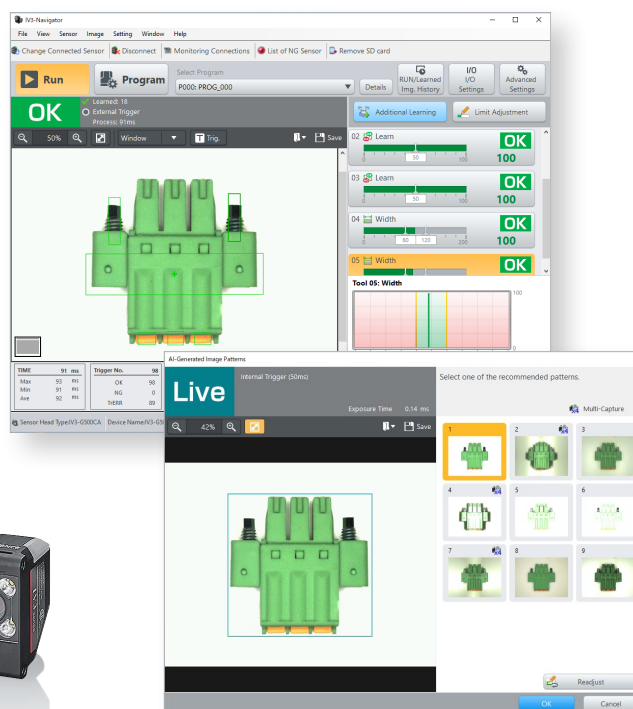


Vision Sensor IV3 Series

User's Manual (PC Software)

Read this manual before use.
Keep this manual in a safe place after reading it
so that it can be used at any time.



- 1 Getting Started
- 2 Installation and Connection
- 3 Basic Operation
- 4 Settings Navigator
- 5 Running
- 6 Adjusting
- 7 Various Functions
- 8 Saving Settings and Images, SD Card
- 9 Connecting to a Network
- 10 Simulator
- 11 Controlling with the Input/Output Line
- 12 Specifications
- A Status Table, Troubleshooting


Introduction


Read this manual before using the product in order to achieve maximum performance.
Keep this manual in a safe place after reading it so that it can be used at any time.


Symbols

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

 **DANGER** It indicates a hazardous situation which, if not avoided, will result in death or serious injury.


 **WARNING** It indicates a hazardous situation which, if not avoided, could result in death or serious injury.


 **CAUTION** It indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

 **NOTICE** It indicates a situation which, if not avoided, could result in product damage as well as property damage.

 **Important** It indicates cautions and limitations that must be followed during operation.

 **Point** It indicates additional information on proper operation.

 **Reference** It indicates tips for better understanding or useful information.

 It indicates the reference pages in this manual or the reference pages in separate manuals.

Cautions

- (1) Unauthorized reproduction of this manual in whole or part is prohibited.
- (2) The contents of this manual may be changed for improvements without prior notice.
- (3) An utmost effort has been made to ensure the contents of this manual are as complete as possible. If there are any mistakes or questions, please contact a KEYENCE office listed in the back of the manual.
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- (5) Any manuals with missing pages or other paging faults will be replaced.





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“SD memory card” is a trademark of SD Association.

Ethernet/IP is a trademark of ODVA, inc.

Safety Information for IV3 Series

General Precautions

	<ul style="list-style-type: none"> • Do not use this product for the purpose to protect a human body or a part of a human body. • Do not use this product in a hazardous location and/or potentially explosive atmosphere. • Do not use this product in an application that may cause death, serious injury or serious property damage due to a failure with this product should occur, such as nuclear power plants, on aircraft, trains, ships, or vehicles, used within medical equipment, playground equipment, roller coasters and other rides, etc.
	<ul style="list-style-type: none"> • If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. • You must perform a sufficient risk assessment for the machine where this product is to be installed prior to installing this product. Provide appropriate protective fail-safe measures on the machine independent from this product in case a failure with this product should occur.
	<p>You must verify that the IV3 Series are operating correctly in terms of functionality and performance before the start and the operation of the IV3 Series.</p>
	<ul style="list-style-type: none"> • KEYENCE never warrants the function or performance of the IV3 Series if it is used in manner that differs from the IV3 Series specifications contained in this instruction manual or if the IV3 Series are modified by yourself. • When the IV3 Series is used in combination with other instruments, functions and performance may be degraded, depending on operating conditions and the surrounding environment. • Do not place the instruments, including peripherals, under the rapid temperature change. It may cause condensation and may damage instruments or peripherals. • Remove the power cable from the power supply if you do not use this product for a long time.

Important Instructions


Observe the following precautions to prevent malfunction of the IV3 series and to ensure that it is used properly.

Precautions on use


 WARNING	The power of this product and instruments connected to this product must be turned off when the cable is to be installed or removed. Failure to do so may cause an electric shock or product damage.
--	--


NOTICE	<ul style="list-style-type: none"> • Use this product with the correct supply voltage. Failure to do so may cause product damage. • For instructions <ul style="list-style-type: none"> • Do not turn OFF the power while setting the items or saving the settings. Otherwise, all or part of the setting data may be lost. • Do not let water, dust or oil stick to the camera/light of the sensor head/sensor. Failure to do so may cause a malfunction. • When this product becomes dirty, do not rub it with a wet cloth, benzene, thinner, or alcohol. Doing so may change the color or shape of the unit. • If the unit is heavily contaminated, disconnect all the cables including the power supply cable, wipe off the dirt with a cloth soaked with mild detergent, and then wipe with a soft dry cloth. • For external master image registration <p>If the external master image registration is to be performed frequently, set [Write to ROM when using Ext. Master Save] of the input option to [Disable] to protect the nonvolatile memory of the internal sensor. When the option is set to [Enable], the nonvolatile memory is guaranteed to write for 100,000 times.</p> • For automatic focus function <ul style="list-style-type: none"> • Automatic focus function is used for adjusting the focusing position at the time of installation. Disabled during the operation. • Focusing position can be registered in each program. The program configurations are guaranteed to switch for 100,000 times. If the focusing position does not need to be changed in each program, set [Auto Focus Adj Pos] to [Common] to extend its duration. • Do not apply shock or vibration to the sensor head/sensor during the focusing position adjustment. Failure to do so may cause product damage. • About SD Card <ul style="list-style-type: none"> • Use the KEYENCE recommended product. • Close the cover of the SD card slot while in use. • When removing the SD card, be sure to perform [SD Card Removal] before removing. • Do not remove the SD card while accessing the SD card. Also, do not turn off the power while accessing the SD card. Otherwise, all or part of the setting data may be lost or damage may occur to the memory. • To prevent data loss, periodically backing up to another storage device is recommended.
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Measures to be taken when an abnormality occurs

 WARNING	<p>In the following cases, turn the power OFF immediately. Using the IV3 Series in an abnormal condition could cause fire, electric shock, or malfunction. Contact our office for repair.</p> <ul style="list-style-type: none"> • If water or debris enters the IV3 Series. • If the IV3 Series is dropped or the case is damaged. • If abnormal smoke or odor emanates from the IV3 Series.
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Precautions on installation

 WARNING	<p>To use this product correctly and safely, avoid installing it in the following locations. Failure to do so may cause fire, electric shock, or malfunction.</p> <ul style="list-style-type: none"> • Outdoors • Altitude above 2500 m (built-in amplifier models) • Altitude above 2500 m (ultra-compact models) • Locations that are humid, dusty or poorly ventilated • Locations where the temperature is high such as those exposed to direct sunlight • Locations where there are flammable or corrosive gases • Locations where the unit may be directly subjected to vibration or impact • Locations where water, oil, or chemicals may splash onto the unit
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 CAUTION	<ul style="list-style-type: none"> • When mounting the sensor with the built-in amplifier type and sensor head of the ultra-compact model which is connected with the AI Lighting unit, use them by mounting them on a metal plate. Failure to do so may cause burn injuries due to the high surface temperature.
---	--

 NOTICE	<ul style="list-style-type: none"> • To improve the anti-noise feature, install the unit following the precautions below. Otherwise, malfunction may occur. • Ground the FG cable of the sensor amplifier. • Do not mount the unit in a cabinet where high-voltage equipment is already installed. • Mount the unit as far from power lines as possible. • Separate the unit as far as possible from the devices that emit strong electric or magnetic field (such as solenoid or chopper). • Separate the I/O signal line from the power line or high-voltage line. • For power supply <ul style="list-style-type: none"> • Noise superimposed on the power supply could cause malfunction. Use a stabilized DC power supply configured with an isolation transformer. • When using a commercially available switching regulator, be sure to ground the frame ground terminal. • Devices including this unit are precision components. Do not apply shock or vibration. • When connecting to a network, let engineers who are knowledgeable about networks handle it.
--	--

Safety Precautions on LED Product

The degree of risk of this product is shown below.

Product	Model	Light source	Risk group*
Ultra-compact model sensor head	IV3-G500CA	White LED	Risk Group 1
	IV3-G600CA		
	IV3-G500MA	Infrared LED	Exempt Group
	IV3-G600MA		
Built-in amplifier type sensor	IV3-400CA	White LED	Risk Group 1
	IV3-500CA		
	IV3-600CA		
	IV3-400MA	Infrared LED	Exempt Group
	IV3-500MA		
	IV3-600MA		
AI Lighting unit	IV3-L4C	White LED	Risk Group 1
	IV3-L5C		
	IV3-L6C		
	IV3-LG5C		
	IV3-LG6C		
	IV3-L4M	Infrared LED	Exempt Group
	IV3-L5M		
	IV3-L6M		
	IV3-LG5M		
	IV3-LG6M		

* LED product is classified as shown below according to IEC 62471.

- Exempt Group Does not pose any photobiological hazard.
- Risk Group 1 (Low-Risk) Does not pose a hazard due to normal behavioral limitations on exposure.
- Risk Group 2 (Moderate-Risk) Does not pose a hazard due to the aversion response to very bright light sources or due to thermal discomfort.
- Risk Group 3 (High-Risk) May pose a hazard even for momentary or brief exposure.

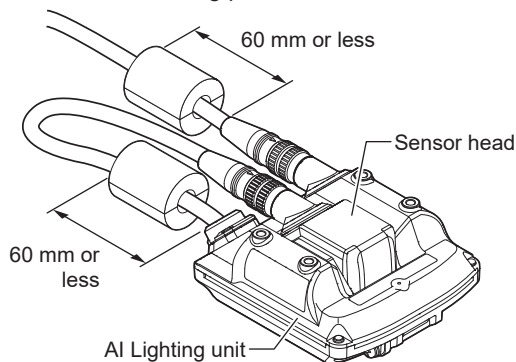
Precautions on Regulations and Standards

CE and UKCA Markings

KEYENCE Corporation has confirmed that this product complies with the essential requirements of the applicable EU Directive(s) and UK regulations, based on the following specifications. Be sure to consider the following specifications when using this product in the Member States of European Union and in the United Kingdom.

● EMC Directive (CE) and Electromagnetic Compatibility Regulations (UKCA)

- Applicable standard : (BS) EN61326-1, Class A
- When using the built-in amplifier types (IV3-400CA/IV3-400MA/IV3-500CA/IV3-500MA/IV3-600CA/IV3-600MA), make sure the length of the power cable, I/O cable and Ethernet cable are less than 30 meters long.
- When using the ultra-compact model (IV3-G500CA/IV3-G500MA/IV3-G600CA/IV3-G600MA), make sure the length of the power cable, I/O cable and Ethernet cable are less than 30 meters long.
- When using the AI Lighting unit for Ultra small type (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), attach the recommended ferrite core or equivalent to the position shown in the figure 1. (2 places)
 - Model : ESD-SR-150 (TOKIN Corporation)
 - Ferrite core mounting position:



These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive and Electromagnetic Compatibility Regulations. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive.

CSA Certificate

This product complies with the following CSA and UL standards and has been certified by CSA.

- Applicable standard: CAN/CSA C22.2 No. 61010-1 UL61010-1

Be sure to consider the following specifications when using this product as a product certified by CSA.

○ Built-in amplifier types (IV3-400CA/IV3-400MA/IV3-500CA/IV3-500MA/IV3-600CA/IV3-600MA)

- Overvoltage category I
- Use this product under pollution degree 3.
- Use this product at the altitude of 2500 m or lower.
- Indoor use only.
- Be sure to consider the following specifications when using the optional Ethernet cable as a product certified by North American certification body. The Ethernet cable (OP-88664/OP-88665/OP-88666) does not comply with North American standards if it is used in the voltage rating required for PoE. To supply power via PoE electric power supply, prepare an Ethernet cable that supports PoE. When not used as PoE, it can be used as an Ethernet communication cable.

○ Ultra-compact model (IV3-G500CA/IV3-G500MA/IV3-G600CA/IV3-G600MA)

- Use the following power supply. CSA/UL certified power supply that provides Class 2 output as defined in the CEC (Canadian Electrical Code) and NEC (National Electrical Code)
- Connect the sensor amplifier power supply and I/O connector to the same power supply that has Class 2 output.
- Overvoltage category I
- Use this product under pollution degree 3.
- Use this product at the altitude of 2500 m or lower.
- Indoor use only.

○ AI Lighting unit (IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M/IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M)

- Overvoltage category I
- Use this product under pollution degree 3.
- Use this product at the altitude of 2500 m or lower (IV3-L**).
- Use this product at the altitude of 2500 m or lower (IV3-LG**).
- Indoor use only.

Software License Agreement

NOTICE TO USER: PLEASE READ THIS SOFTWARE LICENSE AGREEMENT (THIS "AGREEMENT") CAREFULLY. BY USING ALL OR ANY PORTION OF THE [IV3-H1] (THIS "SOFTWARE"), YOU ARE AGREEING TO BE BOUND BY ALL THE TERMS AND CONDITIONS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO ANY TERMS OF THIS AGREEMENT, DO NOT USE THIS SOFTWARE.

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Version of the IV3 Series

You can download the most recent operation software for the sensor (IV3-G120, IV3-400CA, IV3-400MA, IV3-500CA, IV3-500MA, IV3-600CA, IV3-600MA) and PC software for the IV3 Series IV3-Navigator (IV3-H1) from the KEYENCE web site.

Please refer to the description on the homepage for the introduction method.

URL: www.keyence.com/glb

Operation Software for the Sensor

Version	Description
R1.30.**	This is the version of this document.

PC Software for IV3 Series IV3-Navigator (IV3-H1)

Version	Description
R1.30.**	This is the version of this document.

Revision history of Software Version

Version	Description
R1.00.**	The initial version.
R1.10.**	<ul style="list-style-type: none"> • Adds the following functions <ul style="list-style-type: none"> • Multiple Position Adjustments • Multiple Master images • High-Speed Program Switching • Program Auto-Switching (Standard Mode) • Multiple units connection, list display, display switch (IV3-Navigator only) • Supports SFTP • Supports the 4 pin cable (for the built-in amplifier type)
R1.20.**	<ul style="list-style-type: none"> • Adds the following functions <ul style="list-style-type: none"> • Expands the number of installed tools (total of 65 tools) • Expands the types of supported tools in sorting mode • Program auto-switching (sorting mode) • Automatic backup and restoration of settings • Change of thresholds while running • PROFINET • Master status result output • Languages
R1.30.**	Supports IV3-400CA/400MA

MEMO

Structure of This Manual

1	Getting Started	This chapter explains the system configuration and overview of the IV3 Series, package contents, and names and functions of each part.
2	Installation and Connection	This chapter explains the procedures for installing and connecting the sensor and for setting up the PC.
3	Basic Operation	This chapter explains the basic operation and operation flow of the IV3 Series.
4	Settings Navigator	This chapter explains how to set the sensors using the Settings Navigator.
5	Running	This chapter explains how to operate the IV3 Series.
6	Adjusting	This chapter explains how to adjust the IV3 Series.
7	Various Functions	This chapter explains the detailed features of the IV3 Series.
8	Saving Settings and Images, SD Card	This chapter explains how to save the sensor setup or image, and how to set the SD card to use.
9	Connecting to a Network	This chapter explains how to connect and use the network.
10	Simulator	This chapter explains the functions and operations of the Simulator.
11	Controlling with the Input/Output Line	This chapter explains how the input and output terminals control each operation.
12	Specifications	This chapter explains specifications and dimensions.
A	Appendices	This chapter explains error messages and troubleshooting, etc.

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1

Getting Started

This chapter explains the system configurations and overview of the IV3 Series, how to check package contents, and the name and function of each part.

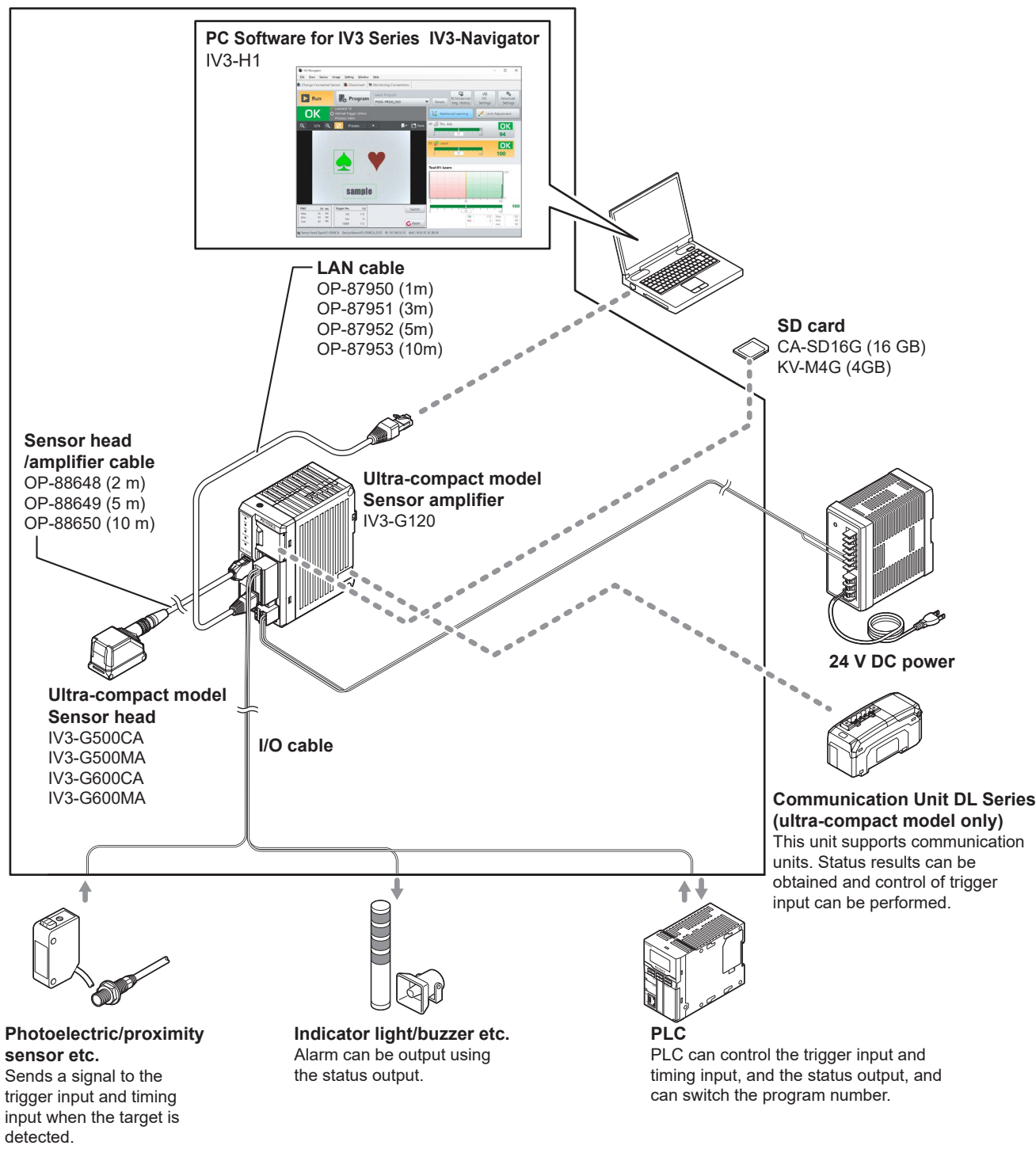
System Configuration	1-2
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Name and Function of Each Part	1-13

System Configuration

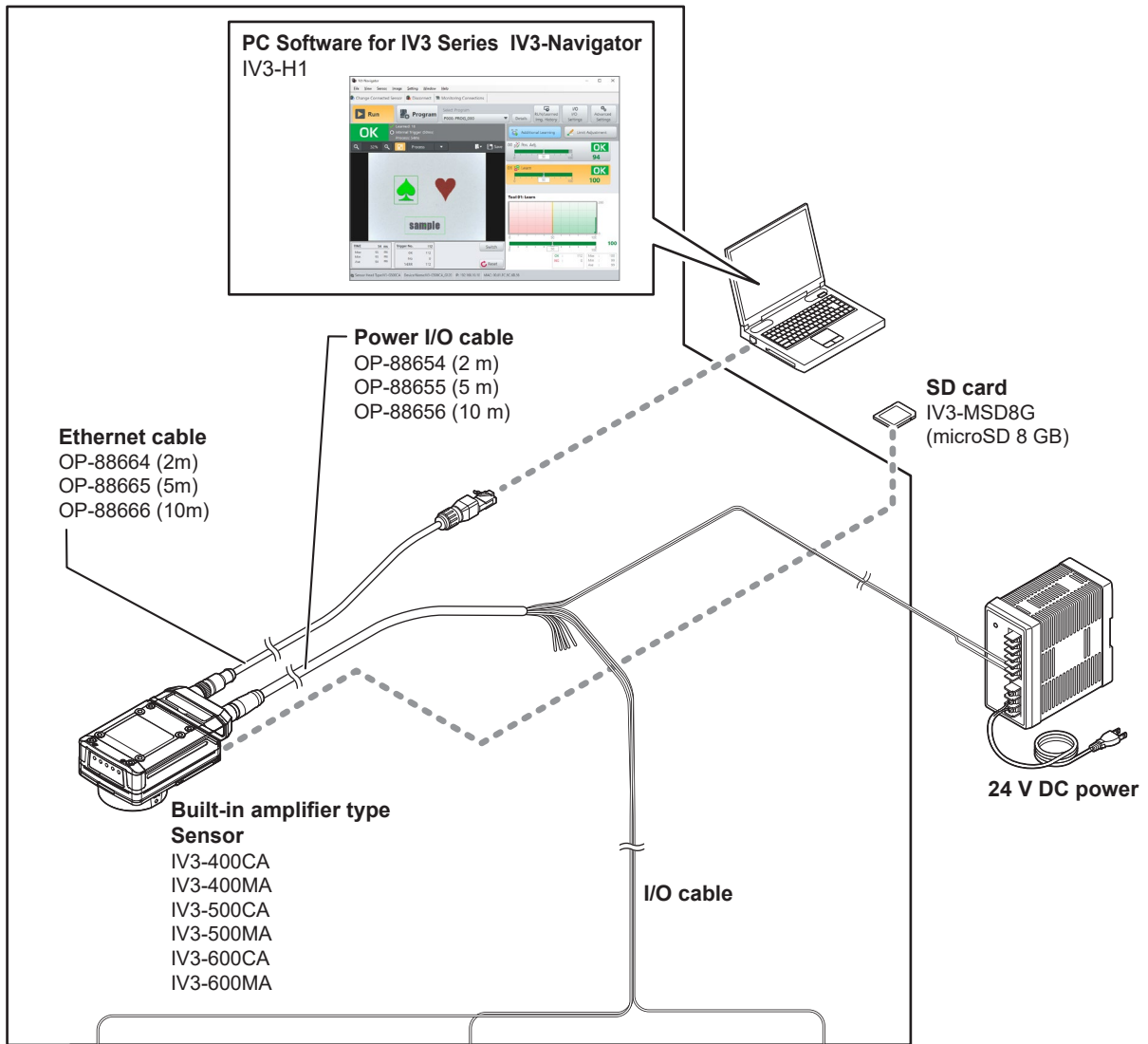
Basic Configurations of the IV3 Series

1 Getting Started

Basic configuration of the ultra-compact model



Basic configuration of the built-in amplifier type



Photoelectric/proximity sensor etc.

Sends a signal to the trigger input and timing input when the target is detected.

Indicator light/buzzer etc.

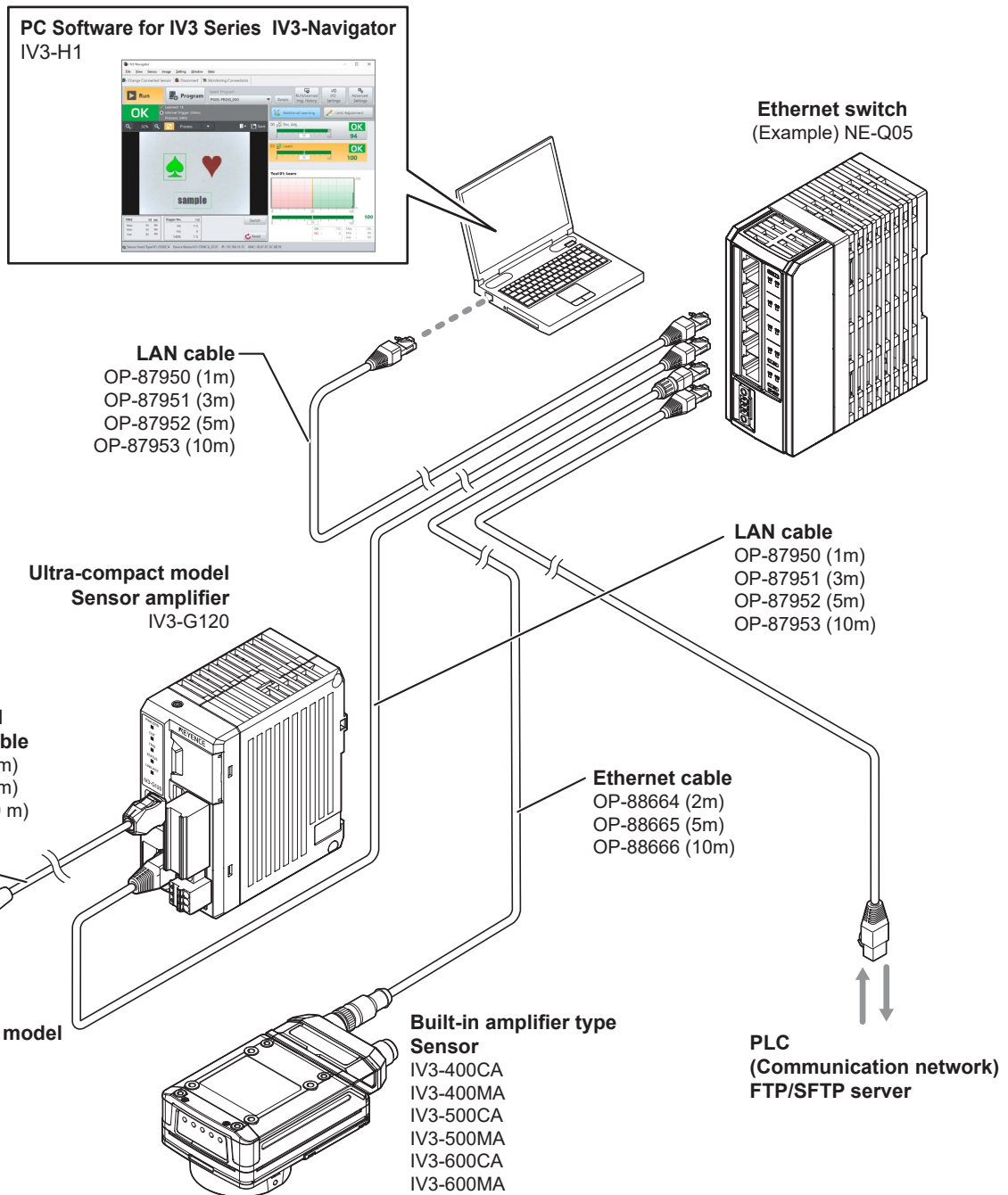
Alarm can be output using the status output.

PLC

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

Connecting the PC and multiple sensors

When connecting multiple sensors with a network, the PC can select a single sensor from among the multiple sensors to connect.



NOTICE

For the method to supply power to the sensor, refer to "Cables" (page 2-15).

Reference

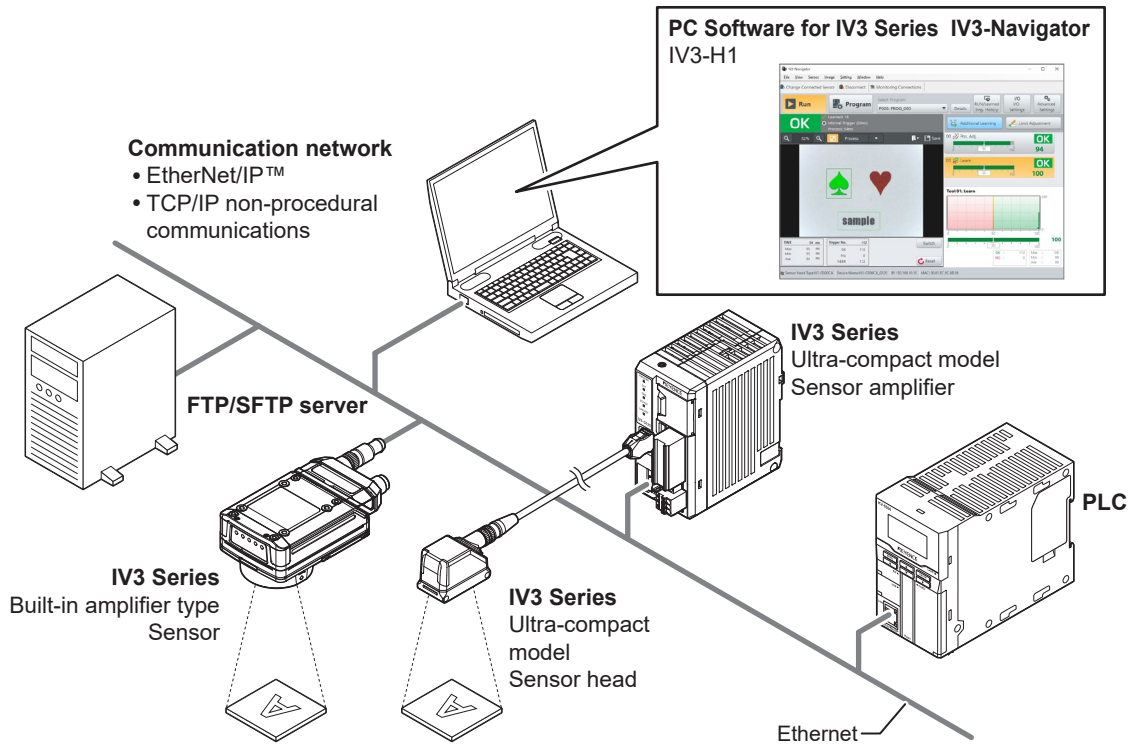
The IV2 Series and IV Series can be connected on a network.

- For details on connecting with the sensor of the IV2 Series, refer to "IV2 Series User's Manual (PC Software)".
- For details on connecting with the sensor of the IV-HG/IV-H Series, refer to "IV-HG/IV-H Series User's Manual (PC Software)".
- For details on connecting with the sensor of the IV-G/IV Series, refer to "IV-G/IV Series User's Manual (PC Software)".

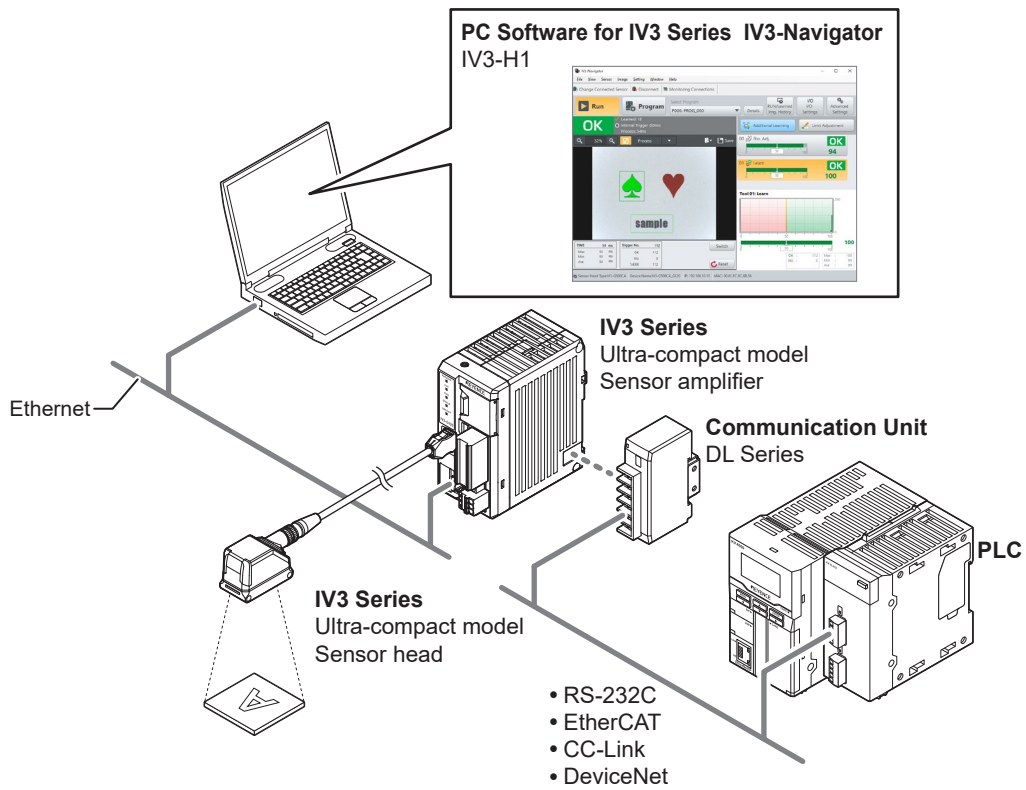
Configuration of the IV3 Series network function

The following functions can be used by configuring a network with the IV3 Series.

- By using the data transfer function, images and status results can be transferred to SD cards and FTP/SFTP servers.
- Trigger input, judgment result acquisition, program number switch (changeover) by connection with PLC on the field Network



● **When using a field network (DL unit) (ultra-compact model only)**



IV3 Series Overview

IV3 Series

The IV3 Series is a "Vision Sensor".

This sensor can be attached easily so complicated detection operations such as detecting the shapes of parts with a photoelectric switch can be achieved easily.

Operation condition settings require the use of the control panel (IV3-CP50) or the PC software IV3-Navigator (IV3-H1) for the IV3 Series.

The sensor with control panel or the sensor with PC are connected via Ethernet so connection with multiple sensors can be performed.

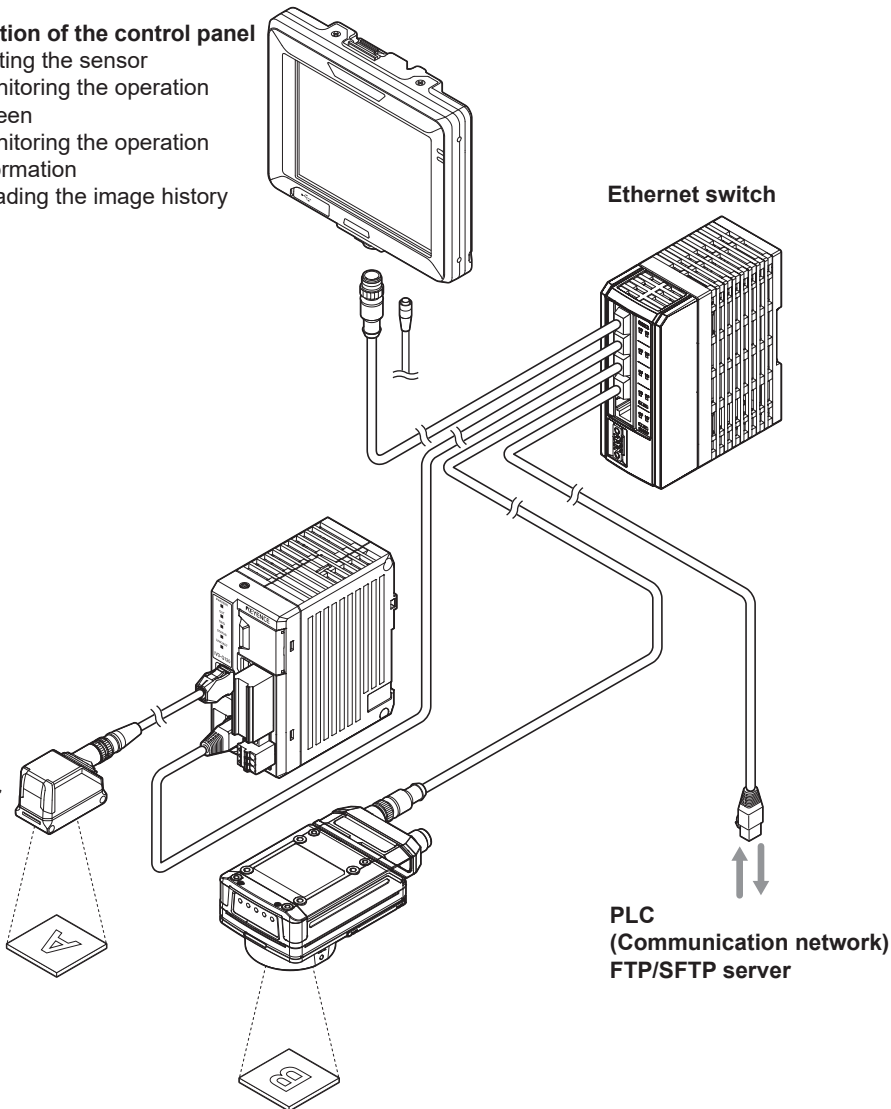
Using with control panel

Function of the control panel

- Setting the sensor
- Monitoring the operation screen
- Monitoring the operation information
- Reading the image history

Functions of sensor

- Camera
- Light
- Image detection
- I/O
- Saving the image history



NOTICE For the method to supply power to the sensor, refer to "Cables" (page 2-15).

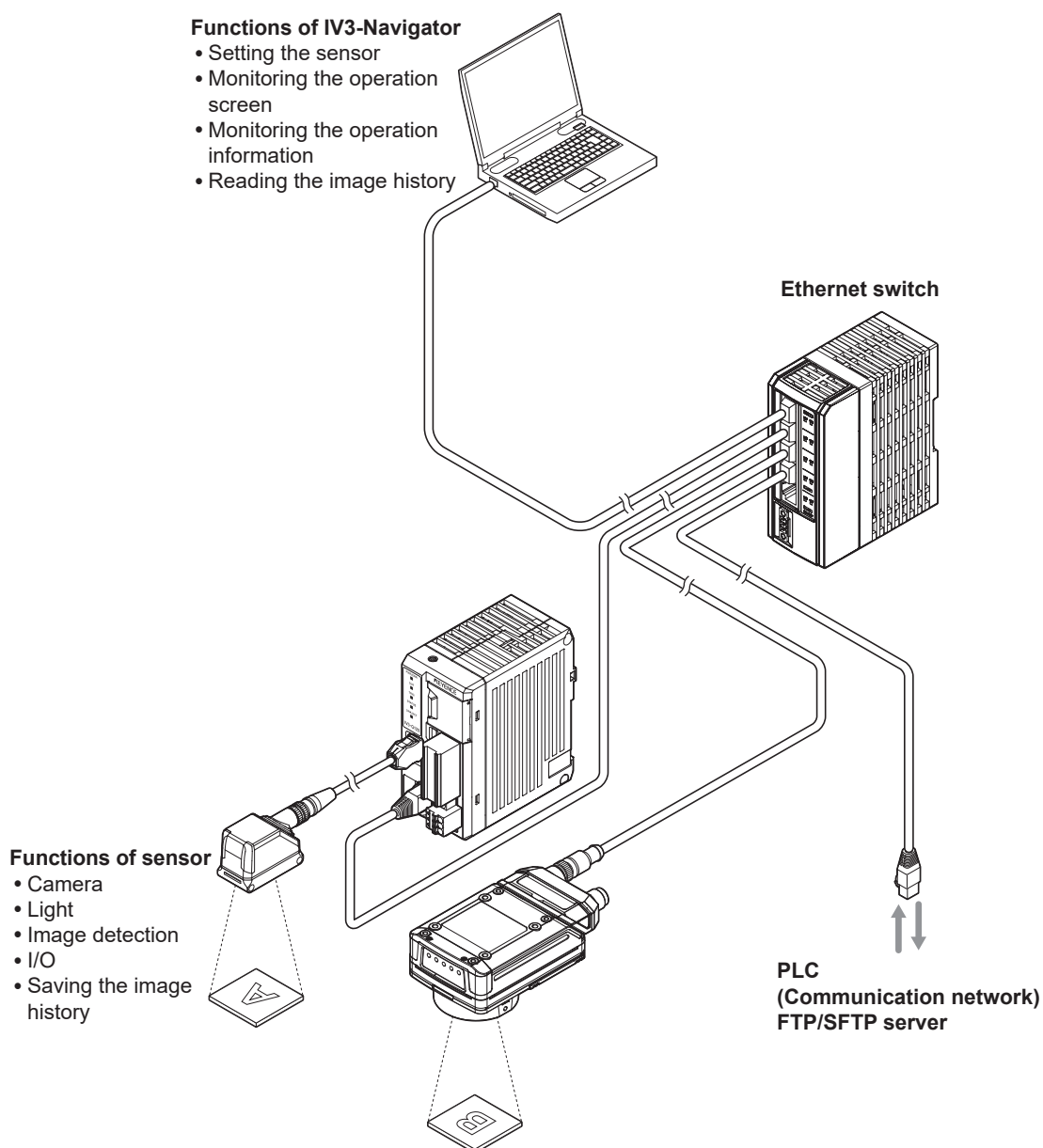
Reference For details of operations using the control panel (IV3-CP50), refer to "IV3 Series User's Manual (Control Panel)".

Using with PC software “IV3-Navigator”

The PC software “IV3-Navigator” has the same functions as the control panel for the IV3 Series.

Functions of IV3-Navigator

- Setting the sensor
- Monitoring the operation screen
- Monitoring the operation information
- Reading the image history



NOTICE

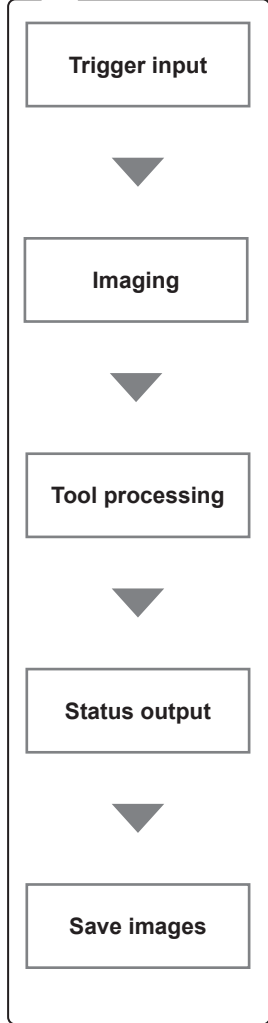
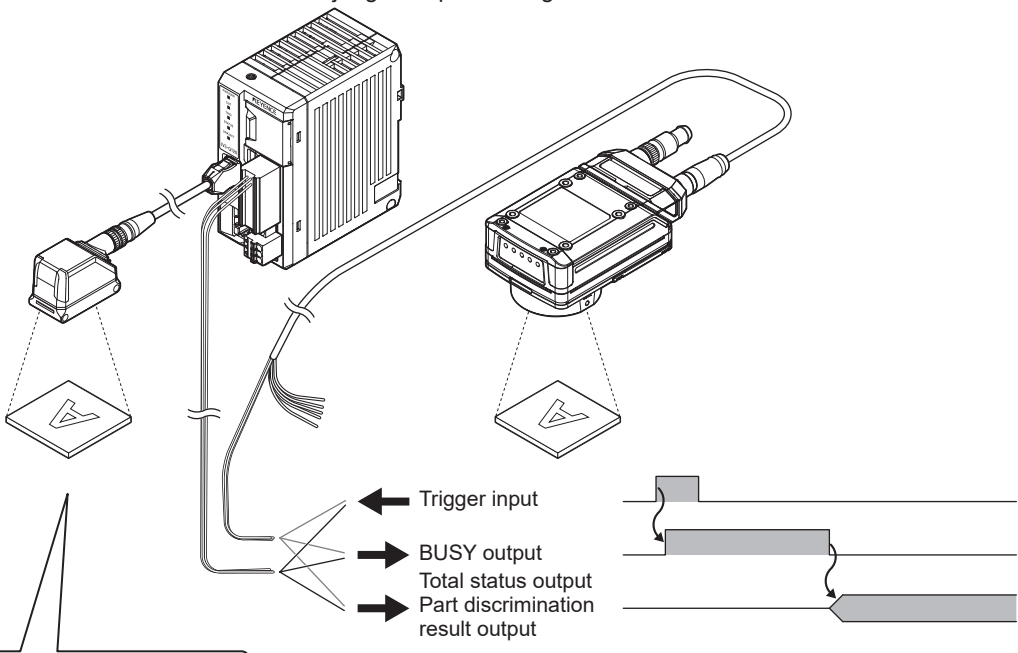
For the method to supply power to the sensor, refer to “Cables” (page 2-15).

Judgment processing flow

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

1

Getting Started



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 the internal trigger function.

Use the built-in light to obtain an image of the target with the CMOS image sensor. BUSY output turns ON.

Standard mode: According to the settings of a detection tool, the image of the target is scanned to detect whether a target is high or low quality. In addition, misaligned positions of the target can be corrected by using the position adjustment tool. Up to 65 tools can be set.
 Sorting mode: Registers multiple varieties and judges which part type the target matches. Up to 8 part types can be registered. Up to 8 detection tools can be set. 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 result.
 Standard mode: When the total status result is OK, the total status OK output is ON.
 When the total status result is NG, the total status NG output is ON.
 Sorting mode: The output where the matching type is assigned is ON.

Saves the image (up to 100 images) to the image history memory in the sensor.
 Conditions for saving the image can be selected from "NG only", "NG/near threshold OK", or "All".

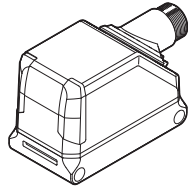
Reference By using the data transfer function, images and status results can be transferred to SD cards and FTP/SFTP servers.

Checking the package contents

The IV3 Series consists of the models below. Check that all of the bundled items below are included with each model before use. Remove, this revision is included with the previous correction.

Ultra-compact model sensor head

- IV3-G500CA
- IV3-G500MA
- IV3-G600CA
- IV3-G600MA

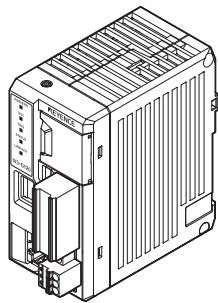


Sensor head x 1

- ☐ "Name and Function of Each Part" (page 1-13)
- ☐ "Mounting the Sensor" (page 2-2)
- ☐ "Cables" (page 2-15)

Ultra-compact model sensor amplifier

- IV3-G120



Sensor amplifier x 1

Instruction Manual x 1



LAN port cap x 1
(mounted in the amplifier)

Power terminal block
(mounted in the amplifier)

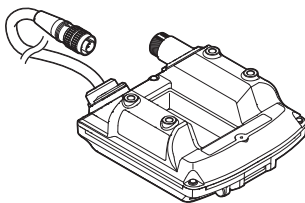
I/O terminal block (mounted in the amplifier)

- ☐ "Name and Function of Each Part" (page 1-13)
- ☐ "Mounting the Sensor" (page 2-2)
- ☐ "Cables" (page 2-15)

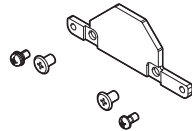
Options for the ultra-compact model

AI Lighting unit

- IV3-LG5C
- IV3-LG6C
- IV3-LG5M
- IV3-LG6M



AI Lighting unit x 1



Sensor head mounting bracket x 1

Mounting screw
(Slim head screw M4 x L6) x 2
(Double sems screw M4 x L6) x 2

Instruction Manual x 1

- ☐ "Mounting the AI Lighting unit" (page 2-6)

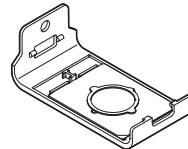
Polarizing filter

■ Polarizing filter (sensor head)

- OP-88642 (color)
- OP-88643 (monochrome)



Mounting screw
M3 x L5 (double-washer sems) x 1



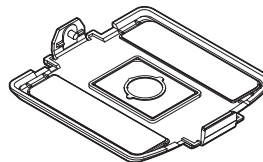
Instruction Manual x 1

- ☐ "Using the polarizing filter" (page 2-10)

■ Polarizing filter for the AI Lighting unit

- OP-88646 (color)
- OP-88647 (monochrome)

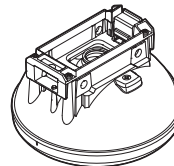
Instruction Manual x 1



- ☐ "Using the polarizing filter" (page 2-10)

Mounting the dome attachment

- IV2-GD05



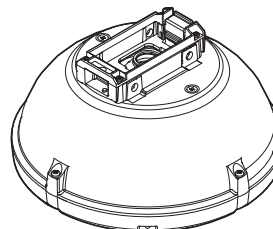
Dome attachment for ultra-compact model (Small)



Mounting screw (M4 x L8) x 2
Mounting screw (M4 x L10) x 2
* Double-washer sems screw

Instruction Manual x 1

- IV2-GD10



Dome attachment for ultra-compact model (Large)



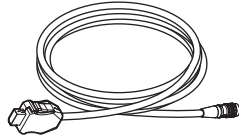
Mounting screw (M4 x L8) x 2
Mounting screw (M4 x L10) x 2
* Double-washer sems screw

Instruction Manual x 1

- ☐ "Mounting the dome attachment for ultra-compact model" (page 2-12)

Sensor head/amplifier cable

- OP-88648 (2m)
- OP-88649 (5m)
- OP-88650 (10m)



Sensor head/amplifier cable x 1

☞ “Cables” (page 2-15)

Mounting bracket (When not using the AI Lighting unit)

■ Vertical mounting bracket

- OP-87908

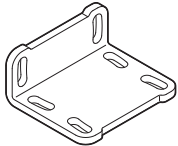


Mounting screw (M4 x L8) x 2
* Double-washer sems screw

Mounting bracket x 1

■ Transverse mounting bracket

- OP-87909

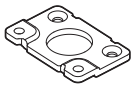


Mounting screw (M4 x L8) x 2
* Double-washer sems screw

Mounting bracket x 1

■ Adjustable bracket

- OP-87910



Mounting screw (M4 x L8) x 2
* Double-washer sems screw



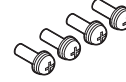
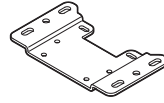
Bracket x 1

Mounting bracket x 1

Mounting bracket (When using the AI Lighting unit)

■ Common mounting bracket (common to built-in amplifier type)

- OP-88634

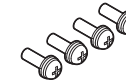
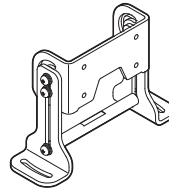


Mounting screw (M3 x L7) x 4

Common mounting bracket x 1

■ Biaxial adjustable mounting bracket for the AI Lighting unit

- OP-88638

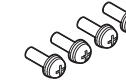
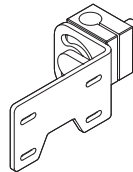


Mounting screw (M3 x L7) x 4

Biaxial adjustable mounting bracket x 1

■ Adjustable bracket for the AI Lighting unit

- OP-88639



Mounting screw (M3 x L7) x 4

Adjustable bracket x 1

SD card

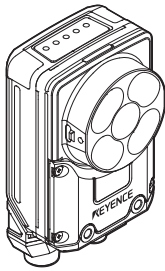
- CA-SD16G (16 GB)
- KV-M4G (4GB)



SD card x 1

Built-in amplifier type sensor

- IV3-400CA • IV3-400MA
- IV3-500CA • IV3-500MA
- IV3-600CA • IV3-600MA



Sensor x 1



Water proof cap for the Power I/O cable connector x 1
(Attached to the unit)



Water proof cap for the Ethernet cable connector x 1
(Attached to the unit)

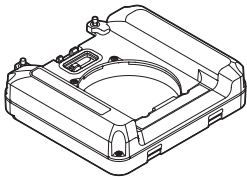
- ☐ "Name and Function of Each Part" (page 1-13)
- ☐ "Mounting the Sensor" (page 2-2)
- ☐ "Cables" (page 2-15)

Options for the built-in amplifier type

AI Lighting unit

- IV3-L4C • IV3-L5C
- IV3-L4M • IV3-L5M
- IV3-L6C
- IV3-L6M

Instruction Manual x 1



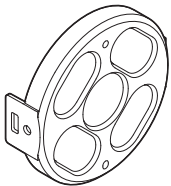
AI Lighting unit x 1

- ☐ "Mounting the AI Lighting unit" (page 2-6)

Polarizing filter

■ Polarizing filter (sensor main unit)

- OP-88640 (color)
- OP-88641 (monochrome)



Mounting screw M2.5 x L5 (double-washer sems) x 2

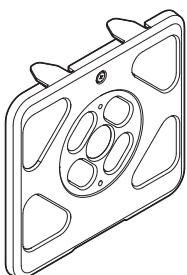
Instruction Manual x 1

- ☐ "Using the polarizing filter" (page 2-10)

■ Polarizing filter for the AI Lighting unit

- OP-88644 (color)
- OP-88645 (monochrome)

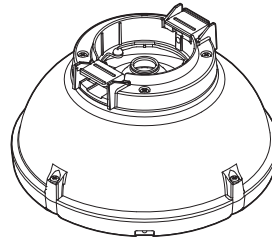
Instruction Manual x 1



- ☐ "Using the polarizing filter" (page 2-10)

Mounting the dome attachment

- IV3-D10



Dome attachment for IV3 built-in amplifier type sensor

- ☐ "Mounting the dome attachment for built-in amplifier type" (page 2-14)

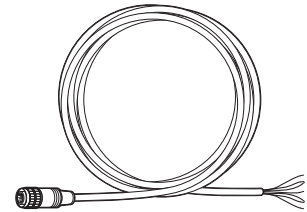


Mounting screw (M2.5 x L8) x 2
* Double-washer sems screw

Instruction Manual x 1

Power I/O cable (M12 A12 pin - strand wire)

- OP-88654 (2m)
- OP-88655 (5m)
- OP-88656 (10m)



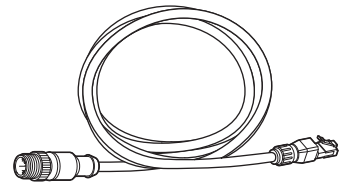
Power I/O cable x 1

- ☐ "Cables" (page 2-15)

Ethernet cable

■ Ethernet cable (M12 X8pin - RJ-45)

- OP-88664 (2m)
- OP-88665 (5m)
- OP-88666 (10m)

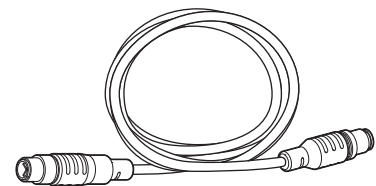


Ethernet cable x 1

- ☐ "Cables" (page 2-15)

■ M12-M12 Ethernet cable (M12 D4pin-M12 X8pin)

- OP-88651 (2m)
- OP-88652 (5m)
- OP-88653 (10m)



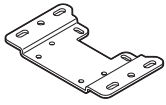
M12-M12 Ethernet cable x1

- ☐ "Cables" (page 2-15)

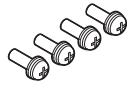
Mounting bracket (common when using the AI Lighting unit)

Common mounting bracket (common to all ultra-compact models)

- OP-88634



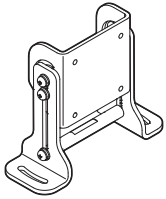
Common mounting bracket x 1



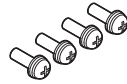
Mounting screw (M3 x L7) x 4

Biaxial adjustable mounting bracket

- OP-88635



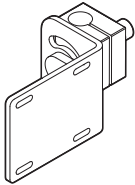
Biaxial adjustable mounting bracket x 1



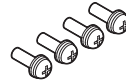
Mounting screw (M3 x L7) x 4

Adjustable bracket

- OP-88636



Adjustable bracket x 1



Mounting screw (M3 x L7) x 4

SD card

- IV3-MSD8G (8 GB: micro SD)



SD Card x 1

Conversion adapter x 1

* Stored in the dedicated case

Conversion connector

Conversion connector for power I/O cable

- OP-88631 (M12 A12pin-A4pin Male) x1



- OP-88632 (M12 A12pin-L5pin Male) x1



Conversion connector for Ethernet cable

- OP-88633 (M12 X8pin-D4pin Female) x1

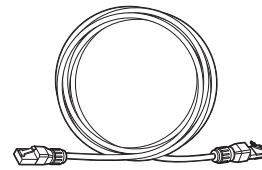


When using the Conversion connector for Ethernet cable (OP-88633), the Ethernet standard is fixed at 100BASE-TX.

Communication cable

LAN cable (RJ-45 - RJ-45)

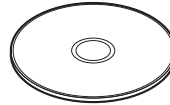
- OP-87950 (1m)
- OP-87951 (3m)
- OP-87952 (5m)
- OP-87953 (10m)



LAN cable (RJ-45 - RJ-45) x 1

PC software for IV3/IV2/IV series

- IV3-H1



DVD x 1

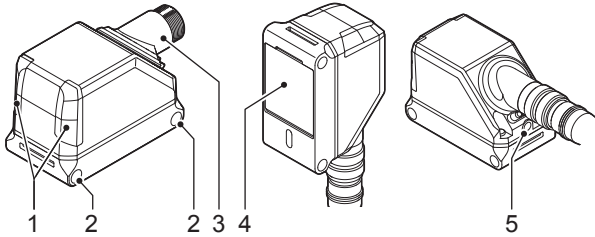
Instruction Manual x 1
 Starting Guide x 1
 "Installing IV3-Navigator (IV3-H1)"
 (page 2-22)

Name and Function of Each Part

Ultra-compact model sensor head

- IV3-G500CA • IV3-G500MA
- IV3-G600CA • IV3-G600MA

Name and function of each part of the ultra-compact model sensor head



1 Status indicator light

Indicates the operating status of the sensor.

☐ “Operation of the status indicator light: Ultra-compact model sensor head” (page 1-14)

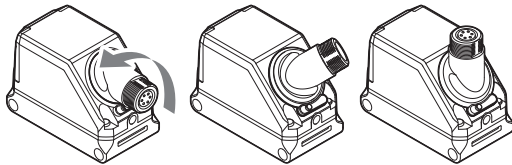
2 Mounting part

Used for mounting the sensor head.

☐ “Mounting the ultra-compact model sensor head” (page 2-3)

3 Connector for Sensor head/amplifier cable

The connector can rotate.



Example of rotating

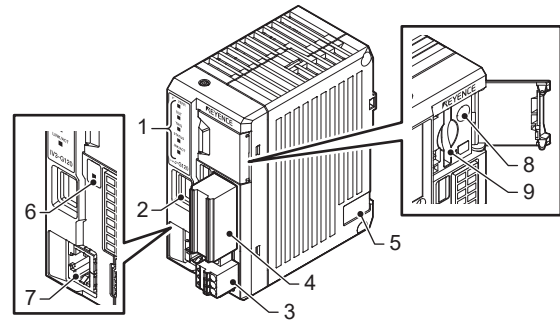
4 Camera and built-in light

5 Mounting part for the polarizing filter

Ultra-compact model sensor amplifier

- IV3-G120

Name and function of each part: Ultra-compact model sensor amplifier



1 Indicator light

Indicates the operating status of the sensor amplifier.

☐ “Operation of the indicator light: Ultra-compact model sensor amplifier” (page 1-14)

2 Connector for the sensor head/amplifier cable

☐ “Cables” (page 2-15)

3 Power terminal block

Supplies power to this unit.

4 I/O terminal block

Connects to the input and output cables.

5 Connector on the communications unit

Used for connecting the communication unit (DL Series).

The protection cover is attached during shipment.

6 SD card indicator light

Indicates the operating status of the SD card.

Green (ON)	The SD card is recognized. When the cover is open, the access stops.
------------	--

Green (Blink)	The SD card is accessed.
---------------	--------------------------

(OFF)	The SD card is not mounted, or not recognized.
-------	--

7 Ethernet connector

Used for connecting to the control panel (IV3-CP50), PC, or field network.

When this is not used, attach the included LAN port cap.

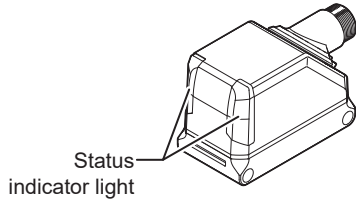
8 IP reset switch

Used for resetting the IP address assigned to this sensor amplifier.

9 SD card slot

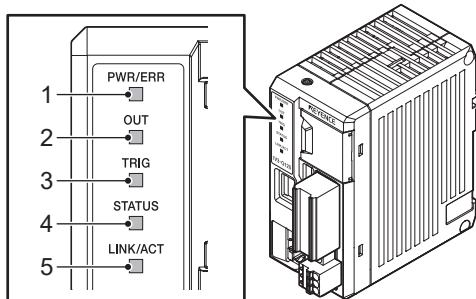
Mount the SD card.

Operation of the status indicator light: Ultra-compact model sensor head



Green (ON)	The total status result is "OK".
Green (Blink)	Under startup or setting in progress. Operation stopped. Blinks once a second.
Red (ON)	The total status result is "NG".
Red (Blink)	An error has occurred.
(OFF)	<ul style="list-style-type: none"> Standby status until the first judgment finishes after starting the operation or after switching the program number. The versions of the sensor head and sensor amplifier do not match. An incompatible sensor head is connected.
Green and red are blinking alternately.	"LED Blinking" is requested.

Operation of the indicator light: Ultra-compact model sensor amplifier



1 PWR/ERR

Green (ON)	Operation is in progress.
Green (Blink)	Setting in progress. Operation stopped. Blinks once a second.
Red (ON)	Unrecoverable error has occurred.
Red (Blink)	Recoverable error has occurred.
Orange (Blink)	<ul style="list-style-type: none"> "LED Blinking" is requested. Blinks four times a second. Settings are being restored from the SD card. Blinks once a second.
(OFF)	<ul style="list-style-type: none"> Settings are being restored from the SD card. Blinks once a second.

2 OUT

Indicates the comprehensive result.

Green (ON)	The total status result is "OK".
Green (Blink)	Startup is in progress. Alternatively, a program is not set.
Red (ON)	The total status result is "NG".
Orange (Blink)	<ul style="list-style-type: none"> "LED Blinking" is requested. Blinks four times a second. Settings are being restored from the SD card. Blinks once a second.
(OFF)	Setting in progress. Standby status until the first judgment finishes after starting the operation or after switching the program number.

3 TRIG

Green (ON)	Green light lights up (one-shot) according to input of the internal or external trigger.
Orange (Blink)	"LED Blinking" is requested. Blinks four times a second.

4 STATUS

Indicates the Ethernet connection status.

Green (ON)	Connected normally to the sensor.
Green (Blink)	IP address has been retrieved but the sensor is not correctly connected.
Red (ON)	The IP address coincides with other device or a network loop is detected.
Red (Blink)	Communication timeout has occurred with the Ethernet/IP scanner.
(OFF)	IP address is not assigned. No correct connection with the PC.

5 LINK/ACT

Indicates the link status to the Ethernet.

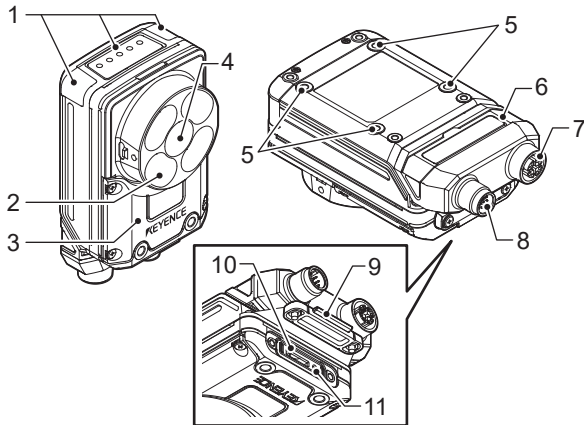
Green (ON)	Normally linked.
Green (Blink)	Normally linked, and the data is sending/receiving.
(OFF)	Sensor is not normally linked.

Reference For the state of the indicator light when the Field Network function is used, see "IV3 Series User's Manual (Field Network)."

Built-in amplifier type sensor

- IV3-400CA • IV3-400MA
- IV3-500CA • IV3-500MA
- IV3-600CA • IV3-600MA

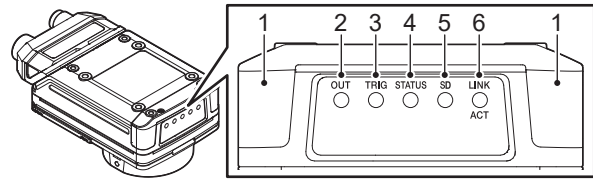
Built-in amplifier type: Name and function of each part of the sensor



- 1 Indicator light**
Indicates the operating status of the sensor.
☐ "Built-in amplifier type: Operation of the indicator light of the sensor" (page 1-15)
- 2 Built-in light**
LED light that illuminates the target.
- 3 Connector cover**
Remove when mounting the AI Lighting unit.
- 4 Camera**
Image the target.
- 5 Mounting part**
Used for mounting the sensor.
- 6 Rotating connector**
The direction the cable is pulled out can be changed.
- 7 Connector for Ethernet cable**
Connector for connecting the Ethernet cable. Use this for connecting the control panel, PC, or Ethernet switch.
☐ "Cables" (page 2-15)
- 8 Connector for power I/O cable**
Connector for connecting the power I/O cable. Use this for supplying the power to the sensor and for connecting with external devices.
☐ "Cables" (page 2-15)
- 9 SD card cover**
Open when inserting/removing the micro SD or using the IP reset switch.
• Tightening torque: 0.15 to 0.20 N·m
- 10 SD card slot**
The slot the microSD card is inserted into. There is an SD access indicator in the slot part.
☐ "Built-in amplifier type: Operation of the indicator light of the sensor" (page 1-15)
- 11 IP reset switch (inside the SD card cover)**
Used for resetting the IP address assigned to this sensor amplifier.

NOTICE	<p>When the cable is not connected to the connector for the power I/O cable or the connector for the Ethernet cable, attach the waterproof cap for included with the connector to maintain the enclosure rating.</p> <p>Tightening torque: 0.45 to 0.55 N·m</p>
---------------	---

Built-in amplifier type: Operation of the indicator light of the sensor



1 Status indicator light

Green (ON)	The total status result is "OK".
Green (Blink)	Under startup or setting in progress. Operation stopped. Blinks once a second.
Red (ON)	The total status result is "NG".
Red (Blink)	An error has occurred.
(OFF)	Standby status until the first judgment finishes after starting the operation or after switching the program number.
Green and red are blinking alternately.	"LED Blinking" is requested.

2 OUT

Indicates the comprehensive result.

Green	The total status result is "OK".
Green (Blink)	Startup is in progress. Alternatively, a program is not set.
Orange (Blink)	<ul style="list-style-type: none"> • "LED Blinking" is requested. Blinks four times a second. • Settings are being restored from the SD card. Blinks once a second.
Red	The total status result is "NG".
(OFF)	Setting in progress. Standby status until the first judgment finishes after starting the operation or after switching the program number.

3 TRIG

Green (ON)	Green light lights up (one-shot) according to input of the internal or external trigger.
Orange (Blink)	"LED Blinking" is requested. Blinks four times a second.

4 STATUS

Indicates the Ethernet connection status.

Green (ON)	Connected normally to the sensor.
Green (Blink)	IP address has been retrieved but the sensor is not correctly connected.
Red (ON)	The IP address coincides with other device or a network loop is detected.
Red (Blink)	Communication timeout has occurred with the Ethernet/IP scanner.
(OFF)	IP address is not assigned. No correct connection with the PC.

5 SD

Indicates the operating status of the SD card.

Green (ON)	The SD card is recognized.
Green (Blink)	The SD card is accessed.
(OFF)	The SD card is not mounted or not recognized.

Reference The operation of the SD access indicator in the slot part is as follows;

Green (ON)	The SD card is recognized.
(OFF)	The SD card is not mounted or not recognized.

6 LINK/ACT

Indicates the link status to the Ethernet.

Green (ON)	Normally linked.
Green (Blink)	Normally linked, and the data is sending/receiving.
(OFF)	Sensor is not normally linked.

2

Installation and Connection

This chapter explains how to mount the sensor, how to set up the PC, and how to connect the cables.

Mounting the Sensor	2-2
Cables	2-15
Setting up the PC	2-22

Mounting the Sensor

About sensor

● Ultra-compact model

- IV3-G500CA • IV3-G500MA
- IV3-G600CA • IV3-G600MA

● Built-in amplifier type

- IV3-400CA • IV3-400MA
- IV3-500CA • IV3-500MA
- IV3-600CA • IV3-600MA

Mounting the sensor head/sensor

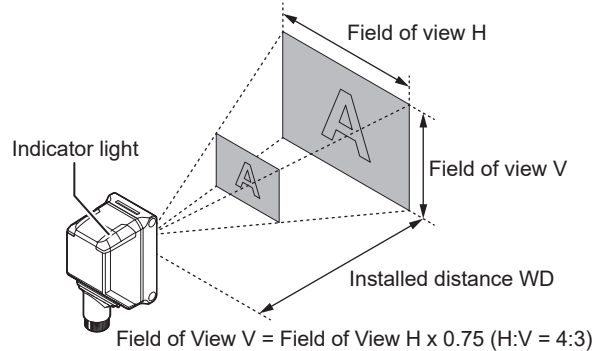
NOTICE Do not place the sensor head/sensor in an environment that exceeds the limit of its environmental resistance, or an environment that propagates vibration directly to the sensor head/sensor. Those may cause a damage or malfunction.

- Point**
- Field of view and optical axis have individual differences. Adjust the sensor position by checking the actual image at the time of installation.
 - Place the sensor in a location where ambient light will not affect the image. Ambient light includes solar light, lights of other devices, and photoelectric sensors. Also, be careful when the light intensity of the ambient light changes. Use a shield to protect when the location cannot be changed.
 - Place the sensor where no object can block out the internal light or the field of view of the sensor.
 - Detection may become unstable if multiple sensors are placed nearby each other, due to the lighting of each sensor. To prevent this, take the measures described below:
 - Delay the timing of external trigger inputs.
 - Use a shield to avoid interference.

Checking the field of view and installed distance

For the IV3 Series, the installed distance and the field of view of the camera is different depending on the type of sensor head/sensor used. Check the type of the sensor head/sensor to be used and its field of view and place it at the proper distance.

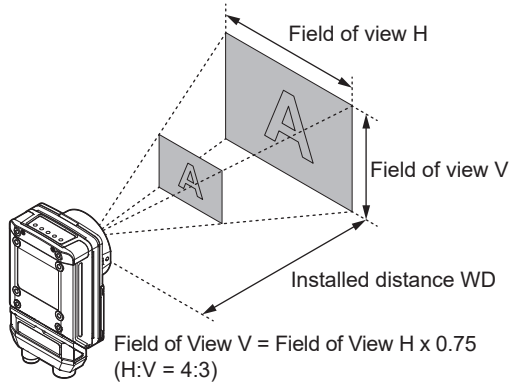
● Ultra-compact model



Model	Installed distance WD	Field of View H	Field of View V
• IV3-G500CA • IV3-G500MA	50	22	16
	100	42	31
	200	81	61
	300	121	90
	400	160	120
	500	199	149
	600	238	179
	800	317	238
	1000	396	297
	1200	474	356
	1400	553	415
	1600	631	474
	1800	710	533
	2000	789	592
	2500	987	740
3000	1,184	888	
• IV3-G600CA • IV3-G600MA	50	51	38
	100	96	72
	200	187	140
	300	278	208
	400	369	276
	500	460	344
	600	550	412
	800	732	548
	1000	914	684
	1200	1,095	820
	1400	1,277	956
	1600	1,458	1,092
	1800	1,640	1,228
	2000	1,822	1,364
	2500	2,276	1,704
3000	2,730	2,044	

(mm)

● Built-in amplifier type



Model	Installed distance WD	Field of View H	Field of View V
• IV3-400CA • IV3-400MA	400	58	44
	500	74	56
	600	90	67
	800	121	91
	1000	152	114
	1200	183	137
	1400	214	161
	1600	246	184
	1800	277	208
	2000	308	231
	2500	386	290
	3000	464	348
• IV3-500CA • IV3-500MA	50	22	16
	100	42	31
	200	81	61
	300	121	90
	400	160	120
	500	199	149
	600	238	179
	800	317	238
	1000	396	297
	1200	474	356
	1400	553	415
	1600	631	474
1800	710	533	
2000	789	592	
2500	987	740	
3000	1,184	888	
• IV3-600CA • IV3-600MA	50	51	38
	100	96	72
	200	187	140
	300	278	208
	400	369	276
	500	460	344
	600	550	412
	800	732	548
	1000	914	684
	1200	1,095	820
	1400	1,277	956
	1600	1,458	1,092
1800	1,640	1,228	
2000	1,822	1,364	
2500	2,276	1,704	
3000	2,730	2,044	

(mm)

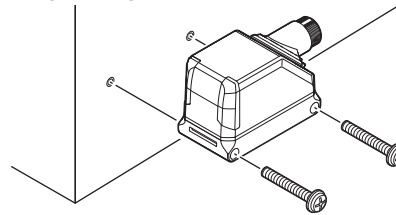
Mounting the ultra-compact model sensor head

- IV3-G500CA • IV3-G500MA
- IV3-G600CA • IV3-G600MA

Mounting the ultra-compact model sensor head

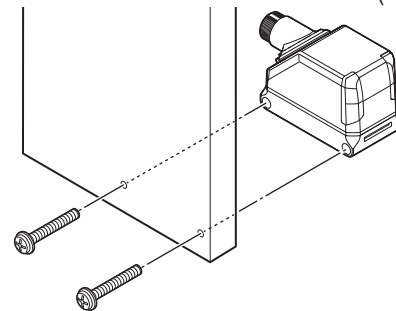
■ When screws are secured from the sensor head

- Screw: M3 x 2
- Tightening torque: 0.3 to 0.6 N·m



■ When screws are secured from the wall

- Screw: M4 x 2
- Tightening torque: 0.7 to 1.5 N·m
- Screw hole on the sensor head: M4 (screw depth : 3.5 mm)



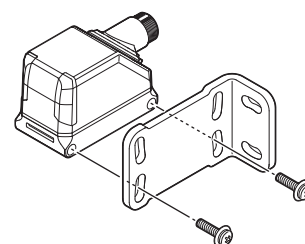
Attaching the optional mounting bracket

■ Vertical mounting bracket (OP-87908)

Attach the bracket using the screws attached to OP-87908.

- Tightening torque: 0.7 to 1.5 N·m

Mounting examples

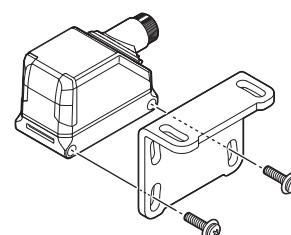


■ Transverse mounting bracket (OP-87909)

Attach the bracket using the screws attached to OP-87909.

- Tightening torque: 0.7 to 1.5 N·m

Mounting examples

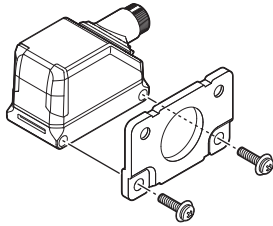


Adjustable bracket (OP-87910)

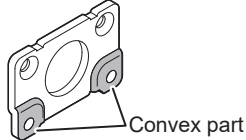
1 Attach the bracket using the screws attached to OP-87910.

- Tightening torque: 0.7 to 1.5 N·m

Mounting examples



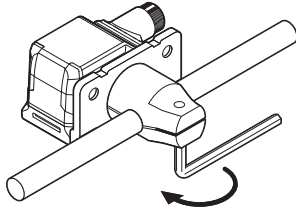
Point Connect the convex parts to the sensor head.



2 Mount the bracket on the support side to fix.

- Tightening torque: 5 N·m

Mounting examples

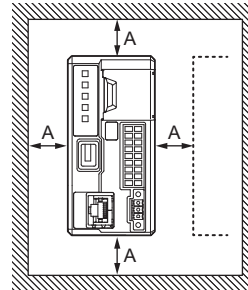


Mounting the ultra-compact model sensor amplifier

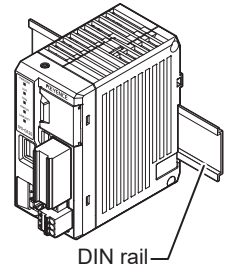
Mount the sensor amplifier as follows for heat release.

- For the mounting direction, place the indicator light toward the front.
- Secure the surrounding space with 30 mm or more.
- Set it on DIN rail mounted on sheet metal.

NOTICE

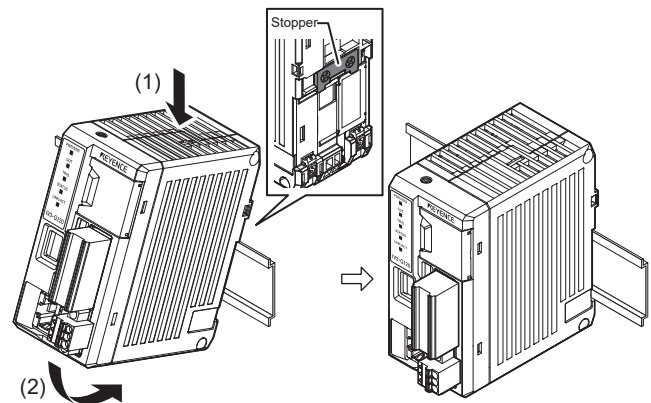


A: 30 mm or more



DIN rail

1 Fit the stopper on the back of the sensor amplifier (center side) to the DIN rail (1), and then push the sensor amplifier in on the arrow mark direction (2) until you hear the clicking sound.



When dismantling, push down the upper part of the front of the amplifier, while pushing the sensor amplifier on the reverse direction of the (1) arrow mark (upper side).

Mounting the built-in amplifier type sensor

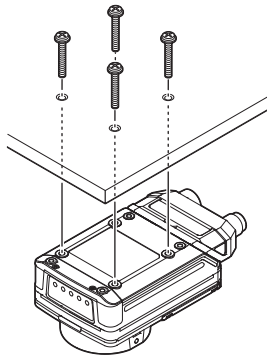
- IV3-400CA • IV3-400MA
- IV3-500CA • IV3-500MA
- IV3-600CA • IV3-600MA

Mounting the sensor

CAUTION For heat dissipation, attach the sensor to metal.

Mounting onto the mounting hole

- Mounting hole size: M3 depth 3.3 mm
- Tightening torque: 0.5 to 0.7 N·m



Reference In addition to the back M3 mounting hole, the sensor can be mounted on the back M2.5 (depth 3.4 mm, tightening torque: 0.2 to 0.3 N·m) and the front M4 (depth 4.1 mm, tightening torque: 0.8 to 1.2 N·m) hole.

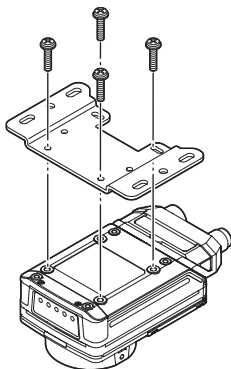
Attaching the optional mounting bracket

Mounting bracket for general use (OP-88634)

Attach the bracket using the screws attached to the mounting bracket for general use (OP-88634).

- Tightening torque: 0.5 to 0.7 N·m

Mounting examples

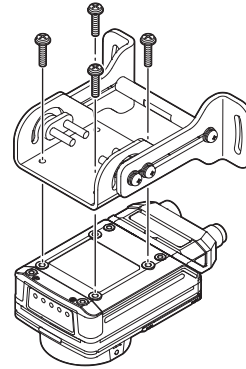


Biaxial adjustable bracket (OP-88635)

1 Attach the bracket using the screws included with the biaxial adjustment bracket (OP-88635).

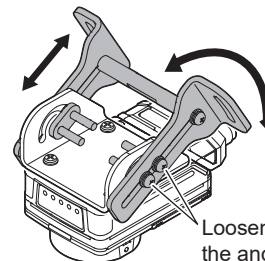
- Tightening torque: 0.5 to 0.7 N·m

Mounting examples



2 Loosen the screws on the left and right side of the mounting bracket, and adjust the angle and distance.

- Tightening torque: 0.7 to 1.5 N·m



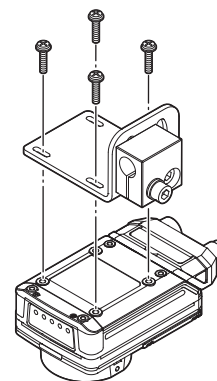
Loosen the screws and adjust the angle and distance

Adjustable bracket (OP-88636)

1 Attach the bracket using the screws included with the adjustable bracket (OP-88636).

- Tightening torque: 0.5 to 0.7 N·m

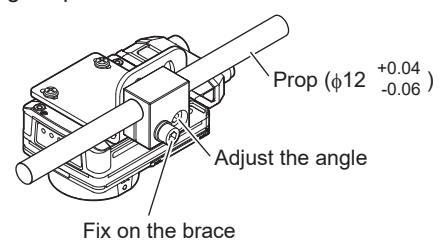
Mounting examples



2 Attach the bracket on the brace side, adjust the angle, and then fix the bracket with a bolt.

- Tightening torque: 7 to 9 N·m

Mounting examples



Mounting the AI Lighting unit

NOTICE When mounting or detaching the attachment, turn off the power of the IV3 Series. Mounting or detaching the attachment while the power is on may cause a malfunction.

Mounting the AI Lighting unit onto the ultra-compact model sensor head

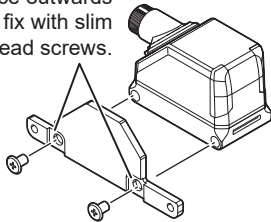
- IV3-LG5C • IV3-LG5M
- IV3-LG6C • IV3-LG6M

■ Mounting the AI Lighting unit (for the ultra-compact model)

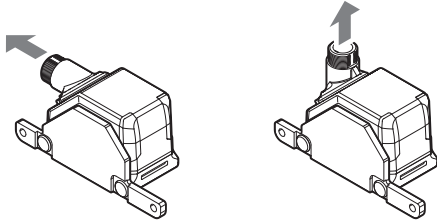
1 Mount the sensor head onto the head mounting bracket.

- Tightening torque: 0.6 to 0.8 N·m

Face the concave surface outwards and fix with slim head screws.

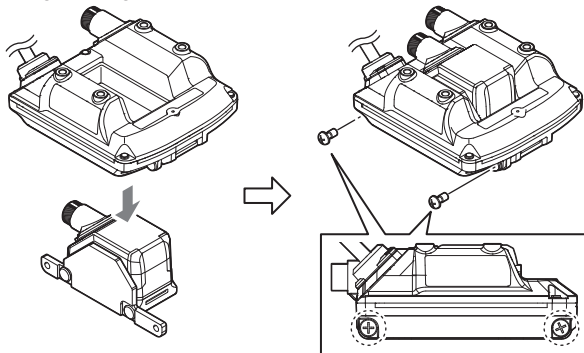


2 Rotate the head cable connector in the direction the cable will be extracted.



3 Mount the sensor head from the light side of the AI Lighting unit and then fix to the mounting holes with screws.

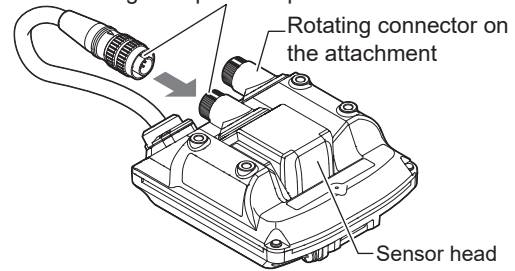
- Tightening torque: 0.5 to 0.7 N·m



4 Connect the AI Lighting unit cable to the sensor head.

- Tightening torque: 0.6 to 0.8 N·m

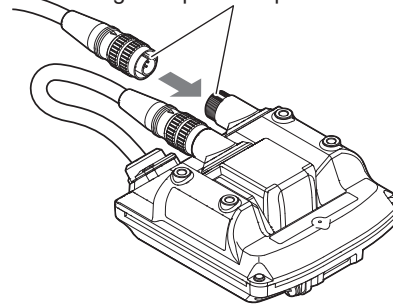
Align the pins and pin connection



5 Connect the sensor head/amplifier cable to the rotating connector on the AI Lighting unit.

- Tightening torque: 0.6 to 0.8 N·m

Align the pins and pin connection



NOTICE

- To tighten the screw by hand, turn it until the connector of the cable touches the sensor head firmly. Then turn it more about by 5° using a tool such as pliers.
- Do not rotate the rotating connector with the cable connected. Doing so may interfere with the base of the cable causing damage. To rotate the rotating connector, make sure to disconnect the cable first.

■ Removing the AI Lighting unit (for the ultra-compact model)

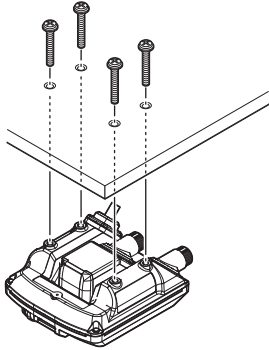
Perform removal in the reverse order.

Mounting the AI Lighting unit (for the ultra-compact model)

CAUTION For heat dissipation, attach the sensor to metal.

Mounting onto the mounting hole

- Mounting hole size: M3 depth 4.4 mm
- Tightening torque: 0.5 to 0.7 N·m



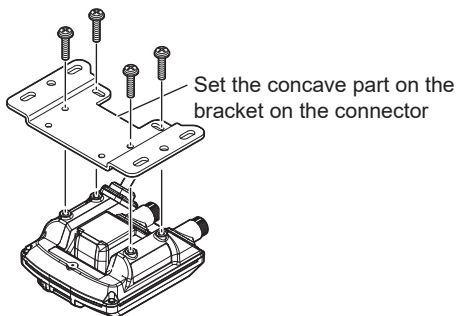
Attaching the optional mounting bracket

Mounting bracket for general use (OP-88634)

Attach the bracket using the screws attached to the mounting bracket for general use (OP-88634).

- Tightening torque: 0.5 to 0.7 N·m

Mounting examples

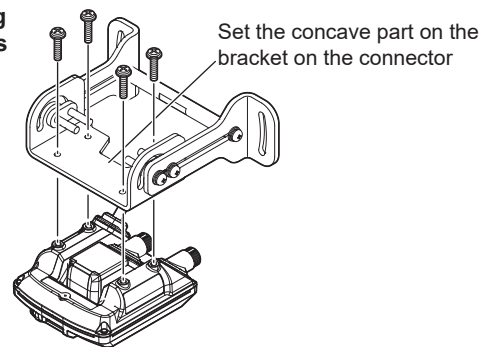


Biaxial adjustable bracket for the AI Lighting unit (OP-88638)

1 Attach the bracket using the screws included with the biaxial adjustment bracket (OP-88638).

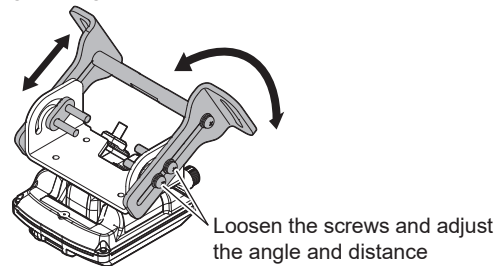
- Tightening torque: 0.5 to 0.7 N·m

Mounting examples



2 Loosen the screws on the left and right side of the mounting bracket, and adjust the angle and distance.

- Tightening torque: 0.7 to 1.5 N·m

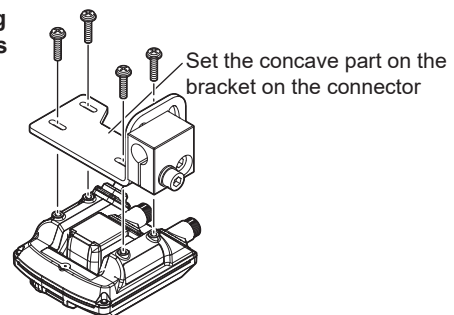


Adjustable bracket for the AI Lighting unit (OP-88639)

1 Attach the bracket using the screws attached to OP-88639.

- Tightening torque: 0.5 to 0.7 N·m

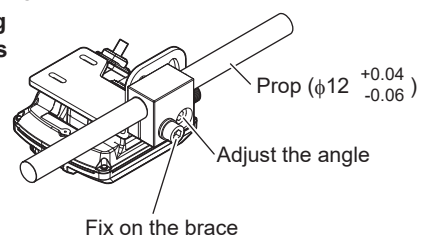
Mounting examples



2 Attach the bracket on the brace side, adjust the angle, and then fix the bracket with a bolt.

- Tightening torque: 7 to 9 N·m

Mounting examples

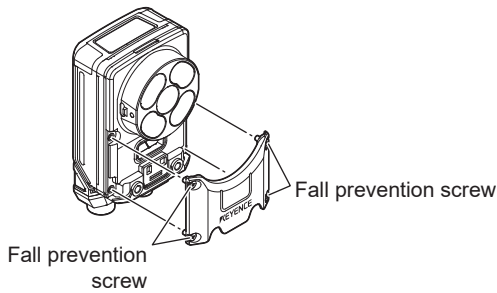


Mounting the AI Lighting unit onto the built-in amplifier type sensor

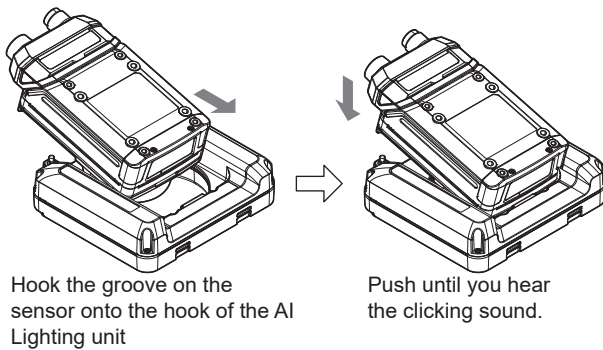
- IV3-L4C • IV3-L4M
- IV3-L5C • IV3-L5M
- IV3-L6C • IV3-L6M

Mounting the AI Lighting unit (for the built-in amplifier type)

1 Remove the connector cover on the front of the sensor.

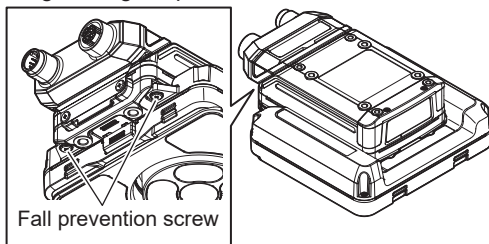


2 Hook the groove on the sensor onto the hook of the AI Lighting unit, and push it in until it makes a clicking sound.



3 Fix the sensor with two fall prevention screws.

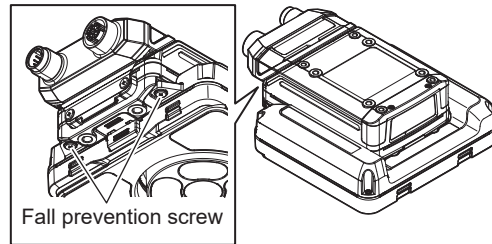
- Tightening torque: 0.15 to 0.20 N·m



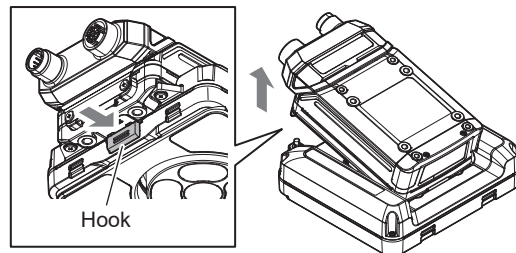
Removing the AI Lighting unit (for the built-in amplifier type)

Perform removal following the procedure below.

1 Loosen the fall prevention screws.



2 Remove the AI Lighting unit while pressing the hook at the bottom of the attachment.



3 Attach the connector cover on the front of the sensor.

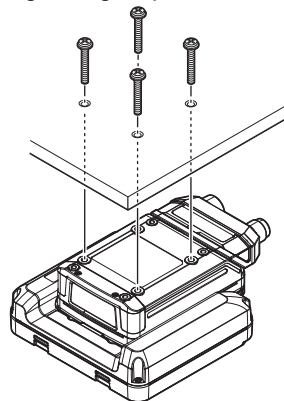
- Tightening torque: 0.15 to 0.20 N·m

Mounting the AI Lighting unit (for the built-in amplifier type)

CAUTION For heat dissipation, attach the sensor to metal.

Mounting onto the mounting hole

- Mounting hole size: M3 depth 3.3 mm
- Tightening torque: 0.5 to 0.7 N·m



Reference In addition to the back M3 mounting hole, the sensor can be mounted on the back M2.5 (depth 3.4 mm, tightening torque: 0.2 to 0.3 N·m) and the front M4 (depth 4.1 mm, tightening torque: 0.8 to 1.2 N·m) hole.

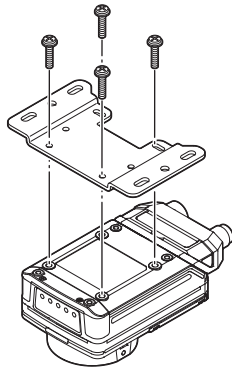
■ Attaching the optional mounting bracket

● Common mounting bracket (OP-88634)

1 Attach the bracket using the screws included with the common mounting bracket (OP-88634).

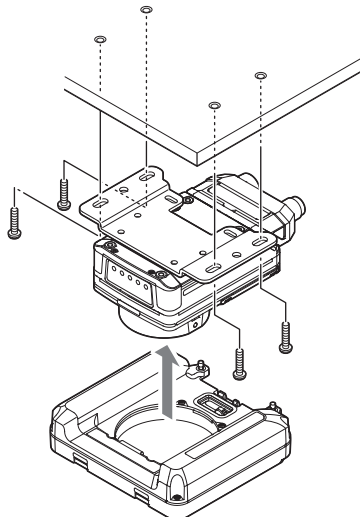
- Tightening torque: 0.5 to 0.7 N·m

Mounting examples



2 After fixing the common mounting bracket to the mounting position, mount the AI Lighting unit onto the sensor.

Mounting examples

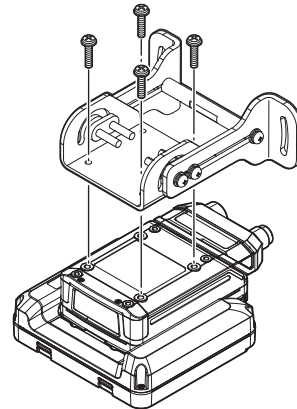


● Biaxial adjustable bracket (OP-88635)

1 Attach the bracket using the screws included with the biaxial adjustment bracket (OP-88635).

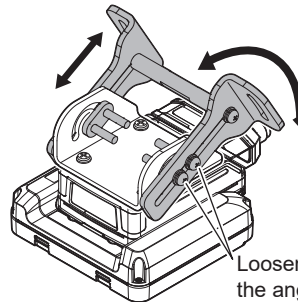
- Tightening torque: 0.5 to 0.7 N·m

Mounting examples



2 Loosen the screws on the left and right side of the mounting bracket, and adjust the angle and distance.

- Tightening torque: 0.7 to 1.5 N·m



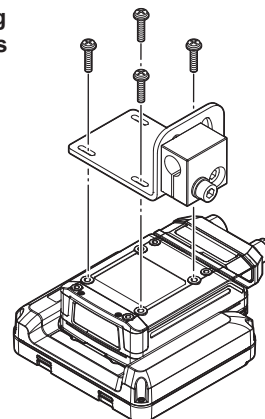
Loosen the screws and adjust the angle and distance

● Adjustable bracket (OP-88636)

1 Attach the bracket using the screws attached to OP-88636.

- Tightening torque: 0.5 to 0.7 N·m

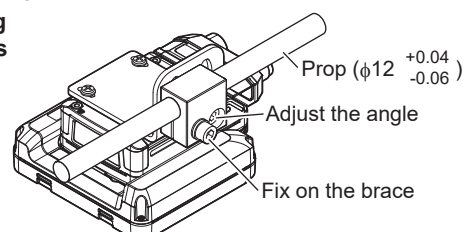
Mounting examples



2 Attach the bracket on the brace side, adjust the angle, and then fix the bracket with a bolt.

- Tightening torque: 7 to 9 N·m

Mounting examples

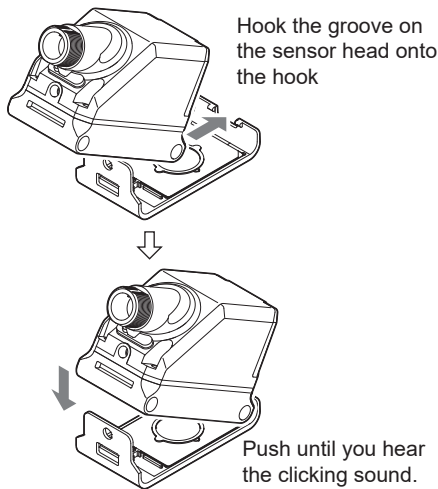


Using the polarizing filter

Point When using the polarizing filter, adjust brightness with the polarization filter attached.
 ☞ “Brightness Adjustment” (page 4-12)

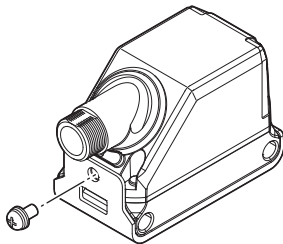
■ Mounting the polarizing filter for the ultra-compact model (OP-88642/OP-88643)

1 Hook the groove on the sensor head onto the hook of the polarizing filter, and push it in until you hear the clicking sound.



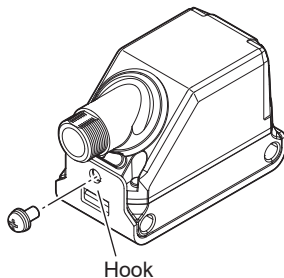
2 Secure the polarizing filter with the attached screw.

• Tightening torque: 0.3 to 0.6 N·m



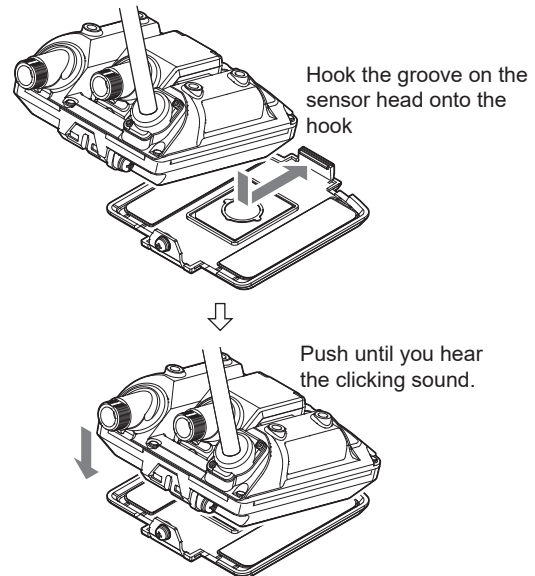
■ Removing the polarizing filter for the ultra-compact model (OP-88642/OP-88643)

1 Remove the screw and then remove the polarizing filter while pulling the hook forward.



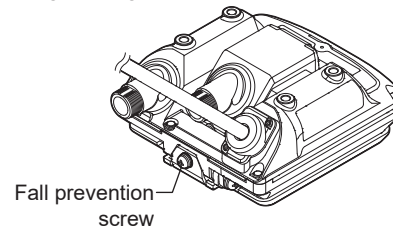
■ Mounting the polarizing filter for the AI Lighting unit (OP-88646/OP-88647): Ultra-compact model

1 Hook the groove on the sensor head onto the hook of the polarizing filter, and push it in until you hear the clicking sound.



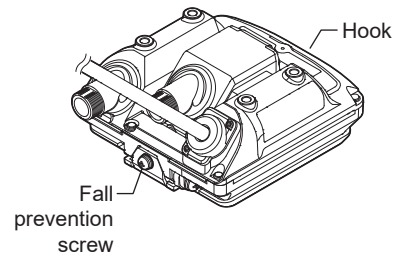
2 Fix the polarizing filter.

• Tightening torque: 0.15 to 0.20N·m



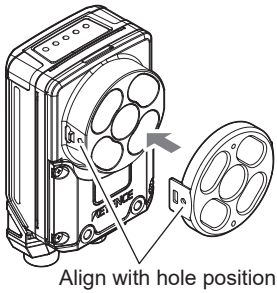
■ Removing the polarizing filter for the AI Lighting unit (OP-88646/OP-88647): Ultra-compact model

1 Loosen the screw and then remove the polarizing filter while pulling the hook forward.



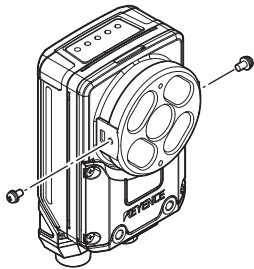
Mounting the polarizing filter for the built-in amplifier type (OP-88640/OP-88641)

- 1 Mount the polarizing filter by aligning the mounting hole on the polarizing filter with the mounting hole on the front of the sensor.



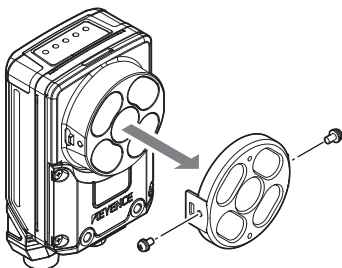
- 2 Secure the polarizing filter with the attached screw.

• Tightening torque: 0.15 to 0.2 N•m



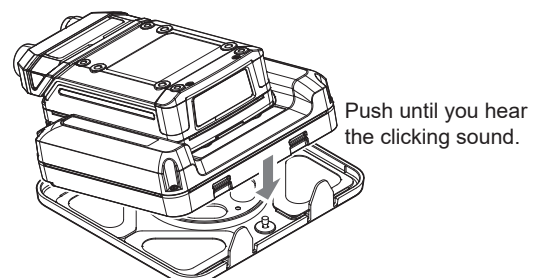
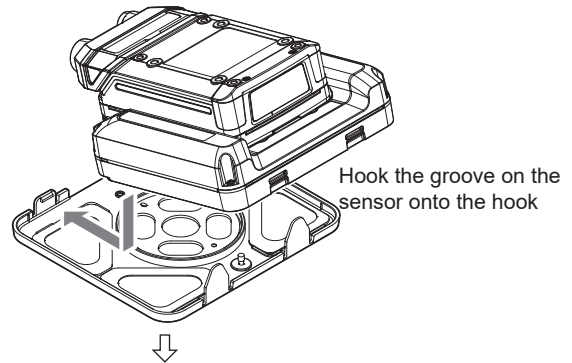
Removing the polarizing filter for the built-in amplifier type (OP-88640/OP-88641)

- 1 Remove the screw and then remove the polarizing filter.



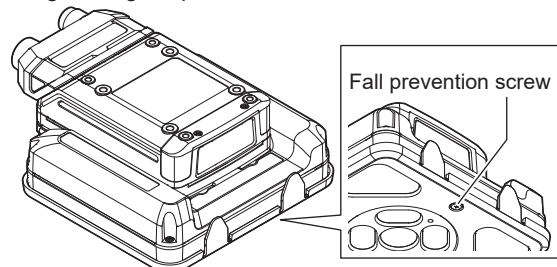
Mounting the polarizing filter for the AI Lighting unit for the built-in amplifier type (OP-88644/OP-88645)

- 1 Hook the groove on the sensor onto the hook of the polarizing filter, and push it in until you hear the clicking sound.



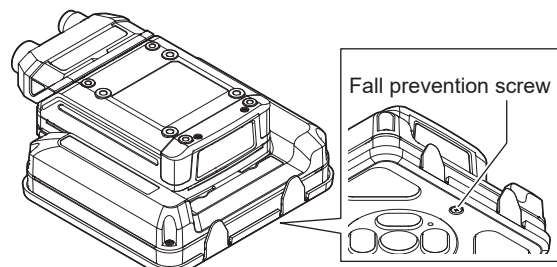
- 2 Fix the polarizing filter.

• Tightening torque: 0.15 to 0.20N•m

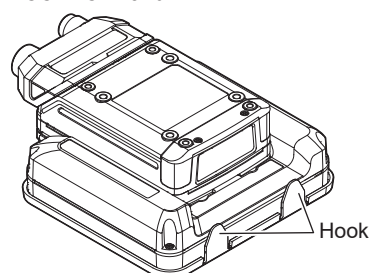


Removing the polarizing filter for the AI Lighting unit for the built-in amplifier type (OP-88644/OP-88645)

- 1 Loosen the screw on the polarizing filter.



- 2 Remove the polarizing filter while pulling the hook forward.



Mounting the dome attachment

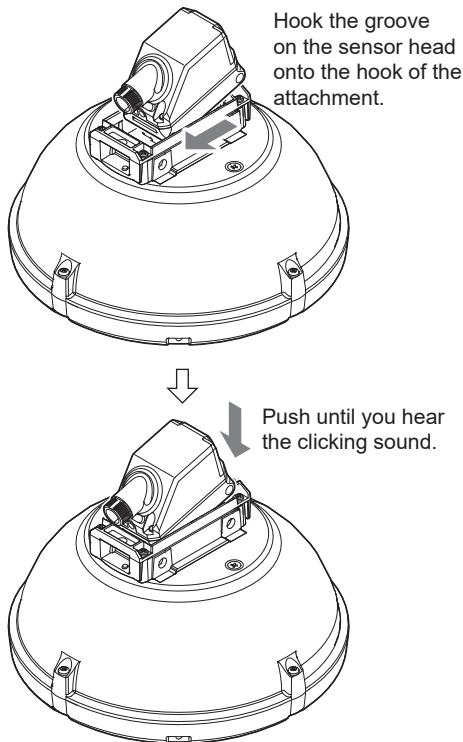
Mounting the dome attachment for ultra-compact model (IV2-GD05/IV2-GD10)

Reference The dome attachment for ultra-compact model can be used with IV3 series (ultra-compact model), IV2 series, IV-HG series, or IV-G series.

- Point**
- Use the dome attachment at a proper installation distance. Failure to do so may mitigate the effect.
 - When using the dome attachment, adjust the brightness with the dome attachment mounted.
 - “Brightness Adjustment” (page 4-12)
 - For the color type, adjust the white balance with the dome attachment mounted.
 - “White Balance (for Color Type Only)” (page 7-24)

Mounting the dome attachment for ultra-compact model

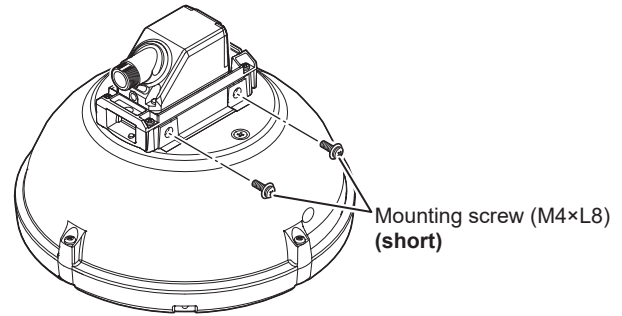
- 1 Hook the groove on the sensor head onto the hook of the dome attachment for the IV3 series, and push it in until you hear the clicking sound.



- Point**
- Attach the sensor head so that the light-receiving part of the sensor head fits into the hole of the dome attachment for the IV3 series.
 - If the engagement between the sensor head and the dome attachment is too tight, please spread the hook of the dome attachment by hand.

- 2 Fix the dome attachment for the IV3 series with attached mounting screws.

- Tightening torque : 0.5N·m



Make sure to fix the dome attachment for the IV3 series with the mounting screws (M4 x L8) to prevent it from falling down.

- If the attached mounting screws (M4 x L10) or screws with no double-washer sems are used, the sensor head may be damaged.
- The attached mounting screws (M4 x L10) are used for securing the mounting bracket.
- If the included mounting screws are not to be used, use double-washer sems screws (M4 x L8).

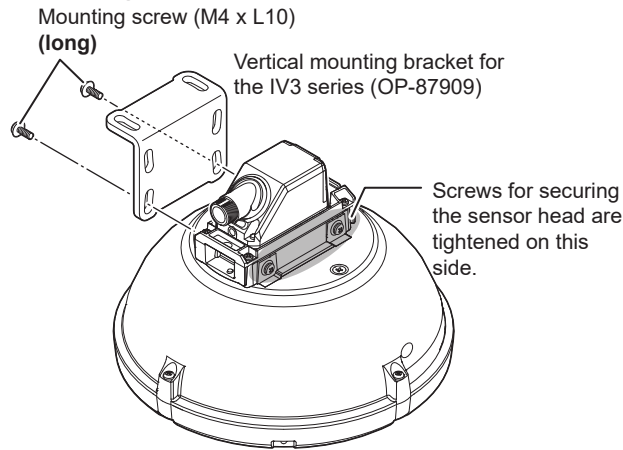
NOTICE

- Point**
- Tighten the mounting screws on the one side of the sensor head. If they are to be used on the opposite side, tighten them on the same side.
 - The mounting method for the IV2-GD10 is described here. The IV-2GD05 can also be mounted in the same way.

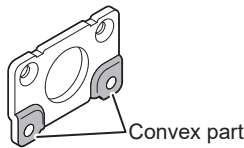
Reference

The vertical mounting bracket for the IV3 series (OP-87908), transverse mounting bracket for the IV3 series (OP-87909), or adjustable bracket for the IV3 series (OP-87910) can be used with the dome attachment for the IV3 series mounted on the sensor head. To use the bracket, attach it on the other side of the sensor head on which the mounting screws (M4 x L8) were tightened in step 2. To attach the bracket, use the two attached mounting screws (M4 x L10).

■ **Mounting examples of the dome attachment**



To attach the adjustable bracket for the IV3 series (OP-87910), connect the convex part to the dome attachment for the IV3 series.

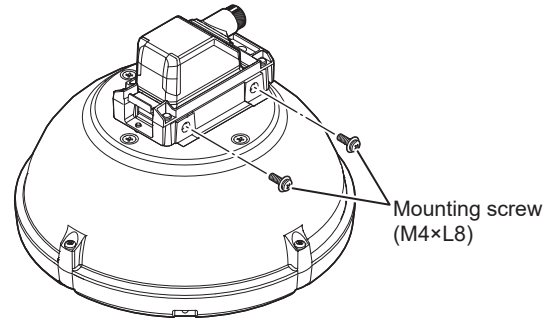


NOTICE	<p>If a sensor head with the dome attachment for the IV3 series attached is to be directly mounted to sheet metal, pay attention to the following items:</p> <ul style="list-style-type: none"> • If they are to be secured from the sheet metal side with screws, be sure to use M4 screws (whose length of screw engagement should be 2.5 to 3.5 mm), and the tightening torque should be 0.7 to 1.5 N·m. • If the screws are to be secured from the sensor head side, be sure to use the M3 screws “double-washer sems screws” or else “screws with spring washer and flat washer” should be used, and the tightening torque should be 0.5 N·m. If screws larger than M4 are used, the sensor head will be damaged.
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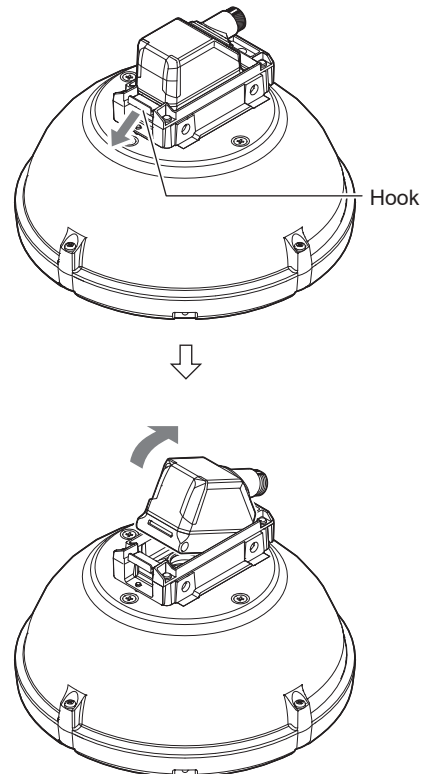
Reference If the dome attachment for the IV3 series is used with the IV3-G300CA/IV3-G600MA, the field of view will be as shown below.

■ **Unmounting the dome attachment**

1 Dismount the screw.



2 Dismount by lifting the front part of the sensor head, while pulling out the hook of the dome attachment for the IV3 series.

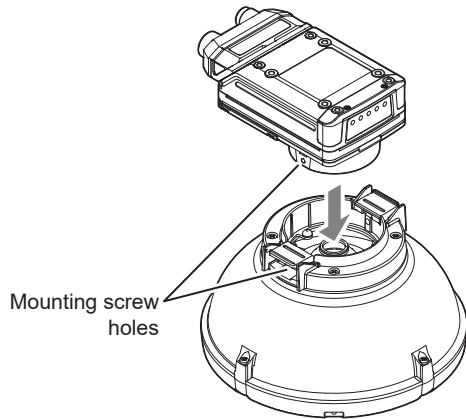


Mounting the dome attachment for built-in amplifier type (IV3-D10)

- Point**
- Use the dome attachment at a proper installation distance. Failure to do so may mitigate the effect.
 - When using the dome attachment, adjust the brightness with the dome attachment mounted.
 - ☐ “Brightness Adjustment” (page 4-12)
 - For the color type, adjust the white balance with the dome attachment mounted.
 - ☐ “White Balance (for Color Type Only)” (page 7-24)

Mounting the dome attachment for built-in amplifier type

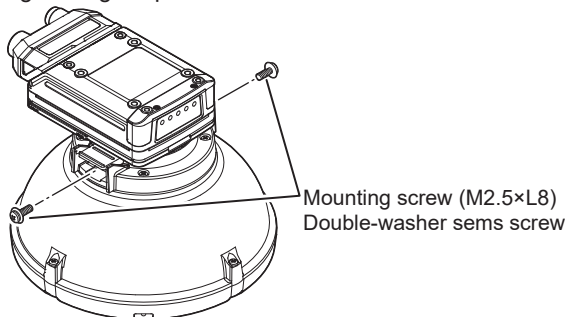
- 1 Align the mounting screw holes on the sensor with the mounting screw holes on the dome attachment, push the sensor all the way into the attachment.



- Point** If the fit is tight, push the sensor in while spreading the hook.

- 2 Fix the dome attachment with attached mounting screws.

- Tightening torque : 0.15 to 0.20 N·m



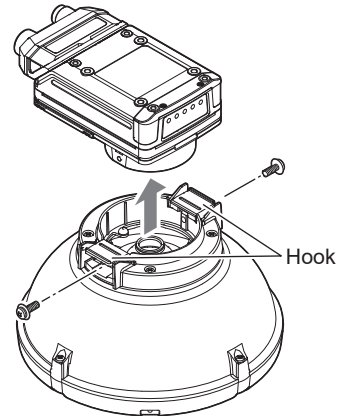
Make sure to fix the dome attachment with the mounting screws (M2.5 x L8) to prevent it from falling down.

NOTICE

- If screws with no double-washer sems are used, the sensor head may be damaged.
- If the included mounting screws are not to be used, use double-washer sems screws (M2.5 x L8).

Removing the dome attachment

- 1 Remove the mounting screws and lift the sensor to remove it while pushing out the hooks of the dome attachment.

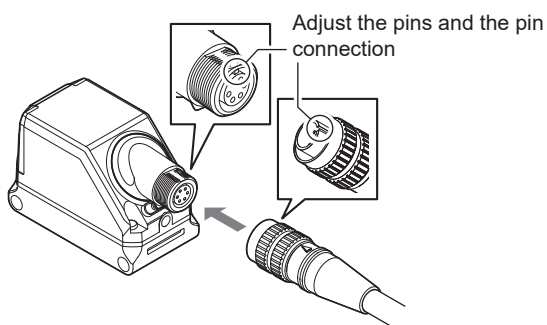


Cables

Wiring the ultra-compact model

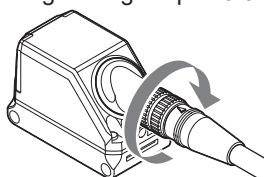
Connecting the sensor head/amplifier cable and sensor head

- 1 Connect the cable to the sensor head as shown below.



- 2 Tighten the connector by turning the screw-on connector in the clockwise direction.

- Tightening torque: 0.6 to 0.8 N·m

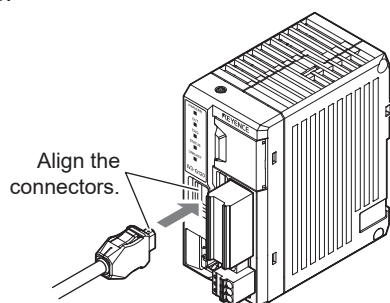


NOTICE

To tighten the screw by hand, turn it until the connector of the cable touches the sensor head firmly. Then turn it more about by 5° using a tool such as pliers.

Connecting the sensor head/amplifier cable and sensor amplifier

Align the connectors and insert the cable until a clicking sound is made.

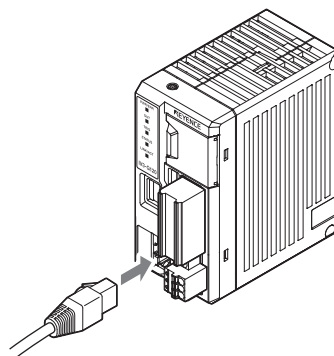


To disconnect the cable, push in the tabs on both sides of the connector and pull out the connector.

Connecting the cable to the sensor amplifier

■ Connecting the Ethernet cable or LAN cable

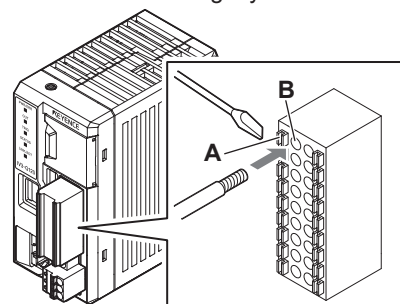
Connect the cable to the sensor amplifier as shown below.



To disconnect the cable, pull the cable while pushing in the tab on the Ethernet cable.

■ Wiring the I/O terminal block

Insert the wire to B by pushing A in with a screwdriver. Pull the wire out slightly to confirm that it is secured.



CAUTION

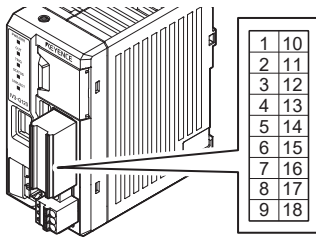
Use a wire with 60°C or higher temperature rating as the electrical wire.

NOTICE

Follow the instructions mentioned below to avoid damage caused by bad connections.

- The nominal cross-sectional area of the wire for connecting the push type terminal block should be 0.2 mm² to 1.5 mm² (AWG16 to 26).
- The stripped part of the wire should not be soldered (pre-soldered).
- Length of the insulation removed from the wire should be around 10 mm.
- Insert the wires to the power terminal block completely.
- Wire the power cables directly or using bar terminals into the terminal block.

