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KEYENCE

96M14939

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Ultra Compact Vision Sensor
IV-G/IV-HG Series
Vision Sensor
IV/IV-H Series



Starting Guide (Monitor)

The Starting Guide describes the basic operations from setting up until starting the operation for IV Series.
For details of functions, refer to the User's Manual (Monitor).

- The User's Manual can be downloaded from the KEYENCE web site:
  http://www.keyence.com/

Operation flow

Mounting, connecting, and wiring the sensor and monitor

Mount the sensor and monitor, and then connect and wire the cable.

Turning on the power

Turn on the power of the sensor and monitor, and then perform the initial start-up setting.
"Operation when the power is turned on" (Page 4)

Settings Navigator

Create the program to be used for operation in [Settings Navigator] (Sensor setup).

STEP 1: Setting of image optimization

Set the image optimization for clearly imaging a target. Adjust the image for defining the differences in the high and low-quality-target. Set the trigger option, adjust the brightness and imaging focus.
"STEP1 Setting the Image Optimization" (Page 5)

STEP 2: Registration of master image

Image the high-quality-target and register the master image to serve as the reference of judgment.
"STEP2 Registering the master image" (Page 7)

STEP 3: Tool setting

Set the tool to judge a target. Set the tool onto the master image and set the threshold for judgment. Up to 16 detection tools and 1 position adjustment tool in one program can be set.
"STEP3 Setting the detection tool" (Page 8)

STEP 4: Output assignment

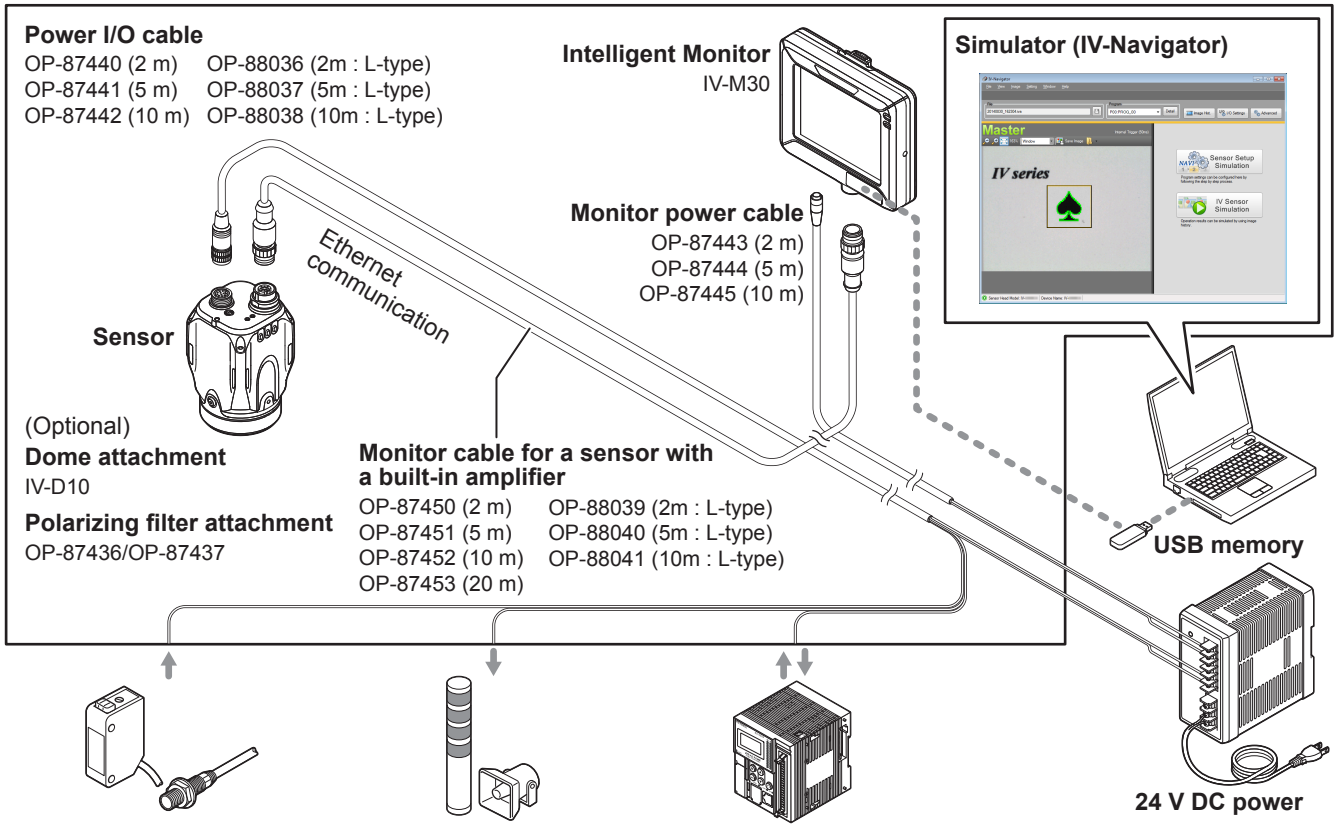
Assign the function to output to each output line.
"STEP4 Assigning output items to an output line" (Page 16)

Starting the operation / Adjustment

Switch the settings screen to the run screen, and start the operation.
If the setting is inappropriate, adjust the threshold and tool settings (Tool Auto Tuning).
"Starting an operation" (Page 17)
"Adjusting the threshold for judgment" (Page 19)
"Tool Auto Tuning (automatically adjusting the judgment condition)" (Page 20)

System configuration for the IV Series (direct connection of 1 unit)

When connecting with the IV/IV-H Series Vision Sensor

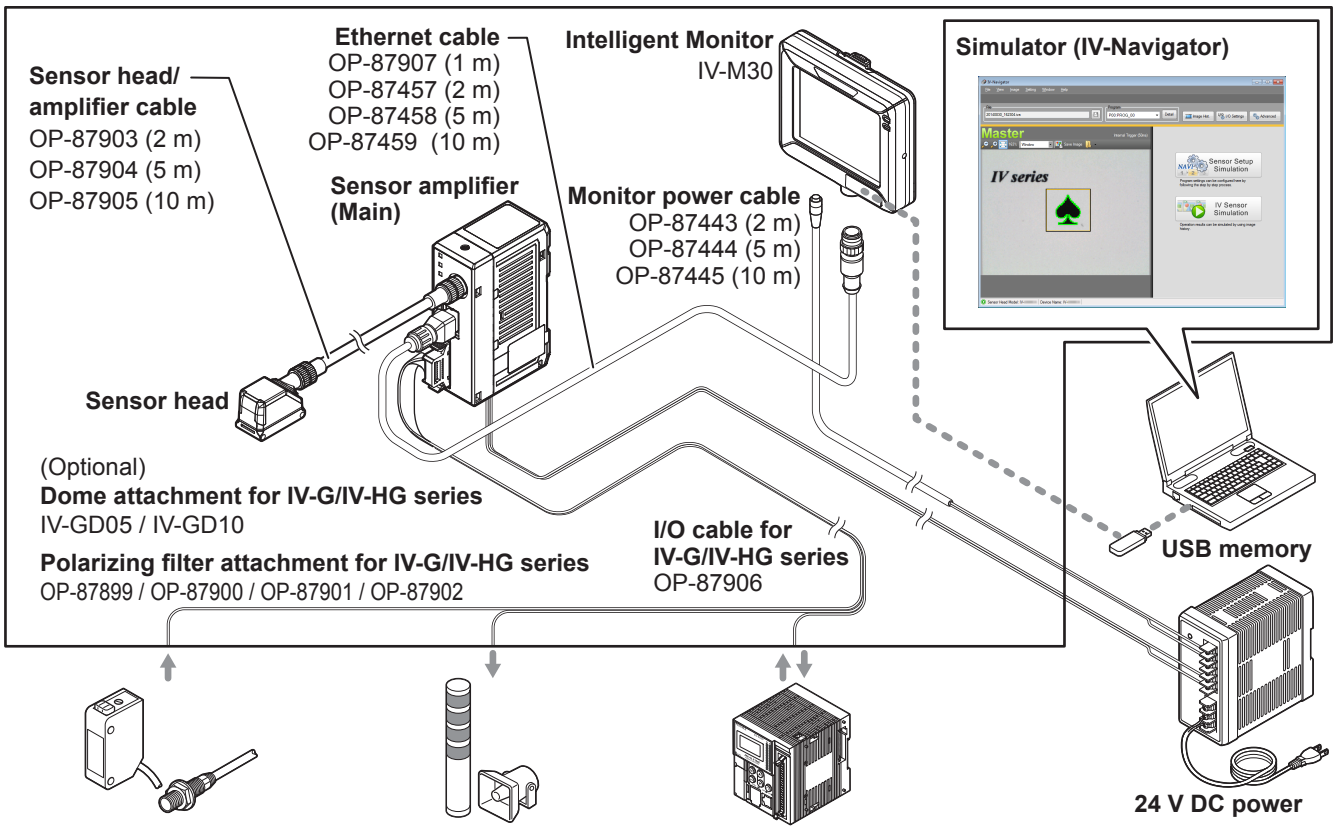


Photoelectric/proximity sensor etc.
Sends the signal to the trigger input when the target is detected.

Indicator light/buzzer etc.
Alarm can be output by the status output function.

PLC
PLC can control the trigger input and the status output function, and can switch the program number.

When connecting with the IV-G/IV-HG Series Ultra Compact Vision Sensor



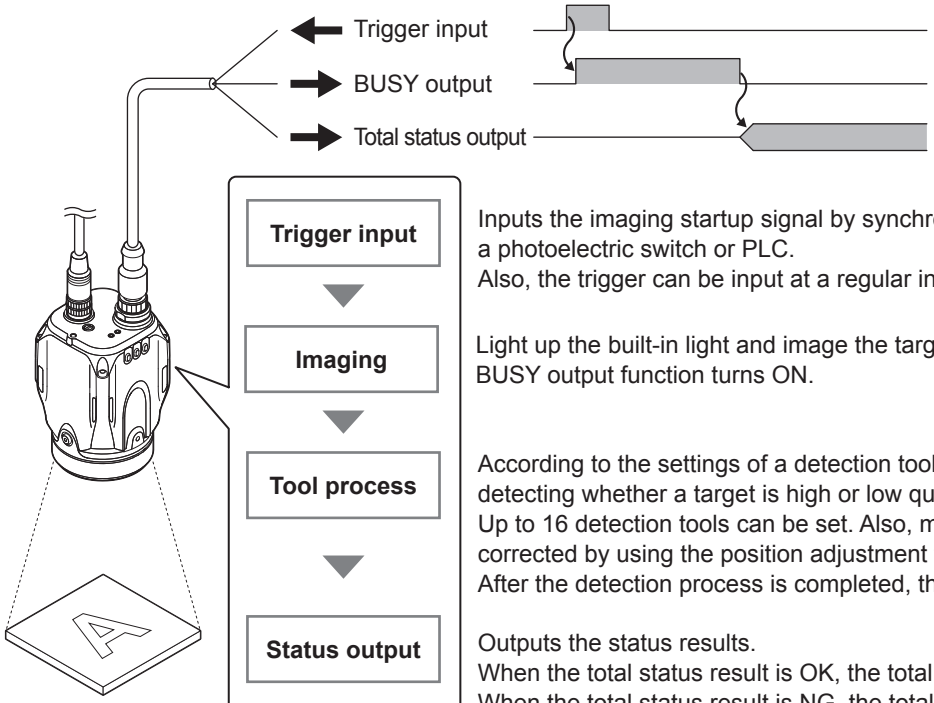
Photoelectric/proximity sensor etc.
Sends the signal to the trigger input when the target is detected.

