement of the "Simple Coordinate" completes, the [Measurement Position Guide] will be enabled. While referring to the measurement position guide, make the stylus ruby tip come into contact with the measurement point, and measure the target.**



If you measure the point, the next measurement point will be guided.
Follow the measurement position guide, and measure all required points.

5. **When the measurement completes, the measurement information area switches to [Measurement Result] tab and the measurement result will be displayed.**



● **Measurement position guide**
Displays measurement points registered with Program Mode, the current position of the stylus ruby tip, and the graph (check measurement position) that indicates their distances.

Check measurement position
Measurement position guide

Measure in a way that the current position of the stylus ruby tip overlaps the registered measurement point.
The graph (check measurement position) gets smaller the closer it comes to the registered position.

● Tolerance indicators
Displays the difference between the design value and the measurement value on a graph.
- Center : Design value
- Light green : Tolerance range
- Dark green : Measurement value

When the values are outside of the tolerance range, the measurement value graph is displayed in red.

● **Total status**
If all the measurement results are within the tolerance range, [OK] is displayed.
If even one value included in the measurement results is outside of the tolerance range, [NG] is displayed.

Specifications are subject to change without notice.

KEYENCE CORPORATION

1-3-14, Higashi-Nakajima, Higashi-Yodogawa-ku, Osaka, 533-8555, Japan PHONE: +81-6-6379-2211

www.keyence.com

AUSTRIA
Phone: +43 22 36-3782 66-0

BELGIUM
Phone: +32 1 528 1222

BRAZIL
Phone: +55-11-3045-4011

CANADA
Phone: +1-905-366-7655

CHINA
Phone: +86-21-3357-1001

CZECH REPUBLIC
Phone: +420 222 191 483

FRANCE
Phone: +33 1 56 37 78 00

GERMANY
Phone: +49 6102 36 89-0

HONG KONG
Phone: +852-3104-1010

HUNGARY
Phone: +36 1 802 73 60

INDIA
Phone: +91-44-4963-0900

INDONESIA
Phone: +62-21-2966-0120

ITALY
Phone: +39-02-6688220

KOREA
Phone: +82-31-789-4300

MALAYSIA
Phone: +60-3-7883-2211

MEXICO
Phone: +52-55-8850-0100

NETHERLANDS
Phone: +31 40 20 66 100

POLAND
Phone: +48 71 36861 60

ROMANIA
Phone: +40 269-232-808

SINGAPORE
Phone: +65-6392-1011

SLOVAKIA
Phone: +421 2 5939 6461

SLOVENIA
Phone: +386 1-4701-666

SWITZERLAND
Phone: +41 43-45577 30

TAIWAN
Phone: +886-2-2721-8080

THAILAND
Phone: +66-2-369-2777

UK & IRELAND
Phone: +44-1908-696900

USA
Phone: +1-201-930-0100

VIETNAM
Phone: +84-4-3772-5555

 14110E 1116-1 96M14113 Printed in Japan

A4WW1-MAN-1086

• 9 6 M 1 4 1 1 3 - 1 •