● Connector pin configuration figure



Terminal No.	Name	Assigning default value	Description
1	IN1	Ext. Trigger ↑	Set external trigger. Rising timing (↑) or falling timing (↓) can be set.
2	IN2	OFF	Input assignable function • Program bit0 to bit6 • Clear Error • Ext. Master Save • Stop saving the SD card • OFF (not used)
3	IN3	OFF	
4	IN4	OFF	
5	IN5	OFF	
6	IN6	OFF	
7	IN7	OFF	
8	IN8	OFF	
9	Unused	Unused	
10	OUT1	Total Status OK (N.O.)	Output assignable function • Total Status OK • Total Status NG • RUN • BUSY • Error • SD card error • Position adjustment • Status result of each tool (Tool 1 to 64) • Logical operation result of each tool (Logic 1 to 4) • Part discrimination result (Part0 to Part7) • Master status result (Master 00 to Master 07) • OFF (not used)
11	OUT2	BUSY (N.O.)	
12	OUT3	Error (N.C.)	
13	OUT4	OFF	
14	OUT5	OFF	
15	OUT6	OFF	
16	OUT7	OFF	
17	OUT8	OFF	
18	OUT COM	OUT COM	Output Common

Compatible cable specification: AWG16 to 26

Reference The output assignment, N.O./N.C., and input line assignment can be changed.

NOTICE For input cables of this sensor, connect with non-contact output (transistor output/SSR output). For contact output (relay output), incorrect input may occur due to contact bouncing.

■ Supplying Power to the Sensor Amplifier

The power terminal block is mounted on the front of the sensor amplifier.

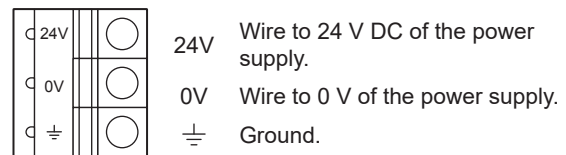
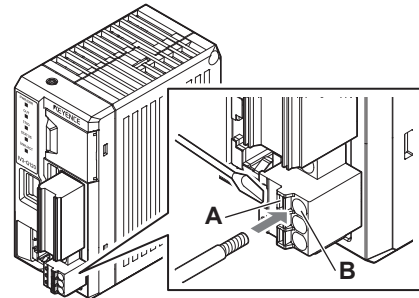
CAUTION Use wire whose temperature rating is 60°C or higher for the power supply.

NOTICE Follow the instructions shown below to avoid damage caused by bad connections.

- The nominal cross-sectional area of the wire for connecting the power should be 0.8 mm² to 1.3 mm² (AWG16 to 18).
- Length of the insulation removed from the wire should be around 9 mm.
- The stripped part of the wire should not be soldered (pre-soldered).
- Insert the wires to the power terminal block completely.
- Wire the power cables directly or using bar terminals into the terminal block.

1 Insert the wire to B by pushing A in with a screwdriver.

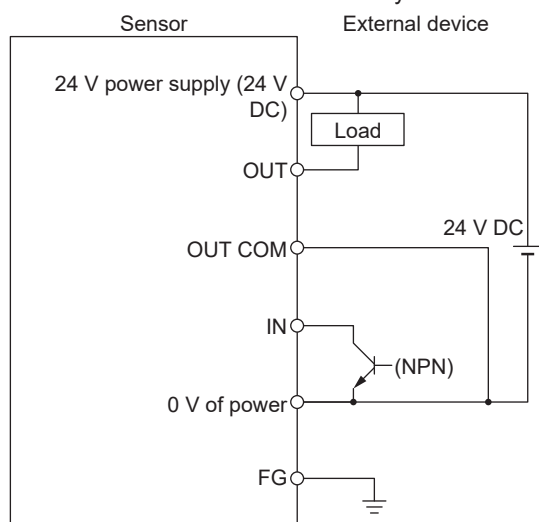
Pull the wire out slightly to confirm that it is secured.



■ Connection diagram

● Selecting NPN output

When NPN is selected as the Polarity



Point OUT COM is a common terminal for OUT. Be sure to connect it to 0V of the power supply.

Electrical specifications

Input circuit: non-voltage input

- ON voltage: 2 V or lower
- OFF current: 0.1 mA or lower
- ON current: 2 mA (short circuit)

Output circuit

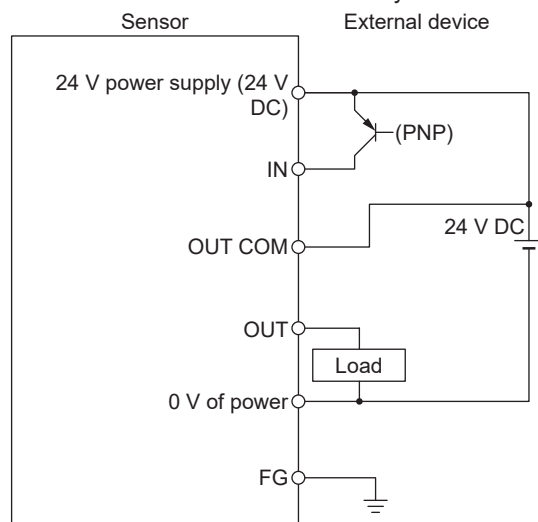
- Maximum rating: 26.4 V, 50 mA
- Remaining voltage: 1.5 V or lower

NOTICE Make sure to keep a total of each output with 160 mA or less.

Reference 0 V (power supply) and FG are insulated.

● Selecting PNP output

When PNP is selected as the Polarity



Point OUT COM is a common terminal for OUT. Be sure to connect it to 24V of the power supply.

Electrical specifications

Input circuit: voltage input

- Maximum input rating: 26.4 V
- ON voltage: 18 V or higher
- OFF current: 0.15 mA or lower
- ON current: 2 mA (at 24 V)

Output circuit

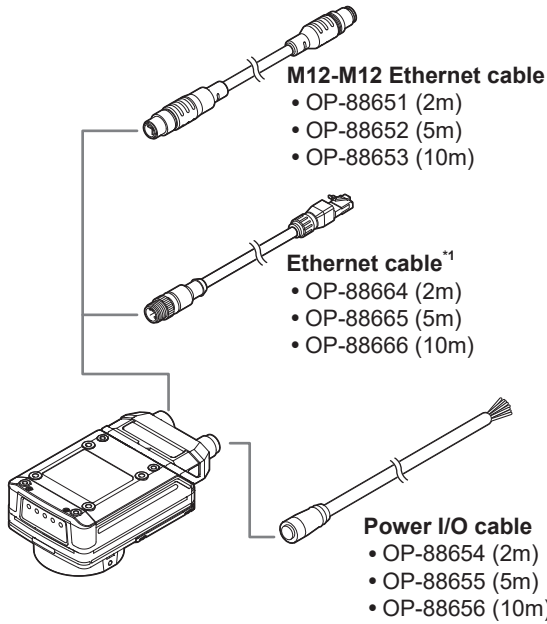
- Maximum rating: 26.4 V, 50 mA
- Remaining voltage: 1.5 V or lower

NOTICE Make sure to keep a total of each output with 160 mA or less.

Reference

- 0 V (power supply) and FG are insulated.
- Use OUTCOM and 0 V of power with a potential difference of 26.4 V or low.

Wiring the built-in amplifier type

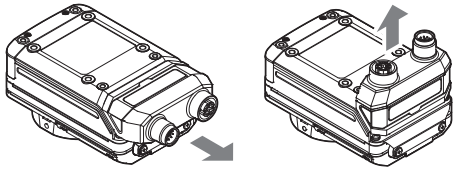


*1 Supports PoE (Power over Ethernet)

Reference "When supplying power with the PoE (Power over Ethernet)" (page 2-20)

Changing the direction of the cable

1 Rotate the rotating connector to determine the direction the cable is to be pulled out.



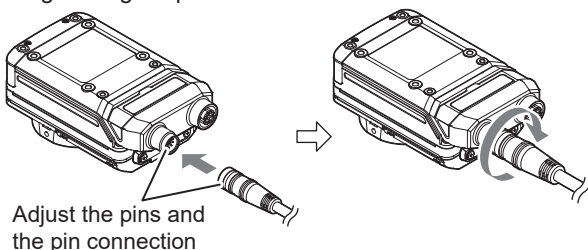
Connecting the cable

NOTICE When supplying the power with PoE, do not connect the power I/O cable.

■ When supplying power with the Power I/O cable

1 Align the pins of the connector for the power I/O cable with the protrusion connection of the cable connector, and connect the cable to the sensor. And then, tighten the connector by turning the screw on the connector in the clockwise direction.

• Tightening torque: 0.6 to 0.8 N·m



NOTICE When connecting the connector, insert it without tipping and tighten it well. If the tightening is weak, vibration can loosen the connector and cause bad connections. Also, the enclosure rating may not be maintained with loose connection.
* After tightening the connector screw by hand, retighten it approximately 90° to 120° with pliers or similar tool.

Connect the Ethernet cable in the same way as needed.

2 Wire each cable according to its intended purpose.

● **Wiring color**

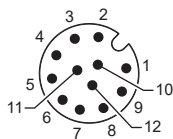
Wiring color	Pin No.	Name	Assigning default value	Description
Brown	1	DC24	-	+ side of power
Blue	2	0V	-	- side of power
Pink	6	IN1	Ext. Trigger ↑	Set external trigger. Rising timing (↑) or falling timing (↓) can be set.
Yellow	4	IN2	OFF	Input assignable function • Program bit0 to bit6 • Clear Error
Light blue	5	IN3	OFF	• Ext. Master Save • Stop saving the SD card
Black	9	OUT1	Total Status OK	• OFF (not used)
White	10	OUT2	BUSY	Output assignable function • Total Status OK • Total Status NG
Gray	11	OUT3	Error	• RUN • BUSY • Error
Purple	3	I/O1*	OFF	• SD card error • Position adjustment
Green	7	I/O2*	OFF	• Status result of each tool (Tool 1 to 64) • Logical operation result of each tool (Logic 1 to 4)
Red	8	I/O3*	OFF	• Part discrimination result (Part0 to Part7) • Master status result (Master 00 to Master 07) • OFF (not used)
Orange	12	OUTCOM	-	Output Common

* The I/O1 to I/O3 can be used by individually selecting IN/OUT.

● Cable specification

- Brown / Blue : AWG22
- Black / White / Gray / Orange : AWG25
- Peach / Yellow / Light blue / Purple / Green / Red: AWG28 (without shield)

● Connector pin layout



Reference The output assignment, N.O./N.C., and input/output cable assignment can be changed.

Use it by assigning the optional function to IN1 to IN3, OUT1 to OUT3, and I/O1 to I/O3.

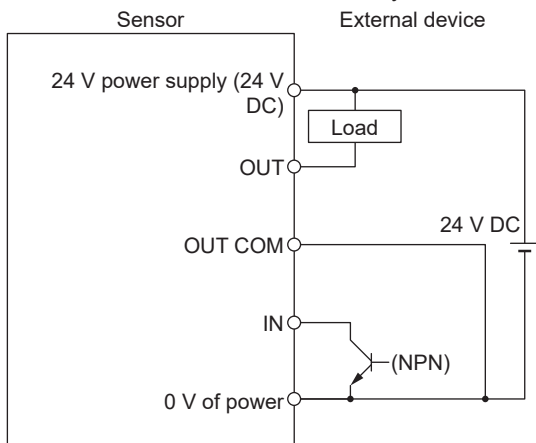
For the input-output switching method of I/O1 to I/O3, refer to "I/O Mapping (Built-In Amplifier Type)" (page 7-18).

NOTICE	<ul style="list-style-type: none"> • Individually insulate the unused input-output cables. • For input cables of this sensor, connect with non-contact output (transistor output/SSR output). For contact output (relay output), incorrect input may occur due to contact bouncing.
---------------	---

■ Connection diagram

● Selecting NPN output

When NPN is selected as the Polarity



Point OUT COM is a common terminal for OUT. Be sure to connect it to 0V of the power supply.

Electrical specifications

- Input circuit: non-voltage input
- ON voltage: 2 V or lower
 - OFF current: 0.1 mA or lower
 - ON current: 2 mA (short circuit)

Output circuit

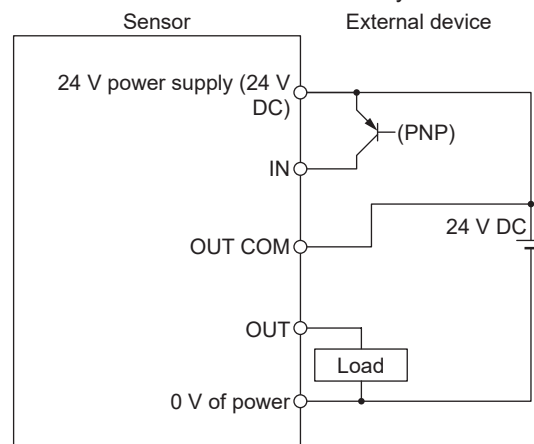
- Maximum rating: 30 V, 50 mA
- Remaining voltage: 1.5 V or lower

NOTICE	Make sure to keep a total of each output with 120 mA or less.
---------------	--

Reference 0 V (power supply) and FG are insulated.

● Selecting PNP output

When PNP is selected as the Polarity



Point OUT COM is a common terminal for OUT. Be sure to connect it to 24V of the power supply.

Electrical specifications

- Input circuit: voltage input
- Maximum input rating: 30 V
 - ON voltage: 18 V or higher
 - OFF current: 0.15 mA or lower
 - ON current: 2 mA (at 24 V)

Output circuit

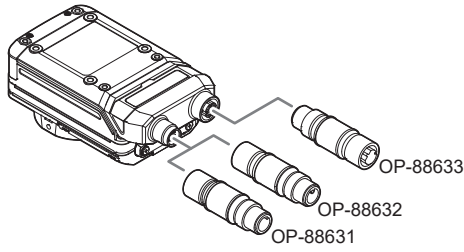
- Maximum rating: 30 V, 50 mA
- Remaining voltage: 1.5 V or lower

NOTICE	Make sure to keep a total of each output with 120 mA or less.
---------------	--

Reference

- Use OUTCOM and 0 V of power with a potential difference of 30 V or low.
- For the wiring color when using the power I/O cable, refer to "Wiring color" (page 2-18) .

■ Connect the conversion connector



Align the recessed part of the conversion connector with the protruding part of the connector on the sensor side, and connect the conversion connector to the sensor. Then, tighten the connector by turning the screw on the connector in the clockwise direction.

- Tightening torque : 0.6 to 0.8 N·m

NOTICE

When connecting the connector, insert it without tipping and tighten it well. If the tightening is weak, vibration can loosen the connector and cause bad connections. Also, the enclosure rating may not be maintained with loose connection.

* After tightening the connector screw by hand, retighten it approximately 90° to 120° with pliers or similar tool.

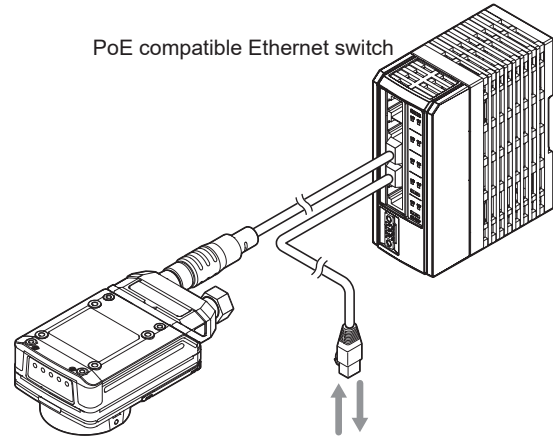
● Connection diagram when using the conversion connector for power I/O cable

Connector pin layout	Pin No.				
	1	2	3	4	5
OP-88631 	DC24V	IN1	0V	OUT1	-
OP-88632 	DC24V	unused	0V	unused	unused

NOTICE

- Use a cable with a conductor resistance that complies with the length of the cable.
 - 10 m or less: 50 Ω/km or less
 - 20 m or less: 25 Ω/km or less
 - 30 m or less: 16 Ω/km or less
- When using the conversion connector for power I/O cable (OP-88631), change the cable specification to 4pin by using the IV3-CP50 or IV3-Navigator. For details on how to change the setting, refer to “Polarity” (page 7-17) .

■ When supplying power with the PoE (Power over Ethernet)



● Specifications of the PoE power supply device

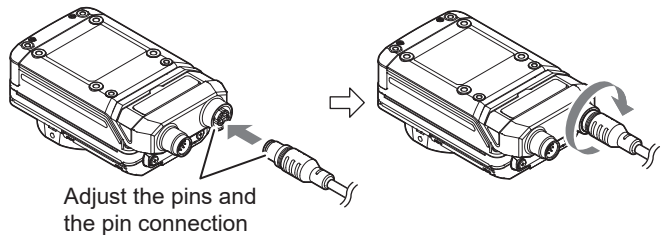
Applicable standard	IEEE802.3af/at/bt
When not using the AI Lighting unit	Power class 4 or higher (class 6 or higher recommended)
When using the AI Lighting unit	Power class 3 or higher (class 4 or higher recommended)

NOTICE

- Power should be supplied from either the power I/O cable (24V DC) or PoE.
- When using the PoE, do not connect the power I/O cable. It may be damaged.
- When using the PoE, operation may be restricted due to power limitation.
- Use OP-88664/OP-88665/OP-88666 or CAT 5e or higher for the Ethernet cable.
- When connecting or disconnecting the Ethernet cable, turn off the power of the PoE power supply device connected to the IV3 Series.

1 Align the pins of the connector for the Ethernet cable with the protrusion connection of the cable connector, and connect the cable to the sensor. And then, tighten the connector by turning the screw on the connector in the clockwise direction.

- Tightening torque: 0.6 to 0.8 N·m



NOTICE

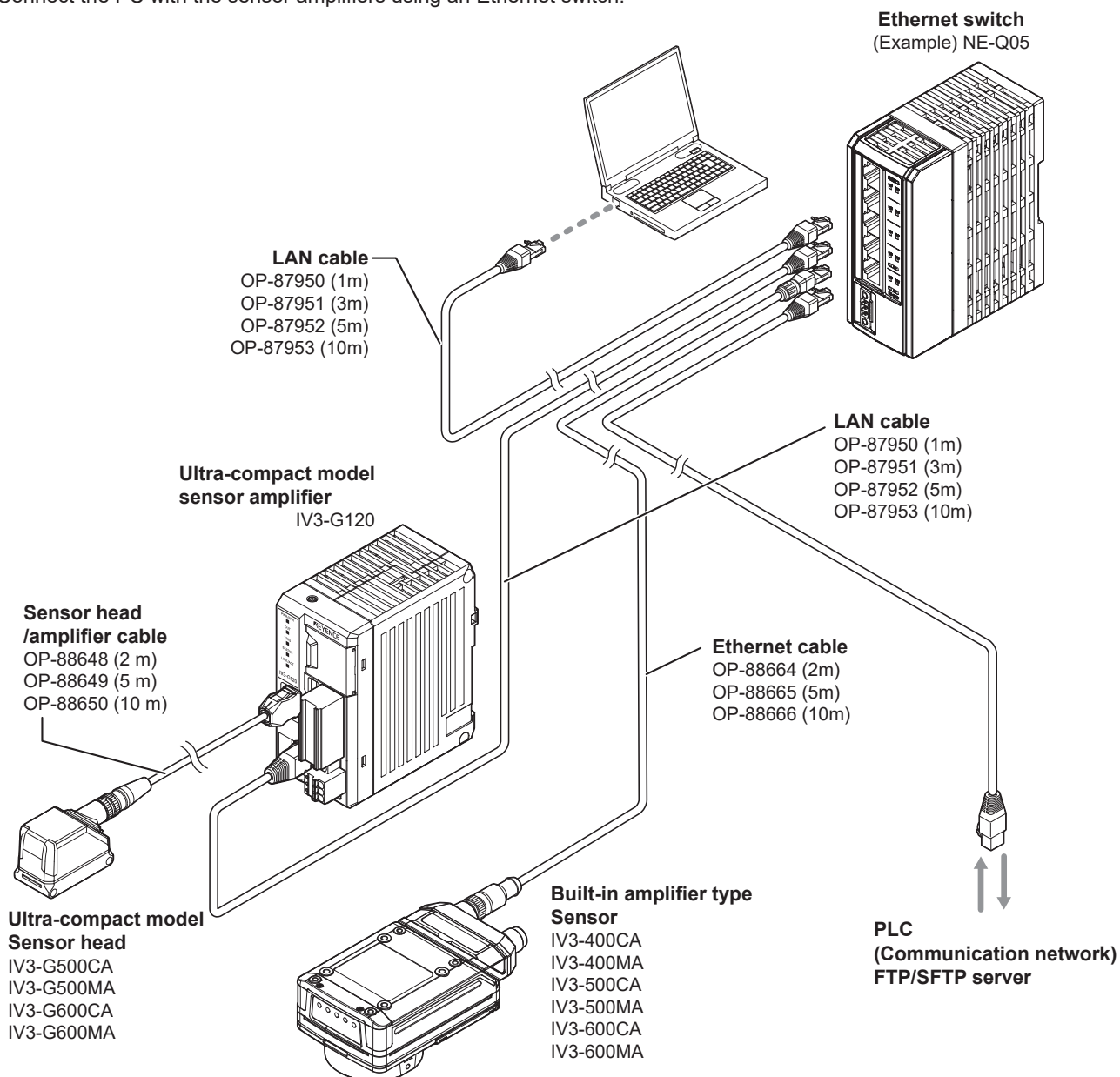
When connecting the connector, insert it without tipping and tighten it well. If the tightening is weak, vibration can loosen the connector and cause bad connections. Also, the enclosure rating may not be maintained with loose connection.

* After tightening the connector screw by hand, retighten it approximately 90° to 120° with pliers or similar tool.

* For the connector for the power I/O cable, attach the waterproof cap for the attached connector to maintain the enclosure rating. Tightening torque: 0.45 to 0.55 N·m

Connecting the sensor and PC

Connect the PC with the sensor amplifiers using an Ethernet switch.


NOTICE

For the method to supply power to the sensor, refer to "Cables" (page 2-15).

Reference

The IV2 Series and IV Series can be connected on a network.

- For details on connecting with the sensor of the IV2 Series, refer to "IV2 Series User's Manual (PC Software)".
- For details on connecting with the sensor of the IV-HG/IV-H Series, refer to "IV-HG/IV-H Series User's Manual (PC Software)".
- For details on connecting with the sensor of the IV-G/IV Series, refer to "IV-G/IV Series User's Manual (PC Software)".

Setting up the PC

This section explains how to install/uninstall the PC Software for the IV3 Series IV3-Navigator (IV3-H1) and how to set up the PC.

Required environment for the PC to be connected

To connect the sensor and PC, the environment which satisfies the following conditions is required. Confirm that the PC to be used satisfies the following conditions.

● OS

- One of the following OS's must be pre-installed. (Supported for 32bit/64bit version)
- Windows 11 Home/Pro/Enterprise
 - Windows 10 Home/Pro/Enterprise
 - Windows 7 (SP1 or higher) ... Home Premium/Professional/Ultimate

● Hardware

○ Interface

Must be equipped with Ethernet (1000BASE-T).

○ Processor

Needs to be compliant with system requirements for OS.

○ Memory capacity

4 GB or more

○ Monitor

- Resolution: 1024 × 768 pixel or higher
- Display color: High Color (16bit) or higher

○ HDD free space required for installation

4 GB or more

● Operating conditions

- .NET Framework 4.5.2 or above needs to be installed.
- Microsoft Visual C++ 2017 Distribution Package Update or above needs to be installed.

* If not installed, it will be installed automatically when IV3-H1 is installed.

Installing IV3-Navigator (IV3-H1)

This section describes the procedure for installing the PC Software for the IV3 Series IV3-Navigator (IV3-H1) on the PC.

! Point

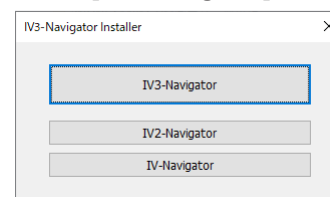
- This section describes the installation using Windows 10 as an example.
- Exit or finish all other running software before the installation.
- Log on with a user who has administrative privileges.
- If the user account control screen appears during the installation, press [Yes].
- If the current user is a user account that does not have administrative privileges, input a user account with administrative privileges and the password.

1 Turn ON the power of the PC and start Windows.

2 Insert the “IV3-H1” disc into the media drive.

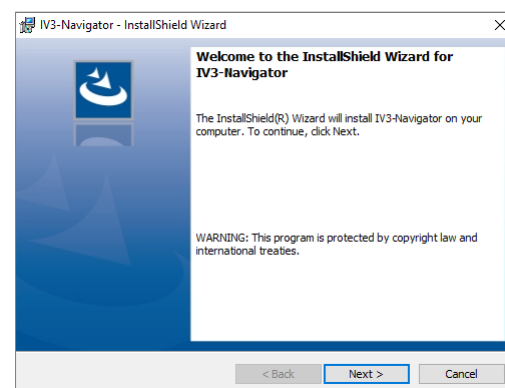
The installation program activates using the auto run function of the PC, and the install program selection screen opens. If the selection window does not display, open the media drive from My Computer and double-click “IV3 Launcher.exe”.

3 Press [IV3-Navigator].



The InstallShield wizard screen opens.

4 Follow the instructions in the window.



5 After completion window for InstallShield Wizard is displayed, press [Finish].

- After installation is finished, close the selection screen.
- Install IV2-Navigator and IV-Navigator if you are using a combination of IV3, IV2, and IV Series devices. On the selection screen, press [IV2-Navigator] or [IV-Navigator]. Follow the instructions in the window.

6 Remove the installation DVD.

Installation destination of the software (reference)

Installation destination of the application software (default settings) are as follows.

Windows 10/7 32 bit version:

C:\Program Files\KEYENCE\IV3-Navigator

Windows 11/10/7 64 bit version:

C:\Program Files (x86)\KEYENCE\IV3-Navigator

Application

IV3-Navigator.exe: IV3-Navigator

Data saving destination

Document for the logon user \IV3-Navigator

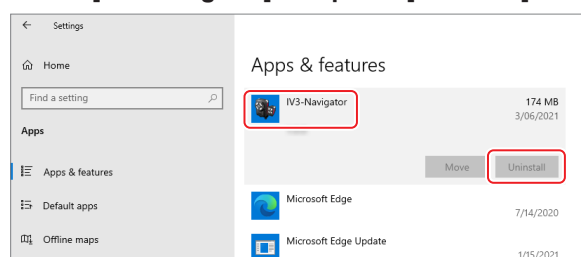
Deleting the software (uninstall)

This section describes the procedure for uninstalling the PC Software for the IV3 Series IV3-Navigator (IV3-H1).

Point

- This section describes the installation using Windows 10 as an example.
- If the user account control screen appears during the installation in the Windows 10 environment, press [Yes].
- Log on with a user who has administrative privileges.

- 1 Turn ON the power of the PC and start Windows.
- 2 Press [Settings] from the start menu.
- 3 Press [Apps].
- 4 Select [IV3-Navigator] and press [Uninstall].



- 5 After the confirmation dialog is displayed, press [Uninstall].

When the IV3-Navigator is removed from the Programs and Features screen, uninstallation is completed.

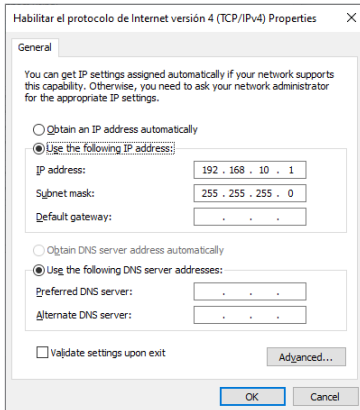
Changing the PC Settings (IP Address Setting)

Point

- Log on with a user who has administrative privileges.
- Auto acquisition of IP address (DHCP server) cannot be used due to the inability to connect with the sensor.

For Windows 10

- 1 Press [Settings] from the start menu.
- 2 Press [Network and Internet].
- 3 Press [Change the Adapter Option].
- 4 Right-click the [Ethernet] icon and select [Properties] from the displayed menu.
- 5 Select [Internet Protocol Version 4 (TCP/IPv4)] and press [Properties].
- 6 Select [Use the following IP address] and input the IP address and Subnet mask.



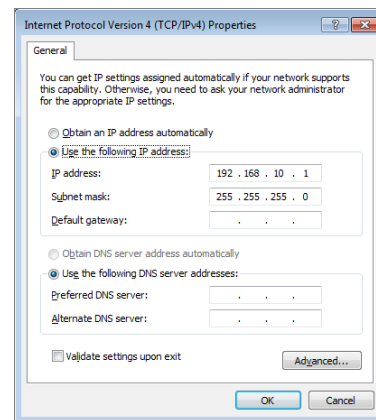
- IP address: 192.168.10.1
- Subnet mask: 255.255.255.0

Reference Set a user-defined IP address (The above is an example). To connect with the existing network, input the IP address that was assigned by the network administrator.

- 7 After setting is completed, press [OK] and close all the windows.

For Windows 7

- 1 Open the Control Panel.
- 2 Press ([Network and Internet]) - [Network and Sharing Center].
- 3 Press [Change adapter settings] on the upper left on the screen.
- 4 Right-click the [Local Area Connection] icon and select [Properties] from the displayed menu.
- 5 Select [Internet Protocol Version 4 (TCP/IPv4)] and press [Properties].
- 6 Select [Use the following IP address] and input the IP address and Subnet mask.



- IP address: 192.168.10.1
- Subnet mask: 255.255.255.0

Reference Set a user-defined IP address (The above is an example). To connect with the existing network, input the IP address that was assigned by the network administrator.

- 7 After setting is completed, press [OK] and close all the windows.

3

Basic Operation

This chapter explains the overview of the IV3-Navigator screen and operation, basic operation flow, and the operation when turning on the power for the first time.

This chapter also explains how to switch the connected sensor and the procedure to return the sensor to the factory default.

Overview of screen and operation	3-2
Basic operation flow	3-4
Operation when the Power is Turned on	3-5
Switching and Terminating the Sensor to be Connected	3-10
Setting to the factory default	3-12
Basic operation for tools	3-13

Overview of screen and operation

This section explains the screen displayed on the PC and operation overview.
 For details of what can be set on each screen and its operations, refer to the applicable section.

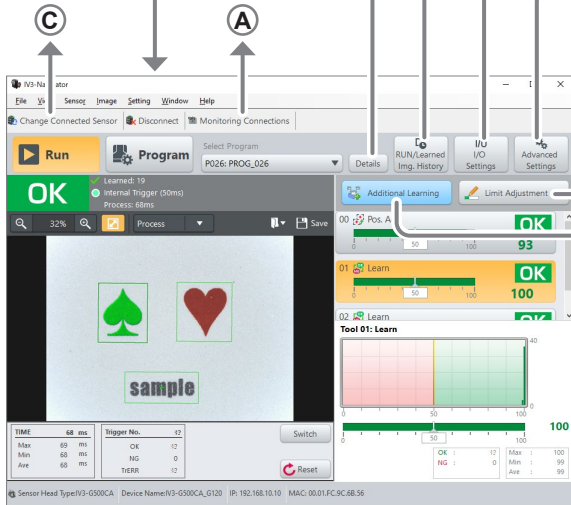
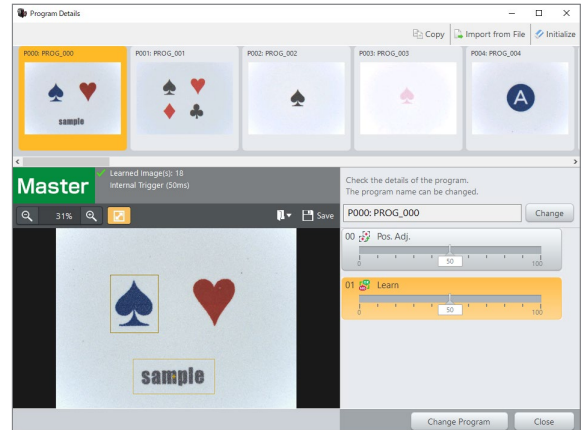
Activation Menu screen

Selects the connection with the sensor or the Simulator.
 You can also change the display language.
 ☞ "Operation when the Power is Turned on" (page 3-5)



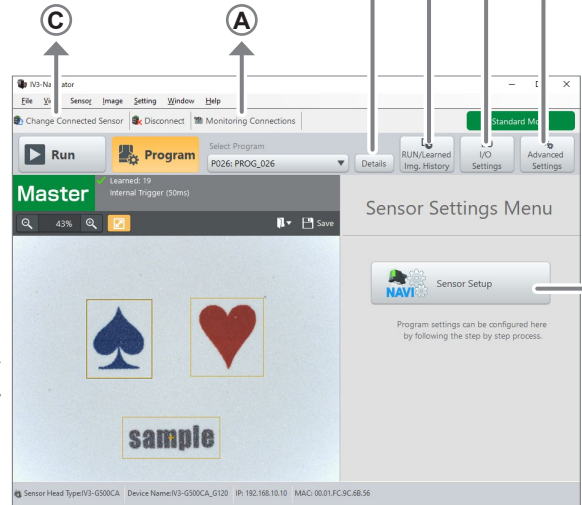
Program Details

Checks or initializes the program.
 ☞ "Operations that can be performed with the program functions" (page 7-2)



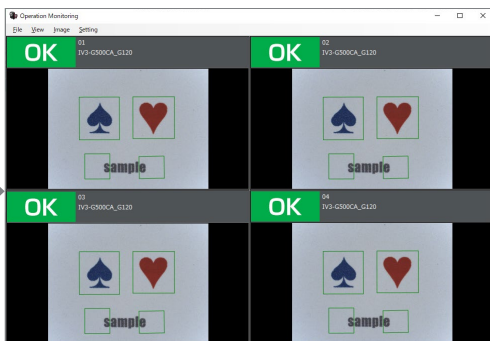
Main screen in [Run]

Images and judges based on the judgment conditions.
 ☞ "Overview of the Screen in [Run] / [Program]" (page 5-3)



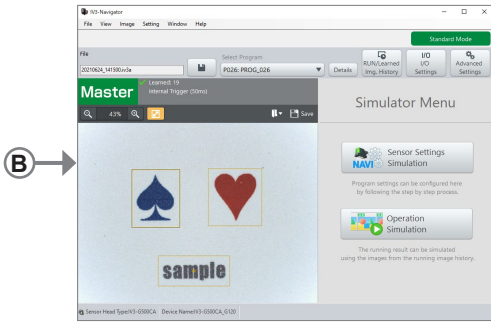
Main screen in [Program]

Configures the program settings, sensor settings, and reference of the image history.
 ☞ "Overview of the Screen in [Run] / [Program]" (page 5-3)



Multiple Sensors Monitoring

Displays the running status of multiple sensors that are connectable.
 ☞ "Multiple Sensors Monitoring" (page 3-16)



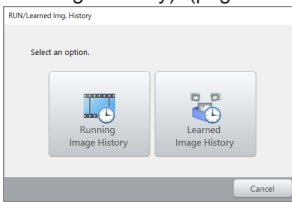
Simulator

The settings of a program saved in a batch backup file (*.iv3a) or an individual program backup (*.iv3a) can be confirmed or changed and the image history can be confirmed.
 ☞ "Chapter 10 Simulator" (page 10-1)

Image History

Opens the running image and learned image history (learning tool only) of the sensor.

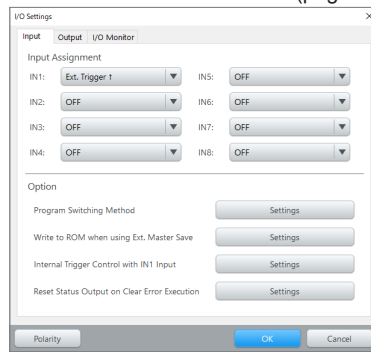
☞ "Confirming the Images Whose Judgment are NG (Running Image History)" (page 5-17)



I/O Settings

Sets the input/output-related settings for the sensor.

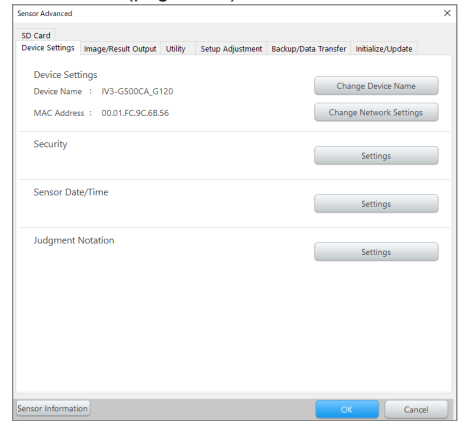
☞ "Setting the Input and Output Information of the Sensor" (page 7-13)



Sensor Advanced

Configures the advanced settings for the sensor.

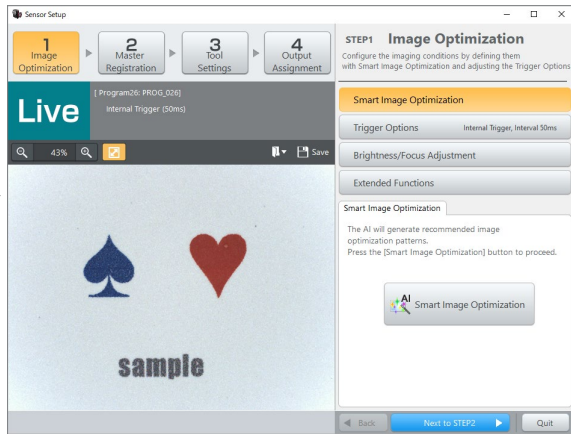
☞ "Setting the Advanced Information of the Sensor" (page 7-19)



Settings Navigator (Sensor Setup)

Sets the program settings to be used for judgment.

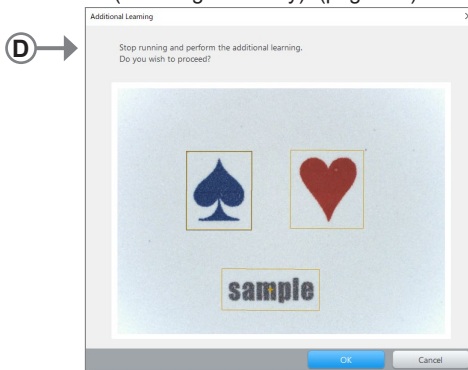
☞ "Chapter 4 Settings Navigator" (page 4-1)



Additional Learning (Learning Tool Only)

Perform additional learning of images.

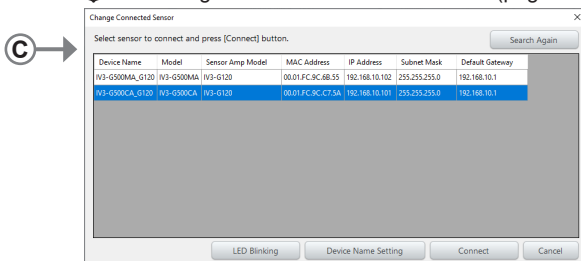
☞ "Auto Adjustment by the Additional Learning (Learning Tool Only)" (page 6-2)



Change Connected Sensor

Switches the connected sensor. Or, terminates the sensor connection.

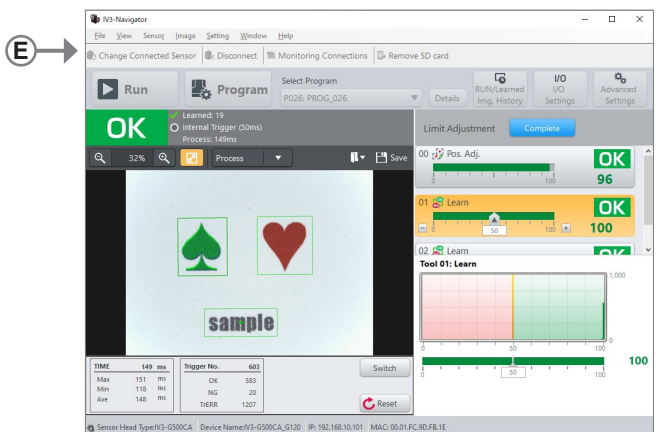
☞ "Switching the Sensor to be Connected" (page 3-10)



Limit Adjustment

Adjusts the judgment threshold.

☞ "Adjusting Thresholds for Judgment" (page 6-15)



Basic operation flow

Installing, connecting, and wiring the sensor

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

Also, install the IV3-Navigator.

☞ "Chapter 2 Installation and Connection" (page 2-1)

Turning on the power

Turn on the power of the sensor, and then perform the initial start-up operation.

☞ "Operation when the Power is Turned on" (page 3-5)

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 settings for clearly imaging a target. Adjust the image for defining differences in an "OK" and "NG" image or Part image.

Set the trigger options, adjust the brightness and camera focal distance.

☞ "1. Image Optimization (Clearly Image a Target)" (page 4-8)

STEP 2: Registration of a master image

Capture an image and register the master image to serve as the reference of judgment.

☞ "2. Master Image Registration (Registering an Image as a Reference)" (page 4-20)

STEP 3: Tool settings/Part Registration settings

Sets the conditions to judge a target.

• Tool Settings

Set the tools onto the master image and set the threshold for judgment.

Up to 65 detection tools and position adjustment tools in one program can be set.

☞ "3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)" (page 4-28)

• Part Registration Settings

Set the tool on the master image and register a part type to be judged.

The target part type will be judged based on the results judged by the detection tool.

Up to 8 detection tools and 1 position adjustment tool in one program can be set.

☞ "3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)" (page 4-121)

STEP 4: Output assignment

Assign the function to output to each output line.

☞ "4. Output Assignment (Setting Details of Outputting to Output Line)" (page 4-147)

Starting the operation/adjustment

Switch the settings screen to the run screen, and start the operation.

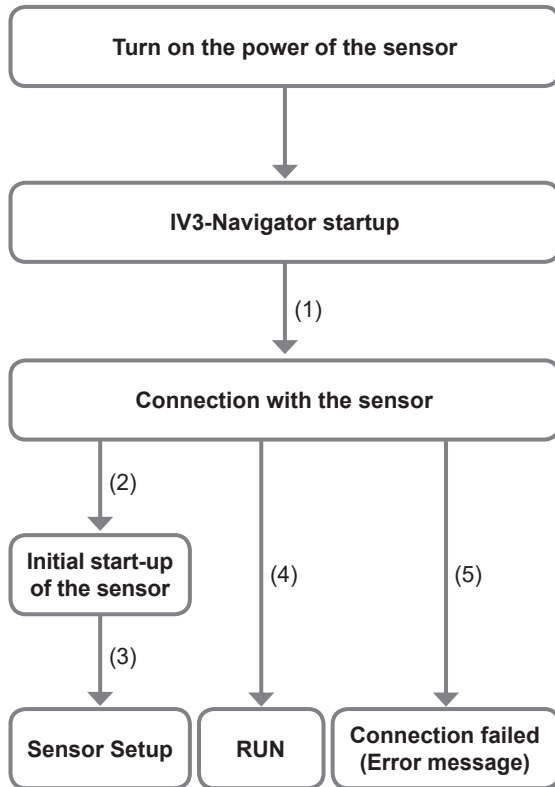
☞ "Chapter 5 Running" (page 5-1)

If the settings are not appropriate, perform the additional learning or limit adjustment.

☞ "Chapter 6 Adjusting" (page 6-1)

Operation when the Power is Turned on

Operation flow when the power is turned on



(1) In order to communicate with the sensor, set a static IP Address on the PC.

☞ “Operation for Initial Startup of the IV3-Navigator” (page 3-6)

(2) When the sensor is turned on for the first time, perform the Initial Sensor Setup.

☞ “Operation for Initial Startup of the Sensor” (page 3-8)

(3) The [Sensor Setup Menu] screen opens. Create a program with the Settings Navigator. After being created, operation begins.

☞ “Chapter 4 Settings Navigator” (page 4-1)

(4) If the software and the sensor setup have already been performed, move to operation automatically by turning on the power.

☞ “Chapter 5 Running” (page 5-1)

(5) When the connection process fails, the software will remain in the connecting screen.

☞ “Remedy when the Software cannot be Connected with the Sensor” (page A-15)

Reference ☞ The sensor can be independently operated.

Operation for Initial Startup of the IV3-Navigator

Point Only engineers who are knowledgeable about networks should attempt connection when connecting the IV3 Series to a network.

Starting the IV3-Navigator

1 Turn on the power of the sensor.

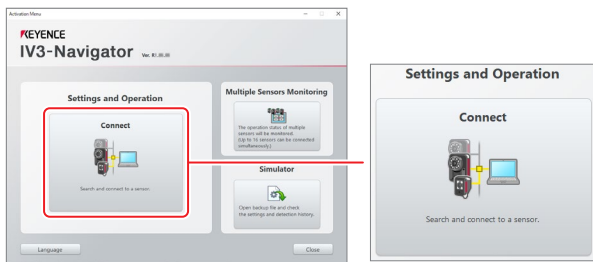
Point Turn on the power of the sensor before [Connect] is pressed in step 3.

2 Double-click the [IV3-Navigator] icon on the desktop.



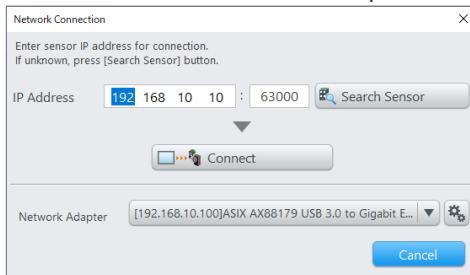
The Activation Menu screen opens.

3 Press [Connect].



Reference If [Language] is pressed, the Select language screen opens. The display language can be changed to the desired language.

The Network Connection screen opens.



There are two ways to set the sensor to be connected.

● **When searching for a sensor on a network**

☐ “Searching for a Sensor to be Connected” (page 3-6)

● **When specifying the sensor by IP address**

☐ “Specifying Sensor to be Connected by IP Address” (page 3-7)

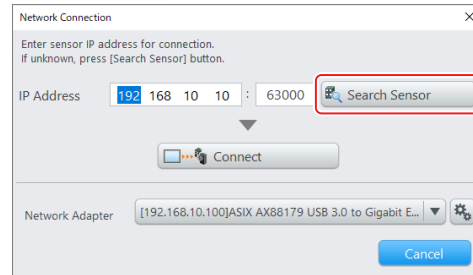
Searching for a Sensor to be Connected

Automatically searches for a sensor on the network and connects with it.

- Reference**
- The approximate time to search is 15 seconds or less if the “Search all network adapters” setting is “No”, and 105 seconds or less if it is “Yes”.
 - Up to 64 sensors can be searched.

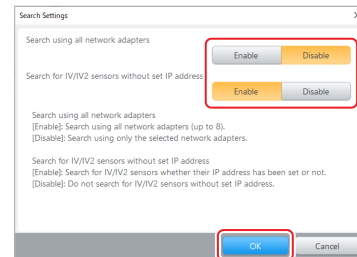
1 Turn on the power of the sensor.

2 Press [Search Sensor].

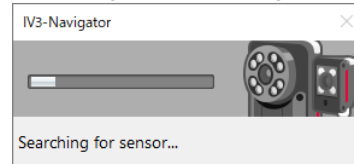


Reference If multiple network adapters are installed on the PC, perform the following:

- Select a network adapter from the drop-down menu.
- Press the search settings button (⚙️) to open the [Search Settings] dialog box, and set the search conditions for the network adapter and sensor.



Searching the sensor begins.



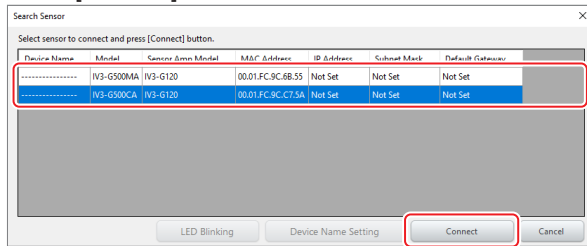
When the searching is finished, the searched result will be displayed.

Point If no sensor is found, refer to ☐ “When the connection cannot be established by specifying the sensor” (page A-16).

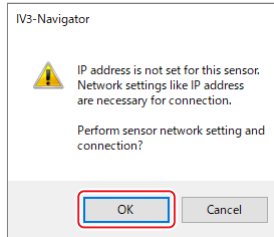
3 Select the sensor to be connected.

- When connecting to the sensor without an IP address

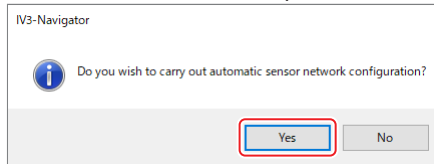
Press [Connect].



The following screen opens. Press [OK].

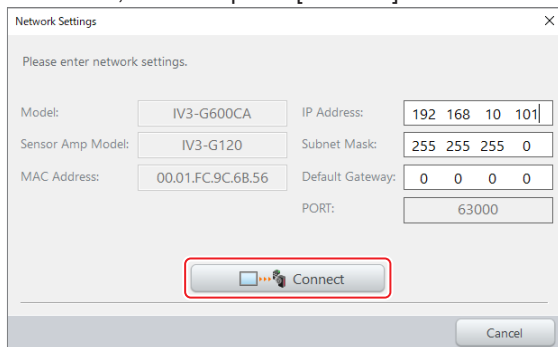


The confirmation screen opens.



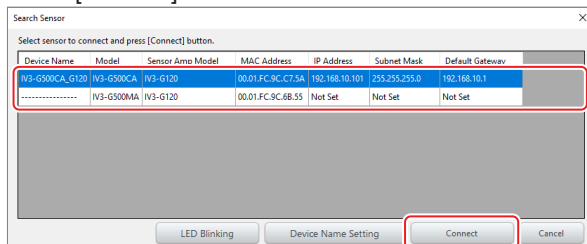
Press [Yes] to automatically configure the sensor network settings to connect to the PC. The Network Settings screen opens.

Input the IP Address, Subnet Mask, Default Gateway, and PORT, and then press [Connect].



- When connecting to the sensor with set IP address

Press [Connect].

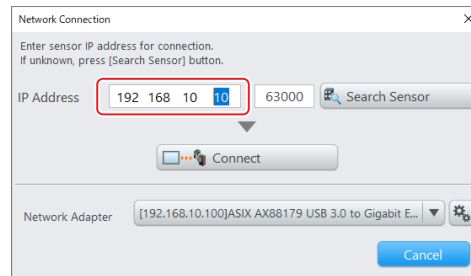


- When the PC is connected with the sensor for the first time, perform the “Initial Sensor Setup” and set the polarity of the sensor and date/time.
 - “Operation for Initial Startup of the Sensor” (page 3-8)
- After the second time connecting with the sensor, the main screen in [Run] or [Program] opens.

Specifying Sensor to be Connected by IP Address

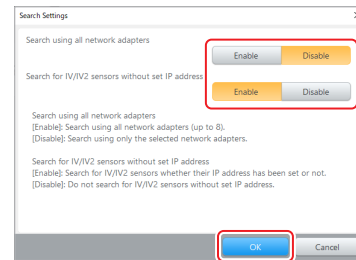
Used when the IP address of the sensor to be connected is defined beforehand.

- 1 Input the IP address of the sensor to be connected.

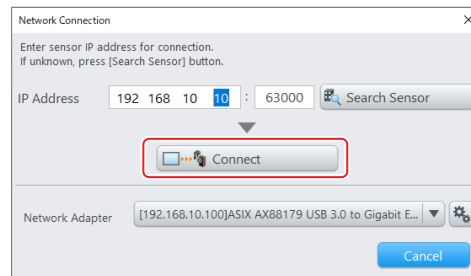


Reference If multiple network adapters are installed on the PC, perform the following:

- Select a network adapter from the drop-down menu.
- Press the search settings button (🔍) to open the [Search Settings] dialog box, and set the search conditions for the network adapter and sensor.



- 2 Press [Connect].



- When the PC is connected with the sensor for the first time, perform the “Initial Sensor Setup” and set the polarity of the sensor and date/time.
 - “Operation for Initial Startup of the Sensor” (page 3-8)
- After the second time connecting with the sensor, the main screen in [Run] or [Program] opens.

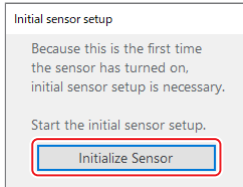
Point When the connection with the sensor is unavailable, refer to □ “When the connection cannot be established by specifying the sensor” (page A-16).

Operation for Initial Startup of the Sensor

When the sensor in the default setting is to be connected, perform the [Initial Sensor Setup] and select the polarity of the sensor (NPN or PNP) and date settings. After the polarity is selected, set up the sensor in Settings Navigator.

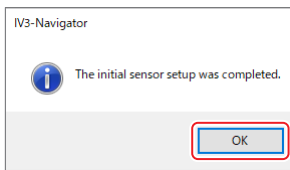
For details on polarity, refer to "Cables" (page 2-15).

1 Press [Initialize Sensor].

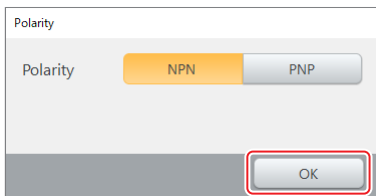


Initialization begins. After initialization is completed, the initialization completion screen opens.

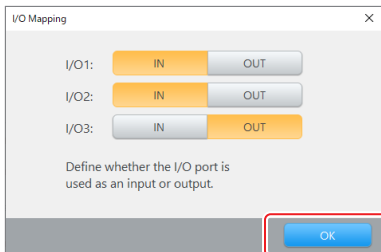
2 Press [OK].



3 Select the polarity of the sensor, and press [OK].

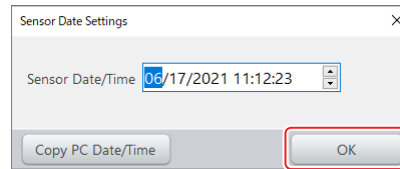


Set the I/O port only when using Built-in amplifier type sensor.



- **IN**
The corresponding I/O port can be used as an input (IN) port.
- **OUT**
The corresponding I/O port can be used as an output (OUT) port.

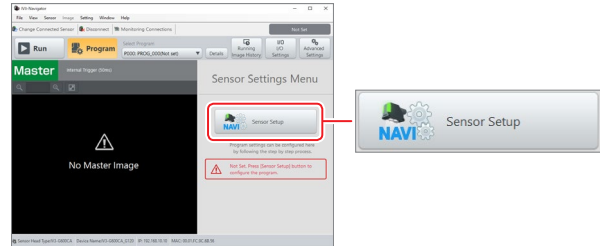
4 Set the current date and time, and press [OK].



Reference When pressing [Copy PC Date/Time], the PC date and time can be copied.

The main screen in [Program] opens.

5 Press [Sensor Setup], and set up the program.



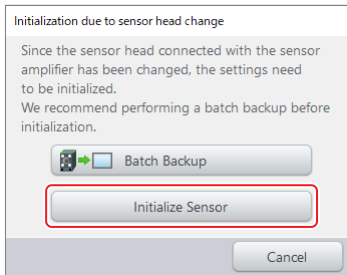
For details, refer to "Chapter 4 Settings Navigator" (page 4-1).

Operation when changing the sensor head (ultra-compact model only)

If the sensor head connected to a sensor amplifier is changed, initialization of the sensor amplifier is required. Initialize the sensor amplifier following the instructions on the displayed screen.

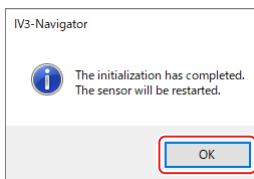
▶ Important The setting information of the sensor is saved in the sensor amplifier. Before initializing the sensor amplifier, it is recommended to perform [Batch Backup]. For details, refer to “Backing up in a Batch” (page 8-3).

1 Press [Initialize Sensor].



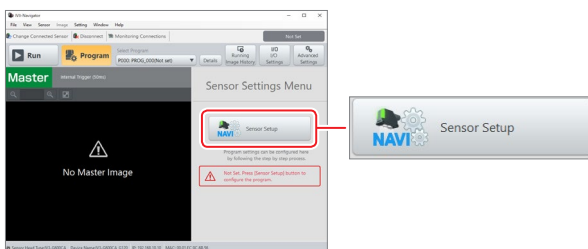
The process to initialize the sensor begins. After initialization is completed, the initialization completion screen opens.

2 Press [OK].



The main screen in [Program] opens.

3 Press [Sensor Setup], and set up the program.

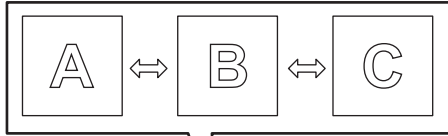


For details, refer to “Chapter 4 Settings Navigator” (page 4-1).

Switching and Terminating the Sensor to be Connected

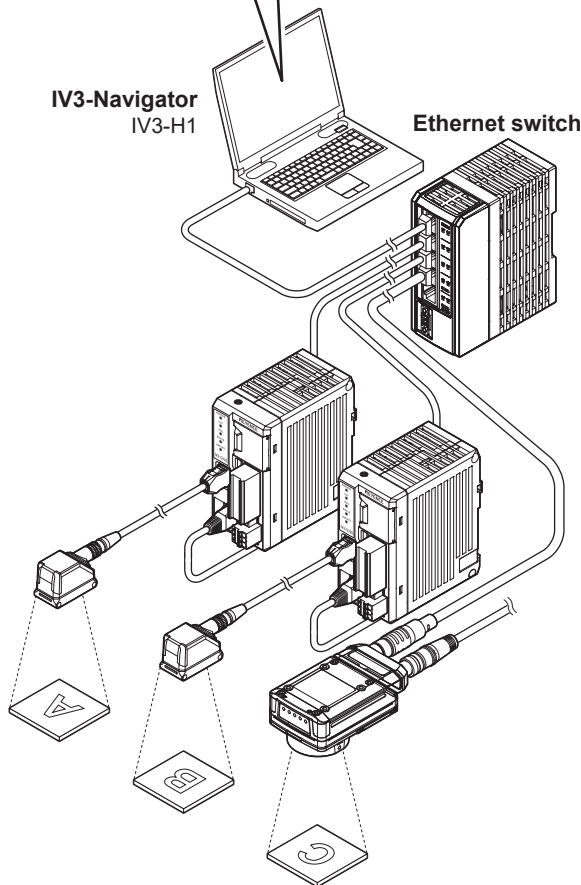
Switching the Sensor to be Connected

When multiple sensors are connected to a PC, the sensor displayed can be changed.



IV3-Navigator
IV3-H1

Ethernet switch

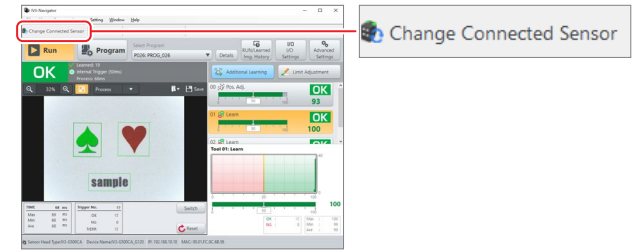


3 Basic Operation

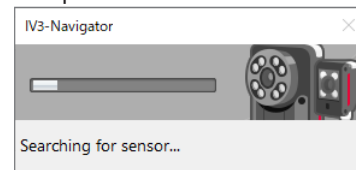
1 Connect the PC with the sensor.

☞ “Operation for Initial Startup of the IV3-Navigator” (page 3-6)

2 Press [Change Connected Sensor].

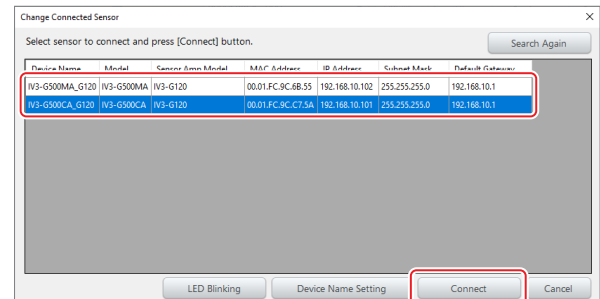


The process to search for the sensor begins.

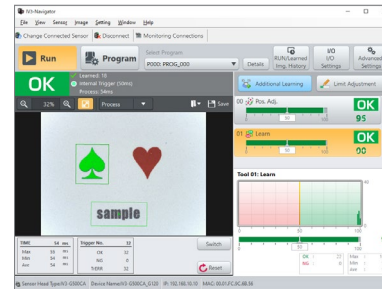


The list of sensors connected to the PC will be displayed.

3 Select the sensor to be displayed on the software and press [Connect].



The screen for the selected sensor opens.

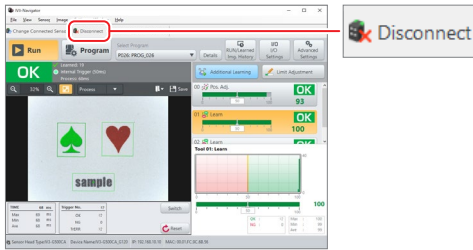


Point

- If the settings for the selected sensor have not been made, the [Sensor Setup Menu] screen will be displayed. For details, refer to ☞ “Chapter 4 Settings Navigator” (page 4-1).
- The sensor to be connected can be switched in the main screen of [Program].

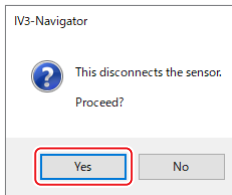
Terminating connection with the sensor

1 Press [Disconnect].

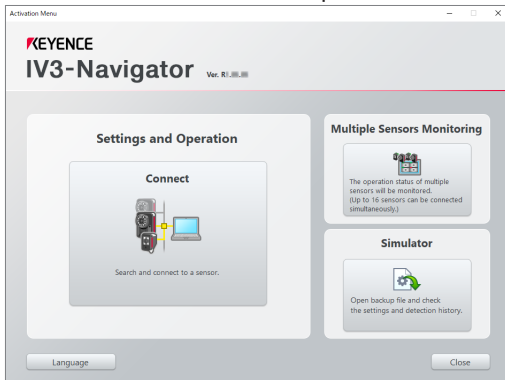


The confirmation screen opens.

2 Press [Yes].



The Activation Menu screen opens.



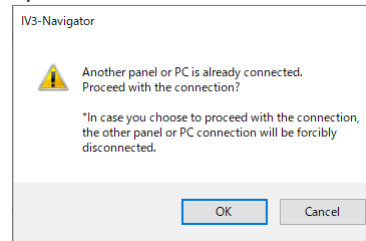
Monitoring Connection

Monitors the running status of each sensor that is connected and connectable. Up to 16 units can be connected simultaneously.

📖 “Multiple Sensors Monitoring” (page 3-16)

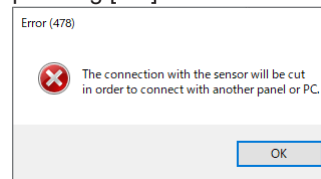
Connection with a Sensor Currently Connected to Another Device

If the selected sensor is already connected with another control panel or a PC, pressing [Connection Start] will open a screen to confirm whether to disconnect the existing connection. Pressing [Yes] will disconnect the existing connection and connect the sensor with the PC in operation.



- Reference** Cannot be connected to the following types of sensors:
- A sensor that is not in operation
 - A sensor with version R1.00

When this action is performed, an error screen will open on the control panel or PC that has been disconnected, and pressing [OK] will restart the control panel or IV3-Navigator.



Setting to the factory default

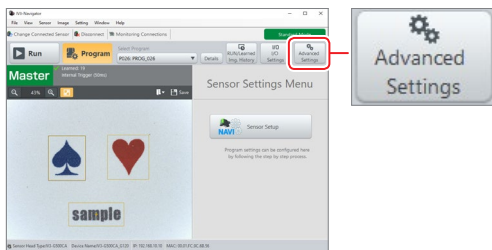
Initializing the Sensor

Initializes the information set in the sensor and sets it to the factory default.

- Reference**
- The following settings will not be initialized.
 - Polarity (Switching NPN/PNP) (Page 7-17)
 - Cable specification (switching between 12 pin/4 pin) (Page 7-17) (built-in amplifier models only)
 - SD card settings backup (switching between enabled/disabled) (Page 8-20)
 - Network Settings (IP Address / Subnet Mask / Default Gateway / Port number (TCP)) (Page 7-21)
 - To initialize the registered programs individually, refer to "Initializing a Program" (page 7-10).

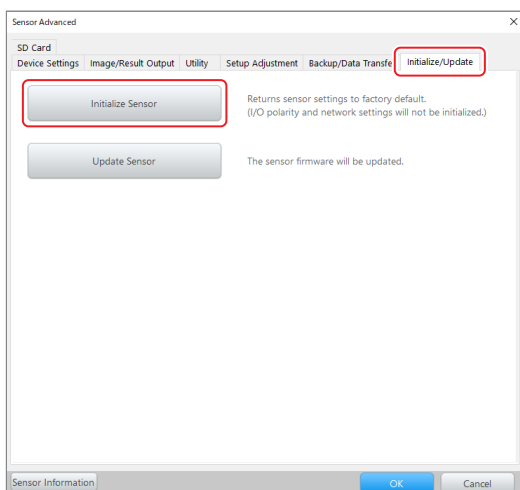
Point If the SD card settings backup (Page 8-20) setting is [Enable], the backup files on the SD card will also be initialized. To use an SD card that has not yet been initialized to restore different sensor settings, remove the SD card before initialization.

1 Switch the IV3-Navigator to the main screen in [Program] and press [Advanced Settings].



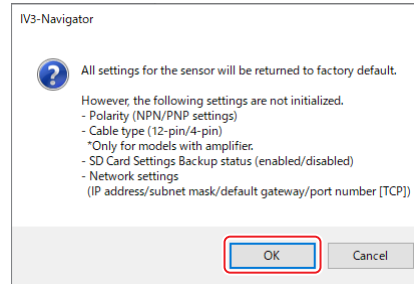
The [Sensor Advanced] screen opens.

2 Select the [Initialize/Update] tab and press [Initialize Sensor].



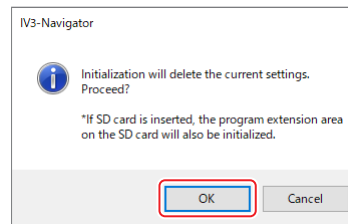
The confirmation screen opens.

3 Press [OK].



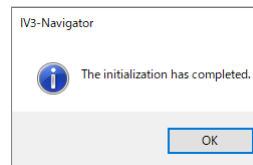
The confirmation screen opens.

4 Press [OK].



Initialization begins. After initialization is completed, the initialization completion screen opens.

5 Press [OK].

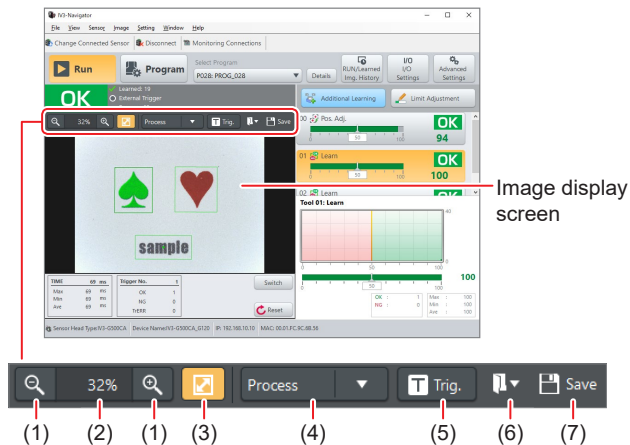


The system returns to the sensor advanced screen.

Basic operation for tools

Operation of the Image Tool Bar

This section explains the operation method for the image tool bar displayed at the upper part of the image display screen for the IV3-Navigator by using the example of the main screen in [Run].

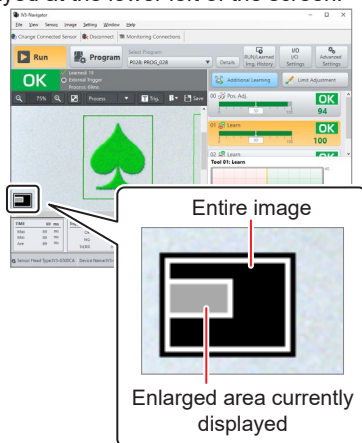


(1) [Zoom In] / [Zoom Out] button

The displayed image is reduced/enlarged for each time the button is pressed.

Displayable zooming rates are as follows.
25%/50%/60%/75%/100%/150%/250%

Reference If an entire image cannot be displayed, the amount of the image currently displayed will be displayed at the lower left of the screen.



(2) Display Magnification

Displays the display magnification of the displayed image on the image display screen.

(3) [Fit Window] button

Makes the display size of the displayed image fit to the window size.

(4) Button to switch the display method for tools

Switches the display method for the tools.

☞ "Selecting the Display Method of the Tool Window" (page 5-7)

(5) [Manual Trigger] / [Trigger ON] button

Displayed if [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Yes]. This button is used when the external trigger cannot be input.

This button is not displayed on the simulator screen.

• [Manual Trigger] button

Displayed while in [Run] mode. Outputs the trigger once for each press of the button.

• [Trigger ON] button

Displayed while in [Program] mode. Switches the continuous trigger to ON/OFF for each press of the button.

(6) [Image File Location] button

• By pressing the button and selecting [Show Saved Image File Location], the folder where the image is saved when pressing [Save] opens.

• By pressing the button and selecting [Change Saved Image File Location], the save destination of an image can be changed.

(7) [Save] button

Individually saves the image displayed on the IV3-Navigator into the PC. The iv3p format file that can be used for a master image registration, additional learning, and operation simulation will also be saved at the same time.

A screen capture of the IV3-Navigator screen will also be saved at the same time.

☞ "Saving Images and Screens Displayed on the IV3-Navigator Individually" (page 8-5)

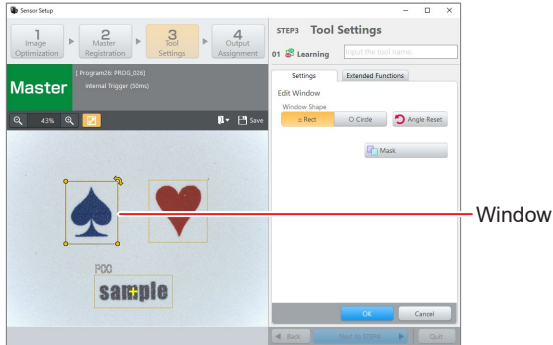
Editing the Window

The window displayed when the tool (standard mode) or the part registration (sorting mode) is set can be edited to any size or direction.

This section explains an example of how to edit the window when adding the learning tool to a standard mode program and pressing [Add Learning Tool].

1 Press [Add Learning Tool] in [Tool Settings] of the Settings Navigator.

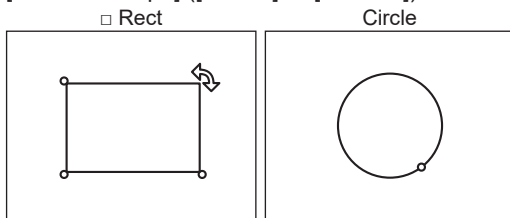
A window appears in the screen.



2 Set the window.

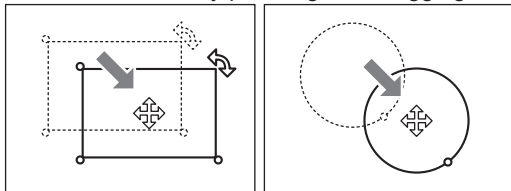
● Selecting the shape of the window

[Window Shape] ([□ Rect] or [○ Circle]) can be selected.



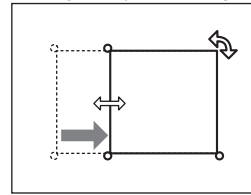
● Moving the window

By pressing inside the window, will be displayed. Move the window by pressing and dragging it.

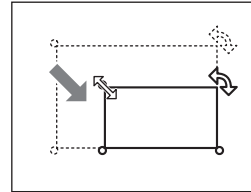


● Changing the size of the window

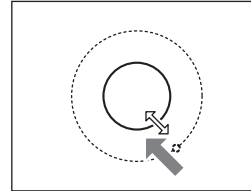
By pressing either side of the window, or will be displayed. The height or width of the window can be changed by pressing and dragging it.



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

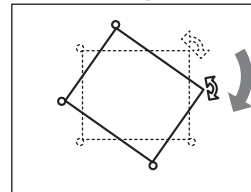


When [○ Circle] is selected in the window shape settings, the size of the circle can be changed by pressing and dragging the outline of the circle.



● Changing the direction (angle) of the window

By pressing and dragging the arrow mark on the upper right of the window, the direction (angle) of the window can be changed.

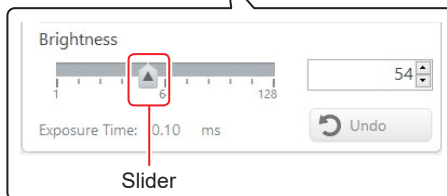
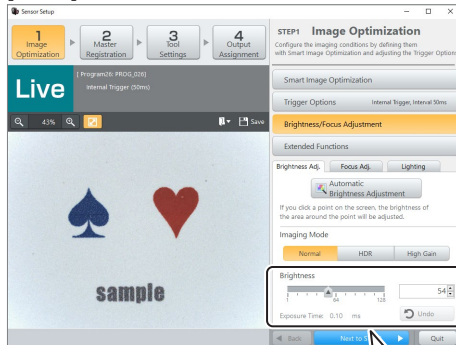


Editing Numbers

The numbers such as the trigger interval value and the threshold of each tool can be edited by multiple methods.

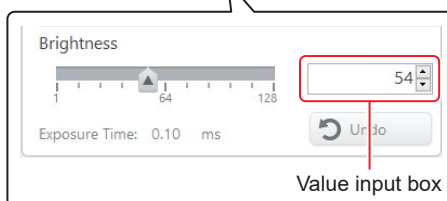
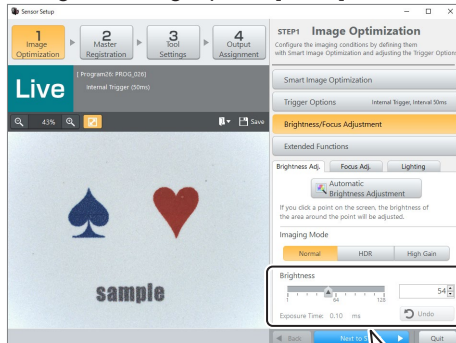
Setting by the Slider

Press the slider, and then slide it to the right or left to set the number. When canceling the change, press [Undo].



Adjust settings using the value input box

Using the value input box, inputs values for the selected option. Or, specify them by pressing the scroll button. When canceling the change, press [Undo].



Point

If there a range for the displayed option, the value input cannot exceed the range.

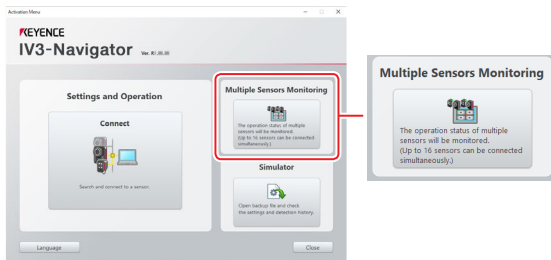
Multiple Sensors Monitoring

Displaying the operation monitoring screen

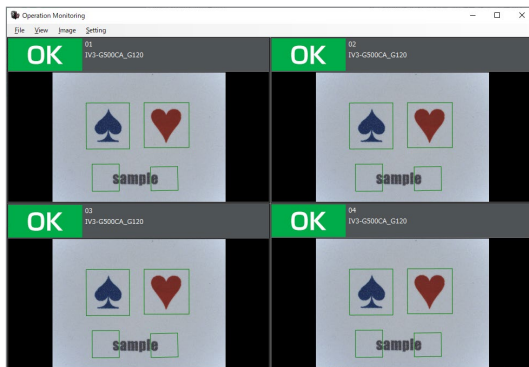
The operation monitoring screen can be displayed from the Activation Menu screen or the screen during the operation.

■ Displaying the operation monitoring screen from the Activation Menu screen

- 1 Press [Multiple Sensors Monitoring] from the Activation Menu screen.

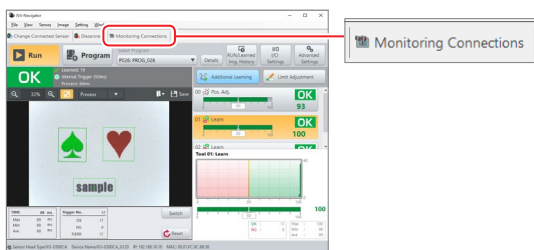


The operation monitoring screen opens.

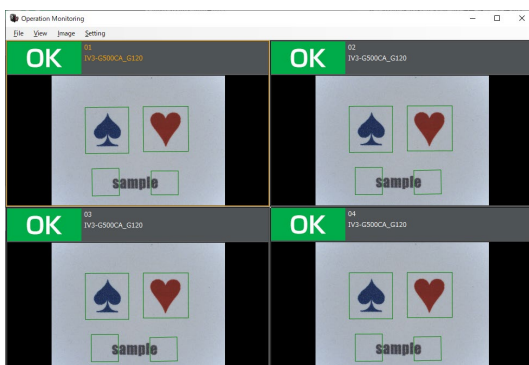


■ Displaying the operation monitoring screen from the screen during the operation

- 1 Press [Monitoring Connection] from the screen during the operation.

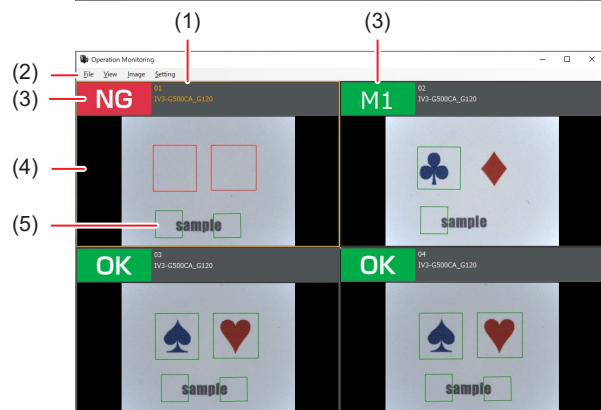
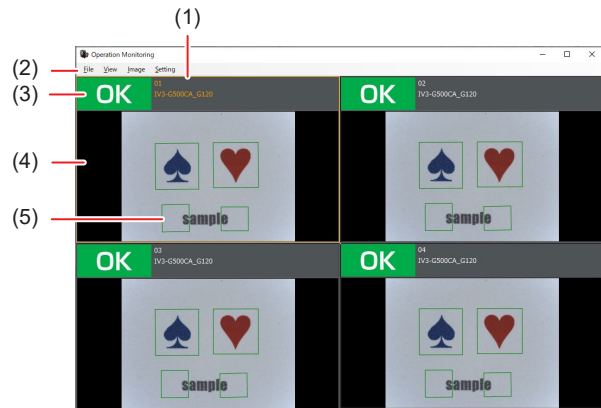


The operation monitoring screen opens.



Operation on the operation monitoring screen

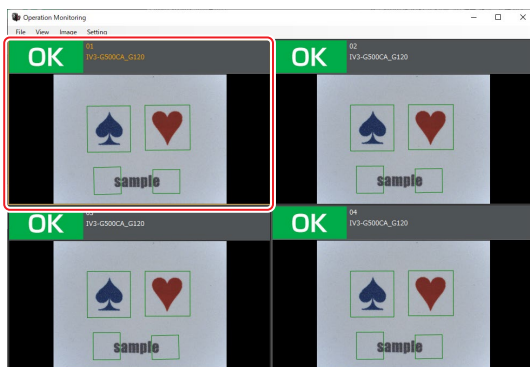
The operation monitoring screen displays the running status of multiple sensors that are connected.



(1)	Number and device name	Names of the connected sensors and their IP addresses are displayed. When one of them is selected, the sensor name and the area around the image turns orange.
(2)	Menu	The following operations can be made. <ul style="list-style-type: none"> File <ul style="list-style-type: none"> Closing the operation monitoring Closing IV3-Navigator View <ul style="list-style-type: none"> Sensor List Image <ul style="list-style-type: none"> Controlling whether to display or hide the tool Setting <ul style="list-style-type: none"> Network Adaptor Clear the sensor that is the target of the monitoring Perform operation monitoring on startup Disable/enable switch
(3)	Sensor judgment condition	The judgment condition of the sensor is displayed. <ul style="list-style-type: none"> OK: Status OK in standard mode NG: Status NG in standard mode, or No type matching in sorting mode M0 to M7: type matching in sorting mode --: The condition is not yet judged, unable to judged, error, or in setting
(4)	Taken image	The sensor image is displayed during the operation. [Program] is displayed during the setup.
(5)	Tool display	The tool window set to the sensor is displayed. Whether to display or hide can be controlled in the menu.

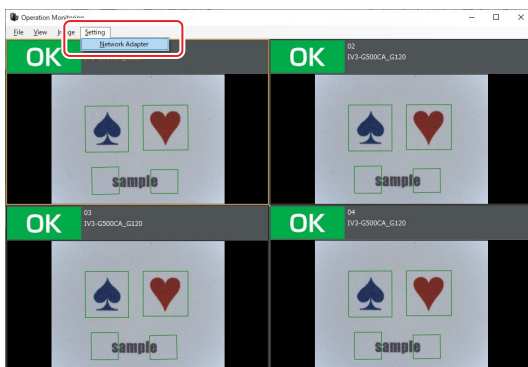
■ Displaying the screen during the operation/ setup of the selected sensor

By double-clicking the selected sensor, the operation screen will be displayed if the sensor has been operated, or the settings screen will be displayed if the sensor has been set.

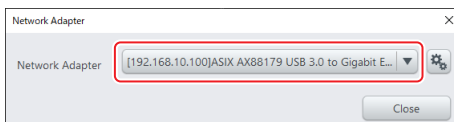


■ Switching the network adapter

1 Press the [Settings] menu → [Network Adapter].



2 Select a network adapter, and press [Close].



Reference You can press the search settings button (🔍) to open the [Search Settings] dialog box, and set the search conditions for the network adapter and sensor.

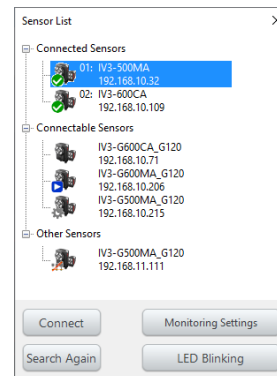
📖 "Searching for a Sensor to be Connected" (page 3-6)

■ Displaying the sensor list

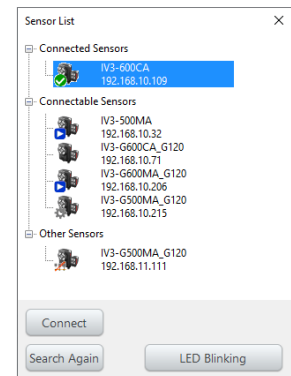
1 On the operation monitoring screen or screen during the operation, turn on [Sensor List] from the [View] menu.

A list of connected sensors, connectable sensors, and other sensors is displayed.

Monitoring connection



Normal connection



	Icons indicating the detected sensor status, device name, and IP address are displayed. Double-click on any sensor to connect to that sensor.
	<ul style="list-style-type: none"> : Connecting : Running : Setting : Not connectable (the IP address is not set, network is different, etc.) : Others (sensor update in progress, etc.)
[Connect]	Connects with the selected sensor.
[Search Again]	Searches sensors again, and updates the sensor list display.
[Monitoring Settings]	Specify the sensor to be monitoring target. 📖 "Monitoring Settings" (page 3-18).
[LED Blinking]	Blinks the LED of the selected sensor.

2 Turn off [Sensor List] from the [View] menu.

The sensor list becomes hidden.

Monitoring Settings

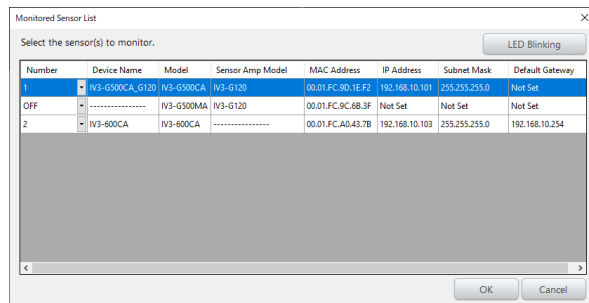
Specify the sensor to be monitoring target.

1 Press [Monitoring Settings] on the Sensor List screen.

Monitored Sensor List screen opens and the information of each sensor is displayed.

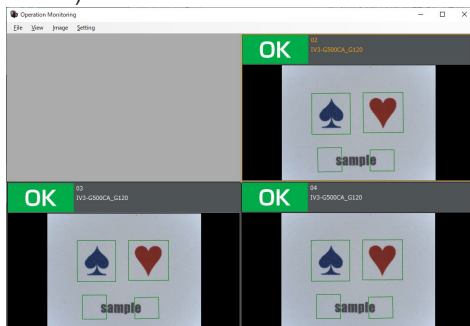
Reference Press [LED Blinking] to blink the LED of the selected sensor.

2 Press [] in the [Number] column to specify the sensor to be monitoring target.



- The sensor to be monitoring target
Select a number from 1 to 16. On the Operation Monitoring screen, the sensor will appear at the location matching to the number.
- The sensor not to be monitoring target
Select OFF. The sensor being OFF will not appear on the Operation Monitoring screen.

Reference Each of the selected numbers matches the specified location on the Operation Monitoring screen. Even if the number is omitted, it is not padded.
For example, if “2”, “3”, and “4” are selected without selecting “1”, on the Operation Monitoring screen, No. 1 (upper left of the 4-split screen) is not displayed, and the selected sensors are displayed in No. 2 (upper right of the 4-split screen), No. 3 (lower left of the 4-split screen) and No. 4 (lower right of the 4-split screen).



4

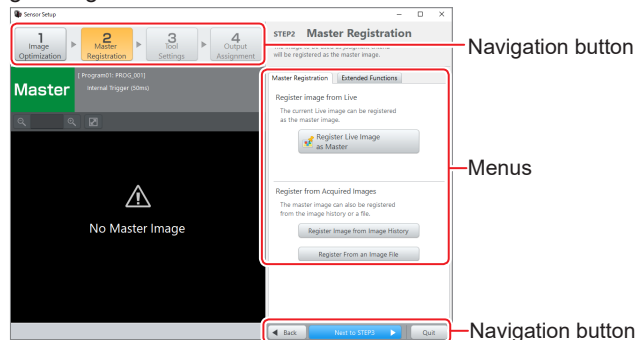
Settings Navigator (Setting the Status Conditions)

This chapter explains the functions and operation methods of the Settings Navigator.

Settings Navigator.....	4-2
Basic operation of the Settings Navigator.....	4-4
1. Image Optimization (Clearly Image a Target).....	4-8
2. Master Image Registration (Registering an Image as a Reference).....	4-20
3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode).....	4-28
3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode).....	4-121
4. Output Assignment (Setting Details of Outputting to Output Line).....	4-147

Settings Navigator

In the Settings Navigator, the settings of the program required for judging the target with the sensor are set in each step. Select sensor setup mode ([Standard Mode] or [Sorting Mode]) while sequentially following the steps with the navigation buttons, and adjust the settings using the menu.



Reference

- In the case of [Standard Mode], step 3 becomes [Tool Settings].
- In the case of [Sorting Mode], step 3 becomes [Part Registration].

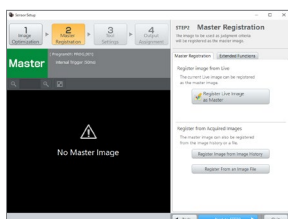
Flow of the Settings Navigator: Standard Mode



Step 1: Image optimization settings

Set the image optimization settings for clearly imaging a target. Adjust the image settings to clearly define the differences between an “OK” and “NG” image.
Set the trigger options, adjust the brightness and camera focal distance.

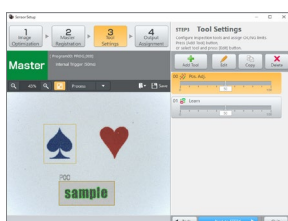
☞ “1. Image Optimization (Clearly Image a Target)” (page 4-8)



Step 2: Registration of a master image

Capture an “OK” image and register the master image to serve as the reference of judgment.

☞ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

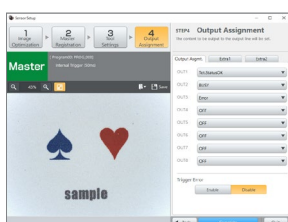


Step 3: Tool settings

Set tools to judge a target.

Set the tools onto the master image and set the threshold for judgment. Up to 65 detection tools and position adjustment tools in one program can be set.

☞ “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-28)

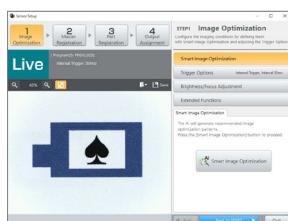


Step 4: Output assignment

Assign the content to output to each output line.

☞ “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)

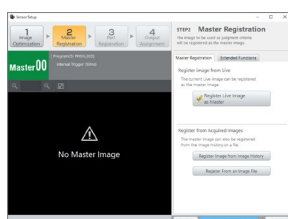
Flow of the Settings Navigator: Sorting Mode



Step 1: Image optimization settings

Set the image optimization settings for clearly imaging a target. Adjust the image settings to clearly define the differences between the target types. Set the trigger options, adjust the brightness and camera focal distance.

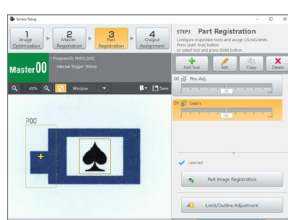
📖 “1. Image Optimization (Clearly Image a Target)” (page 4-8)



Step 2: Registration of a master image

Capture an image and register the master image to serve as the basis to identify part types.

📖 “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

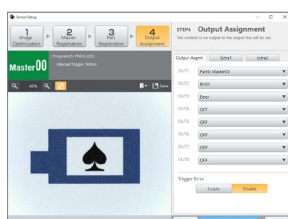


Step 3: Part Registration Settings

Set the tool to identify a part type. Also register the image for the part type to be identified.

Up to 8 detection tools and 1 position adjustment tool in one program can be set.

📖 “3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121)



Step 4: Output assignment

Assign the content to output to each output line.

📖 “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)

Basic operation of the Settings Navigator

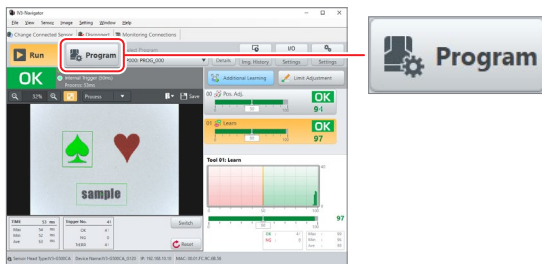
Starting the Settings Navigator

- 1 Turn on the power of the sensor.
- 2 Start the IV3-Navigator.
 - ☐ “Operation for Initial Startup of the IV3-Navigator” (page 3-6)

Point When the sensor is in one of the following conditions, the main screen in [Program] opens. Proceed to step 5.

- When the power is turned on for the first time
- If a program has not been set
- If the initial setup is being performed on the sensor
- When the sensor head is changed

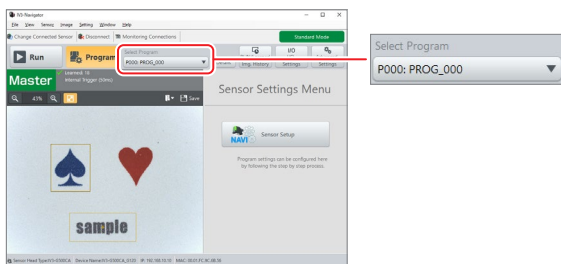
3 Press [Program].



The confirmation screen opens.

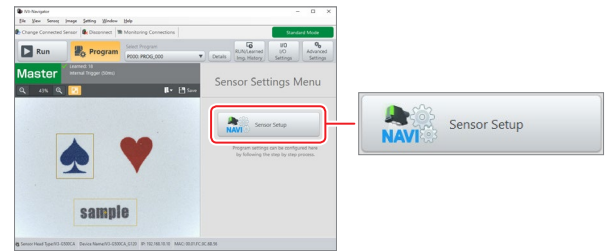
- 4 Press [OK].
IV3-Navigator switches to [Program].

5 Select the program to be set.



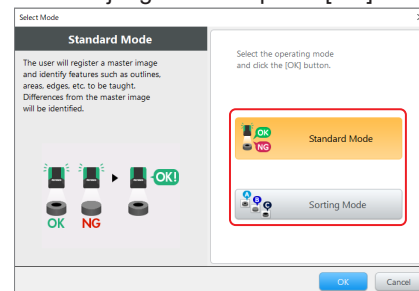
☐ “Changeover for a Target (Program Functions)” (page 7-2)

6 Press [Sensor Setup].

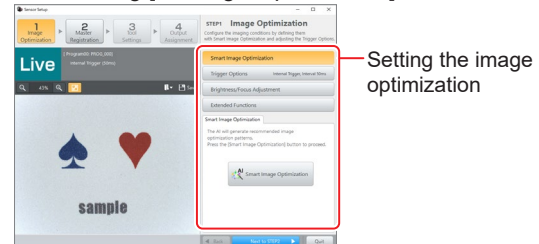


- When a program which has not been set is selected

The [Select Mode] screen is displayed. Select the mode (Standard Mode/Sorting Mode) to be used for judgment and press [OK].



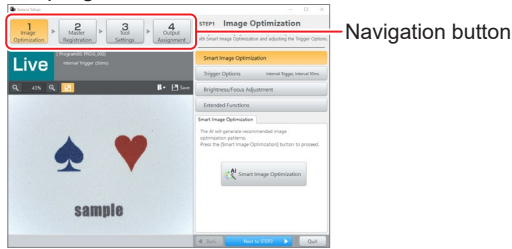
Start setting [1. Image Optimization].



☐ “1. Image Optimization (Clearly Image a Target)” (page 4-8)

● When the program which has been set is selected

Press the navigation button for each step to start setting the program.

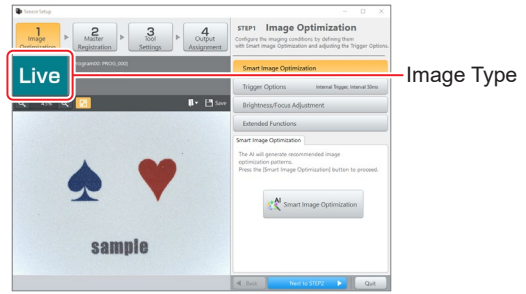


- 📖 “1. Image Optimization (Clearly Image a Target)” (page 4-8)
- 📖 “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)
- 📖 “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-28)(Standard Mode)
- 📖 “3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121) (Sorting Mode)
- 📖 “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)

Point When changing the set program from Standard mode to Sorting mode, or from the Sorting mode to the Standard mode, initialize the program once.
 📖 “Initializing a Program” (page 7-10)

Image Types of the Settings Navigator

The image types displayed in the Settings Navigator screen are as follows.



Type	Description
Live	The current taken image.
Master	The image registered as the master. When multiple master image settings are disabled, “Master” will be displayed; when the multiple master image settings are enabled or in sorting mode, “Master00 to 07” will be displayed; and when the master name is changed, the master name will be displayed.
Test	Test operation screen. Displays the taken image.
Log	The image viewed from files or image history.

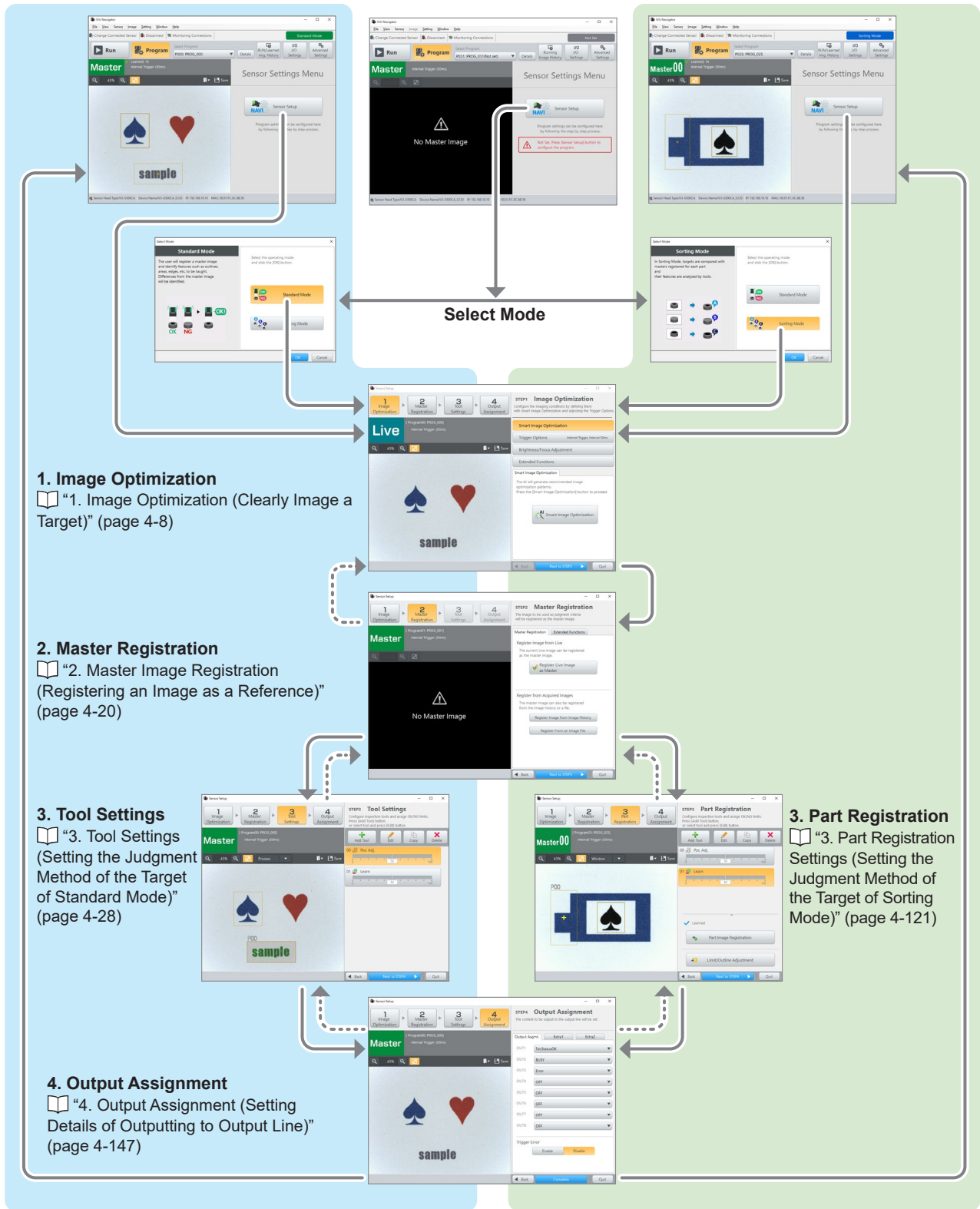
Settings Navigator Screen and Operation Flow

This section explains the screen to be displayed in the Settings Navigator and the operation flow. For details of the contents which can be set on each setting screen and its operations, refer to the applicable sections.

When a [Standard Mode] program is selected

If programs are not being set

When a [Sorting Mode] program is selected

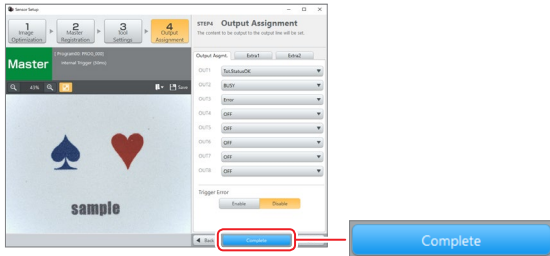


Finishing the Settings Navigator

Finishing by completing all steps

1 Set all steps in the Settings Navigator.

2 Press [Complete].



The confirmation dialog to save appears.

3 Press [Yes].

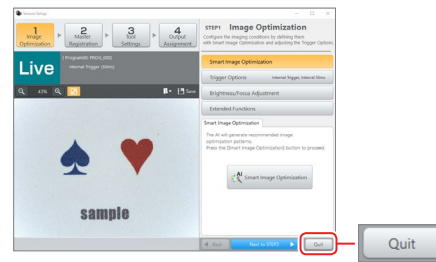
The settings in the Settings Navigator will be saved into the program, and the system returns to the main screen in [Program].

Reference

- By pressing [No], the confirmation dialog to cancel the settings opens. By pressing [Yes], the Settings Navigator closes without saving the settings.
- By pressing [Cancel], the system returns to the Settings Navigator screen.

Finishing without completing all steps.

1 Press [Quit] at the lower right of the screen.



● When the required settings are completed

The confirmation dialog to save appears.

● When the required settings are not completed

The confirmation dialog to finish appears.

- By pressing [OK], the confirmation dialog to save appears.
- By pressing [Cancel], the system returns to the Settings Navigator screen.

Point

The required settings have not completed yet. Even if [OK] is pressed and the setting contents are saved in the program, proper operation cannot be performed.

2 Press [Yes].

The settings in the Settings Navigator will be saved into the program, and the system returns to the main screen in [Program].

Reference

- By pressing [No], the confirmation dialog to cancel the settings opens. By pressing [Yes], the Settings Navigator closes without saving the settings.
- By pressing [Cancel], the system returns to the Settings Navigator screen.

1. Image Optimization (Clearly Image a Target)

In this section, adjust the image optimization for defining differences in an “OK” and “NG” image or part image.

Setting the image optimization

● Smart Image Optimization

By specifying an area on the target, the AI will automatically generate recommended optimized images. One of multiple recommended optimized images can be selected.

☞ “Settings of Smart Image Optimization” (page 4-9)

● Trigger Options

A trigger in this manual indicates the timing to start imaging with the built-in camera of the sensor. In the Trigger Options, set the timing to image a target within the field of view of this device. This device can image a target at any timing and can image continuously.

☞ “Setting the Trigger Options” (page 4-10)

☞ “Checking the field of view and installed distance” (page 2-2)

● Brightness Adjustment

The sensor images a target by receiving the reflected light of the built-in light exposed to a target using the CMOS image sensor.

In the Auto Brightness Adjustment, a target can be imaged with an appropriate brightness by automatically adjusting the light intensity and shutter speed according to the shape and surface condition (color, shininess, material).

☞ “Brightness Adjustment” (page 4-12)

● Focus Adjustment

Adjusts the focus of lens. Adjusts for clearly imaging the shape of a target. Auto focus can adjust the focusing position automatically.

☞ “Focus Adjustment” (page 4-12)



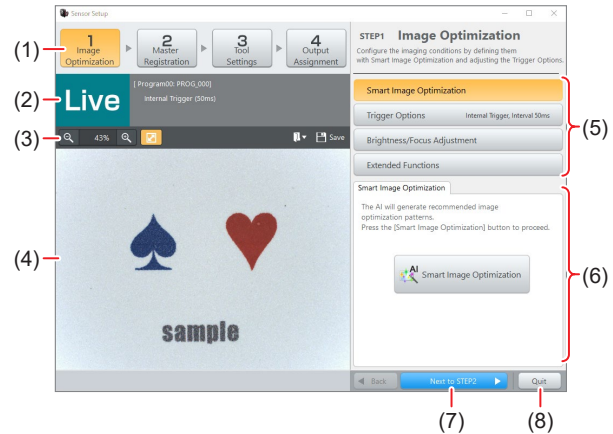
Point

When the master image is registered and image optimization settings other than Trigger Options are changed, the confirmation message that recommends you re-register the master image opens. Press [OK] and re-register the master image.

☞ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

Main Screen for Image Optimization

This section explains the main screen for Image Optimization.



(1) Navigation button

Moves steps in the Settings Navigator.

(2) [Image Type] display

☞ “Image Types of the Settings Navigator” (page 4-5)

(3) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(4) Image taken by the sensor

Displays an image taken by the sensor. The image type to be displayed differs depending on the settings screen.

(5) Settings button

Displays the settings to be set for Image Optimization.

☞ “Settings of Smart Image Optimization” (page 4-9)

☞ “Setting the Trigger Options” (page 4-10)

☞ “Brightness Adjustment” (page 4-12)

☞ “Focus Adjustment” (page 4-8)

☞ “Advanced settings for image optimization” (page 4-16)

(6) Edit settings screen

Displays the settings to be edited of the selected item using the settings button in the tab format.

(7) [Next to STEP2] button

Proceeds to “2. Master Registration”.

☞ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

(8) [Quit] button

Finishes the Settings Navigator.

☞ “Finishing the Settings Navigator” (page 4-7)

Settings of Smart Image Optimization

By specifying an area on the target, the AI will automatically generate recommended optimized images. One of multiple recommended optimized images can be selected.

Setting items for Smart Image Optimization

Items	Description
Specify Target Area	To determine the optimized images, specify the area to be optimized by the AI on the Live image.
AI-Generated Image Patterns	One of the appropriate optimized images can be selected from a number of recommended optimized images generated by AI.
Readjust	Returns to Specify Target Area screen. Used when adjusting settings to generate optimized images using AI again.

Set Smart Image Optimization

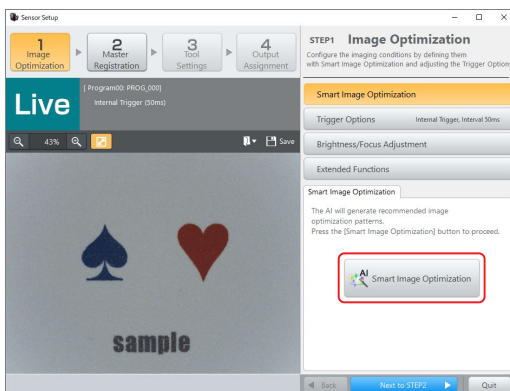
1 Start the Settings Navigator.

“Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

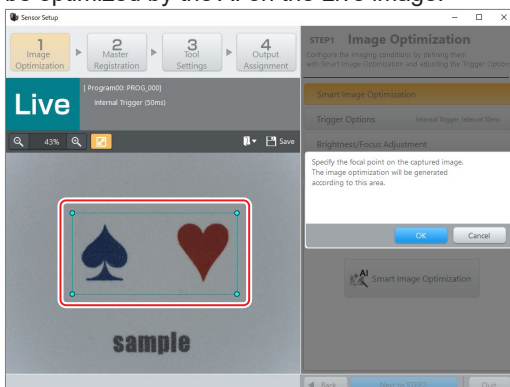
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Smart Image Optimization].



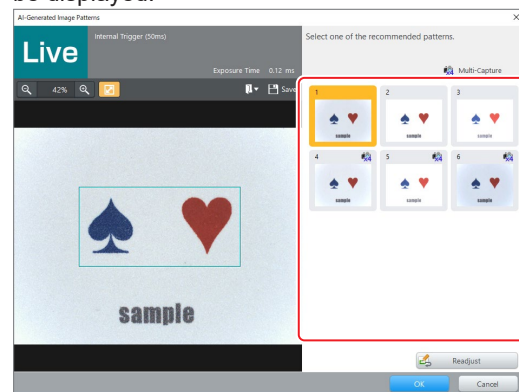
4 Specify the target area.

To determine the optimized image, specify the target to be optimized by the AI on the Live image.



5 Press [OK].

The image obtained by Smart Image Optimization will be displayed.



By pressing [Readjust], the system returns to the procedure to specify the target area. The AI will be able to generate optimized images again based on settings changes.

Point Stop the target during Smart Image Optimization.

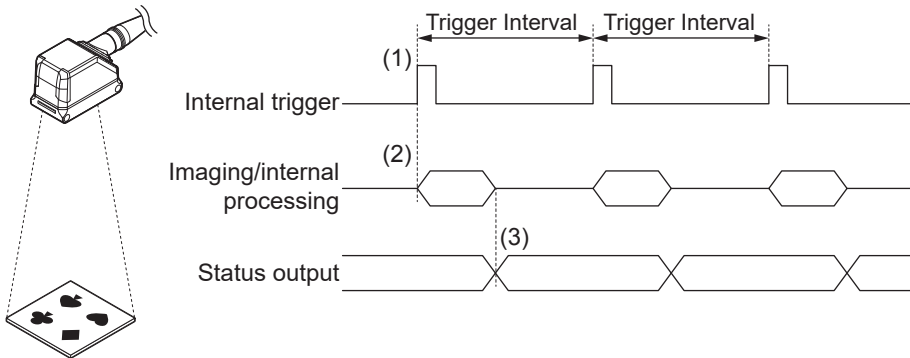
6 Select one Optimized Image and press [OK].

The system returns to the main screen for Image Optimization.

Setting the Trigger Options

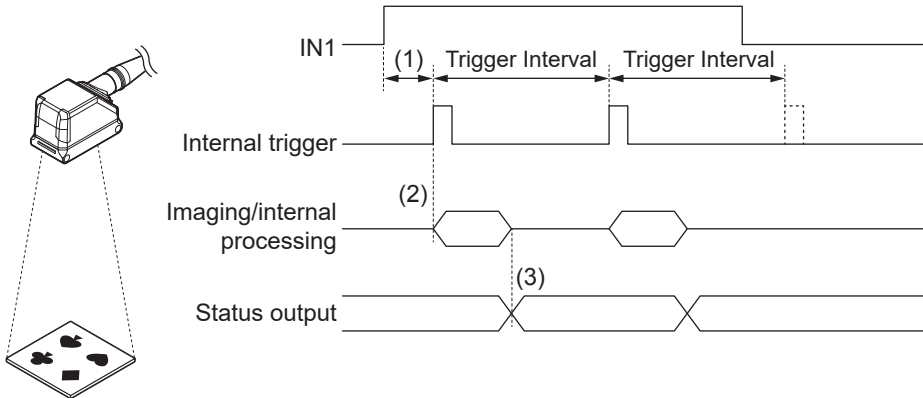
A trigger in this manual indicates the timing to start imaging with the built-in camera of the sensor. In the Trigger Options, set the timing to image a target within the field of view of this device. This device can image a target at any timing and can image continuously.

● Internal trigger



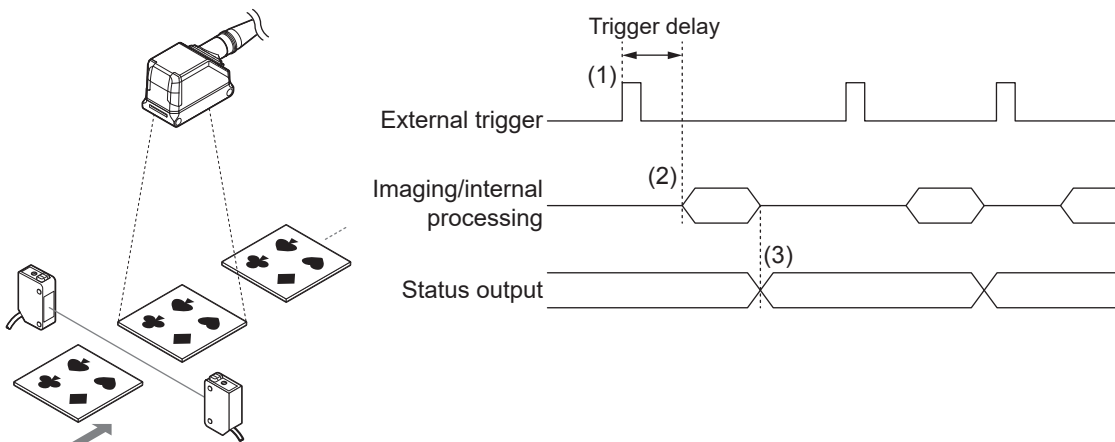
- (1) The trigger interval is determined according to the trigger interval settings.
- (2) Perform internal processing after the imaging.
- (3) Output the status result.

○ If [Internal Trigger Control with IN1 Input] is set to [Enable]



- (1) The trigger will be input within the period of "Internal trigger interval + 1 ms" after IN1 is input (the trigger is input while IN1 is input). Thereafter the trigger will be input according to the trigger interval settings.
 - (2) Perform internal processing after the imaging.
 - (3) Output the status result.
- 📖 "Internal Trigger Control with IN1 Input" (page 7-15)

● External trigger



- (1) Start imaging by inputting the trigger signal from another device.
When the trigger delay interval is set, the imaging start time will be delayed by the specified period.
- (2) Perform internal processing after the imaging.
- (3) Output the status result.

Settings for the Trigger Options

Items	Description
Trigger Type	Select the type of timing used to take an image.
Trigger Interval	Set when [Internal Trigger] is selected in the trigger type setting. Set an interval (cycle) at which the sensor automatically images.
Trigger Delay	Set when [External Trigger] is selected in the trigger type setting. Used when the output timing of the sensor used as an external trigger and the imaging timing of this device cannot be synchronized. This device starts imaging after the set trigger delay time of the timing input passes.

Setting the Trigger Options

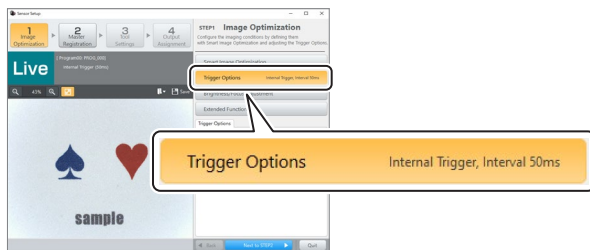
1 Start the Settings Navigator.

“Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

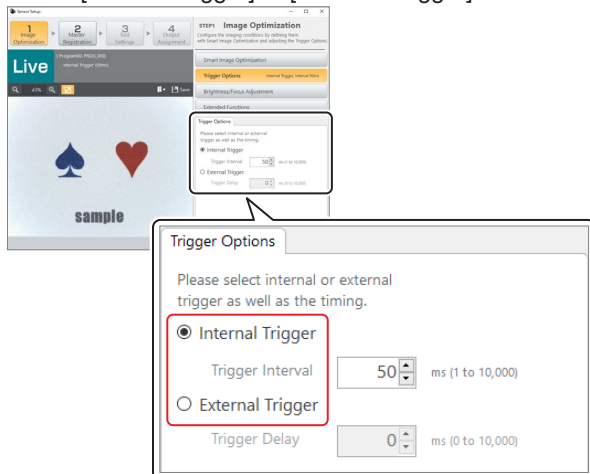
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Trigger Options].



4 Select the trigger type.

Select [Internal Trigger] or [External Trigger].



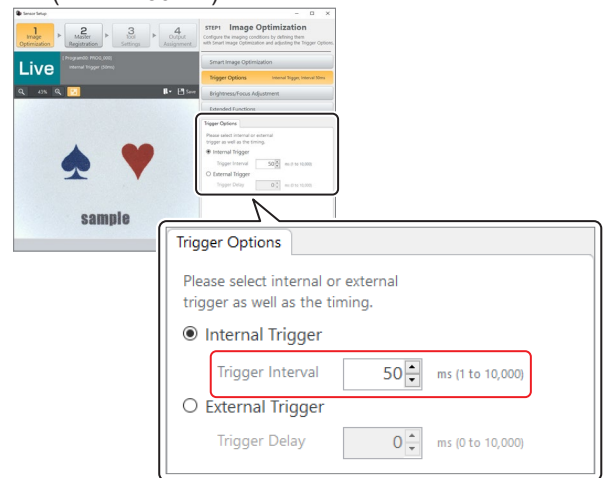
Internal Trigger (default)	Starts imaging continuously within the interval specified in the trigger interval setting. If [Internal Trigger Control with IN1 Input] is set to [Enable], an external input can control the internal trigger.
External Trigger	Starts imaging when receiving an external trigger from a photoelectric sensor or a PLC. The external trigger can be synchronized with a target's motion. The time (trigger delay) between inputting the trigger and when imaging starts can be set.

5 Set [Trigger Interval] or [Trigger Delay].

“Editing Numbers” (page 3-15)

● When [Internal Trigger] is selected in step 4

Set the trigger interval within the range of 1 to 10000 ms (default: 50 ms).



Point

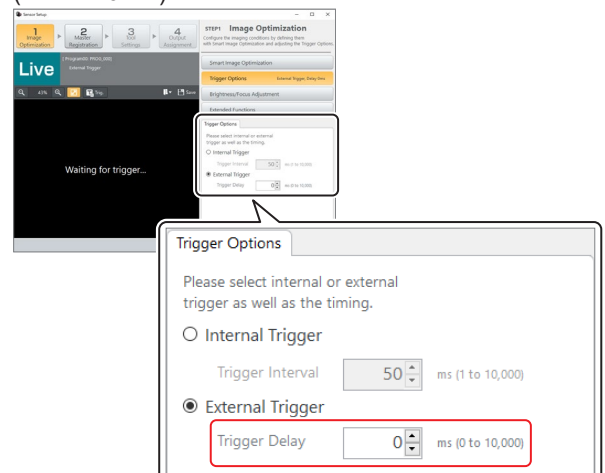
- If the internal trigger is input while BUSY is ON, a trigger error occurs.
- When the lighting mode is set to continuous lighting, the trigger interval can be selected from 1 ms, 25 ms, 50 ms, or 100 ms. For 100 ms or more, values can be selected in 100 ms intervals. The maximum value is 10000 ms.

“Internal trigger” (page 11-3)

“Error Messages” (page A-9)

● When [External Trigger] is selected in step 4

Set the trigger delay within the range of 0 to 10000 ms (default: 0 ms).



Brightness/Focus Adjustment

When modifying optimized image selected by Smart Image Optimization, or when performing fine adjustment for the brightness/focus position, the brightness adjustment, focus adjustment, and lighting conditions can be set.

When using Brightness Adjustment, the target can be imaged with an appropriate brightness by adjusting the light intensity and the imaging mode according to the shape and surface condition (color, shininess, material).

When using Focus Adjustment, adjust the focusing position for clearly imaging the shape of a target.

When adjusting the lighting conditions, select the internal light ON/OFF, lighting unit ON/OFF, and multiple imaging ON/OFF.

Brightness/Focus adjustment settings

Items		Description
Brightness Adjustment	Automatic Brightness Adjustment	The brightness is automatically adjusted so that the brightness of the entire image becomes optimal.
	Auto Adjustment by Specifying a Position on the Image	Automatically adjusts the brightness so that the brightness of the specified area and the area surrounding it becomes optimal.
	Manual Brightness Adjustment	Imaging Mode Brightness
Focus Adjustment	Automatic Focus Adjustment	Adjusts the focusing position automatically.
	Manual Focus Adjustment	Adjust the focus position by the slider.
Lighting	Internal Lighting	Selects ON/OFF for the internal light.
	Ext. Light Unit	Selects ON/OFF for the AI Lighting unit (only when connecting the unit).
	Multi-Capture	Selects the multiple imaging ON/OFF.

Adjusting Brightness

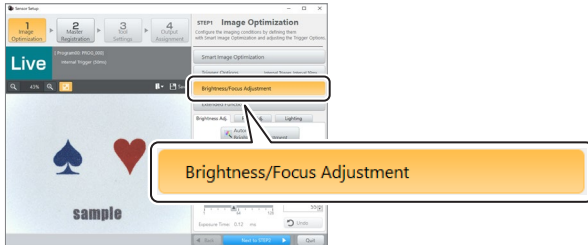
1 Start the Settings Navigator.

📖 “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

📖 “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Brightness/Focus Adjustment].