Indicator light/buzzer etc.
Alarm can be output by the status output function.

PLC
PLC can control the trigger input and the status output function, and can switch the program number.

Judgment processing flow

This section describes the basic judgment processing flow of this device.



Inputs the imaging startup signal by synchronizing to the target position from a photoelectric switch or PLC.
Also, the trigger can be input at a regular interval with an internal trigger function.

Light up the built-in light and image the target by using the CMOS image sensor.
BUSY output function turns ON.

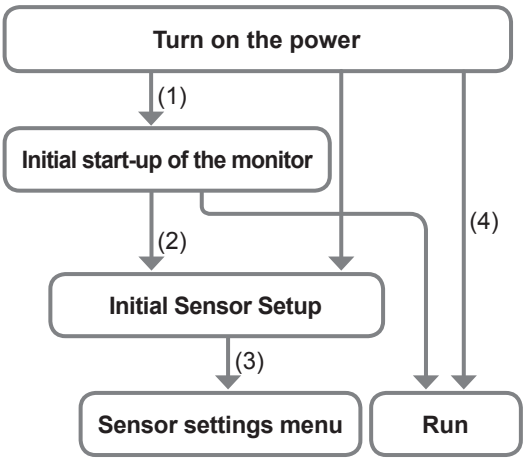
According to the settings of a detection tool, the image of the target is scanned for detecting whether a target is high or low quality.
Up to 16 detection tools can be set. Also, misaligned positions of the target can be corrected by using the position adjustment tool.
After the detection process is completed, the BUSY output function turns OFF.

Outputs the status results.
When the total status result is OK, the total status output is ON.
When the total status result is NG, the total status NG output is ON.

Saves the image to the image history memory in the sensor.
Conditions for saving the image can be selected from “NG only” or “All”.
Color type can save 100 images, and monochrome type can save 300 images.

* When the FTP client function is used, color type can save 70 images, and monochrome type can save 210 images.

Operation when the power is turned on



(1) When the power of the monitor is turned on for the first time, set the display language, date and time, and the connection method with the sensor.
“Operation for initial start-up of the monitor” (Page 4)

(2) When the power of the sensor is turned on for the first time, set the polarity.
“Operation for Initial Sensor Setup” (Page 4)

(3) The Sensor setup menu screen opens. Set the activation condition in Settings Navigator. After the setting is completed, operation begins.
“Starting the Settings Navigator” (Page 5)

(4) After the second time of starting the monitor and sensor, the operation begins when the power is turned on.
“Starting an operation” (Page 17)

Reference

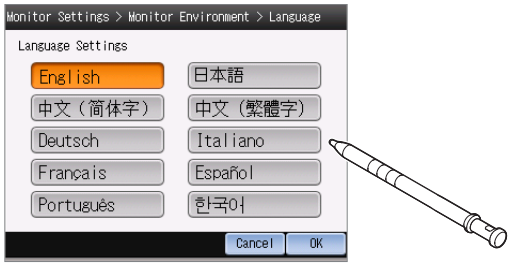
The sensor can be independently operated.

Operation for initial start-up of the monitor

1 Turn on the power of the monitor.

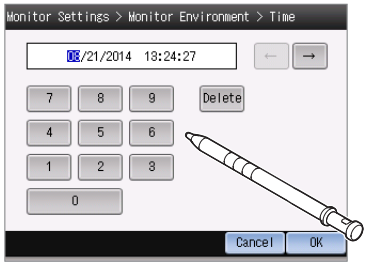
The screen to select the language opens.

2 Select the language to be displayed on the monitor and tap the [OK] button.

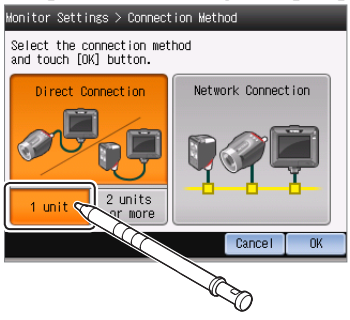


[English] is selected in the default setting.
If you change the default setting and tap the [OK] button, the monitor will restart automatically.

3 Set the current date and time, and tap the [OK] button.



4 Tap the [Direct Connection] button. Tap the [1 unit] button and tap the [OK] button.



The Complete configuration screen opens.

Reference

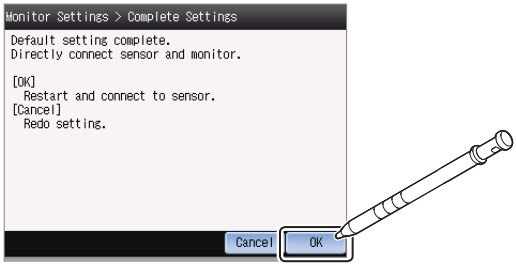
For details on the [Direct Connection (2 units or more)] and [Network connection], refer to the “User’s Manual (Monitor)”.

5 Turn on the power of the sensor.

Point

Turn on the power of the sensor before the monitor is restarted by tapping the [OK] button in step 6.

6 Tap the [OK] button.



The monitor restarts and connects to the sensor.

- When the monitor is connected with the sensor for the first time, set the polarity of the sensor.
“Operation for Initial Sensor Setup” (Page 4)
- After the second time connecting with the sensor, the run screen opens.

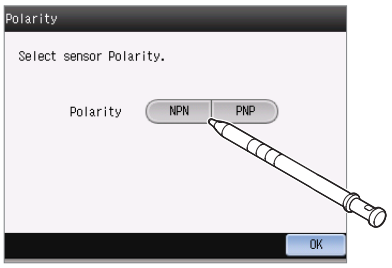
Operation for Initial Sensor Setup

When the monitor is connected to the sensor in the default setting, the screen to select the polarity (NPN or PNP) opens. After the polarity is selected, set up the sensor in Settings Navigator.

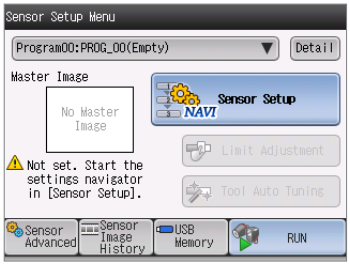
Point

If the IV-G series is used, the Initial Sensor Setup screen opens before step 1.

1 Select the Polarity of the sensor and tap the [OK] button.



The Sensor setup menu screen opens.

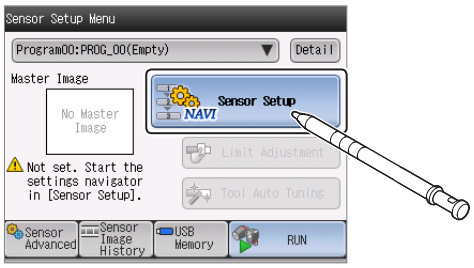


2 Set the judgment condition of the sensor.

“Starting the Settings Navigator” (Page 5)

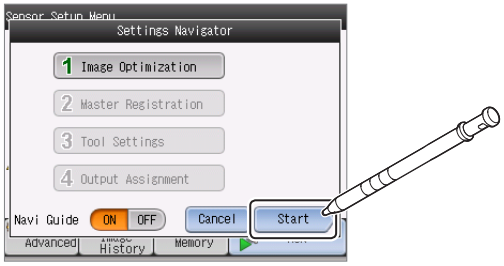
Starting the Settings Navigator

1 Tap the [Sensor setup] button.



Startup screen for Settings Navigator opens.

2 Tap the [Start] button.

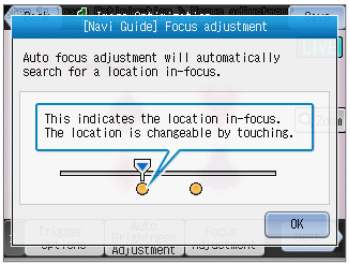


The Navi Guide screen opens.

3 Tap the [OK] button and proceed to “STEP1 Setting the Image Optimization”.

Point

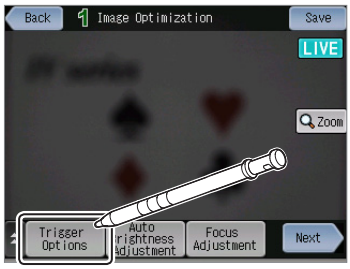
If the setting items are selected according to the Settings Navigator, the Navi Guide opens. If the Navi Guide opens, confirm the message and tap the [OK] button. In this Starting Guide, the description for the Settings Navigator is omitted.



STEP1 Setting the Image Optimization

STEP1-1 Setting the Trigger Options

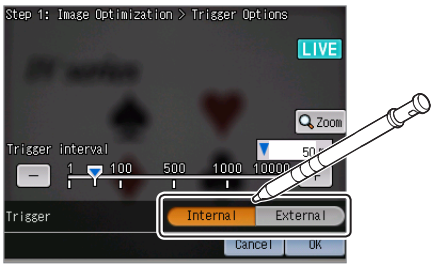
1 Tap the [Trigger Options] button.



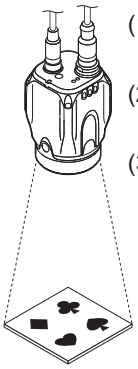
The screen to set the Trigger Options opens.

2 Select the Trigger type.

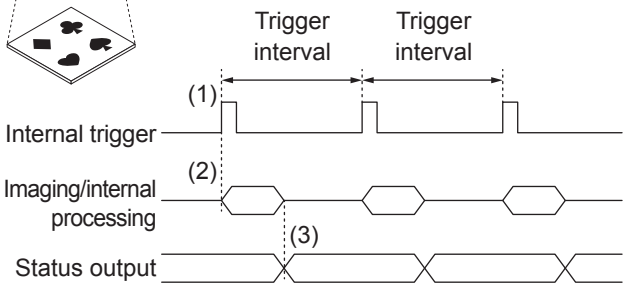
Select the [Internal] or [External] button.



● Internal trigger



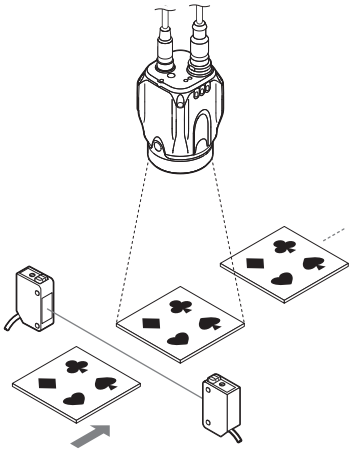
(1) The trigger will be input automatically according to the trigger interval settings.
(2) Performs the internal processing after the imaging.
(3) Outputs the status result.

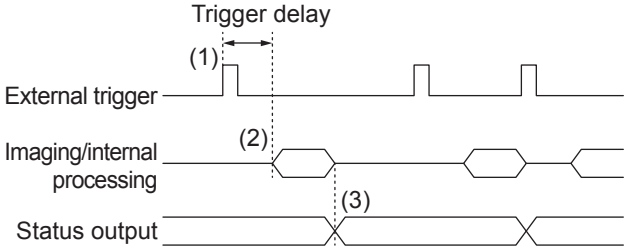


Reference

For details of functions on the internal trigger control with IN1 input, refer to the “User’s Manual (Monitor)”.