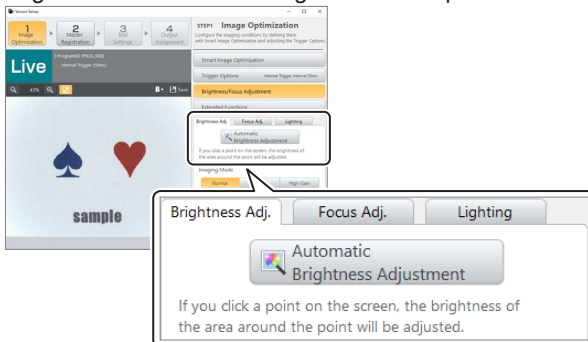
4 Press the [Brightness Adj.] tab.

5 Adjust the brightness.

Point Do not move the target during auto brightness adjustment. The brightness may not be adjusted correctly.

● Adjusting brightness automatically

By pressing [Automatic Brightness Adjustment], the brightness is automatically adjusted so that the brightness of the entire image becomes optimal.



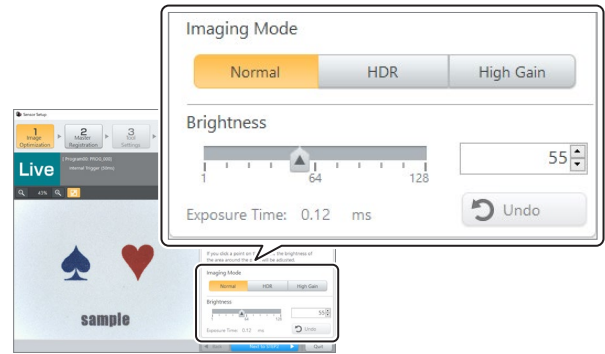
● Adjust automatically by specifying a position on the Image

By specifying a position on the image, the brightness is adjusted automatically so that the brightness of the specified surrounding area becomes optimal. Used when the adjustment results of the [Automatic Brightness Adjustment] button are too bright or dark due to the influence of brightness other than the target.

● Adjusting brightness manually

Manually adjust the brightness as needed by changing the brightness and the imaging mode.

📖 “Editing Numbers” (page 3-15)



Imaging Mode	<ul style="list-style-type: none"> • Normal (default) This mode is the basic imaging mode. The target can be imaged with less noise. • HDR Select to image a target such as metal that reflects light and has high contrast. • High Gain Select to shorten the exposure time or when the imaging environment is in a dark place. Lowers image quality due to high gain.
	Brightness Default value: 20

- Reference**
- The auto adjustment optimally adjusts the imaging mode and brightness.
 - The exposure time will be calculated automatically.

Adjusting focus

Point

- Place the target at the appropriate position.
 ☞ “Mounting the Sensor” (page 2-2)
- Do not move the target during focus adjustment. The focus may not be adjusted correctly.

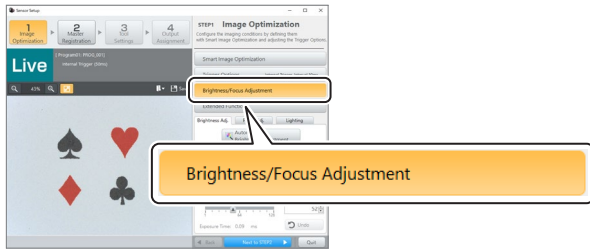
1 Start the Settings Navigator.

☞ “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

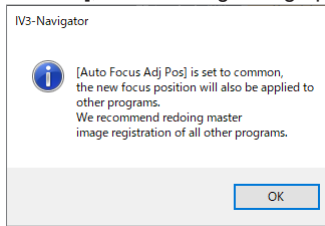
☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Brightness/Focus Adjustment].

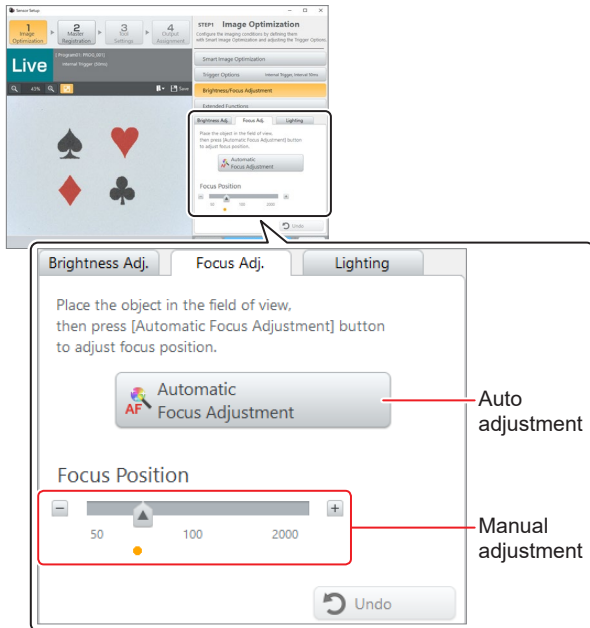


4 Press the [Focus Adj.] tab.

Reference When the [Auto Focus Adj Pos] (Page 7-26) is set to [Common], the following dialog opens.



5 Adjust the focusing position.



● Adjusting the focusing position automatically

When [Automatic Focus Adjustment] is pressed, the focusing position is adjusted automatically.

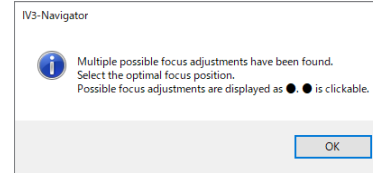
● Adjusting the focusing position manually

Adjust the focus position by the slider.

☞ “Editing Numbers” (page 3-15)

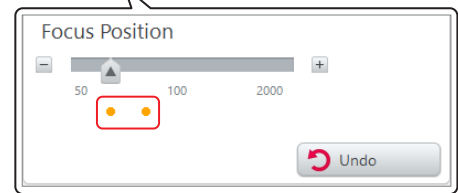
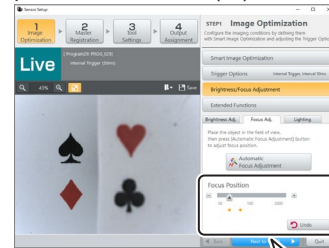
● When multiple focusing positions exist

When there are multiple positions that were identified as the optimal position, the following screen opens.



By pressing [OK], the focus is adjusted to the closest position to the sensor, and the options of the positions that can be focused are indicated by (●).

To change the focusing position to a different position, press the markers (●) for the focusing positions.



Reference

- During the automatic adjustment, the sensor automatically images a target by inputting the internal trigger regardless of the Trigger Options (Page 4-10) settings. Also, when continuous lighting (Page 4-18) is set, imaging will be performed with the flash lighting.
- Auto adjustment searches the positions that can be focused over the entire area.

Setting the lighting conditions

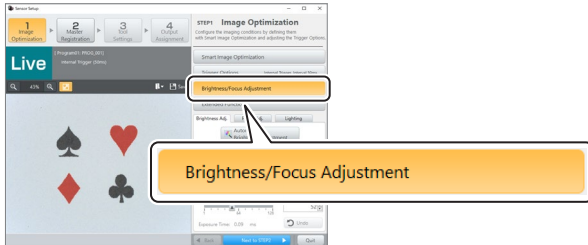
1 Start the Settings Navigator.

☞ “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

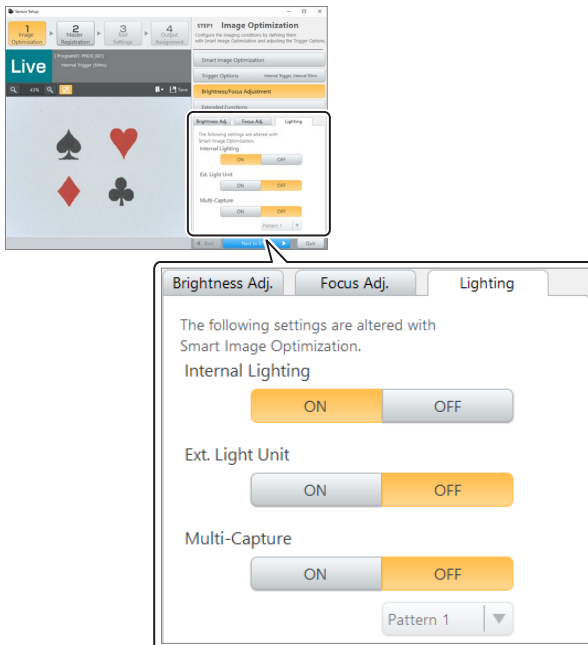
☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Brightness/Focus Adjustment].



4 Press the [Lighting] tab.

5 Set the lighting conditions.



● Selecting ON/OFF for the internal light

Internal Lighting	<ul style="list-style-type: none"> • ON (default) Turns on the built-in light of the sensor. • OFF Turns off the built-in light of the sensor.
-------------------	--

● Selecting ON/OFF for the lighting unit

Ext. Light Unit (only when connected)	<ul style="list-style-type: none"> • ON (default) Turns on the AI Lighting unit. • OFF Turn off the AI Lighting unit.
--	---

● Selecting multi-capture ON/OFF

By turning on only a part of the light of the main unit and the AI Lighting unit, and combining images with different emitting directions, a more ideal image can be obtained.

Multi-Capture	<ul style="list-style-type: none"> • ON Multi-capture is performed. • OFF (default) Multi-Capture is not performed.
---------------	---

Point When using multi-capture stop the target for the exposure time starting from the trigger input. Since an image is combined from images resulting from the multi-capture if the target moves during its capturing, the image will not be combined correctly.

● Selecting the pattern when turning ON Multi-Capture

Pattern 1 to 4	Selects a pattern based on the brightness of the images obtained from multi-capture.
-------------------	--

Advanced settings for image optimization

Adjusts the image optimization settings using the advanced settings menu.

Advanced settings items for image optimization

Items		Description	Ref.
Digital Zoom	Magnification	Set the magnification of digital zoom.	4-17
	Zoom Area	Specify an area in the sensor's field of view as the zooming area.	
Filter/Correction	Distortion Correction (Wide Field of View Sensor Model Only)	Correct image distortion.	4-18
	Color Filters (Color Type Only)	If it is difficult to extract the edge (outline) of targets of different colors, select a filter for a color or a complementary color to be detected.	
Lighting Mode		Select lighting mode for the light.	4-19

Point

When the master image is registered and the advanced settings for image optimization are changed, the confirmation message that recommends you to re-register the master image opens. Press [OK] and re-register the master image.

📖 “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

Setting the digital zoom

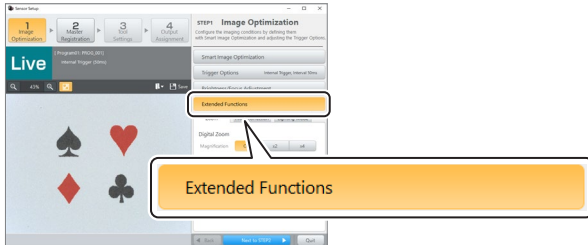
1 Start the Settings Navigator.

📖 “Starting the Settings Navigator” (page 4-4)

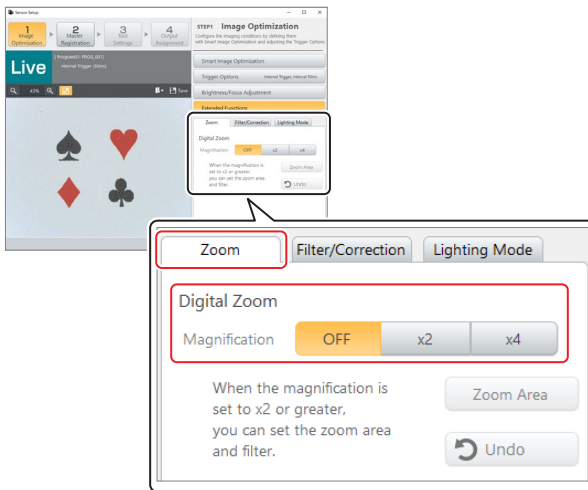
2 Display the main screen for Image Optimization.

📖 “Settings Navigator Screen and Operation Flow” (page 4-6)

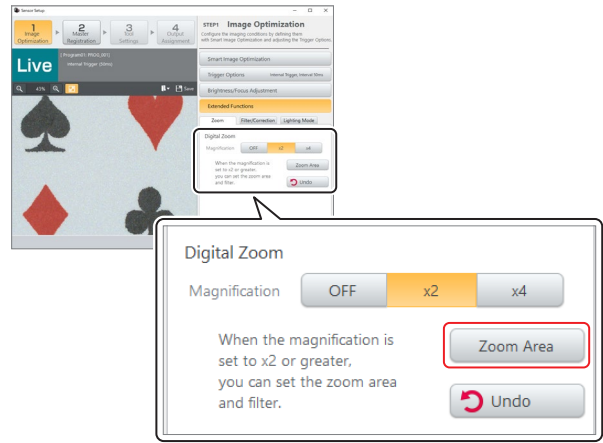
3 Press [Extended Functions].



4 Select the [Zoom] tab and set the [Magnification].

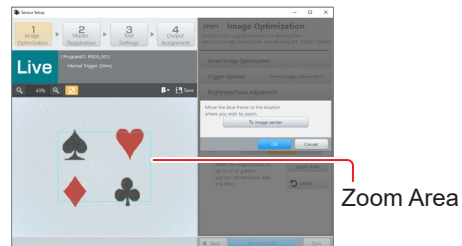


5 Set [Zoom Area] as needed.



● Zoom Area

The zoom area for digital zoom is specified. Press the zoom area to set the area on which to be zoomed.



To move the zoom area to the center of the screen, press [To image center].

Point If the zoom area is moved, the imaging area and tool window are moved together. It is recommended to re-register the master image and re-set the tools when moving the zoom area.

6 Press [OK].

Setting distortion correction (wide field of view sensor model only)/color filters (color type only)

- Point** Color filters are not applied to the following:
- Learning tool
 - Color Area tool
 - Color average tool
 - Color Prohibition/Brightness Prohibition tool
 - Blob Count tool

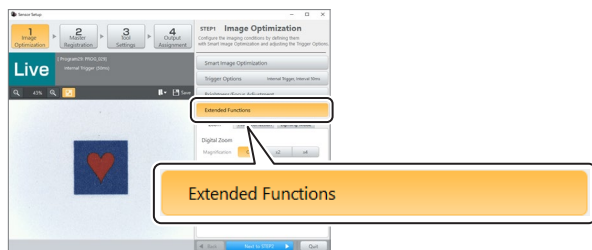
1 Start the Settings Navigator.

☞ “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

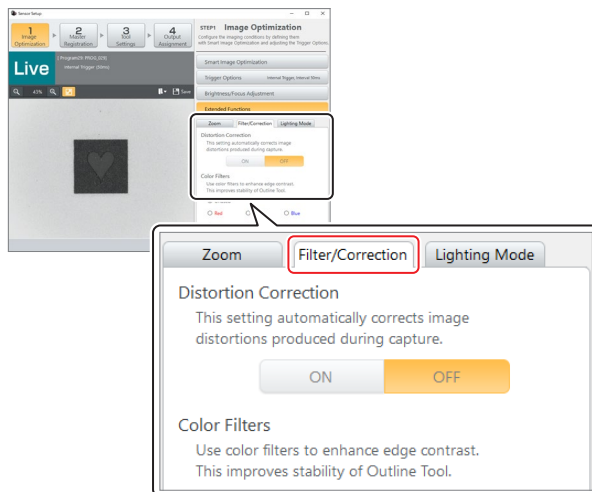
☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Extended Functions].



4 Select the [Filter/Correction] tab.

The image changes to monochrome. In this example, the outline in red and blue will be undefined.



5 Select ON/OFF for the distortion correction.

Correct the image distortion automatically. Use this when you are concerned about the distortion.

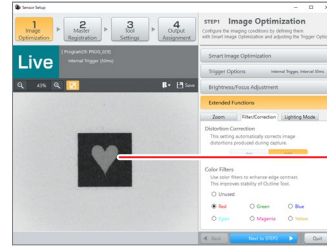
Distortion Correction	• ON (default) Distortion correction is performed.
	• OFF Distortion correction is not performed.

- Point** When distortion correction is ON, the processing time may slow down. For the standard model, it cannot be turned ON.

6 Select the color to apply the color filter.

Select the filter of the color or complementary color to be detected (select red here).

By applying the color filter of the selected color, the red color becomes brighter and the outline with the blue color will be clarified.



Clarified outline

Setting the lighting mode for the light

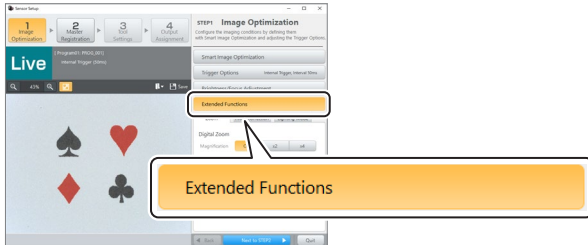
1 Start the Settings Navigator.

☞ “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for Image Optimization.

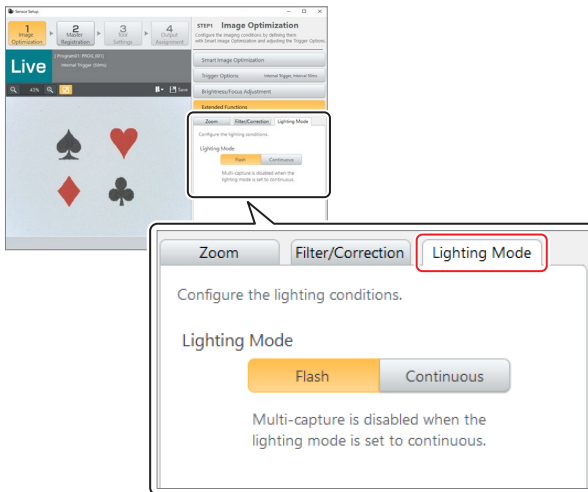
☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Extended Functions].



4 Press the [Lighting Mode] tab.

5 Set [Lighting Mode].



Lighting Mode

- Flash (default)
The built-in light lights within the exposure time when imaging.
- Continuous (color type only)
The built-in light lights regardless of specified exposure time when imaging a target.

Point

- If the lighting mode is changed, re-register the master image and re-set the tool. Otherwise correct judgment may not be possible.
- [Continuous] cannot be selected when using a monochrome type.

2. Master Image Registration (Registering an Image as a Reference)

Main screen for Master Image Registration

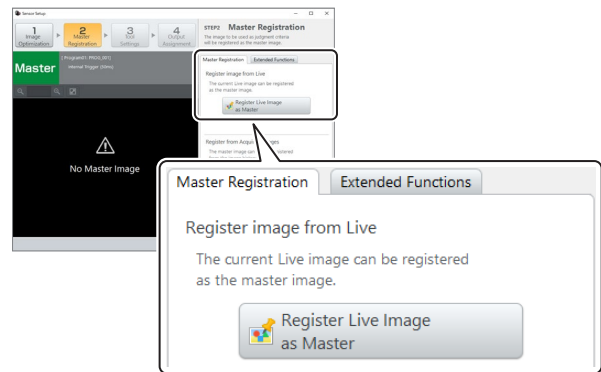
This section explains the main screen for the master image registration.



- (1) **Navigation button**
Moves steps in the Settings Navigator.
- (2) **[Image Type] display**
☐ “Image Types of the Settings Navigator” (page 4-5)
- (3) **Image tool bar**
☐ “Operation of the Image Tool Bar” (page 3-13)
- (4) **Image taken by the sensor**
Displays an image taken by the sensor. The image type to be displayed differs depending on the settings screen.
- (5) **Settings button**
Displays the settings for master registration.
☐ “Register Live Image as Master” (page 4-20)
☐ “Register From a Running Image History” (page 4-21)
☐ “Registering from the File Saved in the PC” (page 4-22)
☐ “Advanced Settings for the Master Registration” (page 4-24)
- (6) **[Back] button**
Returns to the settings screen for Image Optimization.
☐ “1. Image Optimization (Clearly Image a Target)” (page 4-8)
- (7) **[Next to STEP3] button**
Proceeds to “3. Tool Settings” (Standard Mode) or “3. Part Registration” (Sorting Mode).
☐ “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-28)
☐ “3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121)
- (8) **[Quit] button**
Finishes the Settings Navigator.
☐ “Finishing the Settings Navigator” (page 4-7)

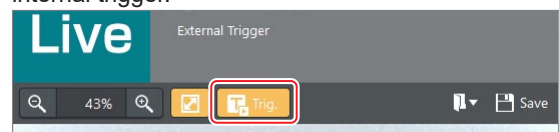
Register Live Image as Master

- 1 **Start the Settings Navigator.**
☐ “Starting the Settings Navigator” (page 4-4)
- 2 **Display the main screen for the Master Registration.**
☐ “Settings Navigator Screen and Operation Flow” (page 4-6)
- 3 **Place the target that will be used as the reference for judgment in the imaging position.**
- 4 **Press [Register Live Image as Master].**

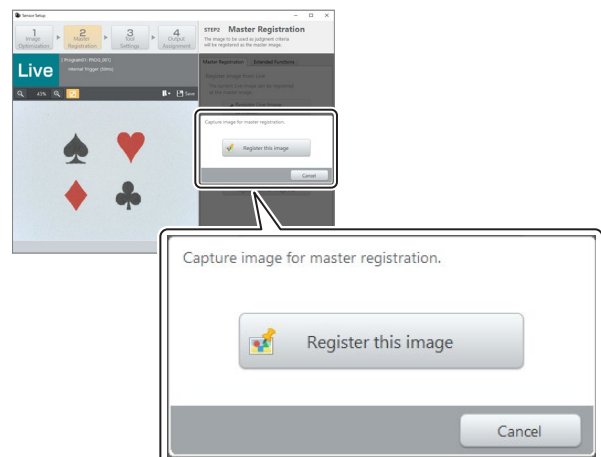


Switches to the [Live] screen.

- 5 **Image the target.**
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.
If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.



- 6 **Check the displayed taken image and press [Register the image].**



The confirmation dialog for the Master Registration opens.

7 Press [OK].

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



Point The settings for the disabled outlines (Page 4-50, Page 4-68) will be initialized. Set the outlines that will be disabled again as needed.

Register From a Running Image History

Registers an image from the image history saved in the memory within the sensor as a master image.

Point To register the master image from the image history, the image to be registered as a master image in the [Running Image History] must be saved.

☞ “Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-17)

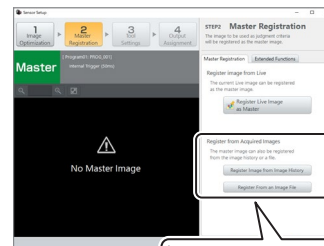
1 Start the Settings Navigator.

☞ “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for the Master Registration.

☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Register Image from Image History].



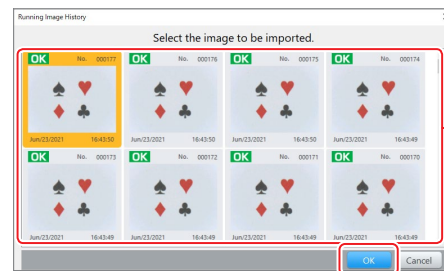
Register from Acquired Images

The master image can also be registered from the image history or a file.

Register Image from Image History

Register From an Image File

4 Select the image to be registered as the master image and press [OK].

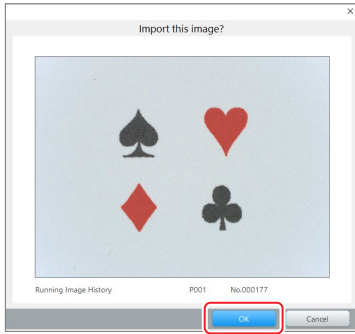


Select the image

The selected image will be displayed.

2. Master Image Registration (Registering an Image as a Reference)

5 Check the displayed image and press [OK].



The confirmation screen opens.

6 Press [OK].

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



Registering from the File Saved in the PC

Registers an image from the PC as the master image.

Point

- Save the image to be registered as the master image into the PC in advance.
- The files which can be registered as a master image are batch backup files (*.iv3a), individual program backup file (*.iv3a) or image capture files (*.iv3p).
☞ “Folder Composition and File Naming Rules” (page 8-8)

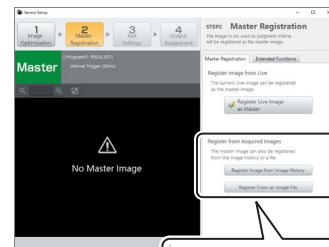
1 Start the Settings Navigator.

☞ “Starting the Settings Navigator” (page 4-4)

2 Display the main screen for the Master Registration.

☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Register From an Image File].



Register from Acquired Images

The master image can also be registered from the image history or a file.

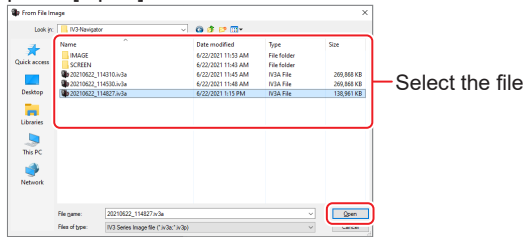
Register Image from Image History

Register From an Image File

4 Select the file to be registered as the master image.

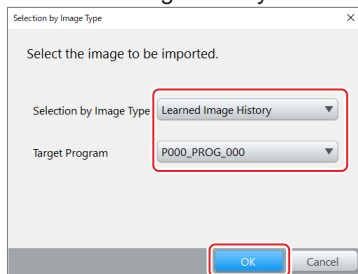
- When using a batch backup file (*.iv3a) or individual program backup file (*.iv3a)

Select the file to be registered as the master image and press [Open].



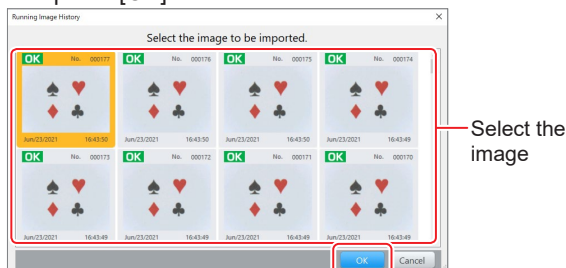
Select the type of the image to be imported from the following. Select the target program when the Learned Image History is selected.

- Running Image History
- Master Image
- Learned Image History



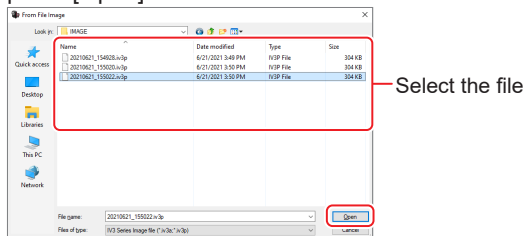
The list of images saved as the selected file image type will be displayed.

Select the image to be registered as the master image and press [OK].

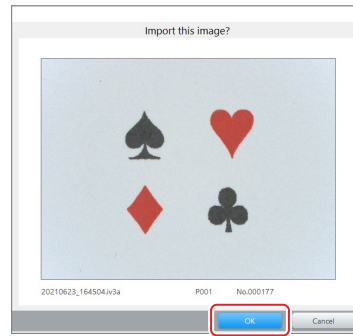


- When using an image capture file (*.iv3p)

Select the file to be registered as the master image and press [Open].



5 Check the displayed image and press [OK].



The confirmation screen opens.

6 Press [OK].

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



Advanced Settings for the Master Registration

Adjusts the master image registration using the advanced settings menu.

Advanced settings items for the master registration

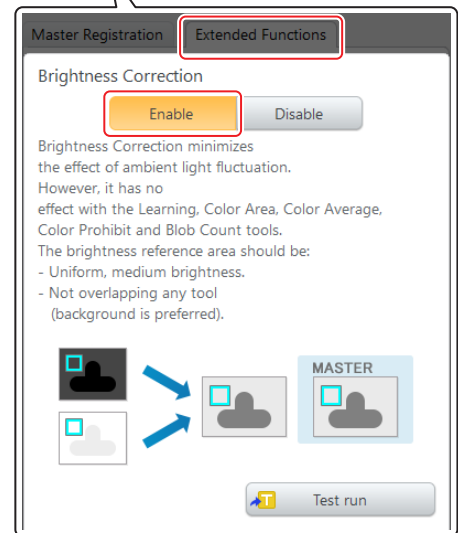
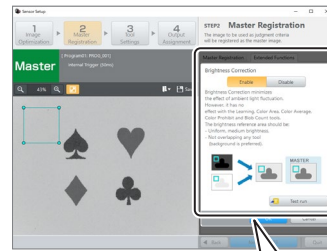
Items	Description	Ref.
Brightness Correction	The impact from changes in lighting can be reduced by setting the brightness level for the master image.	4-24
Master image settings	Up to eight master images can be registered. (Standard mode only)	4-25
Master name	The name of each master image can be edited.	4-27

Brightness Correction

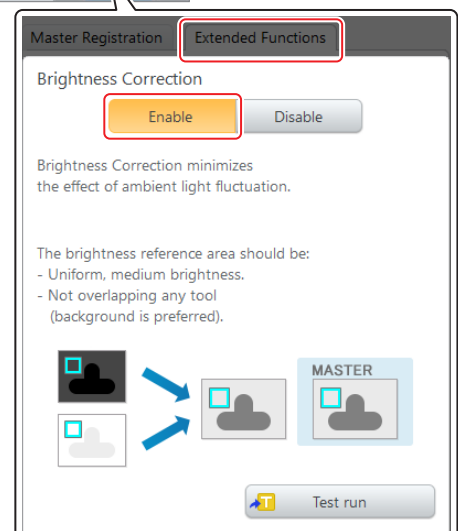
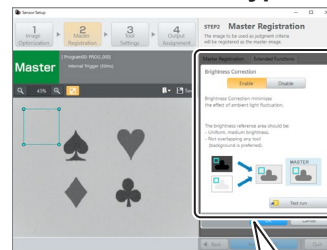
Point

- For a monochrome type, the learning tool cannot be used when enabling brightness correction. Moreover, brightness correction cannot be enabled when the learning tool is set.
- Brightness correction can be set only when a master image is registered.
- The brightness correction can be performed only for the master image 0 when master image settings are [Multiple].
- Brightness correction is not applied to the following tools.
 - Learning tool (color type)
 - Color Area tool, Color Average tool, Color Prohibition tool (color type), and Blob Count tool (color type)

● For color type



● For monochrome type



1 Start the Settings Navigator.

📖 "Starting the Settings Navigator" (page 4-4)

2 Display the main screen for the Master Registration.

📖 "Settings Navigator Screen and Operation Flow" (page 4-6)

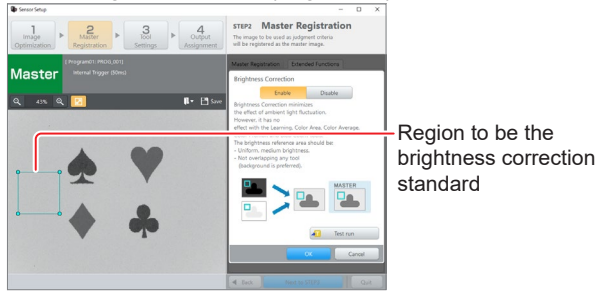
3 Select the [Extended Functions] tab and press [Brightness Correction].

Switches to the master image 0 when master image settings are enabled.

4 Press [Enable].

5 Set the tool window to be a reference for the brightness correction.

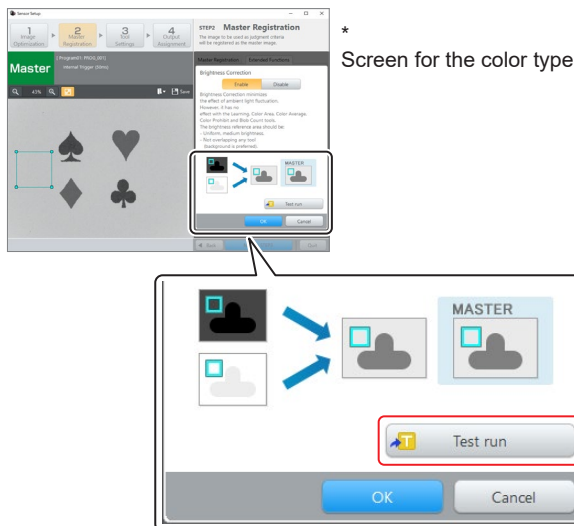
“Editing the Window” (page 3-14)



Point For the region to be a reference of brightness correction, specify the following.

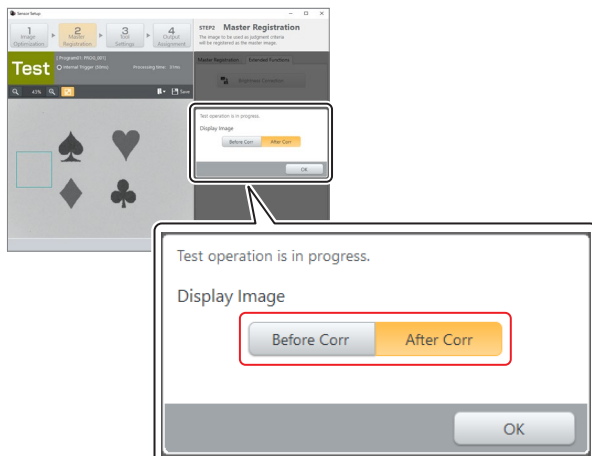
- A region with average medium brightness.
- A region with strong shininess and reflection or a region which is too dark may not be corrected properly.
- A region with a constant imaging status which does not change, such as device parts other than the target's.

6 Press [Test run].



Insert a shield or something similar and if the brightness in the specified standard region changes, check that the brightness for the entire image is corrected.

7 Press [Before Corr]/[After Corr] to check the operation status before and after brightness correction.



8 Press [OK].

The system returns to the brightness correction settings screen.

- When brightness correction is not to be used, press [Disable] on the screen from step 4.
- Brightness correction corrects the brightness of the entire image so that the average brightness of the window that is used as the brightness standard is the same as the brightness of the master image.

Master Image Settings

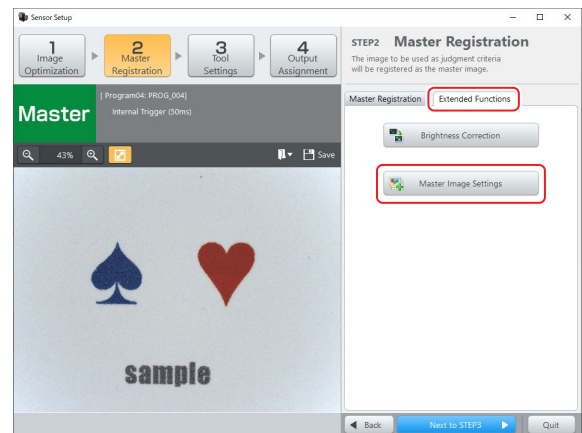
1 Start the Settings Navigator.

“Starting the Settings Navigator” (page 4-4)

2 Display the main screen for the Master Registration.

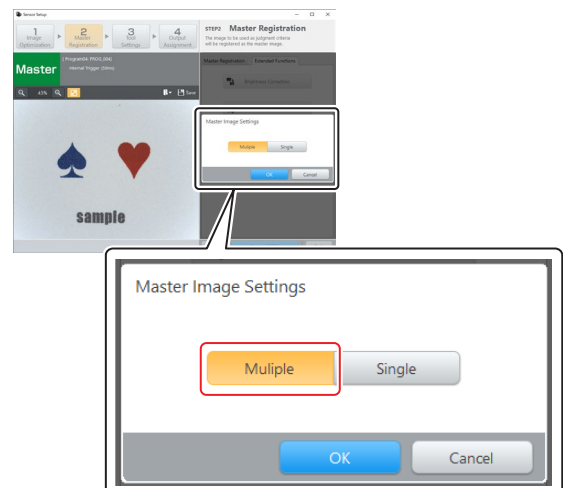
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Select the [Extended Functions] tab and press [Master Image Settings].



The master image settings screen open.

4 Press [Multiple].

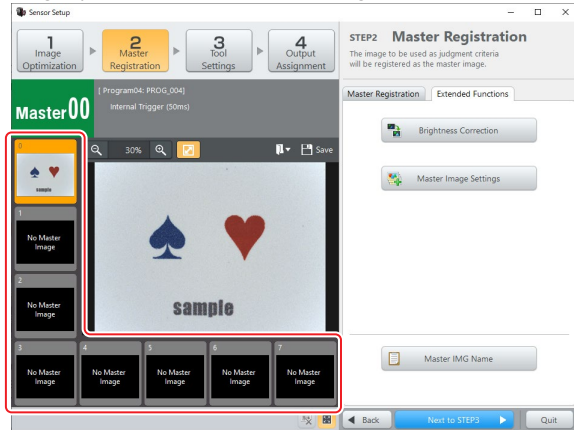


By pressing [Single], master images other than the master image 0 are deleted.

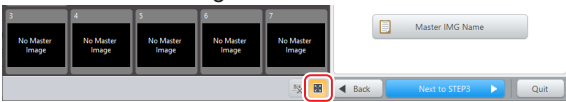
2. Master Image Registration (Registering an Image as a Reference)

5 Press [OK].

The master image list (an area displaying all master images) appears in the master registration screen.

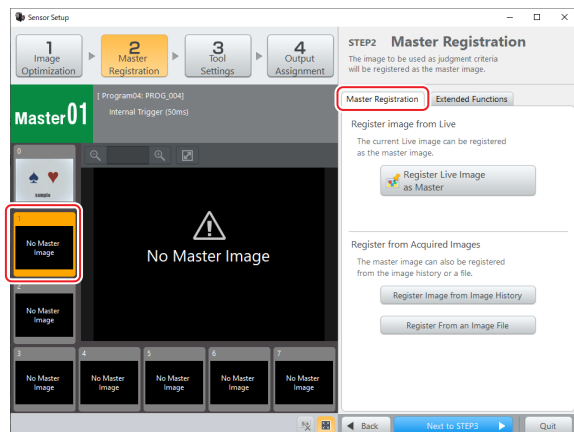


By pressing the “Switch to Display All Master Images <-> Single Master Image” button below the master image, whether the master image list is displayed or hidden can be changed.



6 Press the [Master Registration] tab.

7 Select one master image (0 to 7) to be registered from the master image list.

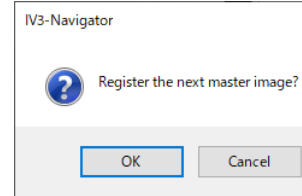


Reference The master image 0 must be registered.

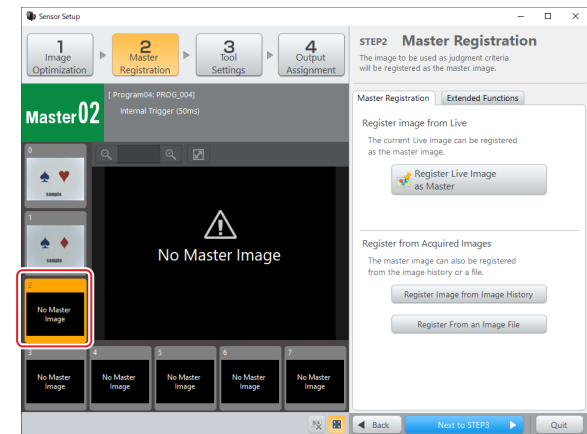
8 Register the master image.

- “Register Live Image as Master” (page 4-20)
- “Register From a Running Image History” (page 4-21)
- “Registering from the File Saved in the PC” (page 4-22)

When the registration ends, a confirmation screen to switch to the next master image appears.



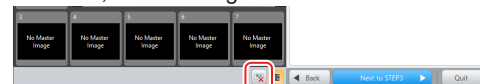
9 By pressing [OK], the next master image is selected.



By pressing [Cancel], the registered master image remains selected.

10 Repeat steps 7 to 9 to register all the master images you want to register (up to 8).

Reference The selected master image can be deleted by pressing “Delete master image” button. However, master image 0 cannot be deleted.



Master name

If the master image settings are [Enable], master names can be set for master images.

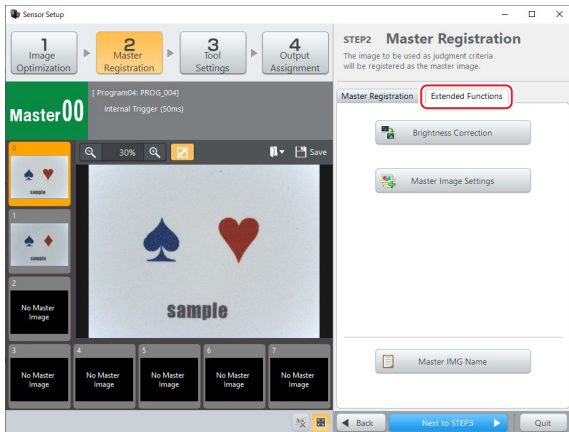
1 Start the Settings Navigator.

“Starting the Settings Navigator” (page 4-4)

2 Display the main screen for the master registration.

“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Select the [Extended Functions] tab.

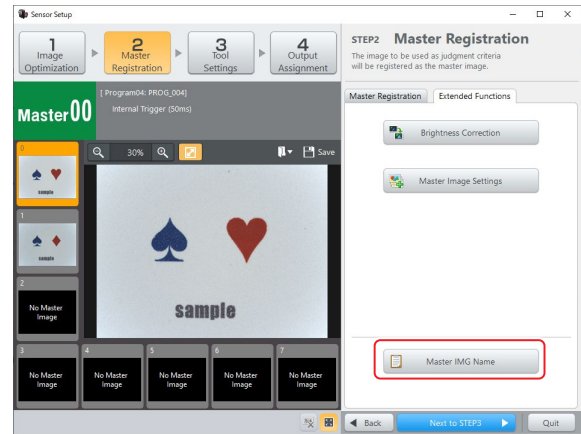


4 If the master image settings are [Enable], select the master image to edit the master name.



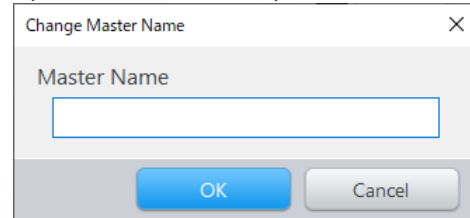
If the master image is not registered, the master name cannot be edited. Register the master image first.

5 Press [Master IMG Name].



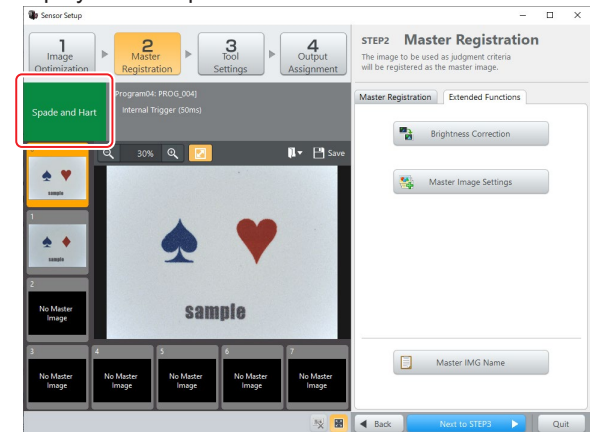
6 Edit the master name.

Up to 16 characters in alphanumeric can be set.



7 Press [OK].

The changed master name appears in the image type display on the top left of the screen.



3. Tool Settings

(Setting the Judgment Method of the Target of Standard Mode)

This section explains the setting methods for "Step 3. Tool Settings" of standard mode.

For "Step 3: Part Registration" of Sorting mode, refer to "3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)" (page 4-121)

In standard mode, set tools in the master image to judge whether a target is OK or No Good.

The aspects of the target registered as the master image are set as an "OK" image. During operation, the sensor judges whether it is an "OK" image or "NG" image by judging the differences in the registered master image and the target to be examined.

The number of tools that can be set in one program are as follows:

- Up to 65 tools can be set.
- If the position adjustment tool or outline tool are included:
 - There is a limit to the total number of tools for the position adjustment tool and outline tool.
 - The number of tools that can be set vary depending on the tool settings. Generally, this is about 40 tools.
 - Generally about 20 tools if the search algorithm for the position adjustment tool is set to high accuracy.

Types of tools

Basic tools

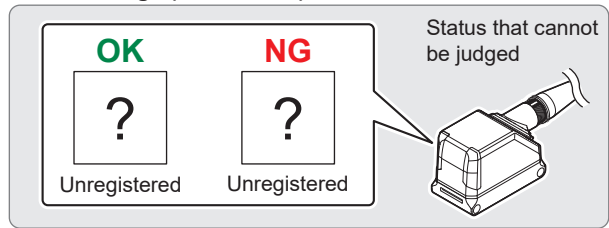
■ Learning tool

A tool which can automatically recognize the difference between targets by registering "OK" and "NG" images used for learning.

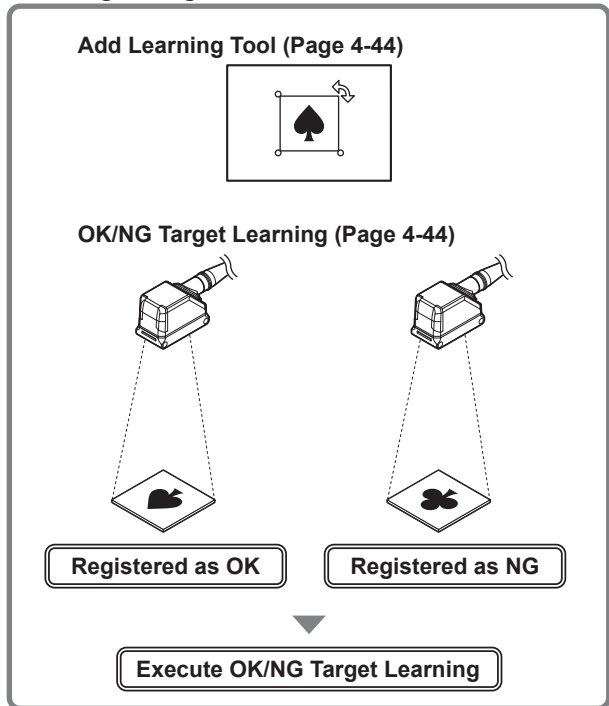
"Auto Adjustment by the Additional Learning (Learning Tool Only)" (page 6-2)

In the learning tool, learning will be executed after setting the tool windows used to identify OK/NG parts (images where the differences are clear) and registering an "OK" image and an "NG" image.

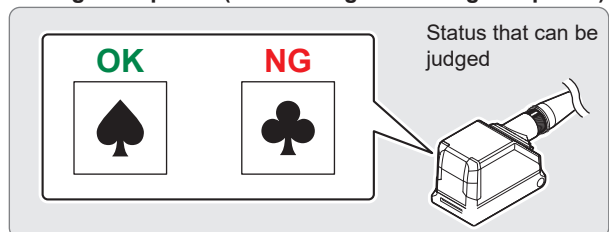
Start settings (not learned)



Learning Settings



Settings completed (OK/NG Target Learning completed)



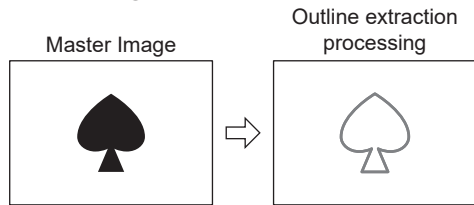
Outline tool

A detection tool to calculate the matching rate for the target based on the outline information of a registered “OK” image.

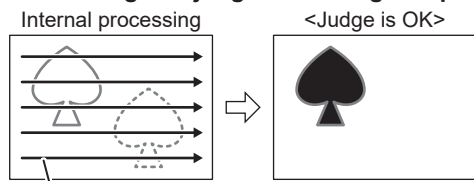
Judges whether a target is OK or NG by setting the threshold for the matching rate.

☞ “Outline tool” (page 4-48)

Tool settings



Processing and judgment during an operation



Searches the region for a target which has the outline of the same shapes as the outline of the “OK” image. Outline can be detected even if a target is rotated.

Example when the result was NG

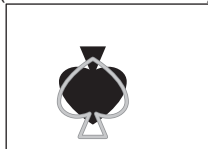
No same shapes exist (Detection of existence)



Different shape (Shape detection)



Different direction (Detection of direction)



Reference The matching rate is indicated in 0 to 100. 100 indicates that an outline is completely matched. The matching rate decreases with more non-matching parts.

Color Area/Area tool

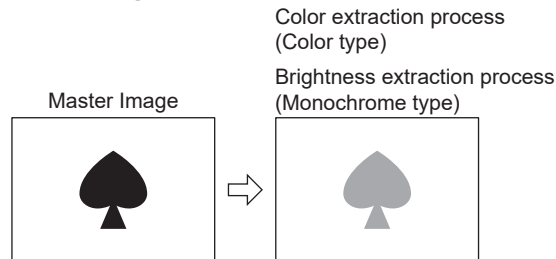
A tool to calculate the matching rate of the area (number of pixels) of a target in comparison to the area (number of pixels) of a registered “OK” image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.

If the sensor is a color type, the tool will be Color Area tool. The system judges the area for presence of pixels of a user-specified color.

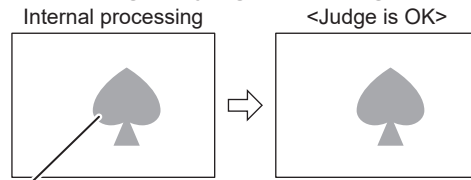
If the sensor is a monochrome type, the tool will be the Area tool. The system judges the area for presence of pixels of a user-specified brightness.

☞ “Color Area/Area tool” (page 4-52)

Tool settings

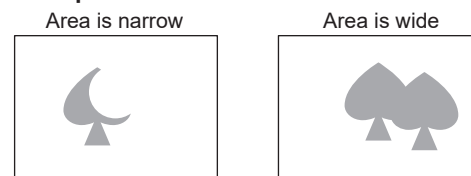


Processing and judgment during an operation



Compares the area of a target as defining an area of an “OK” image to 100 %.

Example when the result 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 for 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 an upper limit for the threshold. ☞ “Upper Limit” (page 4-56)

Color/Brightness Average Tool

A tool to calculate the matching rate in the color/brightness of a target to be examined in comparison to the color/brightness of a registered master image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.

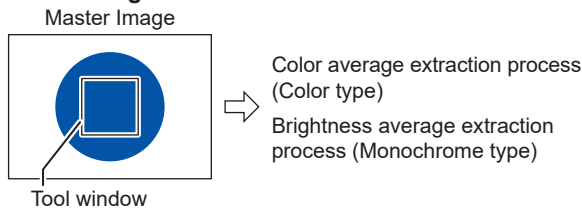
If the sensor is color type, the tool will be the Color Average tool. The system judges using a user-defined color.

If the sensor is monochrome type, the tool will be the Brightness Average tool. The system judges using a user-defined brightness.

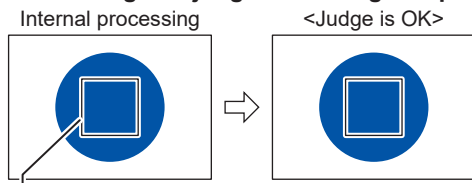
This tool is different from the Color Area/Area tool, as only the color/brightness is considered, and not the amount of pixels in the target area.

☞ "Color/Brightness Average Tool" (page 4-59)

Tool settings

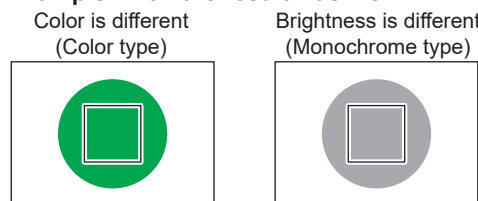


Processing and judgment during an operation



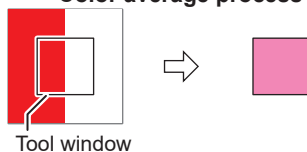
Compares the average color (color type) or brightness (monochrome type) inside a tool window with the color/brightness defined in the master image.

Example when the result was NG



- Reference**
- The matching rate is indicated in 0 to 100. 100 indicates that the color and brightness is completely matched. The matching rate decreases as the color or brightness of the target differs.
 - The average color/brightness value is extracted from inside the tool window. If there are multiple color/brightness values mixed inside the tool window, the average value is calculated according to the area. For example, if red and white are mixed, the color average will be pink.

Color average process



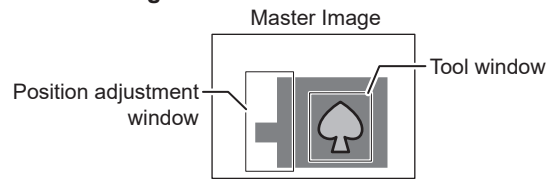
- Using in combination with the external master image registration function enables target changeover of the type of product to be performed easily.
 - ☞ "Input Settings" (page 7-13)
 - ☞ "Registering the Master Image" (page 11-11)

Position Adjustment tool

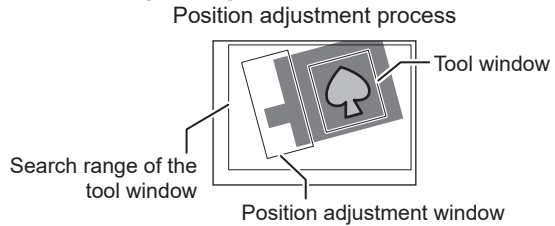
A tool to correct the differences in position of a target by searching for the outline information of a registered "OK" image. The position adjustment is used in conjunction with other detection tools.

☞ "Position Adjustment Tool" (page 4-66)

Tool settings



Processing during an operation



Point

- When the Position Adjustment tool is being used, the processing time will be longer.
- When using an Outline tool with a Position Adjustment tool, the search range position of the Outline tool will be adjusted. The outline of the target is searched in the adjusted search range and the searched outline will be judged.
- If position adjustment fails, the result of position adjustment is NG. In addition, all other detection tools will not perform their judgment process. Failure of position adjustment can be checked with the position adjustment status output. When position adjustment fails, review the position adjustment settings and position determining accuracy for a target.
 - ☞ "4. Output Assignment (Setting Details of Outputting to Output Line)" (page 4-147)
- When the Position Adjustment tool is added, the following settings for the detection tools that have been set will be changed.

Outline tool	When the search range is set as the entire range, field of view the search range will be initialized to the default value in which the position adjustment is enabled.
Color Area/Area tool	When the window shape is set to the entire range, the window shape will be initialized to the default value in which the position adjustment is enabled.
EdgePixels tool	When the window shape is set to the entire range, the window shape will be initialized to the default value in which the position adjustment is enabled.

- In standard mode, multiple position adjustment tools can be set in each program. If multiple position adjustment tools are set, you can set which position adjustment tool will be applied to each detection tool.

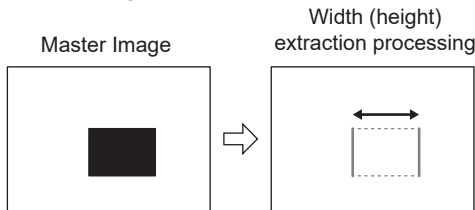
Advanced tools 1

Width tool

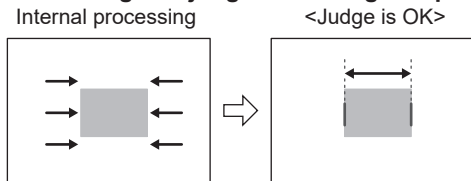
A tool to calculate the matching rate of the width of a target in comparison to the width of a registered "OK" image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.

☞ "Width Tool" (page 4-70)

Tool settings

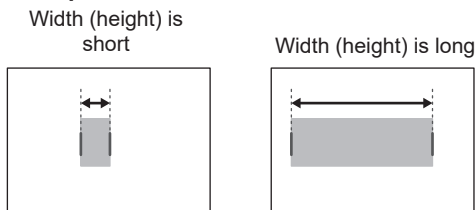


Processing and judgment during an operation



Find the width of a target from both directions.
Compares the width of a target by defining the width of an "OK" image as 100%.

Example when the result was NG



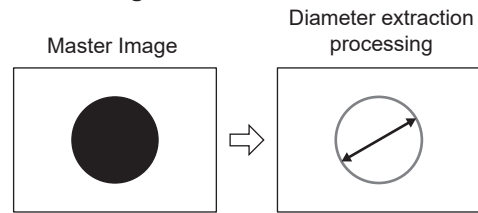
- ☞ Reference
- The matching rate is indicated in 0 to 200 (default). 100 indicates that the width is completely matched to the master image. The matching rate decreases as the width of a target shortens.
 - The setting for the display range and threshold for the matching rate can be changed to 0 to 100 or 0 to 999. If it changes to 0 to 100, set the threshold only for the lower limit.
- ☞ "Upper Limit" (page 4-73)

Diameter tool

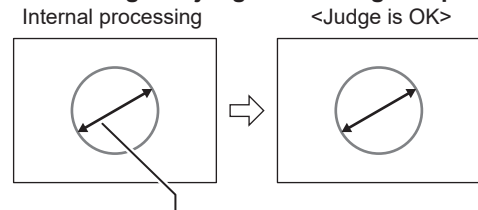
A tool to calculate the matching rate of the diameter of a target in comparison to the diameter of a registered "OK" image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.

☞ "Diameter Tool" (page 4-76)

Tool settings

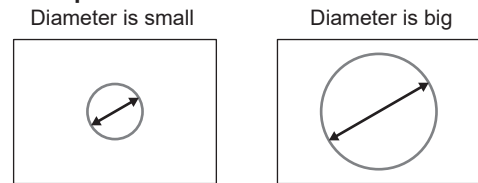


Processing and judgment during an operation



Compares the diameter of a target by defining the diameter of an "OK" image as 100%.

Example when the result was NG



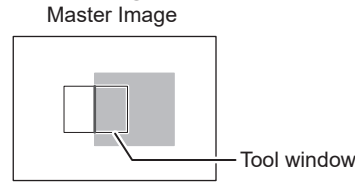
- ☞ Reference
- The matching rate is indicated in 0 to 200 (default). 100 indicates that the diameter is completely matched to the master image. The matching rate decreases as the diameter of a target decreases.
 - The setting for the display range and threshold for the matching rate can be changed to 0 to 100 or 0 to 999. If it changes to 0 to 100, set the threshold only for the lower limit.
- ☞ "Upper Limit" (page 4-78)

Edge tool

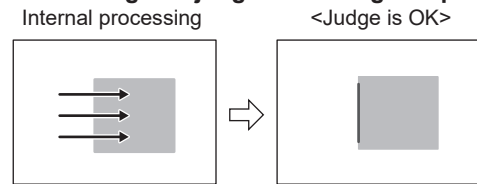
A tool to count and judge the number of edges for a registered "OK" image (Bright/Dark changes). The target is judged within the set region. The Edge tool judges whether a target is OK or NG by setting the threshold for the number of edges.

☞ "Edge Tool" (page 4-82)

Tool settings

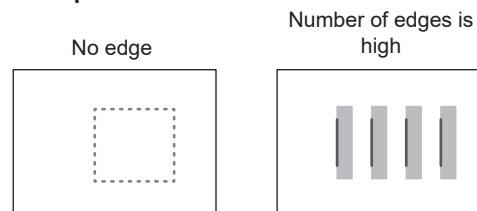


Processing and judgment during an operation



Search the target edge from one direction.
Rotate the tool window to set the direction to be examined.

Example when the result was NG



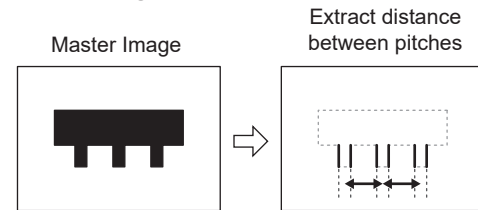
- Reference**
- Maximum value of the matching rate is adjusted automatically. The matching rate is indicated in the number of edges. 0 indicates that there is no edge in the window.
 - Up to 320 edges can be counted. Targets with 321 or more edges cannot be counted.
 - The setting for the display range and threshold for the matching rate can be changed to 0 to 5, 0 to 10, 0 to 20, 0 to 50, 0 to 128, 0 to 256, or 0 to 320. Also, a target can be judged by setting an upper limit for the threshold.
- ☞ "Upper Limit" (page 4-85)

Pitch tool

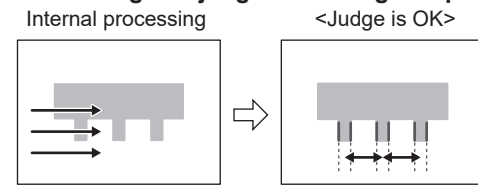
A tool to calculate the matching rate for the distance between pitches of a target in comparison to the average value of the distance between pitches of a registered "OK" image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.

☞ "Pitch tool" (page 4-86)

Tool settings

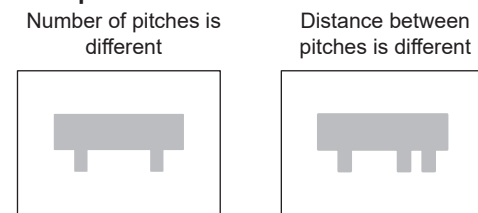


Processing and judgment during an operation



Compares the distance between pitches of a target by defining the average value of the distance between pitches of an "OK" image as 100%.

Example when the result was NG



- Reference**
- The matching rate is indicated in 0 to 200 (default). The average value of all the distances between pitches is 100. Among all of the distances between pitches, the one which deviates the most from the average value is displayed to show the matching rate.
 - Both maximum and minimum values of the distances between all the pitches are displayed in status gauge.
 - When the number of pitches is different from the number for master image, the matching rate is 0.
 - The maximum number of detectable pitches is 159 when the measurement mode is [Pin Pitch], and 160 when the measurement mode is [Pin Width]. More pitches cannot be detected.
 - The display range of matching rate and the setting range of threshold can be changed to 0 to 999.

Hi-Sp.Adj tool

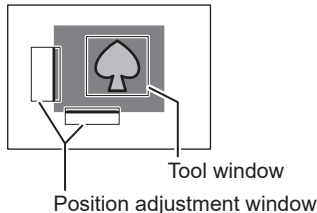
A tool to correct for differences in position of a target by searching the edge feature of a registered "OK" image. The Hi-Sp.Adj tool is used with other detection tools. Compared with the normal position adjustment tool, the Hi-Sp.Adj tool allows for a high speed adjustment process.

Select either 1-Axis Adjustment which corrects X axis position or Y axis position, or 2-Axis Adjustment which corrects both directions of X axis and Y axis.

☞ "High-Speed Position Adjustment Tool" (page 4-92)

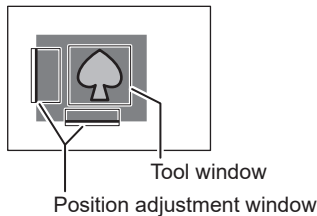
Tool settings

Master Image



Processing during an operation

Position adjustment process



Point

- By using Hi-Sp.Adj tool, processing time increase is smaller than that of the Position Adjustment tool.
- When using the Hi-Sp.Adj tool with an Outline tool, the high speed adjustment tool will adjust the search range. The outline of the target is searched in the adjusted search range and the searched outline will be judged.
- If the Hi-Sp.Adj fails, the result of the Position Adjustment tool is NG. In addition, all other detection tools will not perform their judgment process. Failure of Hi-Sp.Adj can be checked with the Hi-Sp.Adj output. Review the Hi-Sp.Adj settings and the position determining accuracy for a target.
- ☞ "4. Output Assignment (Setting Details of Outputting to Output Line)" (page 4-147)
- When the Hi-Sp.Adj tool is added, the following settings for the detection tools which have been set will be changed.

Outline tool	When the search range is set as the entire range, the search range will be initialized to the default value in which the Hi-Sp.Adj is enabled.
Color Area/ Area tool	When the window shape is set as the entire range, the window shape will be initialized to the default value in which the Hi-Sp.Adj is enabled.
EdgePixels tool	When the window shape is set as the entire range, the window shape will be initialized to the default value in which the Hi-Sp.Adj is enabled.

- In standard mode, multiple high-speed position adjustment tools can be set in each program. If multiple high-speed position adjustment tools are set, you can set which high-speed position adjustment tool will be applied to each detection tool.

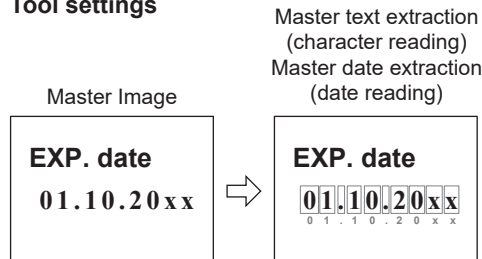
Advanced tools 2

OCR Tool

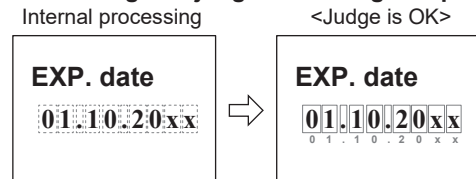
A tool used to determine whether the text and date of the object match the registered "OK" image text and date.

☞ "OCR Tool" (page 4-97)

Tool settings

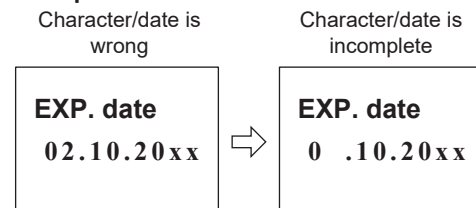


Processing and judgment during an operation



The text and date on the object are read and compared to the text and date on an "OK" image.

Example when the result was NG



- Reference**
- The matching rate is indicated as 0 or 100. If all the text or date match, 100 is displayed. If the text or date does not match, or the number of letters does not match, 0 is displayed.
 - If the shade contrast function is enabled, the matching rate may vary depending on the color shading, even if the text and date match. The lighter the printing is for the text and date, the lower the matching rate will be.

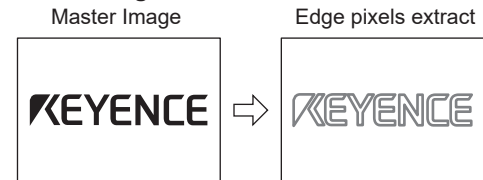
EdgePixels tool

A tool to calculate the matching rate of the number of edge pixels of a target in comparison to the number of edge pixels of a registered "OK" image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.

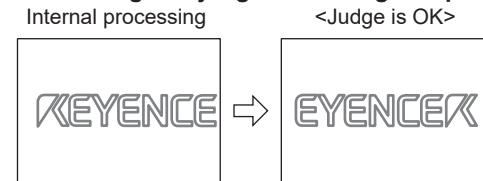
The EdgePixels tool differs from the Outline tool as the target shape is not considered.

☞ "EdgePixels tool" (page 4-105)

Tool settings

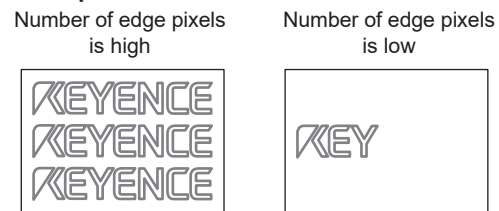


Processing and judgment during an operation



Compares the edge pixels of a target by defining edge pixels of an "OK" image as 100%.

Example when the result was NG



- 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 for 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 an upper limit for the threshold. ☞ "Upper Limit" (page 4-107)

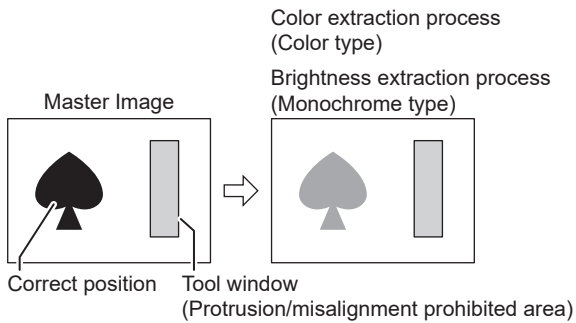
Color Prohibition/Brightness Prohibition tool

A tool that judges protrusions and misalignment of a target into the prohibition range. If protrusion or misalignment occurs into the range registered as the standard (100%) (protrusion/misalignment prohibited area), the matching rate decreases. Judges whether a target is OK or NG by setting the threshold for the matching rate.

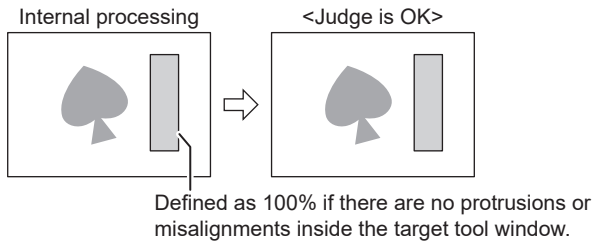
The system judges protrusions and misalignments by the area the target is protruding into the specified tool window. If the sensor is a color type, the system judges by the color area specified by the user. If it is a monochrome type, the system judges by the brightness area specified by the user.

☞ "Color Prohibition/Brightness Prohibition tool" (page 4-109)

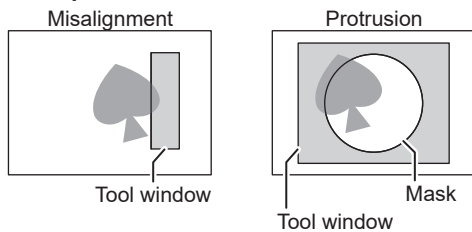
Tool settings



Processing and judgment during an operation



Example when the result was NG



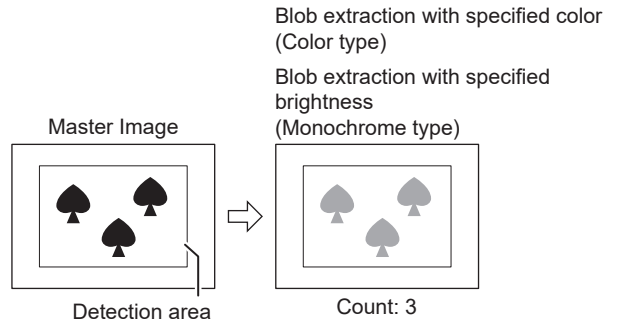
☞ **Reference** The matching rate is indicated in 0 to 100. 100 indicates that there are no misalignments or protrusions. The matching rate decreases the more the protruded and misaligned area (the area the target enters the protrusion prohibited area) increases.

Blob Count tool

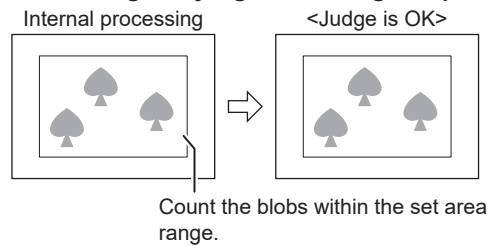
A tool to count the number of blobs of the extracted color (brightness) in a set area. Judges whether a target is OK or NG by setting the threshold to the number of blobs.

☞ "Blob Count Tool" (page 4-115)

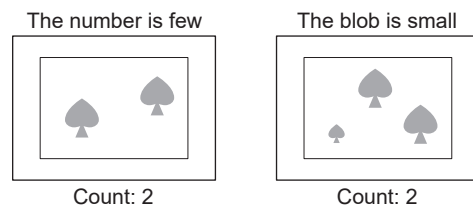
Tool settings



Processing and judgment during an operation



Example when the result was NG



- ☞ **Reference**
- The area range is set in Advanced Settings > Size Settings.
 - The upper limit of the number of counts is 200 per tool.

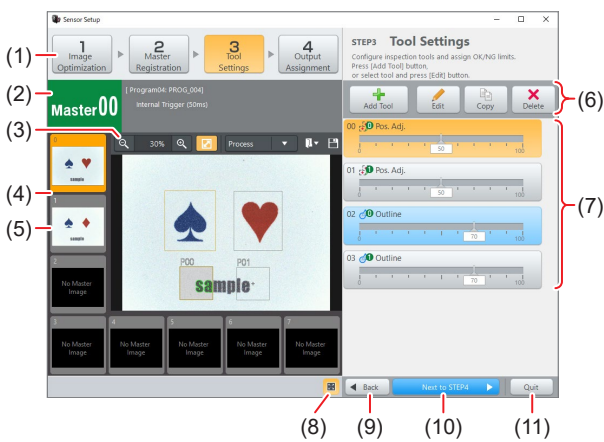
Main Screen for the Tool Settings

This section explains the main screen for the Tool settings.

When multiple masters is disabled



When multiple masters is enabled



(1) Navigation button

Moves steps in the Settings Navigator.

(2) [Image Type] display

□ “Image Types of the Settings Navigator” (page 4-5)

(3) Image tool bar

□ “Operation of the Image Tool Bar” (page 3-13)

(4) Master Image

Displays the master image and tool window. If a search range is set, a tool window which indicates the range (light blue) will be displayed.

(5) Master image list (only when multiple masters is enabled)

Displays the list of all master images.

(6) Tool settings button

Adds, edits, copies, or deletes the tool.

□ “Adding/Editing/Copying/Deleting a Tool” (page 4-36)

(7) Tool list

Displays a list of tools set in the program and a threshold for each tool.

When multiple masters is enabled, the master number (01 etc.) will be displayed for each tool, and the tools for unselected master images will be displayed in gray.

(8) All master images display <-> Single master image display switching button (only when multiple masters is enabled)

Controls whether to display or hide the master image list.

(9) [Back] button

Returns to the master registration screen.

□ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

(10) [Next to STEP4] button

Proceeds to the Output Assignment settings.

□ “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)

(11) [Quit] button

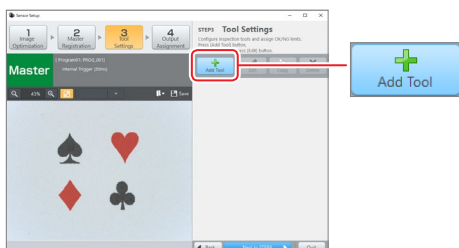
Finishes the Settings Navigator.

□ “Finishing the Settings Navigator” (page 4-7)

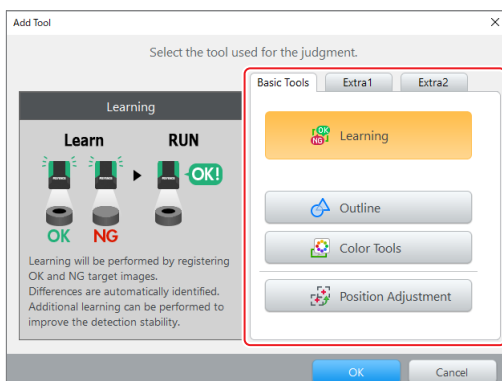
Adding/Editing/Copying/Deleting a Tool

Adding a Tool

1 Press [Add Tool].



2 Select the tool to be added and press [OK].



3 Adjust setting items for each tool.

● Basic Tools

□ “Learning tool” (page 4-41)

□ “Outline tool” (page 4-48)

□ “Color Area/Area tool” (page 4-52)

□ “Color/Brightness Average Tool” (page 4-59)

□ “Position Adjustment Tool” (page 4-66)

● Extra1

□ “Width Tool” (page 4-70)

□ “Diameter Tool” (page 4-76)

□ “Edge Tool” (page 4-82)

□ “Pitch tool” (page 4-86)

□ “High-Speed Position Adjustment Tool” (page 4-92)

● Extra2

□ “OCR Tool” (page 4-97)

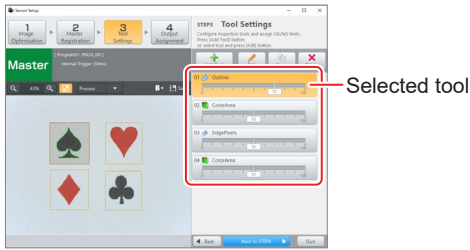
□ “EdgePixels tool” (page 4-105)

□ “Color Prohibition/Brightness Prohibition tool” (page 4-109)

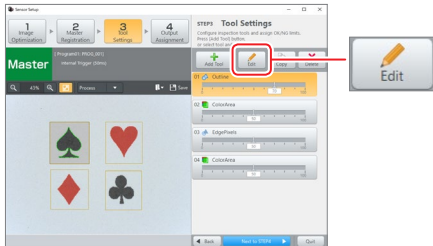
□ “Blob Count Tool” (page 4-115)

Editing a tool

1 Select a tool to edit the settings.



2 Press [Edit].



3 Edit setting items for each tool.

● Basic Tools

- 📖 "Learning tool" (page 4-41)
- 📖 "Outline tool" (page 4-48)
- 📖 "Color Area/Area tool" (page 4-52)
- 📖 "Color/Brightness Average Tool" (page 4-59)
- 📖 "Position Adjustment Tool" (page 4-66)

● Extra1

- 📖 "Width Tool" (page 4-70)
- 📖 "Diameter Tool" (page 4-76)
- 📖 "Edge Tool" (page 4-82)
- 📖 "Pitch tool" (page 4-86)
- 📖 "High-Speed Position Adjustment Tool" (page 4-92)

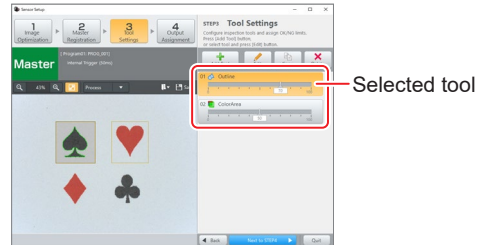
● Extra2

- 📖 "OCR Tool" (page 4-97)
- 📖 "EdgePixels tool" (page 4-105)
- 📖 "Color Prohibition/Brightness Prohibition tool" (page 4-109)
- 📖 "Blob Count Tool" (page 4-115)

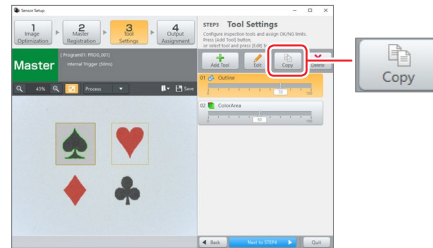
Copying a Tool

- ⚠ Point
 - Copies a tool which has been set, and pastes it to the same position. The Pos. Adj. tool and Hi-Sp.Adj tool cannot be copied.
 - If 64 tools are set, tools cannot be copied.

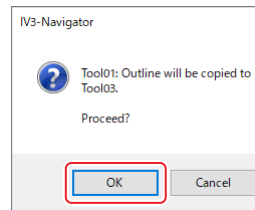
1 Select a tool to be copied.



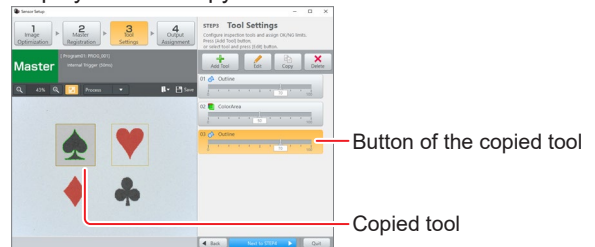
2 Press [Copy].



3 Press [OK].



The copied tool window will be selected and displayed in the copy source tool window.



Reference The next available tool number which has not been set will be automatically assigned as the copied tool number.

4 Press [Edit] and adjust the settings of the copied tool.

● Basic Tools

- ☐ “Learning tool” (page 4-41)
- ☐ “Outline tool” (page 4-48)
- ☐ “Color Area/Area tool” (page 4-52)
- ☐ “Color/Brightness Average Tool” (page 4-59)
- ☐ “Position Adjustment Tool” (page 4-66)

● Extra1

- ☐ “Width Tool” (page 4-70)
- ☐ “Diameter Tool” (page 4-76)
- ☐ “Edge Tool” (page 4-82)
- ☐ “Pitch tool” (page 4-86)
- ☐ “High-Speed Position Adjustment Tool” (page 4-92)

● Extra2

- ☐ “OCR Tool” (page 4-97)
- ☐ “EdgePixels tool” (page 4-105)
- ☐ “Color Prohibition/Brightness Prohibition tool” (page 4-109)
- ☐ “Blob Count Tool” (page 4-115)

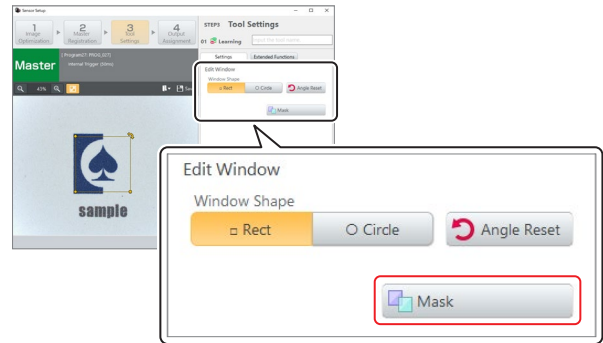
Common Setting Items for the Tool Settings

Mask settings

Adds a rectangular/circular mask region in the window frame.

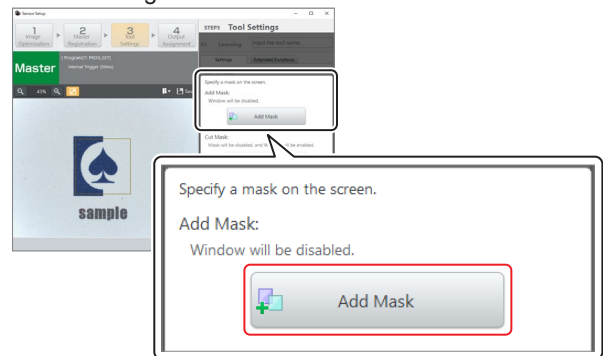
- Rect (default): Specifies a rectangular mask region or a mask cutting region.
- Circle: Specifies the area to mask the target or remove from the mask with a circular window.

1 Press [Mask].



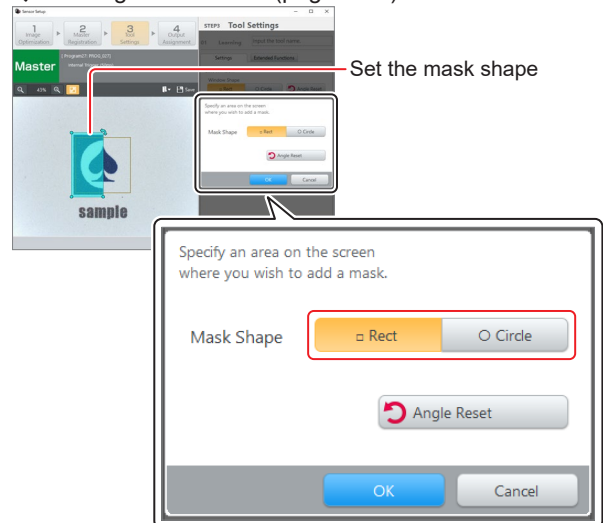
2 Press [Add Mask].

Area inside the mask region is excluded from a detection target.



3 Select the mask shape, position, size, and angle according to the target.

☐ “Editing the Window” (page 3-14)

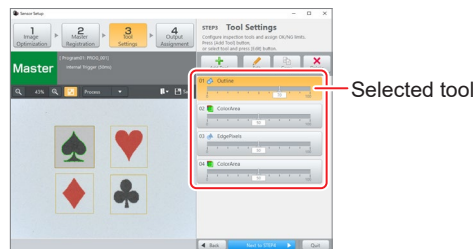


4 Press [OK].

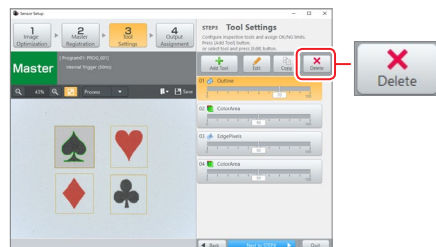
The system returns to the screen to set the mask region.

Deleting a tool

1 Select a tool to be deleted.



2 Press [Delete].



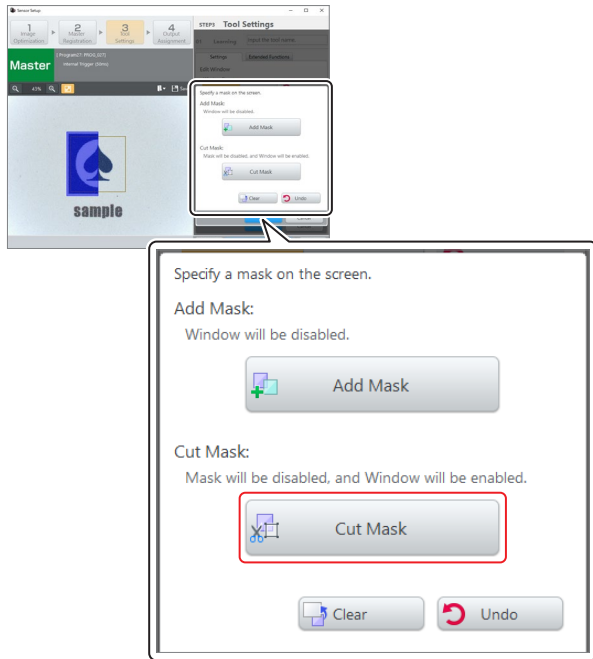
The confirmation screen opens.

3 Press [OK].

The selected tool will be deleted and the sensor returns to the main screen for the Tool settings.

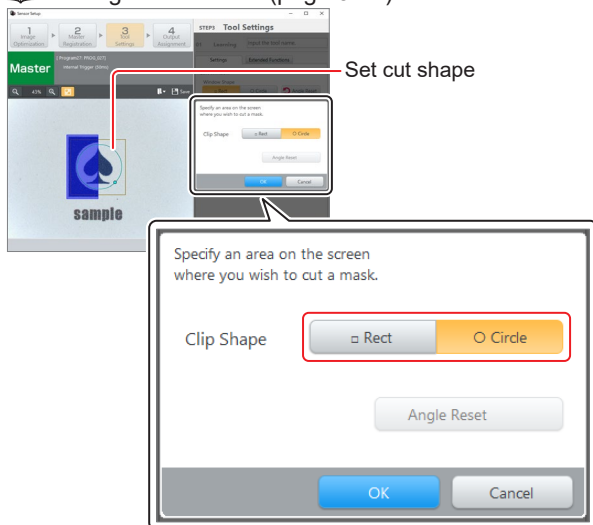
5 Press [Cut Mask] to cut a mask region.

Inside the region removed from the mask, the mask is disabled and detection is enabled.



6 Select the shape, position, size, and angle of the area to remove from the mask according to the target.

“Editing the Window” (page 3-14)



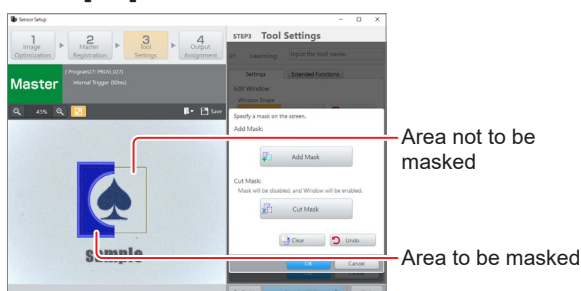
7 Press [OK].

The system returns to the screen to set the mask region.

8 Repeat steps 2 to 7 as needed to set the mask region.

Adding a mask or removing sections of the mask can be performed up to 20 times.

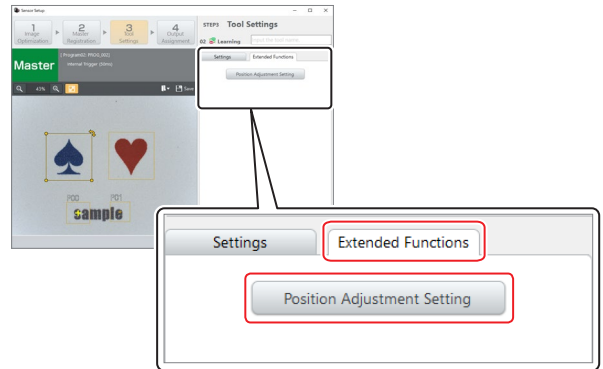
9 Press [OK].



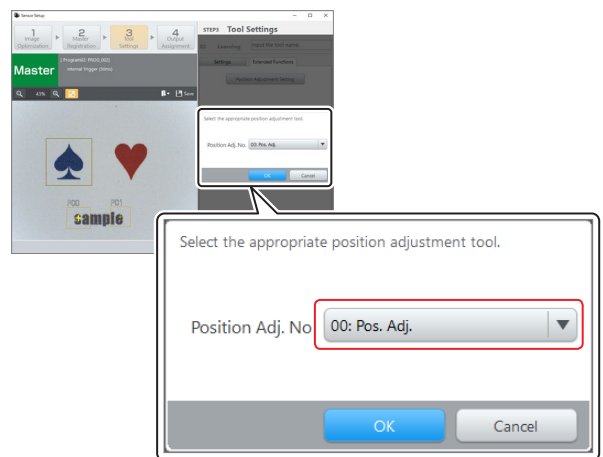
Position Adjustment Setting

If multiple position adjustment tools or high-speed position adjustment tools are set, you can select a position adjustment /high-speed position adjustment tool to be applied by each detection tool.

1 Press the [Extended Functions] tab → [Position Adjustment Setting] tab of the detection tool.



2 Select the number of the Position Adjustment/ High-Speed Position Adjustment tool to be applied from [Pos. Adj. No.].



When master image settings are disabled

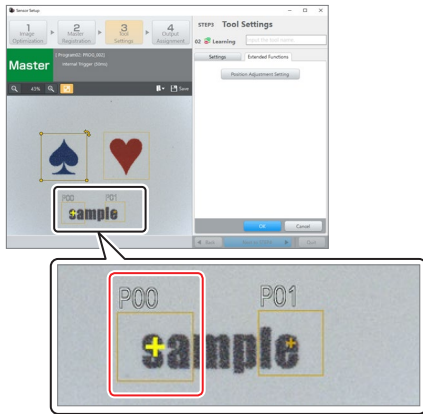
- The default value when setting the Position Adjustment/High-Speed Position Adjustment tool is [00: Pos. Adj.].
- The default value when not setting the Position Adjustment/High-Speed Position Adjustment tool is [00: (Not Set)].
- If [None] is selected, the Position Adjustment/High-Speed Position Adjustment tool will not be applied (Position adjustment will not be done).

When master image settings are enabled

- Only the Position Adjustment/High-Speed Position Adjustment tool on the same master image can be selected.
- The default is [None].
- If [Do Not Set] is selected, the Position Adjustment/High-Speed Position Adjustment tool will not be applied (Position adjustment will not be done).

3 Press [OK].

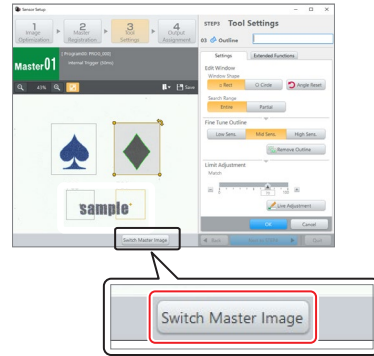
A “+” will appear on the position adjustment/high-speed position adjustment window applied to the currently selected detection tool.



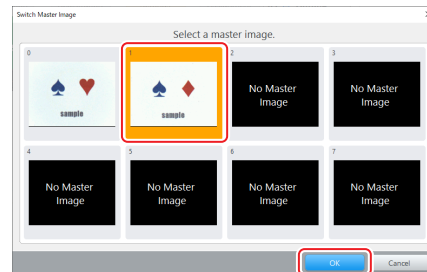
Switch Master Image (only when multiple masters are enabled)

When multiple masters are enabled, the master image to which to add a tool can be switched. This section explains it using an example of the [Outline] tool.

1 Press [Switch Master Image].



2 Select a master image on the master image switching screen, and press [OK].



The master image to which to add the tool will be switched.

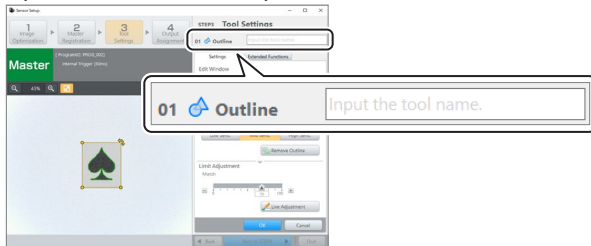
Tool Name Setting

Point If the display language (Page 7-30) is changed, characters may become unreadable.

A user-defined name such as a name of target can be set to tools (up to 16 characters). This section explains it using an example of the [Outline] tool.

1 Input any name into the text box.

Up to 16 characters in alphanumeric can be set.



The tool name can be confirmed in the main screen in [Run].

☞ “Chapter 5 Running” (page 5-1)

Learning tool

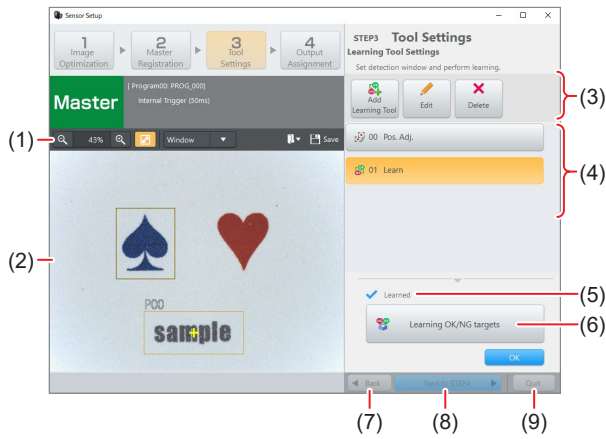
● Setting items for the Learning tool settings

Items		Description
Add Learning Tool	Window Shape	Select the window shape to specify the area of the target to detect.
	Mask	Adds a rectangular/circular mask region in the window frame. Areas inside the mask region are excluded from learning on the target to be detected. In addition, a mask cutting region can be added in the mask region. Inside the mask cutting region, the mask is disabled and it becomes the target of learning. Adding a mask or removing sections of the mask can be performed up to 20 times.
	Tool Name	A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. ☞ "Chapter 5 Running" (page 5-1)
Learning OK/NG targets	Add OK	Registers LIVE images as the OK target/NG target.
	Add NG	
	From File	Imports images to be registered as the OK target/NG target from files saved in the PC.
	From History	Imports images to be registered as the OK target/NG target from the image history.
	Start Learning	Learns the OK images/NG images.

● Setting items for the Learning tool settings (advanced settings)

Items		Description	Ref.
Add Learning Tool	Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the learning tool can be selected.	4-39
Learning OK/NG targets	Variable Brightness	Sets whether to register multiple images of different brightness when registering the OK target/NG target. To use variable brightness, the target must not be moving.	4-46

Learning tool settings screen



(7) [Back] button

Returns to the master registration screen.

☞ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

(8) [Next to STEP4] button

Proceeds to the Output Assignment settings.

☞ “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)

(9) [Quit] button

Finishes the Settings Navigator.

☞ “Finishing the Settings Navigator” (page 4-7)

(1) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(2) Master Image

Displays the master image, tool window for the learning tool, and position adjustment window for the position adjustment tool.

(3) Tool operation button

Adds, edits, or deletes the learning tool and position adjustment tool.

(4) Tool selection button

Selects the tool to confirm/edit/delete the setting contents.

(5) Condition Display

Displays the condition of the learning settings.

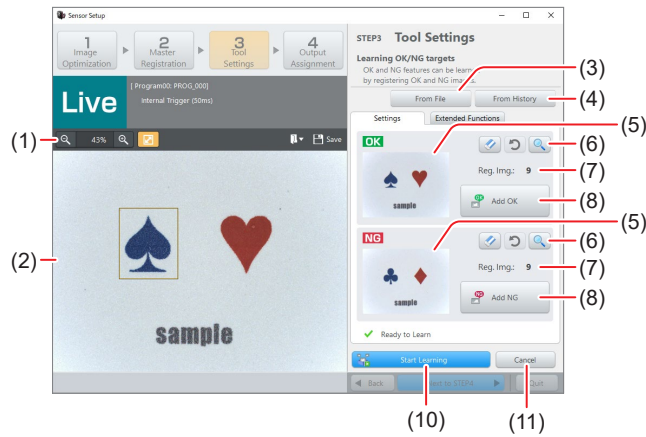
Display	Status
Learning Tool Not Set	The tool window for the learning tool is not set.
Not learned	OK work/NG work learning has not been completed.
Learned	OK target/NG target learning has been learned.
Relearning required	Relearning is needed because of a setting change.

(6) [Learning OK/NG targets] button

Performs the imaging and learning of OK/NG work.

☞ “OK/NG Target Learning for the Learning Tool” (page 4-44)

OK/NG Target Learning Screen



(1) Image tool bar

☞ "Operation of the Image Tool Bar" (page 3-13)

(2) Image taken by the sensor

Displays an image taken by the sensor.

(3) [From File] button

Registers an image saved in the PC as OK target or NG target.

☞ "Registration of Image Saved in PC" (page 4-47)

(4) [From History] button

Registers an image of the running image history as OK target or NG target.

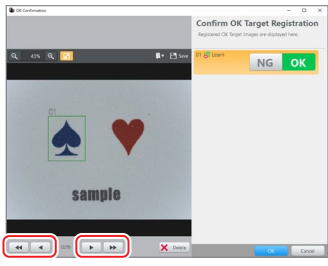
☞ "Registration of Image from the Image History" (page 4-46)

(5) Registered image

Displays the last registered image.

(6) Operation buttons

	Deletes all registered images.
	Deletes the last registered image so that it can be redone.
	The registered image can be expanded and checked. When registering multiple images, they can be confirmed with the move buttons.



(7) Number of images registered

Displays the number of images registered.

Reference If the learning brightness change is [ON], by registering the first image, nine images are registered including the brightness change images (eight images).

(8) [Add OK]/[Add NG] button

Press [Add OK] when registering a capture image as an OK target. Press [Add NG] when registering a capture image as an NG target.

Registers at least one image each. Repeat the operation so that multiple images can be registered as well.

(9) Condition Display

Ready to Learn ...OK target and NG target image registration have been completed, and the sensor is ready to start learning.

(10) [Start Learning] button

Starts the learning.

(11) [Cancel] button

Returns to the main screen of the learning settings.

Add Learning Tool

1 Start the Settings Navigator.

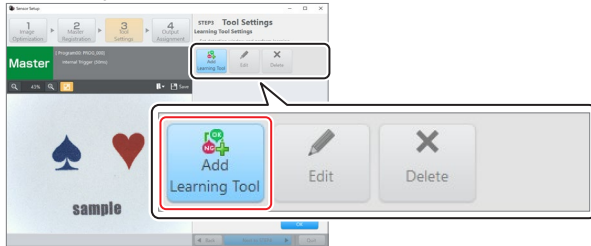
☞ “Starting the Settings Navigator” (page 4-4)

2 Display the learning tool settings screen.

☞ “Settings Navigator Screen and Operation Flow” (page 4-6)

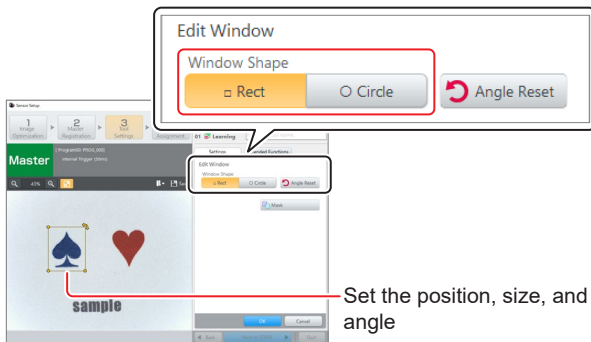
3 Press [Add Learning Tool].

The tool window settings screen for the learning tool will be displayed.



The tool window will be displayed on the master image. Select the window shape, position, size, and angle according to the target.

☞ “Editing the Window” (page 3-14)



Point

- The tool window size should be set according to the size of the image where the difference between an “OK” and “NG” target is clear.
 - ☞ “Optimizing the Size of the Tool Window” (page 6-19)
- If misalignment of the tool window occurs because of target position misalignment when optimizing the window, set the position adjustment tool.
 - ☞ “Position Adjustment Tool” (page 4-66)

OK/NG Target Learning for the Learning Tool

1 Press [Learning OK/NG targets].

☞ “Learning tool settings screen” (page 4-42)

2 Register [OK Target].

● Registration of Taken Image

☞ “Registration of Taken Image” (page 4-46)

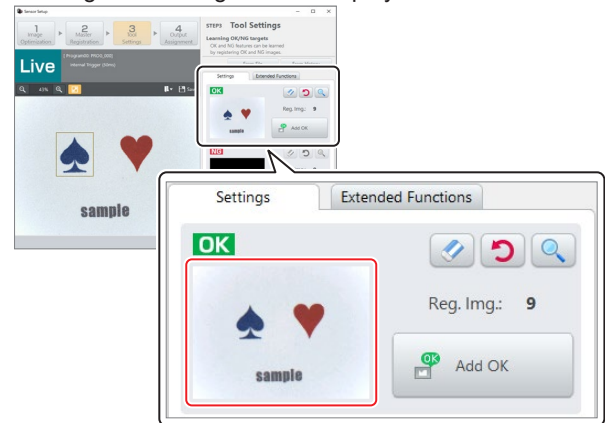
● Registration of Image from the Image History

☞ “Registration of Image from the Image History” (page 4-46)

● Registration of image saved in a file

☞ “Registration of Image Saved in PC” (page 4-47)

The registered image will be displayed.



Point

- If multiple learning tools are set, capture a target where all learning tool judgments are OK. Learning cannot be performed correctly on a target with mixed OK and NG judgments. In this case, perform additional learning.
- ☞ “Learning Multiple Images for Stability” (page 6-20)

4 Add or Adjust the [Mask] as needed.

☞ “Mask settings” (page 4-38)

5 Perform the position adjustment setting as needed.

☞ “Position Adjustment Setting” (page 4-39)

6 Perform the settings for the tool name as needed.

☞ “Tool Name Setting” (page 4-40)

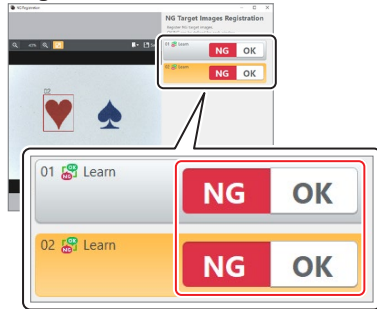
7 Press [OK].

The system returns to the learning tool settings screen.

3 Register [NG Target].

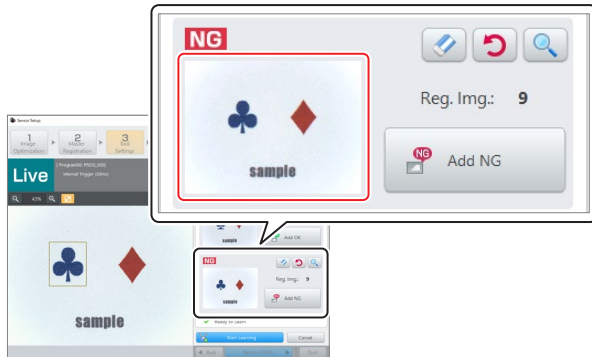
The registration method is the same as step 2.

- Point** When setting multiple learning tools, a screen for selecting OK or NG will appear for each learning tool at registering an NG target. Select OK or NG.



- Be sure to register a target or background to be judged as an NG in one of the multiple learning tools.

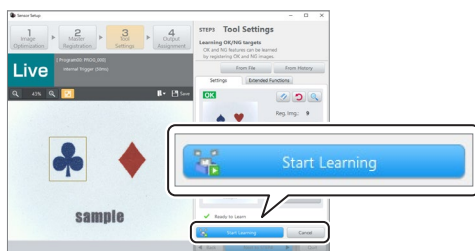
The registered image will be displayed.



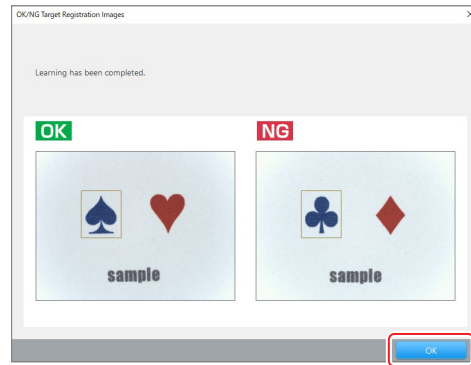
4 Repeat step 2 or step 3 when registering multiple images.

- Point** By capturing multiple images of different judgment criteria, the judgment stability will be improved automatically.
- “Learning Multiple Images for Stability” (page 6-20)

5 Press [Start Learning].

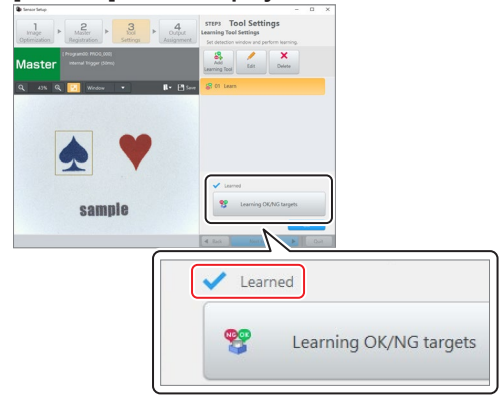


6 Check the registered image and press [OK].



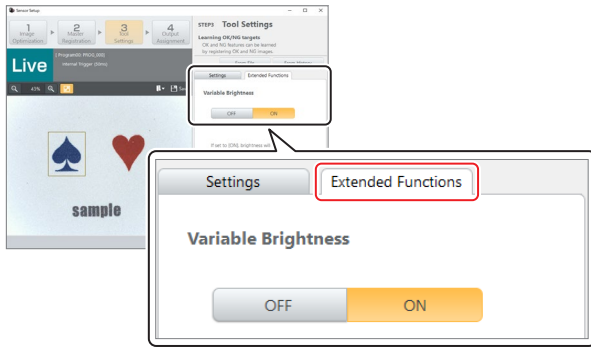
The system returns to the learning tool settings screen.

- Point** When the learning settings are completed, [Learned] will be displayed.



Registration of Taken Image

1 When changing the [Variable Brightness] setting, select the [Extended Functions] tab.



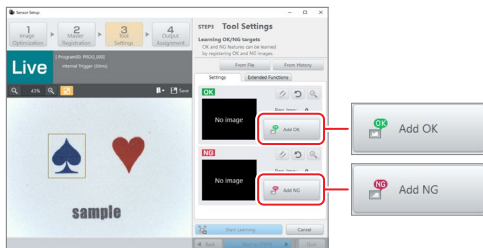
Reference Variable brightness can be ON in the following cases.

- During internal trigger
- When pressing [T] with external trigger set to image by using the internal trigger.

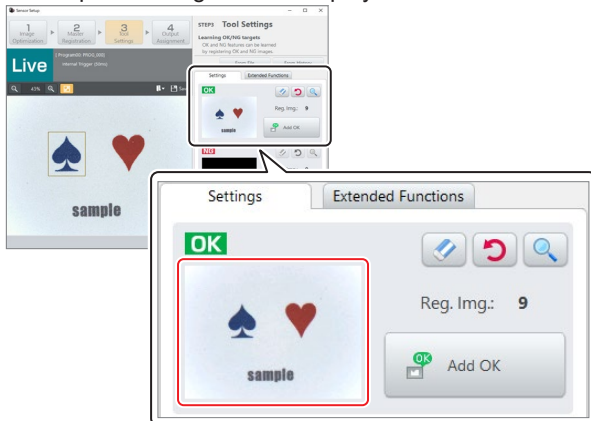
2 Image a target to be registered.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.
If an external trigger cannot be input, press [T] to take an image of the target by temporarily using the internal trigger.

3 Press [Add OK] or [Add NG].

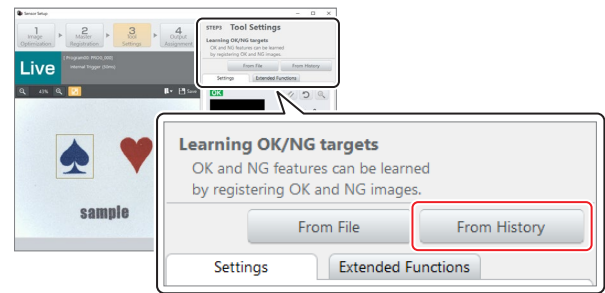


The captured image will be displayed.

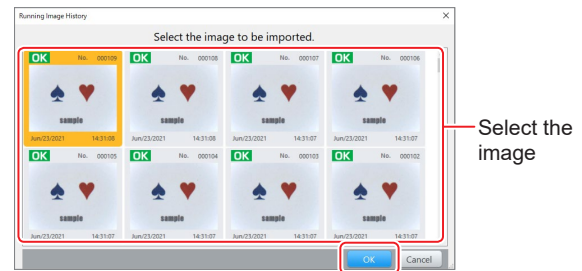


Registration of Image from the Image History

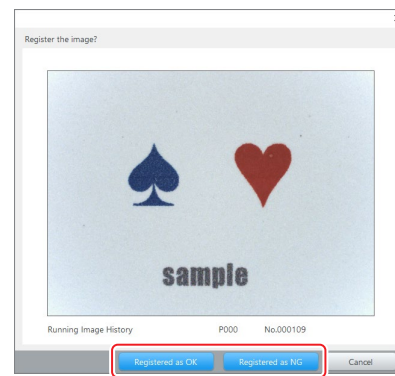
1 Press [From History].



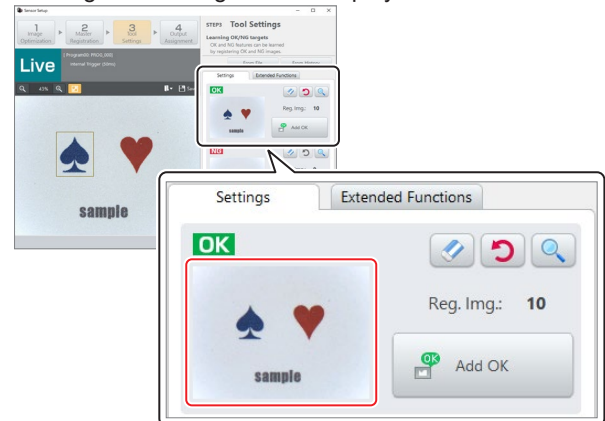
2 Select the image to be registered, and press [OK].



3 Press [Registered as OK] or [Registered as NG].

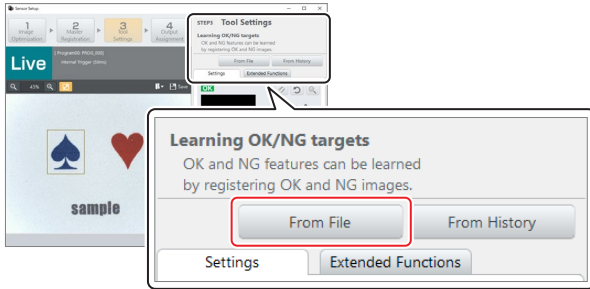


The registered image will be displayed.

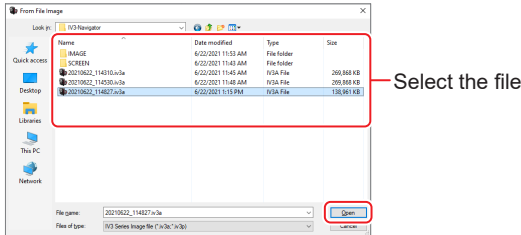


Registration of Image Saved in PC

1 Press [From File].



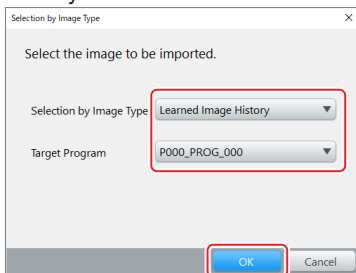
2 Select the file to be imported, and press [Open].



3 If a batch backup file (*.iv3a) or individual program backup file (*.iv3a) is selected, select the image type to be imported from the following.

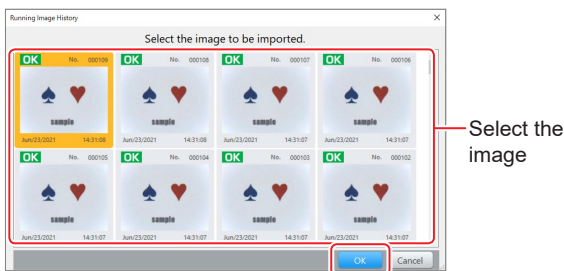
- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.



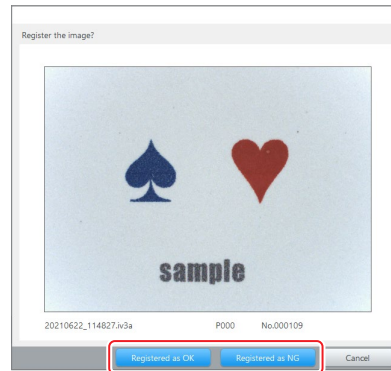
The list of images saved as the selected file image type will be displayed.

4 Select the image to be registered, and press [OK].

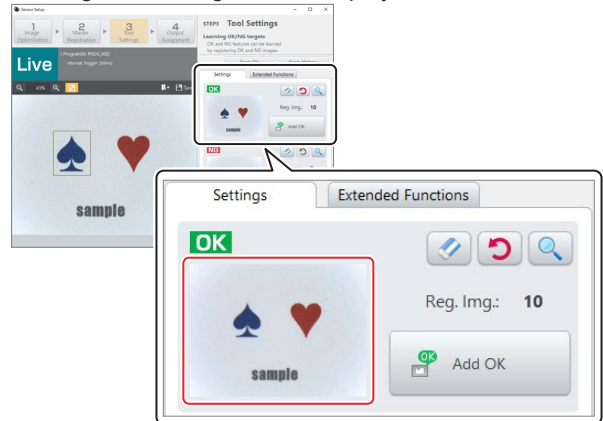


The registered image will be displayed.

5 Press [Registered as OK] or [Registered as NG].




The registered image will be displayed.



Outline tool

● Setting items for the Outline tool

Items		Description
Edit Window	Window Shape	Select the window shape used to specify the area of the target to be detected.
	Search Range	Specifies an area in which to search for the outline of a target. By specifying a narrower area as the search range, the processing time will be shortened.
Fine Tune Outline	Remove Outline	Judges by disabling an unnecessary outline which interrupts the stabilized detection. The disabled outlines can be specified by tracing the extracted outline.
	Sensitivity	The outline extraction sensitivity can be selected according to the target quality.
Limit Adjustment		Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)

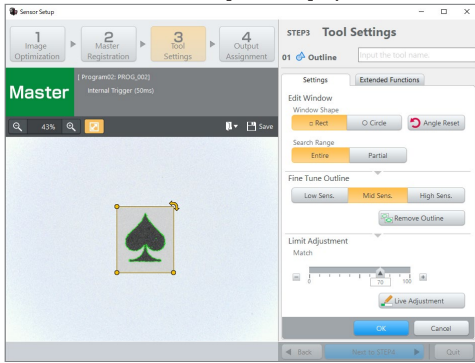
● Setting items for the Outline tool (advanced settings)

Items	Description	Ref.
Rotation Range	<p>Sets the range of rotation to search for the outline of the target. The system judges NG if an angle of the target exceeds its rotation range even if the target is the same shape.</p> <ul style="list-style-type: none"> • If the rotation range is set wide, the acceptable range of variation in the angles at which a target can be placed is wider. • If the rotation range is set narrow, the processing time can be shortened. • The direction of the target can be judged by limiting the rotation range. 	4-51
Search Algorithm	The detection mode of the Outline tool can be changed depending on the inspection requirements.	4-51
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Outline tool can be selected.	4-39

Setting the Outline Tool

1 Add the [Outline] tool.

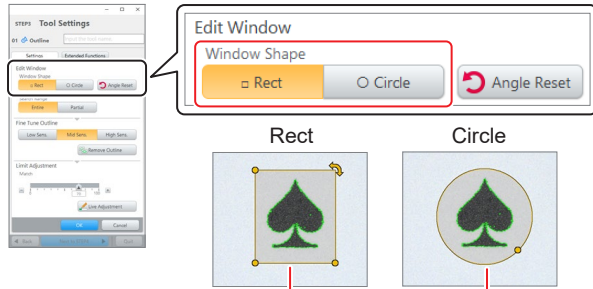
“Adding a Tool” (page 4-36)
The main screen for [Outline] opens.



2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.



Set the position, size, and angle

Reference The window angle can be reset using the [Angle Reset] button.

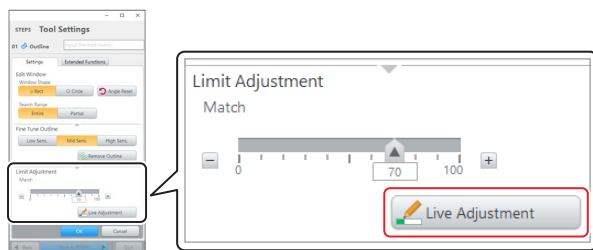
3 Set the search range as needed.

“Search Range Settings” (page 4-50)

4 Adjust the outline as needed.

“Settings for Disabling Outlines” (page 4-50)
“Setting a Sensitivity” (page 4-50)

5 Press [Live Adjustment].



The sensor changes to the test operation.

6 Take an “OK” image and a “NG” image.

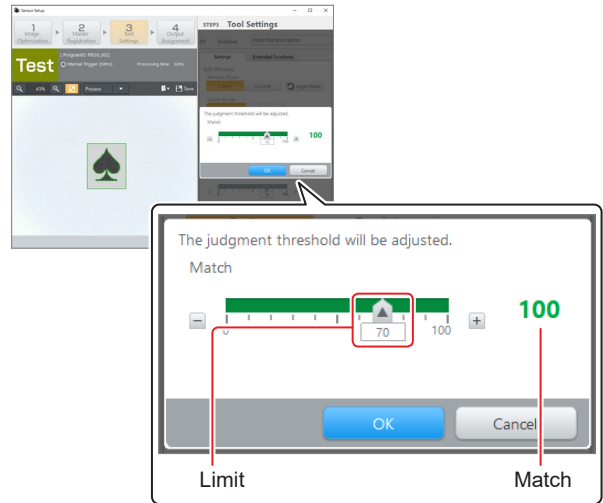
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate 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.
 - A matching rate of 100 indicates that an outline is completely matched. The matching rate decreases with differences between the outline of the target and the master image.
- “Selecting the Display Method of the Tool Window” (page 5-7)
“Editing Numbers” (page 3-15)
“Adjusting Thresholds for Judgment” (page 6-15)
“Matching Rate of the Outline Tool and Position Adjustment Tool” (page A-6)

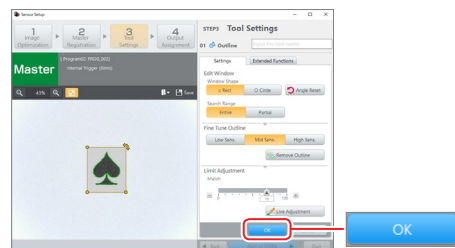
8 Press [OK].

The system returns to the main screen of [Outline].

9 Set the tool name as needed.

“Tool Name Setting” (page 4-40)

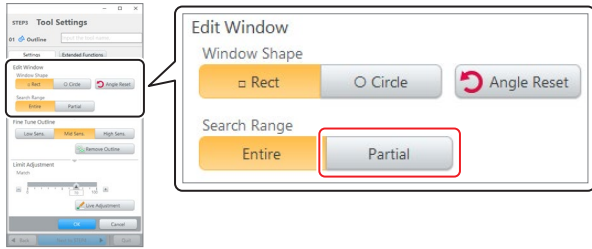
10 Press [OK].



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

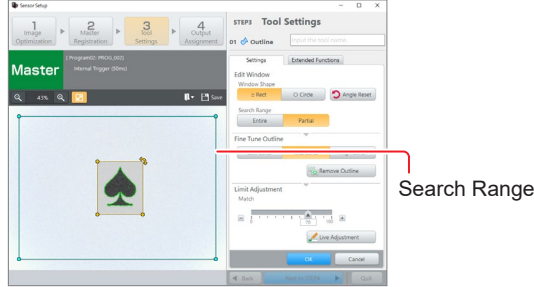
Search Range Settings

1 Press [Partial].



2 Set the tool window to indicate the search range.

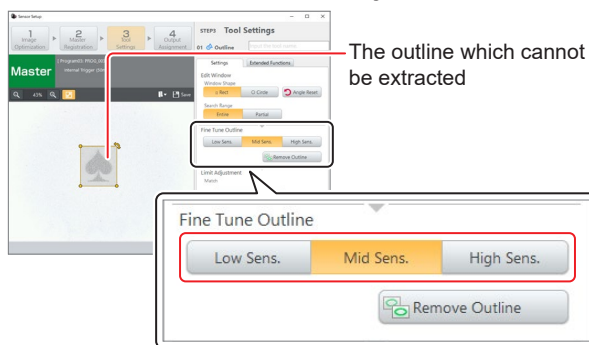
“Editing the Window” (page 3-14)



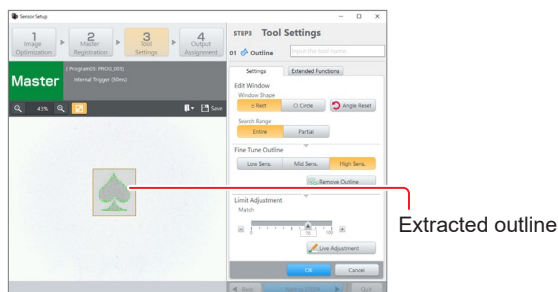
Reference The search range cannot be rotated.

Setting a Sensitivity

1 Select the extraction sensitivity of the outline.

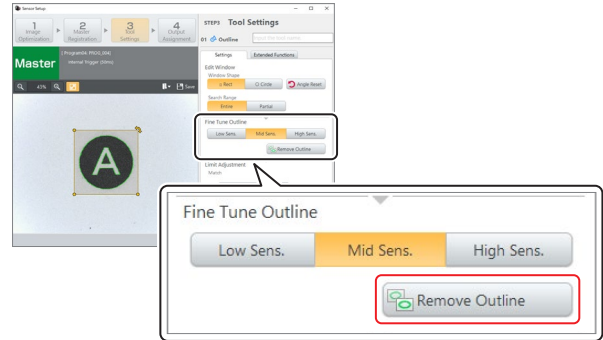


2 Confirm the condition of the outline extraction, which changes according to the selected [Sensitivity].



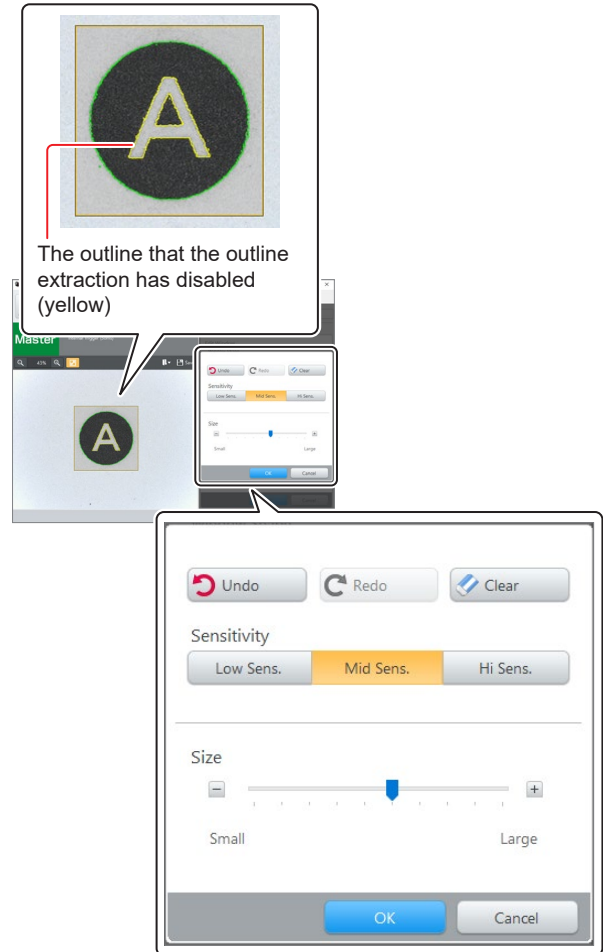
Settings for Disabling Outlines

1 Press [Remove Outline].



2 Specify the unnecessary outline by dragging with the mouse.

The specified outline changes from green to yellow.



Reference

- The size of the mouse cursor when specifying the unnecessary outlines can be changed in [Size].
- The [Undo] button is applicable up to 20 times.

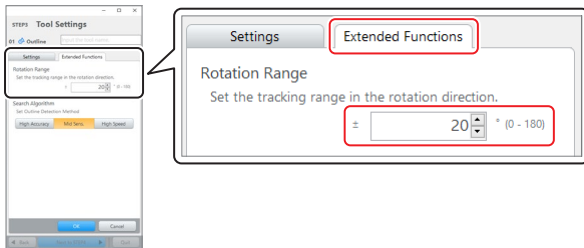
3 When setting is completed, press [OK].

The system returns to the main screen of [Outline].

Advanced settings for the Outline Tool

■ Rotation Range

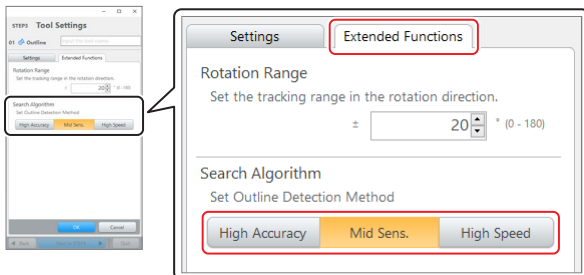
- 1 Select the [Extended Functions] tab and set the rotation range.



- 2 Press the [Settings] tab.
The system returns to the main screen of [Outline].

■ Search Algorithm

- 1 Select the [Extended Functions] tab and select the search algorithm type (High Accuracy/Mid Sens./High Speed).



- Point**
- Select [High Accuracy] when detection is not stable because of a small difference in the matching rate of an “OK” and “NG” image.
 - Select [Mid Sens.] when detection is not stable because of the influence of an unnecessary outline other than the target such as the background.
 - Select [High Speed] to shorten the processing time.

- 2 Press the [Settings] tab.
The system returns to the main screen of [Outline].

Color Area/Area tool

● Setting items for the color area/area tool

Items		Description
Edit Window	Window Shape	Selects the window shape to specify an area of the target to be extracted.
	Mask	Adds a rectangular/circular mask region in the window frame. The area inside the mask region is excluded from the area extraction target. In addition, a mask cutting region can be added in the mask region. Inside the region removed from the mask, the mask is disabled and the area extraction is enabled. Adding a mask or removing sections of the mask can be performed up to 20 times.
Color Extraction (For color type)	Extract Color from Image	Press the area on the master image to extract the color and set the extraction range.
	Extraction Area Adjustment	Expands or reduces automatically the extraction area of the color extracted.
	LIVE image	The color range to be extracted can be set using the Live image of the target. In addition, the range of color to be extracted can be based on the image in the image history or from an image on a saved file.
Brightness Extraction (For monochrome type)	Extract Brightness from Image	Press the area on the master image to extract the brightness and set the extraction range.
	LIVE image	A brightness range to be extracted can be set using the Live image of the target.
Limit Adjustment		Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
Upper Limit	Upper Limit	Enables an upper limit on the threshold. Enable when OK/NG judgment is desired for a situation when the target area is larger than the area extracted from the master image.
	Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. ☞ "Chapter 5 Running" (page 5-1)

● Setting items for the color area/area tool (advanced settings)

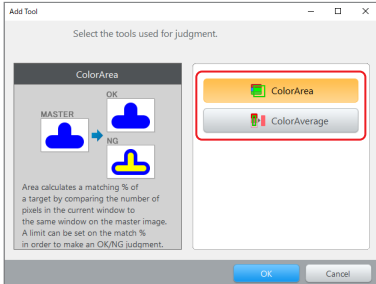
Items	Description	Ref.
Advanced Color Extraction (For color type)	<ul style="list-style-type: none"> • Color type Specifies a color to be extracted using HSV (H: Hue, S: Saturation, V: Brightness). 	4-57
Advanced Brightness Extraction (For monochrome type)	<ul style="list-style-type: none"> • Monochrome type Specifies the brightness value to be extracted. 	
LIVE image	The color/brightness range to be extracted can be set using the Live image of the target.	
Fixed Reference Area	Select the condition for which the matching rate of the Color Area/Area is 100%.	4-58
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Color Area/Area tool can be selected.	4-39

Setting the Color Area/Area Tool

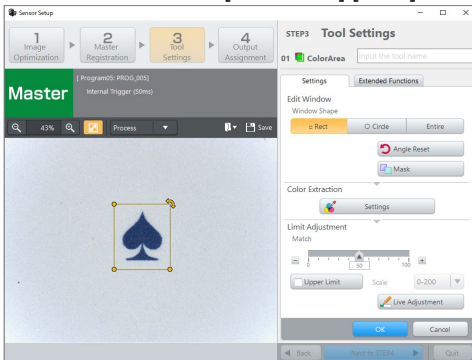
1 Add the [ColorArea] tool (color type) or [Area] tool (monochrome type).

In the screen that appears by selecting [Color Tools], select [ColorArea] or [Area] and press [OK].

📖 “Adding a Tool” (page 4-36)



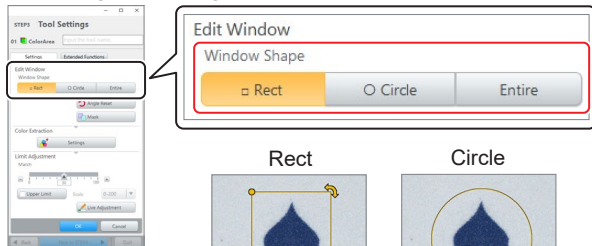
The main screen for [ColorArea]/[Area].



2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.



Set the position, size, and angle

When [Entire] is selected, the tool window will be hidden.

Reference The window angle can be reset using the [Angle Reset] button.

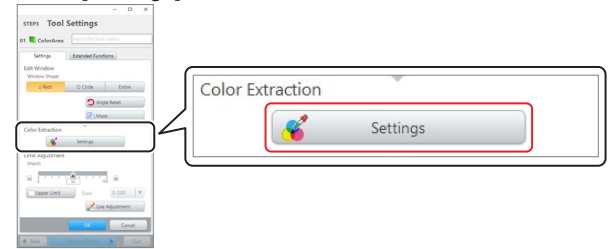
3 Apply the mask as needed.

📖 “Mask settings” (page 4-38)

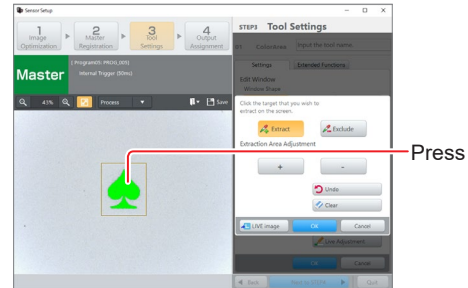
4 Set the area to extract from the target.

● For color type

Press [Settings] of the color extraction.



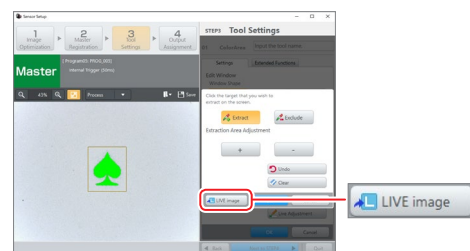
The screen to select a color to be extracted opens. Press the color to be the reference of judgment for the area.



The pressed color will be extracted.

- If the areas of color that have not been extracted are pressed repeatedly, the extraction range can be increased.
- Press [Exclude] to specify the color to exclude from the extracted color.
- Press the [+] / [-] of the extraction area adjustment, and the range of color to be extracted can be expanded / reduced.
- Press [Undo] to cancel the previous operation (UNDO).
- To re-extract the color, press [Clear] and then press the color to be the reference of judgment again.
- By pressing [LIVE image], the range of color to be extracted can be set based on the file image saved in the Live image/Running image history/PC of the target.

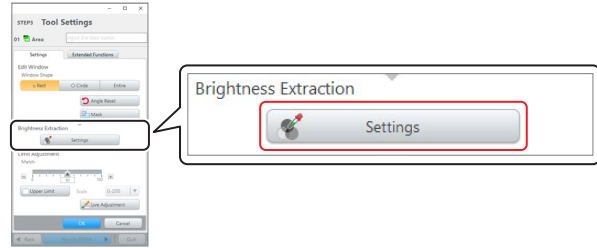
📖 “Adjusting in the Live Image” (page 4-55)



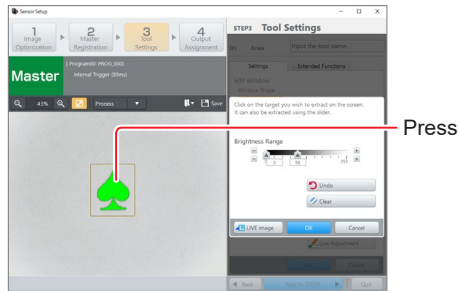
When setting is completed, press [OK]. The system returns to the main screen for [ColorArea].

● For monochrome type

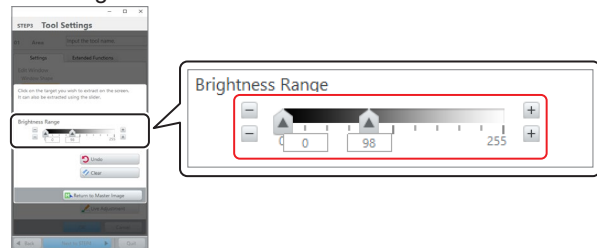
Press [Settings] of the brightness extraction.



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

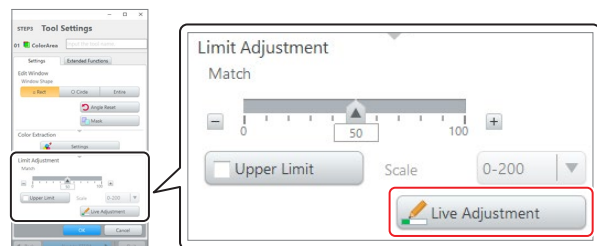


- The pressed brightness will be extracted.
- If the areas of brightness that have not been extracted are pressed repeatedly, the extraction range can be expanded.
 - Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
- 📖 “Editing Numbers” (page 3-15)
Pressing [+] / [-] can set the upper and the lower limit of brightness in a range within 0 to 255 with the extracted brightness as a reference.
- Press [Undo] to cancel the previous operation (UNDO).
 - To re-extract the brightness, press [Clear] and then press the color to be the reference of judgment again.
 - By pressing [LIVE image], the range of brightness to be extracted can be set based on the Live Image of the target.



When setting is completed, press [OK]. The system returns to the main screen for [Area].

5 Press [Live Adjustment].



The sensor changes to the test operation.

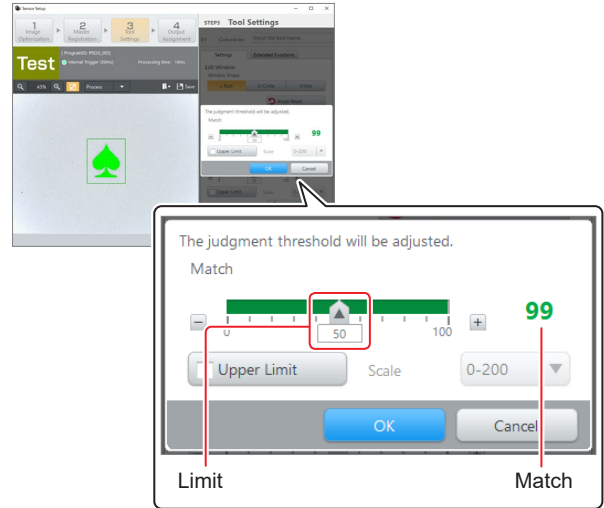
6 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger. If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate 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.
 - The matching rate is 100 when an area matches perfectly. This becomes smaller with a narrower area and larger with a wider area. If the matching rate exceeds the upper limit of the threshold range, the matching rate will display as the upper limit of the threshold range.
- 📖 “Selecting the Display Method of the Tool Window” (page 5-7)
📖 “Editing Numbers” (page 3-15)
📖 “Shortening the Processing Time” (page 6-26)

8 Set the upper limit as needed.

📖 “Upper Limit” (page 4-56)

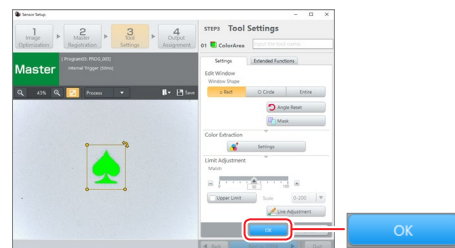
9 When setting is completed, press [OK].

The system returns to the main screen for [ColorArea]/[Area].

10 Set the tool name as needed.

📖 “Tool Name Setting” (page 4-40)

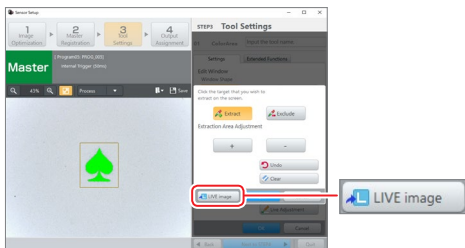
11 Press [OK].



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

Adjusting in the Live Image

1 Press [LIVE image].

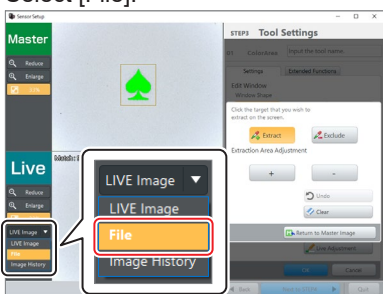


The Master image (top) and Live image (bottom) are displayed. When adjusting with the LIVE image, go to step 3.

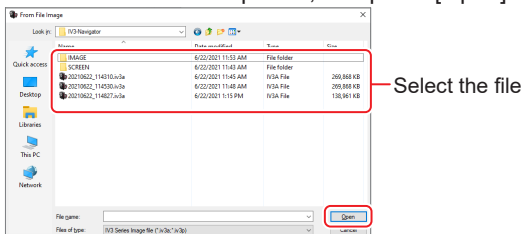
2 When adjusting with other than the Live image, press the drop-down menu to import the image.

When importing from a file saved in the PC

Select [File].



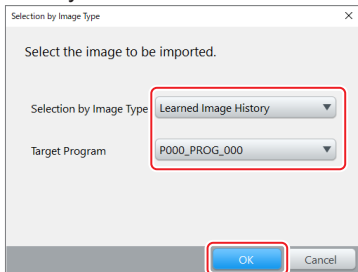
Select the file to be imported, and press [Open].



When selecting a batch backup file (*.iv3a) or individual program backup file (*.iv3a), select the image type from the following, and press [OK].

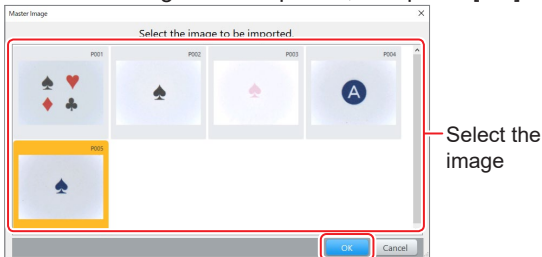
- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.

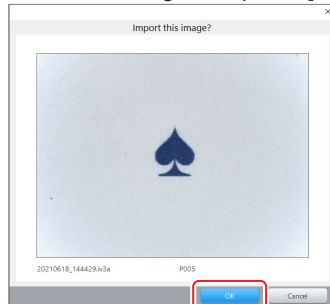


The list of images saved as the selected file image type will be displayed.

Select the image to be imported, and press [OK].



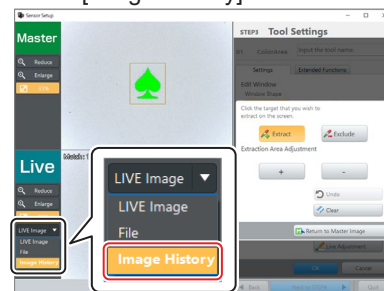
Check the image and press [OK].



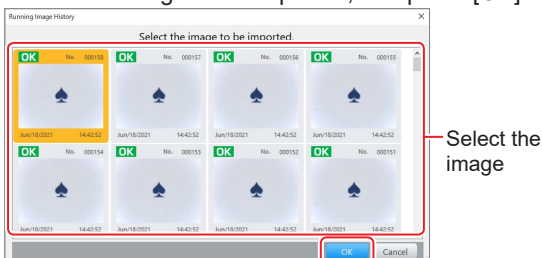
The imported image will be displayed on the bottom side of the screen.

When importing from the running image history

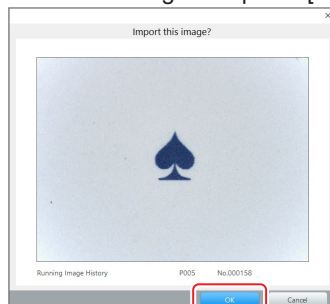
Select [Image History].



Select the image to be imported, and press [OK].

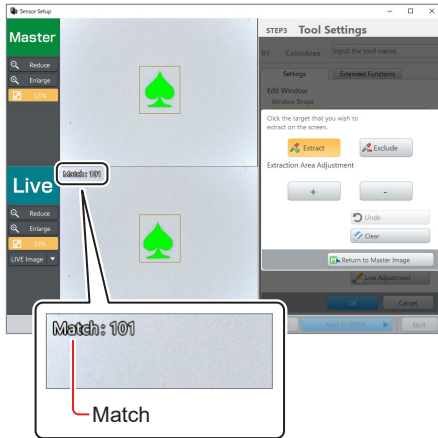


Check the image and press [OK].



The imported image will be displayed on the bottom side of the screen.

3 Adjust the color extraction area by checking the matching rate.



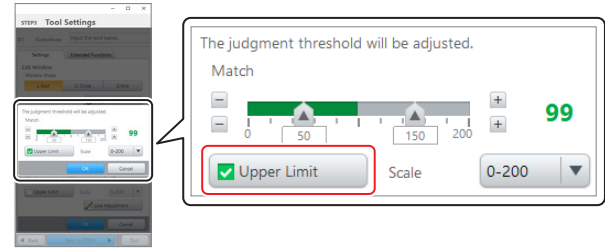
By selecting the [Extract] or [Exclude] button and pressing on an image (Master/Live/Log), the color extraction area can be adjusted.

- Press [Extract], and if the areas of color that have not been extracted are pressed repeatedly, the extraction range can be expanded.
- Press [Exclude] to specify the color to exclude from the extracted color.
- Press [+] / [-], and the range of color to be extracted can be expanded/reduced.
- To re-extract the color, press [Clear] and then press the color to be the reference of judgment again.

4 After setting is completed, press [Return to Master Image].

Upper Limit

1 Switch the check box to ON for [Upper Limit].

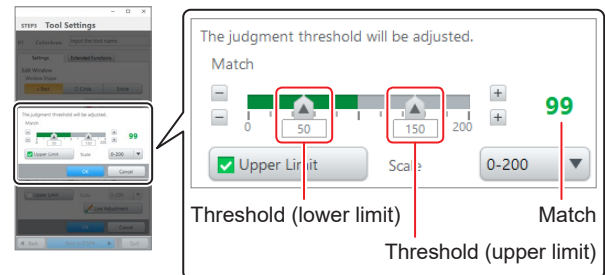


The sliders to set the upper limit and the lower limit of the threshold will be displayed.

Select the Settings scale from [0-200] or [0-999] according to the range of the matching rate necessary for judgment.

OFF (default)		Sets the upper and the lower limit of the threshold in a range within 0 to 100.
ON	0-200 (default value)	Sets the upper and the lower limit of the threshold in a range within 0 to 200.
	0-999	Sets the upper and the lower limit of the threshold in a range within 0 to 999. The slider movement unit is 5.

2 Adjust the threshold for anomaly detection by checking the matching rate.



- Reference**
- A target is detected as OK if the matching rate is between the lower limit and the upper limit, and detected as NG if the matching rate is greater than the upper limit or smaller than the lower limit.
 - The matching rate is 100 when an area matches perfectly. This becomes smaller with a narrower area and larger with a wider area. If the matching rate exceeds the upper limit of the threshold range, the matching rate will display as the upper limit of the threshold range.
- 📖 “Selecting the Display Method of the Tool Window” (page 5-7)
 - 📖 “Editing Numbers” (page 3-15)
 - 📖 “Adjusting Thresholds for Judgment” (page 6-15)

3 When setting is completed, press [OK].

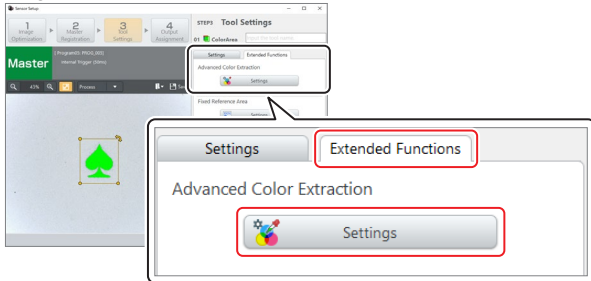
The system returns to the main screen for [ColorArea]/[Area].

Advanced settings of the ColorArea/Area Tool

Advanced Color Extraction/Advanced Brightness Extraction

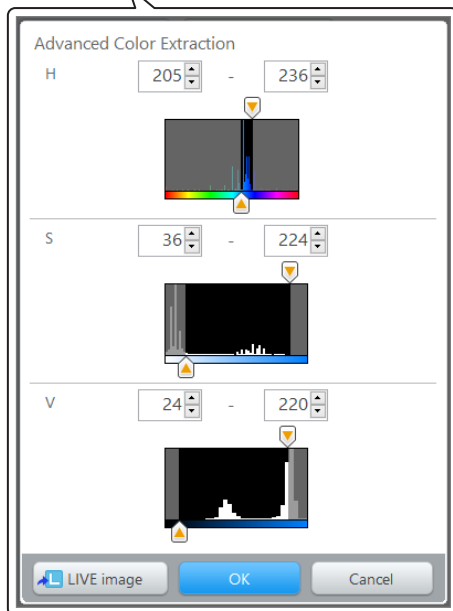
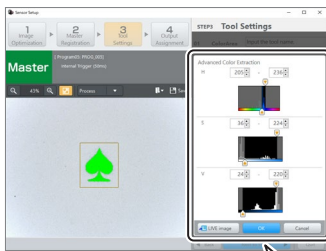
1 Select the [Extended Functions] tab and press [Settings] of [Advanced Color Extraction].

For a monochrome type, press [Settings] of [Advanced Brightness Extraction].



2 Specify a color or brightness of the extraction target.

● For color type



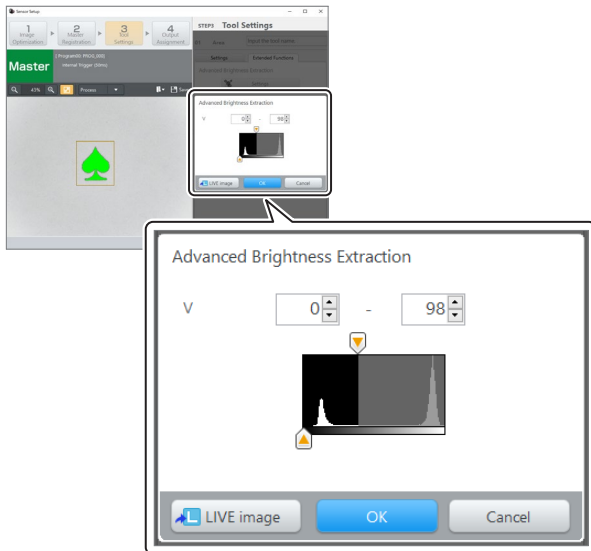
Reference

- You can adjust the value by slider while confirming the color histogram. The values within the range specified by the sliders will be used as the brightness.
- The vertical axis indicates the extracted pixel.
- Among the pixels of each color to be extracted, the maximum one becomes the maximum value of the vertical axis.
- The range and extraction rules in the color extraction detailed settings are shown as follows.

	Set the upper limit and lower limit for the range of 0 to 359.
H	<ul style="list-style-type: none"> Lower limit ≤ Upper limit The extraction range of a color is from the lower limit to the upper limit. Lower limit > Upper limit The extraction range of a color is from 0 to the upper limit, and from the lower limit to 359.
S	Set the upper limit and lower limit for the range of 0 to 255.
V	The extraction range of a color is from the lower limit to the upper limit.

- By pressing [LIVE image], the range of the extracted color can be set based on the Live Image of the target.

● For monochrome type



- Reference
- Adjust the value by slider while confirming the monochrome histogram. The values within the range specified by the sliders will be used as the brightness.
 - The vertical axis indicates the extracted pixel. Among the extracted pixels of each brightness, the one that has the most pixels becomes the maximum value of vertical axis.
 - The range and extraction rules in the extraction detailed settings are shown as follows.

V	Set the upper limit and lower limit for the range of 0 to 255. The extraction range of the brightness is from the lower limit to the upper limit.
---	--

- By pressing [LIVE image], the range of brightness to be extracted can be set based on the Live Image of the target.

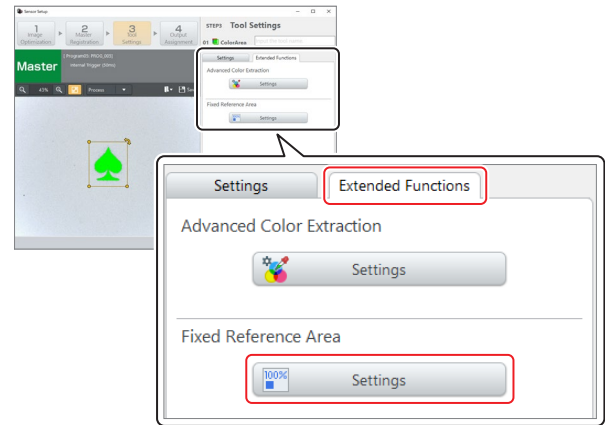
3 Press [OK].

The system returns to the main screen for [ColorArea]/[Area].

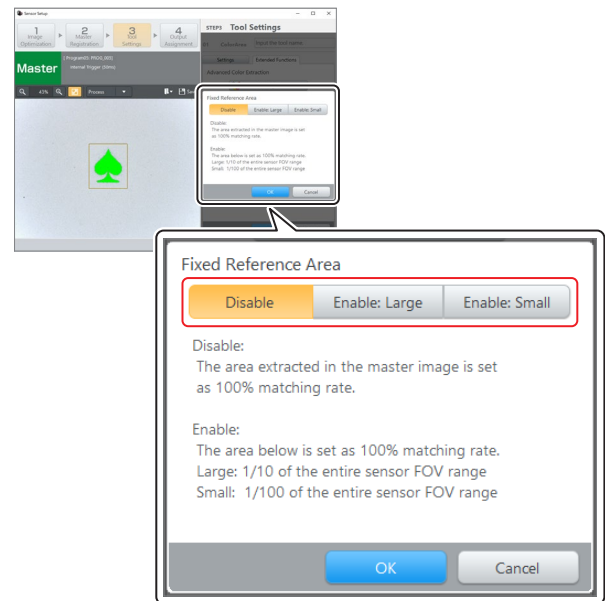
■ Fixed Reference Area

- Reference
- Select [Enable] if the master image does not contain the color/brightness to be used for judgment.
 - Color Prohibition/Brightness Prohibition tool (page 4-109) is helpful for judging target protrusions and misalignments.

1 Select the [Extended Functions] tab and press [Settings] for [Fixed Reference Area].



2 Adjust the fixed reference area settings.



3 Press [OK].

The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

The system returns to the main screen for [ColorArea]/[Area].

Color/Brightness Average Tool

● Setting Items for the Color/Brightness Average tool

Items		Description
Master Color Settings (For color type)	Window Shape	Select the window shape to specify an area of the target to be extracted.
	Angle Reset	When the window shape is set to [□Rect], resets the angle of the window.
Master Bright. Settings (For monochrome type)	Mask	Adds a rectangular/circular mask region in the window frame. The area inside the mask area is excluded from the color and brightness average. In addition, adds a rectangular/circular cutting region in the mask region. The mask is disabled inside the mask cutting region and it becomes the target of color and brightness average. Adding a mask or removing sections of the mask can be performed up to 20 times.
Limit Adjustment		Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. 📖 "Chapter 5 Running" (page 5-1)

● Setting Items for the Color/Brightness Average tool (advanced settings)

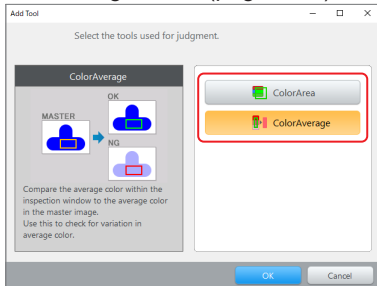
Items	Description	Ref.
Color Range Settings (For color type)	<ul style="list-style-type: none"> • Color type Specifies the judgment sensitivity for the color extracted from the master image. 	4-61
Brightness Range Settings (For monochrome type)	<ul style="list-style-type: none"> • Monochrome type Specifies the judgment sensitivity for the brightness extracted from the master image. 	
LIVE image	The color range to be extracted can be set using the Live image of the target.	
From a Hist.	Imports images to be used for the judgment sensitivity from the running image history.	
From File	Imports an image used for the judgment sensitivity from a file saved on your computer.	
Spec. Method	Selects how to specify the master color/brightness.	4-65
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Color/Brightness Average tool can be selected.	4-39

Setting the Color/Brightness Average Tool

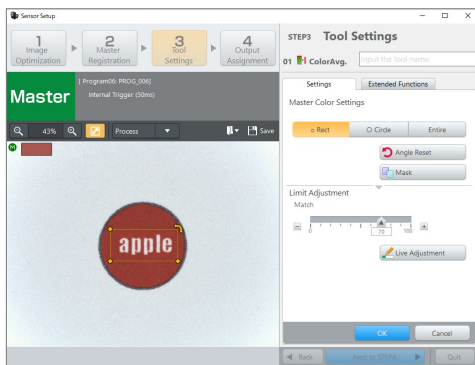
1 Add the [ColorAverage] tool (color type) or [Bright. Avg.] tool (monochrome type).

In the screen that appears by selecting [Color Tool], select [ColorAverage]/[Bright. Avg.] and press [OK].

☞ “Adding a Tool” (page 4-36)



The main screen for [ColorAvg.]/[Bright. Avg.] opens.

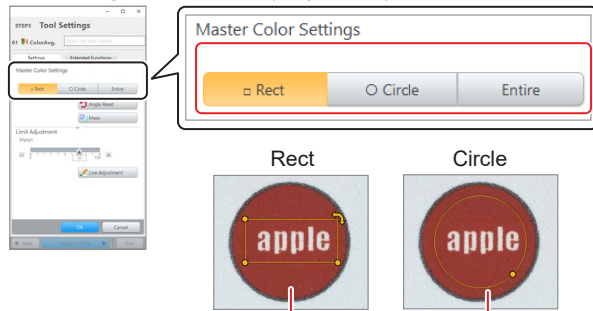


2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.

☞ “Editing the Window” (page 3-14)



Set the position, size, and angle

When [Entire] is selected, the tool window will be hidden.

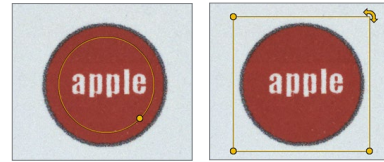
Reference The window angle can be reset using the [Angle Reset] button.

Point

- The average color or average brightness value is automatically extracted from inside the window.
- Only set the window size to the color or brightness area that you want to judge. If the background is included, the average color or brightness average that includes the background color will be registered. Therefore, the matching rate difference between an “OK” image and a “NG” image that you want to judge will decrease.

Good example

Bad example

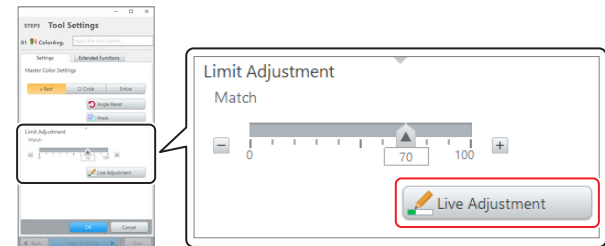


3 Apply the mask as needed.

The area inside the mask area is excluded from average color or average brightness extraction.

☞ “Mask settings” (page 4-38)

4 Press [Live Adjustment].



The sensor changes to the test operation.

5 Take an “OK” image and a “NG” image.

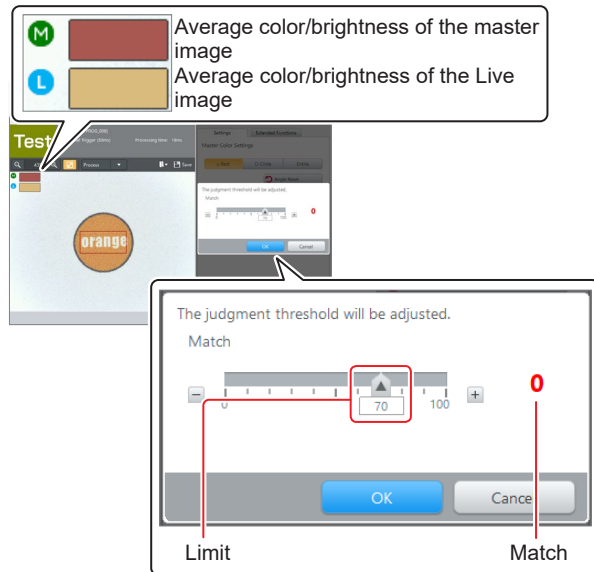
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

6 Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.



Reference

- 100 indicates that the color and brightness is completely matched. The matching rate decreases as the color or brightness of the target differs. For the color average tool, the smallest matching rate for H/S/V calculated individually will be the matching rate for the tool.
 - 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.
- [Book icon] “Selecting the Display Method of the Tool Window” (page 5-7)
 [Book icon] “Editing Numbers” (page 3-15)
 [Book icon] “Adjusting Thresholds for Judgment” (page 6-15)

7 Set the tool name as needed.

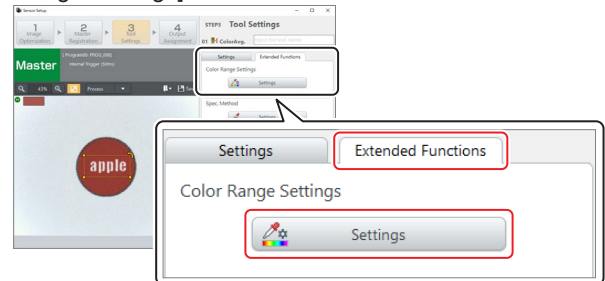
[Book icon] “Tool Name Setting” (page 4-40)

Advanced settings of the Color/Brightness Average tool

Color Range Settings /Brightness Range Settings

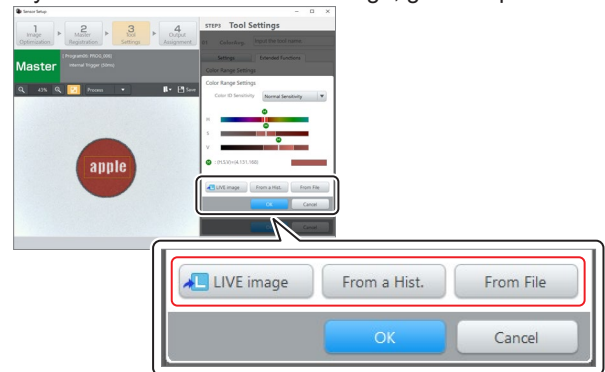
1 Select the [Extended Functions] tab and press [Settings] of [Color Range Settings].

For a monochrome type, press [Settings] of [Brightness Range Settings].



2 Select an image for which you want to adjust the color/brightness area.

If you want to use the master image, go to step 3.



● To use the Live image

Press [LIVE image].

The color area can be set based on the Live image of the target.

● When importing from the image history

Press [From a Hist.] to select the image that is desired to be used.

Reference [Book icon] For details of how to perform this operation, refer to [Book icon] “When importing from the running image history” (page 4-55).

● When importing from a file saved in the PC

Press the [From File] button to select the file that is desired to be imported.

Reference [Book icon] For details of how to perform this operation, refer to [Book icon] “When importing from a file saved in the PC” (page 4-55).

When selecting a batch backup file (*.iv3a) or individual program backup file (*.iv3a), select the image type from the following.

- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.

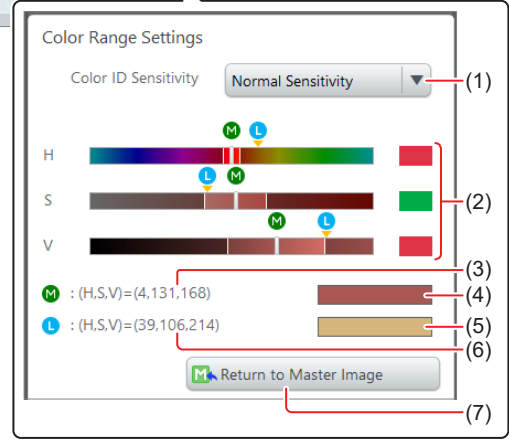
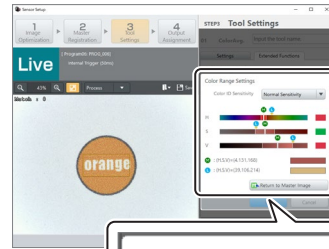
3 Select the color/brightness judgment sensitivity.

● For color type

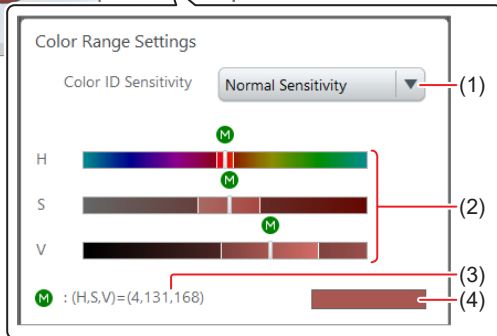
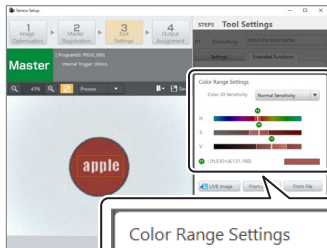


- Selecting [High Sensitivity]/[Normal Sensitivity]/[Low Sensitivity] automatically sets the judgment area. (The average color (HSV) value is the center of the master image window.)
- To narrow the OK area, select [High Sensitivity]. This enables small color differences to be differentiated.
- To widen the OK area, select [Low Sensitivity]. This setting makes judgment resistant to individual OK color differences and light interference.
- [Manual] enables the desired area to be set as needed.
- Re-registering the master image or registering an external master image automatically updates the area in conjunction with the average color for the updated master image. If [Manual] is selected, it is automatically updated while retaining the specified area.

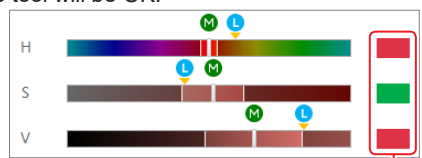
○ Selecting sensitivity on an image other than the master image



○ Selecting sensitivity on the master image

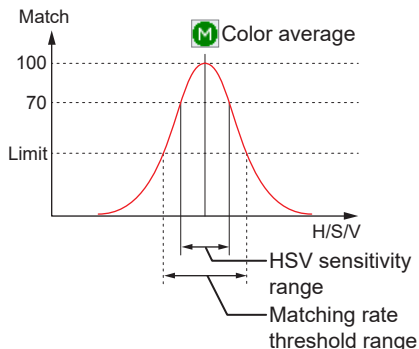


No.	Description
(1)	Selects the color judgment sensitivity ([High Sensitivity]/[Normal Sensitivity] (default)/[Low Sensitivity]/[Manual]).
(2)	The following items are displayed on the bar graph (H/S/V). <ul style="list-style-type: none"> • M (Average color value of the master image) • Solid line (color judgment sensitivity area) • Dotted line (threshold area of the color average tool) Reference Bar graph scale H : Automatically adjusts the average color value of the master image to be centered on the bar. S/V : Left end is 0 and right end is 255.
(3)	Displays the average HSV value of the master image.
(4)	Displays the average color of the master image.

No.	Description
(1)	Selects the color judgment sensitivity ([High Sensitivity]/[Normal Sensitivity] (default)/[Low Sensitivity]/[Manual]). <ul style="list-style-type: none"> • The following items are displayed on the bar graph (H/S/V). <ul style="list-style-type: none"> • M (Average color value of the master image) • L (Average color value of the Live image) • L (Average color value of the image file or history image) • Solid line (color judgment sensitivity area) • Dotted line (threshold area of the color average tool) • Displays the total status result for each sensitivity on the right side of the bar graph (H/S/V). When all status results are OK, the total status result for the tool will be OK.
(2)	 <p>Status result (Green: OK; red: NG)</p> Reference Bar graph scale H : Automatically adjusts the average color value of the master image to be centered on the bar. S/V : Left end is 0 and right end is 255.
(3)	Displays the average HSV value of the master image.
(4)	Displays the average color of the master image.
(5)	Displays the average HSV value of the imported image.
(6)	Displays the average color of the imported image.
(7)	Presses this when setting is completed.

Reference Relationship between the color judgment sensitivity and matching rate

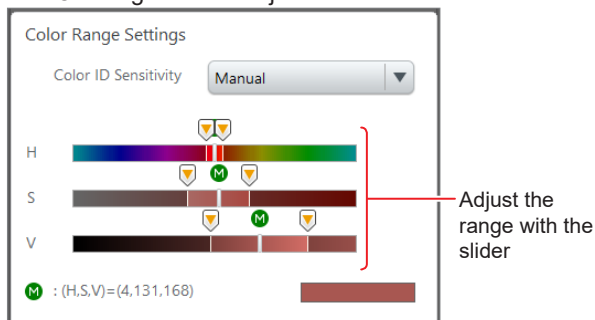
- When the average color of the target matches the average color of the master image, the matching rate is 100. The matching rate decreases as the difference between the average color of the target and master image increases. The sensitivity area is automatically adjusted so that the matching rate becomes 70.



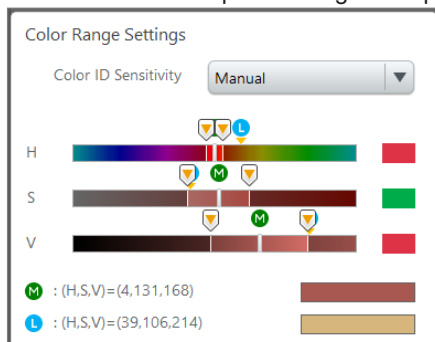
- The color average tool individually calculates the matching rate of H (hue)/S (saturation)/V (brightness) for the target.
- The smallest matching rate for H/S/V calculated individually will be the matching rate for the color average tool.

○ When [Manual] is selected

The OK range can be adjusted as needed.



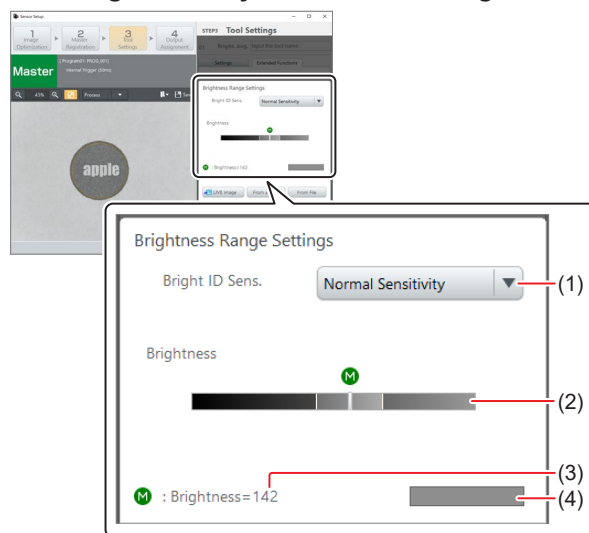
For an image other than the master image, the average color value of the imported image is displayed.



● For monochrome type

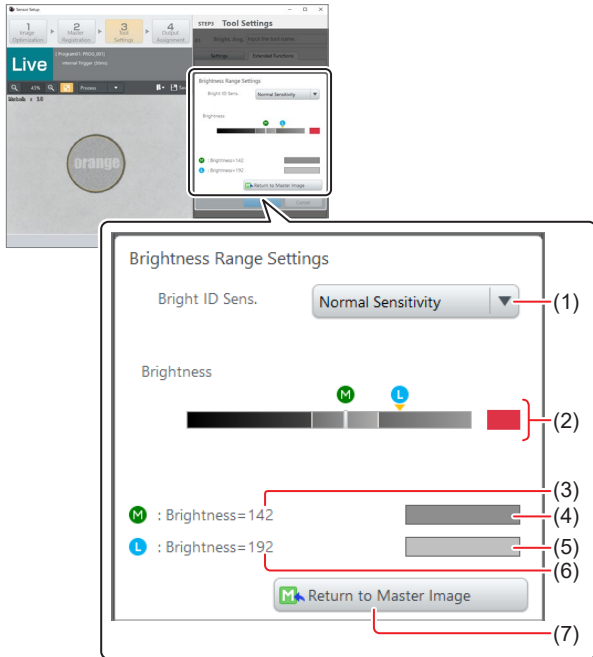
- **Point** Selecting [High Sensitivity]/[Normal Sensitivity]/[Low Sensitivity] automatically sets the judgment area. (The average brightness value is the center of the master image window.)
- To narrow the range of OK brightness, select [High Sensitivity]. This enables small brightness differences to be differentiated.
- To widen the range of OK brightness, select [Low Sensitivity]. This setting makes judgment resistant to individual brightness differences and light interference.
- [Manual] enables the desired area to be set as needed.
- Re-registering the master image or registering an external master image automatically updates the area in conjunction with the average brightness for the updated master image. If [Manual] is selected, it is automatically updated while retaining the specified area.

○ Selecting sensitivity on the master image



No.	Description
(1)	Selects the brightness judgment sensitivity ([High Sensitivity] / [Normal Sensitivity] (default) / [Low Sensitivity]/[Manual]).
(2)	The following items are displayed on the bar graph. <ul style="list-style-type: none"> • M (Average brightness value of the master image) • Solid line (brightness judgment sensitivity area) • Dotted line (threshold area of the brightness average tool)
(3)	Displays the average brightness value of the master image.
(4)	Displays the average brightness of the master image.

○ Selecting sensitivity on an image other than the master image

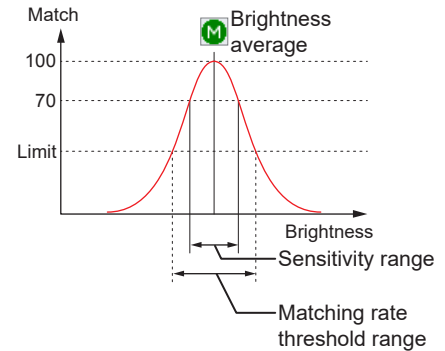


No.	Description
(1)	Selects the brightness judgment sensitivity ([High Sensitivity] / [Normal Sensitivity] (default) / [Low Sensitivity]/[Manual]).
(2)	<ul style="list-style-type: none"> The following items are displayed on the bar graph. <ul style="list-style-type: none"> M (Average brightness value of the master image) L (Average brightness value of the Live image) L (Average brightness value of the image file or history image) Solid line (brightness judgment sensitivity area) Dotted line (threshold area of the brightness average tool) The tool status result is displayed on the right side of the bar graph. <div style="text-align: center;"> <p>Status result (Green: OK; red: NG)</p> </div>
	<div style="border: 1px solid gray; padding: 2px;"> <p>Reference The bar graph scale is from 0 on the left to 255 on the right.</p> </div>
(3)	Displays the average brightness value of the master image.
(4)	Displays the average brightness of the master image.
(5)	Displays the average brightness value of the imported image.
(6)	Displays the average brightness of the imported image.
(7)	Presses this when setting is completed.

Reference

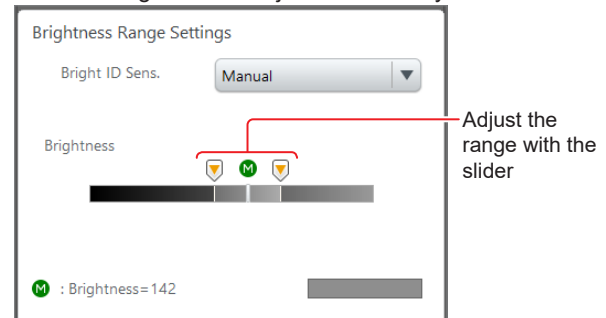
Relationship between the brightness judgment sensitivity and matching rate

- When the average brightness of the target matches the average color of the master image, the matching rate is 100. The matching rate decreases as the difference between the average brightness of the target and master image increases. The sensitivity area is automatically adjusted so that the matching rate becomes 70.

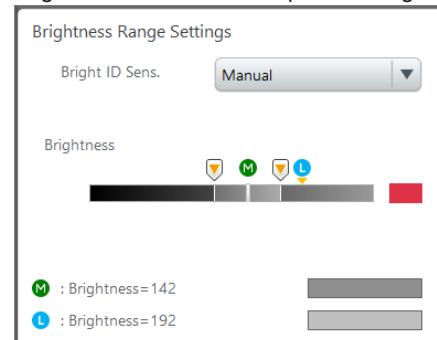


○ When [Manual] is selected

The OK range can be adjusted arbitrarily.



For an image other than the master image, the average brightness value of the imported image is displayed.



4 When setting is completed, press [OK].

The system returns to the main screen for the extended functions settings.

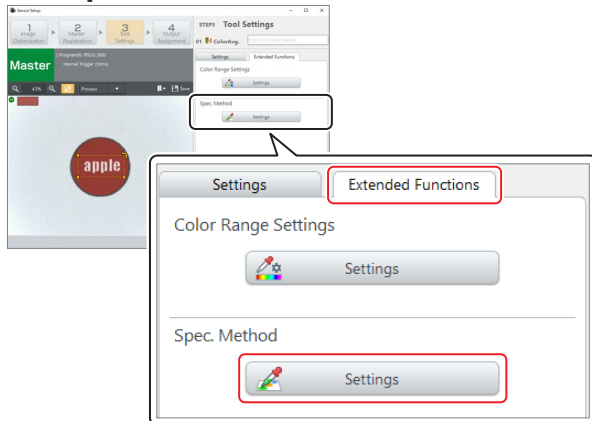
5 Press the [Settings] tab.

The system returns to the main screen for [ColorAvg.] / [Bright. Avg.].

Specify Method

1 Select the [Extended Functions] tab and press [Settings] of [Spec. Method].

For a monochrome type, press [Settings] of [Spec. Method].



3 Press [OK].

The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

The system returns to the main screen for [ColorAvg.]/[Bright. Avg.].

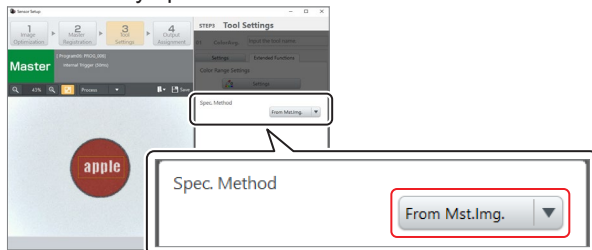
2 Select how to specify the master color/brightness.

Point When updating the master color/brightness registered for the master image, select [From Mst.Img.].

● From Mst.Img. (default)

The average color/brightness value in the window specified with the master image is set as the master color/brightness.

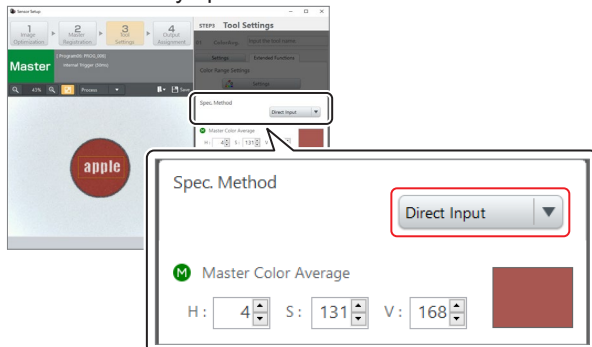
If the master image is updated, the master color is automatically updated.



● Direct Input


Input the HSV value/brightness to specify the master color/brightness.

Even if the master image is updated, the master color is not automatically updated.



Position Adjustment Tool

● Setting items for the Position Adjustment tool

Items		Description
Edit Window	Window Shape	Select the shape of the window to specify the area of the target used as the position adjustment reference.
	Search Range	Specifies an area in which to serve as the reference of position adjustment for a target. By specifying a narrower area as the search range, the processing time will be shortened.
Fine Tune Outline	Remove Outline	Judges by disabling an unnecessary outline which interrupts the stabilized detection. The disabled outlines can be specified by tracing the extracted outline.
	Sensitivity	The outline extraction sensitivity can be selected according to the target quality.
Limit Adjustment		Adjusts the threshold (matching rate) which judges whether the position adjustment succeeds or fails. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)

● Setting items for the Position Adjustment tool (Advanced Settings)

Items	Description	Ref.
Rotation Range	Sets the range of rotation to adjust the position for the target. The status result of the position adjustment is NG and position is not adjusted if the angle of rotation of the target exceeds its rotation range. <ul style="list-style-type: none"> • If the rotation range is set wide, the acceptable range of variation in the angles at which a target can be placed is wider. • If the rotation range is set narrow, the processing time can be shortened. 	4-69
Search Algorithm	The algorithm used to search for the Position Adjustment tool can be adjusted depending on the inspection requirements.	4-69

Setting of the Position Adjustment Tool

1 Adds the [Pos. Adj.] tool.

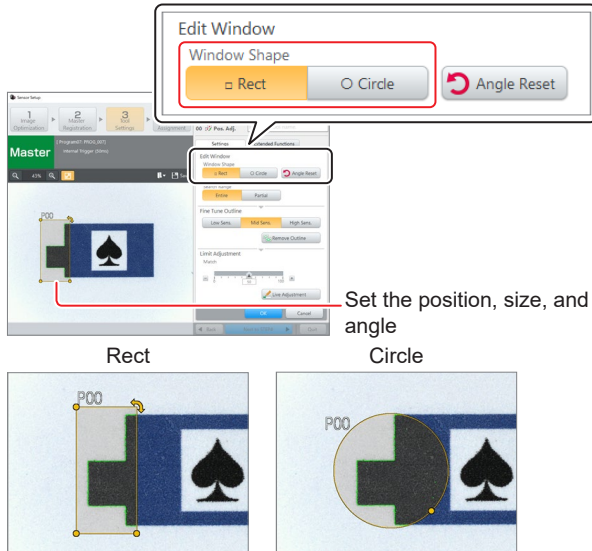
☞ “Adding a Tool” (page 4-36)
The main screen for [Pos. Adj.] opens.

2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.

☞ “Editing the Window” (page 3-14)



Point Set the position and size of the position adjustment tool to capture as much of a part that is common amongst all targets as possible.
☞ “Stabilizing the Position Adjustment” (page 6-21)

Reference The window angle can be reset using the [Angle Reset] button.

3 Set the search range as needed.

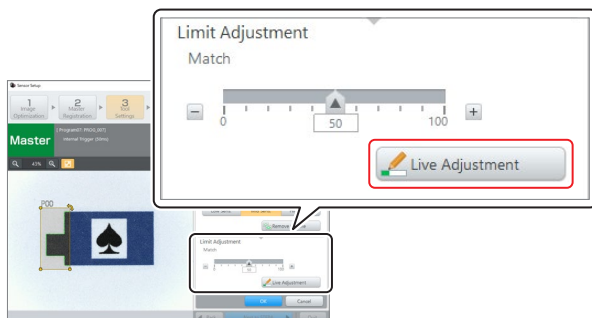
☞ “Search Range Settings” (page 4-68)

4 Adjust the outline as needed.

☞ “Settings for Disabling Outlines” (page 4-68)

☞ “Setting a Sensitivity” (page 4-68)

5 Press [Live Adjustment].



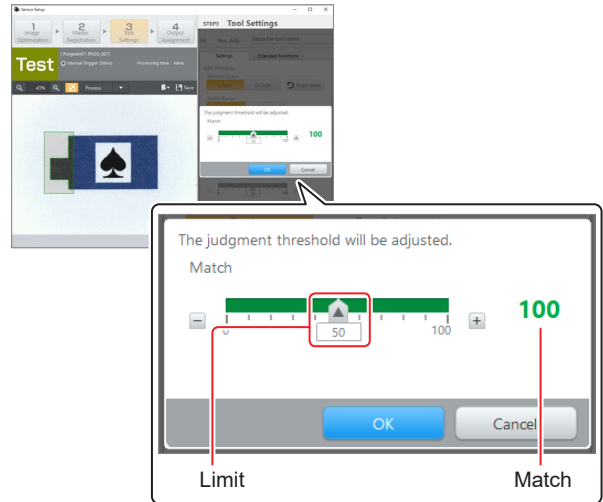
The sensor changes to the test operation.

6 Image the target.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold to judge whether or not the position adjustment succeeds by checking the matching rate.



Reference

- If there are many variations of the target shape that the position adjustment tool 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.

☞ “Selecting the Display Method of the Tool Window” (page 5-7)
☞ “Editing Numbers” (page 3-15)
☞ “Adjusting Thresholds for Judgment” (page 6-15)

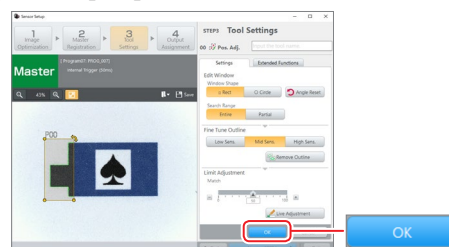
8 When setting is completed, press [OK].

The system returns to the main screen for [Pos. Adj.].

9 Set the tool name as needed.

☞ “Tool Name Setting” (page 4-40)

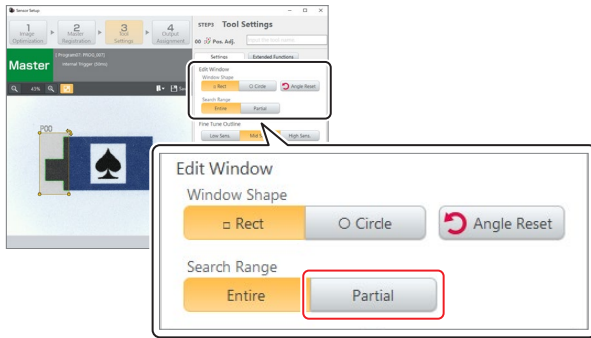
10 Press [OK].



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

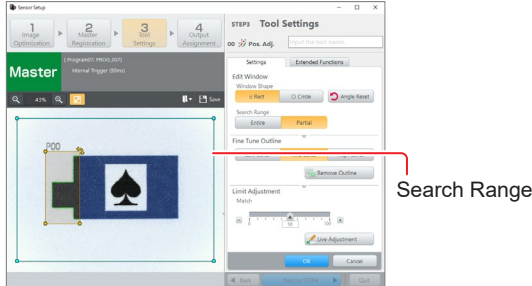
Search Range Settings

1 Press [Partial].



2 Set the tool window to indicate the search range.

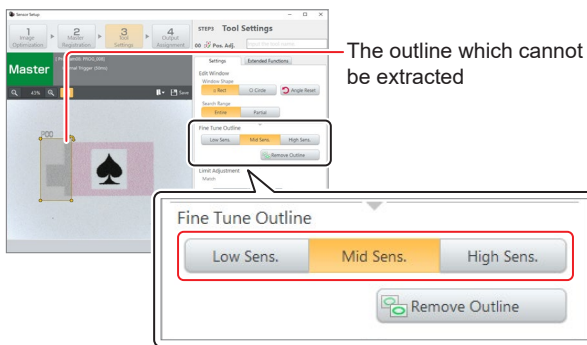
☞ “Editing the Window” (page 3-14)



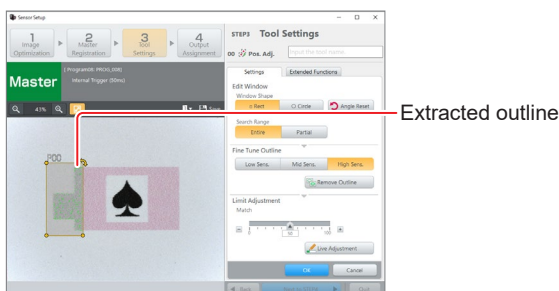
Reference The search range cannot be rotated.

Setting a Sensitivity

1 Select the extraction sensitivity of the outline.

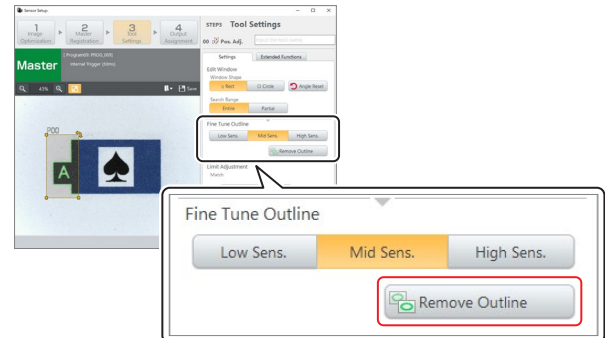


2 Confirm the condition of the outline extraction, which changes according to the selected [Sensitivity].



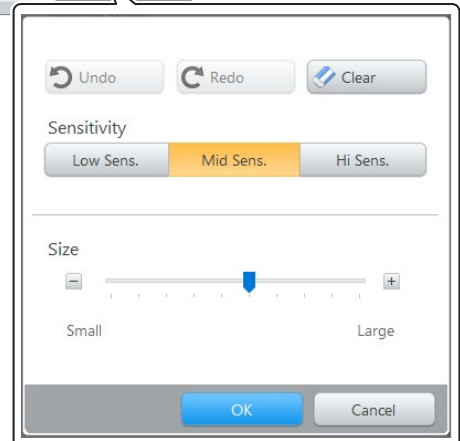
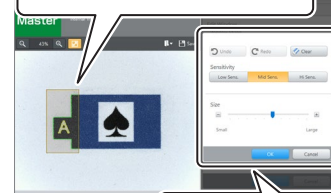
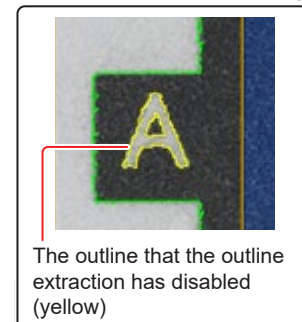
Settings for Disabling Outlines

1 Press [Remove Outline].



2 Specify the unnecessary outline by dragging with the mouse.

The specified outline changes from green to yellow.



Reference

- The size of the mouse cursor when specifying the unnecessary outlines can be changed in [Size].
- The [Undo] button is applicable up to 20 times.

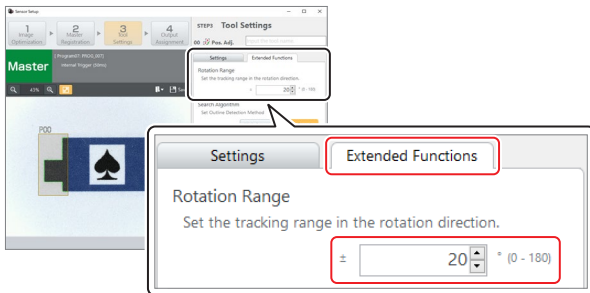
3 Press [OK].

The system returns to the main screen for [Pos. Adj.].

Advanced settings of the Position Adjustment tool

■ Rotation Range

- 1 Select the [Extended Functions] tab and set the rotation range.

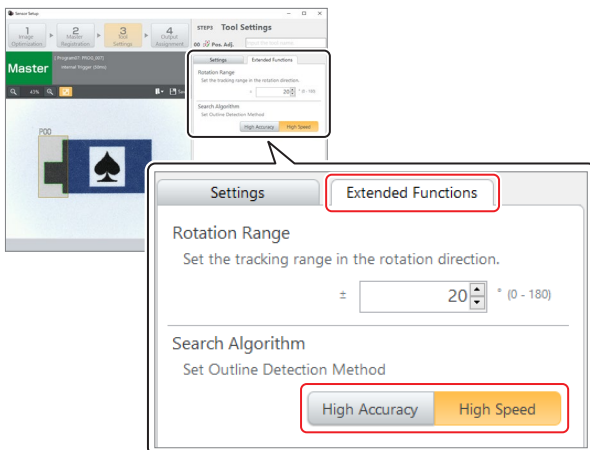


- 2 After setting is completed, press the [Settings] tab.

The system returns to the main screen for [Pos. Adj.].

■ Search Algorithm

- 1 Select the [Extended Functions] tab and select a search algorithm type (High Accuracy/High Speed) for the position adjustment window.



Point

- Select [High Accuracy] when detection is not stable because of a small difference in the matching rate of an “OK” and “NG” image.
- Select [High Accuracy] when detection is not stable because of the influence of an unnecessary outline other than the target, such as the background.
- Select [High Speed] to shorten the processing time.

- 2 After setting is completed, press the [Settings] tab.

The system returns to the main screen for [Pos. Adj.].

Width Tool

● Setting items for the Width tool

Items		Description
Edit Window		Specifies the area of the target to be detected using a tool window.
	Mask	Adds a rectangular mask region in the tool window frame. The area inside the mask region is excluded from the width detection target.
Automatic Edge Sensitivity Adjustment		Automatically adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.
	(Manual adjustment)	Manually adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.
	LIVE image	The edge sensitivity can be adjusted using the Live image from the target.
Limit Adjustment		Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
	Upper Limit	Enables an upper limit on the threshold. Enable when OK/NG judgment is desired for a situation when the target width is longer than the width extracted from the master image.
	Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. 📖 "Chapter 5 Running" (page 5-1)

● Setting items for the Width tool (advanced settings)

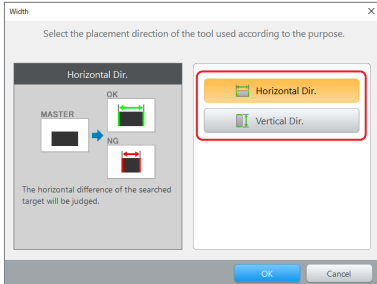
Items		Description	Ref.
Width Extraction Method	Width Mode	Select the method used to extract the target width.	4-73
Scaling Setting	Scaling Setting	Sets scaling. Set when length is being used for anomaly detection instead of the matching rate.	4-80
	Display Value	When scaling is enabled, inputs the display value in relation to matching rate 100. A matching rate of 100 indicates that the width is completely matched. The matching rate becomes smaller with a narrower width and larger with a wider width.	
	Copy Setting	When scaling is enabled, copy the scaling settings from another tool.	
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Width tool can be selected.	4-39

Setting the Width Tool

1 Select the [Extra1] tab, and add the [Width] tool.

“Adding a Tool” (page 4-36)
The [Width] direction selection screen opens.

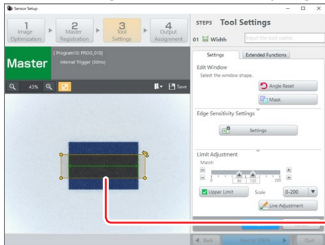
2 Press [Horizontal Dir.]/[Vertical Dir.].



The main screen for [Width] opens.

3 Set the position, size, and angle of the tool window according to the target.

“Editing the Window” (page 3-14)



Set the position, size, and angle

Reference The window angle can be reset using the [Angle Reset] button.

4 Apply the mask as needed.

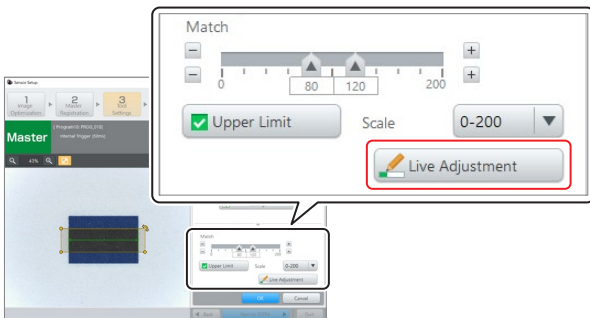
The area inside the mask region is excluded from the width detection target.

“Mask settings” (page 4-38)

5 Adjust the edge sensitivity setting as needed.

“Edge Sensitivity Settings” (page 4-72)

6 Press [Live Adjustment].



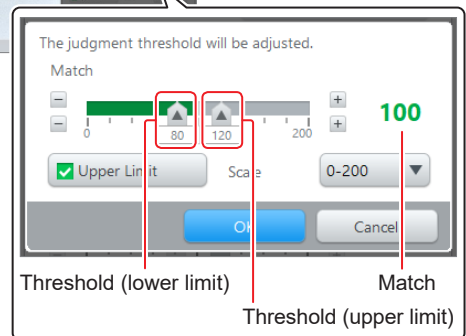
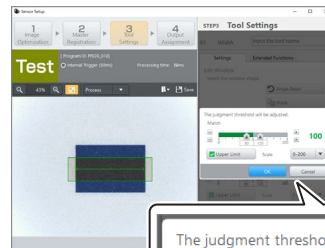
The sensor changes to the test operation.

7 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

8 Adjust the threshold for anomaly detection by checking the matching rate.



Threshold (lower limit)

Match

Threshold (upper limit)

- Reference
- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - The threshold can be changed using the slider or the [+]/[-] button.
- “Selecting the Display Method of the Tool Window” (page 5-7)
“Editing Numbers” (page 3-15)
“Adjusting Thresholds for Judgment” (page 6-15)

9 Set [Upper Limit] as needed.

“Upper Limit” (page 4-73)

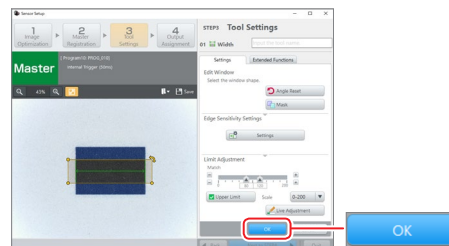
10 When setting is completed, press [OK].

The system returns to the main screen of [Width].

11 Set the tool name as needed.

“Tool Name Setting” (page 4-40)

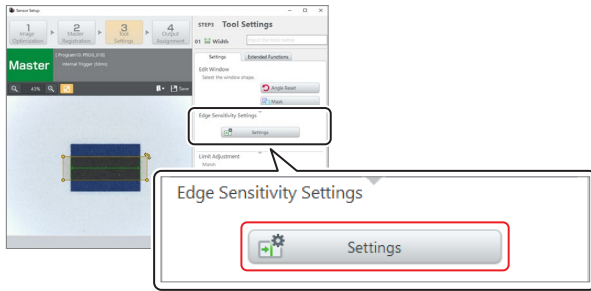
12 Press [OK].



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

Edge Sensitivity Settings

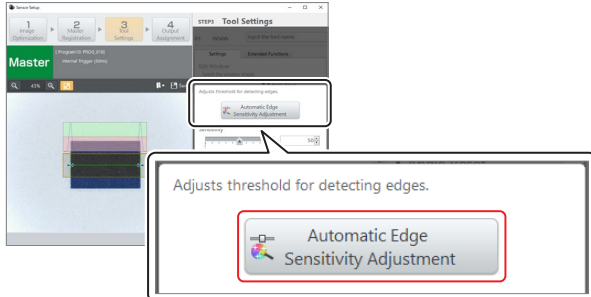
1 Press [Settings] for [Edge Sensitivity Settings].



2 Adjust the edge sensitivity.

● When the edge sensitivity is adjusted automatically

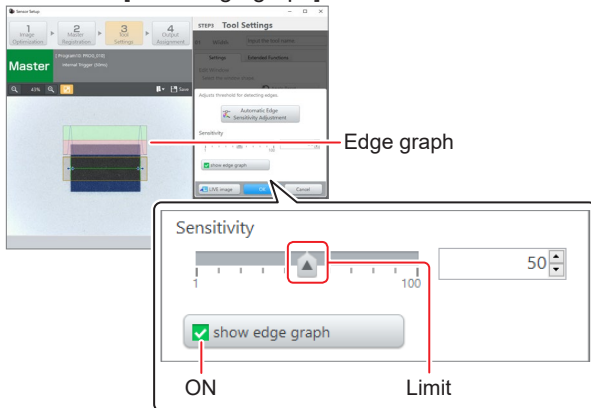
Press [Automatic Edge Sensitivity Adjustment].



The edge sensitivity will be adjusted automatically according to the target.

● When the edge sensitivity is adjusted manually

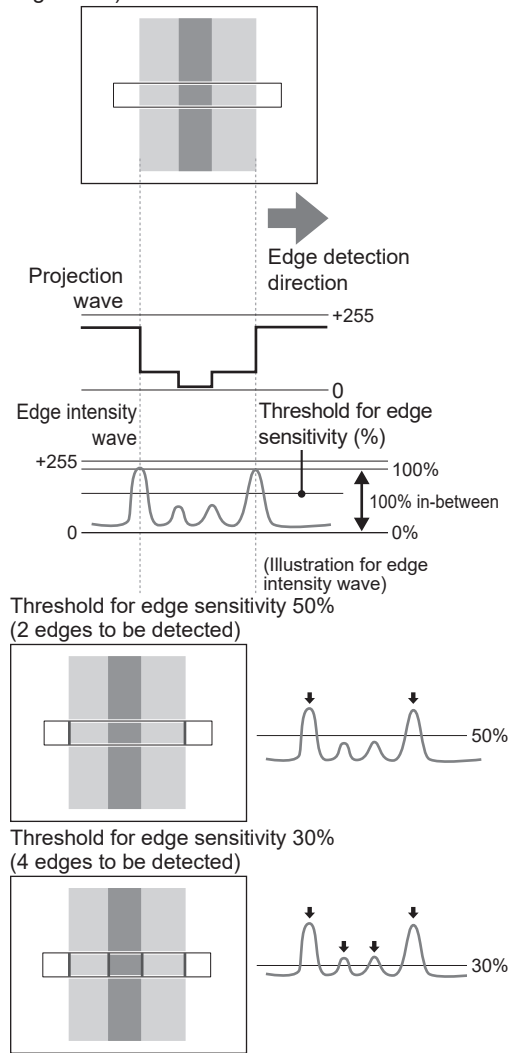
Switch the [show edge graph] check box to ON.



Adjust the threshold value for edge sensitivity by checking the edge graph being displayed.

- Reference**
- The edge sensitivity limit can be adjusted by pressing the red line.
 - Press [LIVE image] to adjust threshold value for edge intensity using the target Live image.

Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



3 Press [OK].

The system returns to the main screen of [Width].

Upper Limit

1 Set the upper limit settings.

When changing the setting scale

Select [0-999] from the [Scale] drop-down menu. Adjust the threshold for anomaly detection by checking the matching rate.

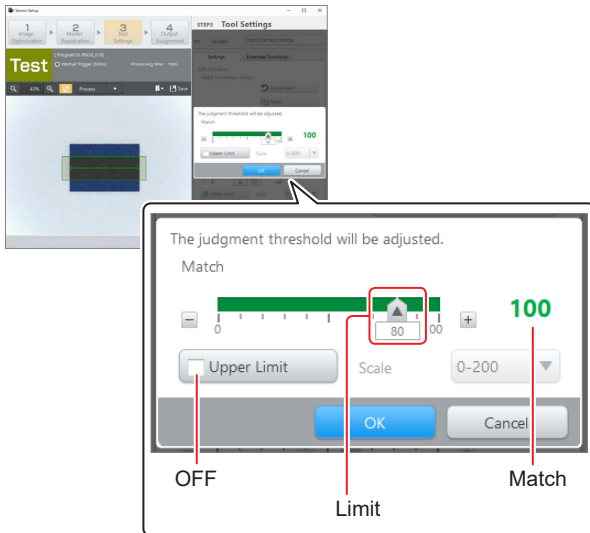
- Reference**
- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - “Selecting the Display Method of the Tool Window” (page 5-7)
 - “Editing Numbers” (page 3-15)
 - “Adjusting Thresholds for Judgment” (page 6-15)

When the upper limit is disabled

Switch the check box to [OFF] for the upper limit. Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.

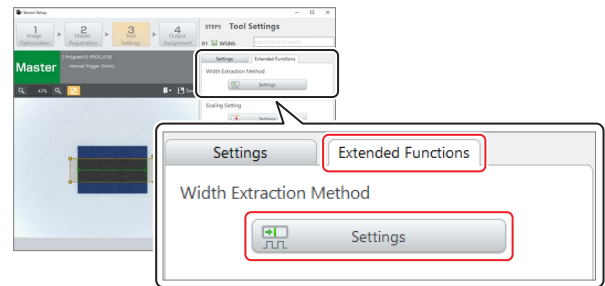


- Reference**
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - “Selecting the Display Method of the Tool Window” (page 5-7)
 - “Editing Numbers” (page 3-15)
 - “Adjusting Thresholds for Judgment” (page 6-15)

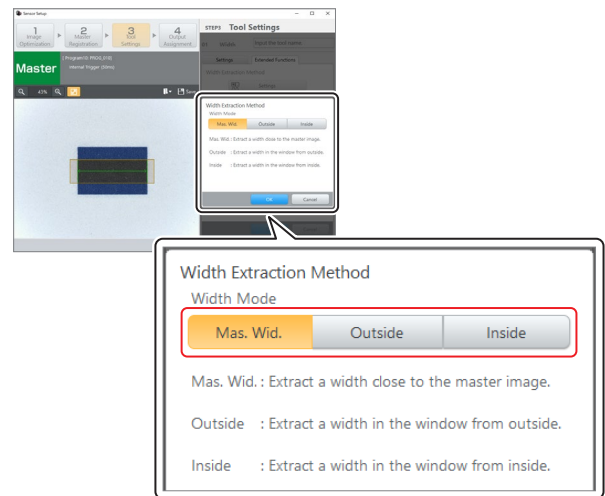
Extended functions for the width tool

Width Extraction Method

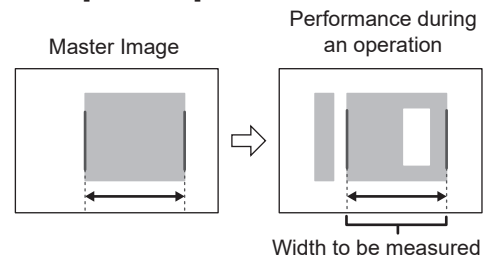
1 Select the [Extended Functions] tab and press [Settings] in [Width Extraction Method].



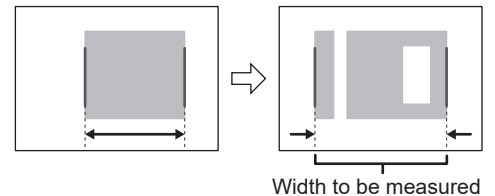
2 Select [Width Extraction Method].



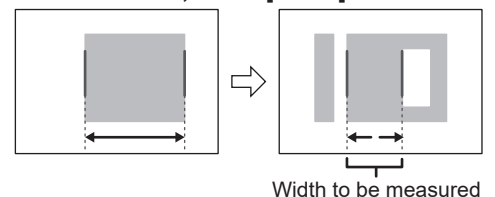
- Point**
- When extracting the width which is similar to the one registered in the master image, select [Mas. Wid.].



- When extracting the outer-most width of the tool window, select [Outside].



- When extracting the inner-most width of the tool window, select [Inside].



3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)

3 Press [OK].

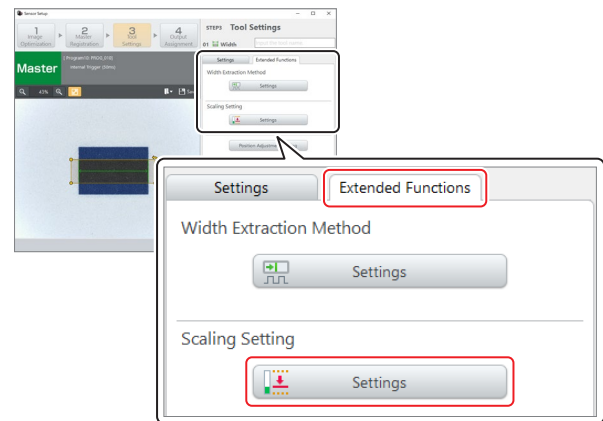
The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

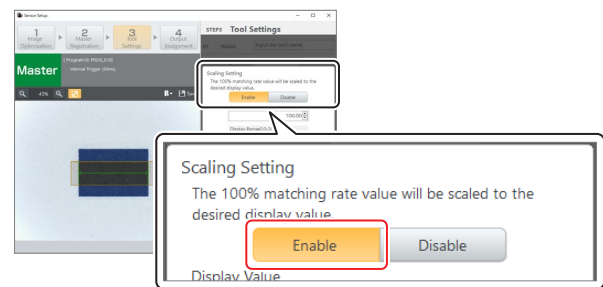
The system returns to the main screen of [Width].

■ Scaling Setting

1 Select the [Extended Functions] tab and press [Settings] in [Scaling Setting].



2 Select [Enable] and perform the Scaling Setting.



Point

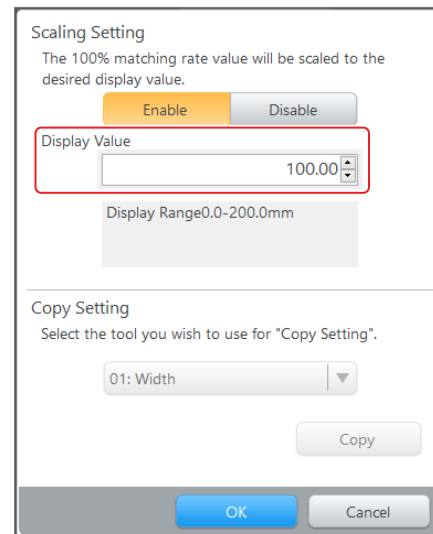
- If scaling is [Enable], the display range and the setting scale (x2 or x10) of the threshold adjustment will be automatically adjusted.
- If scaling is [Enable], the threshold can be adjusted by 0.1 mm.

● When changing the scaling settings

Enter a user-defined value in [Display Value].

The setting range is 0.05 to 9999 (maximum input digits: 4), and the default value is 100.0.

The value of matching rate 100 is scaled by the display value.



Point

The scaling display value can be adjusted by 0.05 mm.

● When copying scaling settings

Select the source tool for the Scaling Setting from the [Copy Setting] drop-down menu, and press [Copy].

The confirmation screen opens.

Press [OK].

Reference The display of [Display Range] is updated to the value after scaling.

Point If the scaling value of the source tool is changed, copy the scaling settings again.

3 Press [OK].

The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

The system returns to the main screen of [Width].

Diameter Tool

● Setting items for the Diameter tool

Items		Description
Edit Window		Specifies the area of the target to be detected using a tool window.
	Mask	Adds a circular mask region in the tool window frame. The area inside the mask region is excluded from the diameter detection target.
Diameter Extraction	Extraction Sensitivity	Selects the sensitivity for diameter extraction according to the target.
	Change Specified Circle	The diameter used for inspection can be changed when there are multiple circles of the extracted diameter.
Limit Adjustment		Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
	Upper Limit	Enables an upper limit on the threshold. Set if the OK/NG judgment is desired when a target diameter is longer than the OK diameter.
	Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. ☞ "Chapter 5 Running" (page 5-1)

● Advanced settings of the Diameter tool

Items		Description	Ref.
Diameter Extraction	Diameter Mode	Select the method used to extract the target diameter.	4-79
Bright/Dark Direction		Selects the direction for which the tool detects the target edge.	4-80
Scaling Setting	Scaling Setting	Sets scaling. Set when length is being used for anomaly detection instead of the matching rate.	4-80
	Display Value	When scaling is enabled, inputs the display value in relation to matching rate 100.	
	Copy Setting	When scaling is enabled, copy the scaling settings from another tool.	
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Diameter tool can be selected.	4-39

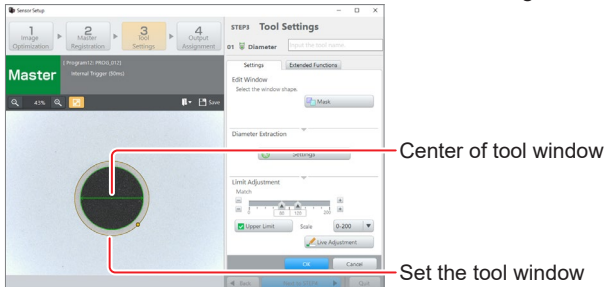
Setting the Diameter tool

1 Select the [Extra1] tab, and add the [Diameter] tool.

☞ “Adding a Tool” (page 4-36)
The main screen for [Diameter] opens.

2 Set the position and size of the tool window according to a target.

Place the center of the tool window inside the target.



☞ “Editing the Window” (page 3-14)

Reference The sensor detects circles from the center of tool window towards outside.

3 Apply the mask as needed.

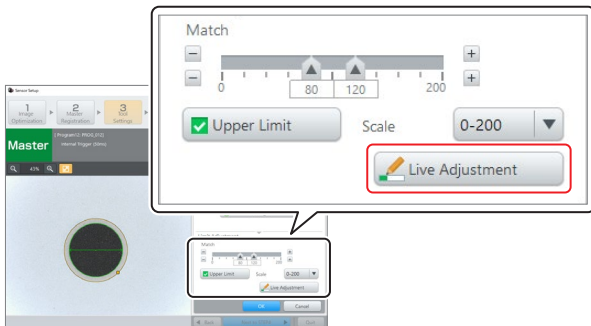
The area inside the mask region is excluded from the diameter detection target.

☞ “Mask settings” (page 4-38)

4 Perform diameter extraction as needed.

☞ “Diameter Extraction Settings” (page 4-78)

5 Press [Live Adjustment].



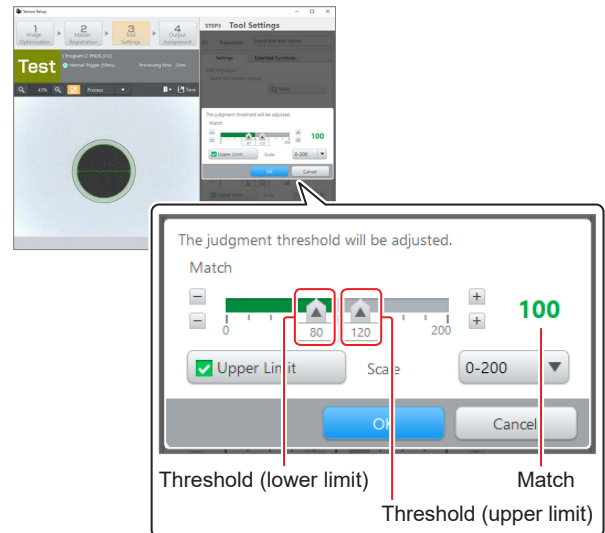
The sensor changes to the test operation.

6 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold for anomaly detection by checking the matching rate.



- Reference**
- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - ☞ “Selecting the Display Method of the Tool Window” (page 5-7)
 - ☞ “Editing Numbers” (page 3-15)
 - ☞ “Adjusting Thresholds for Judgment” (page 6-15)

8 Set [Upper Limit] as needed.

☞ “Upper Limit” (page 4-78)

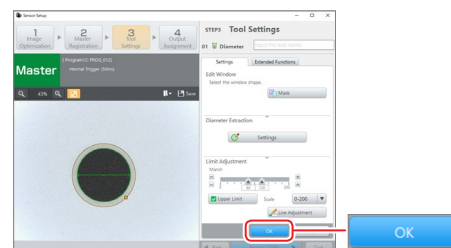
9 When setting is completed, press [OK].

The system returns to the main screen of [Diameter].

10 Set the tool name as needed.

☞ “Tool Name Setting” (page 4-40)

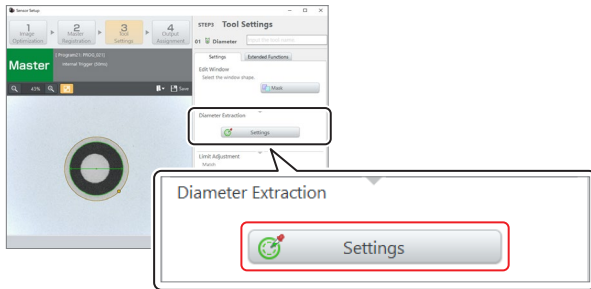
11 Press [OK].



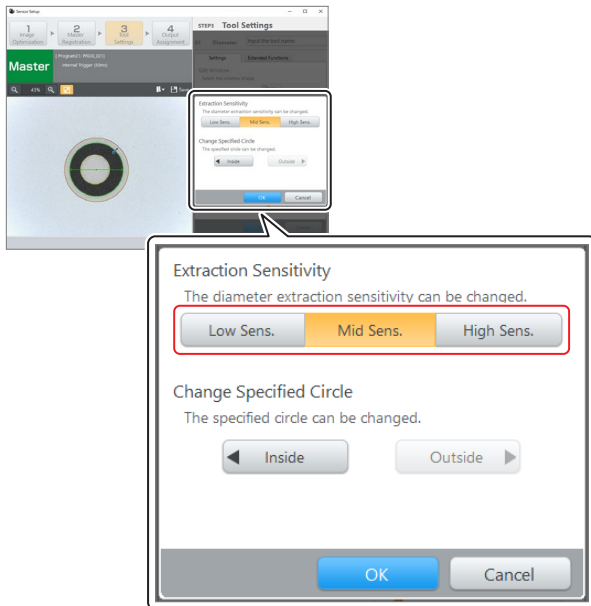
The system returns to the main screen for the tool settings.

Diameter Extraction Settings

1 Press [Settings] of the [Diameter Extraction].



2 Select [Extraction Sensitivity] of a diameter.



3 Press [◀ Inside]/[Outside ▶] of "Change Specified Circle", and select the circle with the diameter to be used for inspection.

Reference The circle used for diameter extraction is displayed in green color. You can also press the yellow candidate circle to select the circle for diameter extraction.

4 Press [OK].

The system returns to the main screen of [Diameter].

Upper Limit

1 Set the upper limit settings.

● When changing the setting scale

Select [0-999] from the [Scale] drop-down menu. Adjust the threshold for anomaly detection by checking the matching rate.

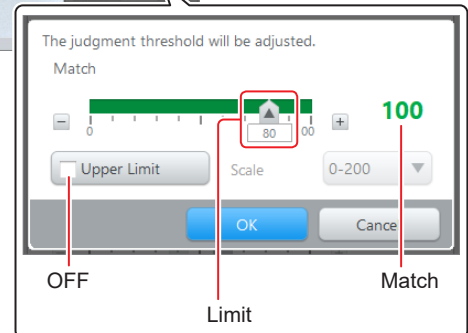
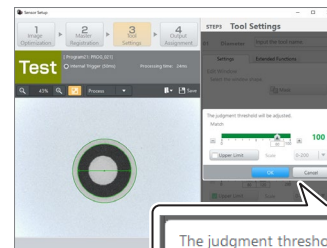
- Reference**
- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - The threshold can be changed using the slider or the [+]/[-] button.
- "Selecting the Display Method of the Tool Window" (page 5-7)
 "Editing Numbers" (page 3-15)
 "Adjusting Thresholds for Judgment" (page 6-15)

● When the upper limit is disabled

Switch the check box to [OFF] for the upper limit. Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of an "OK" image is higher than 90 and if the matching rate of a "NG" image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.

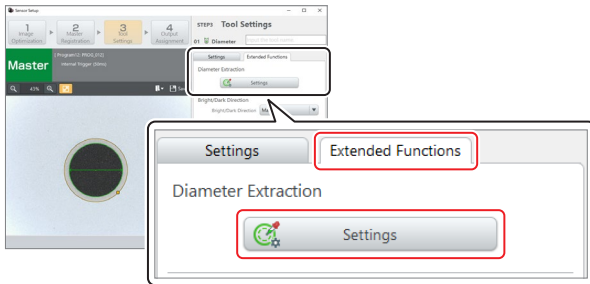


- Reference**
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
 - The threshold can be changed using the slider or the [+]/[-] button.
- "Selecting the Display Method of the Tool Window" (page 5-7)
 "Editing Numbers" (page 3-15)
 "Adjusting Thresholds for Judgment" (page 6-15)

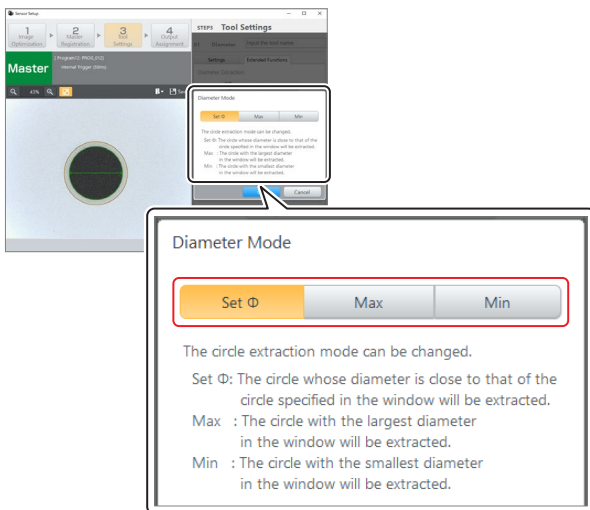
Advanced settings for the Diameter tool

Diameter Mode

1 Select the [Extended Functions] tab and press [Settings] in [Diameter Extraction].

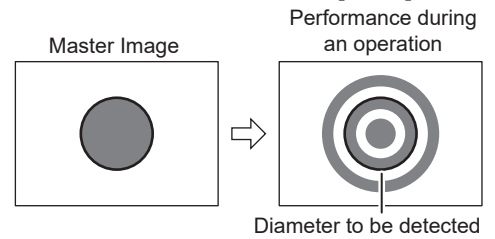


2 Select the diameter mode.

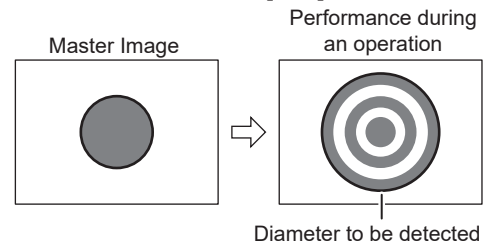


Point

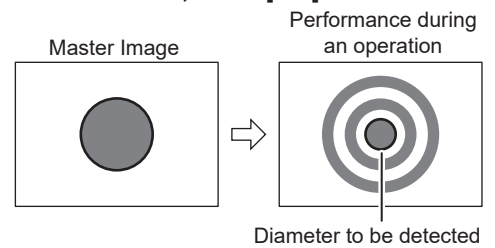
• If the circle desired is the one whose diameter is similar to the circle specified inside the tool window, select [Set Φ].



• When extracting the largest circle inside the tool window, select [Max].



• When extracting the smallest circle inside the tool window, select [Min].



3 Press [OK].

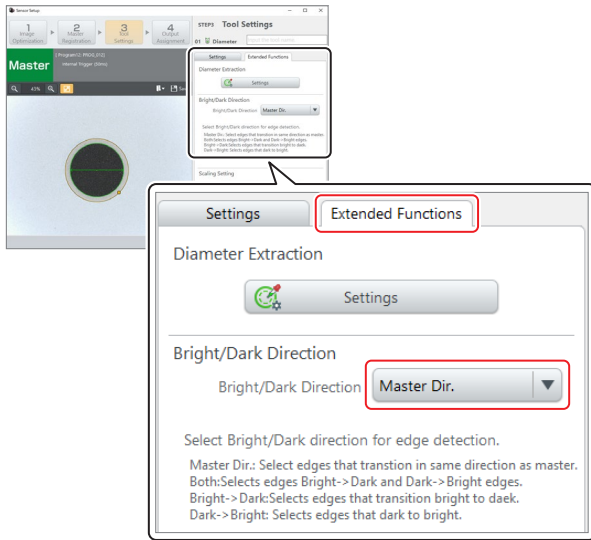
The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

The system returns to the main screen of [Diameter].

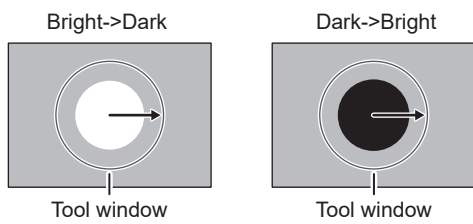
Bright/Dark Direction

1 Select the [Extended Functions] tab and select [Bright/Dark Direction].



Point

- When detecting edges in the same bright/dark direction as the master image, select [Master Dir.].
- When detecting both bright->dark and dark->bright edges, select [Both].
- When detecting edges that change from bright to dark, select [Bright -> Dark].
- When detecting edges that change from dark to bright, select [Dark -> Bright].



Reference

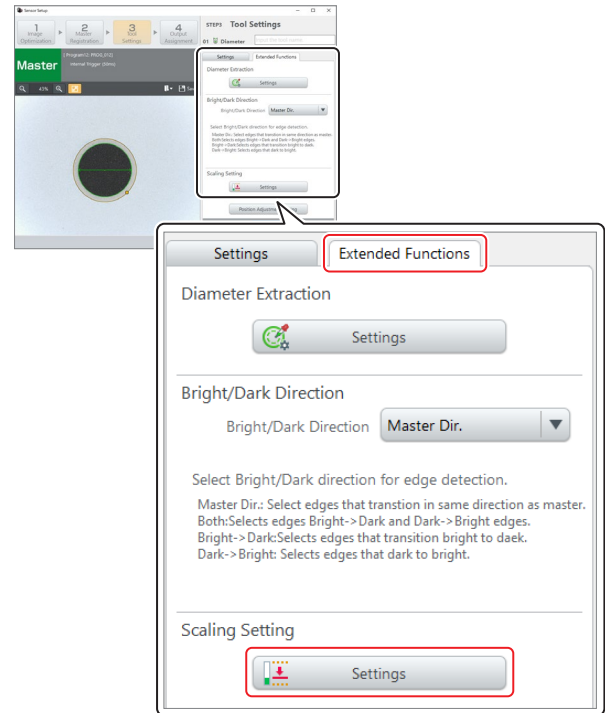
The sensor detects circles from the center of tool window towards outside.

2 Press the [Settings] tab.

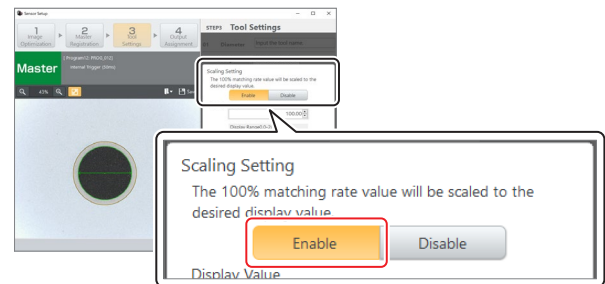
The system returns to the main screen of [Diameter].

Scaling

1 Select the [Extended Functions] tab and press [Settings] in [Scaling Setting].



2 Select [Enable] and perform the Scaling Setting.



Point

- If scaling is enabled, the display range and the setting scale (x2 or x10) of the threshold adjustment will be automatically adjusted.
- If scaling is enabled, the threshold can be adjusted by 0.1 mm.

● When changing the scaling settings

Enter a user-defined value in [Display Value].
The value of matching rate 100 is scaled by the display value.

Scaling Setting
The 100% matching rate value will be scaled to the desired display value.

Enable Disable

Display Value
100.00

Display Range 0.0-200.0mm

Copy Setting
Select the tool you wish to use for "Copy Setting".

01: Diameter

Copy

OK Cancel

Point The scaling display value can be adjusted by 0.05 mm.

3 Press [OK].

The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

The system returns to the main screen of [Diameter].

● When copying scaling settings

Select the source tool for the Scaling Setting from the [Copy Setting] drop-down menu, and press [Copy].

Scaling Setting
The 100% matching rate value will be scaled to the desired display value.

Enable Disable

Display Value
100.00

Display Range 0.0-200.0mm

Copy Setting
Select the tool you wish to use for "Copy Setting".

02: Diameter

Copy

OK Cancel

Reference The display of [Display Range] is updated to the value after scaling.

Point If the scaling value of the source tool is changed, copy the scaling settings again.

The confirmation screen opens.
Press [OK].

Reference The display of [Display Range] is updated to the value after scaling.

Point If the scaling value of the source tool is changed, copy the scaling settings again.

Edge Tool

● Setting items for the Edge tool

Items	Description
Edit Window	Specifies the area of the target to be detected using a tool window.
Mask	Adds a rectangular mask region in the tool window frame.
Add Mask	The area inside the mask region is excluded from the edge detection target.
Automatic Edge Sensitivity Adjustment	Automatically adjusts the sensitivity which detects the edge.
Manual adjustment	Manually adjusts the sensitivity which detects the edge.
LIVE image	The edge sensitivity can be adjusted using the Live image from the target.
Limit Adjustment	Adjusts the threshold (Match ^{*1}) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
Upper Limit	Enables an upper limit on the threshold. Set if OK/NG judgment is desired for a target that has a number of target edges larger than the number of edges of the master image.
Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment. The default value is automatically adjusted according to the number of edges of the registered master image.
Tool Name	A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. ☞ "Chapter 5 Running" (page 5-1)

*1The matching rate is the number of edges.

● Setting items for the Edge tool (advanced settings)

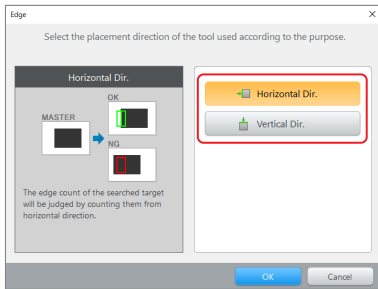
Items	Description	Ref.
Edge Detection	Selects the bright/dark direction which detects a target edge.	4-85
Fine Edge Mode	Set this when the space between edges is narrow.	4-85
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Edge tool can be selected.	4-39

Setting the Edge tool

1 Select the [Extra1] tab, and add the [Edge] tool.

📖 “Adding a Tool” (page 4-36)
Displays the Edge tool direction selection screen.

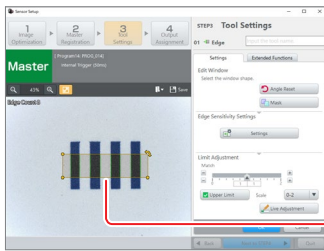
2 Press [Horizontal Dir.]/[Vertical Dir.].



Reference For [Horizontal Dir.], the edges are detected from the left to the right side of the tool window; for [Vertical Dir.], the edges are detected from the top to the bottom.

The main screen for [Edge] opens.

3 Set the position, size, and angle of the tool window according to the target.



Set the position, size, and angle

📖 “Editing the Window” (page 3-14)

Reference The window angle can be reset using the [Angle Reset] button.

4 Apply the mask as needed.

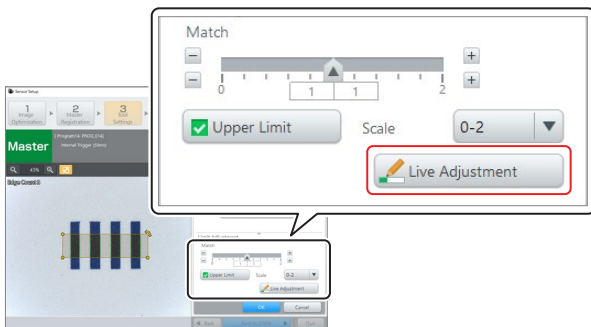
Inside the mask region is excluded from an edge detection target.

📖 “Mask settings” (page 4-38)

5 Adjust the edge sensitivity setting as needed.

📖 “Edge Sensitivity Settings” (page 4-84)

6 Press [Live Adjustment].



The sensor changes to the test operation.

7 Take an “OK” image and a “NG” image.

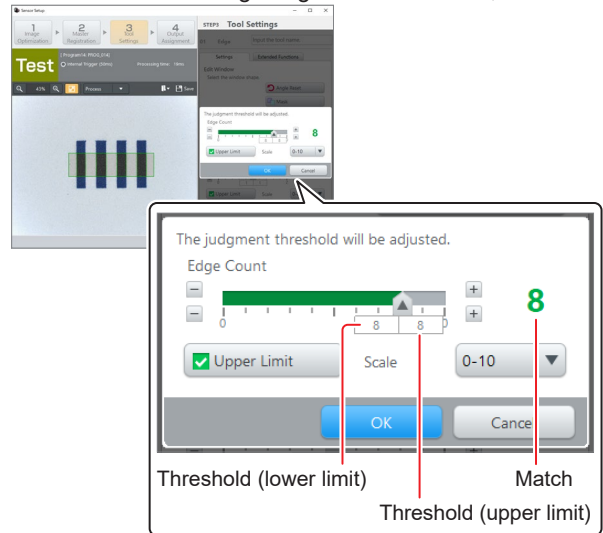
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

8 Adjust the threshold for anomaly detection by checking the number of edges.

<Setting example>

If the number of an “OK” image edges is 8, and if the number of a “NG” image edges is other than 8, set it to 8.



Reference A target is judged OK when the number of edges is within a threshold range, and NG when it is outside the range.

📖 “Selecting the Display Method of the Tool Window” (page 5-7)

📖 “Editing Numbers” (page 3-15)

📖 “Adjusting Thresholds for Judgment” (page 6-15)

9 Set [Upper Limit] as needed.

📖 “Upper Limit” (page 4-85)

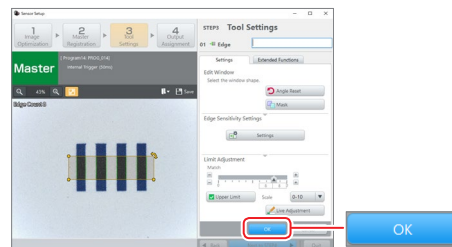
10 When setting is completed, press [OK].

The system returns to the main screen for [Edge].

11 Set the tool name as needed.

📖 “Tool Name Setting” (page 4-40)

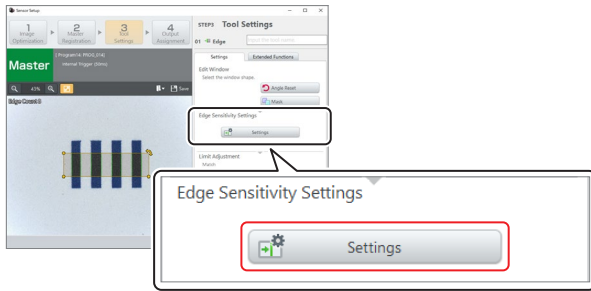
12 Press [OK].



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

Edge Sensitivity Settings

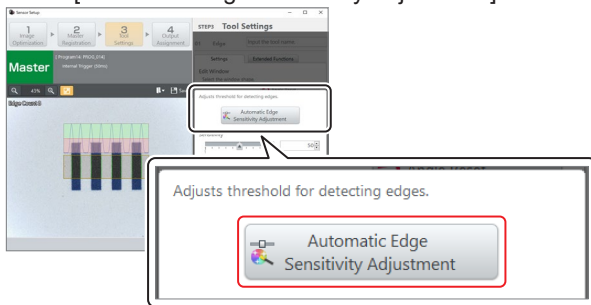
1 Press [Settings] for [Edge Sensitivity Settings].



2 Adjust the edge sensitivity.

● When the edge sensitivity is adjusted automatically

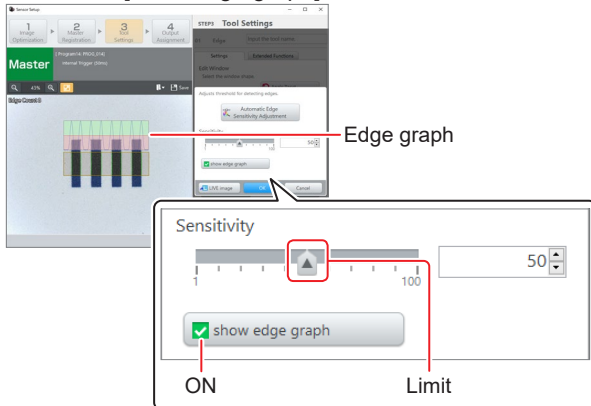
Press [Automatic Edge Sensitivity Adjustment].



The edge sensitivity will be adjusted automatically according to the target.

● When the edge sensitivity is adjusted manually

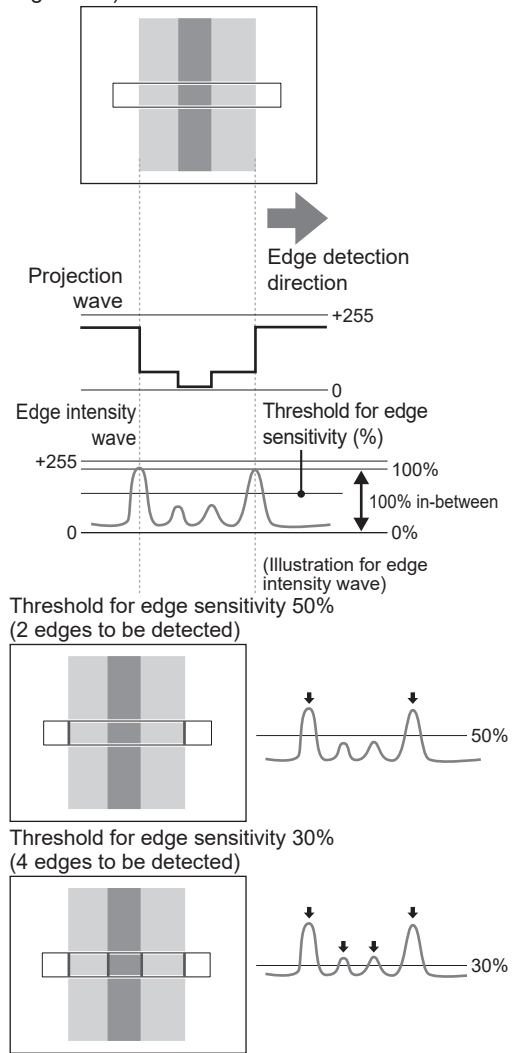
Switch the [show edge graph] check box to ON.



Adjust the threshold value for edge sensitivity by checking the edge graph being displayed.

- Reference**
- The edge sensitivity limit can be adjusted by pressing the red line.
 - Press [LIVE image] to adjust threshold value for edge intensity using the target Live image.

Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



3 Press [OK].

The system returns to the main screen for [Edge].

Upper Limit

1 Set the upper limit settings.

When changing the setting scale

Select [0-999] from the [Scale] drop-down menu. Adjust the threshold for anomaly detection by checking the matching rate.

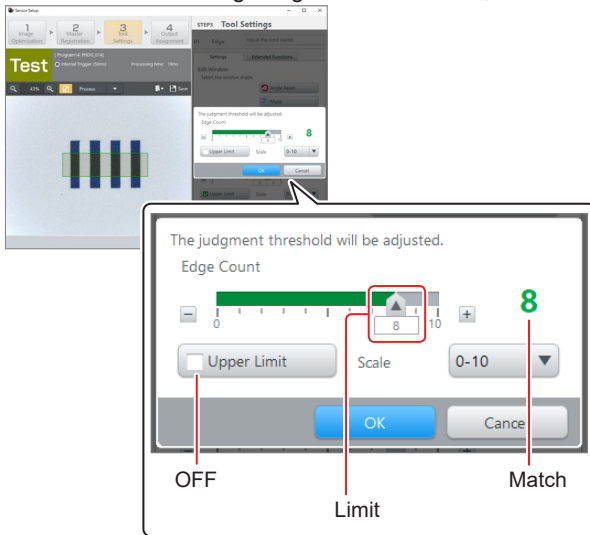
- Reference**
- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - “Selecting the Display Method of the Tool Window” (page 5-7)
 - “Editing Numbers” (page 3-15)
 - “Adjusting Thresholds for Judgment” (page 6-15)

When the upper limit is disabled

Switch the check box to [OFF] for the upper limit. Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the number of an “OK” image edges is 8, and if the number of a “NG” image edges is other than 8, set it to 8.

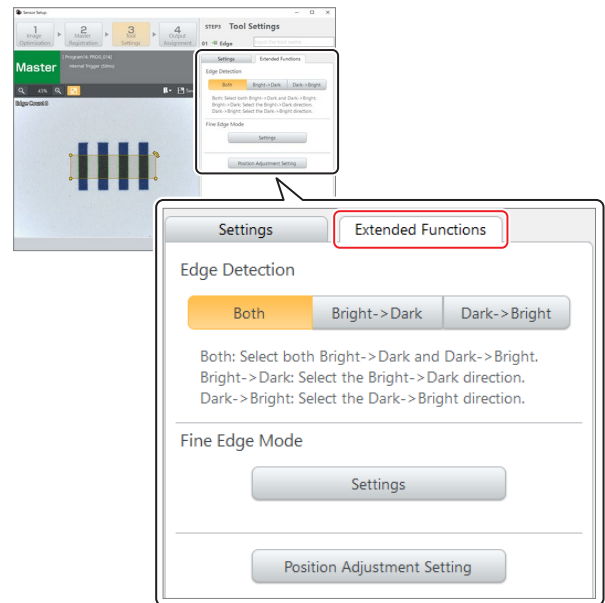


- Reference**
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - “Selecting the Display Method of the Tool Window” (page 5-7)
 - “Editing Numbers” (page 3-15)
 - “Adjusting Thresholds for Judgment” (page 6-15)

Advanced settings of the Edge tool

Edge Detection

1 Select the [Extended Functions] tab and select the [Edge Detection].



Bright/Dark Direction

- When detecting both bright->dark and dark->bright edges, select [Both].
- When detecting edges that change from bright to dark, select [Bright -> Dark].
- When detecting edges that change from dark to bright, select [Dark -> Bright].



- Reference**
- For [Horizontal Dir.], the edges are detected from the left to the right side of the tool window; for [Vertical Dir.], the edges are detected from the top to the bottom.

Fine Edge Mode

Press [Settings] and select [ON] when edges cannot be differentiated ones because the space between edges is narrow.

2 Press the [Settings] tab.

The system returns to the main screen for [Edge].

Pitch tool

● Setting items for the Pitch tool

Items	Description
Edit Window	Specifies the area of the target to be detected using a tool window.
Mask	Adds a rectangular mask region in the tool window frame. Area inside the mask region is excluded from a pitch detection target.
Automatic Edge Sensitivity Adjustment	Automatically adjust the sensitivity that detects the edge that will become the standard of reference for pitch extraction.
Manual adjustment	Manually adjust the sensitivity that detects the edge that will become the standard of reference for pitch extraction.
LIVE image	The edge sensitivity can be adjusted using the Live image from the target.
Limit Adjustment	Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation. A matching rate of 100 indicates that the average value of all pitches is completely matched to the master image. The value which deviates the most from the average value among all pitches becomes the matching rate. When the number of pitches is different from the number for the master image, the matching rate is 0.
Scale	Select the scale for the threshold according to the range of matching rates requires for judgment.
Tool Name	A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. 📖 "Chapter 5 Running" (page 5-1)

● Setting items for the Pitch tool (advanced settings)

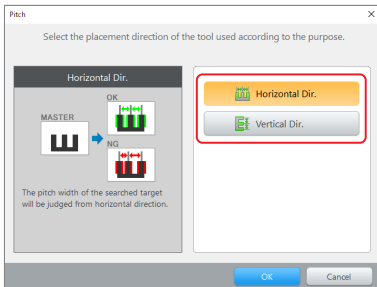
Items	Description	Ref.	
Pitch Extraction Method	Bright/Dark Mode	Select the method to extract the target pitch.	4-89
	Meas. Mode	Select the measuring method for the pitch extracted from a target.	
	Narrow Pitch Mode	Set when pitch width is narrow.	
Scaling Setting	Scaling Setting	Sets scaling. Set when length is being used for anomaly detection instead of the matching rate.	4-90
	Display Value	When the scaling is enabled, input the display value in relation to matching rate (*) 100. A matching rate of 100 indicates that the average value of all pitches is completely matched to the master image. The value which deviates the most from the average value among all pitches becomes the matching rate. When the number of pitches is different from the number for the master image, the matching rate is 0.	
	Copy Setting	When scaling is enabled, copy the scaling settings from another tool.	
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Pitch tool can be selected.	4-39	

Setting the Pitch tool

1 Select the [Extra1] tab, and add the [Pitch] tool.

“Adding a Tool” (page 4-36)
Displays the Pitch tool direction selection screen.