● External trigger



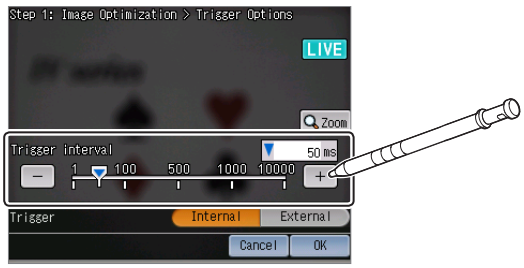


(1) Start imaging by inputting the trigger at an arbitrary timing. When the trigger delay interval is set, the imaging start time will be delayed in the specified period.
(2) Performs the internal processing after imaging.
(3) Outputs the status result.

3 Set the trigger interval or trigger delay.

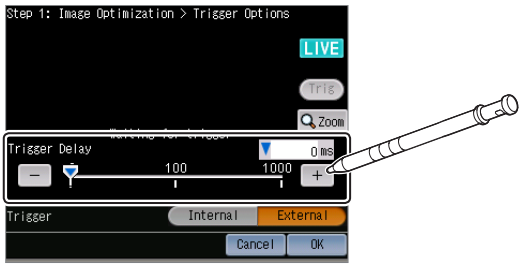
● **When the [Internal] is selected in step 2**

Set the trigger interval within the range of 1 to 10000 ms.



● **When the [External] is selected in step 2**

Set the trigger delay within the range of 1 to 1000 ms.



Reference

The setting of trigger interval and trigger delay can be changed by using the slider or inputting the value.

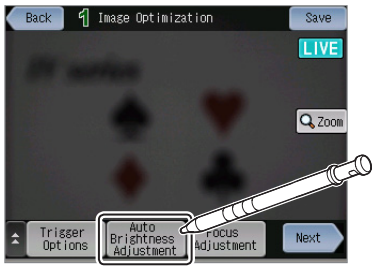
4 After the setting is completed, tap the [OK] button.

The system returns to the main screen for the Image Optimization.

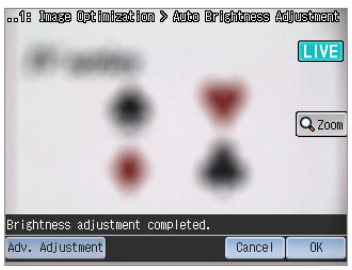
STEP1-2 Automatic brightness adjustment

Images a target with the appropriate brightness.

1 Tap the [Auto Brightness Adjustment] button.



After the adjustment is completed, the “Brightness adjustment completed.” message appears.

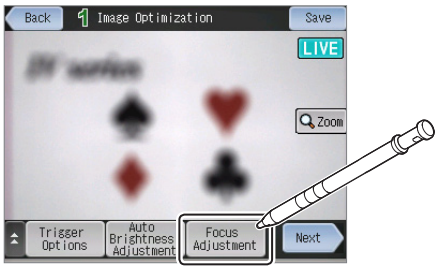


2 Tap the [OK] button.

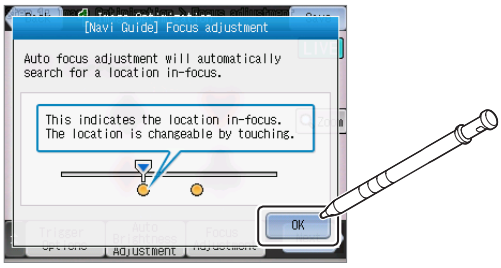
The system returns to the main screen for the Image Optimization.

STEP1-3 Focus adjustment

1 Tap the [Focus Adjustment] button.



2 Tap the [OK] button.

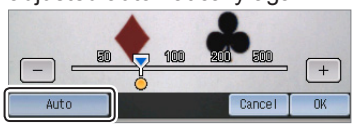


The focusing position is adjusted automatically.

3 Adjust the focusing position as needed.

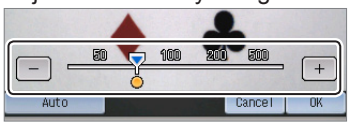
● **When the focusing position is to be adjusted automatically again**

When the [Auto] button is tapped, the focusing position is adjusted automatically again.



● **When the focusing position is to be adjusted manually**

Adjust the focus by using the slider.



● **When multiple focusing position exist**

When there are multiple positions that can be focused, the sensor adjusts to the closest position to the sensor. The options of the position that can be focused will be indicated with (●) mark.

To change the focusing position to the optional position, tap the [Next Pos] or the options (●) of the focusing position.



4 After the setting is completed, tap the [OK] button.

The system returns to the main screen for Image Optimization. When the [Cancel] button is tapped, the focus will be reset to the previous position.

5 Tap the [Next] button to proceed to “STEP2 Registering the master image”.

STEP2 Registering the master image

1 Place the high-quality-target as the reference of judgment on the imaging position.

2 Tap the [Register Live Image as Master] button.

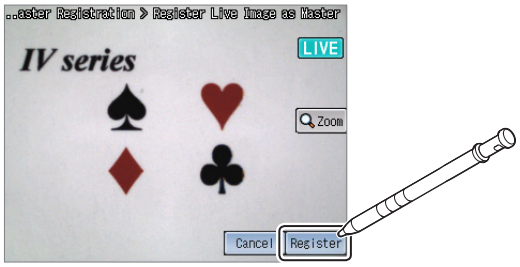


Turns to [LIVE] screen.

3 Image the target.

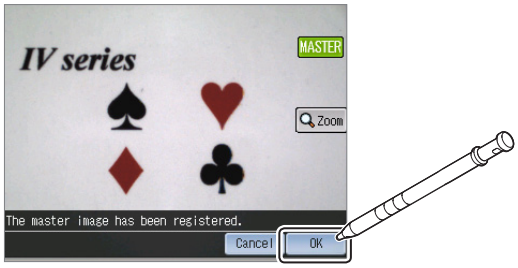
If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

4 Check the image displayed on the monitor and tap the [Register] button.



The confirmation dialog for master image registration appears.

5 Tap the [OK] button.



The master image will be registered and returns to the main screen for the master image registration.

6 Tap the [Next] button to proceed to “STEP3 Setting the detection tool”.

STEP3 Setting the detection tool

Tool type

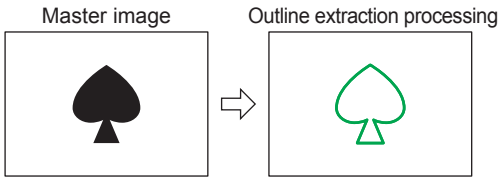
Reference

For details of Advanced Tools (Edge Pixels/Width/Diameter/Edge/Pitch/OCR/High-Speed Position Adjustment), refer to “IV-H/IV-HG Series User’s Manual (Monitor)”.
(IV-H/IV-HG Series only)

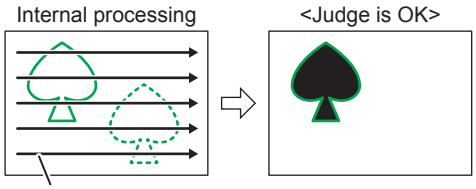
● Outline tools

A detection tool to calculate the matching rate for the target to be examined based on the outline information of a registered high-quality-target. Judges whether a target is a high or low-quality-product by setting the threshold to the matching rate.
“Judging by Outline tool” (Page 9)

Tool settings

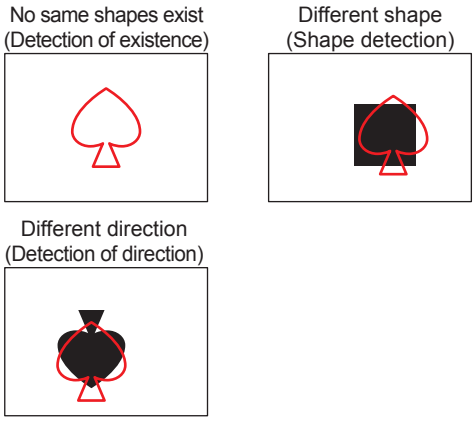


Processing and judgment during an operation



Searches a target which has the outline of same shapes as a outline of a high-quality-target.
Outline can be detected even if a target is rotated.

Example when the result was NG



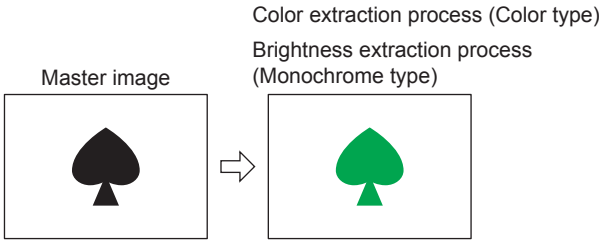
Reference

The matching rate is indicated in 0 to 100.
100 indicates that an outline is completely matched.
The matching rate decreases in accordance with the number of non-matched parts.

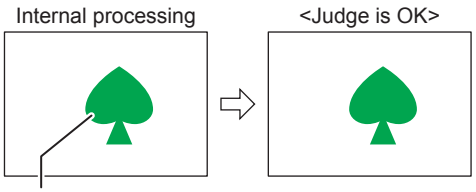
● Color Area tool/Area tool

A tool to calculate the matching rate in the area (number of pixels) of a target to be examined as the basis (100 %) of the area (number of pixels) of a registered high-quality-target. This judges whether a target is a high or low-quality-product by setting the threshold to the matching rate.
If the sensor is a color type, the tool will be Color Area tool. The system judges by the area with an arbitrary specified color.
If the sensor is a monochrome type, the tool will be the Area tool. The system judges by the area with an arbitrary specified brightness.
“Judging by Color Area/ Area tool” (Page 11)

Tool settings

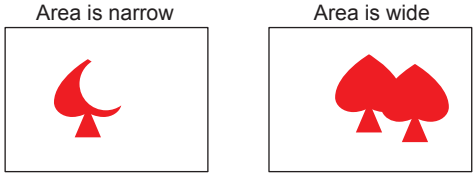


Processing and judgment during an operation



Compares the area of a target as defining an area of high-quality-target to 100 %.

Example when the judgment was NG



Reference

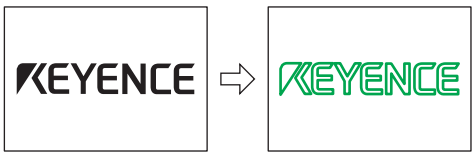
- The matching rate is indicated in 0 to 100 (default). 100 indicates that an area is completely matched. The matching rate decreases as the area of a target narrows.
- The setting range of the display range and threshold for matching rate can be changed to 0-200 or 0-999. Also, a target can be judged by setting the threshold to the upper limit.

● Edge Pixels tool (IV-H/IV-HG Series only)

A tool to calculate the matching rate in the number of edge pixels of a target to be examined as the basis (100 %) of the number of edge pixels of a registered high-quality-target. This judges whether a target is a high or low-quality-product by setting the threshold to the matching rate.
It differs from Outline tool, and the target shape is not considered.
“Judging by Edge Pixels tool (IV-H/IV-HG Series only)” (Page 13)

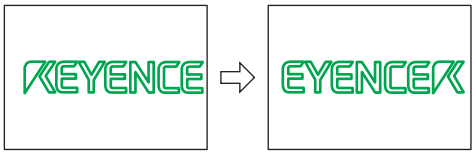
Tool settings

Master image → Edge pixels extract



Processing and judgment during an operation

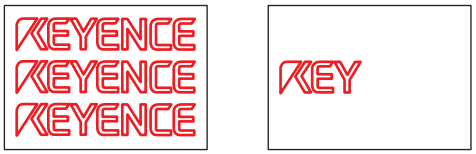
Internal processing → <Judge is OK>



Compares the edge pixels of a target as defining edge pixels of a high-quality-target to 100%.