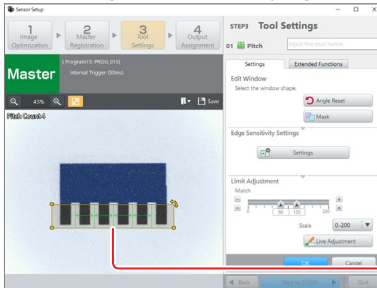
2 Press [Horizontal Dir.]/[Vertical Dir.].



The main screen for [Pitch] opens.

3 Set the position, size, and angle of the tool window according to the target.

“Editing the Window” (page 3-14)



Set the position, size, and angle

Reference The window angle can be reset using the [Angle Reset] button.

4 Apply the mask as needed.

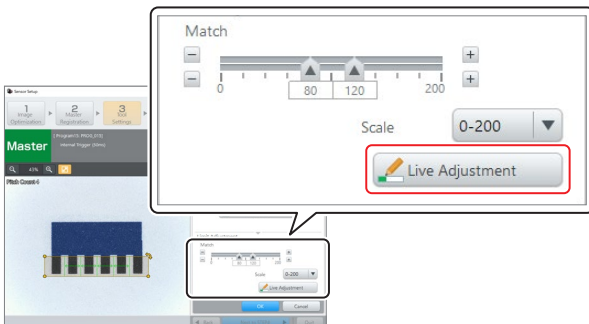
Area inside the mask region is excluded from a pitch detection target.

“Mask settings” (page 4-38)

5 Adjust the edge sensitivity setting as needed.

“Edge Sensitivity Settings” (page 4-88)

6 Press [Live Adjustment].



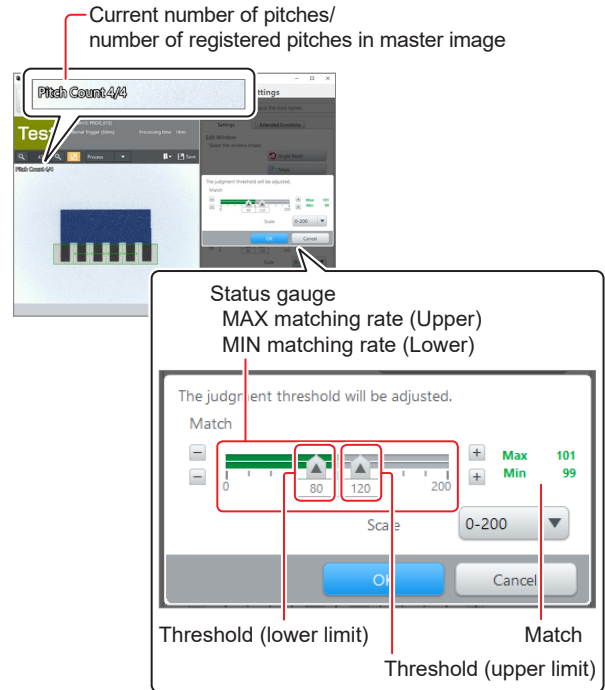
The sensor changes to the test operation.

7 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

8 Adjust the threshold for anomaly detection by checking the matching rate.



- Reference
- When changing the scale, select [0-999] from the [Scale] drop-down menu.
 - The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - “Selecting the Display Method of the Tool Window” (page 5-7)
 - “Editing Numbers” (page 3-15)
 - “Adjusting Thresholds for Judgment” (page 6-15)

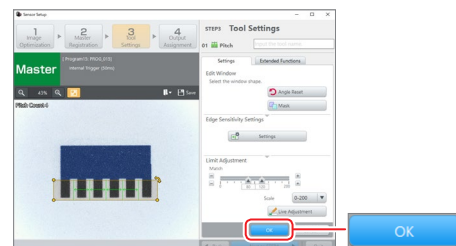
9 When setting is completed, press [OK].

The system returns to the main screen for [Pitch].

10 Set the tool name as needed.

“Tool Name Setting” (page 4-40)

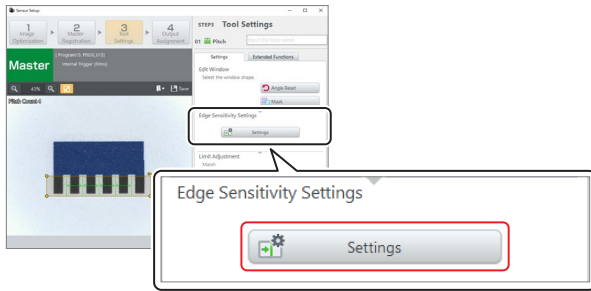
11 Press [OK].



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

Edge Sensitivity Settings

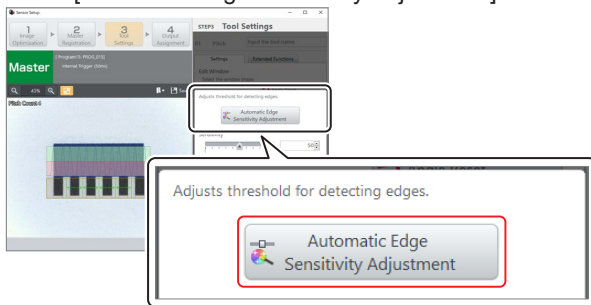
1 Press [Settings] for [Edge Sensitivity Settings].



2 Adjust the edge sensitivity.

When the edge sensitivity is adjusted automatically

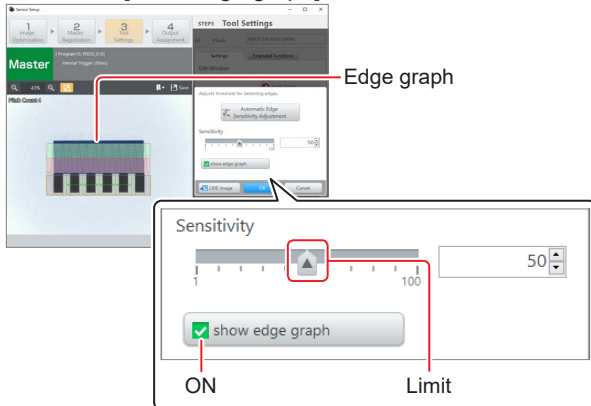
Press [Automatic Edge Sensitivity Adjustment].



The edge sensitivity will be adjusted automatically according to the target.

When the edge sensitivity is adjusted manually

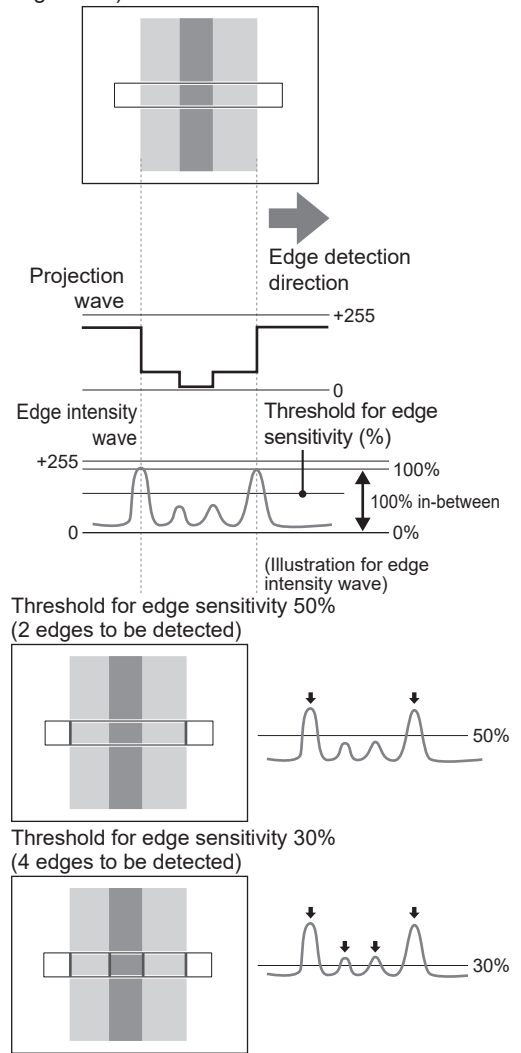
Switch the [show edge graph] check box to ON.



Adjust the threshold value for edge sensitivity by checking the edge graph being displayed.

- Reference**
- The edge sensitivity limit can be adjusted by pressing the red line.
 - Press [LIVE image] to adjust threshold value for edge intensity using the target Live image.

Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



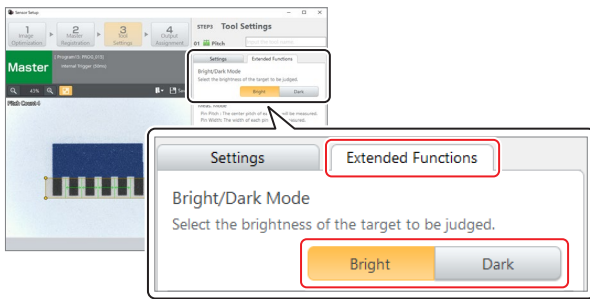
3 Press [OK].

The system returns to the main screen for [Pitch].

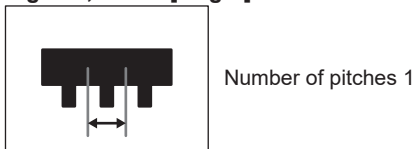
Advanced settings of the Pitch tool

Bright/Dark Mode

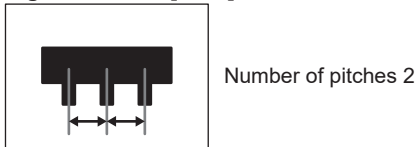
1 Select the [Extended Functions] tab and select [Bright/Dark Mode].



Point • When extracting pitches between bright regions, select [Bright].



• When extracting pitches between dark regions, select [Dark].

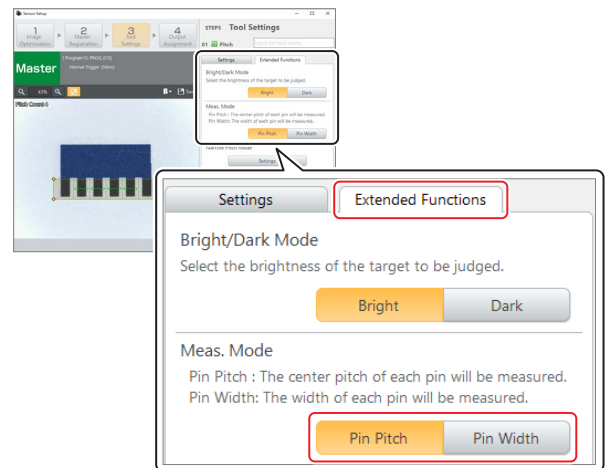


2 Press the [Settings] tab.

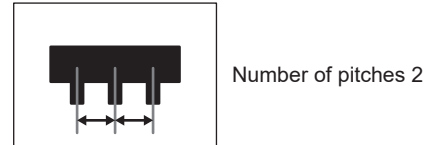
The system returns to the main screen for [Pitch].

Measurement Mode

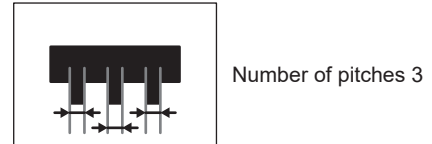
1 Select the [Extended Functions] tab and select [Meas. Mode].



Point • Example of [Pin Pitch]



• Example of [Pin Width]

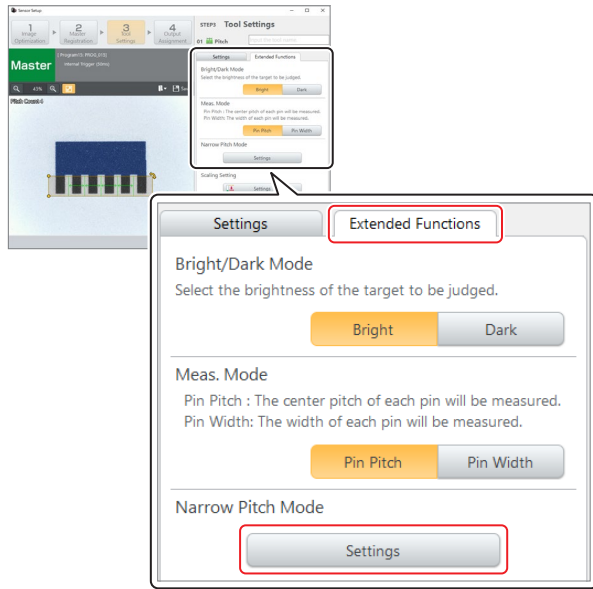


2 Press the [Settings] tab.

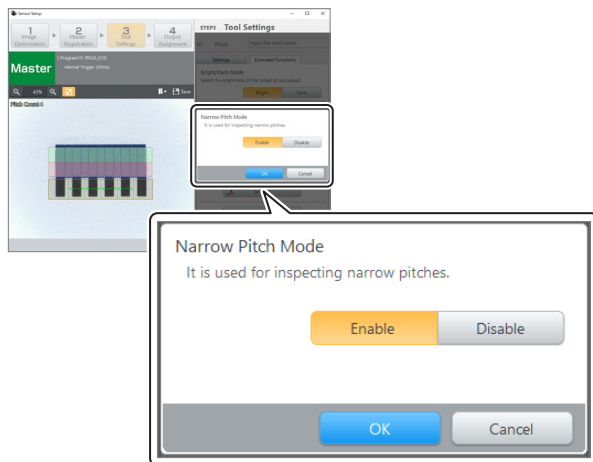
The system returns to the main screen for [Pitch].

Narrow Pitch Mode

1 Select the [Extended Functions] tab and press [Settings] of [Narrow Pitch Mode].



2 Enable/Disable Narrow Pitch Mode.



Reference If [Enable] is selected, pitches can be extracted even when the pitch width is narrow.

3 Press [OK].

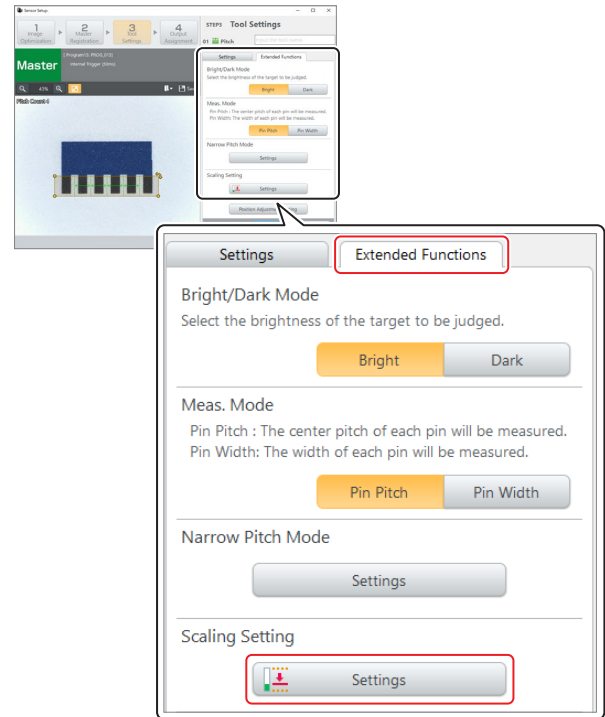
The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

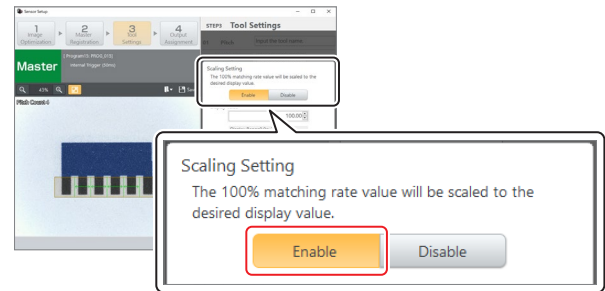
The system returns to the main screen for [Pitch].

Scaling

1 Select the [Extended Functions] tab and press [Settings] in [Scaling Setting].



2 Select [Enable] and perform the Scaling Setting.



- Point**
- If scaling is enabled, the display range and the setting scale (x2 or x10) of the threshold adjustment will be automatically adjusted.
 - If scaling is enabled, the threshold can be adjusted by 0.1 mm.

● When changing the scaling settings

Enter a user-defined value in [Display Value].
The value of matching rate 100 is scaled by the display value.

Scaling Setting
The 100% matching rate value will be scaled to the desired display value.

Enable Disable

Display Value
100.00

Display Range 0.0~200.0mm

Copy Setting
Select the tool you wish to use for "Copy Setting".

01:Pitch

Copy

OK Cancel

Point The scaling display value can be adjusted by 0.05 mm.

● When copying scaling settings

Select the source tool for the Scaling Setting from the [Copy Setting] drop-down menu, and press [Copy].

Scaling Setting
The 100% matching rate value will be scaled to the desired display value.

Enable Disable

Display Value
100.00

Display Range 0.0~200.0mm

Copy Setting
Select the tool you wish to use for "Copy Setting".

02:Pitch

Copy

OK Cancel

The confirmation screen opens.
Press [OK].

Reference The display of [Display Range] is updated to the value after scaling.

Point If the scaling value of the source tool is changed, copy the scaling settings again.

3 Press [OK].

The system returns to the main screen for the extended functions settings.


4 Press the [Settings] tab.

The system returns to the main screen for [Pitch].


High-Speed Position Adjustment Tool

● Setting items for the High-Speed Position Adjustment tool

○1-Ax. Adjustment

Items	Description
Edit Window	Specifies the area of the target to be detected using a tool window.
Scan Direction	Selects the direction for which the tool detects the target edge.
Automatic Edge Sensitivity Adjustment	Automatically adjusts the sensitivity which detects the edge.
Manual adjustment	Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)
LIVE image	The edge sensitivity can be adjusted using the Live image from the target.
Test run	Changes to Test mode, used to check that the position adjustment has been performed correctly.
Tool Name	A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)

○2-Ax. Adjustment

Items	Description	
X-Axis	Edit Window	Specifies the area of the target to be detected using a tool window.
	Scan Direction	Selects the direction for which the tool detects the target edge.
	Automatic Edge Sensitivity Adjustment	Automatically adjusts the sensitivity which detects the edge.
	Manual adjustment	Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)
	LIVE image	The edge sensitivity can be adjusted using the Live image from the target.
Y-Axis	Edit Window	Specifies the area of the target to be detected using a tool window.
	Scan Direction	Selects the direction for which the tool detects the target edge.
	Automatic Edge Sensitivity Adjustment	Automatically adjusts the sensitivity which detects the edge.
	Manual adjustment	Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)
	LIVE image	The edge sensitivity can be adjusted using the Live image from the target.
Common	Test run	Changes to Test mode, used to check that the position adjustment has been performed correctly.
Tool Name	A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)	

● Setting items for the High-Speed Position Adjustment tool (Advanced Settings)

The contents of the extended functions that can be set in [1-Ax. Adjustment], [2-Ax. Adjustment (X-Axis)], and [2-Ax. Adjustment (Y-Axis)] are the same.

Items	Description	Ref.
Edge Detection	Selects the bright/dark direction which detects a target edge.	4-96

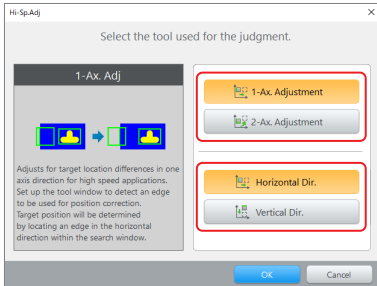
Setting the High-Speed Position Adjustment Tool

1-Axis Adjustment

1 Select the [Extra1] tab, and add the [High-Speed Position Adjustment] tool.

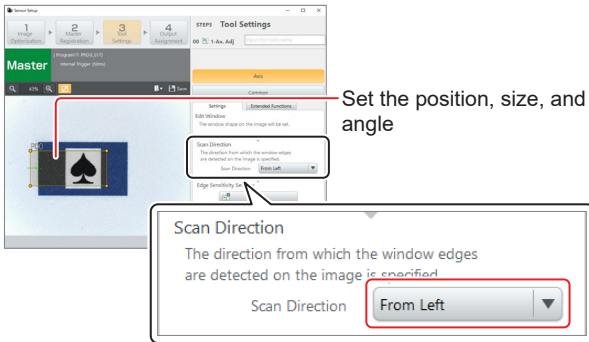
☞ “Adding a Tool” (page 4-36)

2 Select the [1-Ax. Adjustment] button. Press [Horizontal Dir.] or [Vertical Dir.], and press [OK].

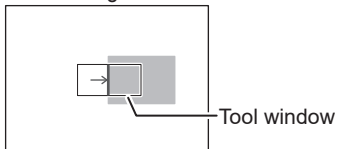


The main screen for [1-Ax. Adj] opens.

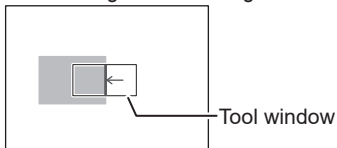
3 Select the detection direction, and set the position and size of the tool window according to a target.



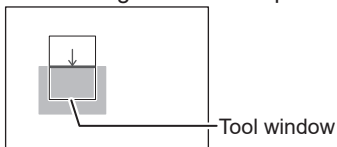
- Detection direction: From Left (default)
Detects edges from the left side of window to the right side.



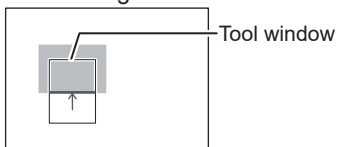
- Scan Direction: From Right
Detects edges from the right side of window to the left side.



- Scan Direction: From Top
Detects edges from the top of window to the bottom.



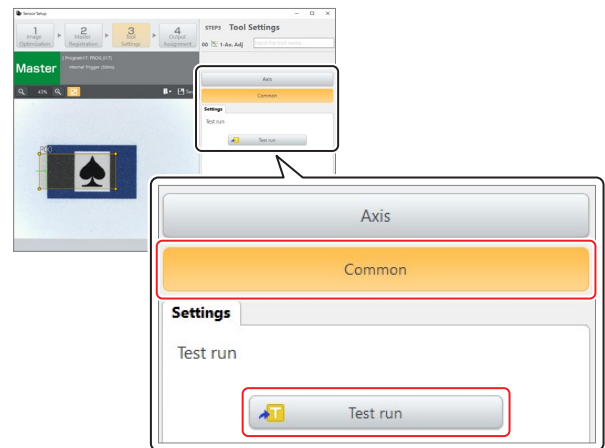
- Scan Direction: From Bottom
Detects edges from the bottom of window to the top.



4 Adjust the edge sensitivity setting as needed.

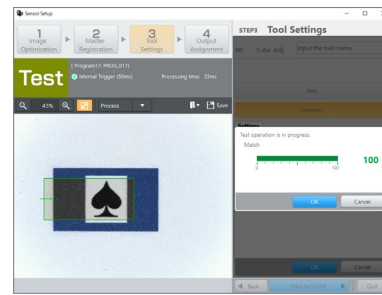
☞ “Edge Sensitivity Settings” (page 4-95)

5 Press [Common], and then press [Test run].



The sensor changes to the test operation.

6 Position correction is performed and the edge detection process can be confirmed.



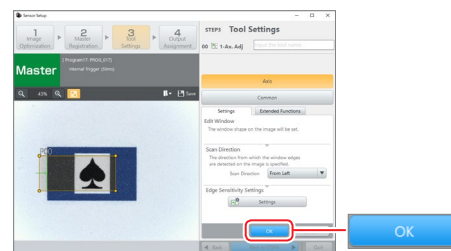
7 Press [OK].

The system returns to the main screen for [1-Ax. Adj].

8 Set the tool name as needed.

☞ “Tool Name Setting” (page 4-40)

9 Press [OK].



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

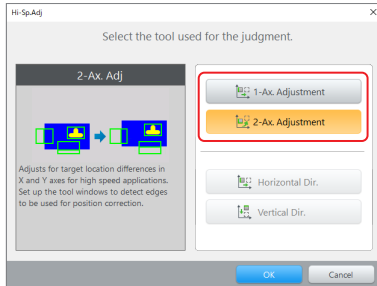
3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)

2-Axis Adjustment

1 Select the [Extra1] tab, and add the [High-Speed Position Adjustment] tool.

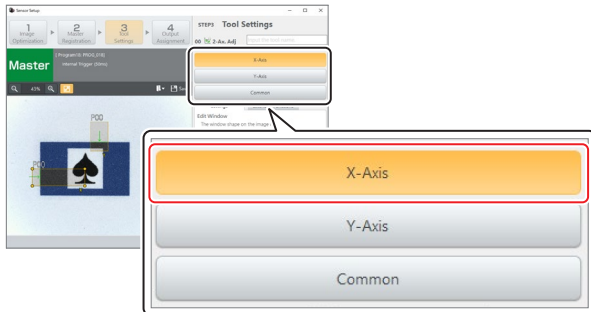
☞ “Adding a Tool” (page 4-36)

2 Select the [2-Ax. Adjustment] button, and press [OK].

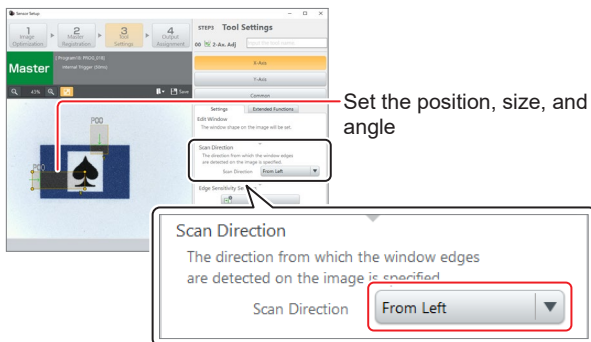


The main screen for [2-Ax. Adj] opens.

3 Press [X-Axis].



4 Select the detection direction, and set the position and size of the tool window according to a target.

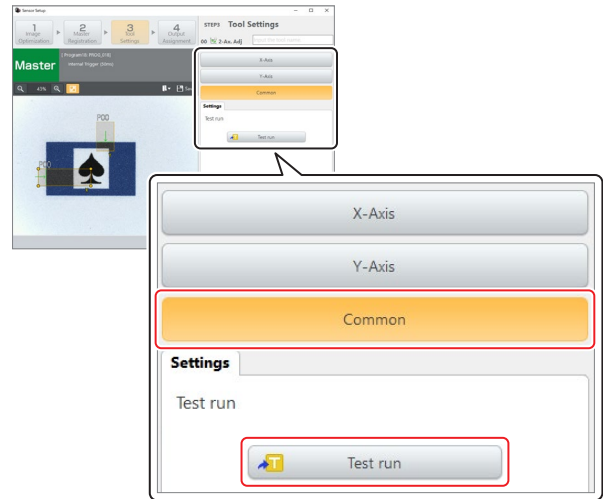


5 Press [Y-Axis], and perform steps 3 and 4 for the Y axis.

6 Adjust the edge sensitivity setting as needed.

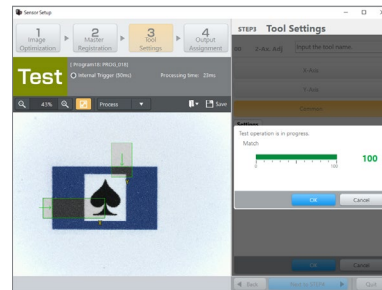
☞ “Edge Sensitivity Settings” (page 4-95)

7 Press [Common], and then press [Test run].



The sensor changes to the test operation.

8 Position correction is performed and the edge detection process can be confirmed.



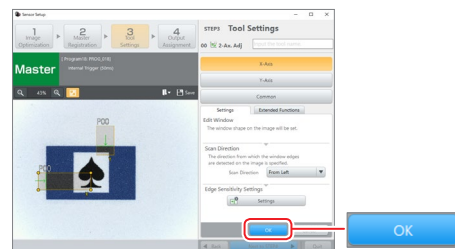
9 Press [OK].

The system returns to the main screen for [2-Ax. Adj].

10 Set the tool name as needed.

☞ “Tool Name Setting” (page 4-40)

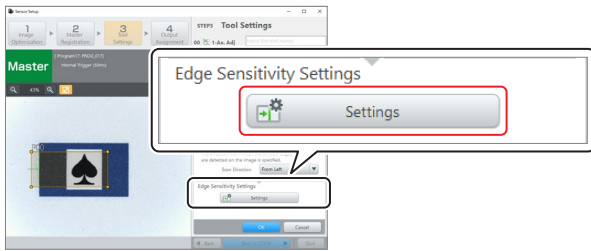
11 Press [OK].



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

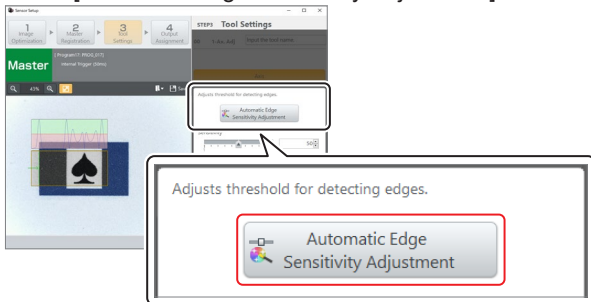
Edge Sensitivity Settings

- For [2-Ax. Adjustment], select an axis to set.
- Press [Settings] for [Edge Sensitivity Settings].



- Adjust the edge sensitivity.
 - When the edge sensitivity is adjusted automatically

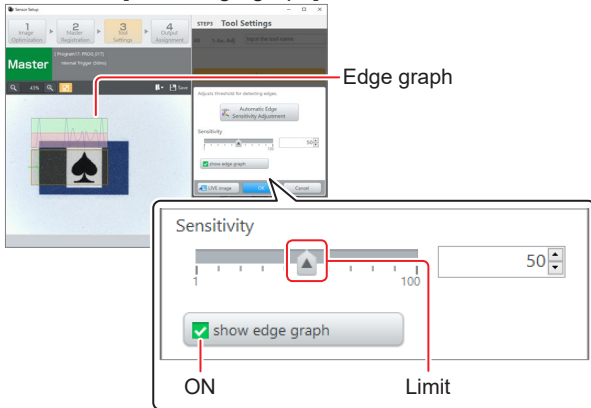
Press [Automatic Edge Sensitivity Adjustment].



The edge sensitivity will be adjusted automatically according to the target.

- When the edge sensitivity is adjusted manually

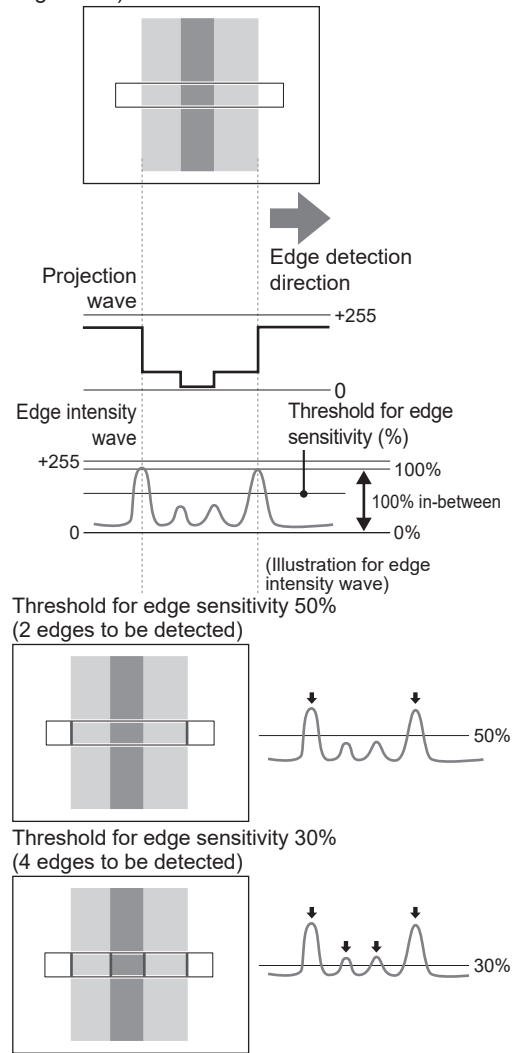
Switch the [show edge graph] check box to ON.



Adjust the threshold value for edge sensitivity by checking the edge graph being displayed.

- Reference**
- The edge sensitivity limit can be adjusted by pressing the red line.
 - Press [LIVE image] to adjust threshold value for edge intensity using the target Live image.

Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



- Press [OK].
 - The system returns to the main screen for [1-Ax. Adj] or [2-Ax. Adj].

- Set the tool name as needed.
 - "Tool Name Setting" (page 4-40)

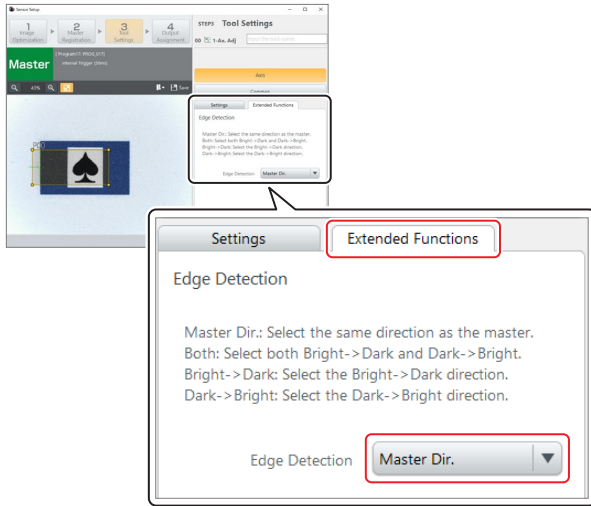
Advanced settings for the High-Speed Position Adjustment tool

The contents of the extended functions that can be set in [1-Ax. Adjustment], [2-Ax. Adjustment (X-Axis)], and [2-Ax. Adjustment (Y-Axis)] are the same.

■ Edge Detection

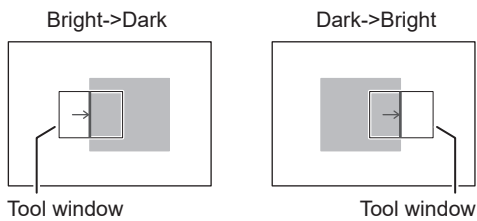
1 For [2-Ax. Adj], select an axis to set.

2 Select the [Extended Functions] tab and select [Edge Detection].



Point

- When detecting edges in the same bright/dark direction as the master image, select [Master Dir.].
- When detecting both bright->dark and dark->bright edges, select [Both].
- When detecting edges that change from bright to dark, select [Bright -> Dark].
- When detecting edges that change from dark to bright, select [Dark -> Bright].



3 Press [OK].


The system returns to the main screen for [High-Speed Position Adjustment].

OCR Tool

● Setting items for the OCR tool

 Point The characters that can be recognized by the OCR tool are as follows.

Numbers	0123456789
Letters	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
Symbols	. / + - : () # * (9 symbols)

Items		Description	
Edit Window	Mask	Add Mask	Adds a rectangular/circular mask region in the tool window frame. Area inside the mask region is excluded from an OCR examination target.
		Cut Mask	Removes a rectangular/circular region from the mask region. Inside the region removed from the mask, the mask is disabled and OCR extraction is enabled.
Reading Settings	Character		Reads the printed text.
	Character Settings	Letter reading	Select whether to read letters.
		Number reading	Select whether to read numbers.
		Symbol reading	Select whether to read symbols.
	Date		Reads the printed text, and extracts the part that was read as the date.
Date Settings	Date format	Selects the date format for the text to be read.	
Status conditions (When the reading target is set to [Character].)	Master text		Edits the master text.
	Judge number of char(s) only		Judges whether the number of letters on the object matches the number of letters in the master text.
Status conditions (When the reading target is set to [Date].)	Master date		Edits the master date.
	Calendar sync		Sets the master date to the current date and time on the sensor.
	Sync Settings	Offset from current (day)	Sets the number of days for the master date to be offset in relation to the current date and time on the sensor.
		Date Change: Time	Set this when delaying the time that the master date changes. The master date will change at "00:00" by default.
		Acceptable error (min)	Set the time error in minutes for dates to be judged as OK both before and after the date change is to occur.
0 in 10s pos of mm/dd	Sets to include a leading zero when the month and/or day in the master date is a single digit.		
Test run			Switches to Test Run mode to check of the OK/NG judgment status. Used to adjust the threshold (Match) used in OK/NG judgment.
			Adjusts the threshold (Match) used in OK/NG judgment when the shade contrast function for character recognition is set to [Enable].
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)	

● Setting items for the OCR tool (advanced settings)

Items	Description	Ref.
Shade Contrast	Evaluate the contrast of the target text or date. If the ink of the text or date is lighter than the master text, the matching rate will decrease.	4-102
OCR Algorithm	The detection mode of the OCR tool can be selected.	4-103
Dot Matrix Print	Select this when reading dot characters such as those made by IJP (ink jet printers) that are not stable.	4-104
Print Type	Set this when [Dot Matrix Print] is [Enable]. Selects the print type of the dot matrix to be read.	
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the OCR tool can be selected.	4-39

3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)

Setting the OCR tool

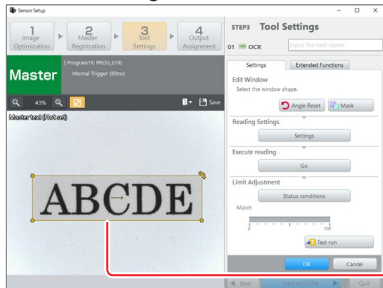
Point The maximum number of characters that can be read by one tool is 16.

1 Select the [Extra2] tab, and add the [OCR] tool.

☞ “Adding a Tool” (page 4-36)
The main screen for [OCR] opens.

2 Set the position, size, and angle of the tool window according to the target text.

Select the target text with the tool window.



Set the position, size, and angle

☞ “Editing the Window” (page 3-14)

3 Apply the mask as needed.

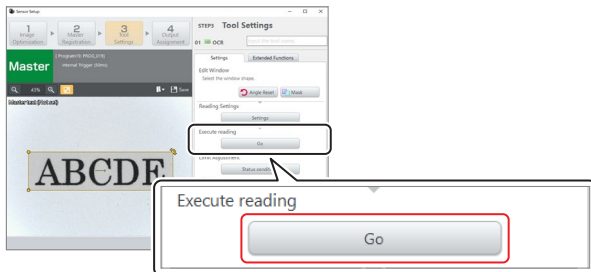
The area inside of the mask region is excluded from character recognition.

☞ “Mask settings” (page 4-38)

4 Configure the reading settings.

☞ “Reading Settings” (page 4-99)

5 Press [Go] of the Execute reading.

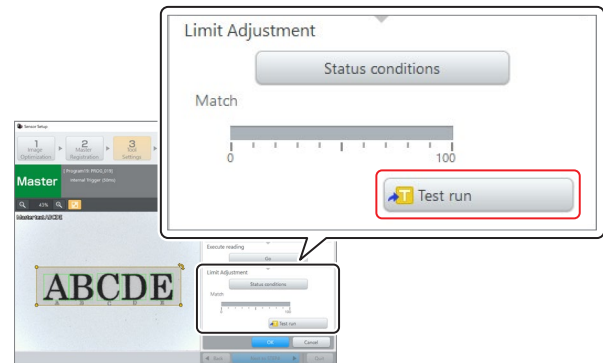


The text or date to be set as the master are read.

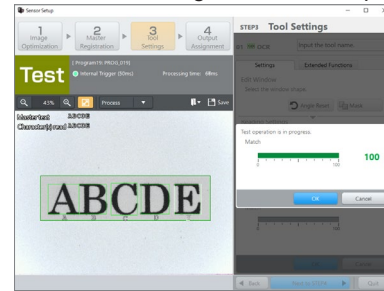
6 Adjust the status conditions as necessary.

☞ “Setting the Status Conditions” (page 4-100)

7 Press [Test run].



The sensor changes to the test operation.



Reference

A character string is judged as OK if the string matches the master text and NG if the string does not match the master text.

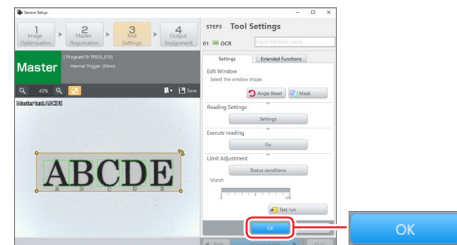
8 Press [OK].

The system returns to the main screen for [OCR].

9 Input a tool name as needed.

☞ “Tool Name Setting” (page 4-40)

10 Press [OK].

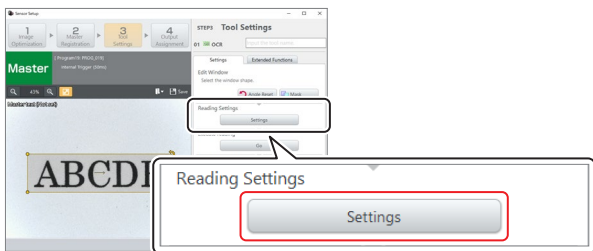


The system returns to the main screen for the tool settings.

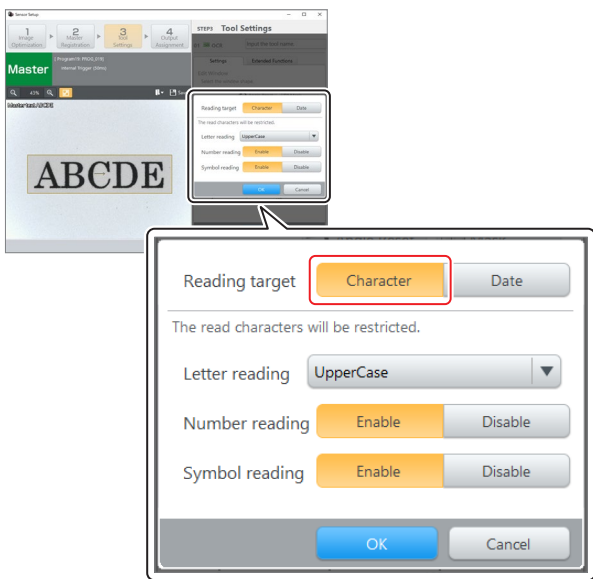
■ Reading Settings

● To read text

1 Press [Settings].



2 Select [Character] as the reading target and set whether to use letters, numbers, or symbols as the reading target.



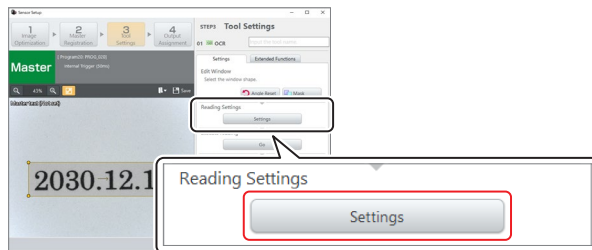
Letter reading	Disable, upper case letters, and upper case/lower case letters can be selected.
Number reading	Enable or disable can be selected.
Symbol reading	Enable or disable can be selected.

3 When setting is completed, press [OK].

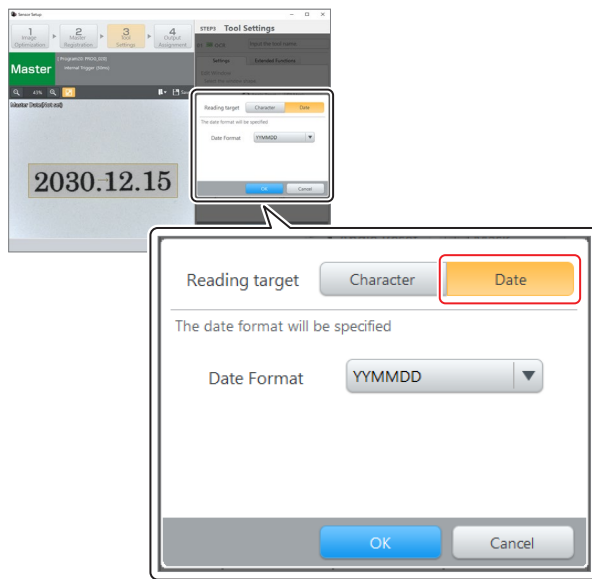
The character string that was selected to be the master is read and the system returns to the main screen for [OCR].

● To read the date

1 Press [Settings].



2 Select [Date] as the reading target, and set [Date Format].



Point Set the date format to match that of the reading target. Dates that differ from the set date format will not be read.

3 Press [OK] and read the date that you want to set as the master text.

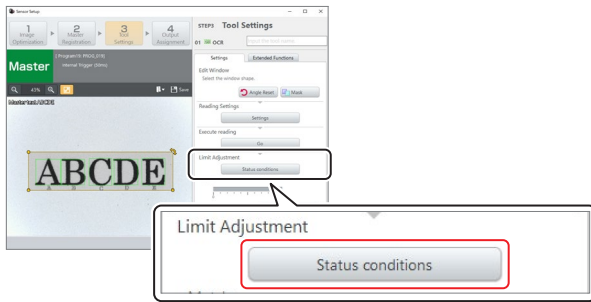
The date that was selected to be the master is read and the system returns to the main screen for [OCR].

3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)

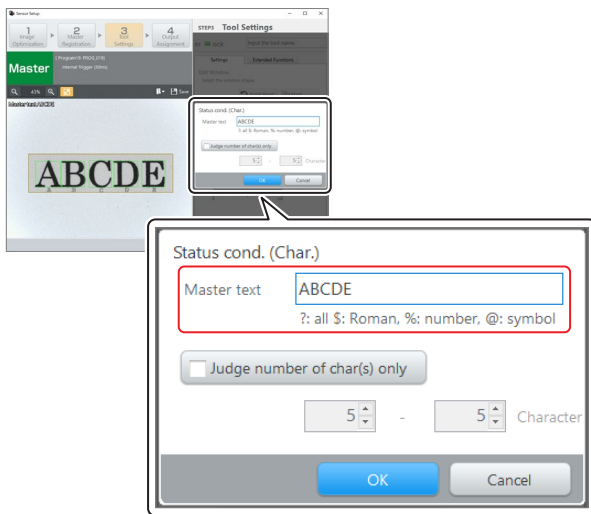
■ Setting the Status Conditions

● To read text

1 Press [Status conditions].

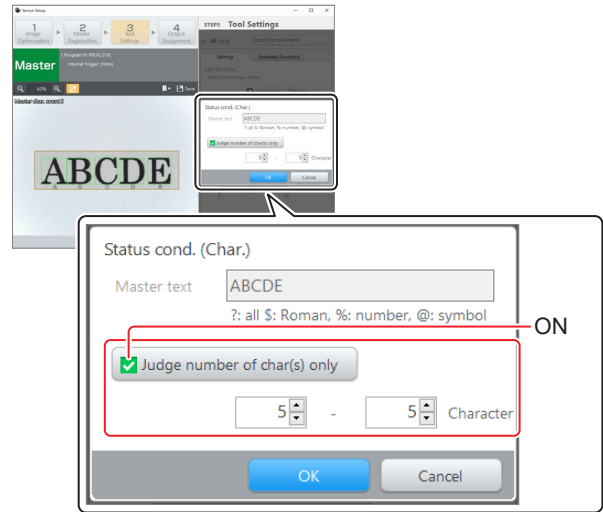


2 Edit [Master text] if necessary.



3 Set [Judge number of char(s) only] if necessary.

If it is necessary to only judge if the number of characters matches the master text, set the [Judge number of char(s) only] check box to ON and enter the number of characters.



Point Specify the minimum and maximum number of characters to judge as OK.

Example: 4 to 8 characters

If the number of characters in a string of text is between four and eight characters, it is judged as OK.

4 When setting is completed, press [OK].

The system returns to the main screen for [OCR].

Point Configure this setting if you want to judge text other than the text read with [Master Registration].

You can set arbitrary characters (all letters, numbers, and symbols) not included in the specified letters, numbers, and symbols.

- ? : Judges all letters, numbers, and symbols as OK.
- \$: Judges all letters as OK.
- % : Judges all numbers as OK.
- @ : Judges all symbols as OK.

[Arbitrary characters] usage example

• Master text: AB\$DE

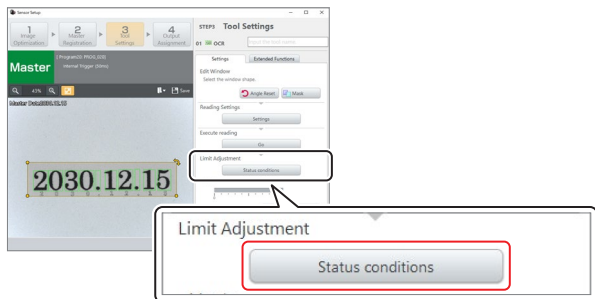
- ABCDE : OK
- ABFDE : OK
- AB5DE : NG

• Master text: AB?DE

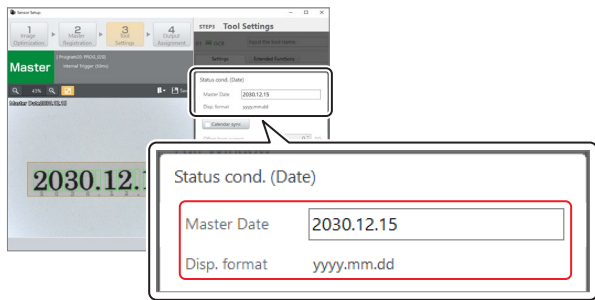
- ABCDE : OK
- ABFDE : OK
- AB5DE : OK

● To read the date

1 Press [Status conditions].



2 Edit the Master Date if necessary.



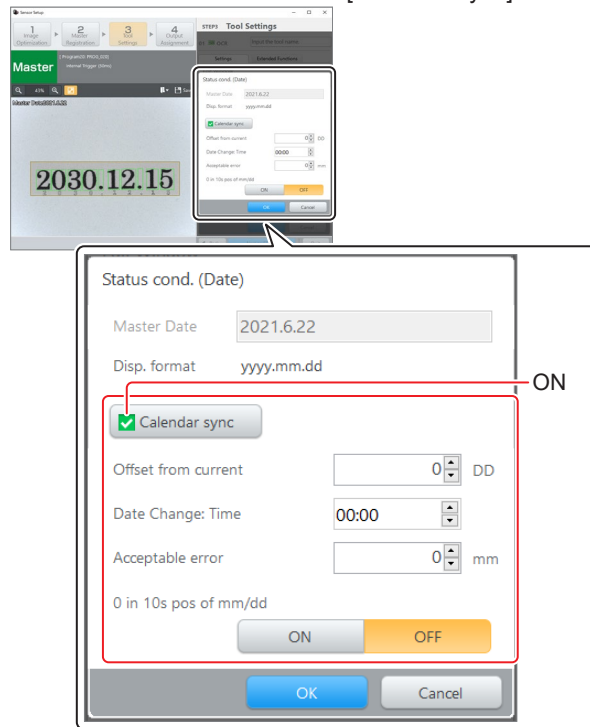
Point

Configure this setting if changing the master date used for the master image. Even if the date is changed, the Master Date is updated without having to read the target text again. Make sure that the format of the edited Master Date is the same as [Date Format] set in [Reading Settings]. If the Master Date format order for the [Reading Settings] date format could not be interpreted, the display format will be unknown and the Master Date will not be set correctly.

3 Set [Calendar sync] as necessary.

Reference The master date will synchronize with the sensor date and time. Set this item to link the reading target date to the current date and time.

Switch the check box to ON for [Calendar sync].



● Offset from current

Offsets the master date by the desired number of days away from the current date on the sensor.

● Date Change: Time

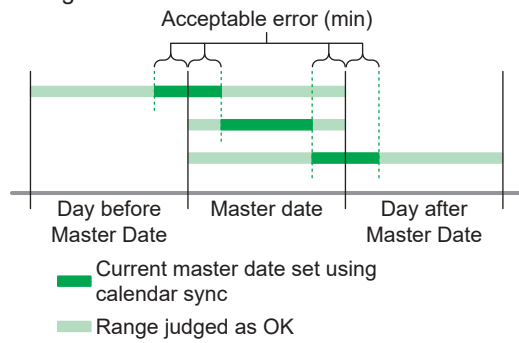
Delays the time that the master date changes to a user-specified time. The default time that the master date change is "00:00".

Reference When the Date Change Time is set to "06:00", operation will continue as the master date of the previous day between "00:00" to "06:00". The master text of the tool will advance to the next day at "06:00".

3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)

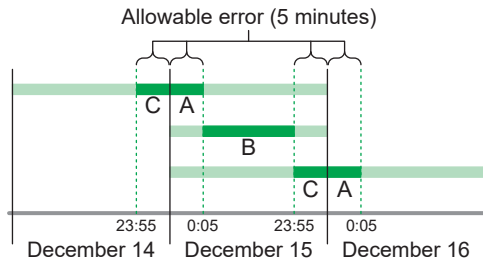
● Acceptable error (min)

Sets the time error (allowable error) in minutes for dates to be judged as OK both before and after the date changes.



If the current master date is set within the [Acceptable error (min)] range by calendar synchronization, the set time before or after the master date can be included in the range to be judged as OK. Set this item if the date may change after the date is printed or before it is checked.

Reference Example with the allowable error set to 5 minutes



- (A) If the current master date is between 0:00 and 0:05 using calendar synchronization, the day before and the day set as the master date will be judged as OK.
- (B) If the current master date is between 0:06 and 23:54 using calendar synchronization, only the day set as the master date will be judged as OK.
- (C) If the current master date is between 23:55 and 24:00 using calendar synchronization, the day set as the master date and the next day will be judged as OK.

● 0 in 10s pos of mm/dd

Sets whether to add a leading [0] when the month and/or day in the target date is a single digit. Select this setting according to the date format of the target date.

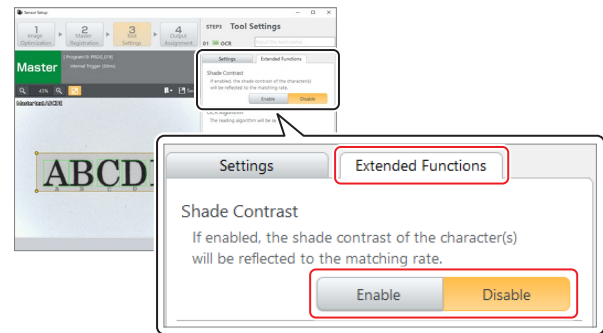
4 When setting is completed, press [OK].

The system returns to the main screen for [OCR].

Advanced settings for the OCR tool

■ Shade Contrast

1 Select the [Extended Functions] tab and set [Shade Contrast].



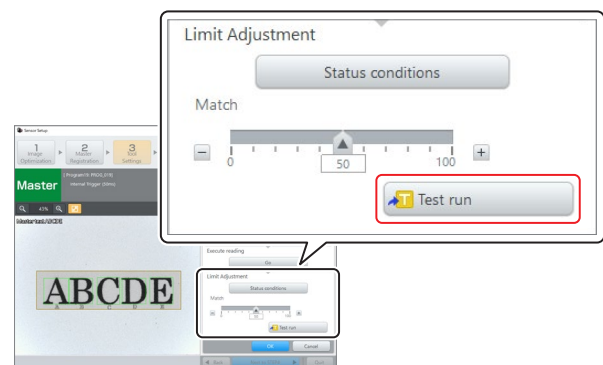
Point If shade contrast is enabled, the threshold for anomaly detection (Matching Rate) can be adjusted on the test run screen.
 “Test run (when Shade Contrast is set to [Enable])” (page 4-102)

2 Press the [Settings] tab.

The system returns to the main screen for [OCR].

● Test run (when Shade Contrast is set to [Enable])

1 Press the [Settings] tab, then [Test run].



The sensor changes to the test operation.

2 Capture an “OK” text or date that is clearly printed and a “NG” text or date that is not printed clearly.

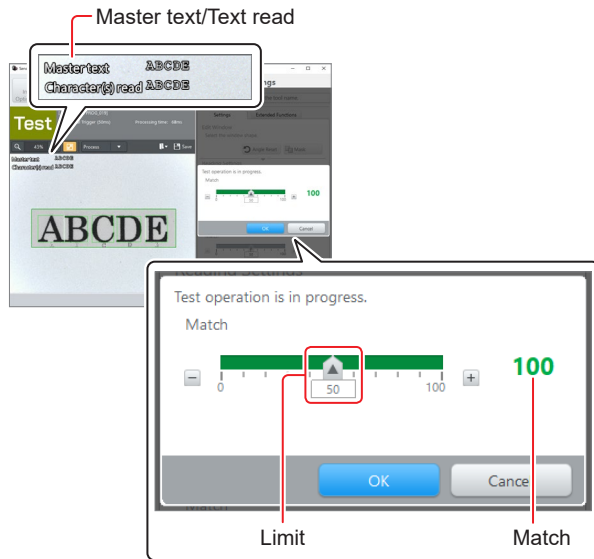
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

3 Adjust the threshold for anomaly detection by checking the matching rate.

<Setup example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.



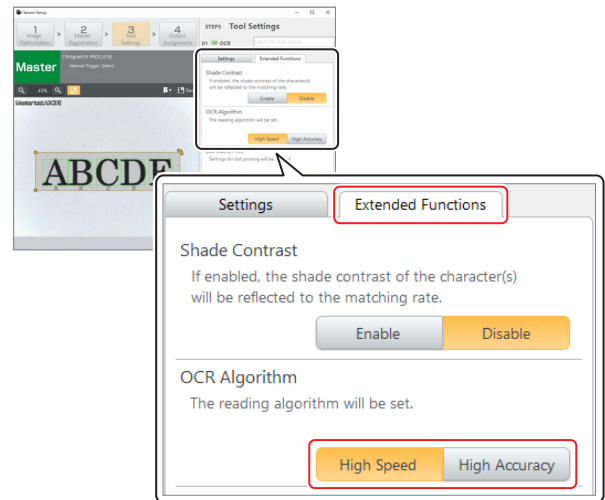
Reference

The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.

- “Selecting the Display Method of the Tool Window” (page 5-7)
- “Editing Numbers” (page 3-15)
- “Adjusting Thresholds for Judgment” (page 6-15)

OCR Algorithm

1 Select the [Extended Functions] tab and select the [OCR Algorithm] type (High Speed/High Accuracy).



Point

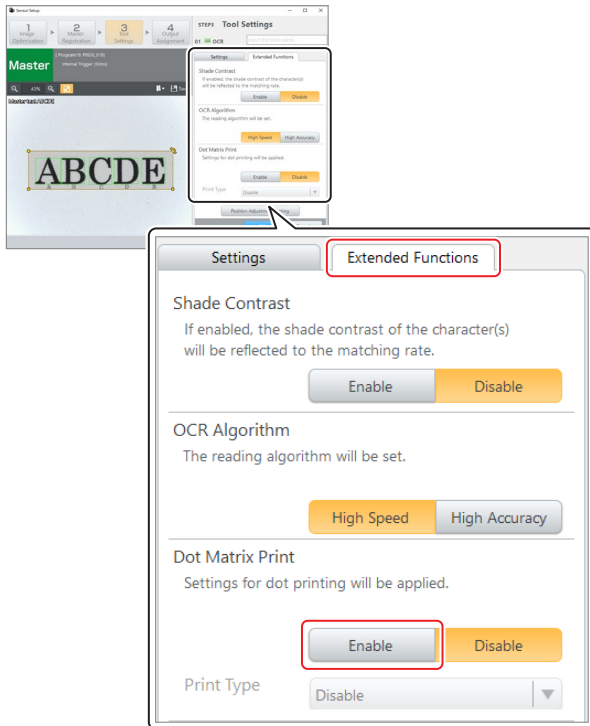
- If the reading target text or date cannot be correctly recognized, select [High Accuracy].
- Select [High Speed] to shorten the processing time.

2 When setting is completed, press [OK].

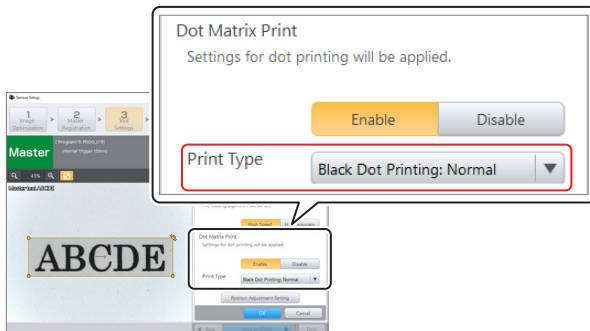
The system returns to the main screen for [OCR].

■ Dot Matrix Print

1 Select the [Extended Functions] tab and select [Enable] for [Dot Matrix Print].



2 Select the Print Type.



Point Select [Enable] when dot characters such as those from IJP (ink jet printer) cannot be read accurately.


- Select [Black Dot Printing] when the printing is darker than the background, or [White Dot Printing] when it is brighter than the background.
- Select the dot roughness from [Normal] or [Coarse]. Select [Coarse] when detection is not stable in [Normal].

3 When setting is completed, press [OK].

The system returns to the main screen for [OCR].

EdgePixels tool

● Setting items for the EdgePixels tool

Items		Description
Edit Window	Window Shape	Selects the window shape to specify the area of the target to detect.
	Mask	Adds a rectangular/circular mask region in the window frame. The area inside the mask region is excluded from the edge pixels extraction target. In addition, a mask cutting region can be added in the mask region. Inside the region removed from the mask, the mask is disabled and edge pixels extraction is enabled. Adding a mask or removing sections of the mask can be performed up to 20 times.
Sensitivity Adjustment		Sets the extraction sensitivity for the edge pixels tool according to the target.
	LIVE image	The extraction sensitivity of the edge pixels tool can be adjusted on the Live image from the target.
Limit Adjustment		Adjusts the threshold (matching rate) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
Upper Limit	Upper Limit	Enables an upper limit on the threshold. Enable when OK/NG judgment is desired for a situation when the target edge pixels are larger than the edge pixels extracted from the master image.
	Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)

● Setting items for the EdgePixels tool (advanced settings)

Items	Description	Ref.
Fixed Reference Area	Select a condition which the matching rate of the EdgePixels tool is 100%.	4-108
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the EdgePixels tool can be selected.	4-39

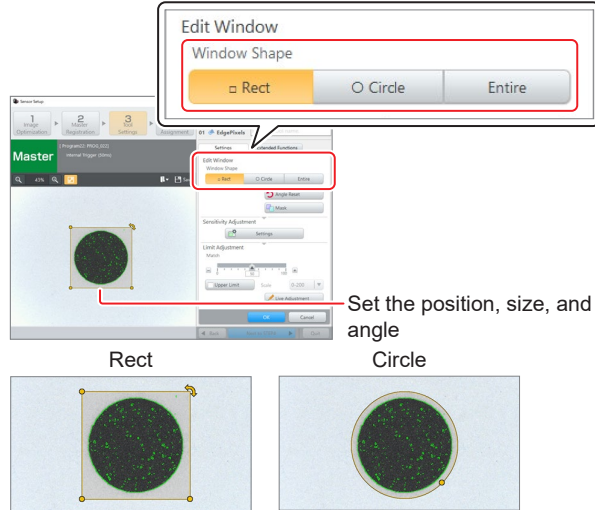
Setting the EdgePixels Tool

1 Add the [EdgePixels] tool.

□ “Adding a Tool” (page 4-36)
The main screen for [EdgePixels] opens.

2 Select the tool window shape, position, size, and angle according to the target.

□ “Editing the Window” (page 3-14)



Set the position, size, and angle

When [Entire] is selected, the tool window will be hidden.

Reference The window angle can be reset using the [Angle Reset] button.

3 Apply the mask as needed.

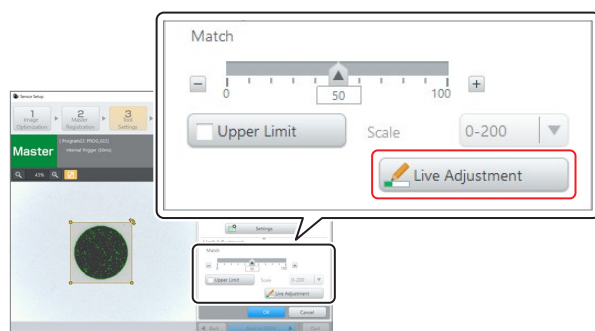
The area inside the mask region is excluded from an edge pixels extraction target.

□ “Mask settings” (page 4-38)

4 Perform the sensitivity setting as needed.

□ “Sensitivity Adjustment” (page 4-107)

5 Press [Live Adjustment].



The sensor changes to the test operation.

6 Take an “OK” image and a “NG” image.

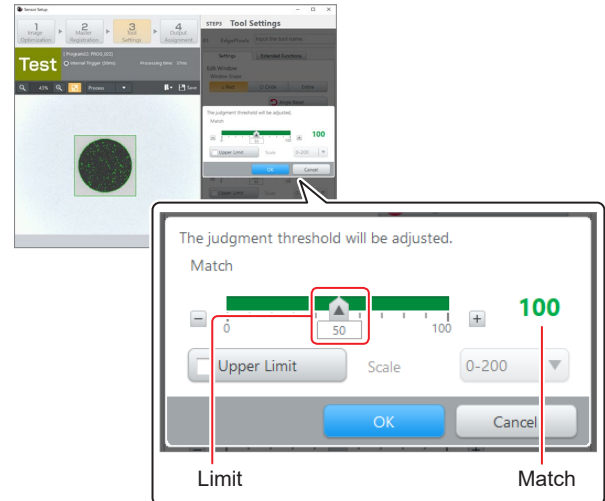
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate 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.

□ “Selecting the Display Method of the Tool Window” (page 5-7)

□ “Editing Numbers” (page 3-15)

□ “Adjusting Thresholds for Judgment” (page 6-15)

8 Set the Upper Limit as needed.

□ “Upper Limit” (page 4-107)

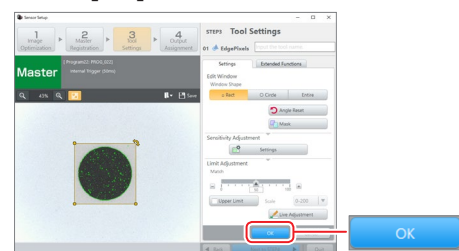
9 When setting is completed, press [OK].

The system returns to the main screen for [EdgePixels].

10 Set the tool name as needed.

□ “Tool Name Setting” (page 4-40)

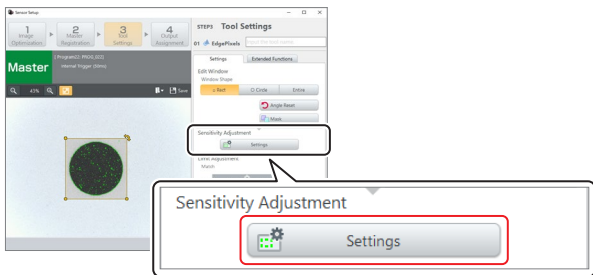
11 Press [OK].



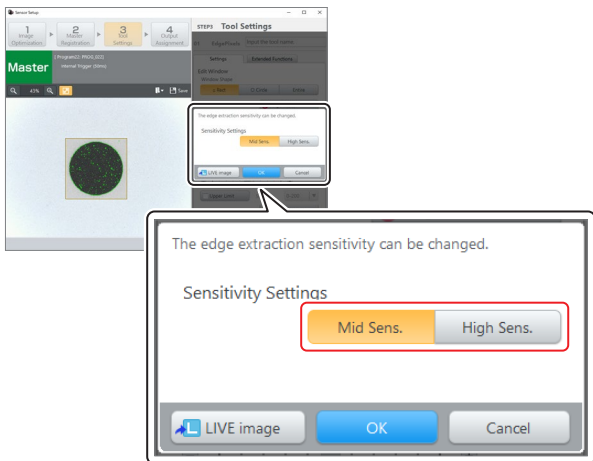
The system returns to the main screen for the tool settings.

Sensitivity Adjustment

1 Press [Settings].



2 Select the extraction sensitivity of the edge pixels.

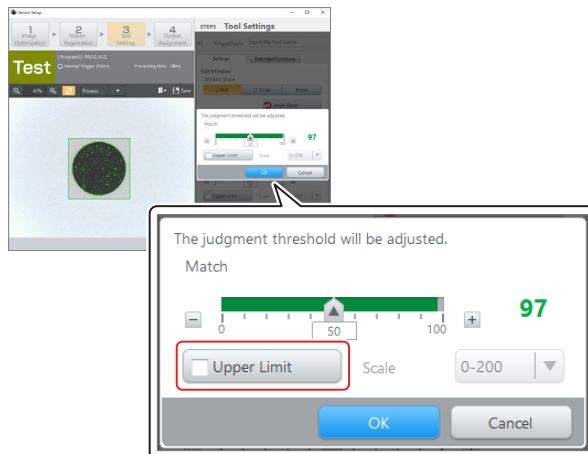


Reference When [LIVE image] is pressed, the extraction sensitivity of the edge pixels can be adjusted from the target Live image.

3 When setting is completed, press [OK].
The system returns to the main screen for [EdgePixels].

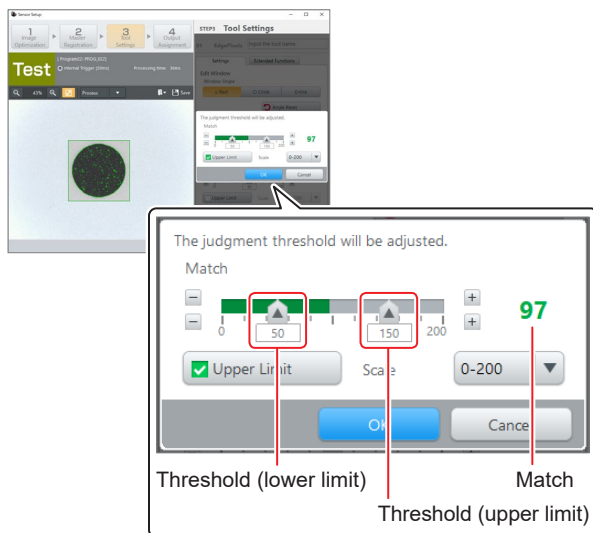
Upper Limit

1 Switch the check box to ON for [Upper Limit].



The sliders to set the upper limit and the lower limit of the threshold will be displayed. Select the Settings scale from [0-200] or [0-999] according to the range of the matching rate necessary for judgment.

2 Adjust the threshold for anomaly detection by checking the matching rate.



Reference A target is detected as OK if the matching rate is between the thresholds, and detected as NG if the matching rate is outside of the thresholds.

- ☐ "Selecting the Display Method of the Tool Window" (page 5-7)
- ☐ "Editing Numbers" (page 3-15)
- ☐ "Adjusting Thresholds for Judgment" (page 6-15)

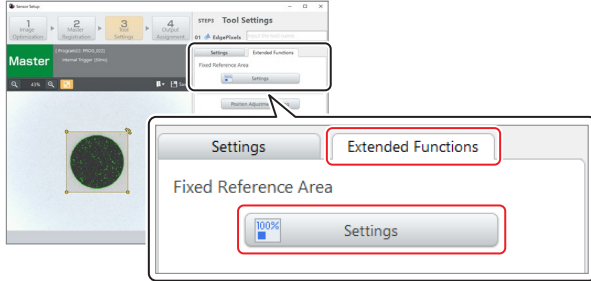
3 When setting is completed, press [OK].
The system returns to the main screen for [EdgePixels].

Advanced settings for the Edge Pixels tool

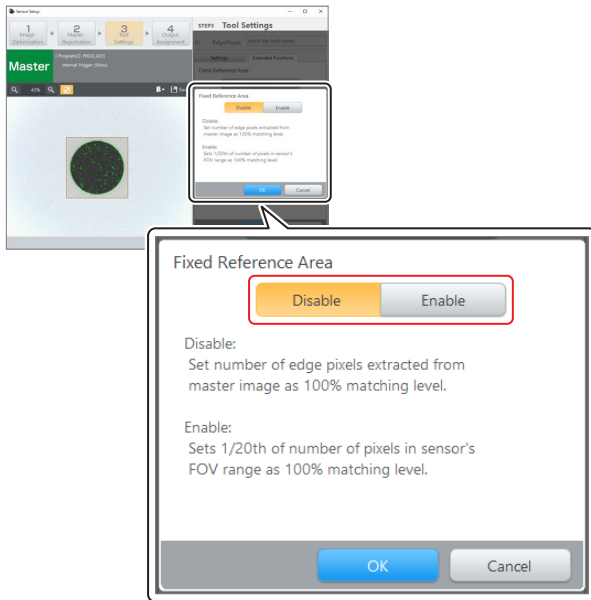
Fixed Reference Area

Reference Select [Enable] if the master image does not contain the edge pixels to be judged.

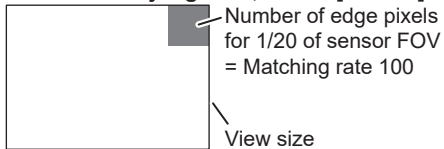
1 Select the [Extended Functions] tab and press [Settings] for [Fixed Reference Area].



2 Adjust the fixed reference area settings.



- When the number of edge pixels extracted from the master image is to be used as the reference for judgment, select [Disable].
- When 1/20th of number of pixels in the sensor's FOV range is to be used as the reference for judgment, select [Enable].



3 When setting is completed, press [OK].

The system returns to the main screen for the extended functions settings.

4 Press the [Settings] tab.

The system returns to the main screen for [EdgePixels].

Color Prohibition/Brightness Prohibition tool

● Setting items for the Color Prohibition/Brightness Prohibition Tool

Items		Description	
Edit Window	Window Shape	Selects the window shape to specify the area of the target to prohibit.	
	Angle Reset	When the window shape is set to [□Rect], resets the angle of the window.	
	Mask	Add Mask	Adds a rectangular/circular mask region in the tool window frame. The area inside the mask region is excluded from the area extraction target.
		Cut Mask	Adds a rectangular/circular cutting region in the mask region. Inside the region removed from the mask, the mask is disabled and the area extraction is enabled.
		Undo	The previous operation can be cancelled. Up to 20 operations can be undone. (UNDO)
Clear	Deletes a mask region which has been set.		
Color Extraction (For color type)		Sets an extraction range by pressing the color to be detected as a protrusion on the master image or Live image.	
	Extraction Area Adjustment	Expands or reduces automatically the extraction area of the color extracted.	
	Undo	The previous operation can be canceled. (UNDO)	
	Clear	Cancels the selection of the extracted color.	
	LIVE image	The color range to be extracted can be set using the Live image of the target.	
Brightness Extraction (For monochrome type)		Sets an extraction range by pressing the brightness to be detected as a protrusion on the master image or Live image.	
	Undo	The previous operation can be canceled. (UNDO)	
	Clear	Removes the extracted brightness from the tool.	
	LIVE image	The brightness range can be extracted from the Live image of the target.	
Threshold/ Sensitivity Adj.	Match	Adjusts the threshold (matching rate) used in the OK/NG judgment.	
	Sensitivity Settings	Selects the sensitivity for which the matching rate of protrusion detection is 0%.	
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. 📖 "Chapter 5 Running" (page 5-1)	

● Setting items for the Color Prohibition/Brightness Prohibition tool (advanced settings)

Items	Description	Ref.
Advanced Color Extraction (For color type)	Specifies a color to be extracted using HSV (H: Hue, S: Saturation, V: Brightness).	4-113
Advanced Brightness Extraction (For monochrome type)	Specifies the brightness value to be extracted.	
LIVE image	A color or brightness range to detect protrusions can be set using the Live image of the target.	
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Color Prohibition/Brightness Prohibition tool can be selected.	4-39

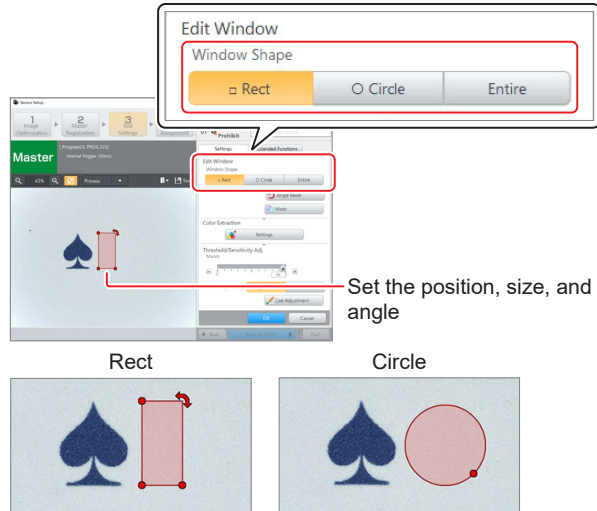
Setting the Color Prohibition/Brightness Prohibition Tool

1 Select the [Extra2] tab and add the [Color Prohibit/Bright. Prohibit] tool.

📖 “Adding a Tool” (page 4-36)
The main screen for [Color Prohibit/Bright. Prohibit] opens.

2 Select the tool window shape, position, size, and angle according to the target.

📖 “Editing the Window” (page 3-14)



When [Entire] is selected, the tool window will be hidden.

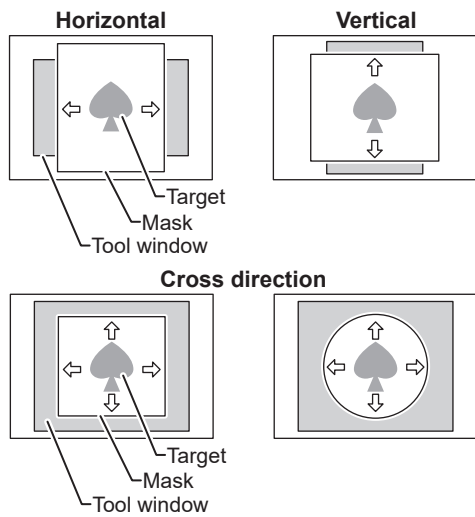
Reference The window angle can be reset using the [Angle Reset] button.

3 Apply the mask as needed.

The area inside the mask region is excluded from being a color/brightness Prohibition detection target.

📖 “Mask settings” (page 4-38)

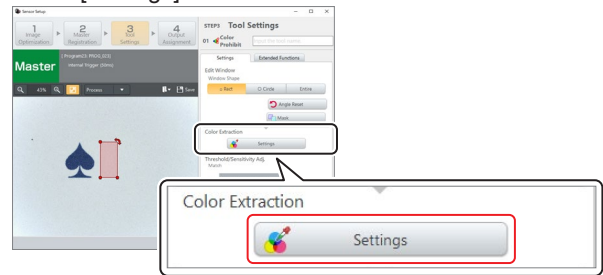
Point Using the tool in conjunction with mask settings enables misalignments and protrusions in various directions to be detected.



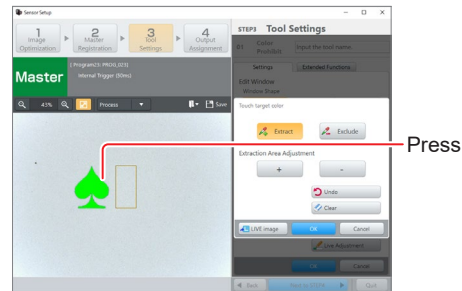
4 Set the area to extract from the target.

● For color type

Press [Settings] of the Color Extraction.

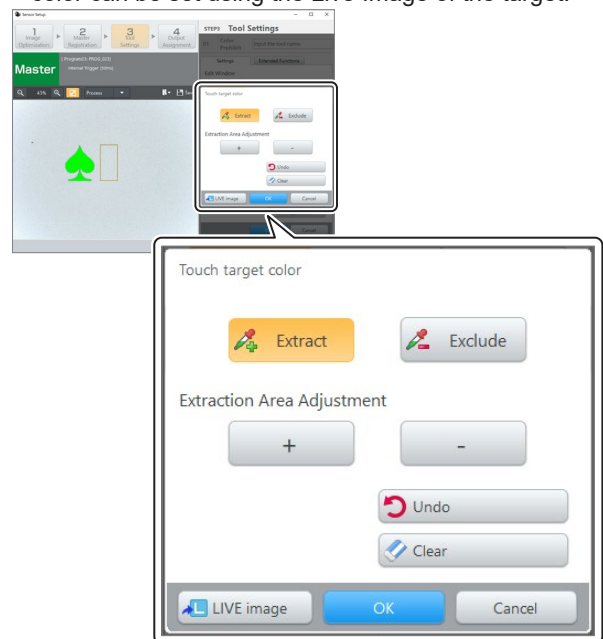


The screen to select a color to be extracted opens. Press the color to be the judgment reference for detection.



The pressed color will be extracted.

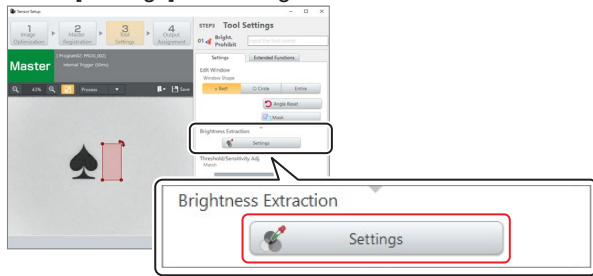
- If the areas of color that have not been extracted are pressed repeatedly, the extraction range can be expanded.
- Press the [Exclude] button to specify the color to exclude from the extracted color.
- Press the [+]/[-] of the extraction area adjustment, and the range of color to be extracted can be expanded/reduced.
- To re-extract the color, press [Clear] and then tap the color to be the reference of judgment again.
- By pressing [LIVE image], the range of the extracted color can be set using the Live Image of the target.



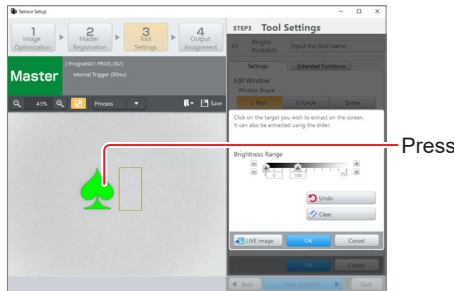
When setting is completed, press [OK]. The system returns to the main screen for [Color Prohibit/Bright. Prohibit].

● For monochrome type

Press [Settings] of the Brightness Extraction.

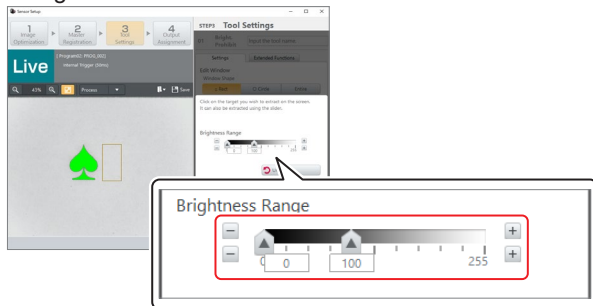


The screen to select brightness to be extracted opens. Press the brightness to be the judgment reference for detection.



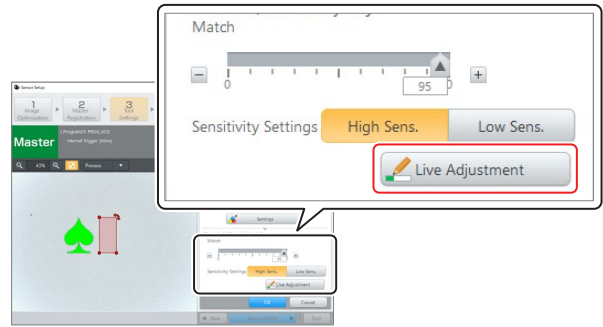
The pressed brightness will be extracted.

- If the areas of brightness that have not been extracted are pressed repeatedly, the extraction range can be expanded.
- Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
- "Editing Numbers" (page 3-15)
- To re-extract the brightness, press [Clear] and then press the brightness to be the reference of judgment again.
- By pressing [LIVE image], the range of brightness to be extracted can be set using the Live Image of the target.



When setting is completed, press [OK]. The system returns to the main screen for [Color Prohibit/Bright. Prohibit].

5 Press [Live Adjustment].

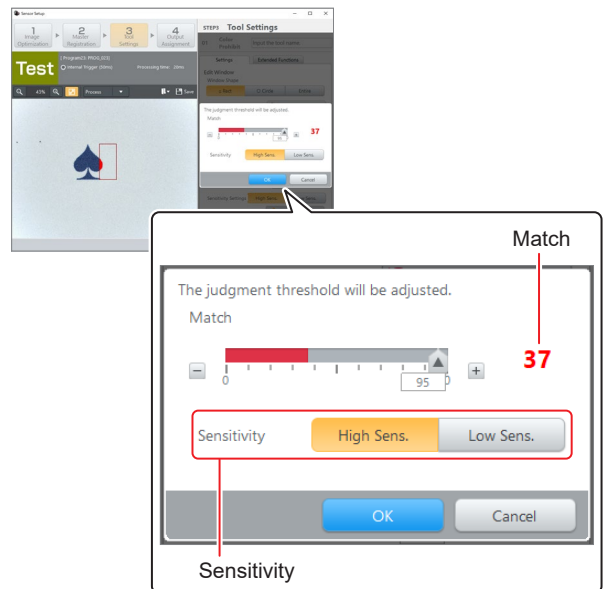


The sensor changes to the test operation.

6 Take an "OK" image and a "NG" image.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger. If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Select a sensitivity for the matching rate.



● High Sens. (default)

If [1/600th of the total sensor view] area in the tool window protrudes, the matching rate is 0%. The sensitivity to detect the protrusion increases. Select this setting when you do not want to allow protrusions or deviations.

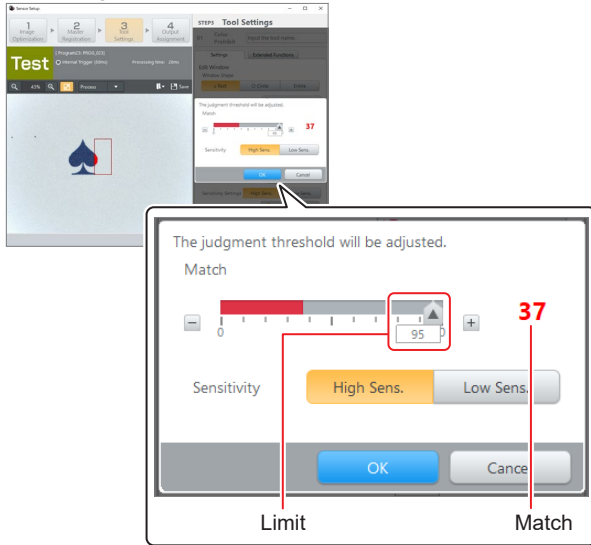
● Low Sens.

If [1/10th of the total sensor view] area in the tool window protrudes, the matching rate is 0%. This setting enables protrusions and deviations to be judged when they are allowed. Additionally, this setting makes judgment resistant to individual target differences and ambient light interference.

8 Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>

Set the detection threshold for the matching rate of the protrusion and misalignment that should be detected as a NG target.



- 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.
- 📖 “Selecting the Display Method of the Tool Window” (page 5-7)
 - 📖 “Editing Numbers” (page 3-15)
 - 📖 “Adjusting Thresholds for Judgment” (page 6-15)

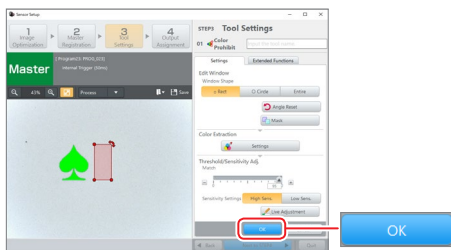
9 When setting is completed, press [OK].

The system returns to the main screen for [Color Prohibit/Bright. Prohibit].

10 Input a tool name as needed.

📖 “Tool Name Setting” (page 4-40)

11 Press [OK].



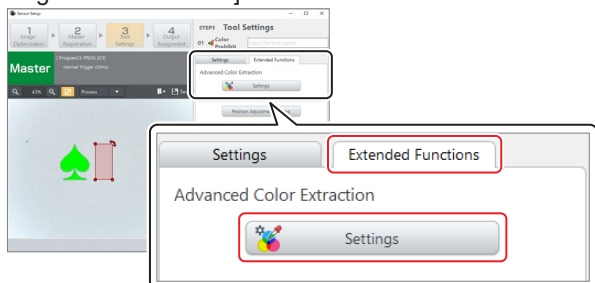
The system returns to the main screen for the tool settings.

Advanced settings for the Color Prohibition/ Brightness Prohibition tool

Advanced Color Extraction/Advanced Brightness Extraction

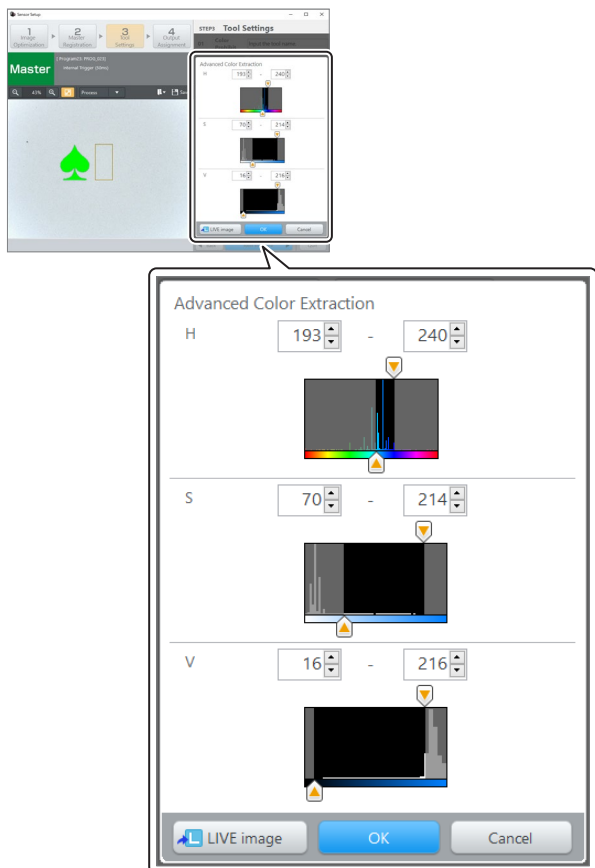
1 Select the [Extended Functions] tab and press [Settings] of [Advanced Color Extraction].

For a monochrome type, press [Settings] of [Advanced
Brightness Extraction].



2 Specify a color or brightness of the extraction target.

● For color type



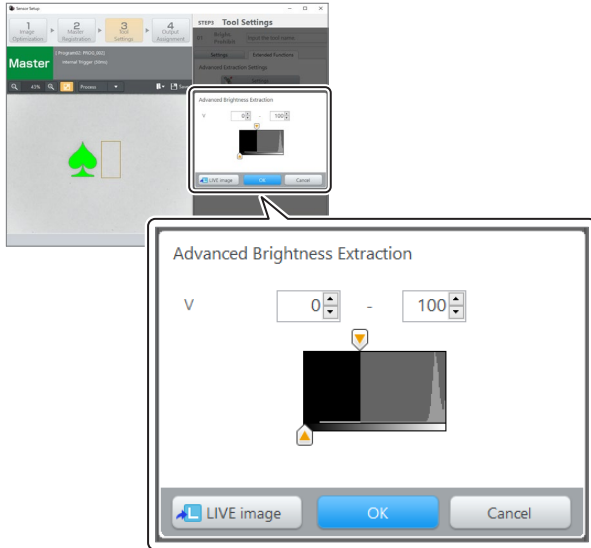
Reference

- You can adjust the value by slider while confirming the color histogram. The values within the range specified by the sliders will be used as the brightness.
- The vertical axis indicates the extracted pixel.
- Among the pixels of each color to be extracted, the maximum one becomes the maximum value of the vertical axis.
- The range and extraction rules in the color extraction detailed settings are shown as follows.

	Set the upper limit and lower limit for the range of 0 to 359.
H	<ul style="list-style-type: none"> • Lower limit ≤ Upper limit The extraction range of a color is from the lower limit to the upper limit. • Lower limit > Upper limit The extraction range of a color is from 0 to the upper limit, and from the lower limit to 359.
S	Set the upper limit and lower limit for the range of 0 to 255.
V	The extraction range of a color is from the lower limit to the upper limit.

- By pressing [LIVE image], the range of the extracted color can be set based on the Live Image of the target.

● For monochrome type



Reference

- Adjust the value by slider while confirming the monochrome histogram. The values within the range specified by the sliders will be used as the brightness.
- The vertical axis indicates the extracted pixel. Among the extracted pixels of each brightness, the one that has the most pixels becomes the maximum value of vertical axis.
- The range and extraction rules in the extraction detailed settings are shown as follows.

V	Set the upper limit and lower limit for the range of 0 to 255. The extraction range of the brightness is from the lower limit to the upper limit.
---	--

- By pressing [LIVE image], the range of brightness to be extracted can be set based on the Live Image of the target.

3 Press [OK].

The system returns to the main screen for [Color Prohibit/Bright. Prohibit].

Blob Count Tool

● Setting items for the Blob Count tool

Items		Description
Edit Window	Window Shape	Selects the window shape to specify an area of the target to be extracted.
	Mask	Adds a rectangular/circular mask region in the window frame. The area inside the mask region is excluded from the area extraction target. In addition, a mask cutting region can be added in the mask region. Inside the region removed from the mask, the mask is disabled and the extraction is enabled. The mask region can be adjusted up to 20 times (UNDO).
Color Extraction (For color type)	Extract Color from Image	Presses the color to be extracted from the master image and set the extraction range.
	Extraction Area Adjustment	Expands or reduces automatically the extraction area of the color extracted.
	LIVE image	The color range to be extracted can be set using the Live image of the target. In addition, the range of color to be extracted can be based on the image in the image history or from an image on a saved file.
Brightness Extraction (For monochrome type)	Extract Brightness from Image	Presses the brightness to be extracted from the master image and set the extraction range.
	LIVE image	A brightness range to be extracted can be set using the Live image of the target.
Limit Adjustment		Adjusts the threshold (count) used in the OK/NG judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.
	Scale	Select the scale for the threshold according to the range of matching rates requires for judgment.
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. 📖 "Chapter 5 Running" (page 5-1)

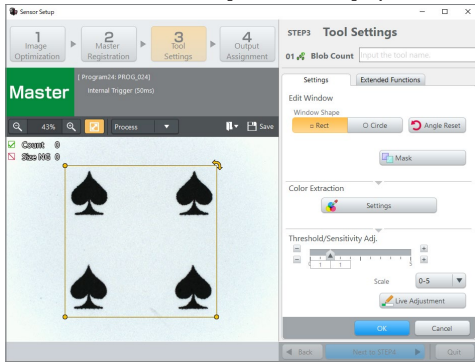
● Setting items for the Blob Count tool (advanced settings)

Items	Description	Ref.
Advanced Color Extraction (For color type)	<ul style="list-style-type: none"> • Color type Specifies a color to be extracted using HSV (H: Hue, S: Saturation, V: Brightness). • Monochrome type Specifies the brightness value to be extracted. 	4-118
Advanced Brightness Extraction (For monochrome type)		
LIVE image	The color/brightness range to be extracted can be set using the Live image of the target.	
Size Limit Setting	Sets the range of a blob size (area) to be counted. As a scale for size settings, 1 to 200 or 1 to 999 can be selected.	4-119
LIVE image	The range of a blob size to be counted in the Live image of the target can be set.	
Boundary Exclusion	Sets whether to count or exclude a target that protrudes from the window.	4-120
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Blob Count tool can be selected.	4-39

Setting the Blob Count tool

1 Select the [Extra2] tab, and add the [Blob Count] tool.

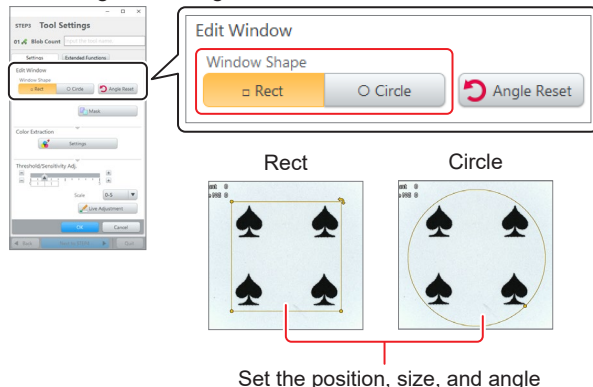
☞ “Adding a Tool” (page 4-36)
The main screen for [Blob Count] opens.



2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.



Set the position, size, and angle

Reference The window angle can be reset using the [Angle Reset] button.

☞ “Adding a Tool” (page 4-36)

3 Apply the mask as needed.

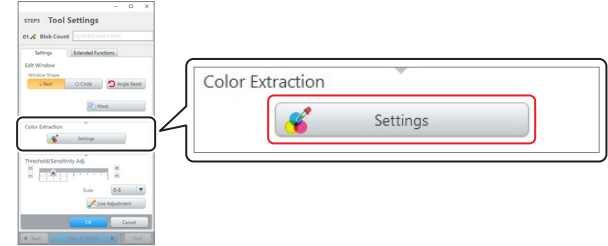
The area inside the mask region is excluded from the blob count.

☞ “Mask settings” (page 4-38)

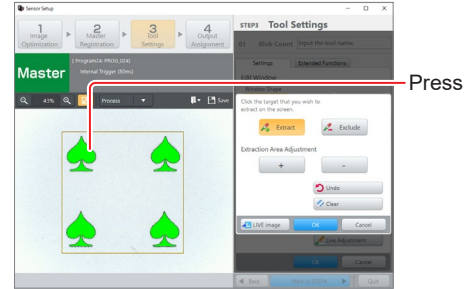
4 Set the area to extract from the target.

● For color type

Press [Settings] of the Color Extraction.

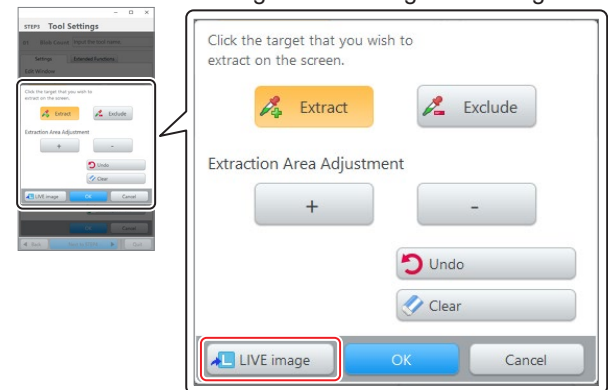


The screen to select a color to be extracted opens.
Press the color of the target to be counted.



The pressed color will be extracted.

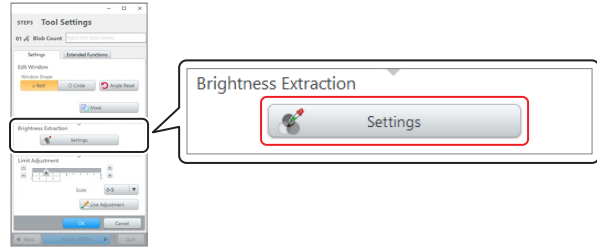
- If the areas of color that have not been extracted are pressed repeatedly, the extraction range can be expanded.
- Press the [Exclude] button to specify the color to exclude from the extracted color.
- Press the [+]/[-] of the extraction area adjustment, and the range of color to be extracted can be expanded/reduced.
- Press [Undo] to cancel the previous operation (UNDO).
- To re-extract the color, press [Clear] and then tap the color to be the reference of judgment again.
- By pressing [LIVE image], the range of the extracted color can be set using the Live Image of the target.



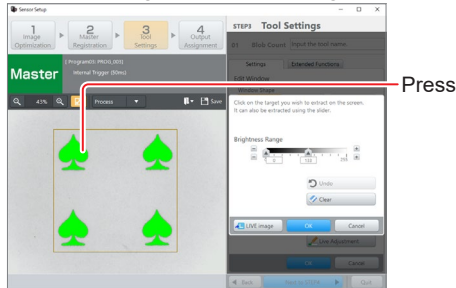
When setting is completed, press [OK].
The system returns to the main screen for [Blob Count].

● For monochrome type

Press [Settings] of the the Brightness Extraction.

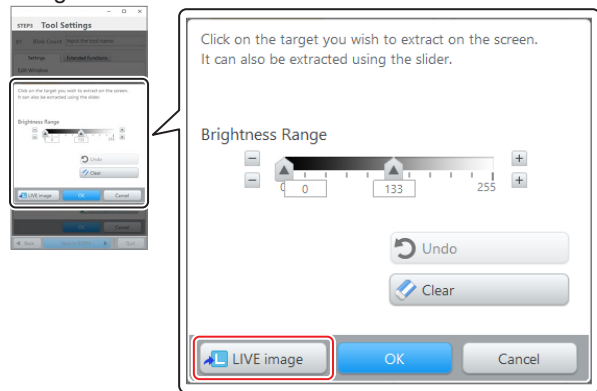


The screen to select brightness to be extracted opens. Press the brightness of the target to be counted.



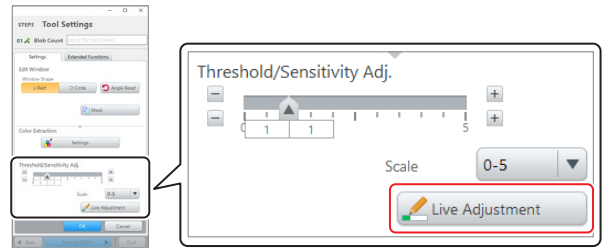
The pressed brightness will be extracted.

- If the areas of brightness that have not been extracted are pressed repeatedly, the extraction range can be expanded.
- Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
- “Outline tool” (page 4-48)
- Press [Undo] to cancel the previous operation (UNDO).
- To re-extract the brightness, press [Clear] and then press the brightness to be the reference of judgment again.
- By pressing [LIVE image], the range of brightness to be extracted can be set using the Live Image of the target.



When setting is completed, press [OK]. The system returns to the main screen for [Blob Count].

5 Press [Live Adjustment].



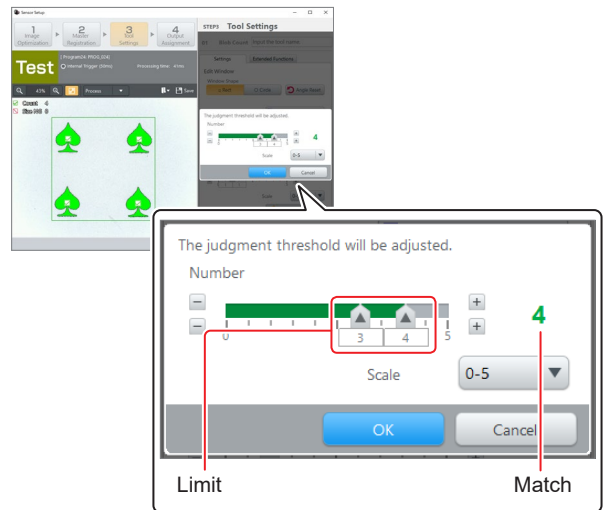
The sensor changes to the test operation.

6 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold for anomaly detection by checking the count.



Reference The target is judged OK when the count is within a threshold range, and NG when it is outside the range.

- “Selecting the Display Method of the Tool Window” (page 5-7)
- “Outline tool” (page 4-48)
- “Adjusting Thresholds for Judgment” (page 6-15)

8 When setting is completed, press [OK].

The system returns to the main screen for [Blob Count].

9 Input a tool name as needed.

□ “Tool Name Setting” (page 4-40)

10 Press [OK].

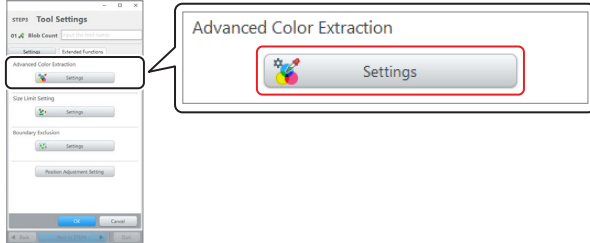
The system returns to the main screen for the tool settings.

Advanced settings for the Blob tool

Advanced Color Extraction/Advanced Brightness Extraction

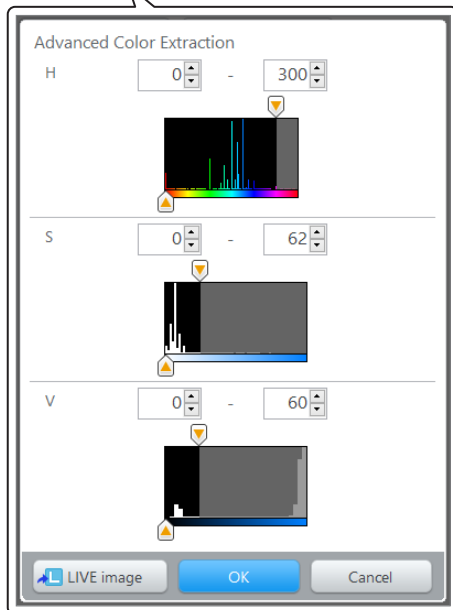
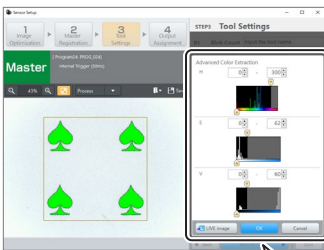
1 Select the [Extended Functions] tab and press [Setup] of [Advanced Color Extraction].

For a monochrome type, press [Setup] of [Advanced Brightness Extraction].



2 Specify a color or brightness of the extraction target.

● For color type



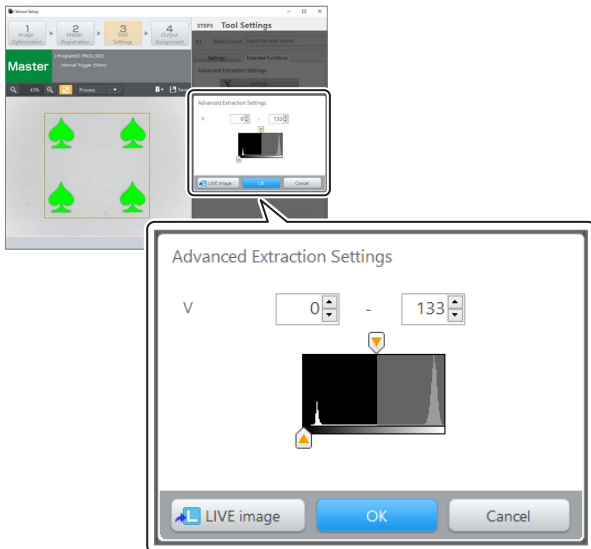
Reference

- You can adjust the value by slider while confirming the color histogram. The values within the range specified by the sliders will be used as the brightness.
- The vertical axis indicates the extracted pixel.
- Among the pixels of each color to be extracted, the maximum one becomes the maximum value of the vertical axis.
- The range and extraction rules in the color extraction detailed settings are shown as follows.

H	<p>Set the upper limit and lower limit for the range of 0 to 359.</p> <ul style="list-style-type: none"> • Lower limit ≤ Upper limit The extraction range of a color is from the lower limit to the upper limit. • Lower limit > Upper limit The extraction range of a color is from 0 to the upper limit, and from the lower limit to 359.
S	<p>Set the upper limit and lower limit for the range of 0 to 255.</p> <p>The extraction range of a color is from the lower limit to the upper limit.</p>
V	<p>Set the upper limit and lower limit for the range of 0 to 255.</p> <p>The extraction range of a color is from the lower limit to the upper limit.</p>

- By pressing [LIVE image], the range of the extracted color can be set based on the Live Image of the target.

● For monochrome type



Reference

- Adjust the value by slider while confirming the monochrome histogram. The values within the range specified by the sliders will be used as the brightness.
- The vertical axis indicates the extracted pixel. Among the extracted pixels of each brightness, the one that has the most pixels becomes the maximum value of vertical axis.
- The range and extraction rules in the extraction detailed settings are shown as follows.

V	Set the upper limit and lower limit for the range of 0 to 255. The extraction range of the brightness is from the lower limit to the upper limit.
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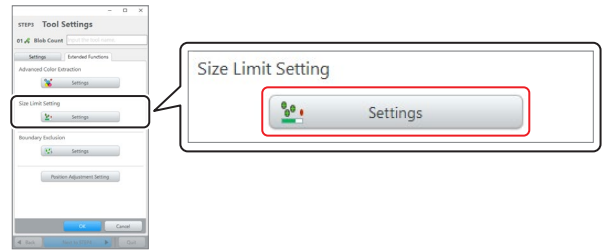
- By pressing [LIVE image], the range of brightness to be extracted can be set based on the Live Image of the target.

3 Press [OK].

The system returns to the advanced settings for [Blob Count].

■ Size Limit Setting

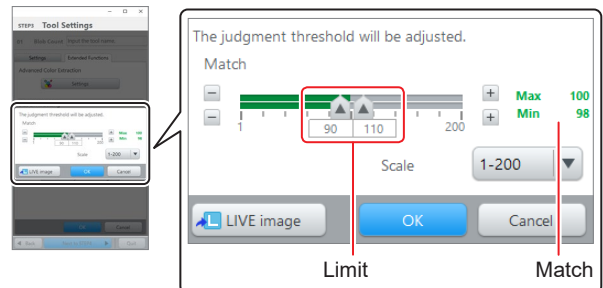
1 Select the [Extended Functions] tab and press [Settings] of [Size Limit Setting].



2 Press [LIVE image] as needed, and take an "OK" image and an "NG" image.

- The image which the sensor is currently imaging will be displayed.
- If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.
- If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.
- When pressing [Return to Master Image], the system returns to the master image display.

3 Adjust the threshold for the size by checking the matching rate.



- Adjust the slider, and the range of the threshold for the size can be expanded/reduced.
- Press [+]/[-], and the range of the threshold for the size can be expanded/reduced.
- The Settings scale can be selected from [1-200] or [1-999] according to the range of the matching rate necessary for judgment.

Reference

The maximum size (area) extracted as a blob in the master image is set as the matching rate of 100. The target is counted when the matching rate is within a threshold range, and "Size NG" when it is outside the range.

- "Selecting the Display Method of the Tool Window" (page 5-7)
- "Outline tool" (page 4-48)
- "Adjusting Thresholds for Judgment" (page 6-15)

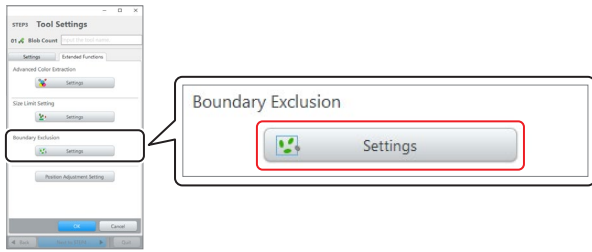
4 When the Live image is displayed, pressing [Return to Master Image] returns to the master image display.

5 Press [OK].

The system returns to the advanced screen for [Blob Count].

Boundary Exclusion

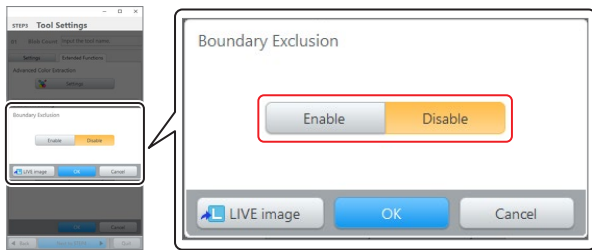
1 Select the [Extended Functions] tab and press [Settings] of [Boundary Exclusion].



2 Press [LIVE image] as needed, and take an "OK" image and an "NG" image.

- The image which the sensor is currently imaging will be displayed.
- If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.
- If the external trigger cannot be input, press [Trig.] to take an image of the target by temporarily using the internal trigger.
- When pressing [Return to Master Image], it returns to the master image display.

3 Select enable or disable according to if the target can be protruding from the field of view.



Enable	The target that protrudes from the window is not counted.
Disable	The target is counted when its size within the window is within the size range.

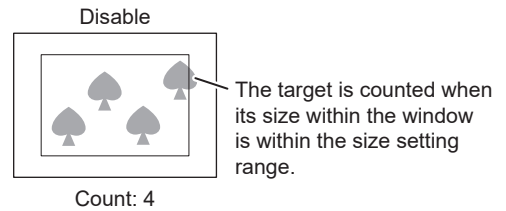
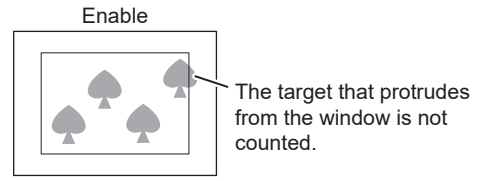
4 When the Live image is displayed, pressing [Return to Master Image] returns to the master image display.

5 Press [OK].

The system returns to the advanced screen for [Blob Count].

Reference

When "Enable" the Boundary Exclusion, the target that protrudes beyond the window is not counted.



3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)

This section explains the setting methods for “Step 3. Part Registration” of Sorting mode.
For “Step 3: Tool Settings” of Standard Mode, refer to “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-28).

Sorting mode enables multiple varieties (up to eight) to be registered and which part type the target matches to be judged.

An example usage of sorting mode:

- Judge multiple part types
- Rank the same part type
- Basic object phase discrimination

Up to 9 detection tools and position adjustment tools can be set in one program at the same time for judgment (up to 8 detection tools can be set).

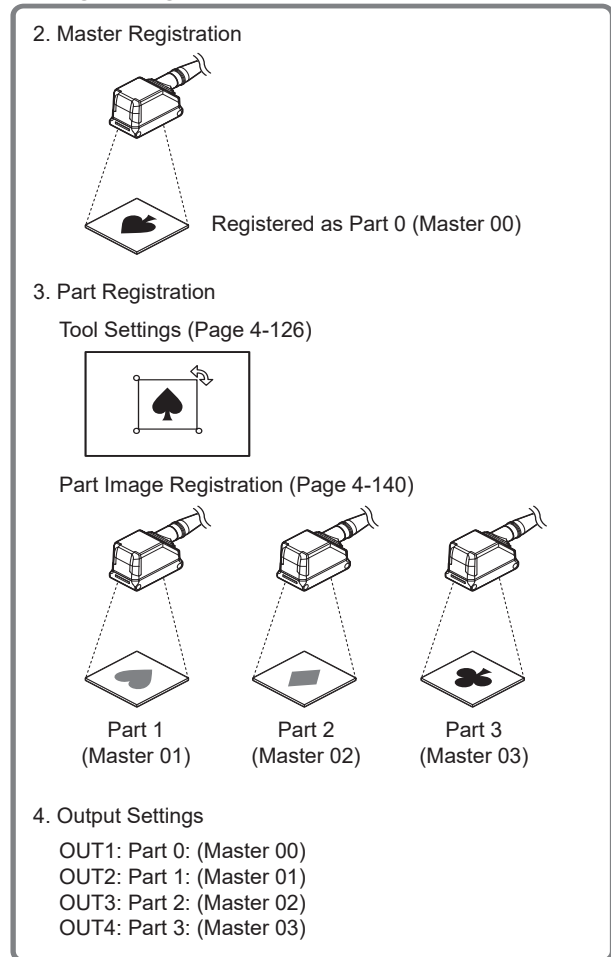
Workflow for Setting and Running Sorting Mode

In Sorting mode, the image registered with master registration is Part 0. The detection tool is set on the master image (Part 0). Register images for Part 1 to Part 7 in “Part Image Registration.”

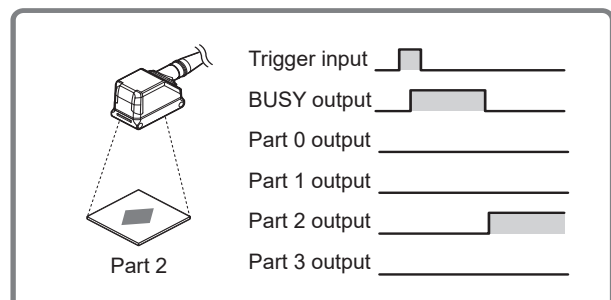
Detection tools are automatically registered with the optimal parameters on multiple part type images. For instance, in the case of the learning tool, it learns the differences between part type images to identify the part type. For the color/brightness average tool, the color and brightness for each part type is registered to identify the part type. Multiple detection tools can also be used in combination to identify part types.

While the device is running, it judges whether a captured image of the object matches any of the part types and identifies the part type.

Settings Navigator



RUN



Types of tools

Basic Tools

■ Learning Tool

A tool that can automatically recognize the difference between objects by registering and learning images that match the part type.

By performing additional learning, stability can be improved as well.

☐ "Auto Adjustment by the Additional Learning (Learning Tool Only)" (page 6-2)

In the learning tool, learning will be executed after setting the tool windows used to identify part types (images where the differences are clear) and registering an image that matches the part type.

☐ "Learning tool" (page 4-41)

☐ "Learning Tool" (page 4-126)

■ Outline Tool

A detection tool to calculate the matching rate for the target based on the outline information of a registered part type.

Judges a part type by setting the threshold for the matching rate.

☐ "Outline tool" (page 4-48)

☐ "Outline Tool" (page 4-127)

■ Color/Brightness Average Tool

A tool to calculate the matching rate in the color and brightness of a target to be examined in comparison to the color and brightness of a registered part type-target (100%). Judges a part type by setting the threshold for the matching rate.

If the sensor is color type, the tool will be the Color Average tool. The system judges using a user-defined color.

If the sensor is monochrome type, the tool will be the Brightness Average tool. The system judges using a user-defined brightness.

This tool is different from the Color Area/Area tool, as only the color/brightness is considered, and not the amount of pixels in the target area.

☐ "Color/Brightness Average Tool" (page 4-59)

☐ "Color/Brightness Average Tool" (page 4-129)

■ Position Adjustment Tool

A tool to correct the differences in position of a target by searching for the outline information of a registered part type. The position adjustment is used in conjunction with other detection tools.

☐ "Position Adjustment Tool" (page 4-66)

☐ "Position Adjustment Tool" (page 4-132)

Advanced Tool 1

■ Width Tool

A detection tool to calculate the width of the target based on the width of a registered part type. Judges a part type by setting the threshold for the width.

☐ "Width Tool" (page 4-70)

☐ "Width Tool" (page 4-134)

■ Diameter Tool

A detection tool to calculate the diameter of the target based on the diameter of a registered part type. Judges a part type by setting the threshold for the diameter.

☐ "Diameter Tool" (page 4-76)

☐ "Diameter Tool" (page 4-136)

■ High Speed Adjustment Tool

A tool to correct for differences in position of a target by searching the edge feature of a registered part type.

The Hi-Sp.Adj tool is used with other detection tools.

Compared with the normal position adjustment tool, the Hi-Sp.Adj tool allows for a high speed adjustment process.

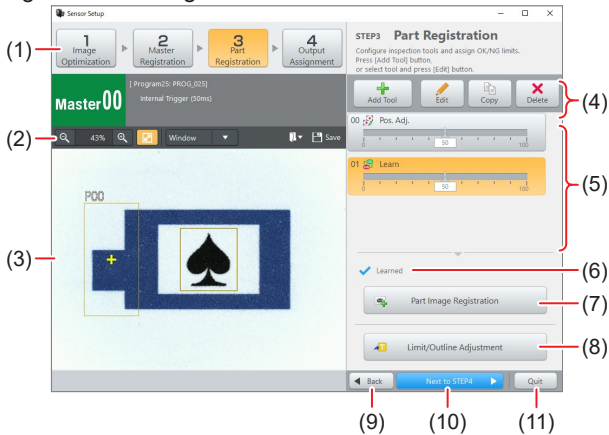
Select either 1-Axis Adjustment which corrects X axis position or Y axis position, or 2-Axis Adjustment which corrects both directions of X axis and Y axis.

☐ "High-Speed Position Adjustment Tool" (page 4-92)

☐ "High-Speed Position Adjustment tool" (page 4-138)

Main Screen for the Part Registration Settings

This section explains the main screen for the Part Registration settings.



- (1) **Navigation button**
Moves steps in the Settings Navigator.
- (2) **Image tool bar**
“Operation of the Image Tool Bar” (page 3-13)
- (3) **Master Image**
Displays the master image, tool window for the learning tool, and position adjustment window for the position adjustment tool. If a search range is set, a window which indicates the range (light blue) will be displayed.
- (4) **Tool operation button**
Adds, edits, or deletes the learning tool and position adjustment tool.
- (5) **Tool selection button**
Selects the tool to confirm/edit/delete the setting contents.
- (6) **Condition Display**
Displays the condition of the learning settings.

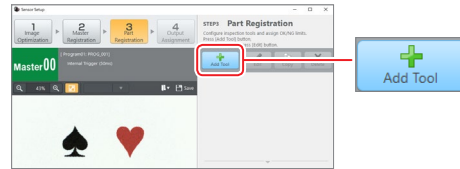
Display	Status
None	The learning tool is not set.
Not learned	The learning for the target to judge the part type has not been completed.
Learned	The target to judge the part type has been learned.
Relearning required	Relearning is needed because of a setting change.
- (7) **[Part Image Registration] button**
Performs the imaging and learning for the target to judge the part type.
“Part Image Registration” (page 4-140)
- (8) **[Limit/Outline Adjustment] button**
This button adjusts the threshold for detection tools with the exception of the position adjustment and high speed adjustment tools and adjusts the outline for the outline tool.
“Limit Adjustment” (page 4-145)
“Adjusting the Outline” (page 4-146)

- (9) **[Back] button**
Returns to the master registration screen.
“2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)
- (10) **[Next to STEP4] button**
Proceeds to the Output Assignment settings.
“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)
- (11) **[Quit] button**
Finishes the Settings Navigator.
“Finishing the Settings Navigator” (page 4-7)

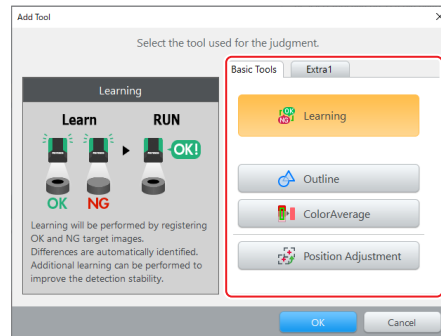
Adding/Editing/Copying/Deleting a Tool

Adding a Tool

1 Press [Add Tool].



2 Select the tool to be added and press [OK].



3 Set setting items for each tool.

● Basic Tools

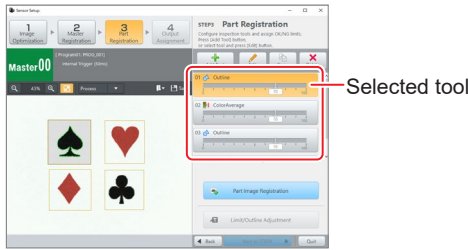
- “Learning Tool” (page 4-126)
- “Outline Tool” (page 4-127)
- “Color/Brightness Average Tool” (page 4-129)
- “Position Adjustment Tool” (page 4-132)

● Extra 1

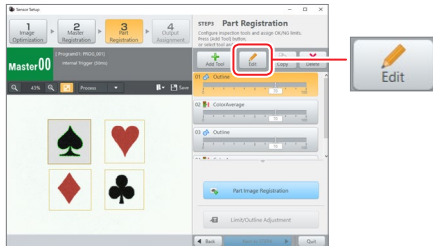
- “Width Tool” (page 4-134)
- “Diameter Tool” (page 4-136)
- “High-Speed Position Adjustment tool” (page 4-138)

Editing a tool

1 Select a tool to edit the settings.



2 Press [Edit].



3 Edit setting items for each tool.

● Basic Tools

- 📖 “Learning Tool” (page 4-126)
- 📖 “Outline Tool” (page 4-127)
- 📖 “Color/Brightness Average Tool” (page 4-129)
- 📖 “Position Adjustment Tool” (page 4-132)

● Extra 1

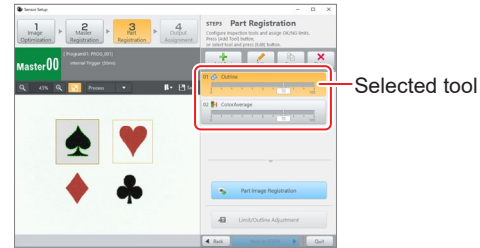
- 📖 “Width Tool” (page 4-134)
- 📖 “Diameter Tool” (page 4-136)
- 📖 “High-Speed Position Adjustment tool” (page 4-138)

Copying a tool

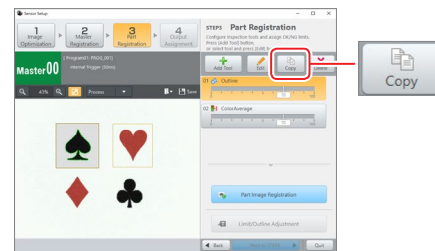
! Point

- Copies a tool which has been set, and pastes it to the same position. The Pos. Adj. tool and Hi-Sp.Adj tool cannot be copied.
- If eight detection tools are set, tools cannot be copied.

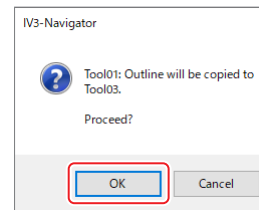
1 Select a tool to be copied.



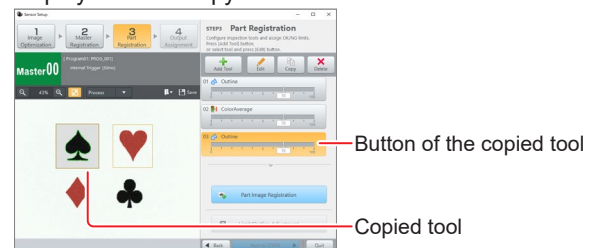
2 Press [Copy].



3 Press [OK].



The copied tool window will be selected and displayed in the copy source tool window.



Reference The next available tool number which has not been set will be automatically assigned as the copied tool number.

4 Press [Edit] and adjust the settings of the copied tool.

● Basic Tools

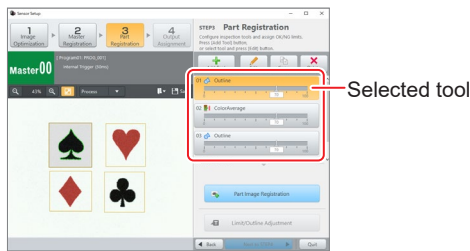
- 📖 “Learning Tool” (page 4-126)
- 📖 “Outline Tool” (page 4-127)
- 📖 “Color/Brightness Average Tool” (page 4-129)
- 📖 “Position Adjustment Tool” (page 4-132)

● Extra 1

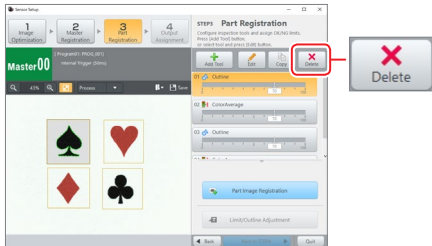
- 📖 “Width Tool” (page 4-134)
- 📖 “Diameter Tool” (page 4-136)
- 📖 “High-Speed Position Adjustment tool” (page 4-138)

Deleting a tool

1 Select a tool to be deleted.



2 Press [Delete].



The confirmation screen opens.

3 Press [OK].

The selected tool will be deleted and the sensor returns to the main screen for the Tool settings.

Common Setting Items for the Tool Settings

Mask

Adds a rectangular/circular mask region in the window frame.

- Rect (default): Specifies a rectangular mask region or a mask cutting region.
- Circle: Specifies the area to mask the target or remove from the mask with a circular window.

📖 "Mask settings" (page 4-38)

Tool Name Setting

The tool name can be edited. Up to 16 characters in alphanumeric can be set.

📖 "Tool Name Setting" (page 4-40)

Learning Tool

● Settings for the Learning Tool

Items	Description	Ref.
Window Shape	Select the window shape to specify the area of the target to detect.	-
Mask	Adds a rectangular/circular mask region in the window frame. The area inside the mask region is excluded from the learning target. In addition, a mask cutting region can be added in the mask region. Inside the region removed from the mask, the mask is disabled and learning is enabled. Adding a mask or removing sections of the mask can be performed up to 20 times.	4-38
Tool Name	A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. "Chapter 5 Running" (page 5-1)	4-40

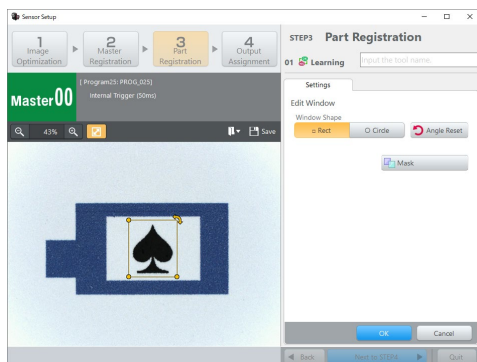
Adding Learning tool for the Part Registration settings

1 Add [Learning Tool].

"Adding a Tool" (page 4-123)

The main screen for [Learning Tool] opens.

Only one learning tool can be set in Sorting mode. Multiple learning tools cannot be set.

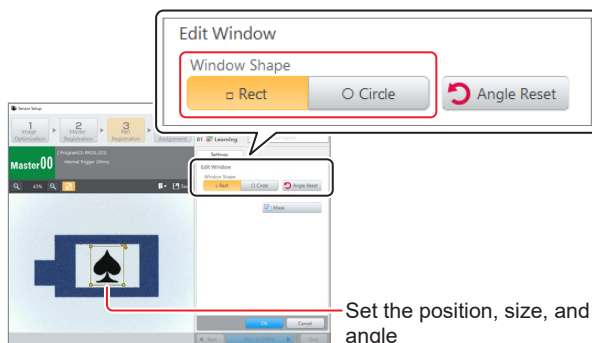


2 Perform [Edit Window].

Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.

"Editing the Window" (page 3-14)



Point

• The tool window size should be set according to the size of the image where the difference between an "OK" and "NG" target is clear.

"Optimizing the Size of the Tool Window" (page 6-19)

• If misalignment of the tool window occurs because of target position misalignment when optimizing the window, set the position adjustment tool.

"Setting of the Position Adjustment Tool" (page 4-133)

3 Add or Adjust the [Mask] as needed.

"Mask settings" (page 4-38)

4 Perform the settings for the tool name as needed.


"Tool Name Setting" (page 4-40)

5 Press [OK].

The system returns to the main screen of the Part Registration settings.

Outline Tool

● Setting items for the Outline tool

Items		Description	Ref.
Edit Window	Window Shape	Select the window shape used to specify the area of the target to be detected.	—
	Search Range	Specifies an area in which to search for the outline of a target. By using a narrower area for the search range, the processing time will be shortened.	
Fine Tune Outline	Remove Outline	Judges by disabling an unnecessary outline which interrupts the stabilized detection. The disabled outlines can be specified by tracing the extracted outline.	4-50
	Sensitivity	The outline extraction sensitivity can be selected according to the target quality.	4-50
Limit Adjustment		Adjusts the threshold (matching rate) used in the part type judgment. During threshold adjustment, the system turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.	—
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)	4-40

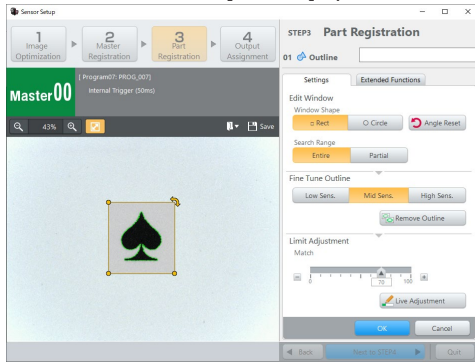
● Setting items for the Outline tool (advanced settings)

Items	Description	Ref.
Rotation Range	<p>Sets the range of rotation to search for the outline of the target. The system judges NG if an angle of the target exceeds its rotation range even if the target is the same shape.</p> <ul style="list-style-type: none"> • If the rotation range is set wide, the acceptable range of variation in the angles at which a target can be placed is wider. • If the rotation range is set narrow, the processing time can be shortened. • The direction of the target can be judged by limiting the rotation range. 	4-51
Search Algorithm	The detection mode of the Outline tool can be changed depending on the inspection requirements.	4-51

Setting the Outline Tool

1 Add the [Outline] tool.

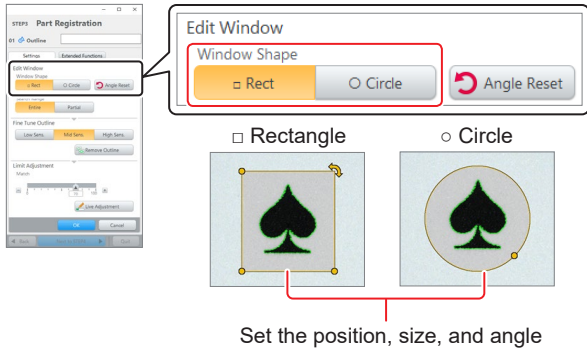
☞ “Adding a Tool” (page 4-123)
The main screen for [Outline] opens.



2 Perform [Edit Window].

☞ Reference ☞ Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.



☞ Reference ☞ The window angle can be reset using the [Angle Reset] button.

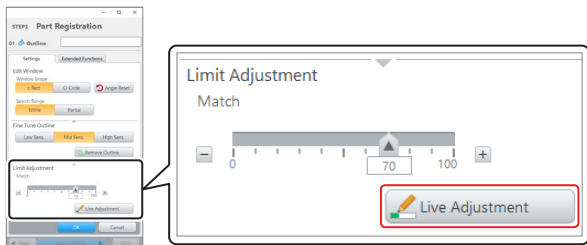
3 Set the search range as needed.

☞ “Search Range Settings” (page 4-50)

4 Adjust the outline as needed.

☞ “Settings for Disabling Outlines” (page 4-50)
☞ “Setting a Sensitivity” (page 4-50)

5 Press [Live Adjustment].



The sensor changes to the test operation.

6 Capture the part type.

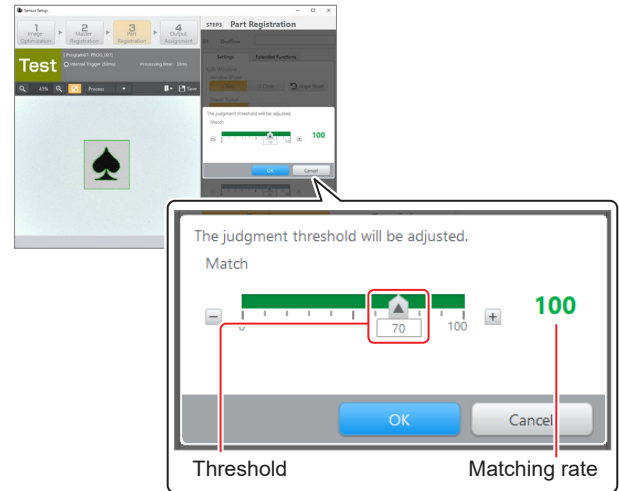
If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1] is set to [Enable], input an external trigger.

If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold for part type judgment by checking the matching rate.

<Setting example>

If the matching rate of the same part type is higher than 90 and if the matching rate of a different part type is lower than 40, set the threshold to 65, which is a value in 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.

- A matching rate of 100 indicates that an outline is completely matched. The matching rate decreases with differences between the outline of the target and the master image.

☞ “Selecting the Display Method of the Tool Window” (page 5-7)

☞ “Editing Numbers” (page 3-15)

☞ “Adjusting Thresholds for Judgment” (page 6-15)

☞ “Matching Rate of the Outline Tool and Position Adjustment Tool” (page A-6)

8 Press [OK].

The system returns to the main screen of [Outline].

9 Set a tool name as needed.

☞ “Tool Name Setting” (page 4-40)

10 Press [OK].

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

☞ Point ☞ [Fine Tune Outline] and [Limit Adjustment] are performed in this section for the image of the part type registered in “2. Master Registration”. For details about [Fine Tune Outline] and [Limit Adjustment] for images registered of other part types, see “Limit/Outline Adjustment.”

☞ “Limit/Outline Adjustment” (page 4-145)

Color/Brightness Average Tool

● Setting Items for the Color/Brightness Average tool

Items		Description	Ref.
Master Color Settings (For color type)	Window Shape	Selects the window shape to specify an area of the target to be extracted.	—
	Angle Reset	When the window shape is set to [□Rect], resets the angle of the window.	
Master Bright. Settings (For monochrome type)	Mask	Adds a rectangular/circular mask region in the window frame. The area inside the mask area is excluded from the color and brightness average. In addition, adds a rectangular/circular cutting region in the mask region. The mask is disabled inside the mask cutting region and it becomes the target of color and brightness average. Adding a mask or removing sections of the mask can be performed up to 20 times.	4-38
Limit Adjustment		Adjusts the threshold (matching rate) used in the part type judgment. During threshold adjustment, the system switches to Test mode so that the threshold can be adjusted to an applicable value for operation.	—
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. 📖 “Chapter 5 Running” (page 5-1)	4-40

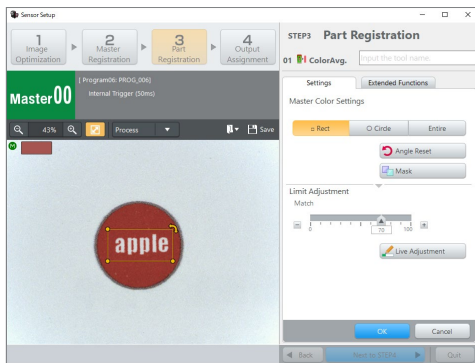
● Setting Items for the Color/Brightness Average tool (advanced settings)

Items	Description	Ref.	
Color Range (For color type)	<ul style="list-style-type: none"> • Color type Specifies the judgment sensitivity for the color extracted from the master image. • Monochrome type Specifies the judgment sensitivity for the brightness extracted from the master image. 	4-61	
Brightness Range (For monochrome type)			
Live image			The color range to be extracted can be set using the Live image of the target.
From a Hist.			Imports images to be used for the judgment sensitivity from the running image history.
From File			Imports an image used for the judgment sensitivity from a file saved on your computer.
Specify Mast.Color (For color type)	Selects how to specify the master color/brightness. In Sorting mode, only [From Mst.Img.] can be selected.	4-65	
Specify Mast.Bright (For monochrome type)			

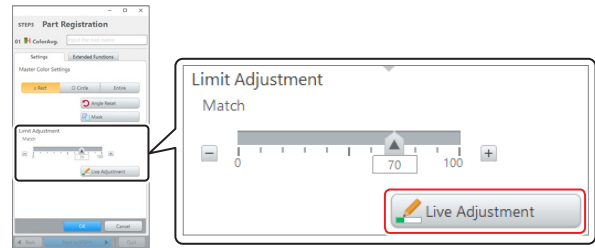
Setting the color/brightness average tool

1 Add the [Color Avg.] tool (color type) or [Bright. Avg.] tool (monochrome type).

☞ “Adding a Tool” (page 4-123)
The main screen for [Color Avg.]/[Bright. Avg.] opens.



4 Press [Live Adjustment].



The sensor changes to the test operation.

5 Capture the part type.

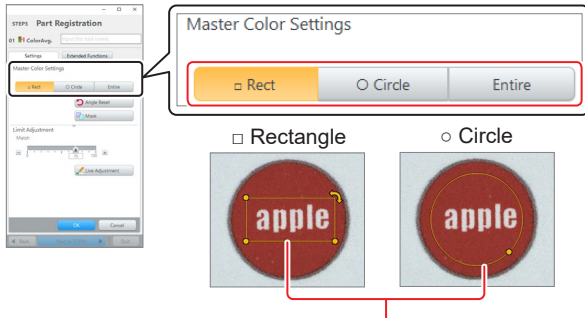
If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1] is set to [Enable], input an external trigger.
If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

2 Perform [Edit Window].

☞ Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.

☞ “Editing the Window” (page 3-14)



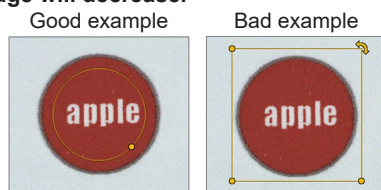
Set a position, size, and angle

When [Entire] is selected, the tool window will be hidden.

☞ Reference The window angle can be reset using the [Angle Reset] button.

Point

- The average color or average brightness value is automatically extracted from inside the window.
- Only set the window size to the color or brightness area that you want to judge. If the background is included, the average color or brightness average that includes the background color will be registered. Therefore, the matching rate difference between the part type that you want to judge will decrease.



3 Apply the mask as needed.

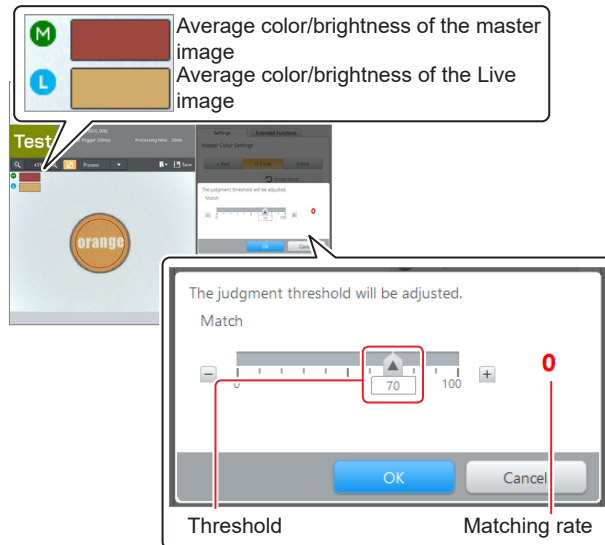
The area inside the mask area is excluded from average color or average brightness extraction.

☞ “Mask settings” (page 4-38)

6 Adjust the threshold for part type judgment by checking the matching rate.

<Setting example>

If the matching rate of the same part type is higher than 90 and if the matching rate of a different part type is lower than 40, set the threshold to 65, which is a value in between 40 and 90.



Reference

- 100 indicates that the color and brightness is completely matched. The matching rate decreases as the color or brightness of the target differs. For the color average tool, the smallest matching rate for H/S/V calculated individually will be the matching rate for the tool.
- 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.
- “Selecting the Display Method of the Tool Window” (page 5-7)
- “Editing Numbers” (page 3-15)
- “Adjusting Thresholds for Judgment” (page 6-15)

7 Set a tool name as needed.

- “Tool Name Setting” (page 4-40)

8 Press [OK].

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


Point

[Limit Adjustment] is performed in this section for the image of the part type registered in “2. Master Registration”.
For details about [Limit Adjustment] for images registered of other part types, see “Limit/Outline Adjustment.”

- “Limit/Outline Adjustment” (page 4-145)

Position Adjustment Tool

● Setting items for the Position Adjustment tool

Items		Description	Ref.
Edit Window	Window Shape	Select the shape of the window to specify the area of the target used as the position adjustment reference.	—
	Search Range	Specifies an area in which to serve as the reference of position adjustment for a target. By using a narrower area for the search range, the processing time will be shortened.	
Fine Tune Outline	Remove Outline	Judges by disabling an unnecessary outline which interrupts the stabilized detection. The disabled outlines can be specified by tracing the extracted outline.	4-50
	Sensitivity	The outline extraction sensitivity can be selected according to the target quality.	4-50
Limit Adjustment		Adjusts the threshold (matching rate) which judges whether the position adjustment succeeds or fails. During threshold adjustment, the system turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.	—
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)	4-40

● Setting items for the Position Adjustment tool (Advanced Settings)

Items	Description	Ref.
Rotation Range	Sets the range of rotation to adjust the position for the target. The status result of the position adjustment is NG and position is not adjusted if the angle of rotation of the target exceeds its rotation range. <ul style="list-style-type: none"> • If the rotation range is set wide, the acceptable range of variation in the angles at which a target can be placed is wider. • If the rotation range is set narrow, the processing time can be shortened. 	4-69
Search Algorithm	The algorithm used to search for the Position Adjustment tool can be adjusted depending on the inspection requirements.	4-69

Setting of the Position Adjustment Tool

Point Only one position adjustment tool can be set in Sorting mode. Position adjustment tool cannot be set.

1 Adds the position adjustment tool.

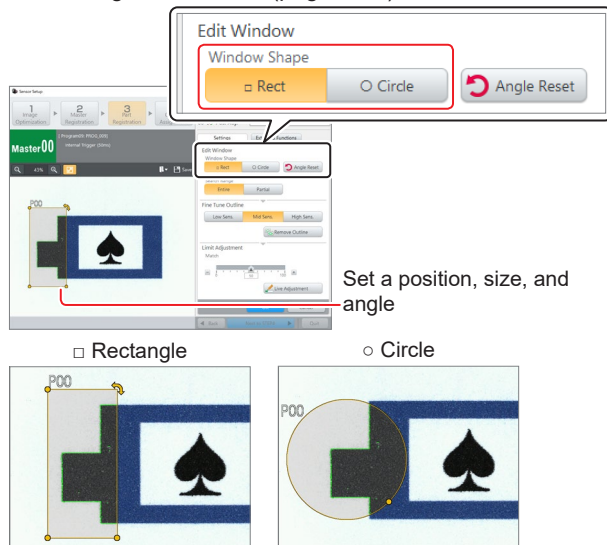
☞ “Adding a Tool” (page 4-123)
The main screen for [Pos. Adj.] opens.

2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the target.

☞ “Editing the Window” (page 3-14)



Set a position, size, and angle

☐ Rectangle

○ Circle

Point Set the position and size of the position adjustment tool to capture as much of a part that is common amongst all targets as possible.

☞ “Stabilizing the Position Adjustment” (page 6-21)

Reference The window angle can be reset using the [Angle Reset] button.

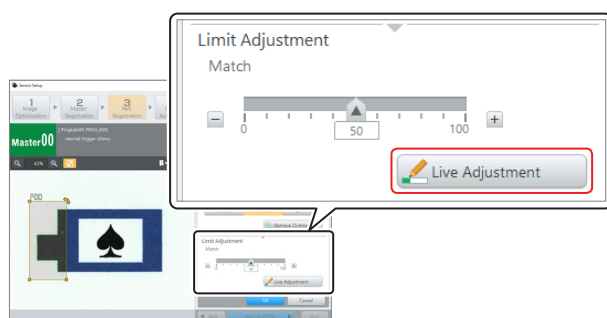
3 Set the search range as needed.

☞ “Search Range Settings” (page 4-68)

4 Adjust the outline as needed.

☞ “Settings for Disabling Outlines” (page 4-68)
☞ “Setting a Sensitivity” (page 4-68)

5 Press [Live Adjustment].



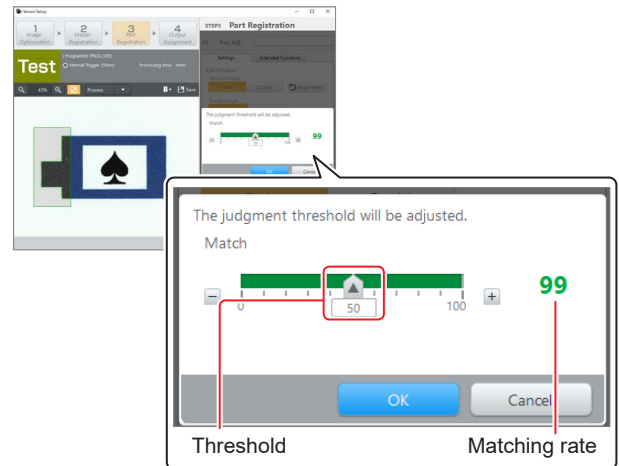
The sensor changes to the test operation.

6 Image the target.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1] is set to [Enable], input an external trigger.

If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

7 Adjust the threshold to judge whether or not the position adjustment succeeds by checking the matching rate.



Reference

- If there are many variations of the target shape that the position adjustment tool 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.

☞ “Selecting the Display Method of the Tool Window” (page 5-7)

☞ “Editing Numbers” (page 3-15)

☞ “Adjusting Thresholds for Judgment” (page 6-15)

8 When setting is completed, press [OK].

The system returns to the main screen for [Pos. Adj.].

9 Set a tool name as needed.

☞ “Tool Name Setting” (page 4-40)

10 Press [OK].

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

Width Tool

● **Setting items for the Width tool**

Items		Description	Ref.
Edit Window		Specifies the area of the target to be detected using a tool window.	—
	Mask	Adds a rectangular mask region in the tool window frame. The area inside the mask region is excluded from the width detection target.	4-38
Edge Sensitivity Auto Adjustment		Automatically adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	4-84
	(Manual adjustment)	Manually adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	
	Live image	The edge sensitivity can be adjusted from the Live image of the target.	
Limit Adjustment		Adjusts the threshold (matching rate) used in the part type judgment. During threshold adjustment, the system turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.	4-85
	Upper Limit	Enables an upper limit on the threshold. Enable when part type judgment is desired for a situation when the target width is greater than the part type width. In sorting mode, this setting can only be selected if [Enable] is set.	
	Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment.	
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. <input type="checkbox"/> "Chapter 5 Running" (page 5-1)	4-40

● **Setting items for the Width tool (advanced settings)**

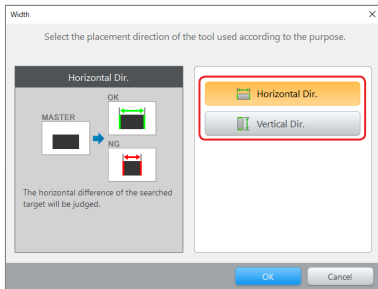
Items		Description	Ref.
Width Extraction Method	Width Mode	Select the method used to extract the target width.	4-73
Scaling	Scaling Setting	Sets scaling. Set when length is being used for part type judgment instead of the matching rate. Scaling is required in Sorting Mode.	4-80
	Display Value	When scaling is enabled, inputs the display value in relation to matching rate 100. A matching rate of 100 indicates that the target width is completely matched to the master image. The matching rate becomes smaller with a narrower width and larger with a wider width.	
	Copy Setting	When scaling is enabled, copy the scaling settings from another tool.	

Setting the Width Tool

1 Select the [Extra 1] tab, and add the [Width] tool.

☞ “Adding a Tool” (page 4-123)
The [Width] direction selection screen opens.

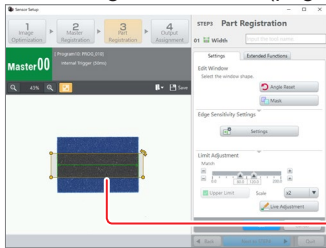
2 Press [Horizontal Dir.]/[Vertical Dir.].



The main screen for [Width] opens.

3 Set the position, size, and angle of the tool window according to the target.

☞ “Editing the Window” (page 3-14)



Set a position, size, and angle

Reference The window angle can be reset using the [Angle Reset] button.

4 Apply the mask as needed.

The area inside the mask region is excluded from the width detection target.

☞ “Mask settings” (page 4-38)

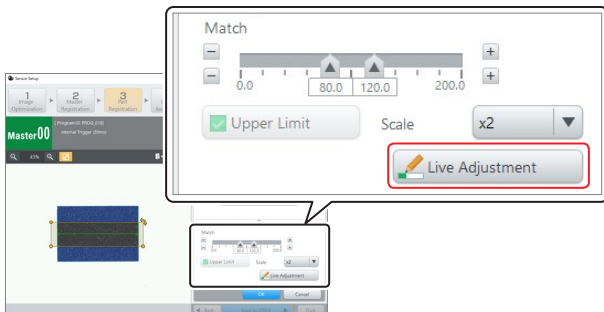
5 Adjust the edge sensitivity setting as needed.

☞ “Edge Sensitivity Settings” (page 4-72)

6 Set scaling.

☞ “Scaling Setting” (page 4-74)

7 Press [Live Adjustment].



The sensor changes to the test operation.

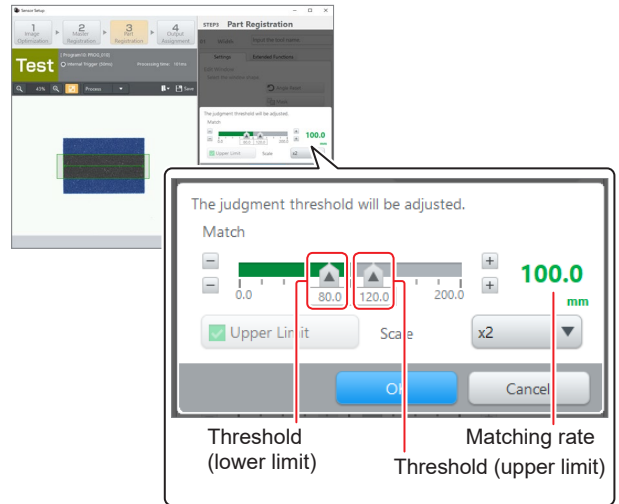
8 Capture the part type.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1] is set to [Enable], input an external trigger.

If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

9 Adjust the threshold for part type judgment by checking the matching rate.

The setting range is 0 to 200 or 0 to 999, the lowest default value is 80, and highest default value is 120 (These vary depending on the scaling setting). Set the judgment range as the same part type.



- Reference**
- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
 - A matching rate of 100 indicates that the target width is completely matched to the master image. The matching rate becomes smaller with a narrower width and larger with a wider width. If the matching rate exceeds the upper limit of the threshold range, the matching rate will display as the upper limit of the threshold range.
 - The threshold can be changed using the slider or the [+]/[-] button.
 - ☞ “Selecting the Display Method of the Tool Window” (page 5-7)
 - ☞ “Editing Numbers” (page 3-15)
 - ☞ “Adjusting Thresholds for Judgment” (page 6-15)

10 When setting is completed, press [OK].

The system returns to the main screen of [Width].

11 Set a tool name as needed.

☞ “Tool Name Setting” (page 4-40)

12 Press [OK].

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

Point [Limit Adjustment] is performed in this section for the image of the part type registered in “2. Master Registration”. For details about [Limit Adjustment] for images registered of other part types, see “Limit/Outline Adjustment.”
☞ “Limit/Outline Adjustment” (page 4-145)

Diameter Tool

● Setting items for the Diameter tool

Items		Description	Ref.
Edit Window		Specifies the area of the target to be detected using a tool window.	—
	Mask	Adds a circular mask region in the tool window frame. The area inside the mask region is excluded from the diameter detection target.	4-38
Diameter Extraction	Ext. Sens	Selects the sensitivity for diameter extraction according to the target.	4-78
	Change Specified Circle	The diameter used for inspection can be changed when there are multiple circles of the extracted diameter.	
Limit Adjustment		Adjusts the threshold (matching rate) used in the part type judgment. During threshold adjustment, the system turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.	4-85
	Upper Limit	Enables an upper limit on the threshold. Set if the part type judgment is desired when a target diameter is longer than the part type diameter. In sorting mode, this setting can only be selected if [Enable] is set.	
	Scale	When the upper limit of the threshold is ON, select the threshold scale according to the range of the matching rate required for judgment.	
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen. ☐ “Chapter 5 Running” (page 5-1)	4-40

● Setting items for the Diameter tool (advanced settings)

Items		Description	Ref.
Diameter Extraction	Diameter Mode	Select the method used to extract the target diameter.	4-79
Bright/Dark Direction		Selects the direction for which the tool detects the target edge.	4-80
Scaling	Scaling Setting	Sets scaling. Set when length is being used for part type judgment instead of the matching rate. Scaling is required in Sorting Mode.	4-80
	Display Value	When scaling is enabled, inputs the display value in relation to matching rate 100.	
	Copy Setting	When scaling is enabled, copy the scaling settings from another tool.	

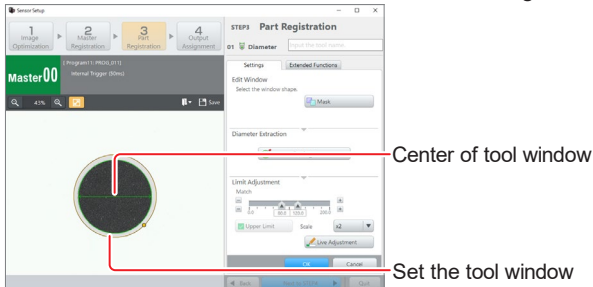
Setting the Diameter Tool

1 Select the [Extra 1] tab, and add the [Diameter] tool.

“Adding a Tool” (page 4-123)
The main screen for [Diameter] opens.

2 Set the position and size of the tool window according to a target.

Place the center of the tool window inside the target.



“Editing the Window” (page 3-14)

Reference The sensor detects circles from the center of tool window towards outside.

3 Apply the mask as needed.

The area inside the mask region is excluded from the diameter detection target.

“Mask settings” (page 4-38)

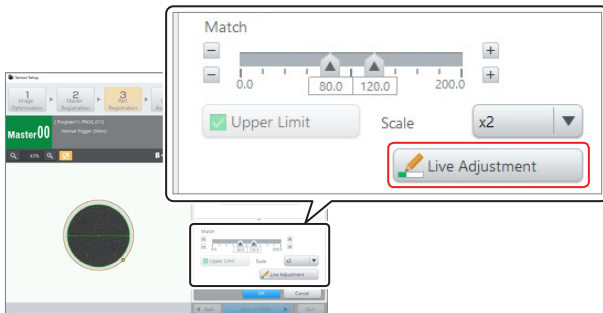
4 Perform diameter extraction as needed.

“Diameter Extraction Settings” (page 4-78)

5 Set scaling.

“Scaling Setting” (page 4-74)

6 Press [Live Adjustment].



The sensor changes to the test operation.

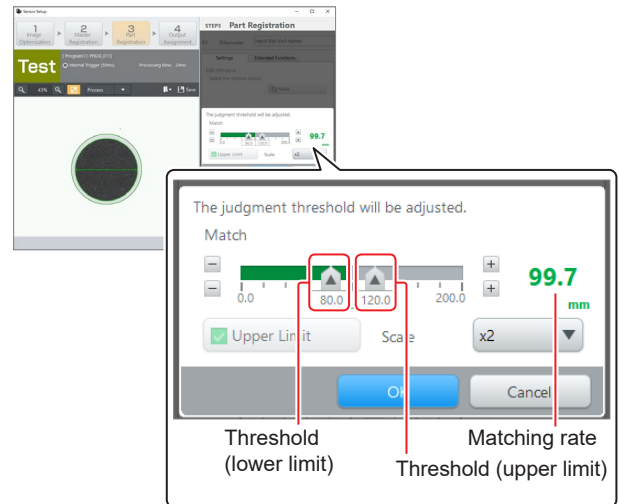
7 Capture the part type.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1] is set to [Enable], input an external trigger.

If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

8 Adjust the threshold for part type judgment by checking the matching rate.

Set the judgment range as the same part type.



Reference

- The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
- The threshold can be changed using the slider or the [+]/[-] button.

“Selecting the Display Method of the Tool Window” (page 5-7)
“Editing Numbers” (page 3-15)
“Adjusting Thresholds for Judgment” (page 6-15)

9 When setting is completed, press [OK].

The system returns to the main screen of [Diameter].

10 Set a tool name as needed.

“Tool Name Setting” (page 4-40)

11 Press [OK].


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

Point [Limit Adjustment] is performed in this section for the image of the part type registered in “2. Master Registration”. For details about [Limit Adjustment] for images registered of other part types, see “Limit/Outline Adjustment.”
“Limit/Outline Adjustment” (page 4-145)

High-Speed Position Adjustment tool

● Setting items for the High-Speed Position Adjustment tool

The contents of the extended functions that can be set in [1-Ax. Adj], [2-Ax. Adj (Axis:X)], and [2-Ax. Adj (Axis:Y)] are the same.

Items		Description	Ref.	
Axis Axis:X Axis:Y	Edit Window	Specifies the area of the target to be detected using a tool window.	—	
	Scan Direction	Selects the direction for which the tool detects the target edge.		
	Edge Sensitivity Settings	Sets the sensitivity which detects the edge.		
	Edge Sensitivity Auto Adjustment	Automatically adjusts the sensitivity which detects the edge.		
	Manual adjustment	Manually adjusts the sensitivity that detects the edge. 1 to 100 (default: 50)		4-95
	Show edge graph	Displays the edge graph on an image.		
Live image	The edge sensitivity can be adjusted from the Live image of the target.			
Common	Test Operation	Changes to Test mode, used to check that the position adjustment has been performed correctly.	4-93	
Tool Name		A user-defined name, such as the name of a target, can be set for tools. Tool names can be checked on the run screen.  "Chapter 5 Running" (page 5-1)	4-40	

● Setting items for the High-Speed Position Adjustment tool (Advanced Settings)

The contents of the extended functions that can be set in [1-Ax. Adj], [2-Ax. Adj (Axis:X)], and [2-Ax. Adj (Axis:Y)] are the same.

Items	Description	Ref.
Edge Detection	Selects the bright/dark direction that detects a target edge.	4-96

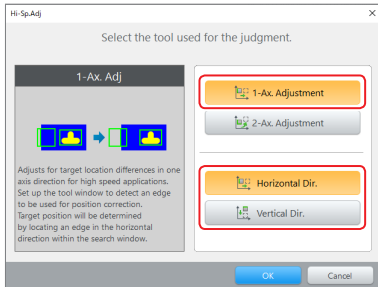
Setting the High-Speed Position Adjustment Tool

1-Axis Adjustment

1 Select the [Extra 1] tab, and add the [Hi-Sp.Adj] tool.

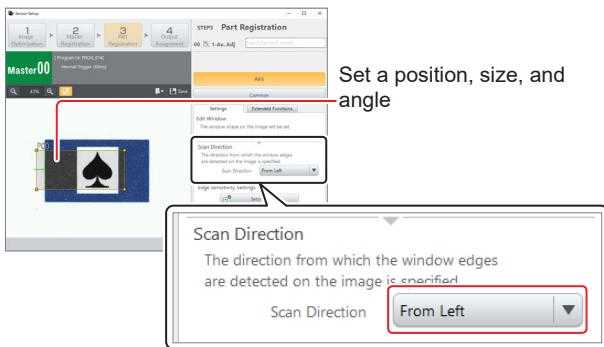
“Adding a Tool” (page 4-123)

2 Select the [1-Ax. Adjustment] button. Press [Horizontal Dir.] or [Vertical Dir.], and press [OK].

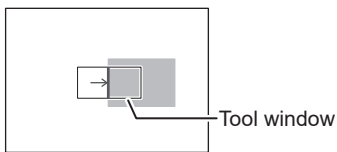


The main screen for [1-Ax. Adj] opens.

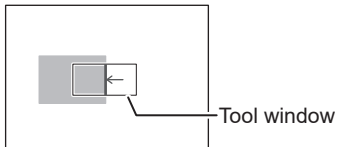
3 Select the detection direction, and set the position and size of the tool window according to a target.



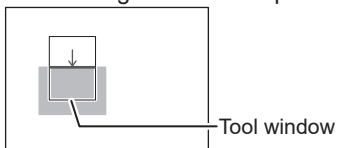
• Detection direction: Left (default)
Detects edges from the left side of window to the right side.



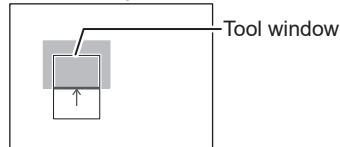
• Scan Direction: Right
Detects edges from the right side of window to the left side.



• Scan Direction: Top
Detects edges from the top of window to the bottom.



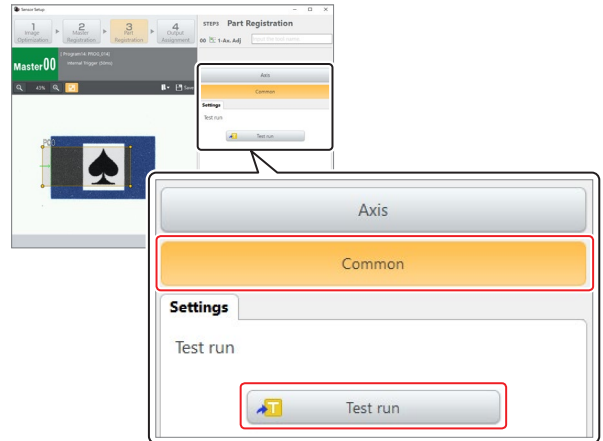
• Scan Direction: Bottom
Detects edges from the bottom of window to the top.



4 Adjust the edge sensitivity setting as needed.

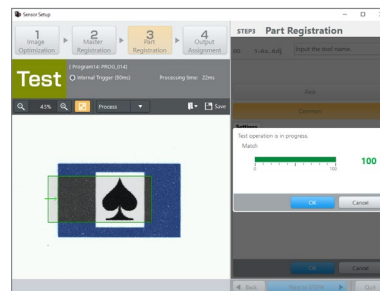
“Edge Sensitivity Settings” (page 4-95)

5 Press [Common], and then press [Test run].



The sensor changes to the test operation.

6 Position correction is performed and the edge detection process can be confirmed.



7 Press [OK].

The system returns to the main screen for [1-Ax. Adj].

8 Set a tool name as needed.

“Tool Name Setting” (page 4-40)

9 Press [OK].

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

Part Image Registration

● Setting items for the Part image registration

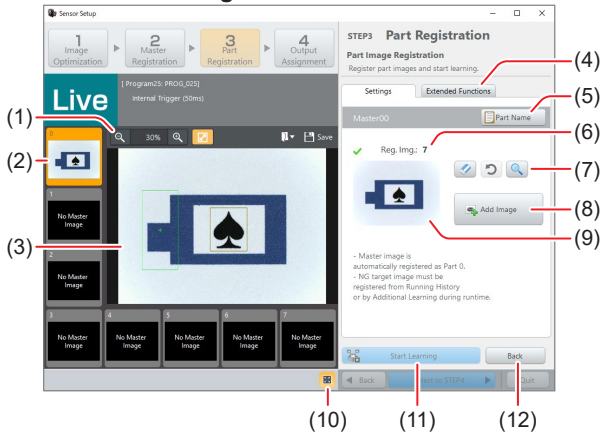
Items	Description	Ref.
Add Part Type	Up to 8 part types can be added.	4-142
Part Name	Part type names for each part type can be edited.	4-142
Add Image	Registers Live images as the target to judge the part type.	4-143
Start Learning (When the learning tool is set)	Learns the target to judge the part type.	4-142

● Setting items for the Part image registration (Advanced Settings)

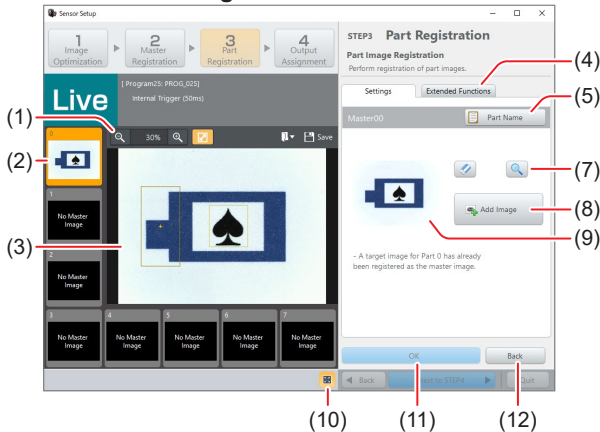
Items	Description	Ref.
Variable Brightness (When the learning tool is set)	Sets whether to register multiple images of different brightness when registering the target to judge the part type. To use variable brightness, the target must not be moving.	4-142
From File	Imports images to be registered as the target to judge the part type from the file saved in the PC.	4-144
From History	Imports images to be registered as the target to judge the part type from the image history.	4-143

Part Image Registration Screen

When the learning tool is set



When the learning tool is not set



(1) Image tool bar

“Operation of the Image Tool Bar” (page 3-13)

(2) Part list

Displays the added part type images.
Up to 8 part types can be displayed.

(3) Image taken by the sensor

Displays an image taken by the sensor.

(4) [Settings]/[Extended Functions] tab

Switches between the settings tab and advanced settings tab.

(5) [Part Name] button

Edits the master names of each part type.

(6) Number of images registered

Displays the number of images registered.

Reference If Variable Brightness is [ON], by registering the first image, seven images are registered including the variable brightness images (six images).

(7) Operation buttons

	Deletes all registered images. The image registered at Part 0 cannot be deleted because it is linked to the master image.
	Deletes the last registered image so that it can be redone.
	The registered image can be expanded and checked. When registering multiple images, they can be confirmed with the move buttons.

(8) [Add Image] button

Press [Add Image] when registering a capture image as a target to judge the part type. Registers at least one image each.
Repeat the operation so that multiple images can be registered as well.

(9) Registered image

Displays the last registered image.

(10) Added part display or hide button

Controls whether to display or hide the added part type image.

(11) [Start Learning] button

Starts the learning.

(12) [Back] button

The system returns to the main screen of the Part Registration settings.

Procedure to Part Image Registration

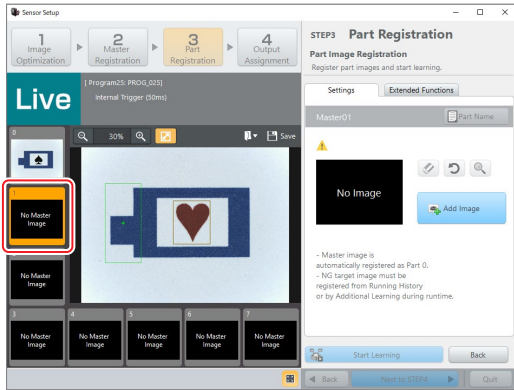
1 Press [Part Image Registration].

☞ “Main Screen for the Part Registration Settings” (page 4-123)

2 Select Part1.

Selects Part1 from the Part list.

- 🔍 **Point**
 - For Part0, a master image is automatically registered. When changing the image of Part0, perform master image registration again.
 - To start learning, at least two part types (including Part0) must be registered.



3 Register the image for the part type.

Registers an image as the target to judge the part type.

● Registration of Taken Image

☞ “Registration of Taken Image” (page 4-143)

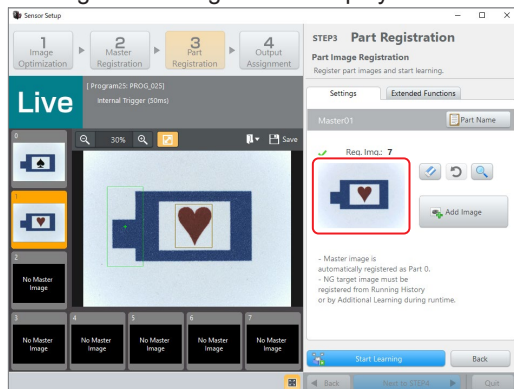
● Registration of Image from the Image History

☞ “Registration of Image from the Image History” (page 4-143)

● Registration of image saved in a file

☞ “Registration of image saved in a file” (page 4-144)

The registered image will be displayed.



4 When the learning tool is set, repeat step 3 when registering multiple images for the part type.

- 🔍 **Point**
 - By capturing multiple images of different judgment criteria, the judgment stability will be improved automatically.
 - ☞ “Learning Multiple Images for Stability” (page 6-20)

5 Add Part2 to 7 as needed.

Up to 7 part types can be added.

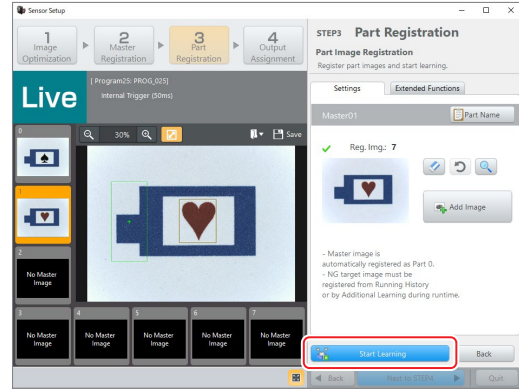
6 Register the images for each part type.

Registers an image as the target to judge the part type. The registration method is the same as step 3 to 4.

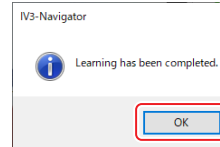
7 Press [Start Learning] or [OK].

● When the learning tool is set

Press [Start Learning].

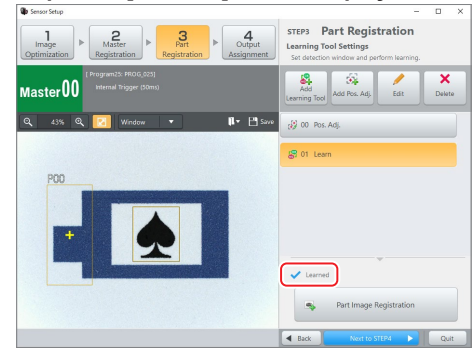


When learning is completed, press [OK].



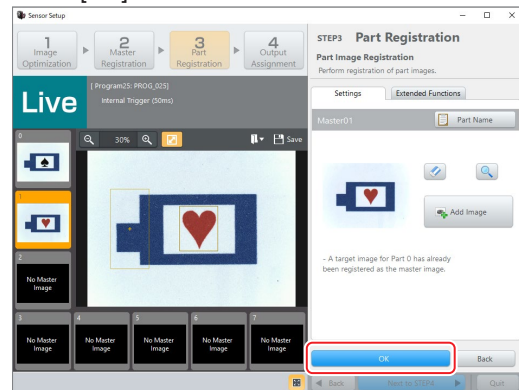
The system returns to the main screen of [Part Registration].

- 🔍 **Point**
 - When the part registration settings are completed, [Learned] will be displayed.



● When the learning tool is not set

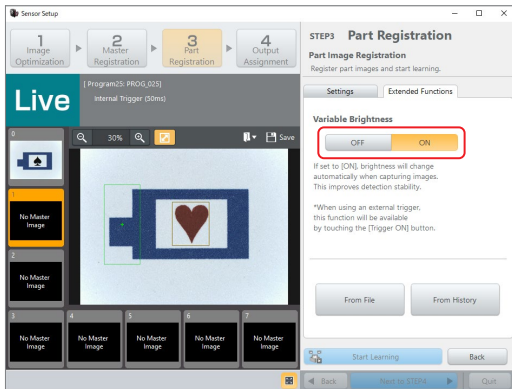
Press [OK].



The system returns to the main screen of [Part Registration].

Registration of Taken Image

1 When changing the [Variable Brightness] setting, select the [Extended Functions] tab.



Reference Variable brightness can be ON in the following cases.

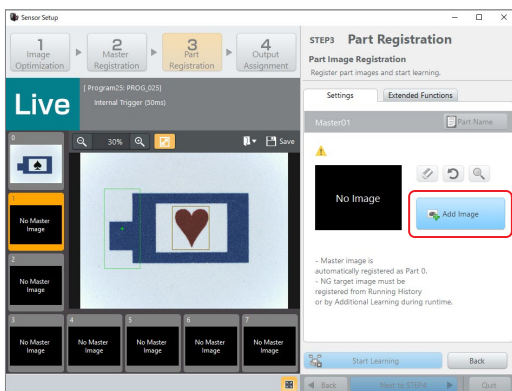
- During internal trigger
- When pressing [T] with external trigger set to image by using the internal trigger.

2 Image a target to be registered.

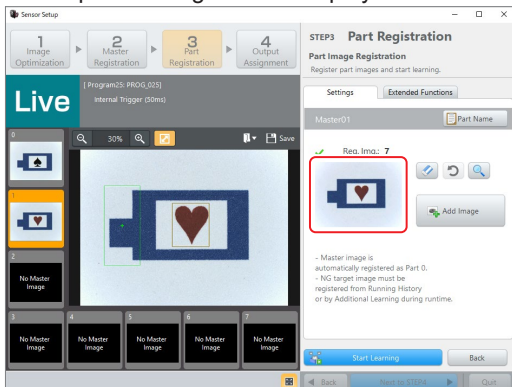
If [Trigger Options] is set to [External Trigger] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.

If an external trigger cannot be input, press [T] to take an image of the target by temporarily using the internal trigger.

3 Press [Add Image].

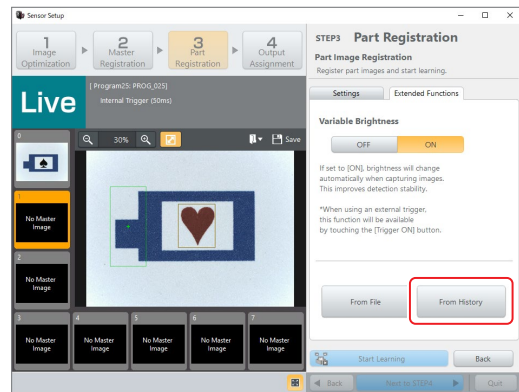


The captured image will be displayed.

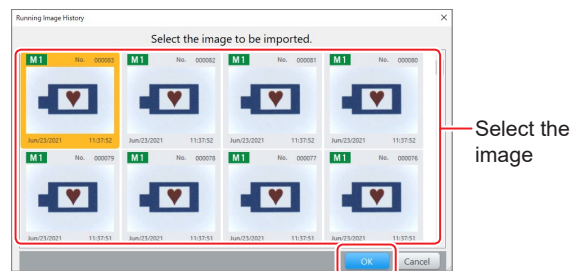


Registration of Image from the Image History

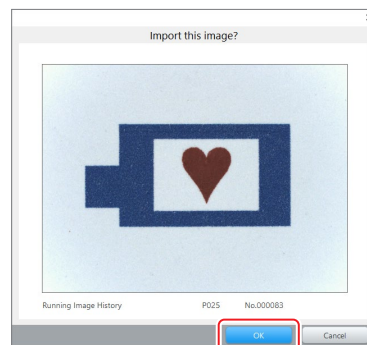
1 Select the [Extended Functions] tab and select [From History].



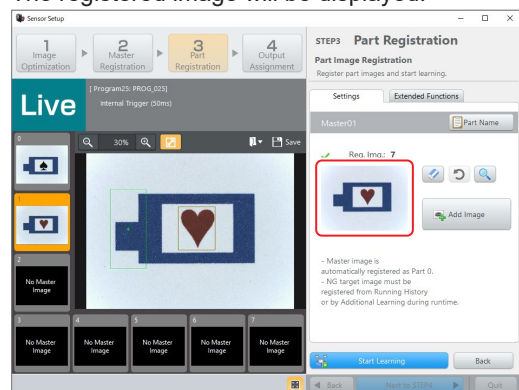
2 Select the image to be registered, and press [OK].



3 Press [OK].



The registered image will be displayed.



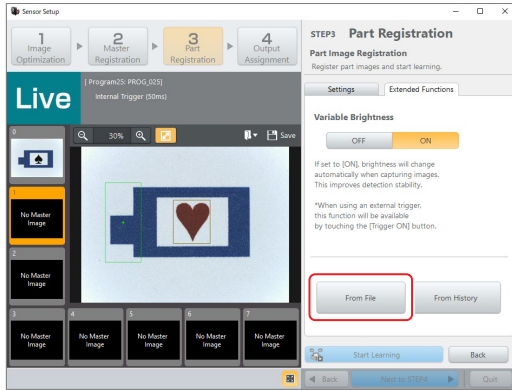
3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)

Registration of image saved in a file

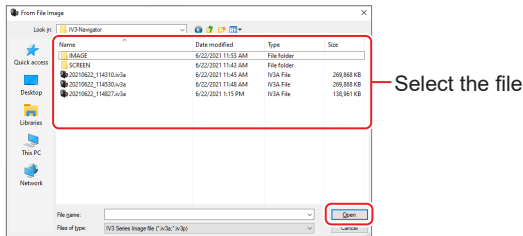
1 Store a batch backup file (*.iv3a), an individual program backup file (*.iv3a) or an image capture file (*.iv3p) beforehand in the PC folder.

☞ “Saving the Sensor Settings and Images” (page 8-3)

2 Press [From File].



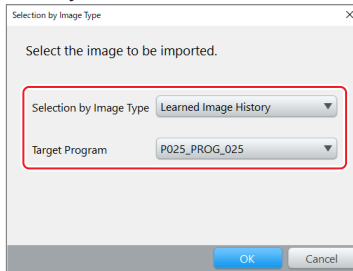
3 Select the file to be imported, and press [Open].



4 If a batch backup file (*.iv3a) or individual program backup file (*.iv3a) is selected, select the image type to be imported from the following.

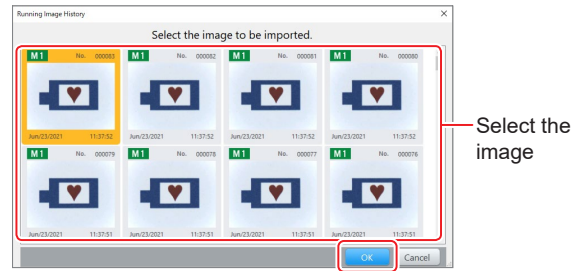
- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.



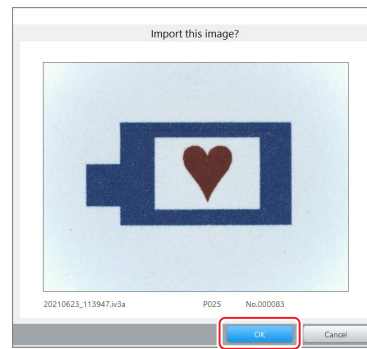
The list of images saved as the selected file image type will be displayed.

5 Select the image to be registered, and press [OK].

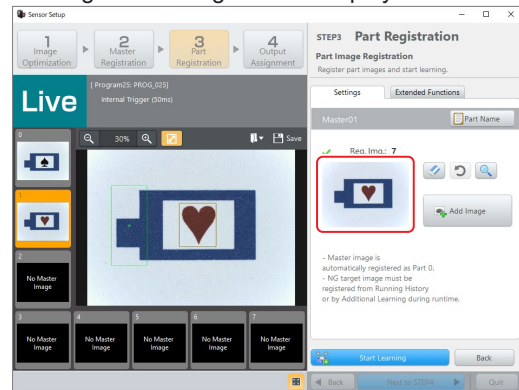


The registered image will be displayed.

6 Press [OK].



The registered image will be displayed.

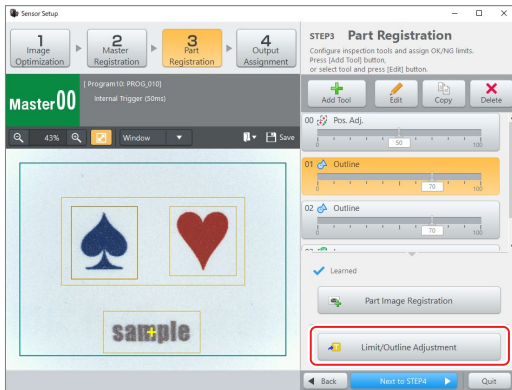


Limit/Outline Adjustment

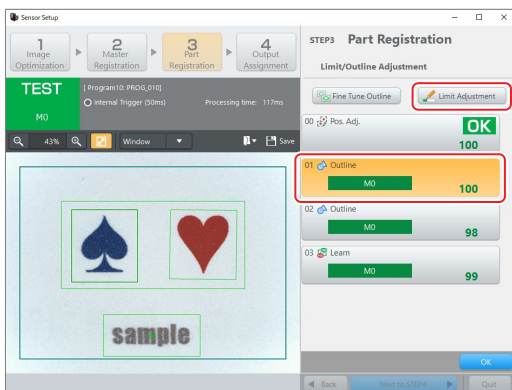
The threshold for each part type registered in the detection tool can be adjusted. Additionally, the outline for each part type registered in the outline tool can also be adjusted. Note that the threshold for the position adjustment/high-speed adjustment tool cannot be adjusted.

Limit Adjustment

- 1 Press [Limit/Outline Adjustment] on the part type settings screen.

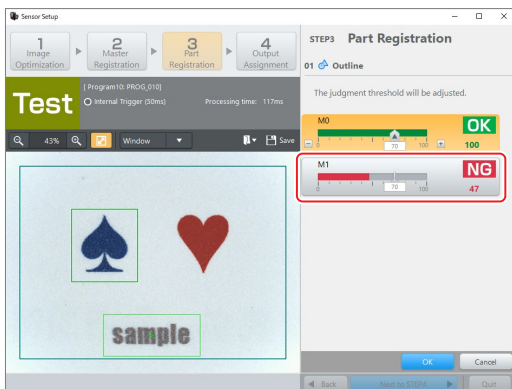


- 2 Select the detection tool and then press [Limit Adjust].



The sensor changes to Test mode.
The Limit Adjustment screen appears.

- 3 Select the part type for which the threshold is to be adjusted.



M0 to M7 displayed on the screen represents Part 0 to Part 7.

- 4 Image the part type target to be the reference of judgment.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input an external trigger.

If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

- 5 Adjust the threshold by checking the matching rate.

The optimal threshold can be set for each part type (M0 to M7).

- Outline Tool/Color/Brightness Average Tool

<Setting example>

If the matching rate of the same part type is higher than 90 and if the matching rate of a different part type is lower than 40, set the threshold to 65, which is a value in between 40 and 90.



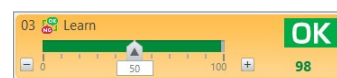
- Reference
 - A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
 - A matching rate of 100 indicates that the target is completely matched to the master image. The matching rate decreases with differences between the outline of the target and the master image.
- 📖 "Adjusting Thresholds for Judgment" (page 6-15)

- Width tool/Diameter tool

- The width tool sets the range of the width to be judged as the same part type.
 - 📖 "Setting the Width Tool" (page 4-135)
- The diameter tool sets the range of the diameter as the same part type.
 - 📖 "Setting the Diameter Tool" (page 4-137)

- Learning tool

- 📌 Point For learning tool, threshold adjustment is not needed since the target match is automatically adjusted by learning. Use threshold adjustment if additional learning cannot be made or when it is determined to be needed after additional learning. Additional learning also enables "NG" images to be registered and learned.
 - 📖 "Auto Adjustment by the Additional Learning (Learning Tool Only)" (page 6-2)



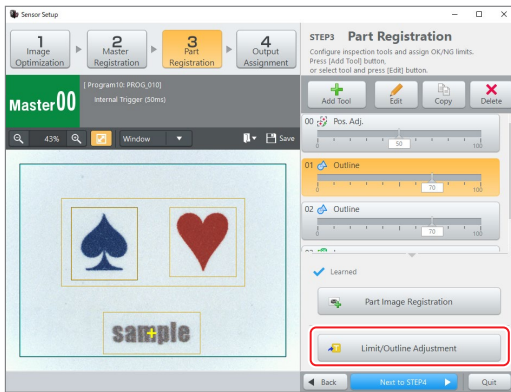
The matching rate of either part type appears. The part type is not displayed. Adjust the threshold so that all part types are "OK" and part type images that are not registered are "NG".

- 6 Press [OK] to return to the threshold/outline adjustment screen.

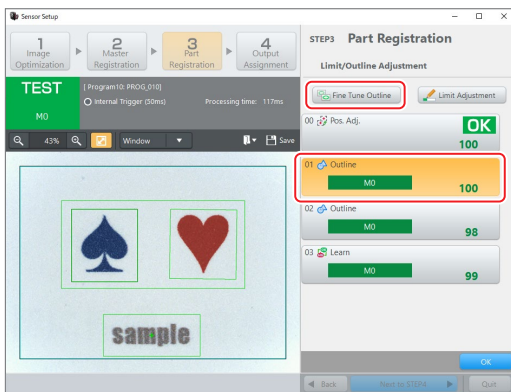
Adjusting the Outline

5 Press [OK] to return to the threshold/outline adjustment screen.

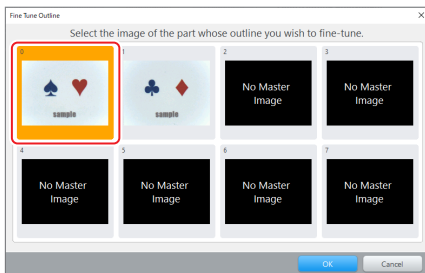
1 Press [Limit/Outline Adjustment] on the part type settings screen.



2 Select the outline tool and then press [Fine Tune Outline].

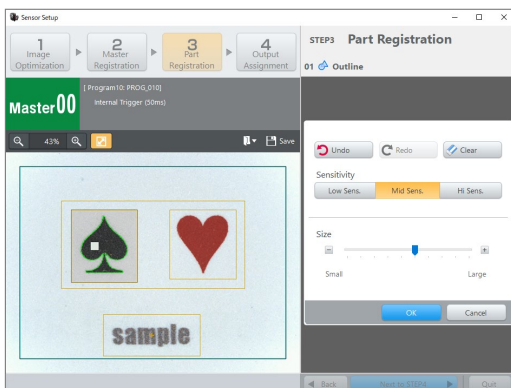


3 Select the part type image for which the outline is to be adjusted, and press [OK].



0 to 7 displayed on the screen represents Part 0 to Part 7.

4 Adjust outline removal and sensitivity.



- ☞ "Settings for Disabling Outlines" (page 4-68)
- ☞ "Setting a Sensitivity" (page 4-68)

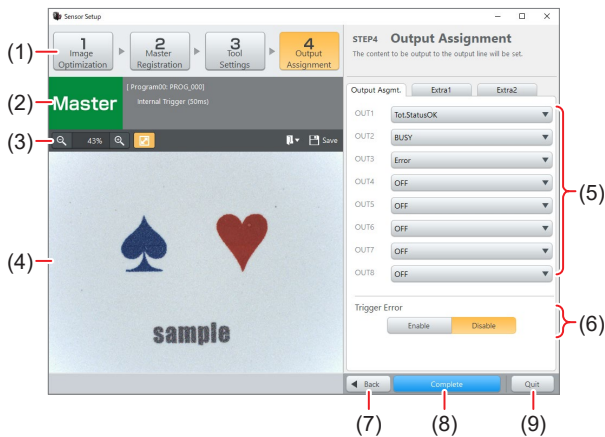
4. Output Assignment (Setting Details of Outputting to Output Line)

Set the output items to be assigned to the output line.

📖 “Cables” (page 2-15)

📖 “Chapter 11 Controlling with the Input/Output Line” (page 11-1)

Main Screen for the Output Assignment



(1) Navigation button

Moves steps in the Settings Navigator.

(2) [Image Type] display

📖 “Image Types of the Settings Navigator” (page 4-5)

(3) Image tool bar

📖 “Operation of the Image Tool Bar” (page 3-13)

(4) Master Image

Displays the master image and tool window.

(5) Output Assignment button

• [Output Asgmt.] tab

Assigns the output item to each output line.

📖 “Setting the Output Assignment” (page 4-148)

• [Extra1] tab, [Extra2] tab

(can be set only in the standard mode)

Sets the total status conditions, logics, and program auto-switching.

📖 “Total Status Conditions” (page 4-150)

📖 “Logic Settings” (page 4-151)

📖 “Program Auto-Switching” (page 4-152)

(6) [Enable]/[Disable] setting for the Trigger Error output

Selects whether to enable/disable the output when a trigger error occurs.

📖 “Error Messages” (page A-9)

(7) [Back] button

Returns to the tool settings screen, or part registration settings screen.

📖 “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-28)

📖 “3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121)

(8) [Complete] button

Finishes the Settings Navigator.

📖 “Finishing the Settings Navigator” (page 4-7)

(9) [Quit] button

Finishes the Settings Navigator.

📖 “Finishing the Settings Navigator” (page 4-7)

Setting Range of the Output Assignment

● In the standard mode

Setting range	Description
OFF	Do not output. Output will be constantly OFF.
Tot.StatusOK	When the total status result of the tools which have been set is OK, the output turns ON. The total status condition can be selected from the following: <ul style="list-style-type: none"> • All Tools OK • Any Tool OK • Logic 1 • Logic 2 • Logic 3 • Logic 4
Tot.StatusNG	When the total status result is NG, the output turns ON.
RUN	When the sensor is running and no system error has occurred, the output turns ON.
BUSY	The output turns ON in the following cases. <ul style="list-style-type: none"> • Judgment process in progress (capture process/image process) • Switching programs • Registering the external master image • Data transferring to an SD card (in the case of settings enabled)
Error	The output turns ON when the following errors occur. <ul style="list-style-type: none"> • System error • Startup memory readout error • Program switching error • External master registration error • SD card access error The following errors are output when settings are [Enable]. <ul style="list-style-type: none"> • Trigger error • FTP error • SD card transfer error
SD card error	The output turns ON when the following errors occur. <ul style="list-style-type: none"> • SD card access error • SD card transfer error (when settings are [Enable])
Tool 00: Pos. Adj.	When the status result of the position adjustment is OK, the output function turns ON.
Tool 01 to 64	When the status results of the detection tool and position adjustment tool are OK, the output function turns ON. Status results can be output by each tool.
Master 00 to 07	<ul style="list-style-type: none"> • When master image settings are enabled and the status results for all tools, except the position adjustment tool, are OK with the selected master image set, the output function turns ON. • If the status result for multiple master numbers is OK, the supported output functions turn ON.
Logic 1 to 4	When the status result of the specified logic is OK, the output turns ON.

● In sorting mode

Setting range	Description
OFF	Do not output. Output will be constantly OFF.
Part0 to Part7	When the status result of the learning tool for a specified part type is OK, the output function turns ON. Status results can be output by each part type.
Total Status NG	When the status result for all part types is NG, the output turns ON.
RUN	When the sensor is running and no system error has occurred, the output turns ON.
BUSY	The output turns ON in the following cases. <ul style="list-style-type: none"> • Judgment process in progress (capture process/image process) • Switching programs • Data transferring to an SD card (in the case of settings enabled)
Error	The output turns ON when the following errors occur. <ul style="list-style-type: none"> • System error • Startup memory readout error • Program switching error • External master registration error • SD card access error The following errors are output when settings are [Enable]. <ul style="list-style-type: none"> • Trigger error • FTP error • SD card transfer error
SD card error	The output turns ON when the following errors occur. <ul style="list-style-type: none"> • SD card access error • SD card transfer error (when settings are [Enable])

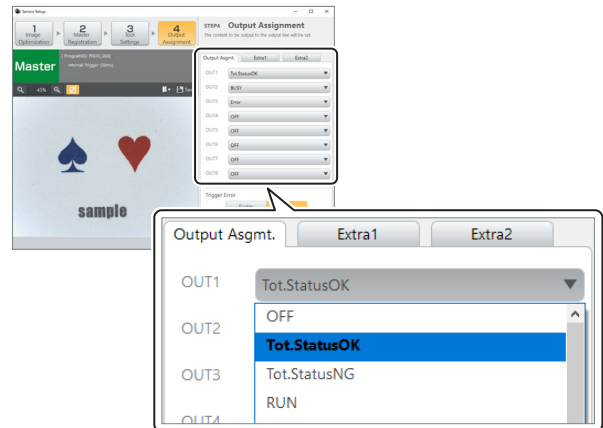
● Default value

Ultra-compact model	Built-in amplifier type	Standard Mode	Sorting Mode
OUT1		Tot.StatusOK (N.O.)	MASTER00 (N.O.)
OUT2		BUSY (N.O.)	
OUT3		Error (N.C.)	
OUT4	I/O1	OFF	
OUT5	I/O2		
OUT6	I/O3		
OUT7	-		
OUT8	-		
Trigger error		Disable	
FTP error			
SD card transfer error			

- Reference**
- The output settings which determine N.O./N.C. can be changed.
 - “Output Settings” (page 7-15)
 - The input cable assignment can be changed.
 - “Input Settings” (page 7-13)
 - The FTP error output can be changed.
 - “FTP Error” (page 9-4)
 - The SD card transfer error output can be changed.
 - “SD card transfer error” (page 8-14)

Setting the Output Assignment

1 Press the item name of an output line and select the output item.



2 Finishes the Settings Navigator.

□ “Finishing the Settings Navigator” (page 4-7)

Extended Functions for the Output Assignment

● Setting Items of the Output Assignment (Extended Function 1)

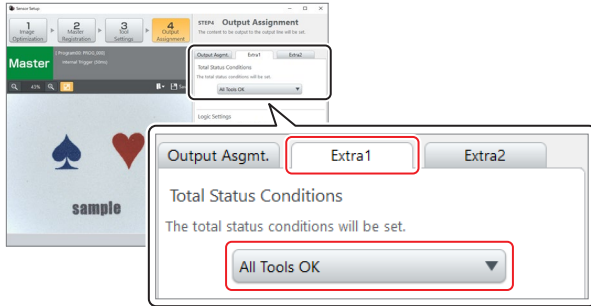
Items	Description	Setting range	Ref.
Total Status Conditions	Selects a condition for the total status result. The total status result is determined according to the selected condition.	<ul style="list-style-type: none"> • All tools OK (default) When the status results of all of the detection tools are OK, the total status output turns ON. • Any Tool OK When the status results of any of the detection tools are OK, the total status output turns ON. • Logic 1 to 4 When the status result for the set logic is OK, the total status output turns ON. 	4-150
Logic Settings	A logical operation can be performed using the status results of selected detection tools and can be applied to an output. Up to 4 items, Logic 1 to 4, can be defined.	<ul style="list-style-type: none"> • Unused (default) The selected items are not used in a logical formula. • Used The status results of the selected items must be OK for the logic output to turn ON. • Used (Inverse) The status results of the selected items must be NG for the logic output to turn ON. 	4-151
Logic	Selects the operation method for the logic settings.	<ul style="list-style-type: none"> • AND (default) When the status results of all of the selected detection tools are OK, the Logic output turns ON. • OR When the status results of any of the selected detection tools are OK, the logic output turns ON. 	

● Setting Items of the Output Assignment (Extended Function 2)

Items	Description	Setting range	Ref.
Program Auto-Switching	Switches the program automatically according to the total status result.	<ul style="list-style-type: none"> • Enable Enables the program auto-switching. • Disable (default) Disables the program auto-switching. 	
Switching destination	If Total Status OK (Standard Mode)	Selects the switching destination program when the total status is OK.	<ul style="list-style-type: none"> • None (default) The program is not switched. • P000 to P127 (program number) Switches to the program with a selected number.
	During Part Type Judgment (Sorting Mode)	Selects the switching destination program for each judged part type (00 to 07).	
	Total Status NG	Selects the switching destination program when the total status is NG.	
	Delay	Sets the delay time when switching.	
NG Confirmation Timing	Selects the timing to judge as total status NG.	<ul style="list-style-type: none"> • Every trigger (default) Determines the target as the total status NG when NG occurs for every trigger. • After Judgment Waiting Time (at internal trigger only) When the total status NG occurs after the judgment waiting time has passed, the program switching operation at the total status NG is executed. Even if the total status NG occurs during the judgment waiting time, the program switching operation at the total status NG is not executed. • After retry count (at external trigger only) When the total status NG counts reach the retry count + 1, the program switching operation at the total status NG is executed. If the total status NG counts are within the retry count, the program switching operation at the total status NG is not executed. 	4-152
Judgment waiting time	Sets the status waiting time when the NG confirmation timing is "After Judgment Waiting Time".	• 0 to 999 s (default: 30 s)	
Retry count	Sets the retry count when the NG confirmation timing is "After Retry Count".	• 0 to 999 counts (default: 5)	

Total Status Conditions

1 Select the [Extra1] tab and select a total status condition.



The total status result is displayed according to the selected condition.

● All Tools OK

When all of the detection tools are OK, the total status output turns ON.

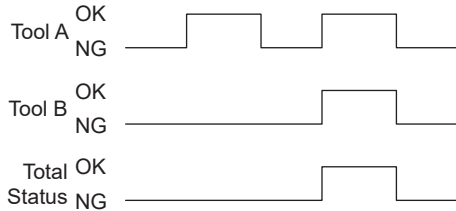


Image of total status output when the total status condition is [All Tool OK]

● Any Tool OK

When any of the detection tools are OK, the total status output turns ON.

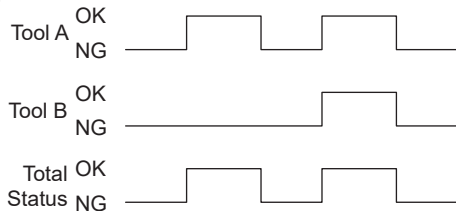


Image of total status output when the total status condition is [Any Tool OK]



For [Any Tools OK], the status result of the position adjustment is not included in the total status conditions.

● Logic 1 to 4

When the status result of the defined logic are OK, the total status output turns ON.

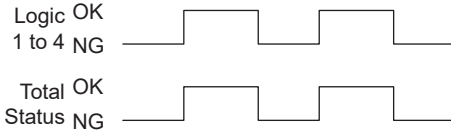


Image of total status output when the total status condition is [Logic 1 to 4]



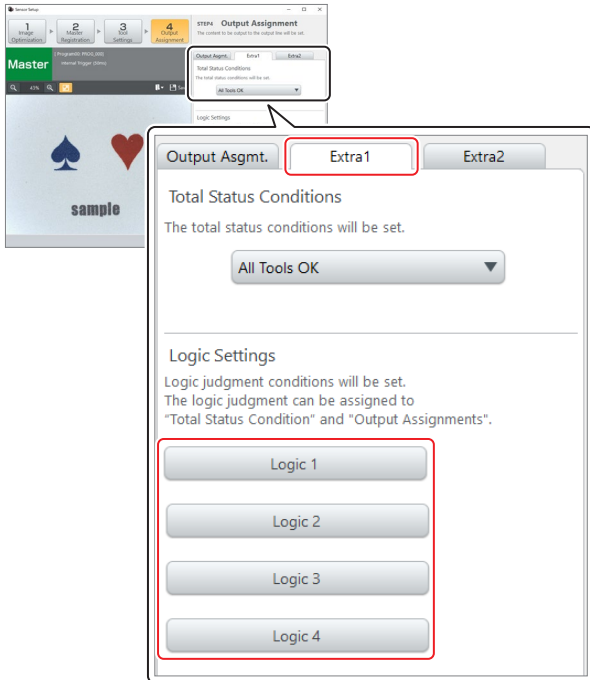
- When the position adjustment fails the status result of each tool is NG.
- If the Learning/Area/Edge Pixel/Width/Diameter/Edge/Pitch/OCR/Blob Count tool window protrudes from the imaging area when position adjustment succeeds, the tool cannot be judged and the status result is NG.

2 When setting is completed, press the [Output Asgmt.] tab.

The system returns to the main screen for [Output Assignment].

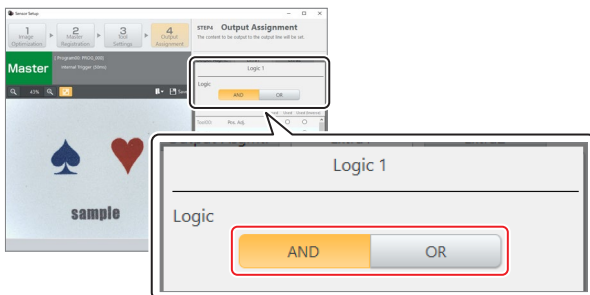
Logic Settings

1 Select the [Extra1] tab and select the logic number to which the logical formula is to be defined.



Reference When an undefined detection tool has been defined to a logic, [Undefined tool selected.] is displayed on the right side of the logic number.

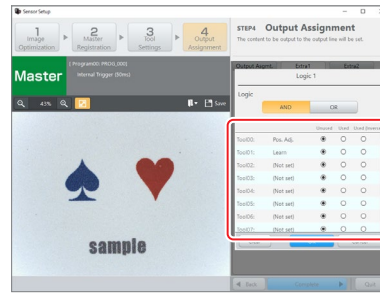
2 Select the operation method for the logic.



Reference

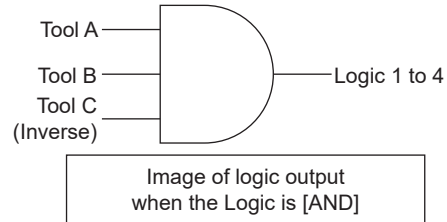
- When [AND] has been selected, the logic output turns ON when the status results of all of the selected detection tools are OK.
- When [OR] has been selected, the logic output turns ON when the status results of any of the selected detection tools are OK.

3 Select items to be integrated into the logic.



The status result of the logic is calculated from OK/NG of all of the items which [Used] or [Used (Inverse)] has been set.

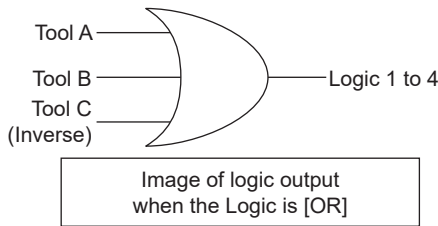
● **Logic : AND**



Tool A	Tool B	Tool C	Logic
OK	OK	OK	NG
NG	OK	OK	NG
OK	NG	OK	NG
NG	NG	OK	NG
OK	OK	NG	OK
NG	OK	NG	NG
OK	NG	NG	NG
NG	NG	NG	NG

4. Output Assignment (Setting Details of Outputting to Output Line)

● Logic : OR



Tool A	Tool B	Tool C	Logic
OK	OK	OK	OK
NG	OK	OK	OK
OK	NG	OK	OK
NG	NG	OK	NG
OK	OK	NG	OK
NG	OK	NG	OK
OK	NG	NG	OK
NG	NG	NG	OK

Reference

- Select either [Unused]/[Used]/[Used (Inverse)] for each item (Pos. Adj./Tool 01 to Tool 64/Master 00 to Master 07/Logic 1 to Logic 3).
- When the status results of the [Used] items are OK, the status output for items in the logic turns ON.
- When the status results of the [Used (Inverse)] items are NG, the status output for items in the logic turns ON.
- To define a logic which has been already set to another logic, use the logic number which is greater than the logic number which has been set.
For example, use either of Logic 2 to Logic 4 in case of defining Logic 1 to another logic.

Point

When the program number has been changed or the sensor is put into [Run] from [Sensor Setup Menu] after the the power is turned ON, a judgment is not performed until a trigger has been input. Until the trigger is input, the judgment result of each tool is OFF.

4 When setting is completed, press [OK].

The system returns to the main screen for the extended functions settings.

5 Press [Output Asgmt.] tab.

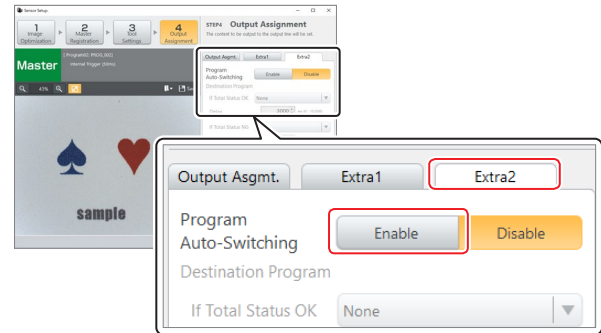
The system returns to the main screen for [Output Assignment].

Program Auto-Switching

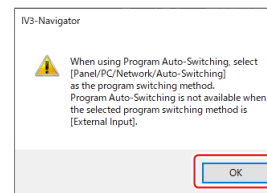
Set the switching conditions for the program auto-switching function.

- ☞ “Using Program Auto-Switching” (page 7-11)
- ☞ “Importing the Status Output (When Program Auto-Switching is “Enable”)” (page 11-8)

1 Select the [Extra2] tab and press [Enable] for program auto-switching.



2 Press [OK] in the confirmation screen.

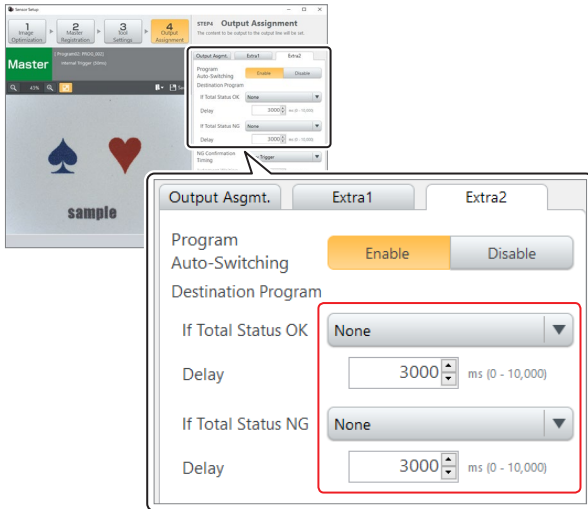


Change the program switching method to [Panel/PC/Network/Auto-Switching].

- ☞ “Program Switching Method” (page 7-14)

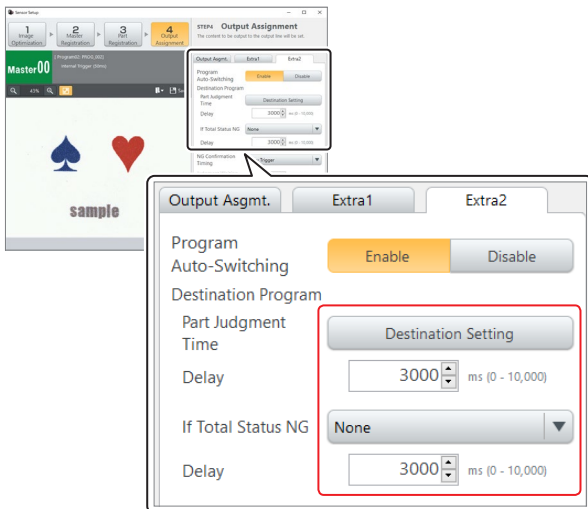
3 Select the switching destination program.

● In standard mode

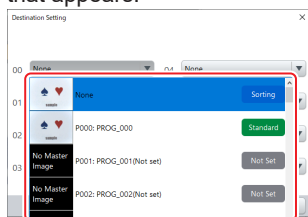


Total Status OK	Selects the switching destination program when the total status is OK.
Total Status NG	Selects the switching destination program when the total status is NG.
Delay	The delay time (default: 3000 ms) for switching can be set.

● In sorting mode

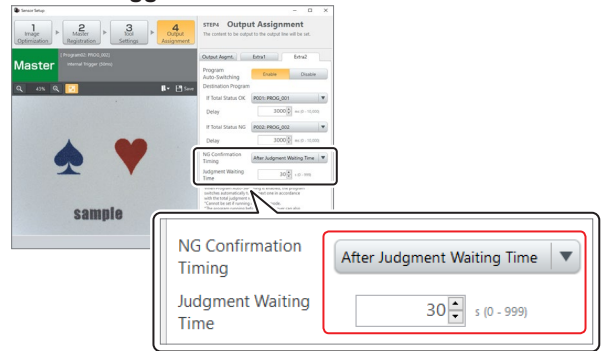


Part Judgment Time	Press [Destination Setting] to select the switching destination program for each part type when the part type discrimination is OK on the destination setting screen that appears.
If Total Status NG	Selects the switching destination program when the total status is NG.
Delay	The delay time (default: 3000 ms) for switching can be set.

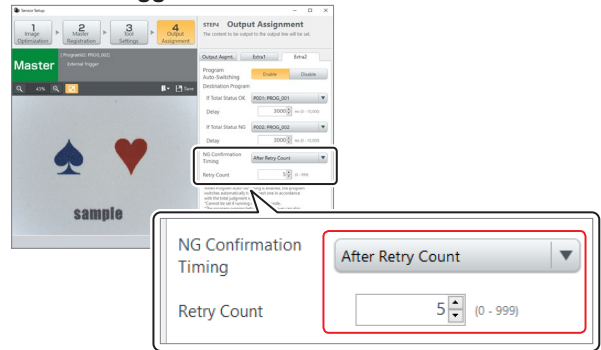


4 Select the timing to determine NG.

Internal trigger



External trigger



NG confirmation timing	The following items can be selected: <ul style="list-style-type: none"> • Every trigger (default) • After Judgment Waiting Time (at internal trigger only) • After retry count (at external trigger only)
After Judgment Waiting Time (at internal trigger only)	Specifies the judgment waiting time (default: 30 s) when the NG confirmation timing is [After Judgment Waiting Time].
After retry count (at external trigger only)	Specifies the retry count (default: 5) when the NG confirmation timing is [After Retry Count].

4. Output Assignment (Setting Details of Outputting to Output Line)

Point

- When "None" is selected for the switching destination, the current operation screen and judgment conditions are retained. When the same program number is selected for the switching destination, switching to the same program is processed and the operation screen and status are reset. If resetting the status in the start point program, select the same program.
- The life-span for the operation of the focusing function (program switch count) is 100,000 times. If the focusing position does not need to be changed in each program, set [Auto Focus Adj Pos] to [Common] to extend its duration.

📖 "Auto Focus Adj Pos" (page 7-19)

Reference

The methods to use "NG Confirmation Timing" properly are as follows:

- **Every trigger**

Determines the status for each trigger. Automatically switches to the program set in the switching destination according to the status result.

This is mainly used for automatic machines and inline status without human intervention.

- **After Judgment Waiting Time (at internal trigger only)**

Even if the judgment process results in the total status NG, the total status result is not determined during the time set in "Judgment Waiting Time". The program switching operation at the total status NG is not executed. When the total status is OK, the program switching operation at the total status OK is executed at that point.

This is mainly used to check the work of assembly processes that require human intervention etc. The amount of time to complete a task can be set, using "Judgment Waiting Time".

- **After retry count (at external trigger only)**

Even if the judgment process results in the total status NG, the total status result is not determined up to the count set in "Retry Count". The program switching operation at the total status NG is not executed. When the total status is OK, the program switching operation at the total status OK is executed at that point.

This is mainly used to check the work of assembly processes that require human intervention etc. The number of times where the operator retries can be set, using "Retry Count".

5

Running

This chapter explains the procedures for starting operation and the names and functions of each section displayed on the operation screen.

The chapter also explains useful functions when confirming operation status.

Starting an Operation	5-2
Overview of the Screen in [Run] / [Program]	5-3
Names and Functions of the Screen in [Run] / [Program]	5-4
Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences)	5-13
Holding the Image of the Sensor on which NG Occurred (NG Hold Function)	5-16
Confirming the Images Whose Judgment are NG (Running Image History)	5-17

Starting an Operation

Starts operation according to the program created with the Settings Navigator.

Reference The sensor can be independently operated.

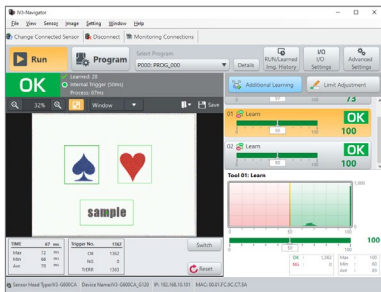
Turning on the power and starting operation

1 Turn on the power of the sensor and boot up IV3-Navigator.

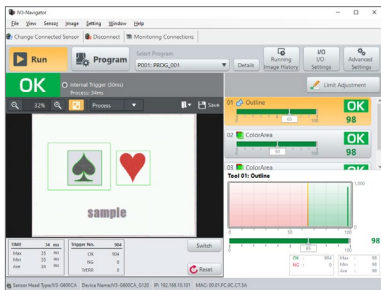
📖 “Operation for Initial Startup of the IV3-Navigator” (page 3-6)

2 Confirm that the main screen in [Run] opens.

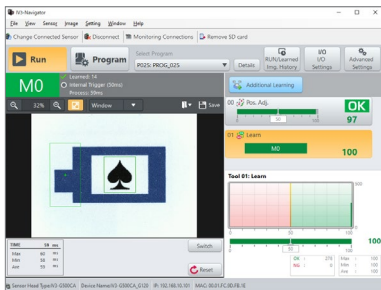
● For a [Standard Mode] (including the learning tool) program



● For a [Standard Mode] (not including the learning tool) program



● For a [Sorting Mode] program



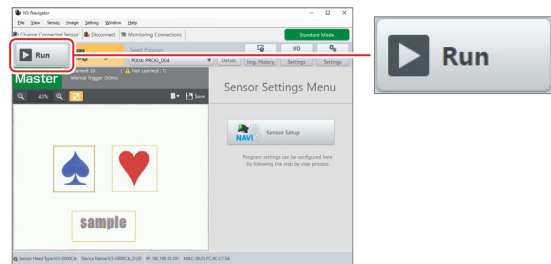
Point If the image or status result does not update, refer to 📖 “Troubleshooting” (page A-7).

Exiting the sensor settings and starting operation

1 Exit any settings screens that are open on the sensor, such as the Settings Navigator.

📖 “Finishing the Settings Navigator” (page 4-7)

2 Press [Run].

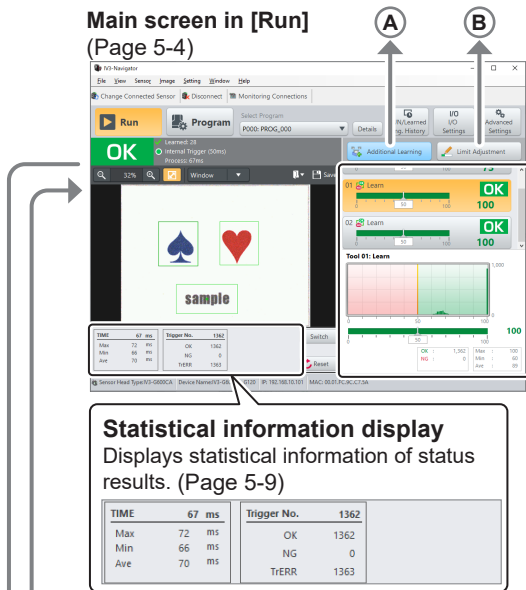


The run screen opens and the operation starts.

Point If the image or status result does not update, refer to 📖 “Troubleshooting” (page A-7).

Overview of the Screen in [Run] / [Program]

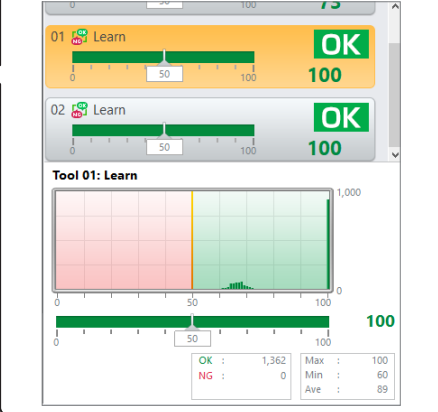
Main screen in [Run]
(Page 5-4)



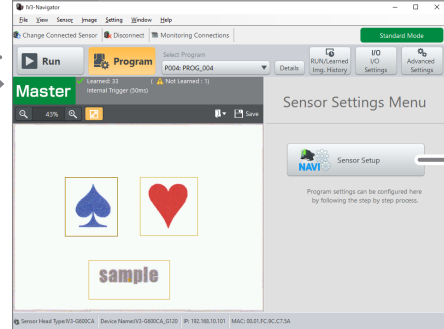
Statistical information display
Displays statistical information of status results. (Page 5-9)

TIME	ms	Trigger No.	1362
Max	72	ms	OK 1362
Min	66	ms	NG 0
Ave	70	ms	TRERR 1363

Tool information display
Displays the threshold/judgment value by tools and the histogram for status result. (Page 5-10)

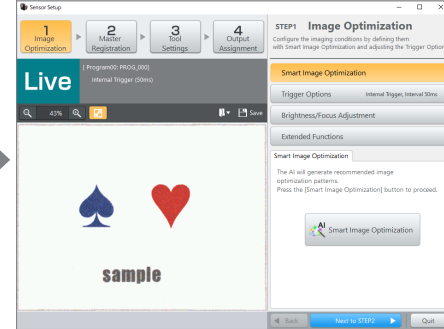


Main screen in [Program]
(Page 5-4)



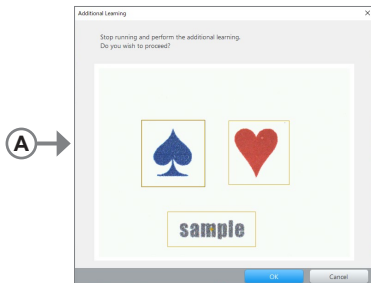
Settings Navigator (Sensor Setup)

Sets the program to be used for judgment.
 "Starting the Settings Navigator" (page 4-4)



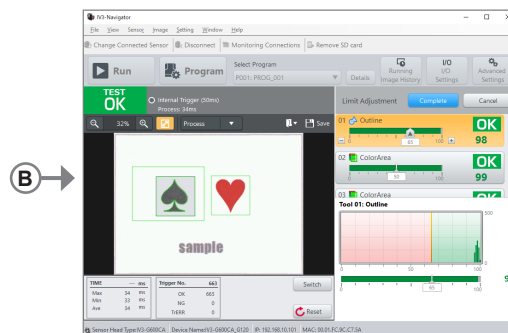
Additional Learning (Learning Tool Only)
Perform additional learning of images.

"Auto Adjustment by the Additional Learning (Learning Tool Only)" (page 6-2)



Limit adjustment (standard mode only)
Adjusts the tool threshold.

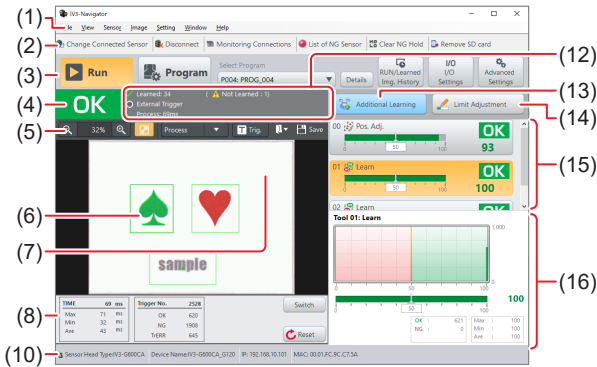
"Adjusting Thresholds for Judgment" (page 6-15)



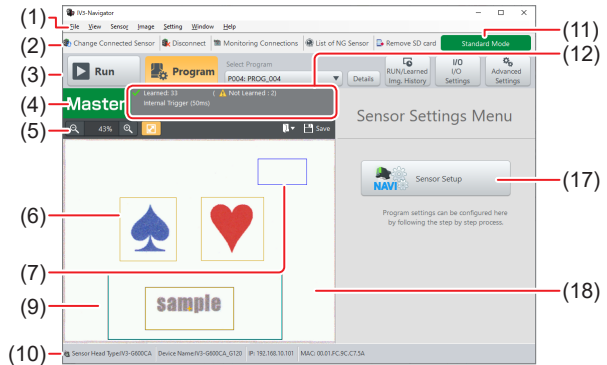
Names and Functions of the Screen in [Run] / [Program]

Main Screen in [Run] / [Program]

● Main screen in [Run]



● Main screen in [Program]



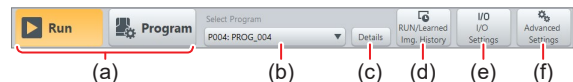
(1) Menu bar

📖 “Operating from the Menu Bar” (page 7-27)

(2) Sensor operation menu

Menu	Function	Ref.
Change Connected Sensor	Detects the connected sensor and changes the currently connected sensor.	3-10
Disconnect	Disconnects the connection to the sensor.	3-11
List of NG Sensor	When the function of [List of NG Sensor Occurrences] is used and the NG occurrence sensor is registered on the list, the button will be displayed. The number of NG occurrences on the sensor registered is displayed.	5-13
Clear NG Hold	If the screen is held after detecting an NG when the [NG Hold Function] is [Enable], this button releases the held screen.	5-16
Remove SD card	Displayed when inserting an SD card. Removes the SD card.	5-16




(3) Settings button




No.	button	Function	Ref.
(a)	[Run] / [Program] switch	Switches the main screen between [Run] and [Program]. <ul style="list-style-type: none"> By pressing [Program] on the main screen in [Run], operation stops and the sensor switches to the main screen in [Program]. By pressing [Run] on the main screen in [Program], setting finishes and the sensor switches to the main screen in [Run]. 	5-3
(b)	Program information	Displays the program number and program name. Programs can be switched from the drop-down menu.	7-2
(c)	Details	Displays the Program Details screen.	7-8
(d)	Running image history or running/learned image history	Displays the running image history and learned image history (only when a learning tool is included).	5-17 6-8
(e)	I/O Settings	Displays the I/O Settings screen.	7-13
(f)	Advanced Settings	Displays the sensor advanced settings screen.	7-19


(4) Total status result/by image type**○ Main screen in [Run] (standard mode)**

For standard mode, displays the total status result. The condition of the total status can be selected from [All Tools OK] / [Any Tool OK] / [Logic 1] to [Logic 4].

	Displayed when the total status result is OK.
	Displayed when the total status result is NG.
	Displayed when the total status result is NG while the NG hold function is set to [Enable]. Holds the image when judged as NG.





 Reference OK/NG can be changed to user-defined characters such as PASS/FAIL.

 "Judgment Notation Settings" (page 7-23)

○ Main screen in [Run] (Sorting mode)

For sorting mode, displays a part type (master)/part type (master) name that is the target to be judged.

	When the master name has not been set: When the results of position adjustment are OK, the part numbers (M0 to M7) for which the part type discrimination is OK will be displayed.
	When the master name has been set: When the results of position adjustment are OK, the part (master) number (00 to 07) for which the part type discrimination is OK (upper) and its part (master) name (lower) will be displayed.
	Displayed when the position adjustment results or part type discrimination results are all NGs.
	Displayed when the position adjustment result or part type discrimination result is NG while the NG hold function is set to [Enable]. Holds the image when judged as NG.

○ Main screen in [Program]

Displays the image type (Master).


(5) Image tool bar

 "Operation of the Image Tool Bar" (page 3-13)

(6) Tool window

Displays the selected tool window region with a green frame when the status result is OK, and displays with a red frame when the status result is NG.

The tool window selected can be changed by pressing a different tool region.


 "Selecting the Display Method of the Tool Window" (page 5-7)

(7) Brightness correction region

When the brightness correction is set, the brightness correction region will be displayed with a blue frame.

(8) Statistical information display

Displays the statistical information of the status results. (default value: hidden).

 "Statistical Information Display" (page 5-9)

(9) Search Range

If the search range of the selected tool is being set to [Partial], the search range will be displayed with a light blue frame. If the position adjustment is set, the search range after position adjustment will be displayed.

(10) Sensor Information

Displays the sensor head model, device name (Page 7-21), IP address (Page 7-21), and MAC address (Page 7-21).

 Point

"Lock Enabled" will be displayed in the lower right of the main screen in [Run] if the password lock is set.



Password is required when while switching to the [Program] main screen.

 "Security" (page 7-22)

(11) Mode

Displays the program mode (Standard Mode/Sorting Mode).

(12) Program information

Displays the information set in the program.

- (a) Learned: 34 (Not Learned: 1)
- (b) External Trigger
- (c) Process: 69ms
- Retry: 5 (d)

No.	Description	Ref.
(a)	Number of learned images (Learning tool only) Displays the number of learned images and number of not reflected images.	6-8
(b)	Trigger type (trigger interval/trigger delay) <ul style="list-style-type: none"> • For the internal trigger: Displays the trigger interval in brackets. • For the external trigger: Displays the trigger delay time in brackets. 	4-11
(c)	Processing time Displays the time between receiving a trigger (external or internal) and when the status result is output. If the output setting is [One-Shot] (Page 7-16), the ON-delay time is not included.	6-26
(d)	Remaining time/Retry count/Switching Displays the remaining time for the judgment waiting time or remaining retry count when setting program auto-switching. [Switching] appears during switching delay after the switching destination program is set.	4-152

(13) [Additional Learning] button (learning tool only)

Performs the additional learning of images displayed on the screen.

☞ "Additional Learning by Taken Image" (page 6-5)

(14) [Limit Adjustment] button

Manually adjusts the tool threshold.

☞ "Adjusting Thresholds for Judgment" (page 6-15)

(15) Status gauge

Displays the status gauge per set tool.

☞ "Tool Information Display" (page 5-10)

(16) Tool information

Displays the information for the selected tool.

☞ "Tool Information Display" (page 5-10)

(17) [Sensor Setup] button

Displays the Settings Navigator screen.

☞ "Starting the Settings Navigator" (page 4-4)

(18) Master image display

Displays the master image registered to the currently selected program. If no master image is registered, the [No Master Image] will be displayed.

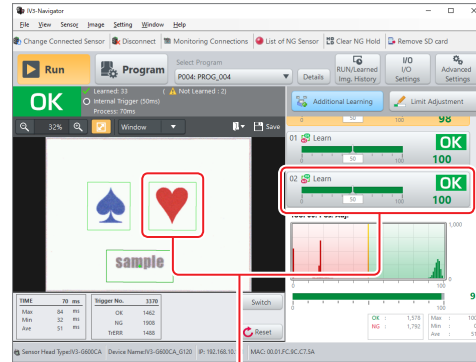
Point Search area and tool window will be hidden when you select [OFF] for the display methods for the tools (Page 5-7).

Selecting the Tool Window

The method for selecting the tool window is as follows.

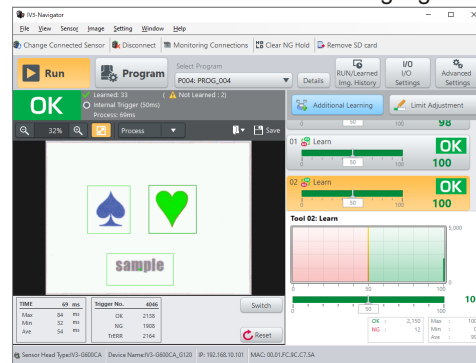
- Press to select the status gauge of the tool window.
- Press to select the tool window displayed on the image of the sensor.

1 Press the tool window displayed on the status gauge or image of the sensor.



Press either one

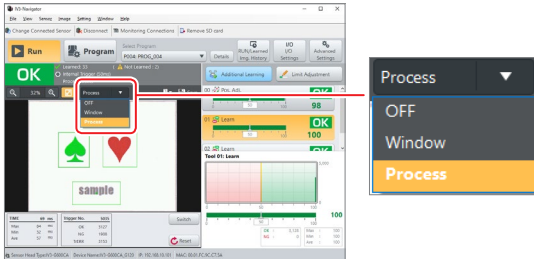
The selected tool window will be highlighted.



Selecting the Display Method of the Tool Window

The display method for the tool window can be selected using the button for the display method of the image tool bar.

- 1 By pressing the button for switching the display method, the suitable display method can be selected.



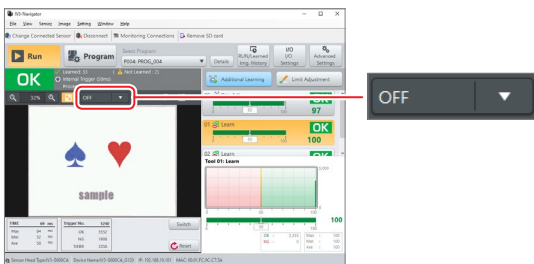
The display method of the tool window changes according to the selected menu.

☞ "Display Methods of Tools (Learning Tool)" (page 5-7)

☞ "Display Methods of Tools (Other Than the Learning Tool)" (page 5-8)

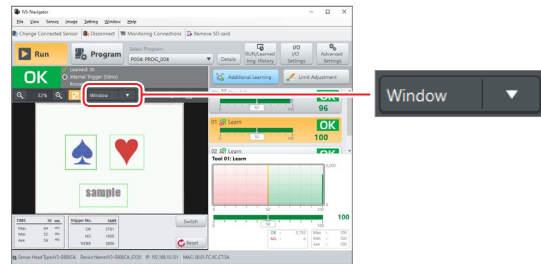
Display Methods of Tools (Learning Tool)

● OFF



All the tool windows and search ranges become hidden.

● Window



○ Selected tool window

- Displays the frame of the tool window with a thick line. If a mask region is set, the region where the tool window and mask region are combined will be displayed.
- Displays the frame of the search range in light blue.

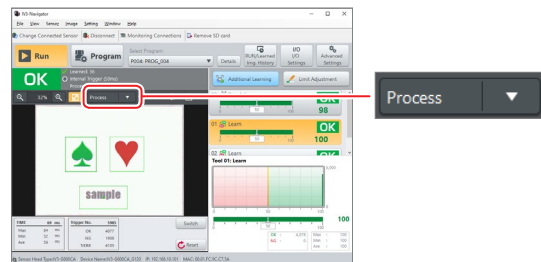
○ Non-selected tool window

- Displays the frame of the tool window with a thin line.
- The search range and the mask region will not be displayed.

○ Common

When the results of position adjustment or status results are OK, the tool will be displayed in green. If one of the status results is NG, the tool will be displayed in red. Displays the brightness correction window in blue.

● Process



Compared to when the [Window] is selected, the following conditions are different. Other details are the same.

○ Selected tool window

- **Tool window: When the status result is OK**
Displays the region with a high matching rate between the target and learned OK work (the region based on which the OK judgment was made) which is shown in green. The higher the matching rate of the region, the darker the green display becomes.
- **Tool window: When the status result is NG**
Displays the region with a high matching rate between the target and learned NG work (the region based on which the NG judgment was made) which is shown in red. The higher the matching rate of the region, the darker the red display becomes.

- Reference
- If a matching rate between the target and both learned OK work and learned NG work is low, the learned work may not be displayed.
 - The display range/density is rough indication. It should be treated as reference information.

○ Selected position adjustment window

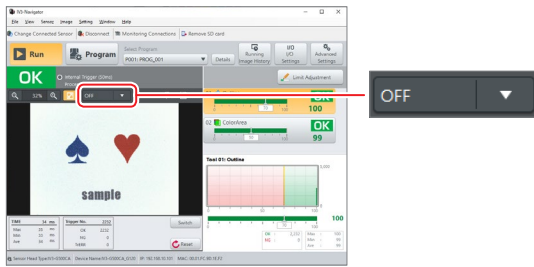
Indicates the recognized outline with a series of points in green (OK) or red (NG).

○ If brightness correction has been set

The inside of the window is displayed with the corrected brightness when selected. (Only the window to be a target of brightness correction)

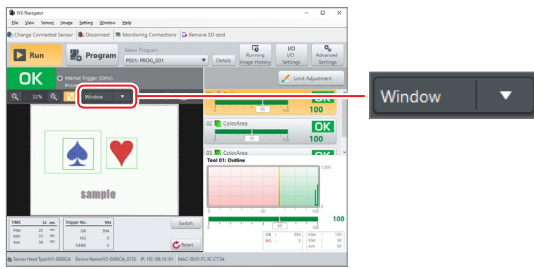
Display Methods of Tools (Other Than the Learning Tool)

● OFF



All the tool windows and search ranges become hidden.

● Window



○ Selected tool

- Displays the frame of the tool window with a thick line. If a mask region is set, the region where the tool window and mask region are combined will be displayed.
- Displays the frame of the search range in light blue.

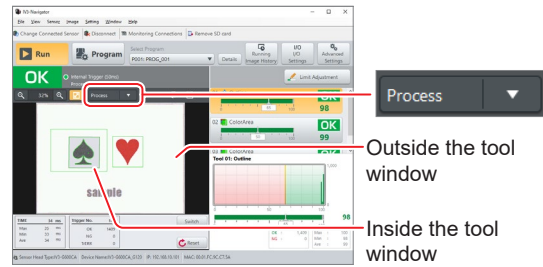
○ Non selected tools

- Displays the frame of the tool window with a thin line.
- The search range and the mask region will not be displayed.

○ Common

When the results of position adjustment or status results are OK, the tool will be displayed in green. If one of the status results is NG, the tool will be displayed in red. Displays the brightness correction window in blue.

● Process



Compared to when the [Window] is selected, the following conditions are different. Other details are the same.

○ Selected tool

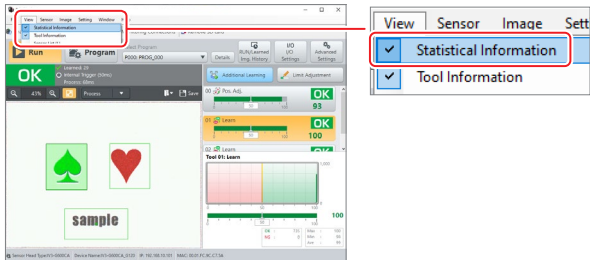
- Outline/edge pixels/width/diameter/edge/pitch tool/ position adjustment
The window indicates the recognized outline/edge with a series of points in green (OK) or red (NG). Inside of the tool window is displayed in monochrome, and outside the tool window in color if the sensor is the color type.
- Color area/color prohibition/brightness prohibition tool
Displays the extracted region as green (OK) or red (NG).
- OCR tool
Displays the recognized text and date on a green (OK) or red (NG) window.
- Color average tool
Displays the master color (M) and target color (L) on the top left of the screen.
- Brightness average tool
Displays the master brightness (M) and target brightness (L) on the top left of the screen.
- Blob count tool
On counted lumps, displays the green check mark (✓) when the number of counts is OK, and the red check mark (✗) when the number of counts is NG. Displays the red oblique line mark (⚡) on size NG lumps.
- If brightness correction has been set
The inside of the tool window is displayed with the corrected brightness when selected. (For tools subject to brightness correction only)

Statistical Information Display

When the [Statistical Information] button in the [View] menu is selected, the statistical information of judgment is displayed.

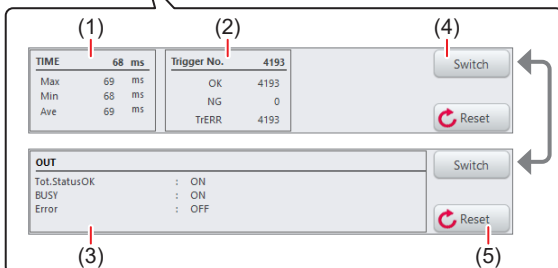
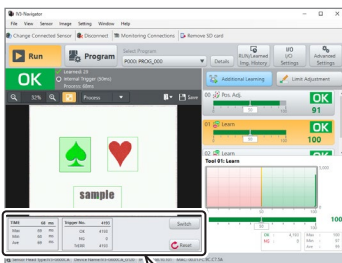
Displaying the Statistical Information

- 1 Select [View] → [Statistical Information] on the menu bar to place a check mark next to [Statistical Information].

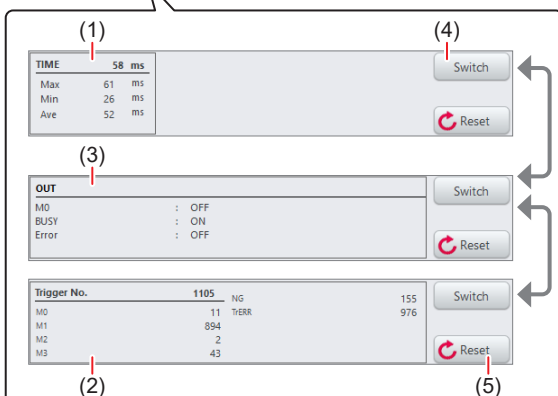
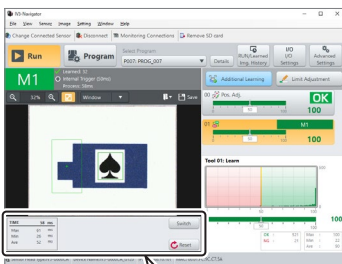


The statistical information will be displayed.