Example when the judgment was NG

Number of edge pixels is high / Number of edge pixels is low



Reference

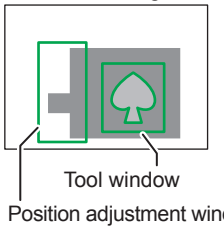
- The matching rate is indicated in 0 to 100 (default). 100 indicates that edge pixels are completely matched. The matching rate decreases as the edge pixels of a target drop off.
- The setting range of the display range and threshold for the matching rate can be changed to 0 to 200 or 0 to 999. Also, a target can be judged by setting the threshold to the upper limit.

● Position adjustment tool

A tool to correct the differences in positioning (position gap) of a target to be examined. The position adjustment is used with other detection tools.
“Adjusting the position gap of a target” (Page 14)

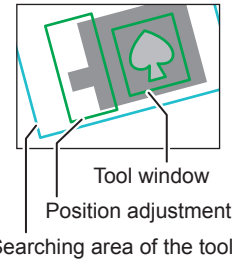
Tool settings

Master image



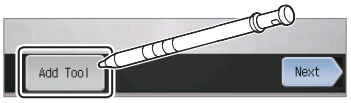
Processing during an operation

Position adjustment process



Judging by Outline tool

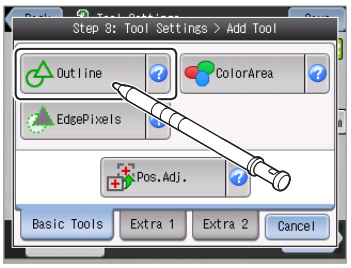
1 Tap the [Add Tool] button.



Reference

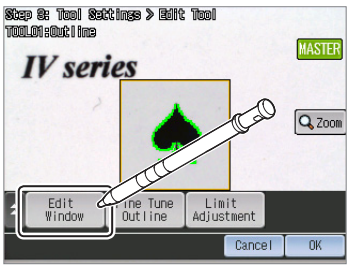
- If no tool is set, only the [Add Tool] button will be displayed.
- If one or more tools are added in one program, the [Edit Tool] and [Delete Tool] buttons will be displayed.

2 Tap the [Outline] button.



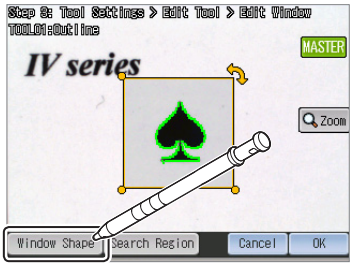
The main screen for Outline tool settings opens.

3 Tap the [Edit Window] button.



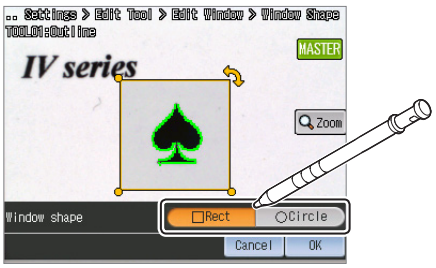
The screen to set the [Window Shape] and [Search Region] opens.
Once the tool window is tapped, you can proceed to step 7.

4 Tap the [Window Shape] button.



The screen to select the window shape opens.

5 Select the tool window shape.

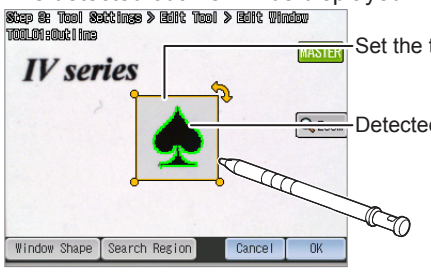


6 Tap the [OK] button.

The system returns to the screen to set the [Window Shape] and [Search Region].

7 Set the position, size, and angle of tool window in accordance with the target.

The detected outline will be displayed in green.



Set the tool window

Detected outline (green)

Point

Set the position and size of tool window by selecting the part that is dissimilar in shape.

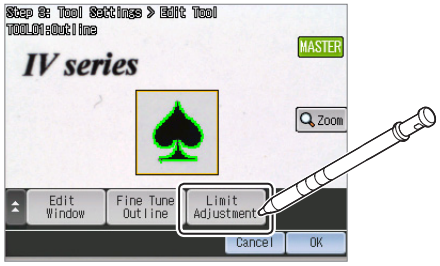
Reference

For details on editing the tool window, refer to “Editing the tool window” (Page 23).

8 After the setting is completed, tap the [OK] button.

The system returns to the main screen for the Outline tool settings.

9 Tap the [Limit Adjustment] button.



The sensor turns to the Test mode.

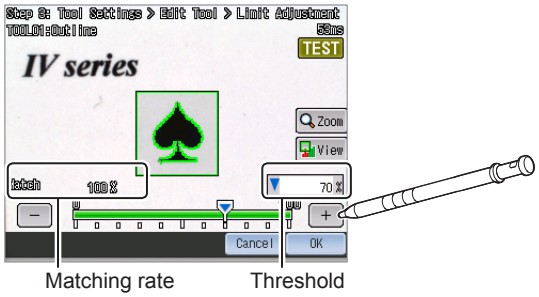
10 Image a high-quality-target and a low-quality-target.

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

11 Adjust the threshold of anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of the high-quality-target is higher than 90 and if the matching rate of the low-quality-target is lower than 40, set the threshold to 65 which is an intermediate value between 40 and 90.



Matching rate

Threshold

Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set in [Limit Adjustment] of the sensor setting menu screen.
  “Adjusting the threshold for judgment” (Page 19)

12 After the setting is completed, tap the [OK] button.

The system returns to the main screen for Outline tool settings.

Point

Make the following settings as needed.
- Search region setting
- Invalid outline setting
- Sensitivity setting
- Advanced settings for Outline tool

For details, refer to the “User’s Manual (Monitor)”.

13 Tap the [OK] button.

The system returns to the main screen for tool settings.

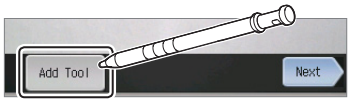
14 After the setting is completed, tap the [Next] button to proceed to the “STEP4 Assigning output items to an output line”.



- Add Tool .....Newly adds a tool.
- Edit Tool .....Edits the tool which has been set.
- Delete Tool .....Deletes the unnecessary tool.

Judging by Color Area/ Area tool

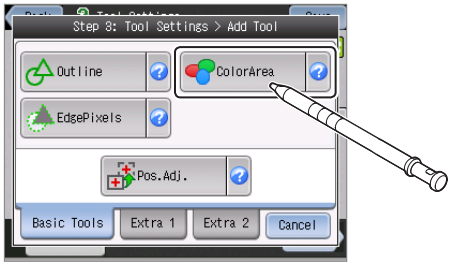
1 **Tap the [Add Tool] button.**



Reference

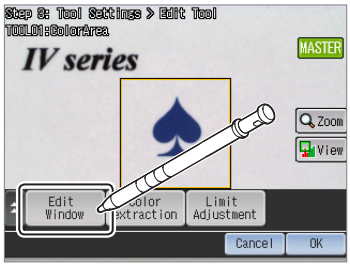
- If no tool is set, only the [Add Tool] button will be displayed.
- If one or more tools are added in one program, the [Edit Tool] and [Delete Tool] buttons will be displayed.

2 **Tap the [Color Area] button (color type) or [Area] button (monochrome type).**



The main screen for Color Area/Area tool settings opens.

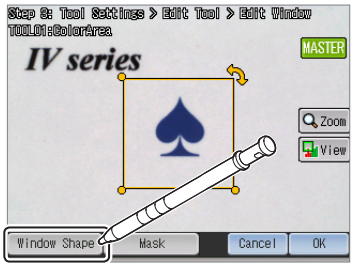
3 **Tap the [Edit Window] button.**



The screen to set the [Window Shape] and [Mask] opens.

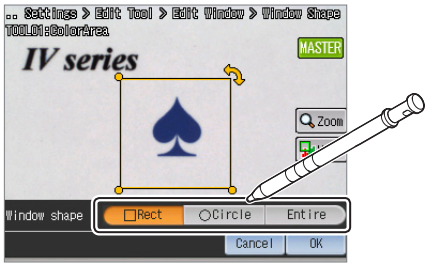
Once the tool window is tapped, you can proceed to step 7.

4 **Tap the [Window Shape] button.**



The screen to select the window shape opens.

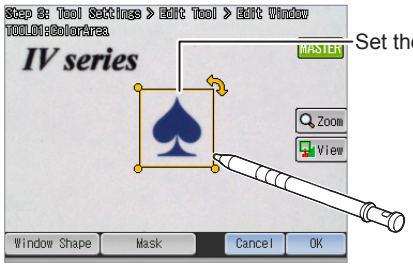
5 **Select the tool window shape.**



6 **Tap the [OK] button.**

The system returns to the screen to set the [Window Shape] and [Mask].

7 **Set the position, size, and angle of tool window in accordance with the target.**



Set the tool window

Reference

For details on editing the tool window, refer to “Editing the tool window” (Page 23).

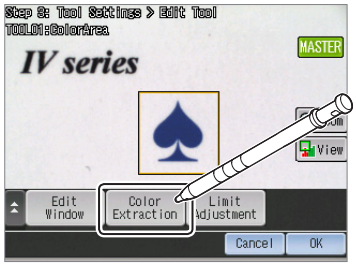
8 **Tap the [OK] button.**

The system returns to the main screen for Color Area/ Area tool settings.

9 **Set the area to be the target to extract.**

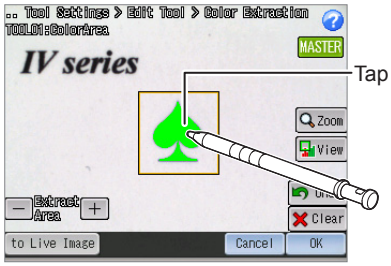
● **For color type**

Tap the [Color Extraction] button.



The screen to select a color to be extracted opens.

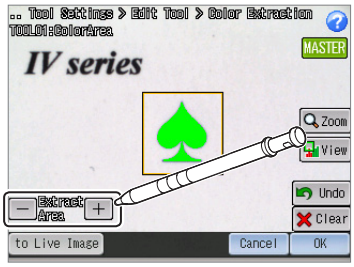
Tap the color to be the reference of judgment for the color area.



Tap

The tapped color will be extracted.

- If the areas of color that have not been extracted are tapped repeatedly, the extraction area can be added.
- Tap the [+] / [-] button of the extraction area, and the area of color to be extracted can be expanded/reduced.



Reference

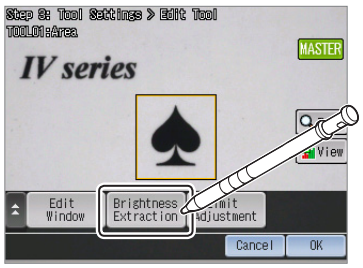
- By tapping the [to LIVE Image] button, the area of the color to be extracted can be set with the LIVE Image of the target.
- To re-extract the color, tap the [Clear] button.

After the setting is completed, tap the [OK] button.

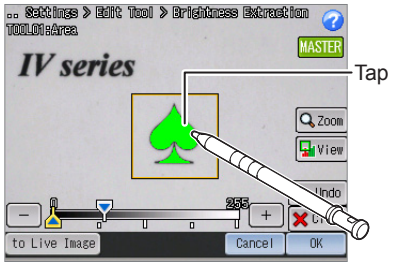
The system returns to the main screen for Color Area tool settings.

● **For monochrome type**

Tap the [Brightness Extraction] button.

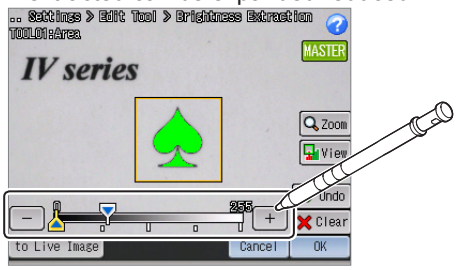


The screen to select a brightness to be extracted opens. Tap the brightness to be the reference of judgment for the area.



The tapped brightness will be extracted.

- If the areas of brightness that have not been extracted are tapped repeatedly, the extraction area can be added.
- By adjusting the slider the range of the brightness to be extracted can be expanded/reduced.

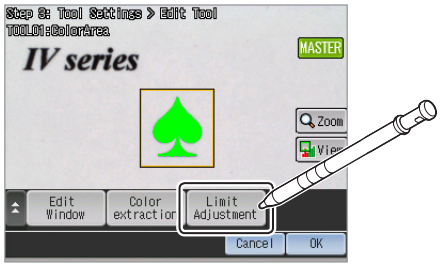


Reference

- By tapping the [to LIVE Image] button, the area of the brightness to be extracted can be set with the LIVE Image of the target.
- To re-extract the brightness, tap the [Clear] button.

After the setting is completed, tap the [OK] button. The system returns to the main screen for Area tool settings.

10 Tap the [Limit Adjustment] button.



The sensor turns to the Test mode.

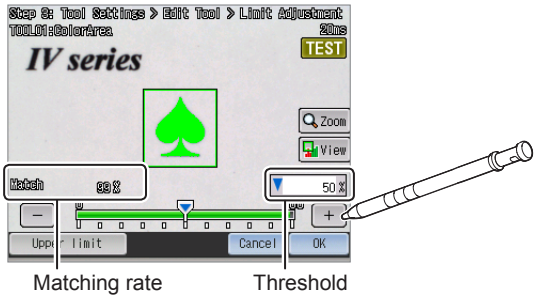
11 Image a high-quality-target and a low-quality-target.

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

12 Adjust the threshold of anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of the high-quality-target is higher than 90 and if the matching rate of the low-quality-target is lower than 40, set the threshold to 65 which is an intermediate value between 40 and 90.



Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set in [Limit Adjustment] of the sensor setting menu screen.

"Adjusting the threshold for judgment" (Page 19)

13 After the setting is completed, tap the [OK] button.

The system returns to the main screen for Color Area/ Area tool settings.

Point

Make the following settings as needed.

- Mask setting
- Upper limit setting
- Advanced settings for Color Area/Area tool

For details, refer to the "User's Manual (Monitor)".

14 Tap the [OK] button.

The system returns to the main screen for tool settings.

15 After the tool settings are completed, tap the [Next] button to proceed to "STEP4 Assigning output items to an output line".



- Add Tool .....Newly adds a tool.
- Edit Tool .....Edits the tool which has been set.
- Delete Tool .....Deletes the unnecessary tool.

Judging by Edge Pixels tool (IV-H/IV-HG Series only)

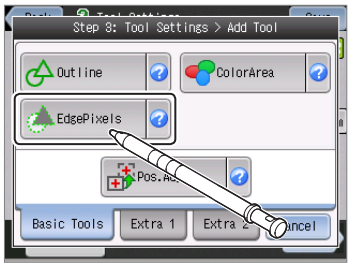
1 Tap the [Add Tool] button.



Reference

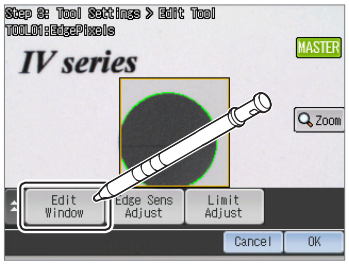
- If no tool is set, only the [Add Tool] button will be displayed.
- If one or more tools are added in one program, the [Edit Tool] and [Delete Tool] buttons will be displayed.

2 Tap the [EdgePixels] button.



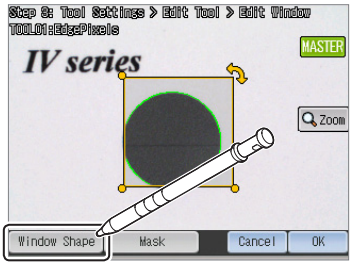
The main screen for Edge Pixels tool settings opens.

3 Tap the [Edit Window] button.

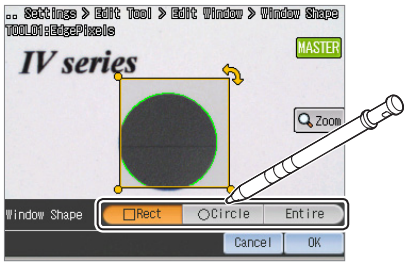


The screen to set the [Window Shape] and [Mask] opens.
Once the tool window is tapped, you can proceed to step 7.

4 Tap the [Window Shape] button.



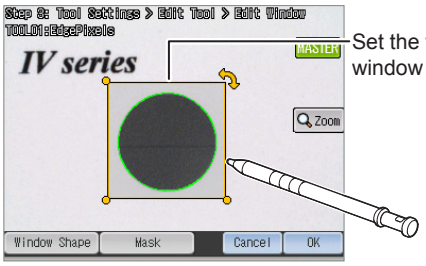
5 Select a tool window shape.



6 Tap the [OK] button.

The system returns to the screen to set the [Window Shape] and [Mask].

7 Set the position, size, and angle of tool window in accordance with a target.



Set the tool window

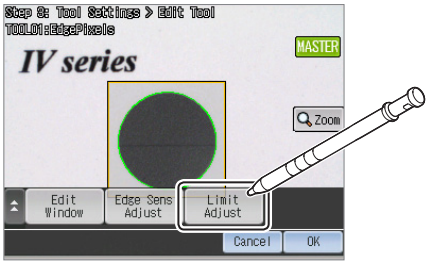
Reference

For details on editing the tool window, refer to “Editing the tool window” (Page 23).

8 Tap the [OK] button.

The system returns to the main screen for the Edge Pixels tool settings.

9 Tap the [Limit Adjustment] button.



The sensor turns to Test mode.

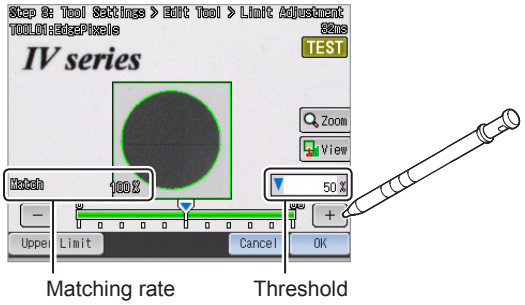
10 Image a high-quality-target and a low-quality-target.

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

11 Adjust the threshold of anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of the high-quality-target is higher than 90 and if the matching rate of the low-quality-target is lower than 40, set the threshold to 65 of the value intermediate between 40 and 90.



Matching rate Threshold

Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set in [Limit Adjustment] of the sensor setting menu screen.
  “Adjusting the threshold for judgment” (Page 19)

12 After the setting is completed, tap the [OK] button.

The system returns to the main screen for Edge Pixels tool settings.

Point

Make the following settings as needed.
- Mask settings
- Edge sensitivity adjustment
- Upper limit setting

For details, refer to the “User’s Manual (Monitor)”.

13 Tap the [OK] button.

The system returns to the main screen for tool settings.

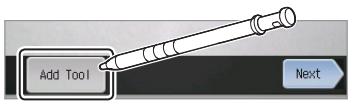
14 After the tool settings are completed, tap the [Next] button to proceed to “STEP4 Assigning output items to an output line”.



- Add Tool .....Newly adds a tool.
- Edit Tool .....Edits the tool which has been set.
- Delete Tool .....Deletes the unnecessary tool.

Adjusting the position gap of a target

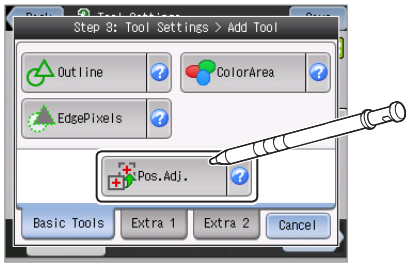
1 Tap the [Add Tool] button.



Reference

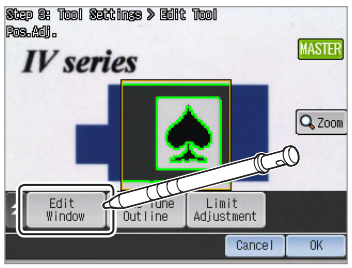
- If no tool is set, only the [Add Tool] button will be displayed.
- If one or more tools are added in one program, the [Edit Tool] and [Delete Tool] buttons will be displayed.

2 Tap the [Pos.Adj.] button.



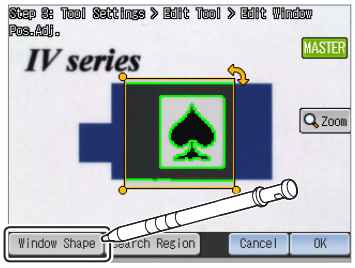
The main screen for Position Adjustment tool settings opens.

3 Tap the [Edit Window] button.



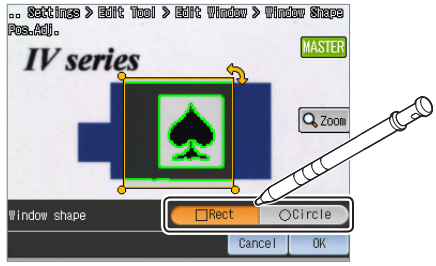
The screen to set the [Window Shape] and [Search Region] opens.

4 Tap the [Window Shape] button.



The screen to select the window shape opens.
Once the tool window is tapped, you can proceed to step 7.

5 Select the tool window shape.

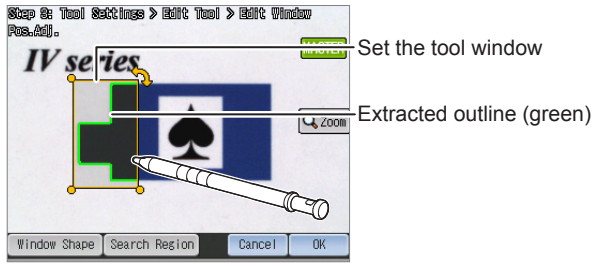


6 Tap the [OK] button.

The system returns to the screen to set the [Window Shape] and [Search Region].

7 Set the position, size, and angle of tool window in accordance with the target.

The extracted outline will be displayed in green.



Point

Set the position and size of tool window as large as possible by selecting the part that is dissimilar in shape.

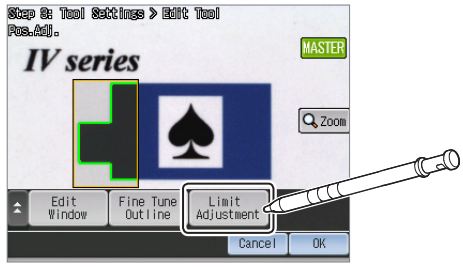
Reference

For details for editing the tool window, refer to “Editing the tool window” (Page 23).