● In standard mode



● In sorting mode



Contents of the statistical information are as follows.

(1) TIME

Displays information related to the processing time.

TIME	Displays the processing time of the latest judgment process.
Max	Displays the maximum value of the processing time.
Min	Displays the minimum value of the processing time.
Ave	Displays the average value of the processing time.

(2) Trigger No.

Displays information related to the number of triggers.

Trigger No.	Displays the total number of triggers issued. This number does not include the number of trigger errors.
OK	Displays the number of triggers issued with the total status OK in the standard mode.
Part type	Displays the number of triggers issued for each part type in sorting mode.
NG	<ul style="list-style-type: none"> • Displays the number of triggers issued with the total status NG in the standard mode. • Displays the number of triggers issued where the part type discrimination is all NG in sorting mode.
TrERR	Displays the number of triggers issued as error triggers.

(3) OUT

Displays the information related to the outputs assigned to an output line in [Output Assignment] of the [Sensor Setup]. (Page 4-147).

- Reference**
- The ON/OFF state of the output is not tracked.
 - For the error output, during normal operation: OFF, at the error occurrence: ON
 - In standard mode, each tool state will be displayed.
Status OK: ON Status NG: OFF
 - In sorting mode, each part type matching state will be displayed.
Suitable (OK): ON Not Suitable (NG): OFF

(4) [Switch] button

Switches the statistical information display.

(5) [Reset] button

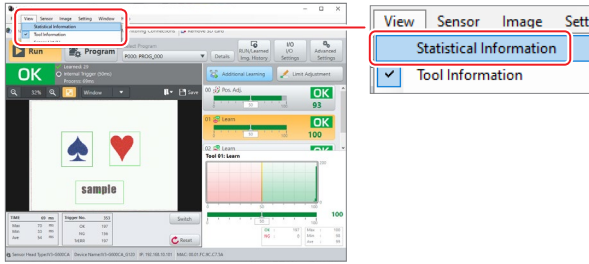
Resets the histogram, processing time, and number of triggers.

- Reference** Pressing the [Reset] button does not reset [OUT].

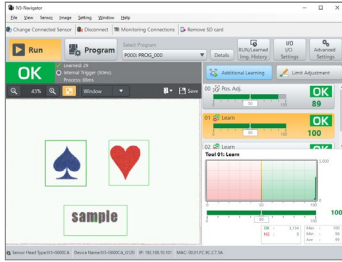
- Reference** The processing time, number of triggers, histogram, judgment record, matching information are reset under the following conditions.
- When [Reset] is pressed.
 - When the power of the sensor is turned OFF.
 - When a tool is added/deleted/copied.
 - When the upper limit of the color area/area/edge pixel/width/diameter/edge/pitch tool is enabled/disabled or when the setting scale is changed.
 - When changing the scaling settings for the width/diameter/pitch tool.
 - When the program is switched.
 - When the sensor is initialized.

Hiding the statistical information

- 1 Select [View] → [Statistical Information] on the menu bar to release the check mark.



The statistical information becomes hidden.



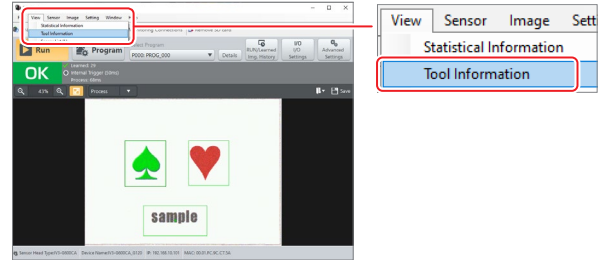
Tool Information Display

You can display or hide the selected tool information with the [View] menu.

- Reference** The matching rate histograms are displayed by default.

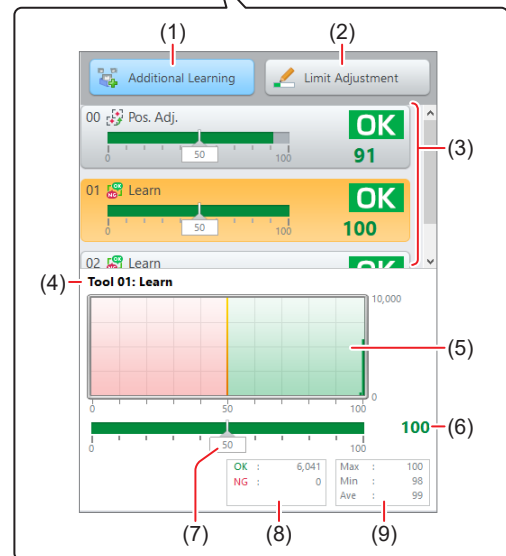
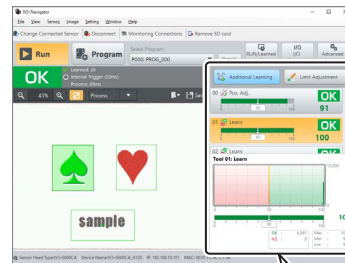
Displaying the tool information

- 1 Select [View] → [Tool Information] on menu bar to place a check mark next to [Tool Information].

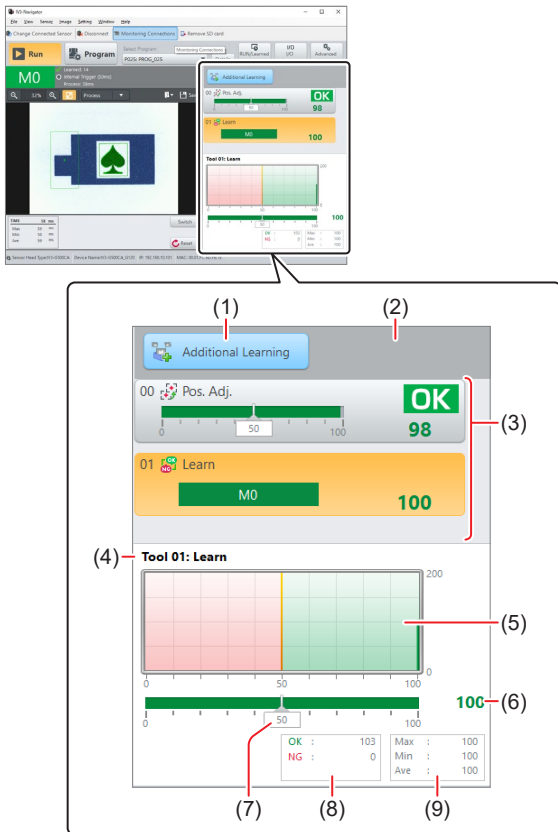


The tool information will be displayed.

- In standard mode



● In sorting mode



Contents of the tool information are as follows.

(1) [Additional Learning] button

☞ “Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

(2) [Limit Adjustment] button (standard mode only)

☞ “Adjusting Thresholds for Judgment” (page 6-15)

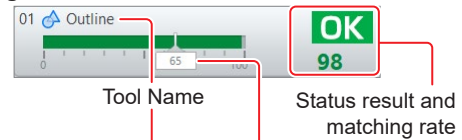
(3) Status gauge

Displays the status results of the tool window set in the program.

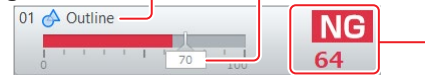
In standard mode

Displays the tool name, status results (OK/NG), a line indicating the threshold, and a value of the matching rate.

• Judge is OK



• Judge is NG

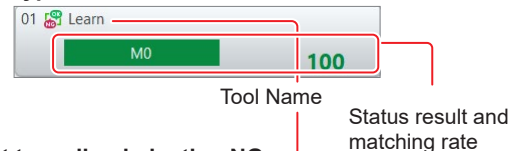


In sorting mode

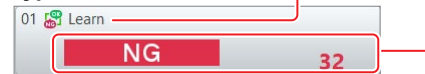
The tool name, status results, and the matching rate value will be displayed except for position adjustment tools. As a status result, the name of the part type (master) will be displayed when the part type discrimination is OK, whereas NG will be displayed when the part type discrimination is NG.

For position adjustment tools, it is the same as that of standard mode.

• Part type discrimination OK



• Part type discrimination NG



For details of the status result, refer to ☞ “Displaying and outputting the status result” (page A-4).

Reference

- Both maximum and minimum values of the distances between all the pitches are displayed in the status gauge of the Pitch tool. Among all of the distances between pitches, the one which deviates the most from the average value is displayed to show the matching rate.
- Threshold is not displayed for the High-Speed Position Adjustment tool.
- If the scaling function is used with the Width/Diameter/Pitch tool, the scaling unit is displayed.
 - ☞ “Displaying and outputting the status result” (page A-4)
- Threshold is not displayed in the status gauge of OCR tool. When the characters/date is completely matching, the matching rate is indicated with 100. If either the text or date does not match, 0 is displayed.
- If [Shade Contrast] of the OCR tool is set to [Enable], the threshold is displayed. The value of the matching rate is associated with the shade contrast of the character/date.

(4) Tool Name

Displays the name of the selected tool.

(5) Histogram

Displays the histogram (frequency distribution) of the selected tool.

With the threshold being a border, the range for OK is displayed in green and for NG is displayed in red.

- Horizontal axis...Displays the distribution of the matching rate. The display of the range is fixed. It cannot be specified arbitrarily.
- Vertical axis.....Adjusts automatically according to the maximum value of the frequency. It cannot be specified arbitrarily.

- Reference**
- The upper limit of the histogram is 999999. The values display stops updating when the upper limit is reached.
 - Pitch tool displays the histogram (frequency distribution) of the selected pitches.

Point When in sorting mode, the histogram can only be displayed for the position adjustment and learning tools. When using the outline, color/brightness average, width, or diameter tools, the message, “Not available in Sorting Mode.” will appear.

(6) Matching rate of the latest judgment process

Displays the matching rate of the latest judgment process.

(7) Limit

Displays the threshold of the selected tool with a vertical line (orange).

- Reference** Threshold is not displayed for the High-Speed Position Adjustment tool.

(8) Judgment Record

Displays the judgment process counts for OK or NG.

- Reference**
- The upper limit of the judgment processing count display is 999999. The values display stops updating when the upper limit is reached.
 - If the judgment threshold is changed, the histogram will update according to the result judged based on the changed threshold. However, the judgment record retains the counts judged based on the previous threshold. Therefore, the judgment conditions on the histogram may be different from the displayed judgment record counts.

(9) Matching rate information

Displays the information related to the matching rate.

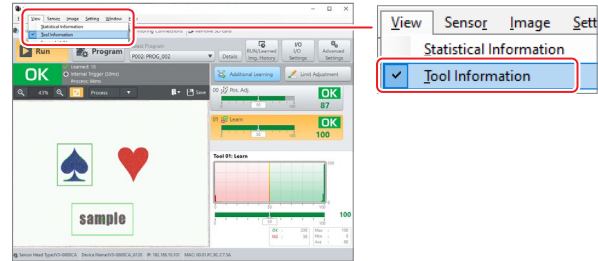
Max	Displays the maximum value of the matching rate.
Min	Displays the minimum value of the matching rate.
Ave	Displays the average value of the matching rate.

- Reference**
- Both maximum (Max) and minimum (Min) values of all the pitches are displayed in the Pitch tool.
 - Ave is not displayed in Edge tool and High-Speed Position Adjustment tool.

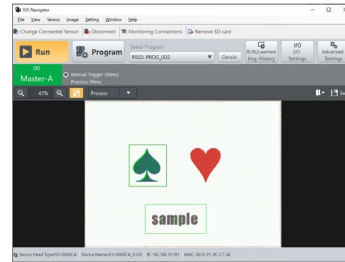
For the method to reset the histogram, judgment record, and matching rate information, refer to “Statistical Information Display” (page 5-9).

Hiding the tool information

- 1** Select [View] → [Tool Information] on menu bar to release the check mark.



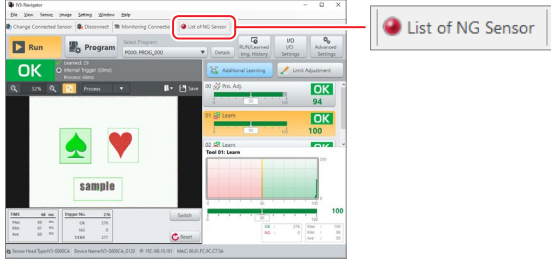
The tool information becomes hidden.



Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences)

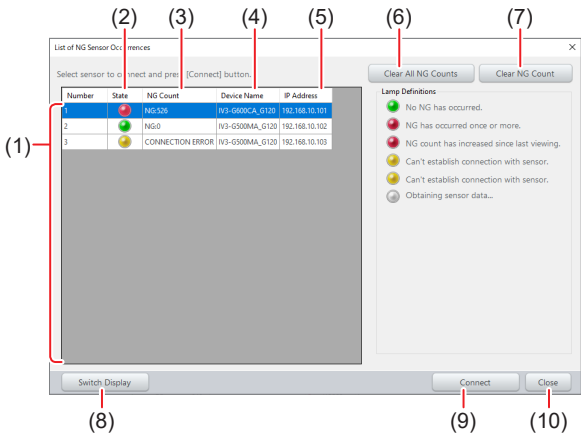
Overview of the List of NG Sensor Occurrences

When using the [List of NG Sensor Occurrences] function, the [List of NG Sensor Occurrences] button blinks (red) when NG occurs on a sensor connected to the PC while in RUN mode.



Press [List of NG Sensor] to display the list of the sensors connected and to confirm their NG statuses.

- Point**
- Only the sensors which have been registered as targets for NG sensor monitoring are displayed in the list.
 - [List of NG Sensor Occurrences] can only be displayed while running.
 - The IV3 Series, IV2 Series and IV Series can be mixed and confirmed on the list.



(1) Sensor list

Displays the sensors registered on the [List of NG Sensor Occurrences].

(2) State

Displays the status of the sensors registered on the [List of NG Sensor].

Green (ON)	No NG occurred.
Red (ON)	An NG has occurred at least once.
Red (Blink)	The number of NG occurrences has increased after displaying the latest [List of NG Sensor Occurrences].
Yellow (lighting) Yellow (blinking)	The sensor is not connected due to a connection error. Check the connection with the sensor. Blinks when confirming the [List of NG Sensor Occurrences] for the first time. Lights up when the status has been confirmed.
Gray	The sensor has not been registered, or the information of the sensor is being acquired.

(3) NG Count

Displays the status of the sensors registered on the [List of NG Sensor Occurrences]. The status of the sensor is displayed with characters.

NG: (counts)	The NG count is displayed as a value from 0 to 99999. The NG count is the accumulated value after turning the power on. The maximum number of NGs that can be displayed is 99999. After 99999 NGs have occurred, the number will not increase.
NOT SET	The sensor for the corresponding number has not been registered.
SYS ERR (No.)	An error number will be displayed when an important or fatal error occurs with the sensor. If multiple errors occur, the lowest error number will be displayed.
CONNECTION ERROR	ERROR The sensor is not connected.
UPDATING	The information from the sensor is being acquired. For example, UPDATED is displayed when the information from the sensor has not yet been acquired after startup.

- Reference**
- To reset the NG count, perform one of the operations below.
- Press [Clear].
 - Turn the power off.
 - Initialize the sensor.

(4) Device Name

Displays the device name assigned to the sensor.

(5) IP Address

Displays the IP address set for the sensor.

(6) [Clear All NG Counts] button

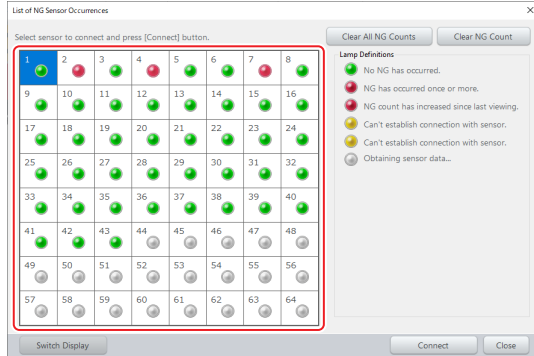
Clears the NG occurrence status of all the sensors registered on the [List of NG Sensor Occurrences].

(7) [Clear NG Count] button

Clears the NG occurrence status of the selected sensor.

(8) [Display Switch] button

Switches the sensor list display. NG occurrence status of up to 64 sensors can be confirmed without scrolling.



(9) [Connect] button

Connects to the selected sensor and displays the sensor's image on the IV3-Navigator. If the sensor on which NG occurred is selected, it can change to that sensor.

(10) [Close] button

Closes the [List of NG Sensor Occurrences] screen.

Setting [List of NG Sensor Occurrences]

1 Display the main screen in [Program].

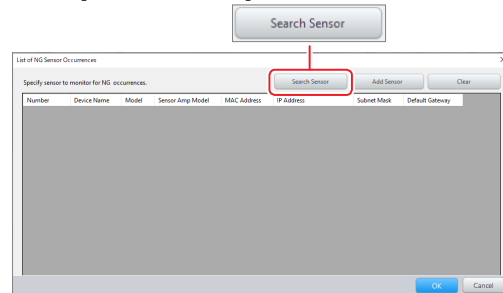
☞ "Overview of the Screen in [Run] / [Program]" (page 5-3)

2 Select [Setting] → [List of NG Sensor Occurrences] from the menu bar.

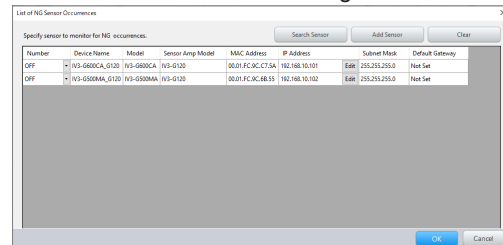
3 Register the sensor.

● **When searching for a sensor and registering it**

Press [Search Sensor].

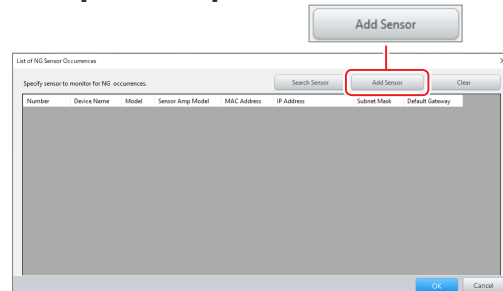


The searched sensor will be registered.

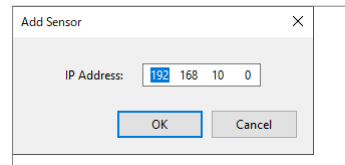


● **When registering by specifying the IP Address of the sensor**

Press [Add Sensor].



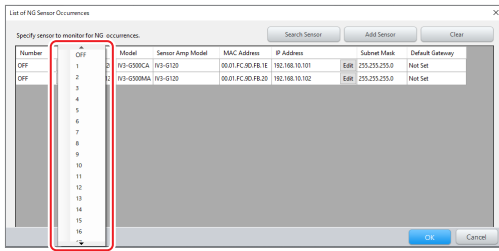
Enter the IP address of a sensor and press [OK].



The sensor of the specified IP address will be registered.

☞ **Reference** The number displayed on the [List of NG Sensor Occurrences] is automatically assigned.

4 Select the number which is displayed on the List of NG Sensor Occurrences from the drop-down menu of [Number].



Reference

- Numbers will be displayed on [List of NG Sensor Occurrences] in the selected order.
- If the sensor was registered by specifying the IP address, the number is automatically assigned. Change the number as needed.

5 Repeat step 3 and step 4 and register the sensors for which the NG status will be monitored.

Point

- Up to 16 sensors can be registered on [List of NG Sensor Occurrences].
- To initialize [List of NG Sensor Occurrences], press [Clear].

6 Press [OK].

The system returns to the main screen in [Program].

Holding the Image of the Sensor on which NG Occurred (NG Hold Function)

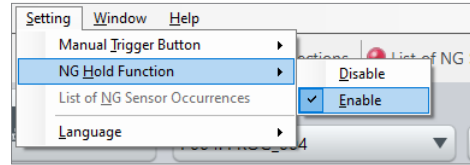
Overview of the NG Hold function

If the NG Hold function is used, the image of the sensor on which NG occurred during Run mode is held and **NG HOLD** is displayed on the screen.

The image when the NG occurred can be confirmed.

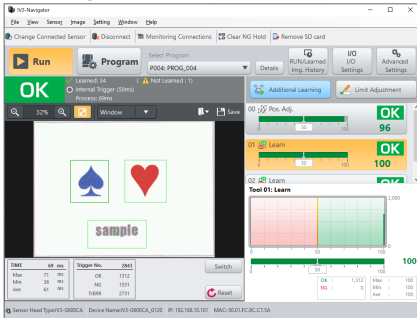
Setting the NG Hold function

- 1 Select [Setting] → [NG Hold Function] → [Enable] from the menu bar.

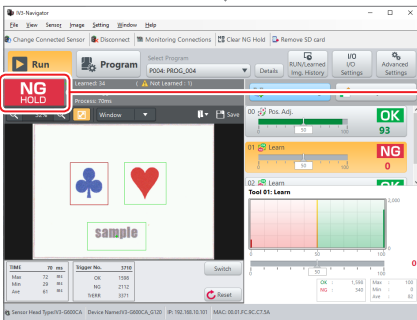


5

Running

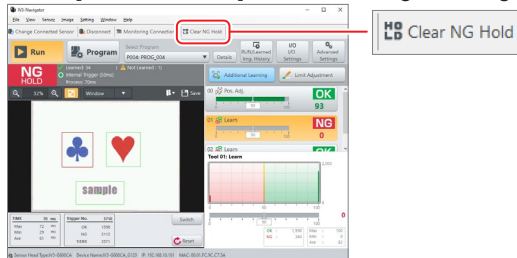


↓ NG occurs during running.



"NG HOLD" is displayed as the total status result and the screen is held.

Press [Clear NG Hold] when releasing the image held.



- Point**
- If another NG occurs during holding of an NG image, the NG image will be updated.
 - The NG hold status will be released with one of the operations below.
 - When the run screen is changed to the [Sensor Setup Menu] screen.
 - When external master image registration is performed.
 - When the status output is reset with an error clear external input.
 - When [Clear NG Hold] is pressed.
 - The operation Information will be updated during NG hold.

Confirming the Images Whose Judgment are NG (Running Image History)

The sensor has built-in memory for saving images used for judgment. According to the save condition, the sensor automatically save the latest images. The saving conditions are as follows.

● NG images only (default value)

Saves only the images where the total status result was NG.

● NG / near threshold OK

Saves the following images.

- The images where the matching rates of the learning tool are close to the threshold, among the images where the judgment results are OK
- Images whose status results are NG

Reference If saving OK images where the matching rates are close to the threshold, the images that should be judged as NG which have been mistakenly judged as OK can be searched.

● All images

Saves all images that were judged.

The saved images are loaded into the PC and can be used for confirming the causes or trends of NG results. Up to 100 images can be saved.

Important Since the memory of the image history is volatile, all saved images are erased when the power is turned OFF. To save the images, perform [Batch Backup].

Displaying the [Running Image History] Screen

This section explains how to display the [Running Image History] screen.

Point There are 2 methods for displaying the [Running Image History] screen. [Logging Settings] can only be set and adjusted from the [Program].

Displaying from the Main Screen in [Run]

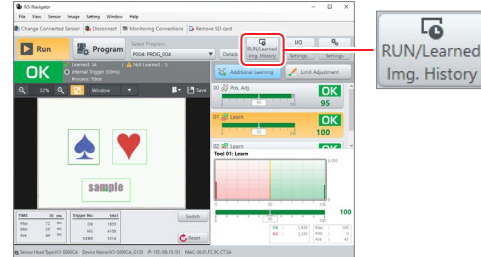
1 Display the main screen in [Run].

☞ “Starting an Operation” (page 5-2)

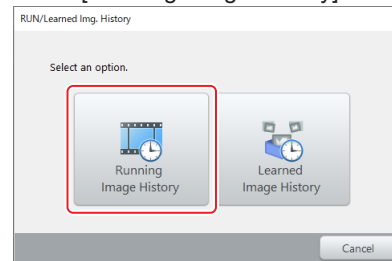
2 Perform the following.

● When using the learning tool

Press [Run/Learned Img. History].

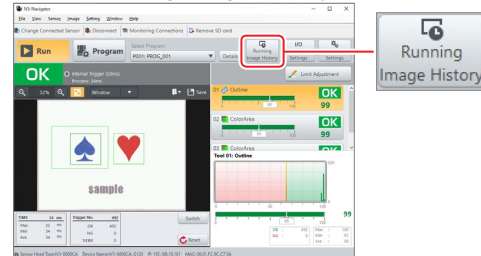


The confirmation screen opens. Press [Running Image History].

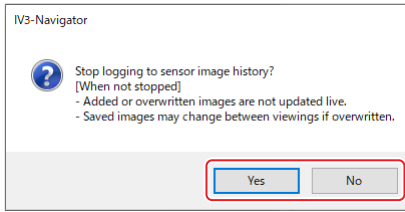


● When not using the learning tool

Press [Running Image History].



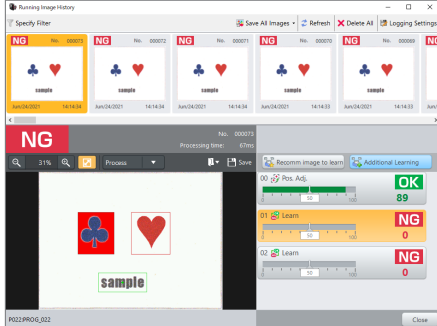
3 Select whether or not to stop logging while running (image-updating of the image history).



Point

- When operation is not paused
- The added or overwritten history image will not be updated automatically. To update, close the history image display once and then display it again.
 - When an image in the history is erased by overwriting and the sensor is updated while displaying the image on the IV3-Navigator, it may not be displayed again on the IV3-Navigator.

The [Running Image History] screen opens.



Displaying from the [Sensor Setup Menu] screen

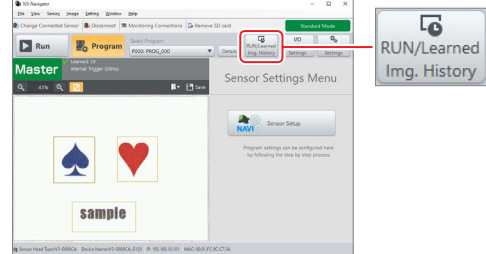
1 Display the main screen in [Program].

“Overview of the Screen in [Run] / [Program]” (page 5-3)

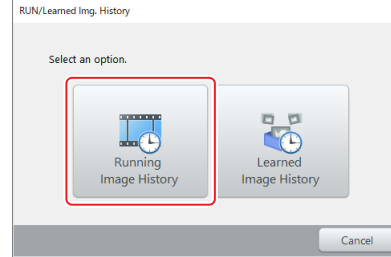
2 Perform the following.

● When using the learning tool

Press [Run/Learned Img. History].

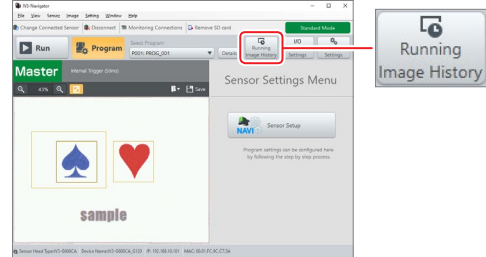


Press [Running Image History].

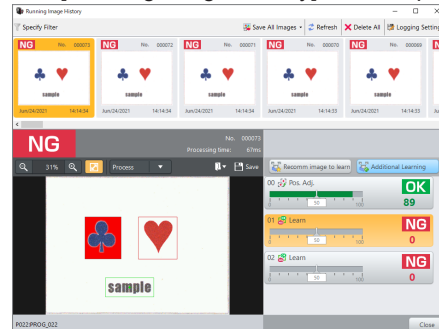


● When not using the learning tool

Press [Running Image History].



The [Running Image History] screen opens.



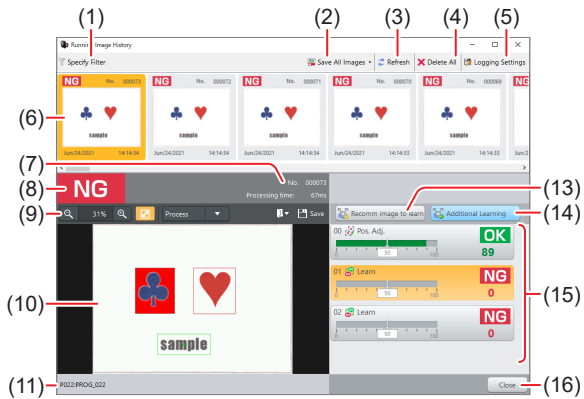
Loading and Confirming Saved Images

Displays the running image history in the sensor.

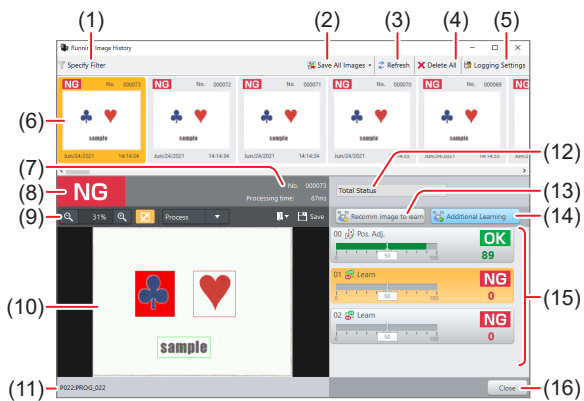
1 Display the [Running Image History] screen.

☞ “Displaying the [Running Image History] Screen” (page 5-17)

● In standard mode

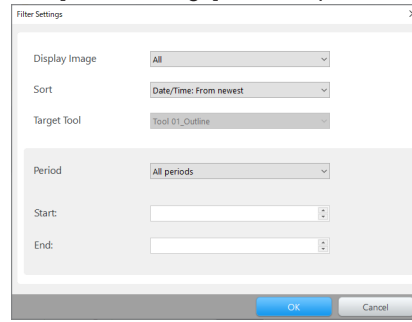


● In sorting mode



(1) [Specify Filter] button

The [Filter Settings] screen opens.



● Display Image

Selects the type of images to be displayed on the [Running Image History] screen from the following. [Near threshold OK] is for the Learning tool.

- All
- NG/near threshold OK
- NG Only

● Sort

Selects the order of images to be displayed on the [Running Image History] screen from the following.

- Match : From highest
- Match : From lowest
- Date/Time: From newest
- Date/Time: From oldest

● Target tool (standard mode only)

Displays only the images containing the selected tools on the [Running Image History] screen.

● Period

Specifies the images to be displayed on the [Running Image History] screen by time period.

- **All periods**
Displays all images.
- **Page**
Specifies the time period for [Start] and [End], and displays images.

(2) [Save All Images] button

Saves the running image history to individual files (*.bmp and *.iv3p) or a batch backup file (*.iv3a).

☞ “Saving the Image History Individually” (page 5-20)

☞ “Backing up the Image History in a Batch” (page 5-21)

Point When backing up the images in a batch from the View screen, the files saved will be [Settings/Running Image History].

(3) [Refresh] button

Displayed if “No” is selected in the logging stop dialog when the image history to be displayed while RUN mode. Clears the image history displayed on the IV3-Navigator, and then acquires and displays the latest image history from the sensor.

(4) [Delete All] button

☞ “Clearing the Saved Images” (page 5-21)

(5) [Logging Settings] button

☞ “Changing the Logging Conditions of the Image History” (page 5-22)

(6) Thumbnail images

Displays the total status result, trigger number, save time, and thumbnail images.

Reference For details of the number of triggers, refer to “Statistical Information Display” (page 5-9).

(7) Trigger number

Displays the processing time and number of triggers of the magnified history image.

(8) Total status result

Displays the total status result of the magnified history image as OK or NG.

(9) Image tool bar

“Operation of the Image Tool Bar” (page 3-13)

(10) Magnified display screen

Magnifies the selected thumbnail image.

(11) Program number

Displays the program number and name of the history image currently being displayed.

(12) Part type selection button (sorting mode only)

Displays the matching rate and status result for images registered in the selected part type judged as masters for each tool.

(13) [Recomm image to learn] button (learning tool only)

Displays the images recommended to be learned.
 “Additional Learning from the Running Image History” (page 6-6)

(14) [Additional Learning] button (learning tool only)

Perform the additional learning with the selected image.
 “Additional Learning from the Running Image History” (page 6-6)

(15) Tool list

Displays the tool list set in the program of the images.

(16) [Close] button

The system returns to the main screen in [Run] or [Program].

Reference An image displayed with red below requires processing with a setting different than the current program.

- Program number
- Program name
- Trigger No.
- Processing time

Saving the Image History Individually

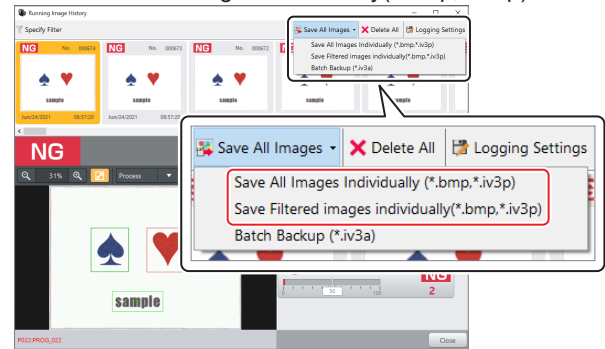
Saves image histories saved in the sensor to individual files (*.bmp and *.iv3p).

1 Display the running image history screen.

“Displaying the [Running Image History] Screen” (page 5-17)

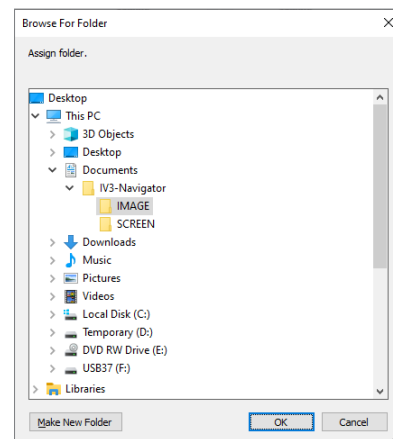
2 Press [Save All Images] and select the saving method from the following.

- Save All Images Individually (*.bmp,*.iv3p)
- Save Filtered images individually(*.bmp,*.iv3p)



The [Browse For Folder] screen opens.

3 Specify the desired save destination and press [OK].



The save completion message opens.

Reference This process saves all files at the same time. To save a file individually, save it with the [Save] button of the image tool bar.
 “Operation of the Image Tool Bar” (page 3-13)

4 Press [OK].

Returns to the [Running Image History] screen.

Backing up the Image History in a Batch

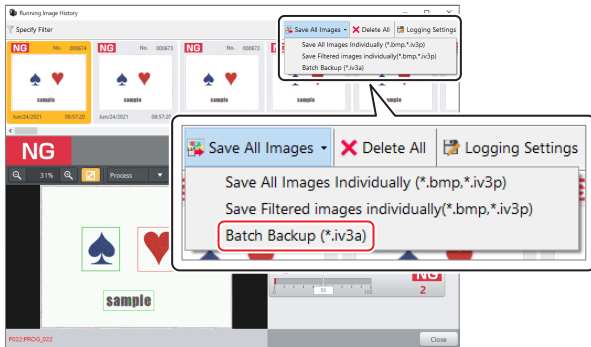
Saves all the images saved in the sensor to a batch backup file (*.iv3a).

Point The [Filter Settings] option is disabled.

1 Display the running image history screen.

“Displaying the [Running Image History] Screen” (page 5-17)

2 Press [Save All Images] and select [Batch Backup (*.iv3a)].

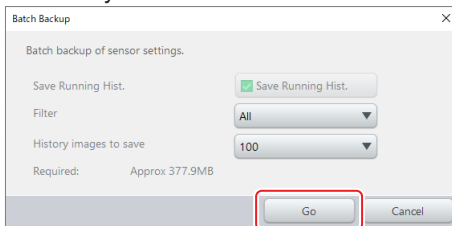


The [Batch Backup] screen opens.

3 Select [Filter] and press [Go].

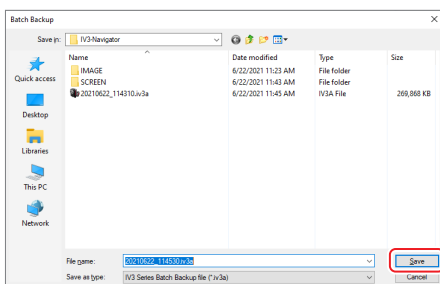
The [Filter] can be selected from the following.

- All
- NG Only



The save as screen opens.

4 Press [Save].



Reference Change the save destination of the file and file name as needed.

The backup completion message opens.

5 Press [OK].

Returns to the [Running Image History] screen.

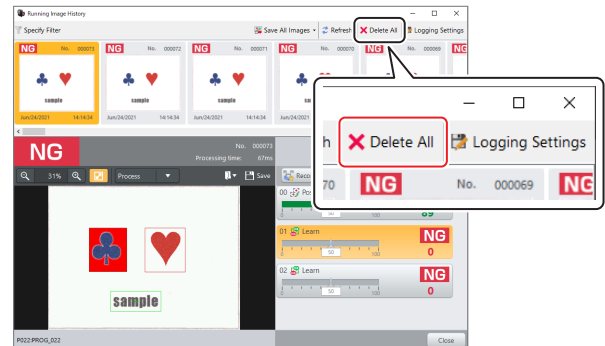
Clearing the Saved Images

Clears the history images saved in the sensor.

1 Display the running image history screen.

“Displaying the [Running Image History] Screen” (page 5-17)

2 Press [Delete All].

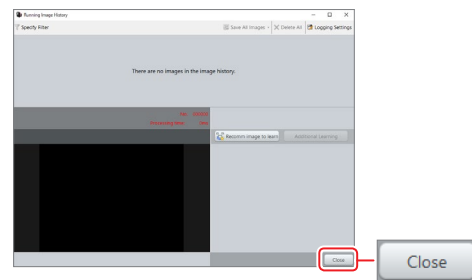


The confirmation screen opens.

3 Press [Yes].

The image history will be cleared.

4 Press [Close].



The system returns to the main screen in [Run] or [Program].

Changing the Logging Conditions of the Image History

Sets the logging condition (storage condition) for the image history.

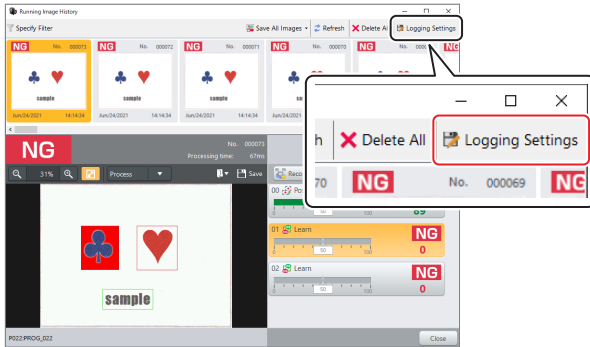
1 Display the main screen in [Program].

☞ “Overview of the Screen in [Run] / [Program]” (page 5-3)

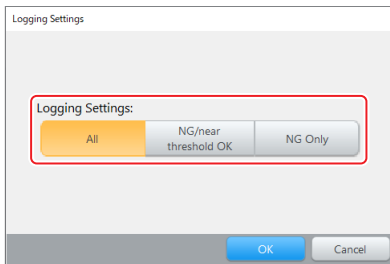
2 Display the running image history screen.

☞ “Displaying the [Running Image History] Screen” (page 5-17)

3 Press [Logging Settings].



4 Select a logging condition.



● All

Saves all the images to the image history regardless of the status result.

● NG/near threshold OK

Saves the following images.

- The images where the matching rates of the learning tool are close to the threshold, among the images where the judgment results are OK
- Images whose status results are NG

Reference ☞ If saving OK images where the matching rates are close to the threshold, the images that should be judged as NG which have been mistakenly judged as OK can be searched.

● NG Only (default value)

Only saves images where the status result is NG to the image history.

5 Press [OK].

Returns to the [Running Image History] screen.

6

Adjusting

This chapter explains the adjustment method to make full use of the judgment capacity of this unit.

Auto Adjustment by the Additional Learning (Learning Tool Only).....	6-2
Adjusting Thresholds for Judgment.....	6-15
Stabilizing the Judgment.....	6-16
Shortening the Processing Time	6-26

Auto Adjustment by the Additional Learning (Learning Tool Only)

Additional Learning

Additional learning function allows for a user to stabilize the judgment of the learning tool for standard mode and sorting mode.

When using the additional learning

Additional learning is used when there is a target whose judgment is not stable during operation or test operation after setting [3. Tool Settings] (Page 4-28) and [3. Part Registration Settings] (Page 4-121) during sensor setup.

Reference A target whose judgment is not stable is the target where the capture status is different from the registration status of the learning settings.
Target misalignment (shape, surface condition, dirt, setting position) and the change of ambient light or background can influence the judgment status.

Advantage of the additional learning

By imaging a target where the detection is not stable or by using images from the history to learn, judgment can be adjusted automatically. By performing the additional learning of multiple images, the stability is improved automatically.

Method for the additional learning

Additional learning can be executed by the following methods.

Using the capture image while in operation

By using the OK/NG judgment image or Part Type discrimination image, adjust automatically the judgment of the learning tool.

☞ "Additional Learning by Taken Image" (page 6-5)

Using the image history

Use images of the running image history to adjust automatically the judgment of the learning tool.

☞ "Additional Learning from the Running Image History" (page 6-6)

Using the learned image history

By using the learned image history and changing the status results of the learning tool, the judgment of the learning tool is adjusted automatically.

In addition, delete images that are needed for learning mode.

☞ "Additional Learning from the Learned Image History" (page 6-10)

Using an image saved in PC

Use a batch backup file (*.iv3a), individual program backup file (*.iv3a), or image capture file (*.iv3p) stored in the PC to adjust automatically the judgment of the learning tool.

☞ "Additional Learning from Files Saved in the PC" (page 6-13)

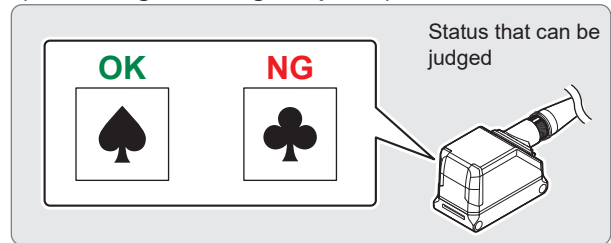
Reference If a batch backup file (*.iv3a) or individual program backup file (*.iv3a) is used, the image to be imported can be selected from the following.

- Running Image History
- Master Image
- Learned Image History

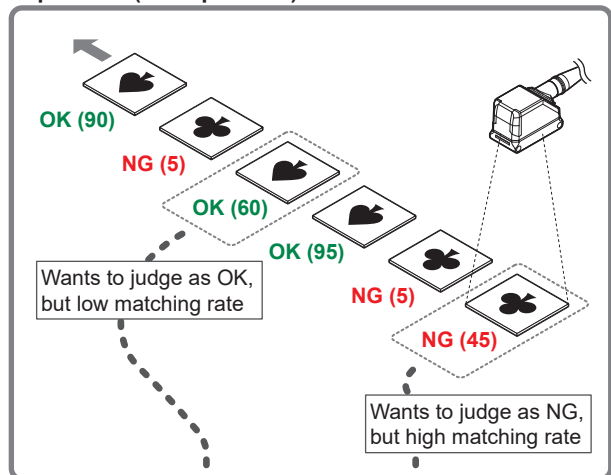
Flow of Additional Learning Operation

In standard mode

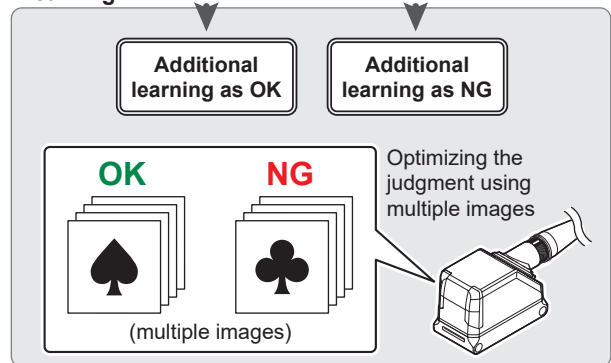
Settings completed
(OK/NG target learning completed)



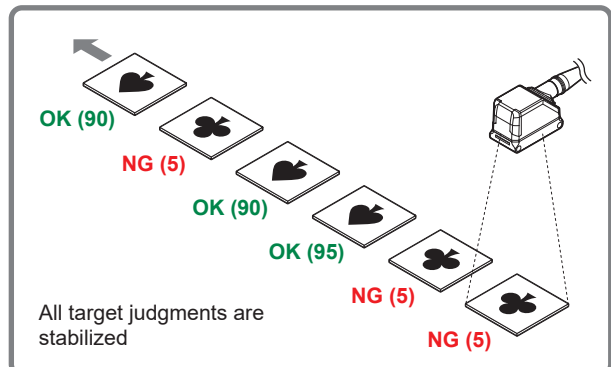
Operation (test operation)



Additional Learning

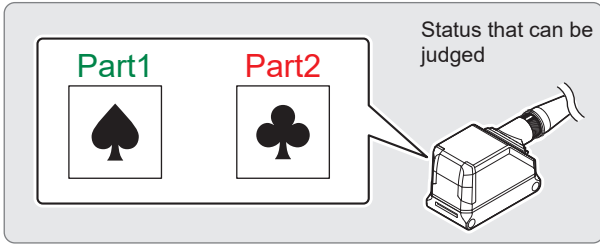


RUN

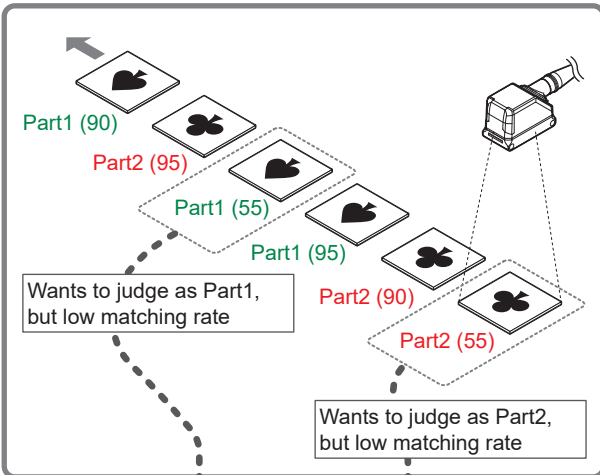


● In sorting mode

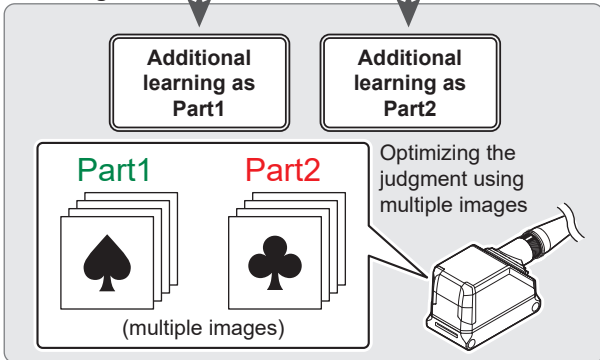
Settings completed
(part type image learned)



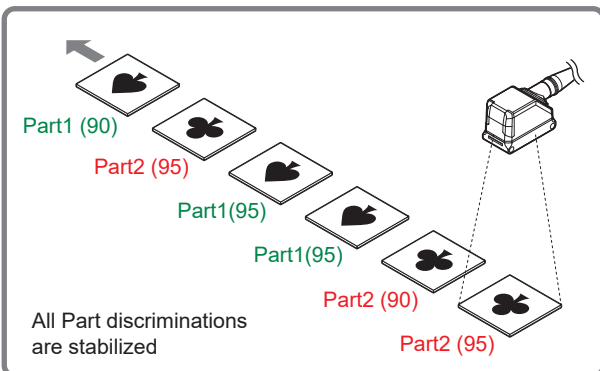
Operation (test operation)



Additional Learning



RUN



What should be done in the following case

Condition	Remedy	Ref.
When additional learning is performed but the wrong status result (OK/NG, or Part Type) is applied.	Modify the learned image to the correct status result in the [Learned image history] screen, and additional learning.	6-10
When you want to confirm the learned image.	Confirm the image in the [Learned image history] screen.	6-7
When you want to delete the learned image.	Delete the image in the [Learned image history] screen.	6-7
When you want to look automatically for an image whose detection is not stable.	Perform additional learning of the "Recomm image to learn" in the [Running Image History] screen.	6-6
When two copies of the same image are captured mistakenly and additional learning is performed so that one of them is OK and the other is NG, or both are different part types each.	Delete the unneeded image in the [Learned image history] screen.	6-7
When an inspection is not stable even though additional learning has been repeatedly performed.	<ul style="list-style-type: none"> • Take large images of the part where the difference in an OK/NG image or part type image is clear. • Set the tool window only for the part where the difference in an OK/NG or part type is clear. For images where the difference in an OK/NG or part type image is small in the tool window, the detection may not be stable. • When a positional deviation of the target occurs, adjust the settings of the position adjustment. In addition, set the search algorithm to the high accuracy. • Perform the additional learning using multiple images where the judgments are not stable. • Check if there are any images with non-reflection. 	6-16 6-21
When changing the settings of the program, such as modifying/adding/deleting tool windows in "3. Tool Settings" or "3. Part Registration Settings" of the Settings Navigator, or re-doing the learning operation by changing the settings for OK/NG target learning or part type image registration.	The additional learning will be cleared. Perform additional learning as needed. The registered image remains in [Learned image history], however, it will be in the state that is not reflected in the learning process (not reflected).	6-10
When you want to perform additional learning by using an image acquired by another sensor.	Use additional learning from an outside media source.	6-13
When the sensor recognizes the background (no target) as OK, but the status should be NG.	Perform additional learning of an image where the background is captured. Register the status result as NG (standard mode only).	6-5 6-6 6-13
When the sensor should judge the background (no target) as OK.	Perform additional learning of an image where the background is captured. Register the status result as OK (standard mode only).	
There are multiple "targets the sensor should judge as OK" and "targets the sensor should judge as NG".	Perform additional learning for all of the targets. Register the status results as OK or NG per tool window (standard mode only).	

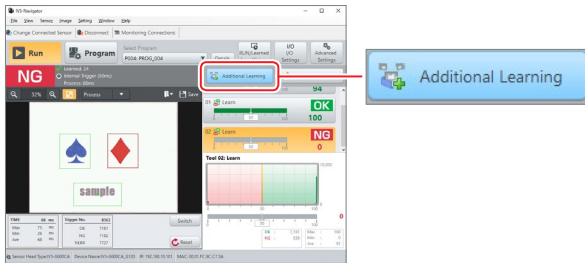
Additional Learning by Taken Image

1 Display the main screen in [Run].

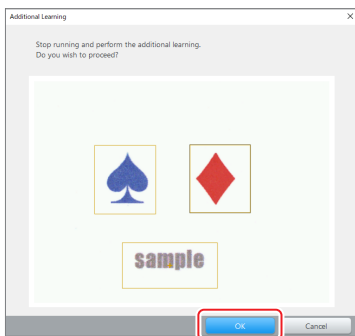
☞ “Starting an Operation” (page 5-2)

2 Capture an image where the target is the object desired for additional learning.

3 Press [Additional Learning].



4 Press [OK].

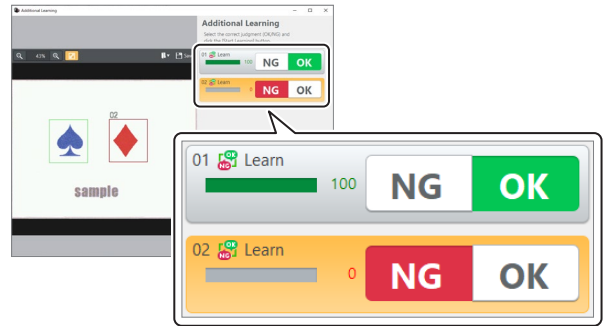


The operation will stop.

Point When the number of images used for additional learning has exceeded the upper limit, the [Check Registered Images] screen appears after operation stops.
 ☞ “Operation When the Registered Number Reaches the Upper Limit” (page 6-14)

5 Confirm the selection state of the status result. Change the status result as needed, then press [Start Learning].

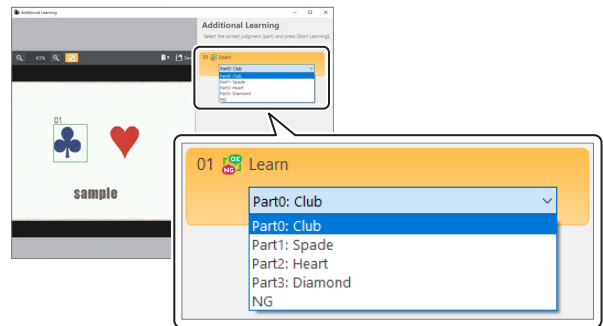
● In standard mode



Point When multiple tool windows are set, confirm/change all status results for the tool windows.

The confirmation screen opens.

● In sorting mode



The confirmation screen opens.

6 Press [OK].

Learning will be performed.

7 After learning has been completed, press [OK].

Point

- When pressing [Cancel] while learning, learning can be canceled.
- When a similar learned image is found, the [Check Registered Images] screen opens.
 ☞ “Confirming the Similar Images and Additional Learning” (page 6-14)
- You can edit/delete images where additional learning of the wrong status result is performed in the [Learned image history] screen.
 ☞ “Additional Learning from the Learned Image History” (page 6-10)

Returns to the Test screen.

Additional Learning from the Running Image History

1 Display the [Running Image History] screen.

☞ “Displaying the [Running Image History] Screen” (page 5-17)

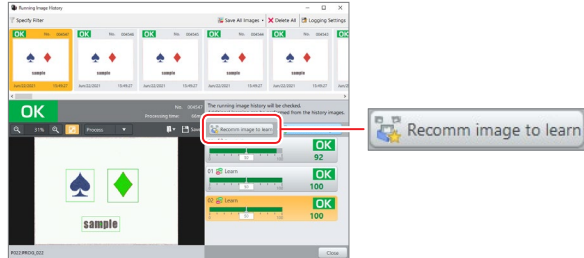
2 Select an image for the additional learning.

☞ “Loading and Confirming Saved Images” (page 5-19)

Point When the number of images used for additional learning has exceeded the upper limit, the [Check Registered Images] screen appears after operation stops.
 ☞ “Operation When the Registered Number Reaches the Upper Limit” (page 6-14)

● When using the recommended image to be learned

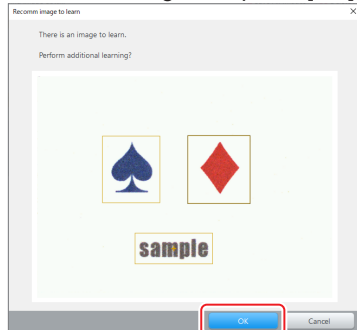
Press [Recomm image to learn].



Images which have high impact on the learning effects are displayed automatically.

- Reference**
- When an image to be learned is not found, finish the additional learning process, or perform additional learning with another method.
 - Images which have no running image history remained may be displayed.

Check the image and press [OK].

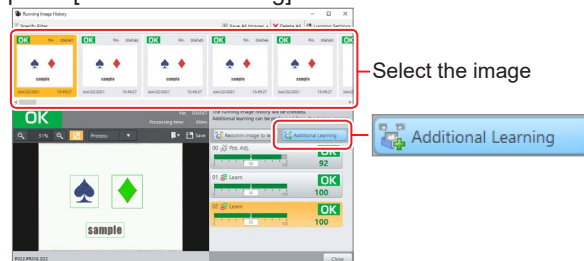


Reference The confirmation screen for stopping operation during Run mode will be displayed. Press [OK], and stop operation.

The [Additional Learning] screen opens.

● When specifying an image for additional learning

Select the image to perform additional learning, and press [Additional Learning].

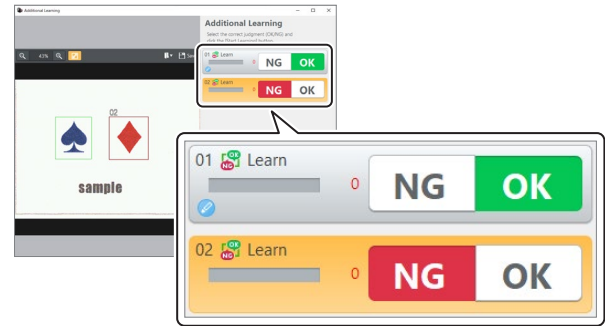


Reference The confirmation screen for stopping operation during Run mode will be displayed. Press [OK], and stop operation.

The [Additional Learning] screen opens.

3 Confirm the selection state of the status result. Change the status result as needed, then press [Start Learning].

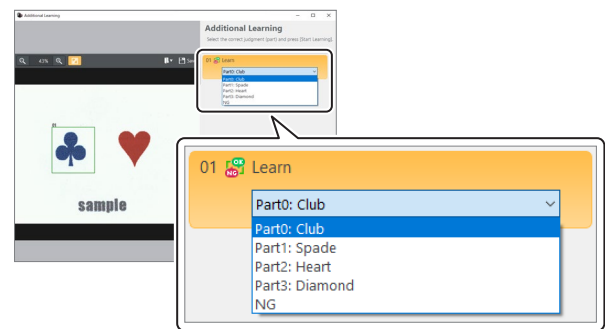
● In standard mode



Point When multiple tool windows are set, confirm/change all status results for the tool windows.

The confirmation screen opens.

● In sorting mode



The confirmation screen opens.

4 Press [OK].

Learning will be performed.

5 After learning has been completed, press [OK].

- Point**
- When pressing [Cancel] while learning, learning can be canceled.
 - When a similar learned image is found, the [Check Registered Images] screen opens.
 ☞ “Confirming the Similar Images and Additional Learning” (page 6-14)
 - You can edit/delete images where additional learning of the wrong status result is performed in the [Learned image history] screen.
 ☞ “Additional Learning from the Learned Image History” (page 6-10)

Returns to the [Running Image History] screen.

Displaying the [Learned image history] screen

The [Learned image history] screen is the screen that can confirm/edit images registered in the OK/NG target learning, part image registration, or additional learning.

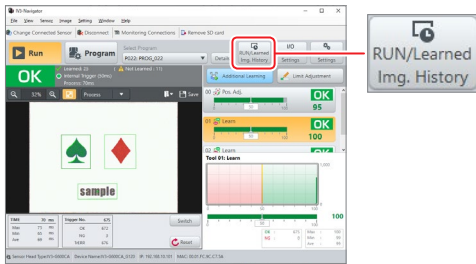
- “OK/NG Target Learning for the Learning Tool” (page 4-44)
- “Part Image Registration” (page 4-140)
- “Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

This section explains how to display the [Learned image history] screen.

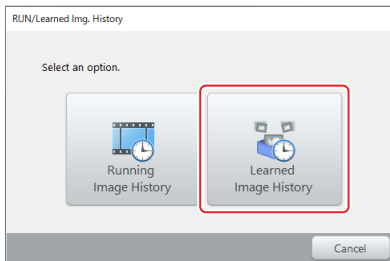
- Point**
 - The [Learned image history] screen can be displayed when using a program in the learning tool.
 - There are two methods for displaying the [Learned image history] screen.

Displaying from the Main Screen in [Run]

- 1 Display the main screen in [Run].
 “Starting an Operation” (page 5-2)
- 2 Press [Run/Learned Img. History].

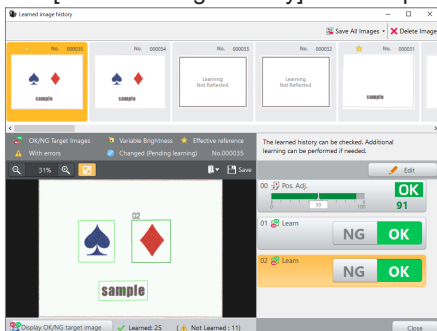


- 3 Press [Learned Image History].



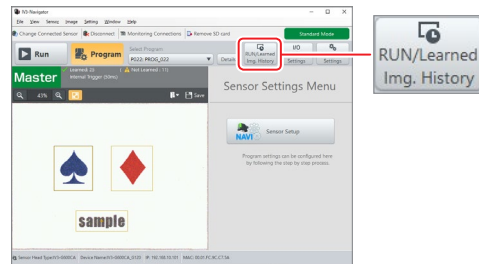
The confirmation dialog for the operation stop appears.

- 4 Press [OK] in the confirmation screen.
- The [Learned image history] screen opens.

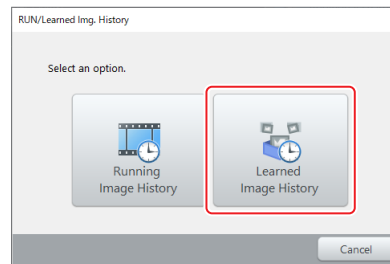


Displaying from the main screen in [Program]

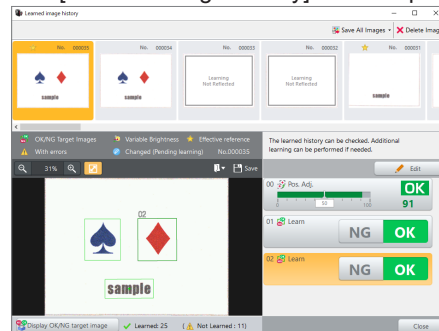
- 1 Press [RUN/Learned Img. History] on the [Sensor Setting Menu] screen.



- 2 Press [Learned Image History].



The [Learned image history] screen opens.



- Point** When an image where an error occurs is included in the learned image history, a confirmation dialog opens.
 “(1) Thumbnail images” (page 6-9)

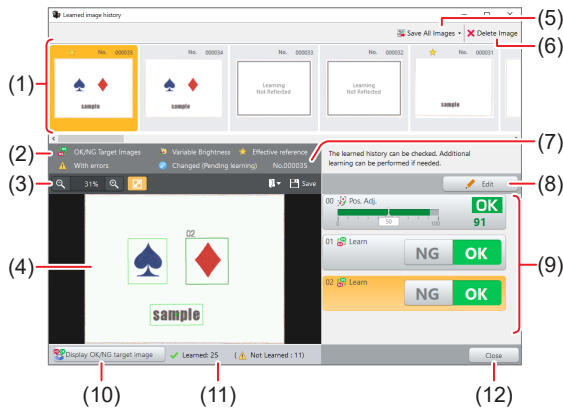
Confirming Learned Image History

Confirm the learned image history in the program.

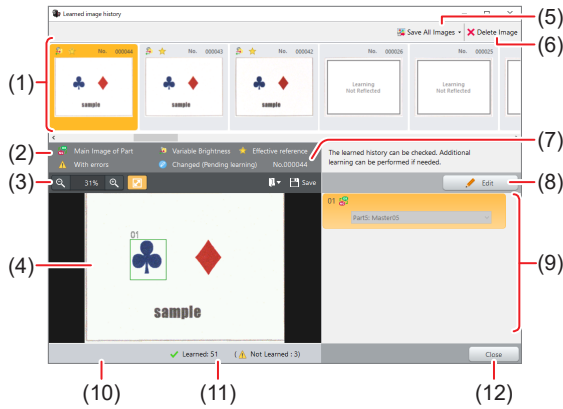
1 Display the [Learned image history] screen.

☞ "Displaying the [Learned image history] screen" (page 6-7)

● In standard mode

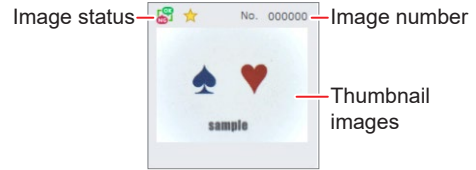


● In sorting mode



(1) Thumbnail images

Displays the image status, image number, and thumbnail image.

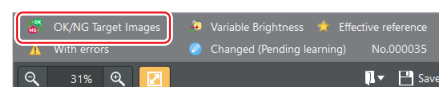


Type	Description
	The original image acquired when registering OK/NG target or a part type.
	The image acquired when [Variable Brightness] is [ON]. Images where the brightness is different are saved. <ul style="list-style-type: none"> Standard Mode: OK 8 images, NG 8 images Sorting Mode: 6 images per part type will be saved.
	Images with high learning effect. Since the influence on judgment is large, the judgment capacity of the sensor may change when editing or deleting to perform additional learning.
	Images which no longer apply to the learning algorithm because the settings were changed. Since changing the settings of the learning tool or position adjustment tool after image registration remove these images from learning, these images adopt the status of [Learning Not Reflected]. No error occurred. Delete or perform additional learning as needed.
	An image on which an error has occurred. <ul style="list-style-type: none"> “OK/NG not selected” Error Images where the tool window was added after registration by additional learning. There is no judgment information (OK/NG) for the added tool window. Select the status result for additional learning. Position Adjustment Error There is a tool window protruded out of the view range as the result of the position adjustment. Additional learning cannot be performed for this image.

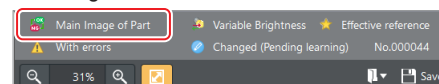
(2) Explanation of the image status

The explanation of the image status icon displayed on a thumbnail image. The icon of the original image is described as "OK/NG Target Images" in standard mode, and as "Main Image of Part" in sorting mode.

In standard mode



In sorting mode



(3) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(4) History image

Displays the image saved in the sensor.

(5) [Save All Images] button

Saves all the images saved in the program to individual files (*.bmp and *.iv3p) or a batch backup file (*.iv3a).

☞ “Saving the Image History Individually” (page 5-20)

☞ “Backing up the Image History in a Batch” (page 5-21)

Point When backing up the images in a batch from the View screen, the files saved will be [Settings/Running Image History].

(6) [Delete Image] button

☞ “Deleting the Learned Images” (page 6-12)

(7) Image number

Displays the image number for the selected thumbnail image.

(8) [Edit] button

Selects this when editing the status result (OK/NG, or Part) of the selected image to redo learning.

☞ “Editing the Status Result to be Learned” (page 6-10)

(9) Tool list

Displays the tool list and the registered status results (OK/NG or Part Type) for the selected thumbnail image.

(10) [Display OK/NG target image] button (standard mode only)

Displays the “OK/NG Target Images” registered in the program.

☞ “OK/NG Target Learning for the Learning Tool” (page 4-44)

(11) Learned

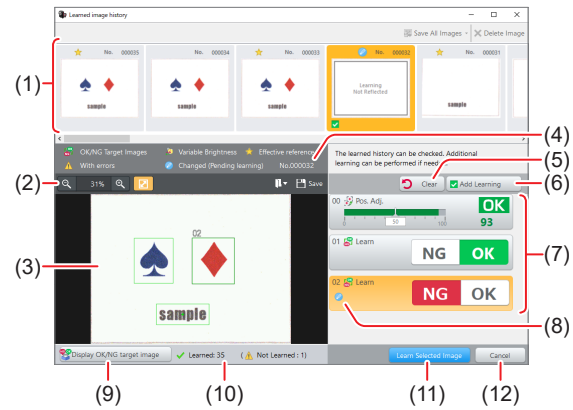
Display the number of learned images and number of not reflected images.

Reference The total number of registered images is up to 100 (including the brightness change function images).

(12) [Close] button

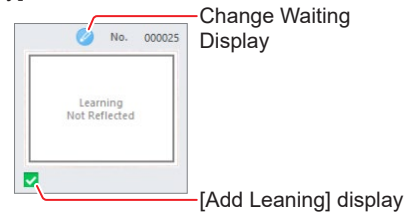
The system returns to the main screen in [Run] or [Program].

Edit Screen of the Learned Image History



(1) Thumbnail images

The following is different from the [Learned image history] screen. Other details are the same.



○ **Change Waiting Display**

The status result of the learning tool has been changed. The image is waiting for the changed contents to be learned.

○ **[Add Learning] display**

A check mark appears when the [Add Learning] button is ON.

(2) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(3) History image

Displays the image and tool windows. The selected tool window is highlighted.

(4) Image number

Displays the image number for the selected thumbnail image.

(5) [Clear] button

Returns status result (OK/NG, or Part Type) edited in the tool window list to the state before editing.

(6) [Add Learning] button

Displayed when the image is not reflected in the learning process. Pressing the button adds the images in display to the learning process.

(7) Tool list

Displays the list of the tools. The status result (OK/NG, or Part Type) can be edited.

(8) Edited display

Displayed when the status result (OK/NG, or Part Type) has been edited.

(9) **[Display OK/NG target image] button (standard mode only)**

Displays the “OK/NG Work Image” registered in the program.

☰ “OK/NG Target Learning for the Learning Tool” (page 4-44)

(10) **Learned**

Display the number of learned images and number of not reflected images.

Reference The total number of registered images is up to 100 (including the brightness change function images).

(11) **[Learn Selected Image] button**

Perform additional learning with the selected image.

(12) **[Close] button**

The system returns to the main screen in [Run] or [Program].

Additional Learning from the Learned Image History

Editing the Status Result to be Learned

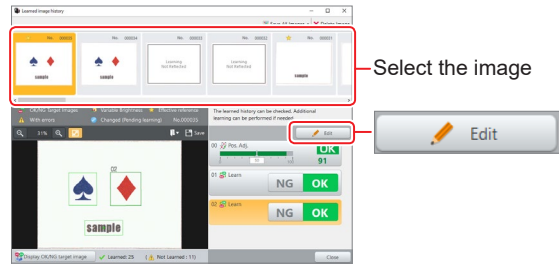


The status result of the images registered as the OK/NG target learning or part image registration cannot be edited.

1 Display the [Learned image history] screen.

☰ “Displaying the [Learned image history] screen” (page 6-7)

2 Select an image on which to edit the status result and press [Edit].



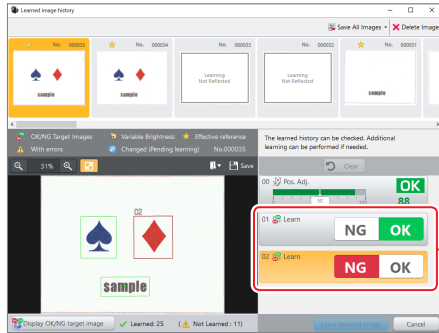
3 Confirm the selection state of the status result of the tool. Change the status result as needed.

● **Image reflected in the learning**



Confirm the selection state of the status result of the learning tool. Change the status result as needed.

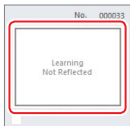
In the standard mode



Change status result (OK/NG, or Part Type)

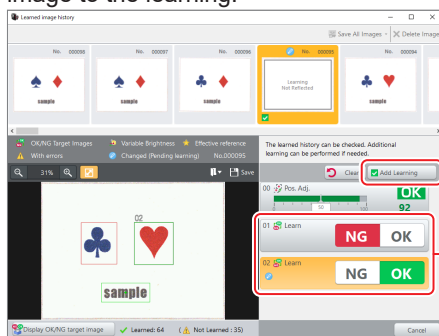
Point The part type discrimination results are shown in sorting mode.

● **Image not reflected to the learning (no error)**



The setting of the learning tool has been changed since this image was registered. Confirm the selection state of the setting contents or status result of the learning tool. When the target judgment can be performed normally using the image, select the desired status result and press [Add Learning].

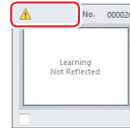
If there is a possibility that the image may judge the target mistakenly, such as in the case that the settings of the learning tool are not appropriate, do not add the image to the learning.



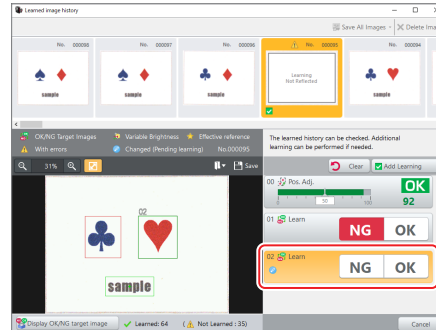
Change status result (OK/NG, or Part Type)

Point The part type discrimination results are shown in sorting mode.

● **Image not reflected to the learning (with errors)**

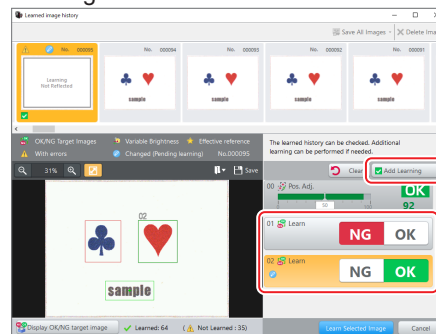


○ **“OK/NG not selected” Error**



There is a learning tool whose status result is not selected.

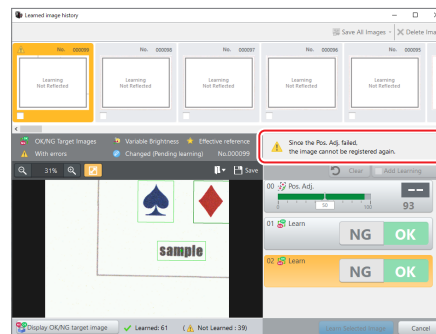
When the target judgment can be performed normally using the image, select the desired status result and press [Add Learning]. If there is a possibility for the image to judge the target mistakenly, do not add to learning.



Change status result (OK/NG, or Part Type)

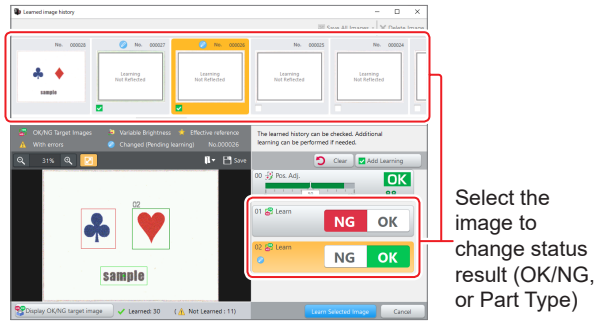
Reference For a changed learning tool, the change waiting display (Page 6-9) opens.

○ **Position Adjustment Error**

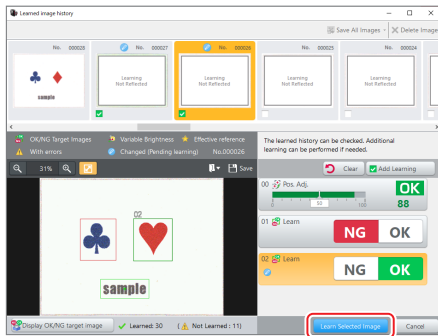


There is a tool window protruded out of the view range as the result of the position adjustment. Additional learning cannot be performed for this image. Check the position adjustment, or delete the image in the [Learned image history] screen.

4 When learning multiple images in a batch, change the selected image with the operation buttons, and repeat step 3.



5 Press [Learn Selected Image].



The confirmation screen opens.

6 Press [OK].

Learning will be performed.

7 After learning has been completed, press [OK].

Returns to the [Learned image history] screen.

- Point**
- When pressing [Cancel] while learning, learning can be canceled.
 - You can edit/delete images where additional learning of the wrong status result is performed in the [Learned image history] screen.
- “Additional Learning from the Learned Image History” (page 6-10)

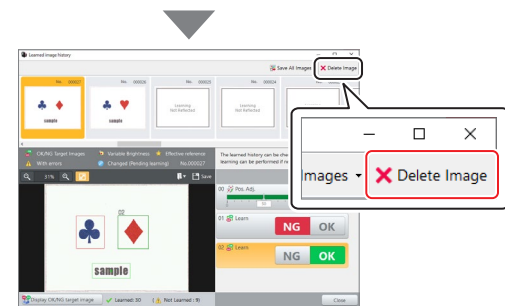
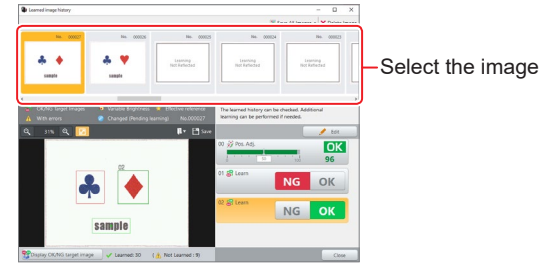
Deleting the Learned Images

Point When deleting images from the learned image history, learning will be executed automatically to adjust the judgment process.

1 Display the [Learned image history] screen.

“Displaying the [Learned image history] screen” (page 6-7)

2 Select an image to be deleted, and press [Delete Image].



The confirmation screen opens.

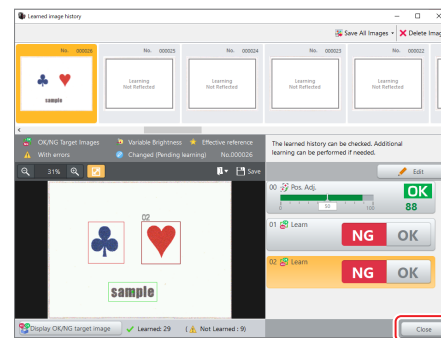
3 Press [OK].

The image is deleted, and learning is executed using the remaining images.

Point Deleting images cannot be undone.

4 After learning has been completed, press [OK].

5 Press [Close].



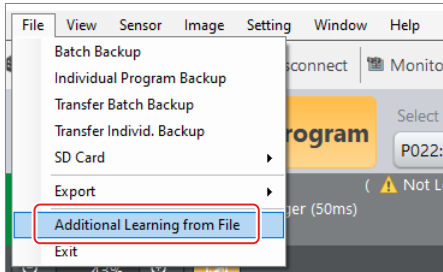
The system returns to the main screen in [Run] or [Program].

Additional Learning from Files Saved in the PC

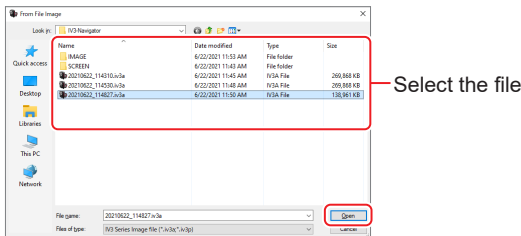
1 Display the main screen in [Program] or [Run].

“Overview of the Screen in [Run] / [Program]” (page 5-3)

2 Select [File] → [Additional Learning from File] from the menu bar.



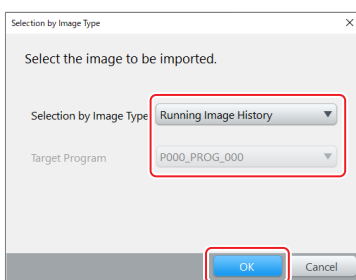
3 Select the batch backup file (*.iv3a), individual program backup file (*.iv3a) or image capture file (*.iv3p), and press [Open].



4 If a batch backup file (*.iv3a) or individual program backup file (*.iv3a) is selected, select the image type to be imported from the following.

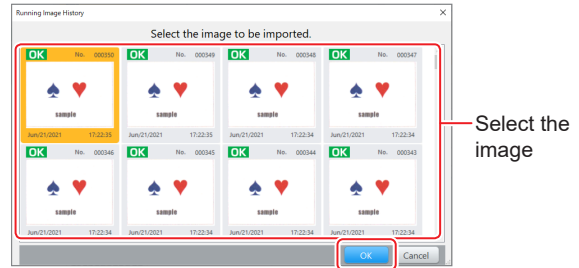
- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.



The list of images saved as the selected file image type is displayed.

5 Select the image to be used for additional learning, and press [OK].

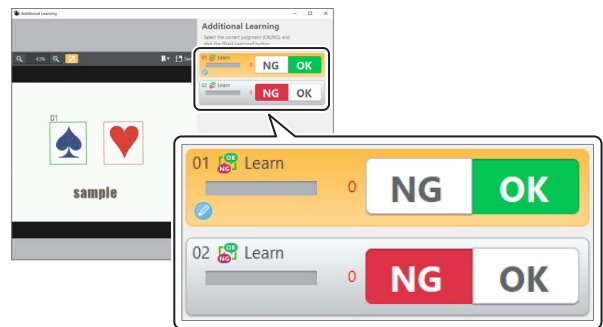


The confirmation screen for stopping operation during Run mode will be displayed. Press [OK], and stop operation.

- Point** When the number of images used for additional learning has exceeded the upper limit, the [Check Registered Images] screen appears after operation stops.
- “Operation When the Registered Number Reaches the Upper Limit” (page 6-14)

The [Additional Learning] screen opens.

6 Confirm the selection state of the status result (OK/NG, or Part Type). Change the status result as needed, then press [Start Learning].



- Point**
- When multiple learning tools are set, confirm/change all status results for the learning tools.
 - The part type discrimination results are shown in sorting mode.

The confirmation screen opens.

7 Press [OK].

Learning will be performed.

8 After learning has been completed, press [OK].

- Point**
- When pressing [Cancel] while learning, learning can be canceled.
 - When a similar learned image is found, the [Check Registered Images] screen opens.
 - “Confirming the Similar Images and Additional Learning” (page 6-14)
 - You can edit/delete images where additional learning of the wrong status result is performed in the [Learned image history] screen.
 - “Additional Learning from the Learned Image History” (page 6-10)

The system returns to the main screen in [Program].

Operation When the Registered Number Reaches the Upper Limit

The number of images that can be registered to the learned image history is up to 100.

- **Standard Mode**
Total number of registration images of OK/NG target learning (including variable brightness image) + registered images of the additional learning
- **Sorting Mode**
Total number of registration images of part type image registration (including variable brightness image) + registered images of the additional learning

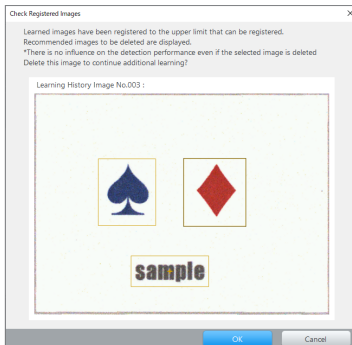
Reference When the variable brightness is OFF, the number of learned image histories that can be displayed will be less than 100.

If additional learning is performed once the upper limit of images has been reached, the [Check Registered Images] screen opens.

Confirm the images recommended to be deleted, and delete them.

Point The total number of master images and learned images that can be memorized in the main unit is about 1000 images for programs 0 to 31 together.
If exceeding this limit, delete unnecessary learned images, etc.

1 The [Check Registered Images] screen opens.



2 When deleting the displayed images, press [OK]. When not deleting them, press [Cancel].

- When pressing [OK], the images will be deleted, and additional learning can be performed.
- When pressing [Cancel], additional learning will finish.

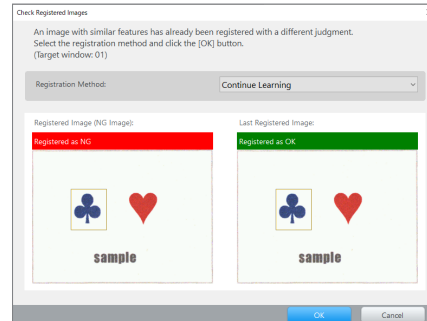
Point When not deleting the images recommended to be deleted, select images from the learned image history to delete.
📖 “Deleting the Learned Images” (page 6-12)

Confirming the Similar Images and Additional Learning

When images which have similar features to images for additional learning have been registered with different status results, the [Check Registered Images] screen opens.

Confirm the status result for each image.

1 The [Check Registered Images] screen opens.



2 Select the registration method.

● In standard mode

- **Continue Learning with Both OK**
Performs the additional learning regarding both status results of [Registered Image] and [Last Registered Image] as OK.
- **Continue Learning with Both NG**
Performs the additional learning regarding both status results of [Registered Image] and [Last Registered Image] as NG.
- **Continue Learning**
Performs the additional learning without changing the status results of [Registered Image] and [Last Registered Image].

● In sorting mode

- **Continue Learning with both M - (Part Number)**
Performs the additional learning regarding both status results of [Registered Image] and [Last Registered Image] as a specified part number.
- **Continue Learning**
Performs the additional learning without changing the status results of [Registered Image] and [Last Registered Image].

3 Press [OK].

Learning will be performed.

Point When performing learning on a similar image with a different status result, stability of the judgment process can be decreased.

Adjusting Thresholds for Judgment

Below is the method for manually adjusting the threshold while in operation.

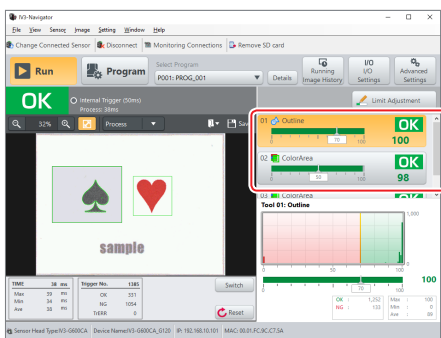
- Point**
- Not available in sorting mode.
 - For the learning tool, threshold adjustment is not needed since the target match is automatically adjusted by learning. Use threshold adjustment if additional learning cannot be made or when it is determined to be needed after additional learning.
- ☞ “Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

Reference Threshold adjustment can be started using the [Limit Adjustment] button in the [Tool Settings] of the Settings Navigator as well.

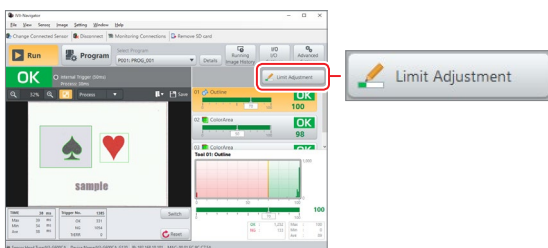
1 Display the main screen in [Run].

☞ “Starting an Operation” (page 5-2)

2 If multiple tools are set in the program, select the tool to adjust the threshold.



3 Press [Limit Adjustment].



The confirmation screen opens.

4 Press [Yes].

The operation stops and turns to “Test run”.

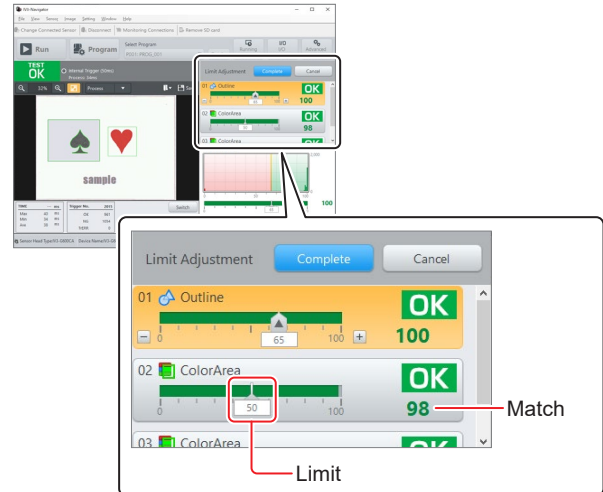
- Point** Operation is not suspended. Changing the threshold reflects the value in the status output from the trigger immediately after the change.
To not reflect the value in the status output, adjust the threshold on the settings screen for each tool’s sensor settings.

5 Capture an “OK” or “NG” image to be the reference of judgment.

6 Adjust the threshold by checking the matching rate.

<Setting example>

If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.



- Point**
- When the learning tool is set, the limit adjustment of the position adjustment cannot be performed from the run screen. Change it from the settings screen.
 - The threshold value after being adjusted cannot be backed up using the “SD card settings backup” function.

- Reference**
- If multiple tools are set in the program, the tool for adjusting the threshold can be selected.
 - 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.
 - The display color of the tool changes according to the status result of the tool.
 - ☞ “Selecting the Display Method of the Tool Window” (page 5-7)
 - The threshold can be changed by using the slider.
 - ☞ “Editing Numbers” (page 3-15)

7 After the adjustment is completed, press [Complete].

The system returns to the main screen in [Run].

Stabilizing the Judgment

This section explains how to adjust the device when the judgment is not stable.

To stabilize judgment, it is necessary to take a clear image of the target and adjust the detection tool such that it functions in a stable manner.

- “Stabilizing the Judgment Process by Taking a Clear Image of the Target” (page 6-16)
 - Make the target large in the field of view
 - Achieving adequate image brightness
 - Achieve good focus
 - Reduce the image blur
 - Reduce the shininess of the glossy or metal surface
 - Adjust the color tint (for color type only)
 - Reduce the effect of lighting variation
- “Stabilizing the Learning Tool” (page 6-19)
- “Stabilizing by Correcting for Misaligned Target Position” (page 6-21)
- “Stabilizing the Position Adjustment” (page 6-21)
- “Stabilizing the High-Speed Position Adjustment” (page 6-22)
- “Stabilizing the Outline Tool” (page 6-22)
- “Stabilizing the Color Area/Area/Color Average/Brightness Average/Color Prohibition/Brightness Prohibition Tool” (page 6-23)
- “Stabilizing the EdgePixels tool” (page 6-23)
- “Stabilizing the Width/Edge/Pitch tool” (page 6-24)
- “Stabilizing the Diameter Tool” (page 6-24)
- “Stabilizing the OCR Tool” (page 6-25)
- “Stabilizing the Blob Count tool” (page 6-25)

Point

If judgment is adjusted to stabilize the inspection, the processing time may become longer, depending on the settings changed. Adjust the judgment process while balancing the required processing time.

Stabilizing the Judgment Process by Taking a Clear Image of the Target

Adjust the imaging conditions so that the sensor can take images with which the detection tools can clearly recognize differences between an “OK” and “NG” image.

Make the target large in the field of view

The judgment stabilizes by taking a large image of the target within the field of view.

Adjusting the installed distance (WD)

Install the sensor close to the target.

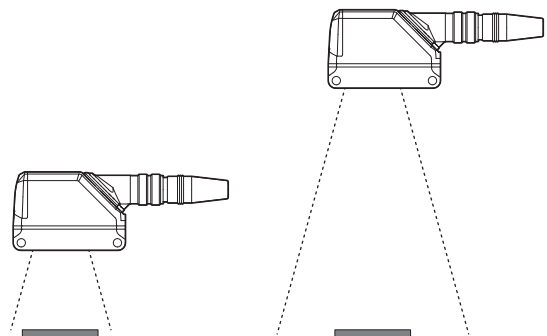
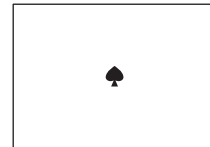
Install the sensor at the appropriate distance from the target upon checking the field of view and the installed distance of the sensor.

☞ “Checking the field of view and installed distance” (page 2-2)

○ : Adequate



× : Inadequate



Using the digital zoom function

The target can be imaged larger using the digital zoom function.

☞ “Setting the digital zoom” (page 4-17)

Achieving Adequate Image Brightness

If the image is too dark, the judgment process becomes unstable due to poor contrast. Also, if the image is too bright, the judgment process may become unstable. Perform Smart Image Optimization and select the best optimized image. When the best optimized image cannot be acquired for Smart Image Optimization, adjust the settings using brightness adjustment.

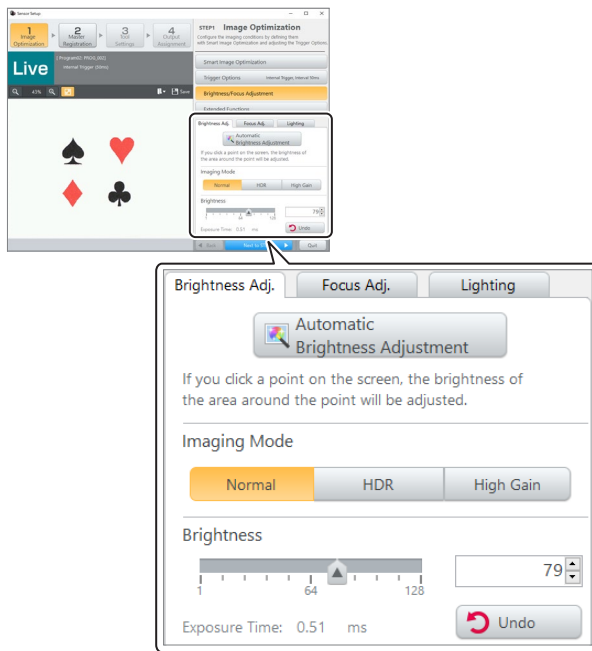
☞ “Settings of Smart Image Optimization” (page 4-9)

☞ “Adjusting Brightness” (page 4-13)

■ When Performing Fine Brightness Adjustment

Finer adjustment of the brightness can be made in Advanced Brightness Adjustment.

☞ “Adjusting Brightness” (page 4-13)



● Adjusting automatically by pressing the target

If you press the image of the target, the brightness around the pressed position will be adjusted to be optimal automatically.

Used when the adjustment results of the [Automatic Brightness Adjustment] button are too bright or dark due to the influence of brightness other than the target.

● Imaging Mode

When [High Gain] is selected, the brightness amplification factor increases and the screen becomes brighter.

● Brightness

Setting a higher value gives a longer exposure time, resulting in a brighter screen.

■ If the brightness cannot be properly adjusted due to uneven brightness

Refer to ☞ “Reducing the Shininess of a Glossy or Metal Surface” (page 6-18).

Achieving Good Focus

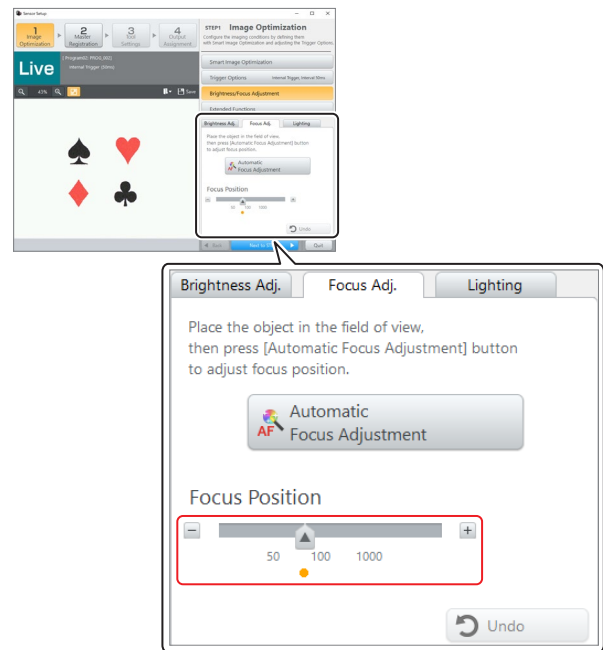
Adjusting the focus is required to clearly image of the target. Since focus can be adjusted automatically using Smart Image Optimization, individual adjustments are not needed. However, when performing fine adjustment etc., the finer adjustment can be made using “Focus Adjustment”.

☞ “Adjusting focus” (page 4-14)

■ When Performing Fine Focus Adjustment

The focusing position may not be adjusted correctly if the image is too dark or too bright. Adjust to an applicable brightness with Brightness Adjustment (Page 4-13) and then perform auto focus adjustment. If the focus still cannot be properly adjusted, adjust the focus manually.

☞ “Adjusting focus” (page 4-14)



Adjust the focus position by the slider.

Reducing the Image Blur

If the image is blurred while imaging a moving target, the image blurring can be corrected and the exposure time (shutter time) can be shortened by using the AI Lighting unit and adjusting the imaging mode/brightness.

Using the AI Lighting Unit

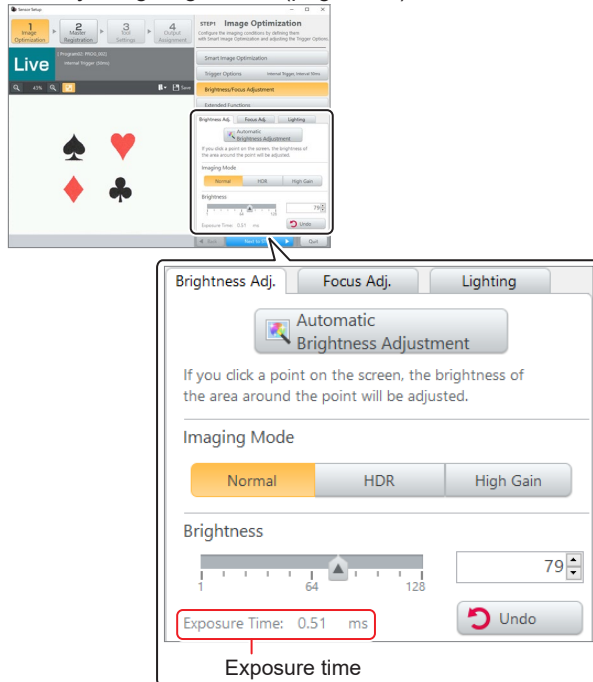
Using the AI Lighting unit increases the light intensity so that the exposure time can be shortened and blurring can be reduced.

☞ “Mounting the AI Lighting unit” (page 2-6)

Adjusting the Imaging Mode and Brightness

Adjust the imaging mode and brightness, and shorten the exposure time. Adjust the exposure time with the advanced brightness adjustment.

☞ “Adjusting Brightness” (page 4-13)



Imaging Mode

- By selecting [High Gain], the brightness gain becomes higher. The screen becomes brighter so that the exposure time can be shortened and the image blurring can be reduced. Image noise may increase.
- The exposure time may be shortened if [HDR] is selected.

Brightness

When the value is reduced, the exposure time becomes shorter, resulting in a less blurry image.

Point Unmounting a polarizing filter can increase the brightness of the image. By unmounting the filter, image blurring can be reduced as the exposure time can be shortened.

Reducing the Shininess of a Glossy or Metal Surface

Glossy and/or metal surfaces may reflect the built-in light back into the camera. Since mirror reflection has a highlight intensity, the amount of light received will be saturated and the surface will shine. This section explains how to reduce the glare.

Using Multiple Imaging

By performing multiple imaging for a target and combining the images of shine-free areas, a clean image with less shine can be created.

The multiple imaging can be performed with only the built-in light of the sensor. However, by using the AI Lighting unit, light can be emitted at a certain angle to the target, resulting in a cleaner image with less shine. Perform Smart Image Optimization and select the image optimization for the multiple imaging. The settings can be done manually from the lighting advanced settings.

☞ “Setting the lighting conditions” (page 4-15)

☞ “Adjusting Brightness” (page 4-13)

☞ “Mounting the AI Lighting unit” (page 2-6)

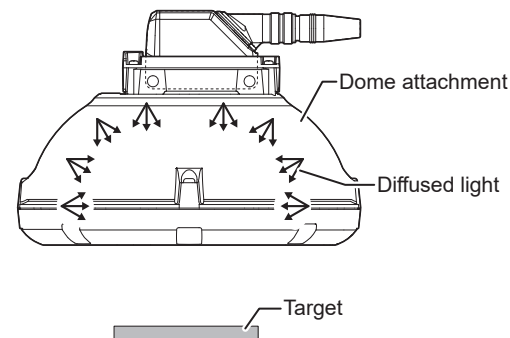
Using the Dome Attachment

Use the dome attachment.

By emitting the target with uniform diffuse light from the entire circumference, bright/dark difference is reduced and glare is prevented.

This is effective for any shapes of targets.

☞ “Mounting the dome attachment” (page 2-12)



Using the Polarizing Filter

Use the polarizing filter. The optical characteristics of the polarizing filter attachment cut off the mirror reflection and reduce the glare on the target's surface.

☞ “Using the polarizing filter” (page 2-10)

Using HDR

By selecting HDR in the imaging mode, glare can be reduced.

The HDR (High Dynamic Range) function prevents light saturation in the area with glare by imaging the target with a wider dynamic range.

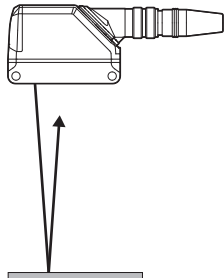
☞ “Adjusting Brightness” (page 4-13)

■ Installing the sensor at an angle

The built-in lighting will not be reflected back into the camera, so the glare on the target's surface can be reduced.

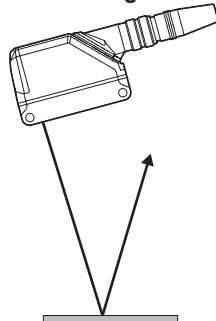
This is effective for flat-surface targets.

When the sensor is installed in front of the target



The mirror reflection of the built-in light reflects into the camera and causes the surface to have glare.

When the sensor is installed at an angle from the target



The mirror reflection of the built-in light does not reflect into the camera so no surface glare occurs.

Adjusting the color tint (for color type only)

Adjust the white balance if the color tint of the color type image is different from that of the target.

📖 "White Balance (for Color Type Only)" (page 7-24)

Reducing the effect of illumination variation

If detection is not stable due to the ambient light from the surroundings where the sensor is installed, the effect of the illumination variation can be reduced using the following method.

- Use the AI Lighting unit.
The lighting intensity of this device will be increased, making it less influenced from changes in surrounding lighting.
- Use the brightness correction function.

📖 "Mounting the AI Lighting unit" (page 2-6)

📖 "Brightness Correction" (page 4-24)

If detection cannot be stabilized with the methods above, use shielding around the sensor to prevent influence from the ambient light.

📖 "Brightness Correction" (page 4-24)

Stabilizing the Learning Tool

Optimizing the Size of the Tool Window

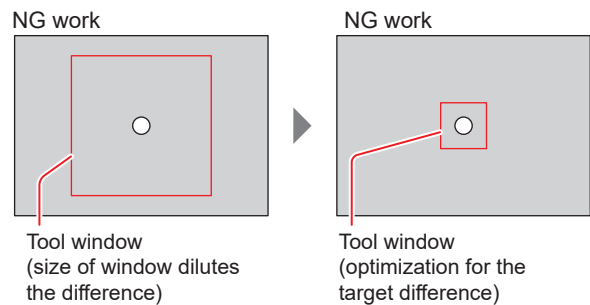
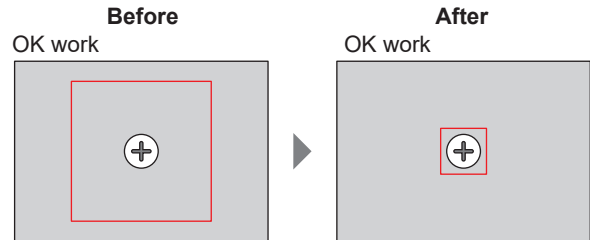
To enhance the learning effect, the tool window should be set according to the size of the image where the difference in an "OK" and "NG" or Part image is clear. When the difference between an "OK" and "NG" target in the tool window is small, judgment may not be stable since the differences cannot be recognized. When the misalignment of the position of the target is large, set a position adjustment tool.

The following is the explanation with an example of standard mode.

■ Setting according to the image target difference to be judged

Usage example: Detection of the presence of a part

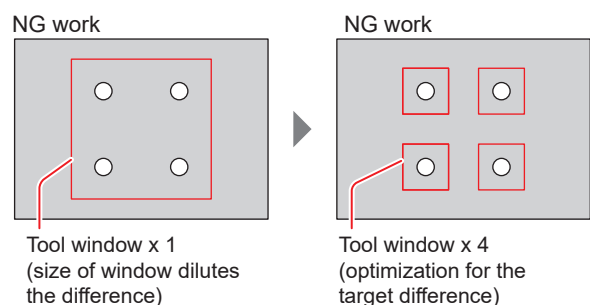
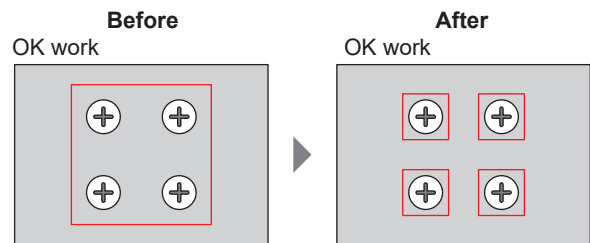
- Before Setting a tool window that is much larger than the target.
- After Setting a tool window that fits to the size of the target.



■ Setting by dividing into multiple tool windows

Usage example: Detection of the presence of four targets (less than 3 is NG).

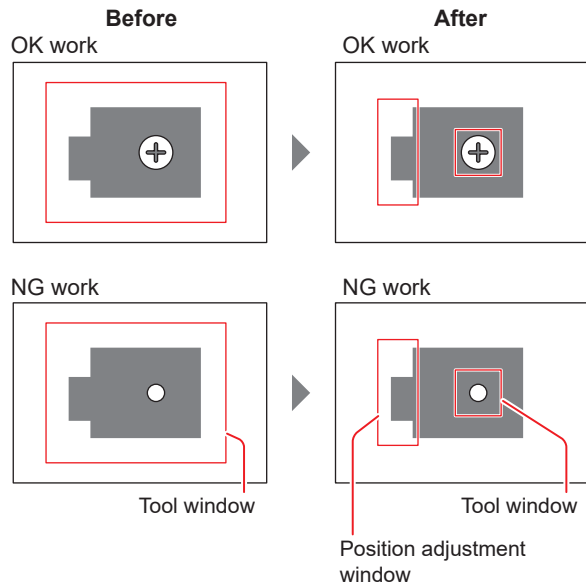
- Before Setting one tool window for the four targets in a batch.
- After Setting four tool windows, one for each target.



Setting the position adjustment tool

Usage example: Detection of the presence of targets whose positions are misaligned.

- Before Setting one large tool window
- After Setting the position adjustment tool and tool window optimized for the targets



- ☐ "Stabilizing by Correcting for Misaligned Target Position" (page 6-21)
- ☐ "Stabilizing the Position Adjustment" (page 6-21)

Learning Multiple Images for Stability

Target misalignment (shape, surface condition, dirt, setting position) or changes of ambient light or background may influence the inspection. In these cases, registering to learn multiple images that are different in capture status will automatically improve judgment stability.

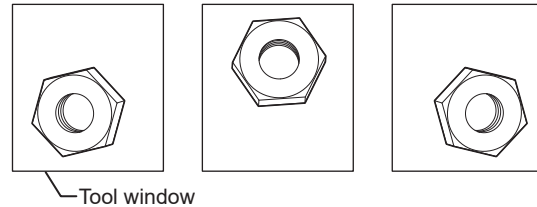
The methods of registering to learn multiple images are "OK/NG Target Learning" or "Part Image Registration", and "Additional Learning".

- ☐ "OK/NG Target Learning for the Learning Tool" (page 4-44)
- ☐ "Part Image Registration" (page 4-140)
- ☐ "Additional Learning" (Page 6-2)

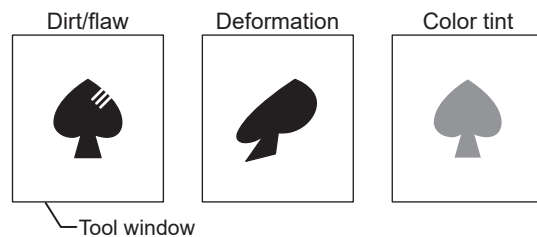
The following indicates examples of images that are different in capture status. Perform learning to register multiple images as OK or NG.

● Example 1: Registering multiple images with position misalignment

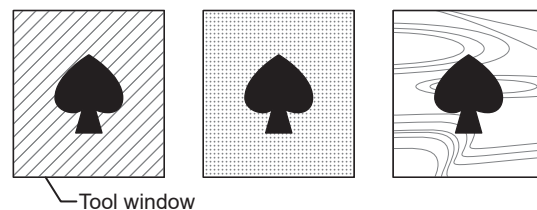
The capture status (what is seen) changes due to target misalignment. If it is the case, multiple images with different capture statuses are registered.



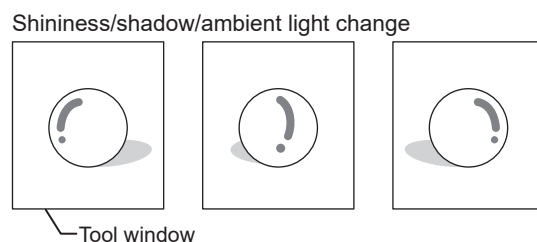
● Example 2: Registering multiple images for changes of the target



● Example 3: Registering multiple images for changes of the background



● Example 4: Registering multiple images for changes of the ambient light



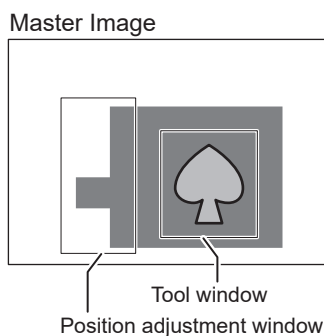
- ☐ **Reference** By turning ON [Variable Brightness] to perform the OK/NG target learning, the influence from the ambient light becomes small.
- ☐ "Registration of Taken Image" (page 4-46)

Stabilizing by Correcting for Misaligned Target Position

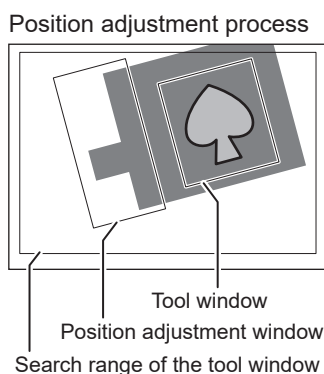
If there is variation (misalignment) in the positioning of the target, the target to be judged may also be removed from the tool window and cannot be judged correctly. Detection can be stabilized by using the position adjusting function.

☞ “Position Adjustment Tool” (page 4-66)

● Tool settings



● Processing during an operation

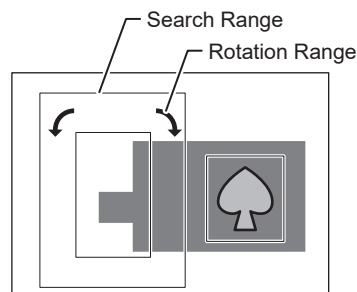


Stabilizing the Position Adjustment

This section explains how to adjust when the position adjustment is not stable.

☞ “Position Adjustment Tool” (page 4-66)

If the target tilts and the position adjustment becomes unstable



● Rotation Range

- Broaden the rotation range if the tilt of the target exceeds the rotation range (default value: $\pm 20^\circ$).
☞ “Rotation Range” (page 4-69)
- To stabilize the position adjustment, the tool window will search with the range \pm a few degrees wider than the set value of the rotation range. (The tool window will search \pm a few degrees even if the rotation range is set to 0° .)

● Search Range

Broaden the search range if the variation in the position of the target exceeds the region to be searched.

☞ “Search Range Settings” (page 4-68)

If the position adjustment becomes unstable due to the effect of the unwanted outlines

- The outline disabling function can disable unwanted outlines.
☞ “Settings for Disabling Outlines” (page 4-68)
- Set the extraction sensitivity to [Low Sens.].
☞ “Setting a Sensitivity” (page 4-68)

If the outline of the reference target cannot be detected

- If the contrast of the target is low, the outline may not be extracted. Set the extraction sensitivity to [High Sens.].
☞ “Setting a Sensitivity” (page 4-68)
If the process remains unstable even after setting the extraction sensitivity to [High Sens.], it may be necessary to adjust the exposure condition for the target.
☞ “Stabilizing the Judgment Process by Taking a Clear Image of the Target” (page 6-16)
- For the color type, the outline extraction may become stable by using the color filter.
☞ “Setting distortion correction (wide field of view sensor model only)/color filters (color type only)” (page 4-18)

When the window position after the position adjustment is misaligned and not stable

Set the search algorithm to [High Accuracy] when the detection is not stable because the position of the tool window after the position adjustment does not match the target position.

☞ “Search Algorithm” (page 4-51)

☞ “Search Algorithm” (page 4-69)

Stabilizing the High-Speed Position Adjustment

This section explains how to adjust when the High-Speed Position Adjustment is not stable.

☞ “High-Speed Position Adjustment Tool” (page 4-92)

If the detection becomes unstable due to the effect of unwanted edges other than the target

- Raise the threshold for edge sensitivity so that unwanted edges are not extracted.
☞ “Edge Sensitivity Settings” (page 4-95)
- Change to an image with no unwanted edges by making the target background plain, etc.

If the edge of a target cannot be detected

- Set the window size as the same as the size of the target.
If the judgment direction is horizontal (X axis in case of 2-Axis Adjustment), set the height of the tool window the same as the height of the target.
- Decrease the threshold for edge sensitivity.
If the edge cannot be detected even after decreasing the threshold for edge sensitivity, it may be necessary to adjust the exposure for the target. Adjust the exposure so that shade on the target does not appear.
☞ “Edge Sensitivity Settings” (page 4-95)

Stabilizing the Outline Tool

This section explains how to adjust the outline tool when the judgment for an “OK” and “NG” image is not stable.

☞ “Outline tool” (page 4-48)

If the outline cannot be detected when the target goes out of position

Adjust the search region. Broaden the search area if the variation in the position of the target exceeds the area to be searched.

☞ “Search Range Settings” (page 4-50)

If the detection becomes unstable due to the effect of unwanted outlines other than the target

- The outline disabling function can disable unwanted outlines.
☞ “Settings for Disabling Outlines” (page 4-50)
- Set the extraction sensitivity to [Low Sens.].
☞ “Setting a Sensitivity” (page 4-50)
- Set the search area so that non-target areas containing unwanted outlines are not searched.
☞ “Search Range Settings” (page 4-50)
- Set the search algorithm to [High Accuracy].
☞ “Search Algorithm” (page 4-51)
- Make an image with no unwanted outlines by making the target background plain, etc.

If the target tilts and the outline cannot be detected

Adjust the rotation range. Broaden the rotation range if the tilt of the target exceeds the rotation range (default value: $\pm 20^\circ$).

☞ “Rotation Range” (page 4-51)

If the matching rate difference between an “OK” and “NG” image is small

Adjust the search algorithm.

If there is no difference between the matching rate for an “OK” and “NG” image, select [Mid Sens] or [High Accuracy]. [High Accuracy] improves judgment accuracy more than [Mid Sens]. However, the processing time becomes longer.

☞ “Search Algorithm” (page 4-51)

If the outline of the target cannot be detected

- If the contrast of the target is low, the outline may not be extracted. Set the extraction sensitivity to [High Sens.].
☞ “Setting a Sensitivity” (page 4-50)
If the process remains unstable even after setting the extraction sensitivity to [High Sens.], it may be necessary to adjust the exposure condition for the target.
☞ “Stabilizing the Judgment Process by Taking a Clear Image of the Target” (page 6-16)
- For the color type, the outline extraction may become stable by using the color filter.
☞ “Setting distortion correction (wide field of view sensor model only)/color filters (color type only)” (page 4-18)

Stabilizing the Color Area/Area/Color Average/Brightness Average/Color Prohibition/Brightness Prohibition Tool

This section explains how to adjust the Color Area/Area/Color Average/Brightness Average/Color Prohibition/Brightness Prohibition tool when the judgment for an “OK” and “NG” image is not stable.

- ☐ “Color Area/Area tool” (page 4-52)
- ☐ “Color/Brightness Average Tool” (page 4-59)
- ☐ “Color Prohibition/Brightness Prohibition tool” (page 4-109)

If the color you wish to judge cannot be extracted

- Press and extract the color or the brightness to be the reference for judgment.
- If the areas of color or brightness that have not been extracted are pressed repeatedly, the extraction range can be added.
- Adjust the extraction range with the extraction range zoom in/zoom out ([+]/[-] buttons). Press [+] to expand the color or brightness range currently being extracted. Press [-] to reduce the range.
- For the Color Area/Color Average/ Color Prohibition tool, isolate the desired color for inspection using the [Exclude], and then press the unnecessary color extracted to exclude it.
 - ☐ “Setting the Color Area/Area Tool” (page 4-53)
 - ☐ “Setting the Color/Brightness Average Tool” (page 4-60)
 - ☐ “Setting the Color Prohibition/Brightness Prohibition Tool” (page 4-110)
- Set the [Fixed Reference Area] to [Enable (Large/ Small)].
 - ☐ “Fixed Reference Area” (page 4-58)
- If color difference detection does not stabilize when using the color average tool, adjust [Color ID Sensitivity] and [Limit]. Use the Live image (capture the target) for adjustment. The sensitivity and threshold can be adjusted while comparing the difference between the master color and target color on the Live image.
 - ☐ “Color Range Settings /Brightness Range Settings” (page 4-61)

If the area search becomes unstable due to unwanted colors being extracted

- For the Color Area/Color Average/Color Prohibition tool, select the [Exclude] button, and then press the color that was unnecessarily extracted to exclude it.
 - ☐ “Setting the Color Area/Area Tool” (page 4-53)
 - ☐ “Setting the Color/Brightness Average Tool” (page 4-60)
 - ☐ “Setting the Color Prohibition/Brightness Prohibition Tool” (page 4-110)
- Adjust with the mask function. The region in which unwanted colors are extracted can be disabled.
 - ☐ “Mask settings” (page 4-38)
- For the color/brightness average tool, adjust the position and size of the window. Set so that the region with unwanted colors is not included in the window.
 - ☐ “Setting the Color/Brightness Average Tool” (page 4-60)

Stabilizing the EdgePixels tool

This section explains how to adjust the EdgePixels tool when the judgment for an “OK” and “NG” image is not stable.

- ☐ “EdgePixels tool” (page 4-105)

If the target edge pixels cannot be extracted

- If the contrast of the target is low, the edge pixels may not be extracted.
 - Set the edge extraction sensitivity to [High Sens.].
 - If the process remains unstable even after setting the edge extraction sensitivity to [High Sens.], it may be necessary to adjust the exposure for the target.
 - ☐ “Sensitivity Adjustment” (page 4-107)
- When the number of the target’s edge pixels is low, capture a bigger target and increase the pixels of the edge to be extracted.

If it becomes unstable due to unwanted edge pixels being extracted

- Adjust with the mask function. Mask the region in which unwanted edge pixels have been extracted.
 - ☐ “Mask settings” (page 4-38)

Stabilizing the Width/Edge/Pitch tool

This section explains how to adjust the Width/Edge/Pitch tool when the judgment for an “OK” and “NG” image is not stable.

- ☞ “Width Tool” (page 4-70)
- ☞ “Edge Tool” (page 4-82)
- ☞ “Pitch tool” (page 4-86)

If the detection becomes unstable due to the effect of unwanted edges other than the target

- Adjust with the mask function. Mask the region in which unwanted edges have been extracted.
 - ☞ “Mask settings” (page 4-38)
- Raise the threshold for edge sensitivity so that unwanted edges are not extracted.
 - ☞ “Edge Sensitivity Settings” (page 4-72)
 - ☞ “Edge Sensitivity Settings” (page 4-84)
 - ☞ “Edge Sensitivity Settings” (page 4-88)
- Change to an image with no unwanted edges by making the target background plain, etc.

If the edge of a target cannot be detected

- Align the rotation angle of tool window with the edge angle.
- Do not protrude from the tool window the side of the target that is not in the judgment direction of the tool window.

If the judgment direction is horizontal, change the height of the tool window to be shorter than the height of the target.
- Decrease the threshold for edge sensitivity.

If the edge cannot be detected even after decreasing the threshold for edge sensitivity, it may be necessary to adjust the exposure for the target. Adjust the exposure so that shade on the target does not appear.

 - ☞ “Edge Sensitivity Settings” (page 4-72)
 - ☞ “Edge Sensitivity Settings” (page 4-84)
 - ☞ “Edge Sensitivity Settings” (page 4-88)

Stabilizing the Diameter Tool

This section explains how to adjust the diameter tool when the judgment for an “OK” and “NG” image is not stable.

- ☞ “Diameter Tool” (page 4-76)

If the detection becomes unstable due to the effect of unwanted circles other than the target

- Adjust with the mask function.
 - ☞ “Mask settings” (page 4-38)
- Set the edge sensitivity to low so that the unwanted circles will not be detected.
 - ☞ “Diameter Extraction Settings” (page 4-78)
- Choose an image with no unwanted edges by making the target background plain, etc.