8 After the setting is completed, tap the [OK] button.

The system returns to the main screen for Position Adjustment tool settings.

9 Tap the [Limit Adjustment] button.

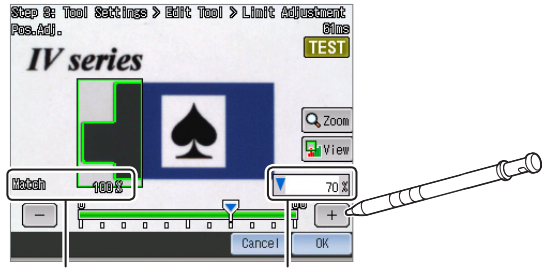


The sensor turns to the Test mode.

10 Image a target.

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

11 Adjust the threshold that judges whether or not the position adjustment is succeeded while checking the matching rate.



Matching rate Threshold

Reference

- If there are many variations of target shapes that a tool window has been set to, set the threshold to a lower matching rate.
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set in [Limit Adjustment] of the sensor setting menu screen.
  “Adjusting the threshold for judgment” (Page 19)

12 After the setting is completed, tap the [OK] button.

The system returns to the main screen for Position Adjustment tool settings.

Point

Make the following settings as needed.

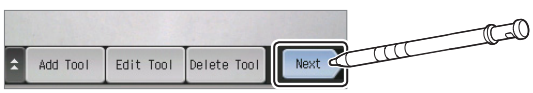
- Search region setting
- Invalid outline setting
- Sensitivity setting
- Advanced settings for Position Adjustment tool

For details, refer to the “User’s Manual (Monitor)”.

13 Tap the [OK] button.

The system returns to the main screen for tool settings.

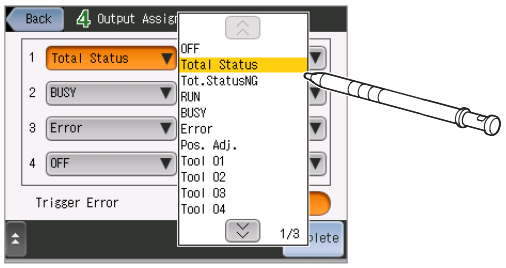
14 After the tool settings are completed, tap the [Next] button to proceed to “STEP4 Assigning output items to an output line”.



- Add Tool .....Newly adds a tool.
- Edit Tool .....Edits the tool which has been set.
- Delete Tool .....Deletes the unnecessary tool.

STEP4 Assigning output items to an output line

1 Tap the item name of the output line to assign the output function, and select the output item.



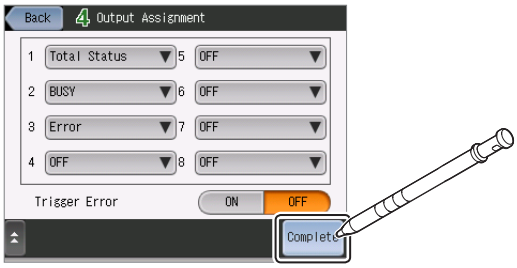
Setting range	Description
OFF	Do not output. Output function will be constantly OFF.
Total Status	When the total status result is OK, the output is ON. The total status conditions can be selected from [All Tools OK] / [Any Tool OK] / [Logic 1] to [Logic 4].
Tot. StatusNG	When the total status result is NG, the output is ON.
RUN	When the sensor is running with no system error, the output is ON.
BUSY	The output function turns ON when the system is in a state that cannot input additional trigger; such as during imaging, judging processing, switching programs, and registering external master image.
Error	The output function turns ON when an error has occurred; such as system error, memory readout error for startup, external master registration error, trigger error (when the trigger settings are enabled).
Pos. Adj.	When position adjustment processing is finished normally, the output function turns ON.
Tool 01 to 16	When the status result of specified tool is OK, the output function turns ON. Status results can be output for each tool.
Logic 1 to 4	When the status result of specified logic is OK, the output function turns ON. For details of logic settings, refer to the “User’s Manual (Monitor)”.

● Default value

OUT1 :Total Status
OUT2 :BUSY
OUT3 :Error
OUT4 :OFF
OUT5* :OFF
OUT6* :OFF
OUT7* :OFF
OUT8* :OFF
Trigger Error : Off

* When the IV-G/IV-HG Series sensor is used.

2 After the setting is completed, tap the [Complete] button.



If the setting of the program is being changed, the saving confirmation dialog appears.

3 Tap the [Yes] button.

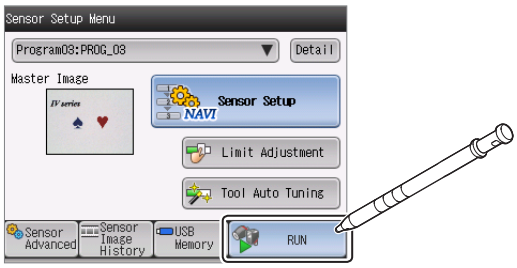
The settings in Settings Navigator will be saved to the program, and the system returns to the main menu for sensor setting menu screen.

Reference

- By tapping the [No] button, the confirmation dialog to cancel the setting appears. By tapping the [OK] button, the screen closes without saving the settings.
- By tapping the [Cancel] button, the system returns to the Settings Navigator screen.

Starting an operation

1 Tap the [RUN] button.



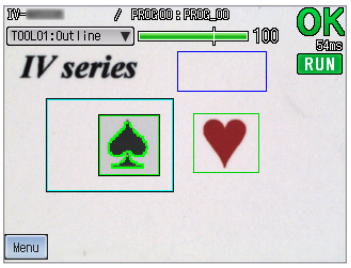
The run screen opens and the system starts the run.

Point

If the external trigger is selected, input the trigger signal from the external device.

“STEP1-1 Setting the Trigger Options” (Page 5)

2 Confirm that the run screen opens on the monitor.



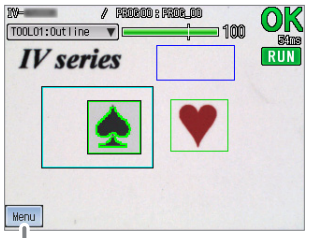
Point

If the image or status result does not update, refer to the “User’s Manual (Monitor)”.

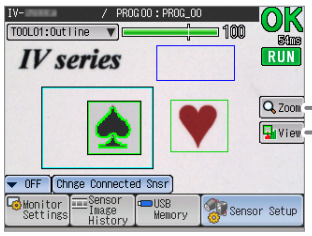
Operating the run screen

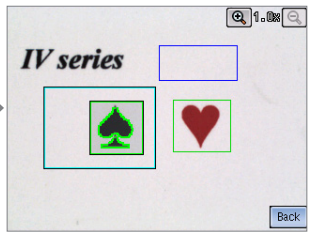
Start screen

Menu OFF



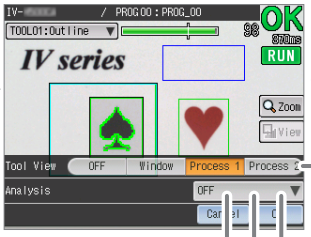
Menu ON





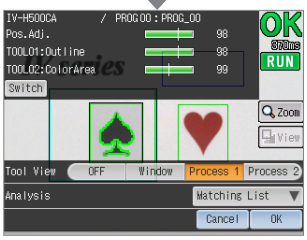
Zoom/Full-screen mode

Hides the title and menu button, and displays the entire image.
Changes the display magnification of an image.



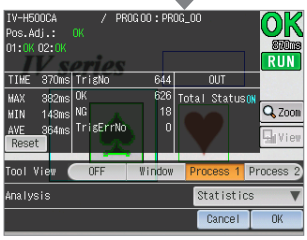
Display setting screen

Selects the [Tool View] and [Analysis] menu, and set the information to display on the monitor.



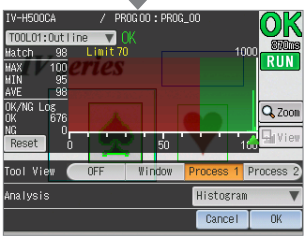
Matching List

The matching list of each setting tool is displayed on monitor. (IV-H/IV-HG Series only)



Statistics display screen

Displays the statistical information of the status result.



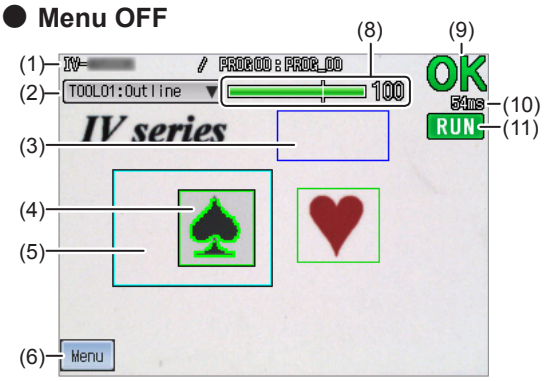
Histogram display screen

Displays the histogram of the status result.

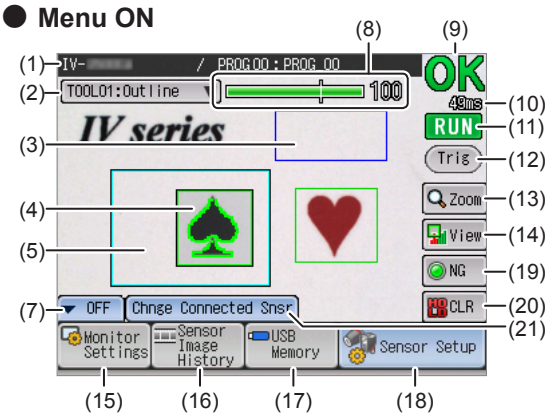
Selecting the display method of the tool. For details, refer to the “User’s Manual (Monitor)”.

Menu display on the run screen

● Menu OFF



● Menu ON



(1) Title
Displays the device name, program number, and program name of the sensor.

(2) Tool name
Displays the tool number and tool name of the tool selected on the monitor.
The selected tool can also be switched.

(3) Brightness correction region
When the brightness correction is being set, the brightness correction region will be displayed with a blue frame.

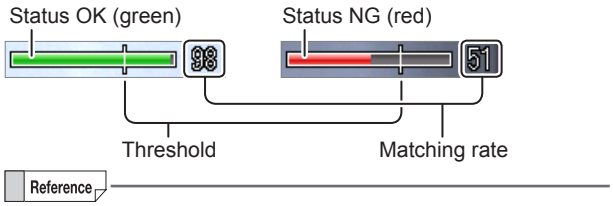
(4) Tool window
Displays the tool region which has been set with green frame when the status result is OK, and displays with red frame when the status result is NG.
The tool selected by tapping the region can also be switched.

(5) Search region
If the search region of the selected tool is being set to Partial, the search region will be displayed with a light blue frame. If the position adjustment is being set, the search region after the position adjustment will be displayed.

(6) [Menu] button
Switches to the display in Menu ON mode.

(7) [OFF] button
Switches to the display in Menu OFF mode.

(8) Status gauge
Displays status result (OK/NG) of the tool selected on the monitor, a line indicating the threshold, and a value of the matching rate.
When the status bar is tapped, the operation turns to Threshold Adjustment mode (Page 19).



(IV-H/IV-HG Series only)
- Both maximum and minimum values of the distances between all the pitches are displayed in status gauge of the Pitch tool. Among all of the distances between pitches, the one which deviates the most from average value is displayed to show the matching rate.
- Threshold is not displayed in High-Speed Position Adjustment tool.
- If the scaling function is used with the Width/ Diameter/Pitch tool, the scaling unit is displayed.

(IV-HG Series only)
- Threshold is not displayed in status gauge of OCR tool. When the all character/date is completely matched, the matching rate is indicated in 100. When any of character/date is not matched, the matching rate is indicated in 0.
- If [Shade Contrast] of OCR tool is set to [Enable], threshold isdisplayed. The value of the matching rate links with a shade contrast of character/date.

(9) OK/NG display
Displays the total status result.
The total status conditions can be selected from [All Tools OK] / [Any Tool OK] / [Logic 1] to [Logic 4].
- When the total status result is OK, “OK” is displayed.
- When the total status result is NG, “NG” is displayed.
- When [NG Hold Function] is set to [ON] and total status results are NG, NG is displayed and the screen is held.

(10) Processing time
Displays the time from receiving an external trigger or an internal trigger to output the status result in ms.

(11) [Image Type] display
Displays the image type.
RUN ..... Indicates “Running”.
TEST ..... Indicates “Test mode”. The status output will not be output.

(12) [Trig] button
When [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], the [Trig] button will be displayed. Each time the [Trig] button is tapped, a trigger signal is output. This button is used when the external trigger cannot be input.
The button can be set to be displayed or hidden.

(13) [Zoom] button
Switches the display in full-screen mode and makes it possible to enlarge the images on the monitor.

(14) [View] button
Displays the menu to select display methods for the tools and analysis screen.

(15) **[Monitor settings] button**
Displays the Monitor settings screen.

(16) **[Sensor Image History] button**
Displays the Sensor Image History screen.

(17) **[USB memory] button**
Displays the USB memory screen.

(18) **[Sensor setup] button.**
Stops the running mode to display the Sensor setup menu screen.

(19) **[NG] button**
When the function of “List of NG Sensor Occurrences” is used and the sensor is registered on the list, the [NG] button will be displayed.
The number of NG occurrences on the sensor registered can be confirmed on the list.

(20) **[HOLD CLR] button**
If the screen is held after detecting an NG when the “NG Hold Function” activated, this button releases the held screen.

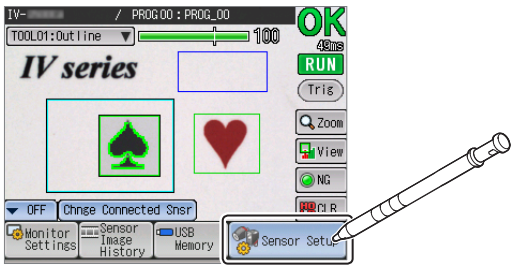
(21) **[Chnge Connected Snsr] button**
When [Direct Connection (2 units or more)] or [Network Connection] is selected, the [Chnge Connection Snsr] button will be displayed.
Detects the connected sensor and changes the sensor to connect to.

Point

- When the [View] is tapped and [OFF] is selected in the display method of the tool, the tool name, search region, tool window, and status bar will be hidden.
- For details of “List of NG Sensor Occurrences” and “NG Hold Function”, refer to the “User’s Manual (Monitor)”.

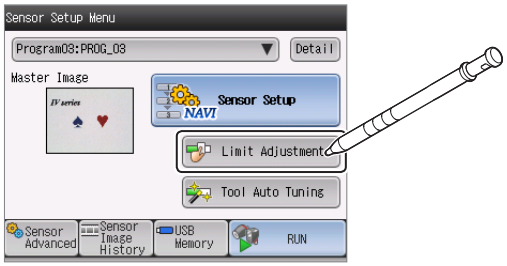
Adjusting the threshold for judgment

1 Turn ON the menu display on the monitor and tap the [Sensor setup] button.

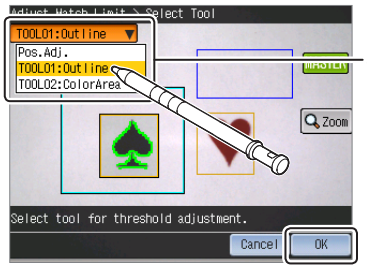


The Sensor setup menu screen opens.

2 Tap the [Limit Adjustment] button.



3 If multiple tools are set in the program, select the tool to adjust the threshold from the pull-down menu and tap the [OK] button.



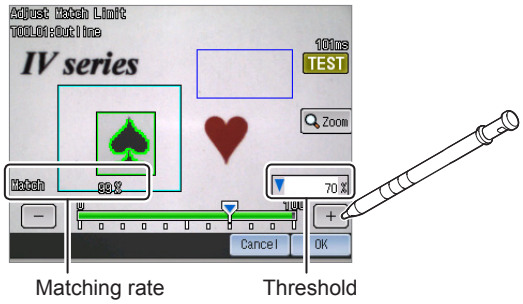
Select the tool

The sensor turns to the Test mode.

4 Image a high or low-quality-target to be the reference of judgment.

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

5 Adjust the threshold by checking the matching rate.



Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- A target is judged by the new threshold from the judgment process of the trigger output after the threshold is changed.
- The threshold can be adjusted by checking the histogram result.
  “Operating the run screen” (Page 17)
  The displayed contents during threshold adjustment are as follows.
  - The histogram before threshold adjustment is displayed.
  - The status results during threshold adjustment are not added to the frequency distribution of the histogram.
  - The counts for OK and NG are not displayed.

6 After the adjustment is completed, tap the [OK] button.

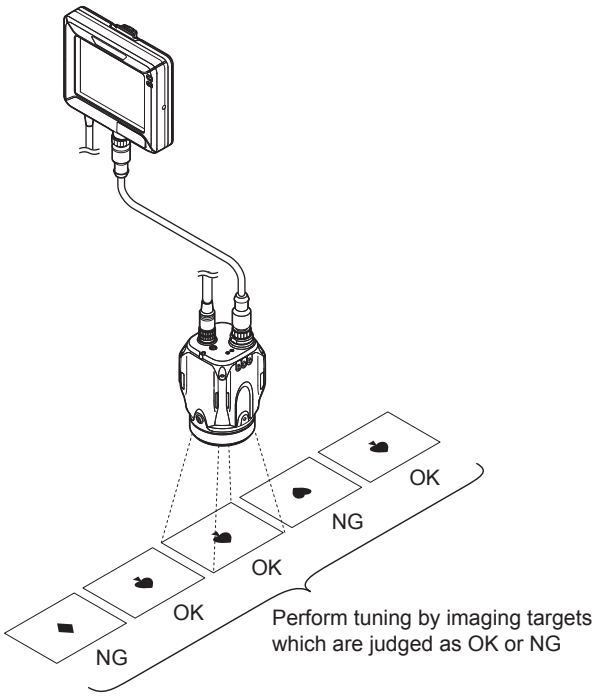
The system returns to the Sensor setup menu screen.

Reference

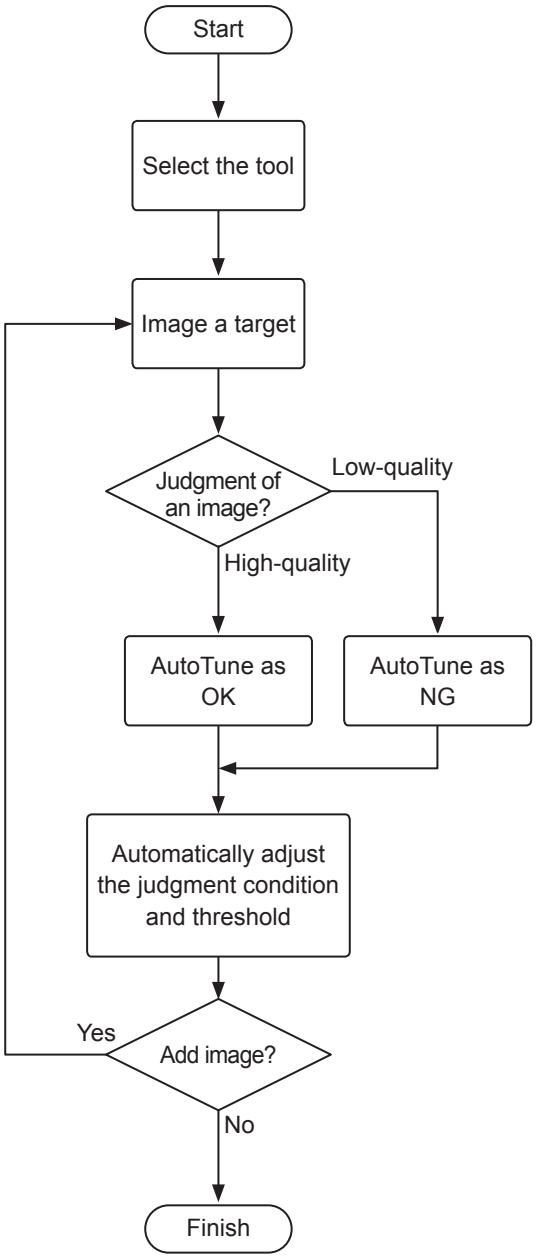
If a program is set with more than one tool, a confirmation dialog for whether or not to adjust threshold for other tools is displayed.
To adjust threshold for other tools, tap the [Yes] button and repeat step 3 to 6.

Tool Auto Tuning (automatically adjusting the judgment condition)

The Tool Auto Tuning is a function to automatically adjust the judgment condition for the detection tool and the judgment threshold for each tool by using multiple high-quality-targets (OK images) and low-quality-targets (NG images).
This section describes the method to register the image as OK or NG to perform tuning while preparing multiple high/low-quality-targets and checking the results of test operation.



Operation flow of Tool Auto Tuning



* Up to 24 images can be used for tuning.

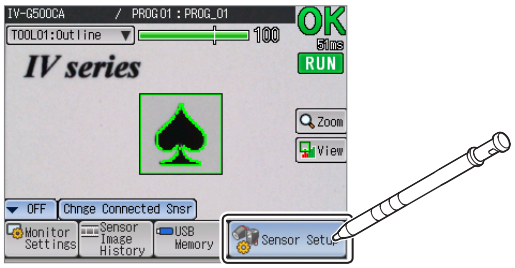
Operating the Tool Auto Tuning

Displays the main screen for Tool Auto Tuning from the Sensor setup menu screen to perform Tool Auto Tuning.

Point

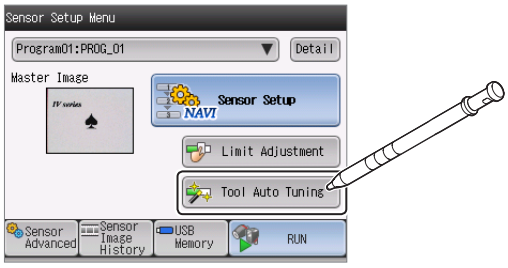
- Outline tool and Color Area/Area tool can use Tool Auto Tuning.
- The Color Area/Area tools with the [Fixed Reference Area] set as [Enable] are excluded from a Tool Auto Tuning target.

1 Turn ON the menu display on the monitor and tap the [Sensor setup] button.



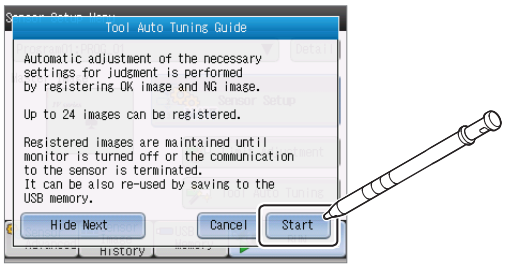
The Sensor setup menu screen opens.

2 Tap the [Tool Auto Tuning] button.

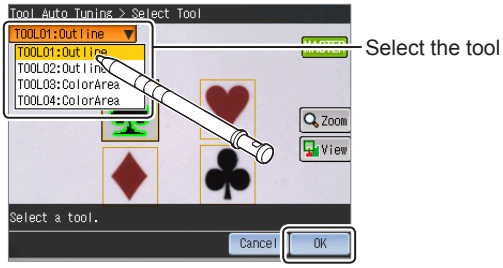


The Tool auto tuning guide screen opens.

3 Tap the [Start] button.

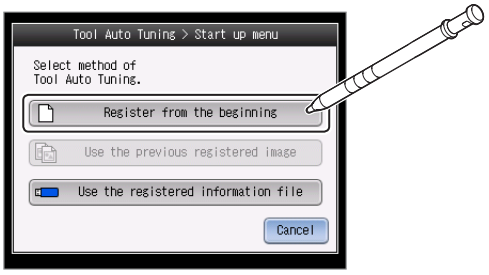


4 If multiple tools are set in the program, select the target tool for Tool Auto Tuning from the pull-down menu, and tap the [OK] button.



The start up menu screen for Tool Auto Tuning opens.

5 Tap the [Start] button.

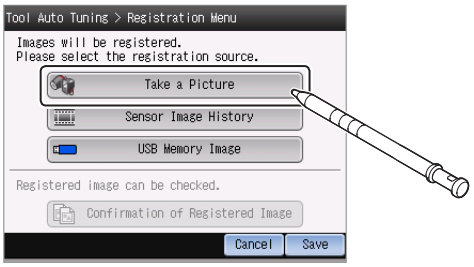


Reference

- When the result (previous registration information) of Tool Auto Tuning is saved on the monitor, the confirmation dialog appears.
- For the operation method of Tool Auto Tuning where the previous registered image or the registered information file is used, refer to the “User’s Manual (Monitor)”.

The registration menu screen for Tool Auto Tuning opens.

6 Tap the [Take a Picture] button.

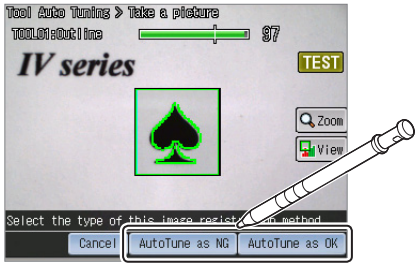


7 Image a high-quality-target to be the criteria for the OK status or a low-quality-target to be the criteria for NG status.

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes], input the external trigger. If an external trigger cannot be input, tap the Trig button to image the target by inputting an internal trigger temporarily. Imaging by inputting an internal trigger finishes by the Pause button.

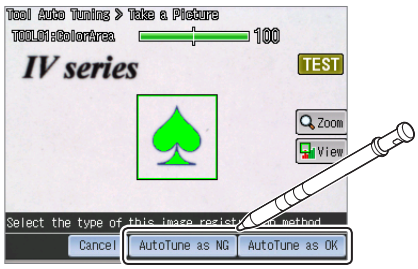
8 Check the displayed image and tap the [AutoTune as OK] or [AutoTune as NG] button.

● For Outline tool

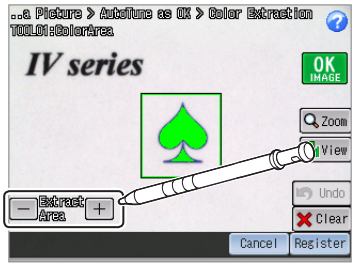


The auto tuning will be performed and the OK or NG image will be displayed.

● For Color Area tool (color type)



If the [AutoTune as OK] button is tapped, the information screen opens.
By tapping the [OK] button, the setup screen for the color extraction area opens.
If the extraction area is inappropriate, tap the color to be the reference of judgment, or tap the [+]/[-] button and expand/reduce the color area to be extracted.

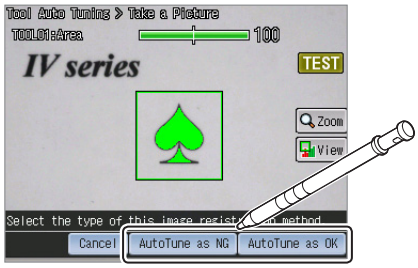


Reference

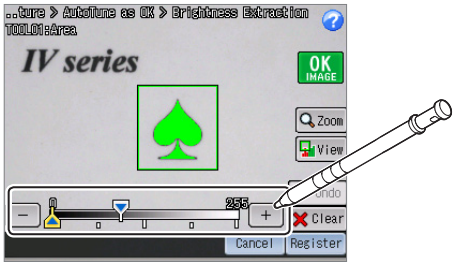
- By tapping the [Undo] button, the previous operation can be cancelled.
- To change the color of the extraction target, tap the [Clear] button and tap the color to be the reference of judgment again.

After the setting is completed, tap the [Register] button. The auto tuning will be performed and the OK or NG image will be displayed.

● For Area tool (monochrome type)



If the [AutoTune as OK] button is tapped, the information screen opens.
By tapping the [OK] button, the setup screen for the brightness extraction area opens.
If the extraction area is inappropriate, tap the brightness to be the reference of judgment, or operate the slider and expand/reduce the brightness area to be extracted.

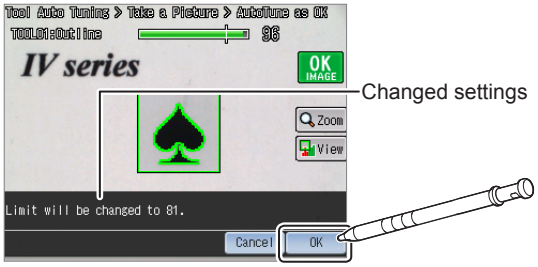


Reference

- By tapping the [Undo] button, the previous operation can be cancelled.
- To change the brightness of the extraction target, tap the [Clear] button and tap the brightness to be the reference of judgment again.

After the setting is completed, tap the [Register] button. The auto tuning will be performed and the OK or NG image will be displayed.

9 Check the changes in settings after the auto tuning is performed and tap the [OK] button.



If the auto tuning has failed, follow the message to change the tool settings or the image to be registered.

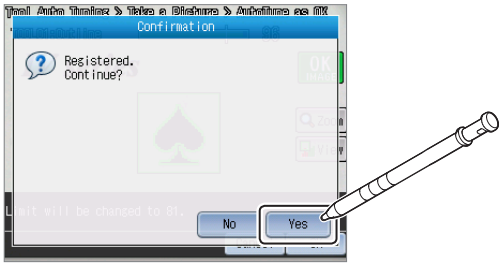
Reference

The type of an image to be registered will be displayed on the upper right on the screen.

- OK IMAGE : Registers as an OK image.
- NG IMAGE : Registers as an NG image.

The confirmation dialog to continuously register another image appears.

10 Tap the [Yes] button and repeat step 7 to 9.

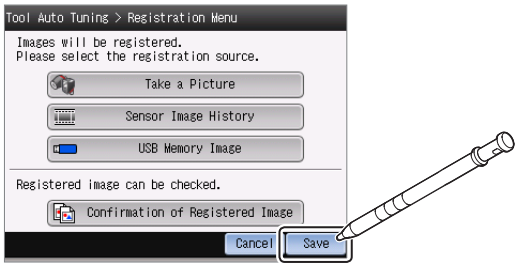


- Registering one or more OK images and NG images is recommended.
- Up to 24 images can be registered.

11 After the registration is completed, tap the [No] button on the confirmation dialog.

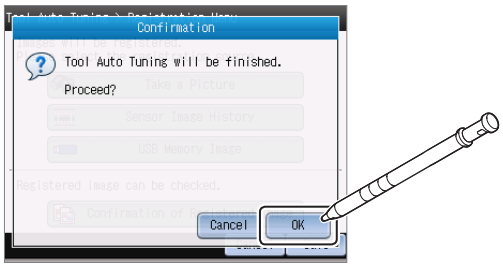
The system returns to the registration menu screen for Tool Auto Tuning.

12 Tap the [Save] button.



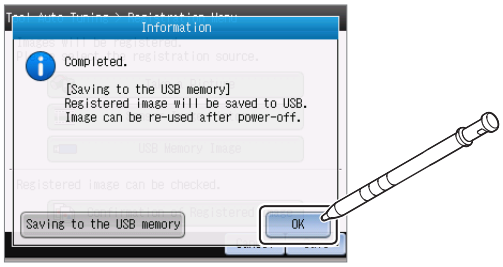
The confirmation dialog appears.

13 Tap the [OK] button.



Adjusted results will be reflected, and the information dialog appears.

14 Tap the [OK] button.



The system returns to the Sensor setup menu screen.

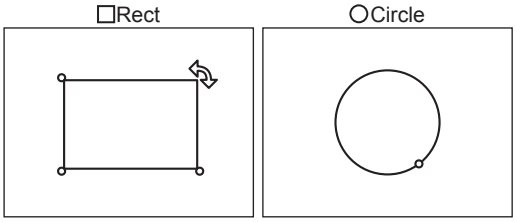
Editing the tool window

● Selecting the shape of the tool window

On the screen to set the detection tool, the screen to select the shape of the tool window opens by tapping the [Window Shape] button.

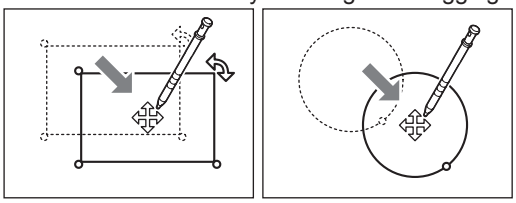
[☐Rect] or [○Circle] can be selected.

☐Rect ○Circle



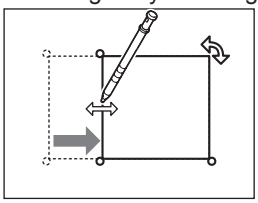
● Moving the tool window

By tapping inside of the tool window, ✥ will be displayed. Move the tool window by touching and dragging it.

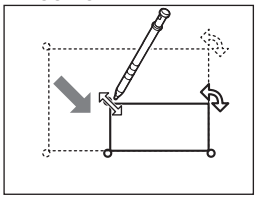


● Changing the size of the tool window

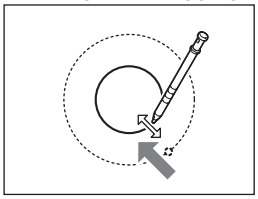
By touching either side of the tool window, ↕ or ⟺ will be displayed. The height or width of the tool window can be changed by touching and dragging it.



By touching one of the corners of the tool window except the upper right corner, ⤢ will be displayed. The size of the tool window can be changed by touching and dragging it.

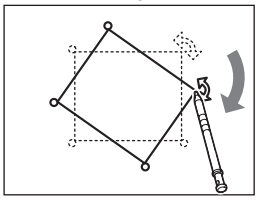


When the [○Circle] is selected in the window shape settings, the size of the circle can be changed by touching and dragging the outline of the circle.



● Changing the direction of the tool window

By touching and dragging the arrow mark on the upper right of the tool window, the direction of the tool window can be changed.



Symbols

The following symbols alert you to important messages.
Be sure to read these messages carefully.

Point

It indicates additional information on proper operation.

Reference

It indicates tips for better understanding or useful information.

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