If the target circle cannot be detected

- Set the detection direction for the diameter to detect both bright and dark directions.
 - ☞ “Bright/Dark Direction” (page 4-80)
- Set the edge sensitivity to [Hi Sens].

If the diameter can not be detected even after setting the edge sensitivity to [Hi Sens], it may be necessary to adjust the exposure for the target. Adjust the exposure so that shade on the target does not appear.

 - ☞ “Diameter Extraction Settings” (page 4-78)

Stabilizing the OCR Tool

This section explains how to adjust the OCR tool when the judgment for an “OK” and “NG” image is not stable.

☞ “OCR Tool” (page 4-97)

When the text or date on the object cannot be read

- If the text or date on the object are not clear, reading may fail.
Adjust the target image capture conditions and clearly display the text or date.
☞ “Stabilizing the Judgment Process by Taking a Clear Image of the Target” (page 6-16)
- Set the OCR algorithm to [High Accuracy].
☞ “OCR Algorithm” (page 4-103)

When unwanted text or date are read

Adjust with the mask function.
Mask the region that contains the unwanted text or date.

☞ “Mask settings” (page 4-38)

When reading dot characters from an IJP (ink jet printer) is not stable

● Dot Matrix Print

When reading dot characters as such from an IJP (ink jet printer) and the inspection is not stable due to the influence of misalignment of the dot position, set [Enable]. Select [Print Type] according to the print to be read.

☞ “Dot Matrix Print” (page 4-104)

Stabilizing the Blob Count tool

This section explains how to adjust the Blob Count tool when the count judgment is not stable.

☞ “Blob Count Tool” (page 4-115)

When color (brightness) blobs to be counted cannot be extracted

- Press and extract the color or the brightness to be the reference for judgment.
- If the areas of color or brightness that have not been extracted are pressed repeatedly, the extraction range can be expanded.
- Adjust the extraction range with the extraction range zoom in/zoom out ([+]/[-]). Press [+] to expand the color or brightness range currently being extracted. Press [-] to reduce the range.
☞ “Advanced Color Extraction/Advanced Brightness Extraction” (page 4-118)

If the area search becomes unstable due to unwanted colors being extracted

Select [Exclude], and then press the color that was unnecessarily extracted to exclude it.

☞ “Advanced Color Extraction/Advanced Brightness Extraction” (page 4-118)

When counting targets that are clearly different in size from one to be counted

Set the range of a size for counting.
By adjusting the range, objects with different sizes from the target to be counted can be excluded from the target for counting.

☞ “Size Limit Setting” (page 4-119)

Shortening the Processing Time

This section explains how to adjust the device to shorten the processing time.

To shorten the processing time, perform adjustments to shorten the processing times of the imaging process and the detection tools.

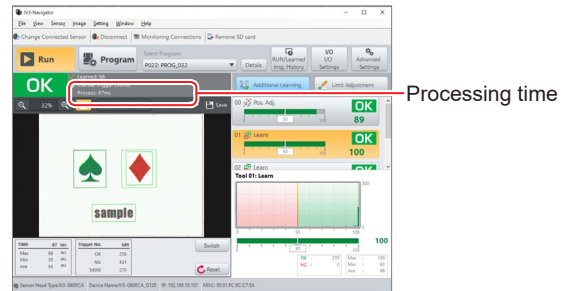
- Shortening the Imaging Processing Time(page 6-27)
- Shortening the processing time of each tool(page 6-28)
- Shortening the processing time of the Outline tool(page 6-28)
- Shortening the processing time of the Color Area/Area/Width/Diameter/Edge/Pitch/Edge Pixel/Color Prohibition/Brightness Prohibition/Blob Count tool(page 6-28)
- Shortening the Processing Time of the OCR Tool(page 6-29)
- Shortening the Processing Time of the Position Adjustment(page 6-29)

Point If the processing time is shortened, the stability of judgment may decrease. The processing time should therefore be adjusted while maintaining balance with the stability of the judgment process.

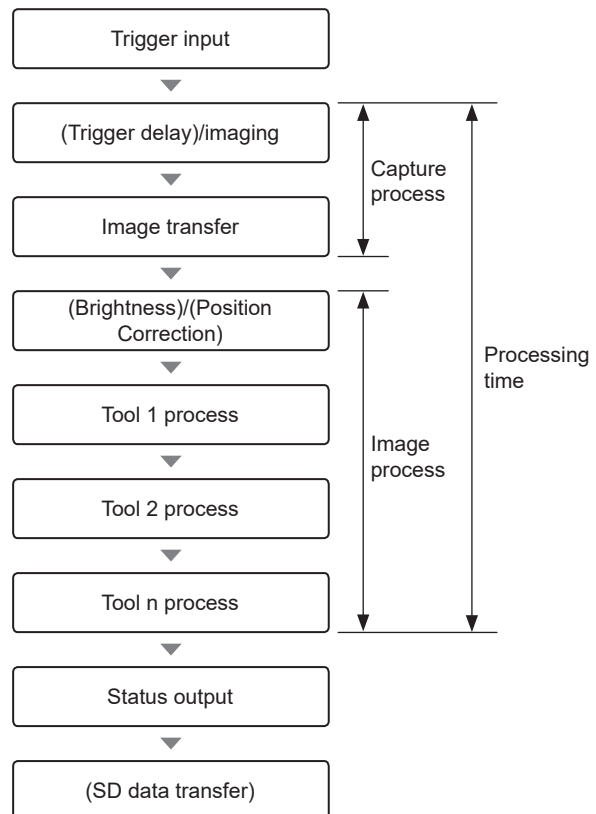
For the Processing Time

The processing time is the period of time from when an external or internal trigger is received until the status result is finalized.

The processing time is displayed on the run screen or the test screen.



Flow of the internal process



Methods to shorten the processing time are as follows.

- Shortening the imaging processing time.
- Shortening the processing time of each tool.
- Do not use position/brightness adjustment.
- Do not use the FTP/SFTP client function.
- Do not use the SD data transfer function.
- Do not use a field network.

Shortening the Imaging Processing Time

● Exposure time

The processing time can be shortened by shortening the exposure time (Page 4-13). A longer exposure time makes the processing time longer, as it takes longer to take the image.

By adjusting the "Brightness" slider of the brightness adjustment, the exposure time can be shortened.



Point

The exposure time can be also shortened using the following method.

- **Use the AI Lighting unit.**
- **Remove the polarizing filter or dome attachment.**

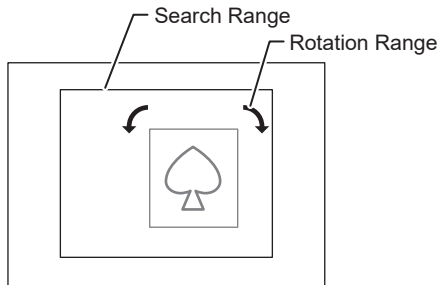
Selecting the tool

- The processing time will be shorter than the Outline tool when using the Color Area/Area/Width/Diameter/Edge/Pitch/Edge Pixel/Color Prohibition/Brightness Prohibition tool. When judgment can be made using the Color Area/Area/Width/Diameter/Edge/Pitch/Edge Pixel/Color Prohibition/Brightness Prohibition tool, select one mentioned above.
- The processing time will be shorter for the High-Speed Position Adjustment tool than the normal Position Adjustment tool. If the High-Speed Position Adjustment tool can be used, select the High-Speed Position Adjustment tool.

Shortening the processing time of each tool

Shortening the processing time of the Outline tool

The processing time can be shortened by adjusting the settings for the search range, rotation range, and search algorithm.



● Search Range

The time for searching for a target in the field of view can be shortened by reducing the search range and setting the search region from [Entire] (default value) to [Partial].

Make sure that the range of the positions for the target does not exceed the search region.

☐ "Search Range Settings" (page 4-50)

● Rotation Range

The search time for a target that is rotated in relation to the master image can be shortened by reducing the rotation range. (default value: $\pm 20^\circ$)

Make sure that the range of installation angles for the target does not exceed the rotation range.

☐ "Rotation Range" (page 4-51)

● Search Algorithm

Select [High Speed]. This will decrease judgment accuracy, but the processing time will be shorter.

☐ "Search Algorithm" (page 4-51)

● Producing an image with less unwanted outlines

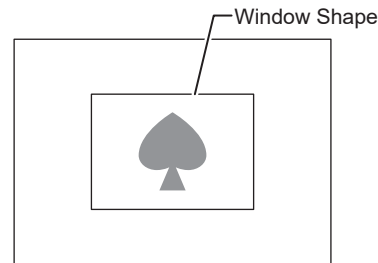
The processing time becomes longer for images with multiple unwanted outlines other than the target outlines.

- Make an image with no unwanted outlines by making the target background plain, etc.
- Set the search area so that non-target images containing unwanted outlines are not searched.

☐ "Search Range Settings" (page 4-50)

Shortening the processing time of the Color Area/Area/Width/Diameter/Edge/Pitch/Edge Pixel/Color Prohibition/Brightness Prohibition/Blob Count tool

The processing time can be shortened by adjusting the window shape settings.



● Window Shape

If the current window shape is [Entire], change and reduce the window size by modifying the window shape setting to [□ Rect] or [○ Circle].

The processing time can be shortened by reducing the size of the window.

☐ "Color Area/Area tool" (page 4-52)

☐ "Width Tool" (page 4-70)

☐ "Diameter Tool" (page 4-76)

☐ "Edge Tool" (page 4-82)

☐ "Pitch tool" (page 4-86)

☐ "EdgePixels tool" (page 4-105)

☐ "Color Prohibition/Brightness Prohibition tool" (page 4-109)

☐ "Blob Count Tool" (page 4-115)

● Window orientation

For the Width/Edge/Pitch tool, do not rotate the tool window (secure the orientation horizontally or vertically) to reduce processing time.

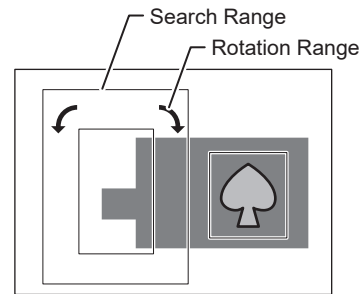
Shortening the Processing Time of the OCR Tool

If you are using the OCR tool, you can shorten the processing time by clearly displaying the object text and date.

- Make an image with no unwanted background information by making the target background plain, etc.
- Adjust the target image capture conditions and clearly display the text or date.

Shortening the Processing Time of the Position Adjustment

When position adjustment is performed, the processing time can be shortened by adjusting the search range settings or rotation range settings.



● Search Range

The time for searching for a target in the field of view can be shortened by reducing the search range and setting the search region from [Entire] (default value) to [Partial].

Note that when the search region is reduced in size, the range of target positions that the position adjustment tool can correct for becomes narrower.

☞ “Search Range Settings” (page 4-68)

● Rotation Range

The search time for a target that is rotated in relation to the master image can be shortened by reducing the rotation range. (default value: $\pm 20^\circ$)

Note that the range of target angles that the position adjustment function can correct for becomes narrower when reducing the rotation range.

☞ “Rotation Range” (page 4-69)

● Search Algorithm

Select [High Speed]. This will decrease the positioning accuracy, but the processing time will be shorter.

☞ “Search Algorithm” (page 4-69)

● Producing an image with less unwanted outlines

The processing time becomes longer for images with multiple unwanted outlines other than the target outlines.

- Make an image with no unwanted outlines by making the target background plain, etc.
- Set the search area so that non-target images containing unwanted outlines are not searched.

☞ “Search Range Settings” (page 4-68)

● Using High-Speed Position Adjustment tool

Compared with the normal position adjustment tool, the High-Speed Position Adjustment tool has a faster processing time.

MEMO

7

Various Functions

In this section, the program function, [I/O Settings] screen, [Sensor Advanced] screen, and menu bar operation method are explained.

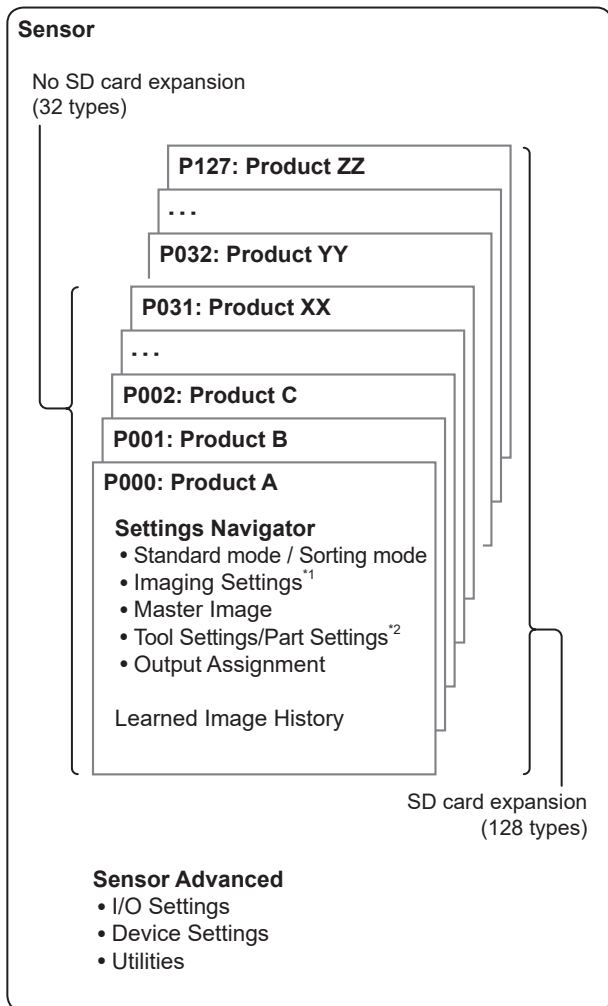
Changeover for a Target (Program Functions)	7-2
Using Program Auto-Switching	7-11
Setting the Input and Output Information of the Sensor	7-13
Setting the Advanced Information of the Sensor	7-19
Operating from the Menu Bar	7-27
Converting IV3P Data to BMP Data Using the IV3P-Converter	7-32

Changeover for a Target (Program Functions)

Overview of the Program Functions

The sensor can save the judgment conditions set in the Settings Navigator as program files. Up to 32 programs can be saved in the sensor, representing 32 types of target (32 products).

Additionally, if the transfer program settings for the SD card (Page 8-11) is set to [Enable], up to 128 programs can be saved, representing 128 types of targets (128 products). By reading the judgment condition which has been saved according to each product, target changeover can be done easily.



*1 Includes the focusing position.

*2 Includes the threshold of each tool/detection window.

Reference The [SD Card Access] function creates 96 setting types (P. 032 to P. 127) on the SD card.

Operations that can be performed with the program functions

- Saves 128 types (128 products) of judgment conditions (programs).
☞ "Chapter 4 Settings Navigator" (page 4-1)
- Reads and operates the saved program.
☞ "Using the Program Functions (Changing Over)" (page 7-5)
- Selects the reading method of the program.
☞ "Program Switching Method" (page 7-14)
- Imports programs from a batch backup file.
☞ "Importing a Program" (page 7-9)
- Appends any name, such as the manufactured product name, to the judgment conditions (programs).
☞ "Editing a Program Name" (page 7-10)
- Copies and uses the judgment conditions (programs) for another program number.
☞ "Copying a Program" (page 7-8)
- Returns the judgment conditions (programs) to the status before setting.
☞ "Initializing a Program" (page 7-10)

Preparing the Program Functions

Registers the judgment condition for each product to the program before running.

Preparation Flow

(1) Prepare the SD card

If there will be changeover with between 33 to 128 different types or programs, set [SD Card Access] for the SD card to [Enable].

☞ “Transferring Program Settings” (page 8-11)

This setting is not required if there are 32 or fewer changeover types.

(2) Select the program number

Select a program number to register a judgment condition from P000 to P031.

Select a program number from P000 to P127 if [SD Card Access] is enabled.

(3) Set the judgment conditions in the Settings Navigator

Set the judgment condition for a product in the Settings Navigator.

(4) Select a program switch method

Select the method to switch the program.

- Switch from an external input line
- Selecting the program from the main screen in [Run].
- Displaying the Program Details screen and selecting the program.
- Switch from a field network
- Switch automatically using the program auto-switching settings

Reference

The following functions can be used to prepare programs for changeover.

- Imports programs from a batch backup file.
 - ☞ “Importing a Program” (page 7-9)
- The product name can be registered to the program.
 - ☞ “Editing a Program Name” (page 7-10)
- To register a similar product, the program can be copied, and then the settings can be edited.
 - ☞ “Copying a Program” (page 7-8)
- Initializes and returns the judgment condition registered in the program to the status before setting.
 - ☞ “Initializing a Program” (page 7-10)

Preparing the SD card

To use the program function to changeover between 33 and 128 types of targets, insert an SD card into this device and set [SD Card Access] for the SD card to [Enable].

Supported SD card Ultra-compact model: CA-SD16G/KV-M4G

Built-in amplifier type: IV3-MSD8G

1 Insert the SD card into SD card slot on the sensor amplifier.

☞ “Inserting/Removing the SD Card” (page 8-9)

2 Set [SD Card Access] for the SD card to [Enable].

☞ “Transferring Program Settings” (page 8-11)

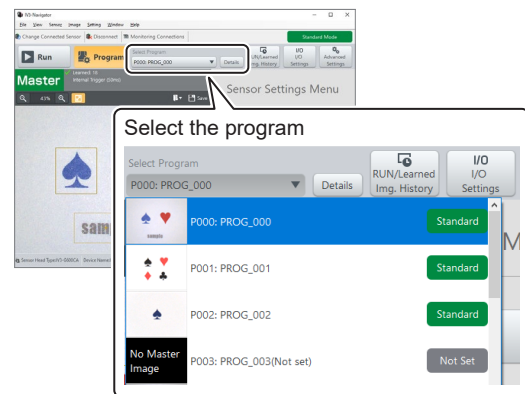
Transfer program settings information is created on the SD card.

Preparation procedures

1 Display the main screen in [Program].

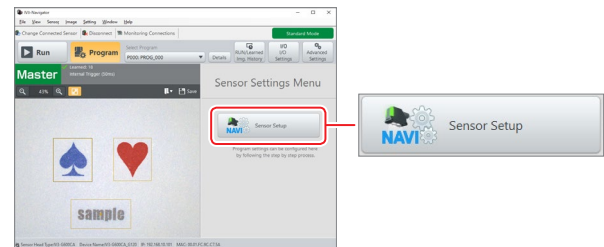
☞ “Overview of the Screen in [Run] / [Program]” (page 5-3)

2 Select a program number to register the judgment conditions for a product.



Reference The program can also be selected from the [Details] button (Page 7-8).

3 Set the judgment conditions in the Settings Navigator.

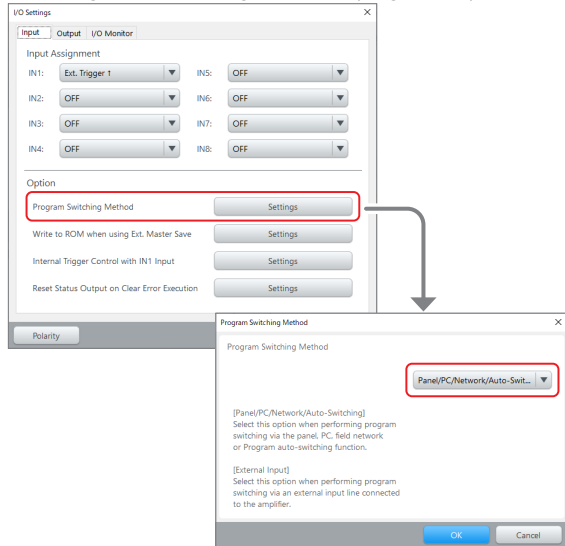


☞ “Chapter 4 Settings Navigator” (page 4-1)

4 Repeat steps 2 and 3 to register programs for the number of products that are to be changed over.

5 If necessary, set the program switching method.

☰ “Program Switching Method” (page 7-14)



● **External Input**

Use this setting to switch programs by inputting signals from the PLC to the input line of the sensor

● **Panel/PC/Communication/Auto-Switching**

Use this settings to switch programs from a PC or a field network, or by the program auto-switching settings.

6 If [Program Switching Method] is set to [External Input], set [Input Assignment].

☰ “Input Assignment” (page 7-14)

The bits that are required to be set will differ depending on the number of programs to be registered.

Product numbers to be registered (Program numbers)	bit to be assigned to the input line
2	bit0
3 to 4	bit0/bit1
5 to 8	bit0/bit1/bit2
9 to 16	bit0/bit1/bit2/bit3
17 to 32	bit0/bit1/bit2/bit3/bit4
33 to 64	bit0/bit1/bit2/bit3/bit4/bit5
65 to 128	bit0/bit1/bit2/bit3/bit4/bit5/bit6

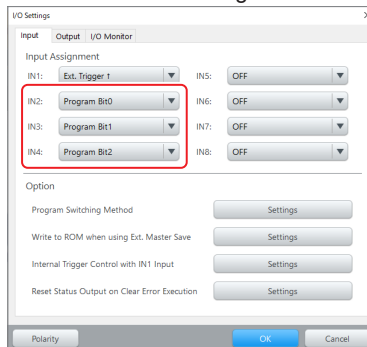
Point

- Setting “SD Card Access” (Page 8-11) to [Enable] allows 33 or more programs (maximum of 128) to be set.
- When switching programs on the built-in amplifier type by external input, up to 32 programs can be set.

Reference

Setup example

When 7 programs are to be registered, bit0, bit1, and bit2 are assigned to arbitrary IN terminals. bit3 to bit6 are not assigned.



Using the Program Functions (Changing Over)

● Precautions when [SD Card Access] for the SD card is set to [Enable]

▶ Important

- Do not open the SD card slot cover or remove the SD card while the device is being activated. Also do not perform the procedure to remove the SD card (Page 8-10).
- Do not use SD cards other than ones specified by KEYENCE.
- If you perform any of the following operations, a program switch error will occur:
 - Switching to a program saved on the SD card while the device is running when an SD Card is not recognized.
 - When operation stops because the SD card is not recognized while running a program on the SD card.
 - After the power is turned off with a program in the SD card selected, as the SD card is not recognized by the sensor during startup.
 - Switching to a program on the SD card when [SD card Access] is set to [Disable].
- Resolving a program switch error:
 - Stop operation. When the error is canceled, the settings screen opens.
- A program switch error in RUN mode can be assigned to an external output line and output to an external device. It can also be obtained using a field network PLC.
- To back up the sensor settings or copy settings to different sensors, use the batch backup function (Page 8-3). The settings cannot be correctly saved by only copying data on the SD card.
- Precautions when using the transfer program settings in combination with the function to transfer data to the SD card:
 - Export data on the SD card when the device is not running.
 - After inserting the SD card, the data transfer function will automatically be restored when operation starts or the power is turned on.

● How to clear a program switching error

Clear the error messages by operation of the control panel or PC (IV3-Navigator). The error will be canceled and the settings screen will appear. Clear error input is disabled. Thereafter, perform the following operations:

- When using the advanced program, re-read the SD card on which the correct advanced program is saved.
- When not using [SD card Access], set the [SD card Access] to [Disable].

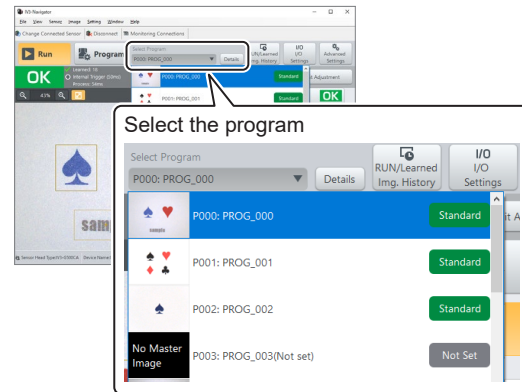
When [Program Switching Method] is set to [Panel/PC/Communications/Auto-Switching]

■ When switching the program in the main screen in [Run]

1 Start the run mode.

📖 “Starting an Operation” (page 5-2)

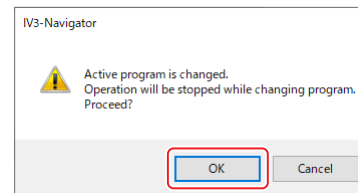
2 Select the program number to which the product to be judged is registered.



The confirmation screen opens.

Reference The program number can also be selected while confirming the master image by pressing [Details] (Page 7-8).

3 Start run mode with the new program number by pressing [OK].



When switching the program in the [Program Details] screen

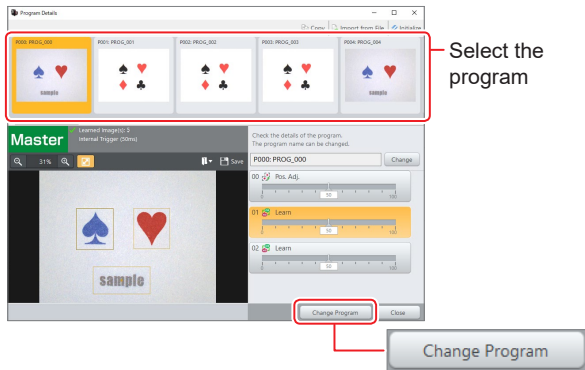
1 Start Run mode.

☞ “Starting an Operation” (page 5-2)

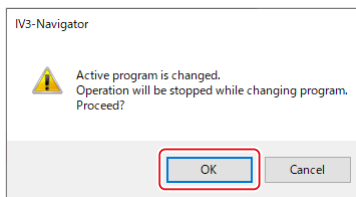
2 Displays the Program Details screen.

☞ “Displaying the [Program Details] screen” (page 7-8)

3 Select the program to which the product to be judged is registered, and press [Change Program].



4 Start run mode with the new program number by pressing [OK].



To switch a program from a field network

For details of how to switch programs using a field network, refer to “IV3 Series User’s Manual (Field Network).”

When Setting the [Program Switching Method] to [External Input].

1 Start the run mode.

☞ “Starting an Operation” (page 5-2)

2 Select the program number to which the product to be judged is registered using the input lines.

- Change the status of the input lines IN2 to IN8 on which bit0 to bit6 are assigned to in the input assignment (Page 7-14) to change the program number (for the ultra-compact model: IN2 to IN8, for the built-in amplifier type: IN2 to N3 and I/O1 to I/O3). Once the program has been changed, save the settings. Start RUN mode with the new program number.

For details, refer to the following.

☞ “Assignment of program numbers using bit0 to bit4 (when [SD Card Access] is set to [Disable])” (page 7-6)

☞ “Assignment of program numbers using bit0 to bit6 (when [SD Card Access] is set to [Enable])” (page 7-7)

- The ON/OFF state of the input lines corresponding to the sensor polarity is as follows.

Polarity	ON	OFF
NPN	The state shorted with 0 V line	Open
PNP	The state that voltage is applied	Open

Reference ☞ For details of the controlling method and the timing chart, refer to ☞ “Changing Over” (page 11-10).

● Assignment of program numbers using bit0 to bit4 (when [SD Card Access] is set to [Disable])

Program number	bit4 (MSB)	bit3	bit2	bit1	bit0 (LSB)
P000	OFF	OFF	OFF	OFF	OFF
P001	OFF	OFF	OFF	OFF	ON
P002	OFF	OFF	OFF	ON	OFF
P003	OFF	OFF	OFF	ON	ON
P004	OFF	OFF	ON	OFF	OFF
P005	OFF	OFF	ON	OFF	ON
P006	OFF	OFF	ON	ON	OFF
P007	OFF	OFF	ON	ON	ON
P008	OFF	ON	OFF	OFF	OFF
P009	OFF	ON	OFF	OFF	ON
P010	OFF	ON	OFF	ON	OFF
P011	OFF	ON	OFF	ON	ON
P012	OFF	ON	ON	OFF	OFF
P013	OFF	ON	ON	OFF	ON
P014	OFF	ON	ON	ON	OFF
P015	OFF	ON	ON	ON	ON
P016	ON	OFF	OFF	OFF	OFF
P017	ON	OFF	OFF	OFF	ON
P018	ON	OFF	OFF	ON	OFF
P019	ON	OFF	OFF	ON	ON
P020	ON	OFF	ON	OFF	OFF
P021	ON	OFF	ON	OFF	ON
P022	ON	OFF	ON	ON	OFF
P023	ON	OFF	ON	ON	ON
P024	ON	ON	OFF	OFF	OFF
P025	ON	ON	OFF	OFF	ON
P026	ON	ON	OFF	ON	OFF
P027	ON	ON	OFF	ON	ON
P028	ON	ON	ON	OFF	OFF
P029	ON	ON	ON	OFF	ON
P030	ON	ON	ON	ON	OFF
P031	ON	ON	ON	ON	ON

Point ☞ For program switching by external input of the built-in amplifier type, up to 32 programs can be set. When it is required to switch 33 programs or more, change programs from a field network or the control panel.

● Assignment of program numbers using bit0 to bit6 (when [SD Card Access] is set to [Enable])

Program number	bit6 (MSB)	bit5	bit4	bit3	bit2	bit1	bit0 (LSB)
P000	OFF	OFF	OFF	OFF	OFF	OFF	OFF
P001	OFF	OFF	OFF	OFF	OFF	OFF	ON
P002	OFF	OFF	OFF	OFF	OFF	ON	OFF
P003	OFF	OFF	OFF	OFF	OFF	ON	ON
P004	OFF	OFF	OFF	OFF	ON	OFF	OFF
P005	OFF	OFF	OFF	OFF	ON	OFF	ON
P006	OFF	OFF	OFF	OFF	ON	ON	OFF
P007	OFF	OFF	OFF	OFF	ON	ON	ON
P008	OFF	OFF	OFF	ON	OFF	OFF	OFF
P009	OFF	OFF	OFF	ON	OFF	OFF	ON
P010	OFF	OFF	OFF	ON	OFF	ON	OFF
P011	OFF	OFF	OFF	ON	OFF	ON	ON
P012	OFF	OFF	OFF	ON	ON	OFF	OFF
P013	OFF	OFF	OFF	ON	ON	OFF	ON
P014	OFF	OFF	OFF	ON	ON	ON	OFF
P015	OFF	OFF	OFF	ON	ON	ON	ON
P016	OFF	OFF	ON	OFF	OFF	OFF	OFF
P017	OFF	OFF	ON	OFF	OFF	OFF	ON
P018	OFF	OFF	ON	OFF	OFF	ON	OFF
P019	OFF	OFF	ON	OFF	OFF	ON	ON
P020	OFF	OFF	ON	OFF	ON	OFF	OFF
P021	OFF	OFF	ON	OFF	ON	OFF	ON
P022	OFF	OFF	ON	OFF	ON	ON	OFF
P023	OFF	OFF	ON	OFF	ON	ON	ON
P024	OFF	OFF	ON	ON	OFF	OFF	OFF
P025	OFF	OFF	ON	ON	OFF	OFF	ON
P026	OFF	OFF	ON	ON	OFF	ON	OFF
P027	OFF	OFF	ON	ON	OFF	ON	ON
P028	OFF	OFF	ON	ON	ON	OFF	OFF
P029	OFF	OFF	ON	ON	ON	OFF	ON
P030	OFF	OFF	ON	ON	ON	ON	OFF
P031	OFF	OFF	ON	ON	ON	ON	ON
P032	OFF	ON	OFF	OFF	OFF	OFF	OFF
P033	OFF	ON	OFF	OFF	OFF	OFF	ON
P034	OFF	ON	OFF	OFF	OFF	ON	OFF
P035	OFF	ON	OFF	OFF	OFF	ON	ON
P036	OFF	ON	OFF	OFF	ON	OFF	OFF
P037	OFF	ON	OFF	OFF	ON	OFF	ON
P038	OFF	ON	OFF	OFF	ON	ON	OFF
P039	OFF	ON	OFF	OFF	ON	ON	ON
P040	OFF	ON	OFF	ON	OFF	OFF	OFF
P041	OFF	ON	OFF	ON	OFF	OFF	ON
P042	OFF	ON	OFF	ON	OFF	ON	OFF
P043	OFF	ON	OFF	ON	OFF	ON	ON
P044	OFF	ON	OFF	ON	ON	OFF	OFF
P045	OFF	ON	OFF	ON	ON	OFF	ON
P046	OFF	ON	OFF	ON	ON	ON	OFF
P047	OFF	ON	OFF	ON	ON	ON	ON
P048	OFF	ON	ON	OFF	OFF	OFF	OFF
P049	OFF	ON	ON	OFF	OFF	OFF	ON
P050	OFF	ON	ON	OFF	OFF	ON	OFF
P051	OFF	ON	ON	OFF	OFF	ON	ON
P052	OFF	ON	ON	OFF	ON	OFF	OFF
P053	OFF	ON	ON	OFF	ON	OFF	ON
P054	OFF	ON	ON	OFF	ON	ON	OFF
P055	OFF	ON	ON	OFF	ON	ON	ON
P056	OFF	ON	ON	ON	OFF	OFF	OFF
P057	OFF	ON	ON	ON	OFF	OFF	ON
P058	OFF	ON	ON	ON	OFF	ON	OFF
P059	OFF	ON	ON	ON	OFF	ON	ON
P060	OFF	ON	ON	ON	ON	OFF	OFF
P061	OFF	ON	ON	ON	ON	OFF	ON
P062	OFF	ON	ON	ON	ON	ON	OFF
P063	OFF	ON	ON	ON	ON	ON	ON

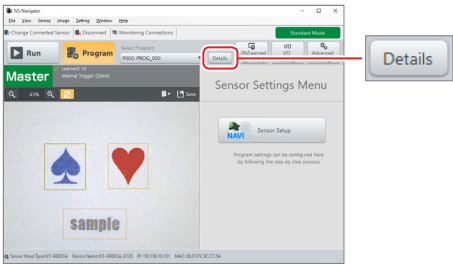
Program number	bit6 (MSB)	bit5	bit4	bit3	bit2	bit1	bit0 (LSB)
P064	ON	OFF	OFF	OFF	OFF	OFF	OFF
P065	ON	OFF	OFF	OFF	OFF	OFF	ON
P066	ON	OFF	OFF	OFF	OFF	ON	OFF
P067	ON	OFF	OFF	OFF	OFF	ON	ON
P068	ON	OFF	OFF	OFF	ON	OFF	OFF
P069	ON	OFF	OFF	OFF	ON	OFF	ON
P070	ON	OFF	OFF	OFF	ON	ON	OFF
P071	ON	OFF	OFF	OFF	ON	ON	ON
P072	ON	OFF	OFF	ON	OFF	OFF	OFF
P073	ON	OFF	OFF	ON	OFF	OFF	ON
P074	ON	OFF	OFF	ON	OFF	ON	OFF
P075	ON	OFF	OFF	ON	OFF	ON	ON
P076	ON	OFF	OFF	ON	ON	OFF	OFF
P077	ON	OFF	OFF	ON	ON	OFF	ON
P078	ON	OFF	OFF	ON	ON	ON	OFF
P079	ON	OFF	OFF	ON	ON	ON	ON
P080	ON	OFF	ON	OFF	OFF	OFF	OFF
P081	ON	OFF	ON	OFF	OFF	ON	OFF
P082	ON	OFF	ON	OFF	OFF	ON	ON
P083	ON	OFF	ON	OFF	OFF	ON	ON
P084	ON	OFF	ON	OFF	ON	OFF	OFF
P085	ON	OFF	ON	OFF	ON	OFF	ON
P086	ON	OFF	ON	OFF	ON	ON	OFF
P087	ON	OFF	ON	OFF	ON	ON	ON
P088	ON	OFF	ON	ON	OFF	OFF	OFF
P089	ON	OFF	ON	ON	OFF	OFF	ON
P090	ON	OFF	ON	ON	OFF	ON	OFF
P091	ON	OFF	ON	ON	OFF	ON	ON
P092	ON	OFF	ON	ON	ON	OFF	OFF
P093	ON	OFF	ON	ON	ON	OFF	ON
P094	ON	OFF	ON	ON	ON	ON	OFF
P095	ON	OFF	ON	ON	ON	ON	ON
P096	ON	ON	OFF	OFF	OFF	OFF	OFF
P097	ON	ON	OFF	OFF	OFF	OFF	ON
P098	ON	ON	OFF	OFF	OFF	ON	OFF
P099	ON	ON	OFF	OFF	OFF	ON	ON
P100	ON	ON	OFF	OFF	ON	OFF	OFF
P101	ON	ON	OFF	OFF	ON	OFF	ON
P102	ON	ON	OFF	OFF	ON	ON	OFF
P103	ON	ON	OFF	OFF	ON	ON	ON
P104	ON	ON	OFF	ON	OFF	OFF	OFF
P105	ON	ON	OFF	ON	OFF	OFF	ON
P106	ON	ON	OFF	ON	OFF	ON	OFF
P107	ON	ON	OFF	ON	OFF	ON	ON
P108	ON	ON	OFF	ON	ON	OFF	OFF
P109	ON	ON	OFF	ON	ON	OFF	ON
P110	ON	ON	OFF	ON	ON	ON	OFF
P111	ON	ON	OFF	ON	ON	ON	ON
P112	ON	ON	ON	OFF	OFF	OFF	OFF
P113	ON	ON	ON	OFF	OFF	OFF	ON
P114	ON	ON	ON	OFF	OFF	ON	OFF
P115	ON	ON	ON	OFF	OFF	ON	ON
P116	ON	ON	ON	OFF	ON	OFF	OFF
P117	ON	ON	ON	OFF	ON	OFF	ON
P118	ON	ON	ON	OFF	ON	ON	OFF
P119	ON	ON	ON	OFF	ON	ON	ON
P120	ON	ON	ON	ON	OFF	OFF	OFF
P121	ON	ON	ON	ON	OFF	OFF	ON
P122	ON	ON	ON	ON	OFF	ON	OFF
P123	ON	ON	ON	ON	OFF	ON	ON
P124	ON	ON	ON	ON	ON	OFF	OFF
P125	ON	ON	ON	ON	ON	OFF	ON
P126	ON	ON	ON	ON	ON	ON	OFF
P127	ON	ON	ON	ON	ON	ON	ON

Displaying the [Program Details] screen

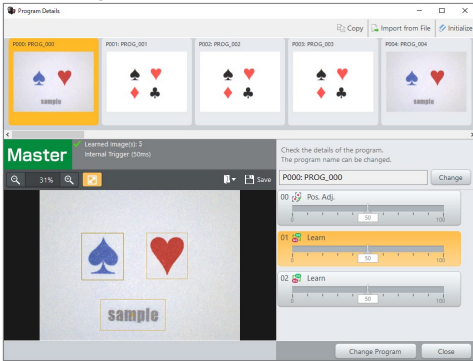
This section explains the Program Details screen displayed when [Details] is pressed on the main screen of the IV3-Navigator.

Point When the Program Details screen is opened by pressing [Details] on the main screen in [Run], only [Change Program] can be pressed.

- 1 Display the main screen in [Run] or [Program].
 □ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- 2 Press [Details].



The [Program Details] screen opens.



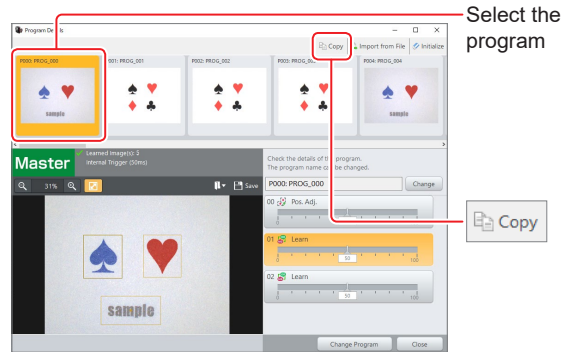
- 3 Configure the program settings.
 □ “Editing a Program Name” (page 7-10)
 □ “Importing a Program” (page 7-9)
 □ “Copying a Program” (page 7-8)
 □ “Initializing a Program” (page 7-10)

- 4 Press [Close].

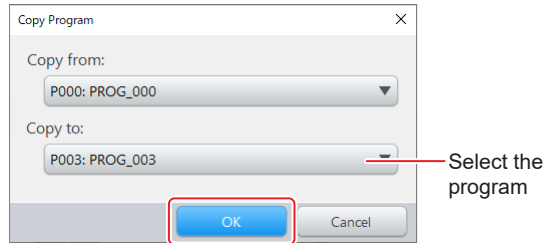
Copying a Program

Copies a set program to another program number. Re-uses the set items and creates a new program.

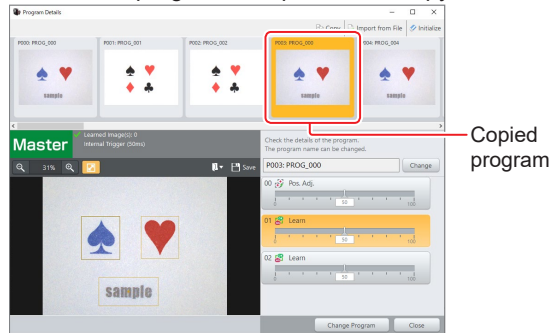
- 1 Display the [Program Details] screen.
 □ “Displaying the [Program Details] screen” (page 7-8)
- 2 Select the program to be copied and press [Copy].



- 3 Select the program number to which the source program will be copied and press [OK].



The source program is copied to the copy destination.



Importing a Program

Imports one program from an individual program backup file (*.iv3a) or a batch backup file (*.iv3a). Re-uses the imported program settings to create a new program.

📖 “Backing up in a Batch” (page 8-3)

📖 “Backing up the Program Individually” (page 8-4)

📌 **Point** Programs cannot be imported from the SD card.

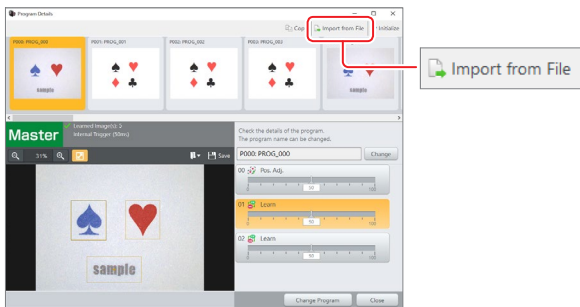
1 Display the main screen in [Program].

📖 “Overview of the Screen in [Run] / [Program]” (page 5-3)

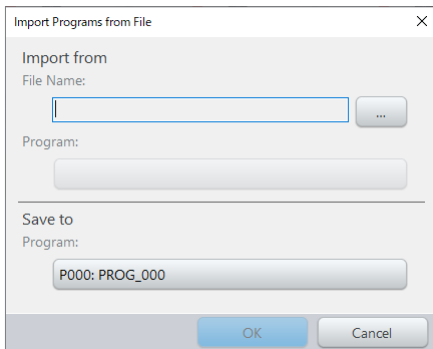
2 Display the [Program Details] screen.

📖 “Displaying the [Program Details] screen” (page 7-8)

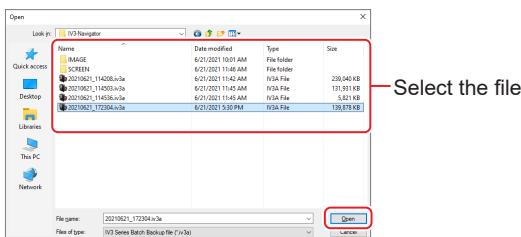
3 Press [Import from File].



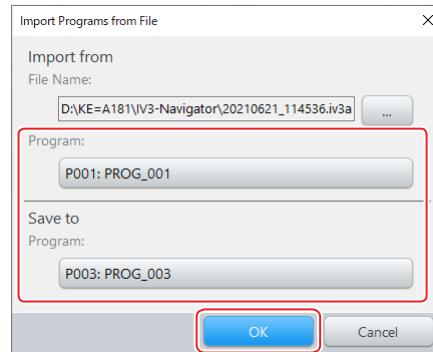
4 Press [...].



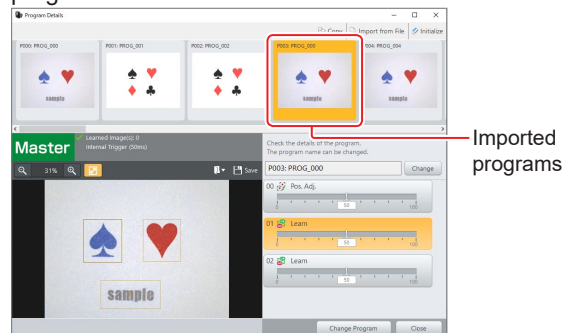
5 Select a batch backup file (*.iv3a) or an individual program backup file (*.iv3a) and press [Open].



6 Select the number of the source program and the number of the destination program, and press [OK].



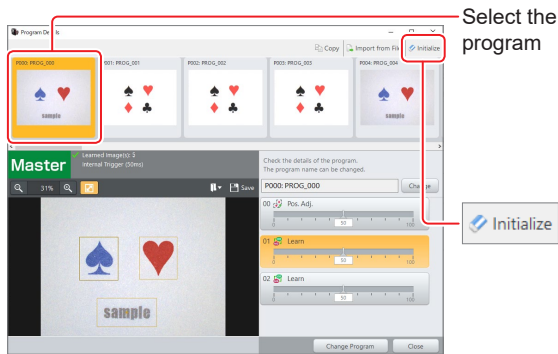
The source program is copied to the destination program number.



Initializing a Program

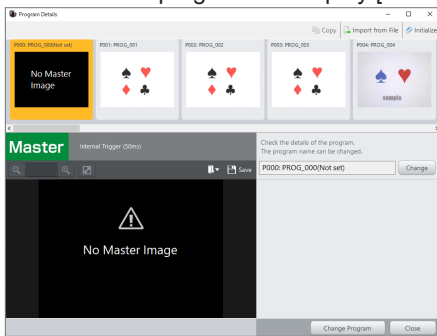
Initializes settings in the program and resets the program to the default.

- 1 Display the [Program Details] screen.
 ☞ “Displaying the [Program Details] screen” (page 7-8)
- 2 Select the program to be initialized and press [Initialize].



The confirmation screen opens.

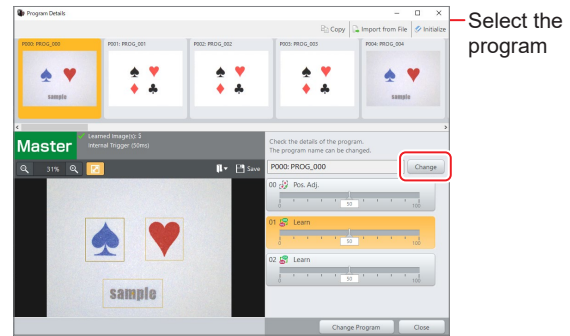
- 3 Press [OK].
 The system returns to the [Program Details] screen.
 The initialized program will display [No Master Image].



Editing a Program Name

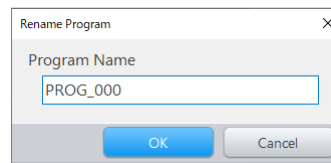
Edits the program name.

- 1 Display the [Program Details] screen.
 ☞ “Displaying the [Program Details] screen” (page 7-8)
- 2 Select the program to change the program name and press [Change].



The [Rename Program] screen opens.

- 3 Enter the user-defined program name and press [OK].



You can enter up to 16 alphanumeric characters.

- ☞ **Point** If the display language (Page 7-30) is changed, the device name might be replaced and displayed as hyphens (-).

Using Program Auto-Switching

● Program Auto-Switching

If multiple programs are used to perform a single examination, examinations can be performed continuously without controlling the program switching with a PLC etc.

☞ "Program Auto-Switching" (page 4-152)

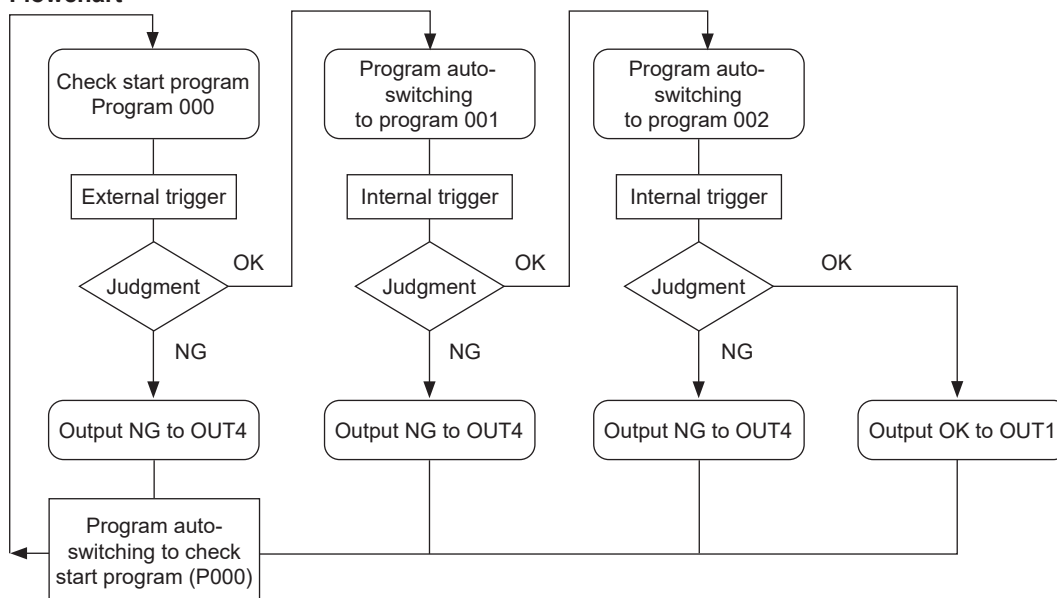
☞ "Importing the Status Output (When Program Auto-Switching is "Enable")" (page 11-8)

The following flow can be set easily.

● Setup example

- Output the total status OK to OUT1 when all judgments in programs 000 to 002 are OK.
- Output the total status NG to OUT4 when any of judgments in programs 000 to 002 are NG.
- Return to the program 000 after determining the judgment.

Flowchart



Each program setting (for the ultra-compact model)

		P000	P001	P002
Trigger		External	Internal	Internal
Switching destination	Total Status OK	P001	P002	P000
	Total Status NG	P000 *1	P000	P000
Output Assignment	OUT1	OFF	OFF	Total Status OK
	OUT4 *2	Total Status NG	Total Status NG	Total Status NG

*1 Do not select "None" but select "P000". When selecting "None", the judgment is not reset.

*2 The output of built-in amplifier type is limited to OUT3, thus set the desired output number.

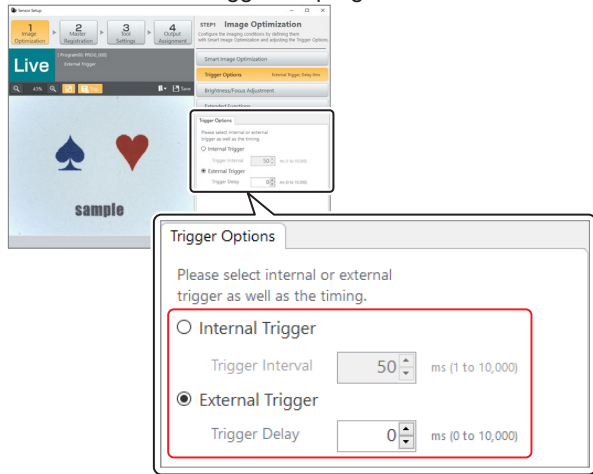
Point By assigning the total status OK to OUT1 for P002 only, you can prevent the total status OK from being output for the program in the middle of the process.

● **Setting procedures**

This section explains the settings using program 000 as an example.

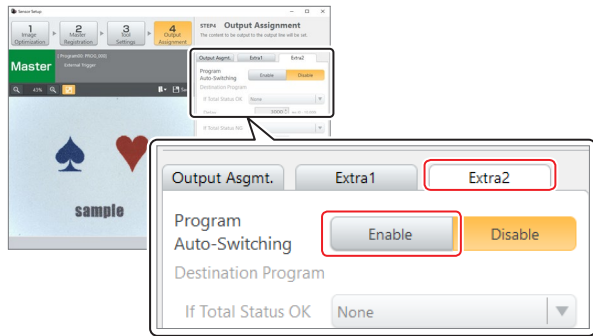
1 Set the trigger options.

Select the external trigger for program 000.
Select the internal trigger for programs 001 and 002.



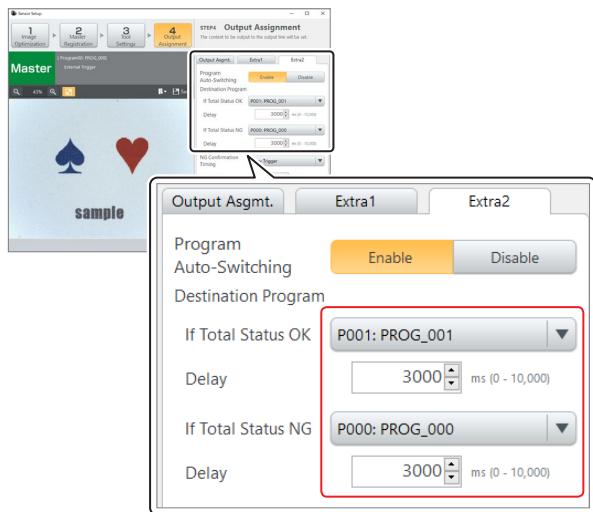
☞ "Setting the Trigger Options" (page 4-10)

2 Enable the program auto-switching by selecting the [4. Output Assignment] → [Extra2] tab.

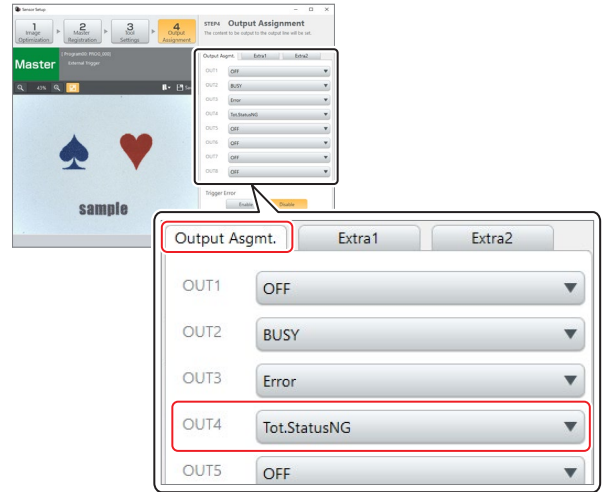


☞ "Program Auto-Switching" (page 4-152)

3 Select the program switching destination at the total status OK and program switching destination at the total status NG.



4 Select the [Output Assignment] tab, and select "Total Status NG" for OUT4.



☞ "4. Output Assignment (Setting Details of Outputting to Output Line)" (page 4-147)

5 With the same procedures, set P001 and P002 according to each program.

Point

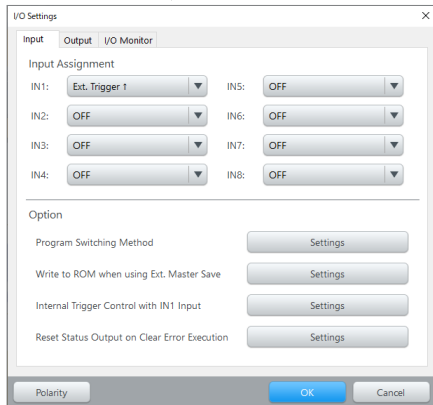
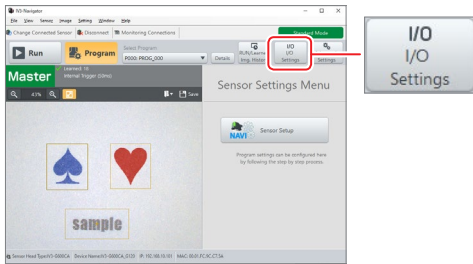
- To use program auto-switching, select "Panel/PC/Communications/Auto-Switching" as the program switching method. ☞ "Program Switching Method" (page 7-14)
- The statistical information will be reset because the program is switched.
- To use program auto-switching, change manually to the start point program before starting operation.
- The program number switched by program auto-switching will not be saved in the internal sensor ROM.
- The life-span for the operation of the focusing function (program switch count) is 100,000 times. If the focusing position does not need to be changed in each program, set [Auto Focus Adj Pos] to [Common] to extend its duration. ☞ "Auto Focus Adj Pos" (page 7-19)

Setting the Input and Output Information of the Sensor

I/O Settings

This section explains the [I/O Settings] screen displayed when [I/O Settings] on the main screen is pressed.

Point The settings for inputting and outputting for the sensor can only be changed when [I/O Settings] is pressed while on the main screen of [Program].



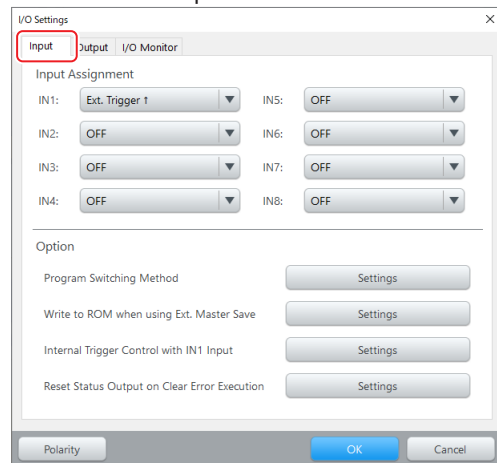
- 📖 “Input Settings” (page 7-13)
- 📖 “Output Settings” (page 7-15)
- 📖 “I/O Monitor” (page 7-17)

Input Settings

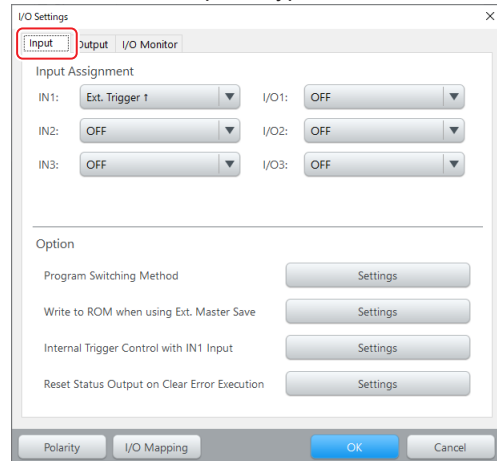
Set the input settings for the sensor.

- 1 Press [I/O Settings] in the main screen in [Program].
 - 📖 “Overview of the Screen in [Run] / [Program]” (page 5-3)
 - 📖 “I/O Settings” (page 7-13)

- 2 Press the [Input] tab and make settings. For the ultra-compact model



For the built-in amplifier type



● Input Assignment

○ IN1

Sets the detection timing of the trigger input for IN1 input line.

• Ext. Trigger ↑ (Default)

Sets the sensor so that the trigger input is received with the rising edge of the external trigger.

• Ext. Trigger ↓

Sets the sensor so that the trigger input is received with the falling edge of the external trigger.

○ IN2 to IN8 (for the ultra-compact model)

Sets the roles for input lines IN2 to IN8.

• OFF (default)

Disregards the input.

• Program Bit0 to Bit6

Specifies the number for switching programs.

📖 “Changeover for a Target (Program Functions)” (page 7-2)

• Clear Error

Used to clear error outputs.

📖 “Clearing Errors” (page 11-13)

• Ext. Master Save

Registers a new master image using the external input.

📖 “Registering the Master Image” (page 11-11)

• SD Card Save Stop

Stop data transfer to the SD card and access to the expansion programs. The SD card indicator light turns off.

📖 “Behavior When the Sensor Power is Turned On or Off” (page 11-14)

○ IN2 to IN3, I/O1 to I/O3 (for the built-in amplifier type)

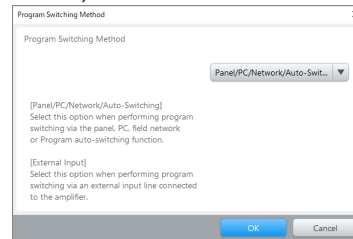
Sets the roles for input lines IN2 to IN3 or I/O1 to I/O3. The detailed setting methods are the same as those of the ultra-compact model input lines IN2 to IN8. When I/O1 to I/O3 are set to OUT (output) in the I/O mapping settings, the input lines cannot be set.

● Option

○ Program Switching Method

Sets the method for switching the program number.

📖 “Changeover for a Target (Program Functions)” (page 7-2)



• Panel/PC/Communication/Auto-Switching (Default)

The program number can be switched from the control panel, PC (IV3-Navigator), field network, DL, nonprocedural command, or program auto-switching.

• External Input

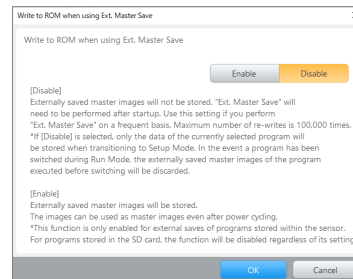
The program number can be switched using external input.

Point

If [External Input] is set, one of the program Bit0 to Bit6 must be assigned to one of IN2 to IN8 in [Input Assignment].

📖 “Input Assignment” (page 7-14)

○ Write to ROM when using Ext. Master Save



• Enable

Writes data to the ROM of the sensor when master image registration is performed using the external input or field network.

📖 “Registering the Master Image” (page 11-11)

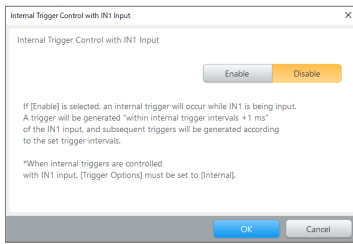
• Disable (default)

Writes only the master images of active programs selected in the settings mode to the ROM of the sensor. The other data will not be written.

Point

The target programs that write to ROM are P000 to P031.

● Internal Trigger Control with IN1 Input



• Enable

Imaging and judgment will be performed at the intervals of the internal trigger while the input to IN1 is ON.

☞ “Setting the Trigger Options” (page 4-10)

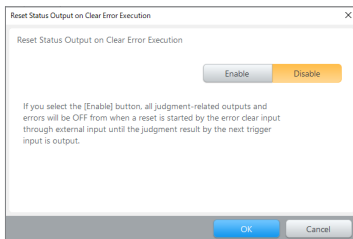
• Disable (default)

Does not control the internal trigger with input to IN1.

Point

- **[Internal Trigger Control with IN1 Input] is the common setting for all programs. It cannot be set for each program.**
- **If [Trigger Options] is set to [External Trigger], IN1 input will be accepted as an external trigger.**
- **This setting is disabled when communicating via a field network.**

● Reset Status Output on Clear Error Execution



• Enable

Resets status output when clear error is input. Judgment-related outputs and errors will be turned off until the judgment result by the next trigger input is output.

• Disable (default)

Does not reset status output when clear error is input.

Point

Judgment output cannot be reset using the Clear Error Input via the field network.

3 Press [OK].

The system returns to the main screen in [Program].

Output Settings

Set the Output Settings of the sensor.

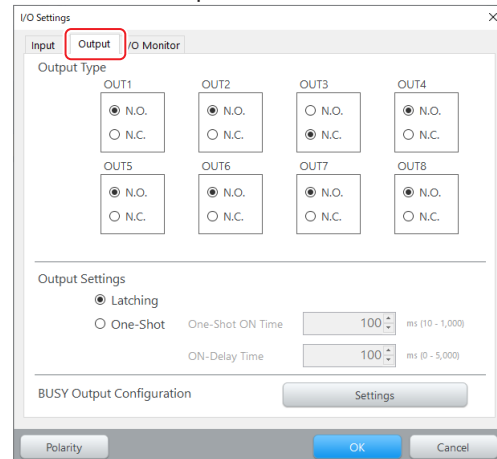
1 Press [I/O Settings] in the main screen in [Program].

☞ “Overview of the Screen in [Run] / [Program]” (page 5-3)

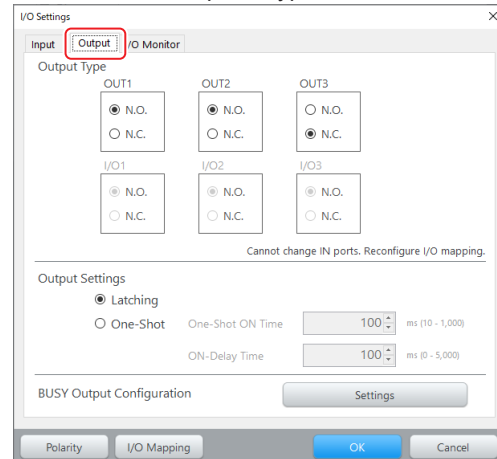
☞ “I/O Settings” (page 7-13)

2 Press the [Output] tab and make settings.

For the ultra-compact model



For the built-in amplifier type



● **Output Type (OUT1 to OUT8) (for the ultra-compact model)**

Specifies the output format of the output line with [N.O.] or [N.C.].

● **Output Type (OUT1 to OUT3, I/O1 to I/O3) (for the built-in amplifier type)**

Specifies the output format of the output line with [N.O.] or [N.C.].

When I/O1 to I/O3 are set to IN (input) in the I/O mapping settings, the output lines cannot be set.

● **Output Settings**

📖 "Changing the timing of status outputs" (page 11-7)

○ **[Latching] (default)**

Outputs the result simultaneously with the judgment condition of the sensor.

○ **[One-Shot]**

Outputs the result as a one-shot. The one-shot time and ON delay time for the one-shot output can be set.

• **One-Shot ON Time**

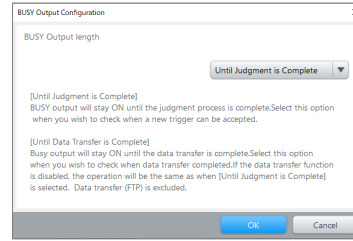
Specifies the length of time for which the one-shot will be active within 10 to 1000 ms. (Default value: 100 ms)

• **ON-Delay Time**

Specifies the delay before the one-shot turns on within 0 to 5000 ms. (Default value: 100 ms)

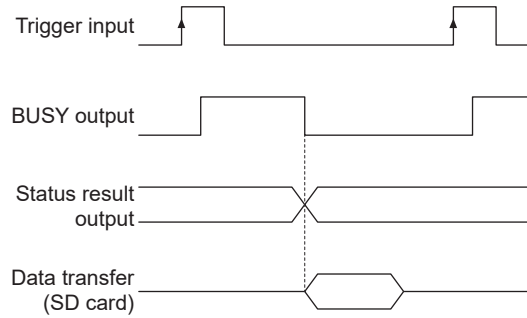
● **BUSY Output Configuration**

Sets the Busy output length.



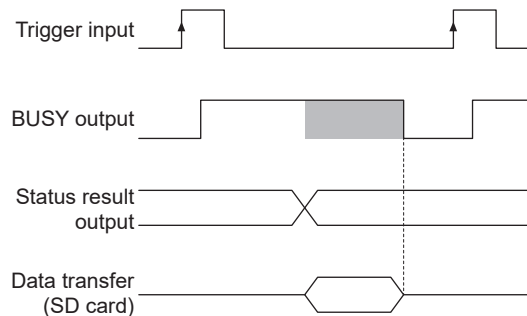
○ **Until Judgment is Complete (default)**

The BUSY output turns on when the trigger is input and turns off when the judgment results are updated.



○ **Until Data Transfer is Complete**

The BUSY output turns on when the trigger is input and turns off when data transfer is complete, after the judgment results are updated. This setting prevents a trigger input while data is being transferred when using the function to transfer data to the SD card.



This setting is not valid for data transfer (FTP). BUSY output does not turn on during FTP/SFTP data transfer.

3 Press [OK].

The system returns to the main screen in [Program].

I/O Monitor

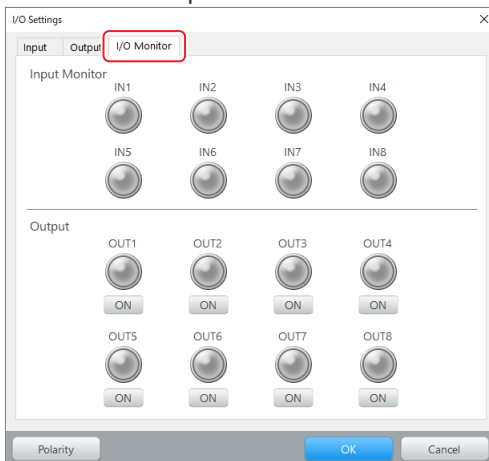
Use the I/O monitor to confirm the correct function and wiring for the I/O lines.

1 Press [I/O Settings] in the main screen in [Program].

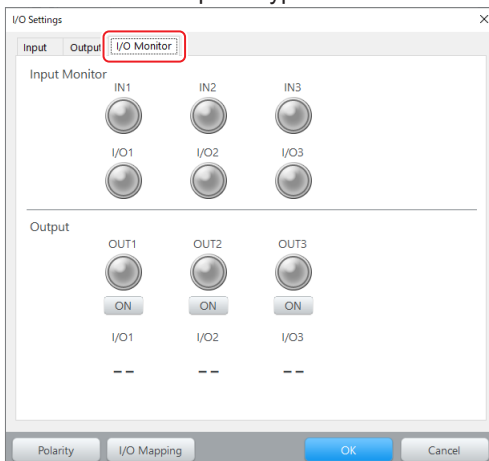
- ☐ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☐ “I/O Settings” (page 7-13)

2 Press the [I/O Monitor] tab and control the monitor.

For the ultra-compact model



For the built-in amplifier type



● Input Monitor

Displays the input status of external input in real time. Whether or not the ON/OFF output from the external input is being correctly input can be confirmed.

● Output

Press [ON] to turn ON each OUT output. Press [OFF] to turn them OFF.

Confirm that the output destination is correctly receiving the output.

3 Press [OK].

The system returns to the main screen in [Program].

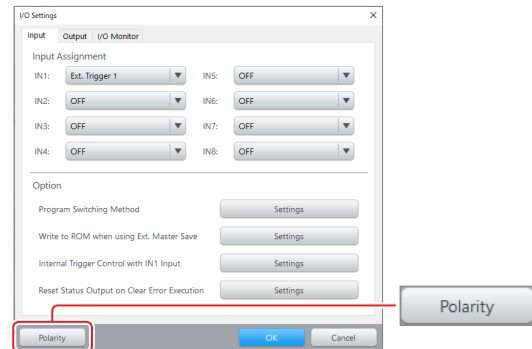
Polarity

Sets the sensor polarity.

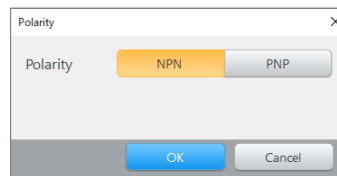
1 Press [I/O Settings] in the main screen in [Program].

- ☐ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☐ “I/O Settings” (page 7-13)

2 Press [Polarity].



3 Select [NPN] or [PNP] under Polarity.



• NPN

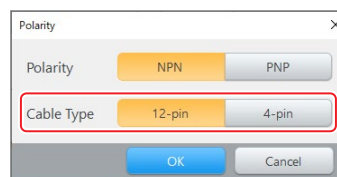
Output circuit....Photo MOS relay
Input circuit.....non-voltage input

• PNP

Output circuit....Photo MOS relay
Input circuit.....voltage input

- ☐ “Cables” (page 2-15)

4 Select [12 pin] or [4 pin] for the cable type in the case of the built-in amplifier type.



• 12pin

Select this to use a power I/O cable (OP-88654/88655 /88656).

• 4pin

Select this to use a conversion connector for the power I/O cable (OP-88631/88632).

- ☐ “Cables” (page 2-15)

5 Press [OK].

If the polarity is switched, the confirmation dialog opens.

6 Press [OK].

Returns to the [I/O Settings] screen.

7 Press [OK].

The system returns to the main screen in [Program].

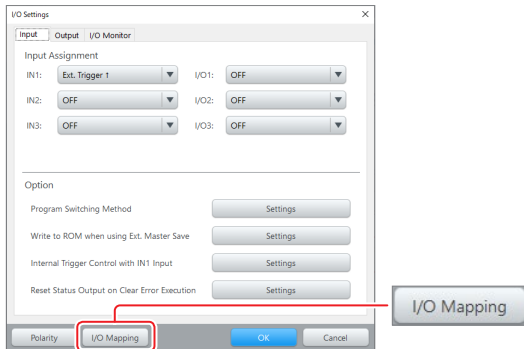
I/O Mapping (Built-In Amplifier Type)

Sets whether to use IN or OUT for ports where input and output can be switched (I/O ports).

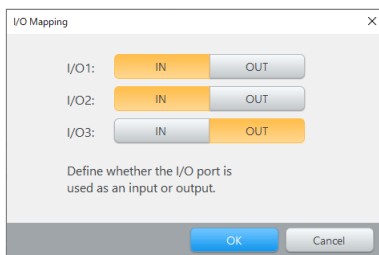
1 Press [I/O Settings] in the main screen in [Program].

- ☐ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☐ “I/O Settings” (page 7-13)

2 Press [I/O Mapping].



3 Set the I/O ports.



- **IN**
The corresponding I/O port can be used as an input (IN) port.
- **OUT**
The corresponding I/O port can be used as an output (OUT) port.

Point When changing IN/OUT, the input settings, output settings, and I/O monitor settings will be influenced. Check each setting again after it is changed.

4 Press [OK].

If the I/O port settings are switched, the confirmation screen opens.

5 Press [OK].

Returns to the [I/O Settings] screen.

6 Press [OK].

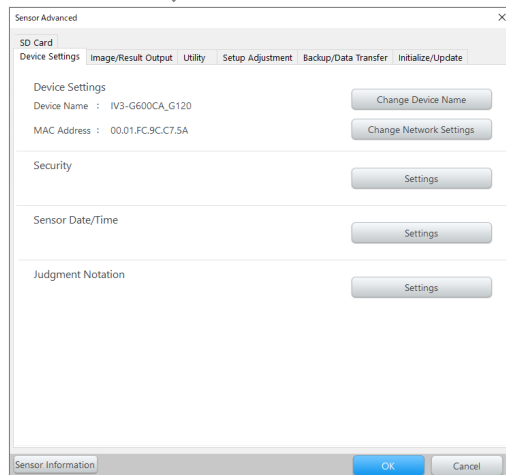
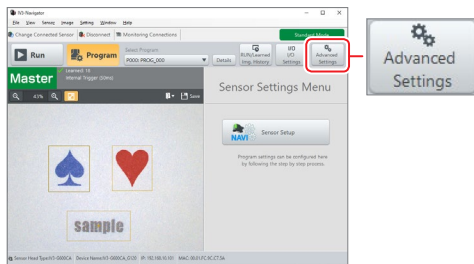
The system returns to the main screen in [Program].

Setting the Advanced Information of the Sensor

Sensor Advanced Settings

This section explains the [Sensor Advanced] screen displayed when [Advanced Settings] on the main screen is pressed.

Point The advanced settings of the sensor can only be changed when [Advanced Settings] is pressed in the main screen in [Program].



[Device Settings] tab

● Device Settings

Sets a sensor name and changes the network settings.

☞ "Device Settings" (page 7-21)

● Security

Sets the password lock setting.

☞ "Security" (page 7-22)

● Sensor Date/Time

Confirms or changes the time set in the sensor.

☞ "Sensor Date/Time" (page 7-23)

● Judgment Notation

Sets the notation (OK/NG) of the status results to a user-defined notation.

☞ "Judgment Notation Settings" (page 7-23)

[Image/Result Output] tab

● Output Destination

Sets the SD card data transfer function or FTP/SFTP client function settings for the sensor.

☞ "Transferring Judgment Results or Judged Images to the SD Card" (page 8-13)

☞ "Saving Judgment Results and Judged Images to an FTP/SFTP Server" (page 9-2)

[Utility] tab

● FieldNet/Comm. Unit (DL)

Sets the field network settings for the sensor and the settings for when the system is connected to the (DL series) communication unit.

☞ "Connecting to a Field Network" (page 9-10)

● High-Speed Program Switching

Selects the programs to be used for high-speed program switching.

☞ "High-Speed Program Switching" (page 7-24)

● SD Card Settings Backup

Automatically backs up the sensor settings to an SD card when the sensor settings are changed.

☞ "Automatically Back Up/Restore the Settings on the SD Card" (page 8-20)

[Setup Adjustment] tab

● White Balance (for color type only)

Adjusts the white balance of the image displayed on the screen.

☞ "White Balance (for Color Type Only)" (page 7-24)

● Image Display Direction

Rotates the screen display 180°.

☞ "Image Display Direction" (page 7-25)

● Auto Focus Adj Pos

Sets whether or not to make the adjustment position for the auto focus common to all programs.

☞ "Auto Focus Adj Pos" (page 7-26)

[Backup/Data Transfer] tab

● **Batch Backup**

Saves the settings data or image history saved in the sensor to the PC.

📖 “Backing up in a Batch” (page 8-3)

● **Individ. Program Backup**

Save the setting data saved in the sensor into the PC for each individual program. The image history can also be saved.

📖 “Backing up the Program Individually” (page 8-4)

● **Transfer Batch Backup**

Transfers all settings data saved in the PC to the sensor.

📖 “Transferring the Backed up Settings to the Sensor” (page 8-6)

● **Transfer Individ. Backup**

Transfers each individual program settings data saved in the PC to the sensor.

📖 “Transferring the Backed up Settings to the Sensor” (page 8-6)

[Initialize/Update] tab

● **Initialize Sensor**

Initializes the information set in the sensor.

📖 “Initializing the Sensor” (page 3-12)

● **Update Sensor**

Updates the operation software of the sensor.

For details, refer to KEYENCE homepage.

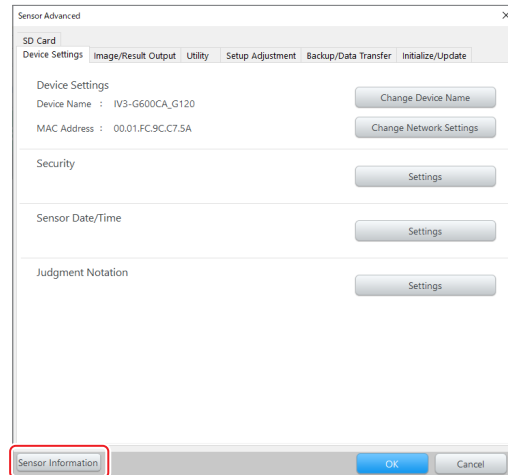
URL: www.keyence.com/glb

[SD Card] tab

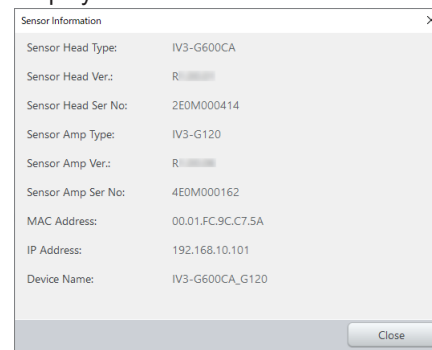
Configure the SD card data settings.

📖 “Setting up the SD Card” (page 8-9)

[Sensor Information] button



Displays the information set in the sensor.



Device Settings

Setting a Device Name

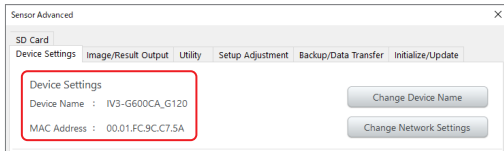
1 Press [Advanced Settings] in the main screen in [Program].

“Overview of the Screen in [Run] / [Program]” (page 5-3)

“Sensor Advanced Settings” (page 7-19)

2 Select the [Device Settings] tab.

3 Set the environment settings of the sensor.



● Device Name

Displays the sensor name.

To change the sensor name, press [Change Device Name] and input a user-defined name in the Device Name screen.

The sensor can be arbitrarily named and controlled.

Point If the display language (Page 7-30) is changed, the device name might be replaced and displayed as hyphens (-).

● MAC Address

Displays the MAC address of the sensor.

The MAC address cannot be changed.

4 When setting is completed, press [OK].

The system returns to the main screen in [Program].

Changing the Network Settings

Point

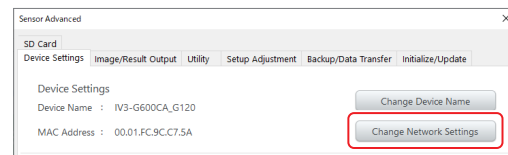
- How to use the network setting
 - The IP address of the connected sensor can be changed.
 - The network settings of the sensor can be initialized.
- The settings can also be initialized using the IP reset switch (Page A-23) of the sensor.

1 Press [Advanced Settings] in the main screen in [Program].

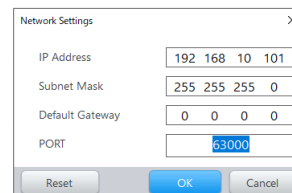
“Overview of the Screen in [Run] / [Program]” (page 5-3)

“Sensor Advanced Settings” (page 7-19)

2 Select the [Device Settings] tab and press [Change Network Settings].



3 Set the network address of the sensor.



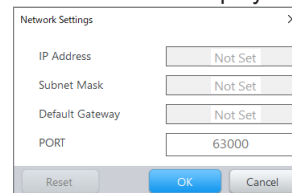
● IP Address/Subnet Mask/Default Gateway/PORT

Displays the address for each network and port number. Set the desired address and port number, and press [OK].

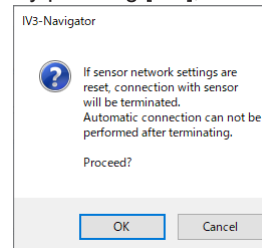
● [Reset] button

By pressing [Reset], resets the IP Address / Subnet Mask / Default Gateway.

“Not Set” will be displayed after the reset.



By pressing [OK], the confirmation dialog appears.



By pressing [OK], the network settings will reset and the system returns to the Activation Menu screen.

4 Press [OK].

The connection to the sensor will be disconnected and reconnected. If reconnection is successful, the main screen of [Program] will be displayed. If reconnection fails, the [Activation Menu] screen opens.

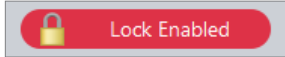
Security

Sets a password on the sensor to prevent incorrect operation.

Two levels of security authorizations (supervisor password and operator password) can be set.

● Enable the security

Display the main screen in [Run]. The “Lock Enabled” message appears in the lower right of the screen.



In the main screen in [Run], the following operation can be locked, and it can be unlocked using passwords according to their authorizations.

Operation that can be unlocked using an operator password

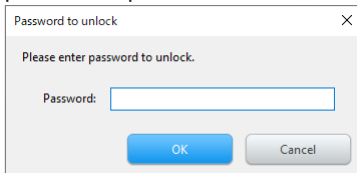
- Manual Trigger Button
- Image Additional Learning
- Limit Adjustment
- Reset Statistics
- Clear NG HOLD
- Stop logging when opening running history display
- Display the learning history

Operation that can be unlocked using a supervisor password

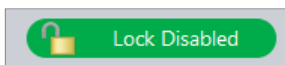
- Operation that can be unlocked using a user password
- Transition to the main screen in [Program]
- Clearing NG Count on the list of NG occurrences
- Connection with the sensor where the security is enabled
- Transferring program settings

● Unlock the security

Input the password when the input dialog for the password opens.



The “Lock Disabled” message appears in the lower right of the screen.



If the security is unlocked, operation will be locked again by pressing [Lock Disabled] on the status bar on the bottom of the screen. After 60 seconds passes without performing any of the above locked operations, the sensor will return to a locked state.

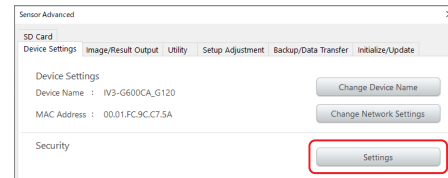
If the security is unlocked and the sensor is returned to the main screen in [Program], the password lock will be disabled until the sensor returns to the main screen in [Run].

Setting the Password

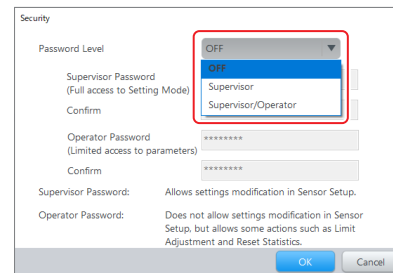
1 Press [Advanced Settings] in the main screen in [Program].

- ☞ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☞ “Sensor Advanced Settings” (page 7-19)

2 Select the [Device Settings] tab and press [Settings] of [Security].



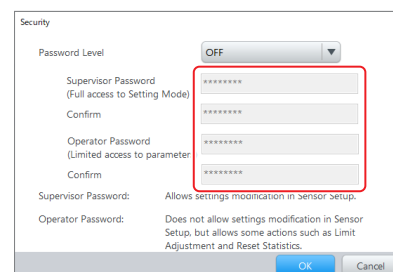
3 Select a target for enabling a password.



- **OFF**
Disables all passwords.
- **Supervisor**
Enables the supervisor password. The settings can be changed in the settings mode using the supervisor password.
- **Supervisor/Operator**
Enables both the supervisor password and operator password. Although the threshold changing and statistics reset and others in operation are available when the operator password is used, the settings cannot be changed in the settings mode.

4 Input a user-defined password.

- Input a password into the [Supervisor Password] and the [Confirmation] fields.
- Input a password into the [Operator Password] and the [Confirmation] fields.
- Up to 8 characters can be set.
- Default: None (blank)



Reference The password will always be displayed as "*****", regardless of the characters entered.

5 Press [OK].

The system returns to the main screen in [Program].

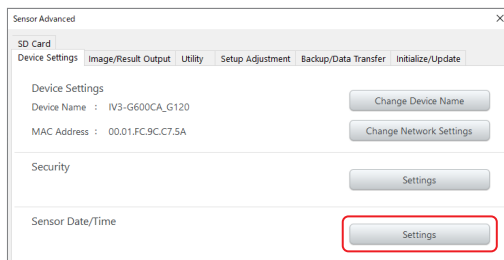
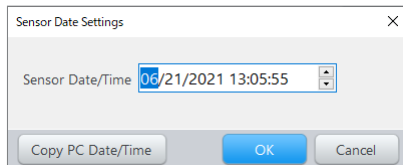


- After setting a password and displaying the run screen, the security becomes enabled.
- To disable the security, select [OFF] of [Password Level] in step 3.

Sensor Date/Time**1 Press [Advanced Settings] in the main screen in [Program].**

“Overview of the Screen in [Run] / [Program]” (page 5-3)

“Sensor Advanced Settings” (page 7-19)

2 Select the [Device Settings] tab and press [Settings] of [Sensor Date/Time].**3 Set the sensor date settings.**

When pressing [Copy PC Date/Time], the PC date and time can be copied.

4 Press [OK].

The system returns to the [Sensor Advanced] screen.

5 Press [OK].

The system returns to the main screen in [Program].

Judgment Notation Settings

Sets the notation (OK/NG) of the total status results on the run screen to a user-defined notation.



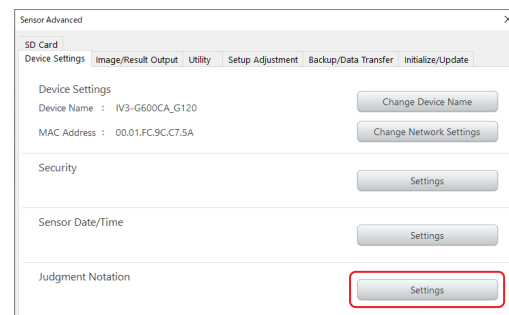
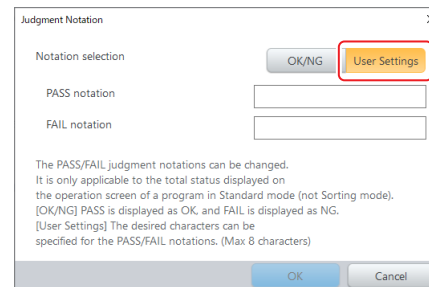
Point

- Only the characters for the total status results on the run screen can be changed. This setting will not be applied to other screens or output information.
- This setting will not be applied to sorting mode.

1 Press [Advanced Settings] in the main screen in [Program].

“Overview of the Screen in [Run] / [Program]” (page 5-3)

“Sensor Advanced Settings” (page 7-19)

2 Select the [Device Settings] tab and press [Settings] of [Judgment Notation].**3 Select the [User Settings] button, and set arbitrary notations to [PASS notation] and [FAIL notation].****● Notation selection****○ OK/NG**

[OK] is displayed if the total status result is good and [NG] if it is bad.

○ User Settings

Any desired character string can be set.

(Up to 8 one-byte alphanumeric characters)

If user settings were selected, input character strings for both good and bad products.

4 Press [OK].

The system returns to the [Sensor Advanced] screen.

5 Press [OK].

The system returns to the main screen in [Program].

High-Speed Program Switching

Selects the programs to be used for high-speed program switching.

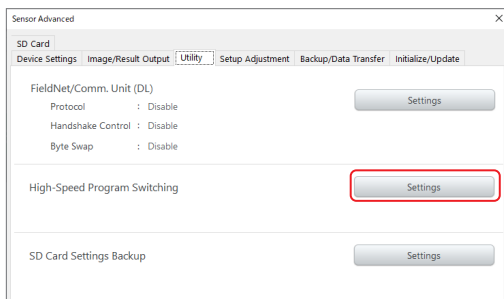
By reading to retain the setting contents of the target program, switching between the target programs can be performed at high speed.

- The approximate time to switch to the target program is within 100 ms (The time for focus adjustment is not included).
- By setting high-speed program switching, additional processing time will be required when the sensor starts and when settings are changed (it may take several tens of seconds).

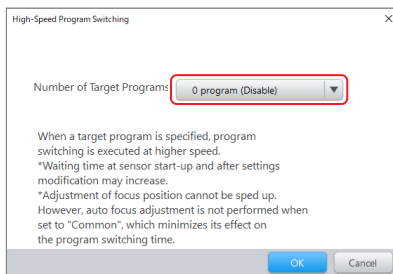
1 Press [Advanced Settings] in the main screen in [Program].

- ☐ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☐ “Sensor Advanced Settings” (page 7-19)

2 Select the [Utility] tab and press [Settings] of [High-Speed Program Switching].



3 Select the number of target programs from [Number of Target Programs], and then press [OK].



0 Program (Disable)	High-speed program switching disabled
2. Program (P000 to P001)	High-speed switching enabled, only for two programs of P000 to P001
4. Program (P000 to P003)	High-speed switching enabled, only for four programs of P000 to P003
8. Program (P000 to P007)	High-speed switching enabled, only for eight programs of P000 to P007

A progress bar will be displayed while preparing high-speed program switching.

White Balance (for Color Type Only)

Adjusts the white balance (color tint) of the built-in camera of the sensor.

Reference The white balance is adjusted by default.

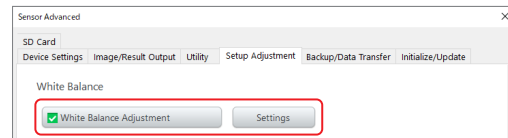
Point When using the AI Lighting unit or polarizing filter, perform the white balance with the attachment mounted.

1 Press [Advanced Settings] in the main screen in [Program].

- ☐ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☐ “Sensor Advanced Settings” (page 7-19)

2 Select the [Setup Adjustment] tab.

3 Place the check mark ON for the [White Balance Adjustment] check box and press [Settings].



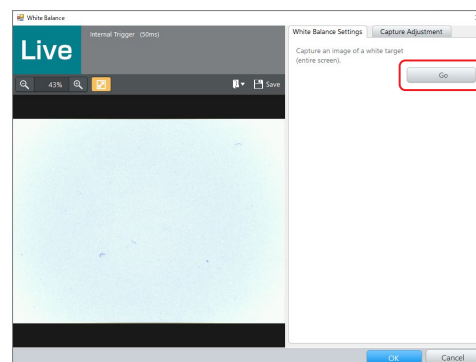
4 Image a white-colored target and press [Go].

Point If the displayed taken image is not suitable for adjusting the white balance, press the [Capture Adjustment] tab to adjust the taken image.

If the white balance setting has been set to [Enable], the image will be displayed with the white balance adjustment applied.

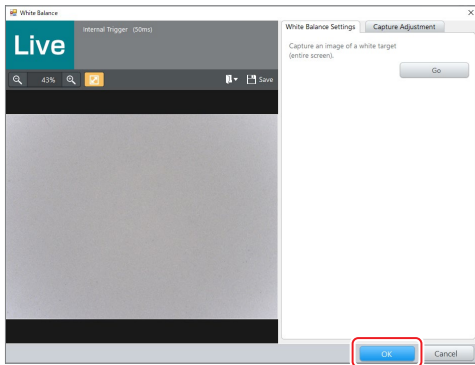
The following adjustments can be made.

- ☐ “Brightness/Focus Adjustment” (page 4-12)
- ☐ “Setting the lighting conditions” (page 4-15)
- ☐ “Setting the lighting mode for the light” (page 4-19)
- ☐ “Setting the digital zoom” (page 4-17)



When adjustment is completed, the message, “White balance adjustment has been completed.” opens.

5 Press [OK].



The system returns to the [Sensor Advanced] screen.

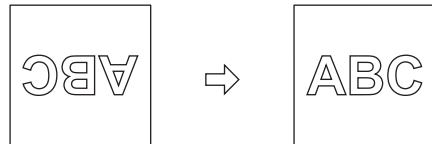
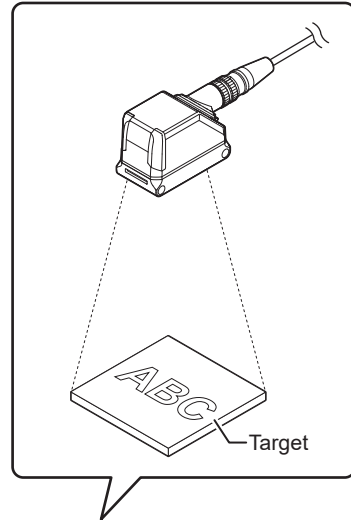
6 Press [OK].

The system returns to the main screen in [Program].

Point After changing the white balance, a message prompting you to re-register the master image opens. Press [OK] and then re-register the master image.
 “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

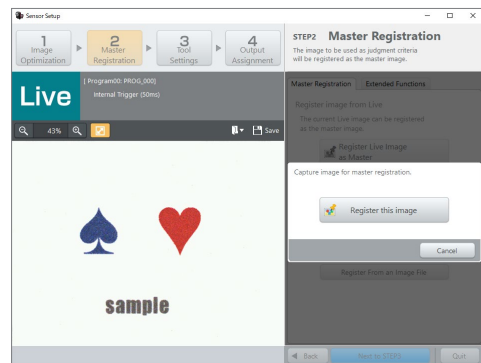
Image Display Direction

Due to the installation restrictions of the sensor or the target, the image may be rotated. The image can be rotated by 180 degrees using [Image Display Direction].

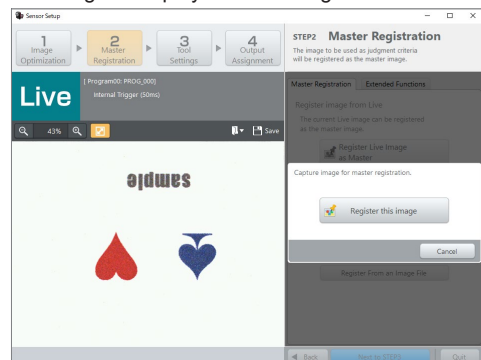


Before 180° rotation

After 180° rotation



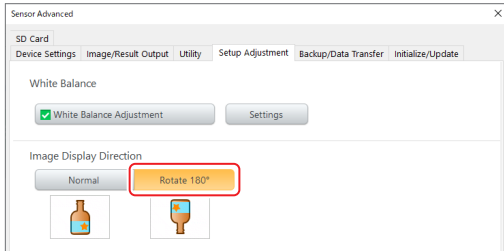
The image is displayed after being rotated 180°.



1 Press [Advanced Settings] in the main screen in [Program].

- ☰ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☰ “Sensor Advanced Settings” (page 7-19)

2 Select the [Setup Adjustment] tab and press [Rotate 180°].



- Point** If [Image Display Direction] was changed, a message prompting the re-registration of the master image opens. Press [OK] and then re-register the master image.
 - ☰ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

3 Press [OK].

The system returns to the main screen in [Program].

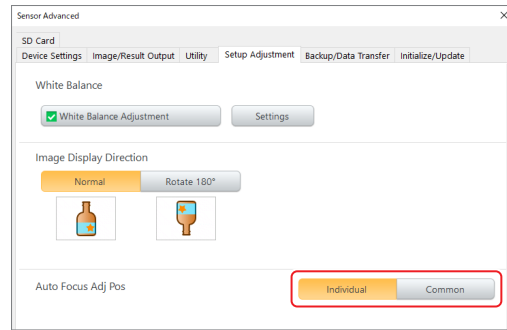
Auto Focus Adj Pos

Sets whether or not to make the adjustment position for the auto focus common to all programs.

1 Press [Advanced Settings] in the main screen in [Program].

- ☰ “Overview of the Screen in [Run] / [Program]” (page 5-3)
- ☰ “Sensor Advanced Settings” (page 7-19)

2 Select the [Setup Adjustment] tab, and set [Auto Focus Adj Pos].



Individual

Sets the focus adjustment position in each program. Select this when the focus position is different for each target registered in each program. Re-adjusts the focusing position when the program number is switched. Switching programs takes longer with this option due to the time needed to adjust the focusing position.

Common

Sets the focus adjustment position common to all programs. Select this when the focus position of the target registered in each program is the same. The program can be quickly switched because re-adjustment of the focusing position will not be performed when the program number is switched.

NOTICE	<p>The life-span for the operation of the focusing function (program switch count) is 100,000 times. If the focusing position does not need to be changed in each program, set [Auto Focus Adj Pos] to [Common] to extend its duration.</p>
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3 When setting is completed, press [OK].

The system returns to the main screen in [Program].

- Point** When [Auto Focus Adj Pos] is changed, a message recommending re-registration of the master image opens. Press [OK] and then re-register the master image.
 - ☰ “2. Master Image Registration (Registering an Image as a Reference)” (page 4-20)

Operating from the Menu Bar

[File] Menu

Batch Backup

Backs up the data saved in the sensor to the PC in a batch.

📖 "Backing up in a Batch" (page 8-3)

Individual Program Backup

Backs up the setting data saved in the sensor into the PC individually for each program.

📖 "Backing up the Program Individually" (page 8-4)

Transfer Batch Backup

Transfers the setting data (batch backup file) saved in the PC to the sensor.

📖 "Transfer in a Batch" (page 8-6)

Transfer Individ. Backup

Transfers the settings data saved in the PC to the sensor for each individual program.

📖 "Transferring the program individually" (page 8-7)

SD Card

Check Capacity

Checks the SD card capacity.

📖 "SD Card Capacity" (page 8-10)

Remove

Removes the SD card.

📖 "Removing the SD card" (page 8-10)

Export

Save Program Settings List

Outputs the information set as sensor in the Tab delimited text.

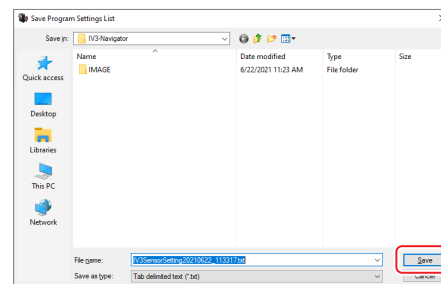
1 Display the main screen in [Program].

📖 "Overview of the Screen in [Run] / [Program]" (page 5-3)

2 Select [File] → [Export] → [Save Program Settings List] from the menu bar.

The Program Settings List screen opens.

3 Press [Save].



Reference Change the save destination of the file and file name as needed.

The save completion message opens.

4 Press [OK].

The system returns to the main screen in [Program].

Reference The example for displaying the saved Program settings list file with Microsoft Excel is below.

	A	B	
1	[Model Information]		
2	Sensor Head Model	IV3-G600CA	
3	Sensor Amp Model	IV3-G120	
4			
5	[Program]		
6	Current Program		4
7			
8	[RunningImage History]		
9	Logging Settings	All	
10			
11	[I/O Settings]		
12	Input	Input Assignment (IN1-IN8)	Ext. Tr
13	Input	Write to ROM when using Ext. Master Save	No
14	Input	Enable program switching through external input	No
15	Input	Enable Internal Trigger Control with IN1 Input	No

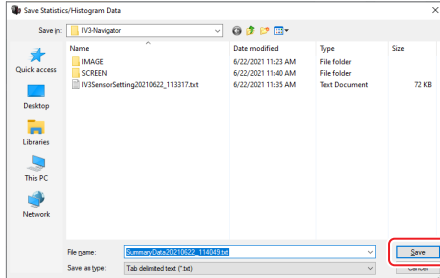
Save Statistics/Histogram Data

Outputs the statistical information and histogram information as tab-delimited text.

1 Select [File] → [Export] → [Save Statistics/Histogram Data] from the menu bar.

The Save Statistics/Histogram Data screen opens.

2 Press [Save].



Reference Change the save destination of the file and file name as needed.

The save completion message opens.

3 Press [OK].

The system returns to the main screen in [Run] or [Program].

Reference The example for displaying the saved Statistics/histogram data file with Microsoft Excel is below.

	A	B	C	D	E	F	G	H
1	Statistical Information	TIME	Max	Min	Ave			
2	Statistical Information	TIME		74	26	55		
3	Statistical Information	Trigger	Trigger No.	OK	NG	TrigErrorNo		
4	Statistical Information	Trigger		1,702	1,058	644	1,062	
5								
6	Histogram	Tool00:Pos. Adj.	Limit	OK	NG			
7	Histogram	Tool00:Pos. Adj.		50	1,059	643		
8	Histogram	Tool00:Pos. Adj.	Match	0	1	2	3	4
9	Histogram	Tool00:Pos. Adj.	Judgment Count	537	0	0	0	0
10	Histogram	Tool01:Learn	Limit	OK	NG			
11	Histogram	Tool01:Learn		50	1,059	0		
12	Histogram	Tool01:Learn	Match	0	1	2	3	4
13	Histogram	Tool01:Learn	Judgment Count	0	0	0	0	0
14	Histogram	Tool02:Learn	Limit	OK	NG			
15	Histogram	Tool02:Learn		50	1,058	1		

[View] Menu

Statistical Information

Controls whether to display or hide the statistical information.

📖 “Statistical Information Display” (page 5-9)

Tool Information

Controls whether to display or hide the tool data.

📖 “Tool Information Display” (page 5-10)

Sensor List

Controls whether to display or hide the sensor list.

📖 “Displaying the sensor list” (page 3-17)

Additional Learning from File

📖 “Additional Learning from Files Saved in the PC” (page 6-13)

Exit

Exits the IV3-Navigator.

1 Select [File] → [Exit] from the menu bar.

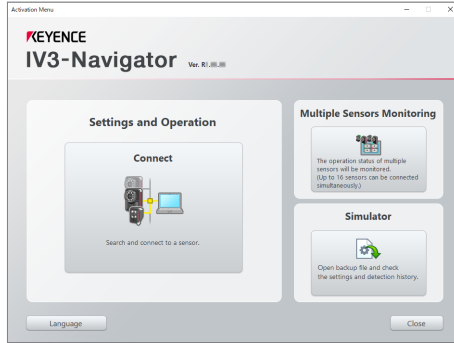
The IV3-Navigator exits.

[Sensor] menu**Disconnect**

Disconnects the connection between the sensor and PC, and displays the connection menu screen.

- 1 Select **[Sensor]** → **[Disconnect]** from the menu bar.

The system returns to the Activation Menu screen.

**Reset Statistics**

Resets the statistical information and histograms.

- 1 Display the main screen in **[Run]**.
- 2 Select **[Sensor]** → **[Reset Statistics]** from the menu bar.

The confirmation screen opens.

- 3 Press **[Yes]**.

The statistical information and histograms will be reset.

Initialize Sensor

Initializes the information set in the sensor and sets it to the factory default.

📖 "Initializing the Sensor" (page 3-12)

Update Sensor

Updates the operation software of the sensor. For details, refer to KEYENCE homepage.

URL: www.keyence.com/glb

[Image] Menu**Zoom****Reduce (Zoom Out)**

Reduces the image displayed on the IV3-Navigator. Select **[Image]** → **[Zoom]** → **[Reduce (Zoom Out)]** from the menu bar. The image will be reduced with each selection.

📖 Reference The image can be reduced to a minimum size of 25%.

Enlarge (Zoom In)

Magnifies the image displayed on the IV3-Navigator. Select **[Image]** → **[Zoom]** → **[Enlarge (Zoom In)]** from the menu bar. The image will be magnified with each selection.

📖 Reference The image can be magnified to a maximum size of 250%.

Fit Window

Fits the image displayed on the IV3-Navigator to the screen size and displays it.

Select **[Image]** → **[Zoom]** → **[Fit Window]** from the menu bar.

Display Tools

Switches the display method for the tools.

Select **[Image]** → **[Display Tools]** from the menu bar and select a display method.

Selectable display methods are as follows.

OFF/Window/Process

For details of each display method, refer to 📖 "Tool Information Display" (page 5-10).

Manual Trigger

Issues a trigger one time for each selection of **[Image]** → **[Manual Trigger]** from the menu bar. This button is used when the external trigger cannot be input.

Enabled when **[External Trigger]** is selected or **[Enable Internal Trigger Control with IN1 Input Input]** is set to **[Enable]**.

Capture

■ Save Image

Saves a bmp format file of the captured image and an iv3p format file which can be used for master image registration or additional learning at the same time. A screen capture of the IV3-Navigator screen will also be saved at the same time. Select [Image] → [Capture] → [Save Image] from the menu bar.

■ Show saved image file location

Opens the save destination folder for the captured image. Select [Image] → [Capture] → [Show saved image file location] from the menu bar.

■ Change saved image file location


Opens the reference screen for the folder and changes the save destination for the captured image.

- 1 Select [Image] → [Capture] → [Change saved image file location] from the menu bar.
- 2 In the reference screen of the folder, select a user-defined folder and press [OK].


[Setting] Menu

Manual Trigger Button


When [External Trigger] is selected or [Enable Internal Trigger Control with IN1 Input Input] is set to [Enable], use this setting to show/hide the [Manual Trigger] button. Select [Setting] → [Manual Trigger Button] from the menu bar and select [Show]/[Hide].

 **When an internal trigger is set, the Manual trigger button will not be displayed.**

NG Hold Function

Switch to enable/disable NG Hold function. Select [Setting] → [NG Hold Function] from the menu bar, and select [Disable]/[Enable].
 "Holding the Image of the Sensor on which NG Occurred (NG Hold Function)" (page 5-16)

List of NG Sensor Occurrences

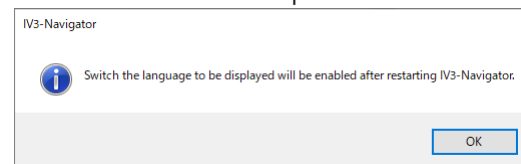
Displays the list screen of NG Sensor Occurrences. Select [Setting] → [List of NG Sensor Occurrences] from the menu bar.
 "Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences)" (page 5-13)


Language

Switches the display language of the IV3-Navigator.

- 1 Select [Setting] → [Language] from the menu bar and select the desired language.

The confirmation screen opens.



- 2 Press [OK].
- 3 Exits the IV3-Navigator.
 "Exit" (page 7-28)
- 4 Start the IV3-Navigator again.

The display language of the IV3-Navigator will be switched to the language selected in step 1.

[Window] Menu**Program Details**

Displays the Program Details screen.
 Select [Window] → [Program Details] from the menu bar.
 ☰ “Operations that can be performed with the program functions” (page 7-2)

Running Image History

Display the running image history screen.
 Select [Window] → [Running Image History] from the menu bar.
 ☰ “Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-17)

I/O Settings

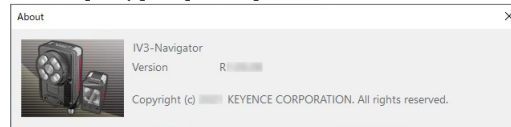
Displays the I/O Settings screen.
 Select [Window] → [I/O Settings] from the menu bar.
 ☰ “Setting the Input and Output Information of the Sensor” (page 7-13)

Sensor Advanced

Displays the sensor advanced settings screen.
 Select [Window] → [Sensor Advanced] from the menu bar.
 ☰ “Setting the Advanced Information of the Sensor” (page 7-19)

[Help] Menu**About**

Displays the version information of the IV3-Navigator.
 Select [Help] → [About] from the menu bar.





Converting IV3P Data to BMP Data Using the IV3P-Converter

IV3P-Converter is a software for transferring images from the IV3P format, which have been saved individually in the image history or saved by the FTP/SFTP client function, to the BMP format.

The operating method used to display files is generally the same as the operating method used for the explorer in the Windows operating system.

Installing the IV3P-Converter

When the IV3-Navigator is installed on the PC, the IV3P-Converter is installed simultaneously. Therefore, there is no need to install the IV3P-Converter separately.

-  For the details of the IV3-Navigator installing procedure, refer to  "Installing IV3-Navigator (IV3-H1)" (page 2-22).
- When you install the IV3-Navigator, the shortcut icon of the IV3P-Converter is also created on the PC desktop.

Starting up the IV3P-Converter

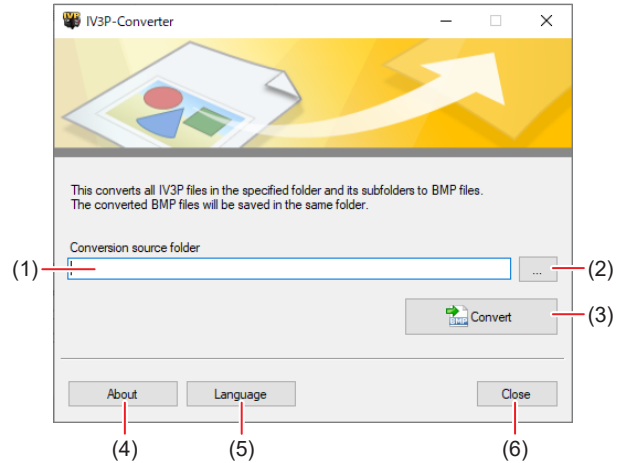
- 1** Double-click the [IV3P-Converter] icon on the desktop.



The IV3P-Converter starts.

Main screen of the IV3P-Converter

This section explains the main screen of the IV3P-Converter.

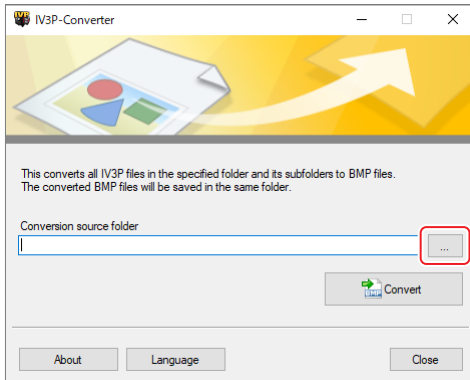


- (1) Conversion source folder**
Specifies the folder where the IV3P data to be converted is stored.
- (2) [...] button**
Opens the folder menu to specify the conversion source folder.
- (3) [Convert] button**
Converts all of the IV3P data that is stored in the folder specified at the conversion source folder and its subfolders to BMP data.
- (4) [About] button**
Displays the About IVP-Converter screen.
- (5) [Language] button**
Displays the language selection screen. The display language can be changed to the desired language.
- (6) [Close] button**
Exits the IV3P-Converter.

Converting IV3P data to BMP data

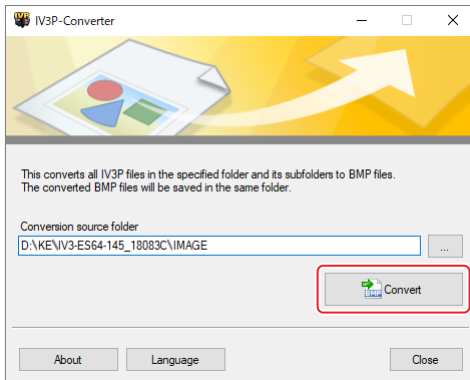
Saves IV3P data as BMP data, which can be opened in other applications.

1 By pressing [...], specifies the folder where the IV3P data to be converted is stored.



All of the IV3P data that is stored in the specified folder and its subfolders are the conversion targets.

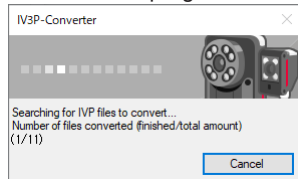
2 Press [Convert] to execute BMP conversion.



BMP data is saved in the conversion source folder.

Reference

- The BMP data is saved in the same folder as the pre-converted IV3P files.
- During the conversion, the following screen is displayed and the total amount of IV3P data and conversion progress can be confirmed.



Point

- **If there are BMP files with the same names, they will be over written.**
- **Up to 100,000 files of IV3P data can be converted at a time.**

MEMO

8

Saving Settings and Images, SD Card

This section explains how to save the sensor setup or image files, and how to set the SD card.

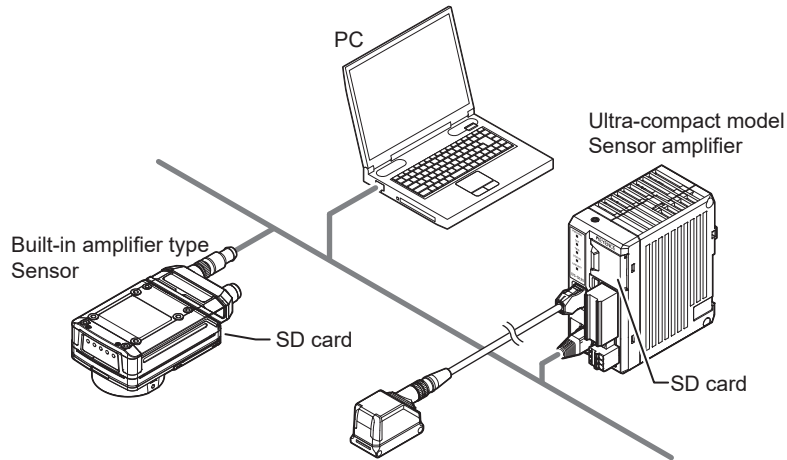
Saving Settings and Images, SD Card.....	8-2
Saving the Sensor Settings and Images	8-3
Setting up the SD Card	8-9
Transferring Judgment Results or Judged Images to the SD Card.....	8-13
Automatically Back Up/Restore the Settings on the SD Card	8-20



Saving Settings and Images, SD Card

This device can use external media (SD card).

An SD card can be used by inserting it into the sensor for the built-in amplifier type, and into the sensor amplifier for the ultra-compact model.



Available function

Available function with PC

What can be performed		Function	Ref.
Saving device settings on PC	All	Batch Backup	8-3
	Individual programs	Individual Program Backup	8-4
Saving device running image history on PC	All	Batch Backup	8-3
	Individual programs	Individual Program Backup	8-4
Importing settings backed up on PC (all programs in a batch) to the device		Transfer Program Settings	8-13
Importing individual programs from setting files backed up on PC to the device		Program Details Function	7-8
Capturing an image of the PC screen for saving		Screen Capture Function	8-5
Capturing images shot by the sensor for saving		Screen Capture Function	8-5
Using images saved on PC to set up the device	Additional Learning (learning tool)	Additional Learning	6-2
	Master Registration	Master Registration	4-20
	Color Extraction	Color Area tool Blob count tool	4-57 4-118
Updating operating software		Update Sensor	7-29

SD card

What can be performed	Function	Ref.
Transferring image data and status results to external media	Data Transfer (SD card)	8-13
Increasing the number of programs to be changed over (Expanding the number of programs to 128)	Transfer Program Function	8-11
Automatically back up the settings for this device	Automatically back up/restore the settings on the SD card	8-20
Use the settings automatically backed up for restoration		

Saving the Sensor Settings and Images

Backs up the data saved in the sensor, transfers the setting data, and captures an image.

Saving the Sensor Settings or the Image History

Backing up in a Batch

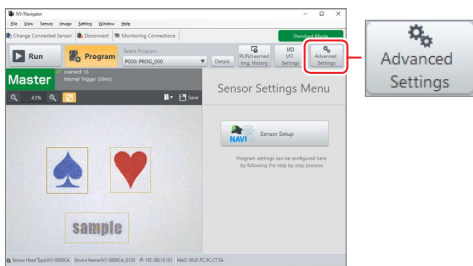
Backs up the data saved in the sensor to the PC in a batch. When multiple sensors are to be used, the settings can be copied based on the batch backup data.

- Point**
 - It is recommended to perform a batch backup of the data saved in the sensor in case of malfunction of the product.
 - The saving time increases when this is performed in [Run]. Execution while in the [Program] mode is recommended.
 - If [SD Card Access] is set to [Enable], the program data saved on the SD card is also backed up.

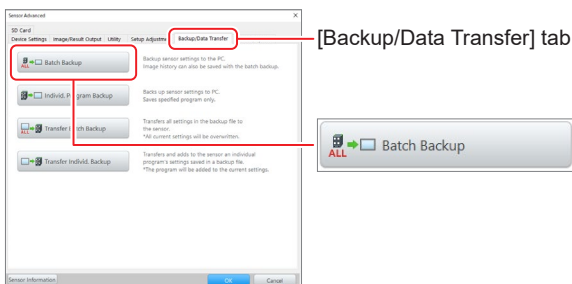
1 Display the main screen in [Run] or [Program].

“Overview of the Screen in [Run] / [Program]” (page 5-3)

2 Press [Advanced Settings].

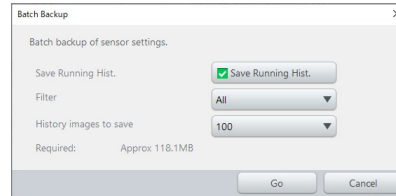


3 Select the [Backup/Data Transfer] tab and press [Batch Backup].



The Batch Backup screen opens.

4 Configure the Batch Backup settings.



● Save Running Hist.

To back up all the images of the image history in addition to the sensor settings (Sensor Setup (Settings Navigator) and advanced settings of all programs), place a check mark ON in the [Save Running Hist.] check box.

● Filter

This setting can be set when [Save Running Hist.] is ON. [All] or [NG Only] can be selected for the running image history to be saved.

● History images to save

The maximum number of the image histories to be saved is 100. It can be selected from 20/50/100.

● Required

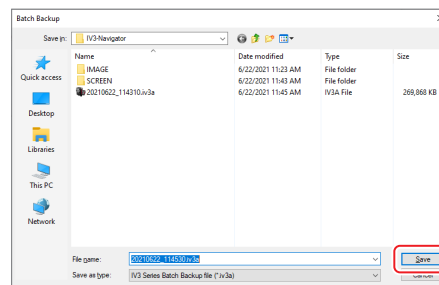
Displays the expected size of the backup file.

5 Press [Go].

- Point** When the running image history has been saved while in [Run], the images saved object may be updated and deleted during the batch backup. A deleted image is not saved. Because of this, saving while in [Program] is recommended.

The Save As screen opens.

6 Press [Save].



- Reference** Change the save destination of the file and file name as needed.

The backup completion message opens.

7 Press [OK].

The system returns to the sensor advanced screen.



Backing up the Program Individually

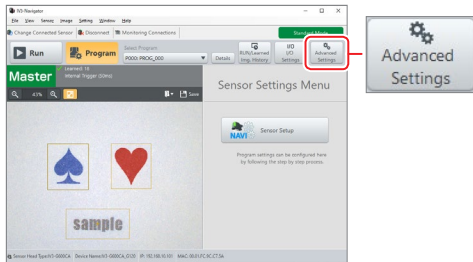
Backs up the setting data saved in the sensor into the PC individually for each program.

Point The saving time increases when this is performed in [Run]. Execution while in the [Program] mode is recommended.

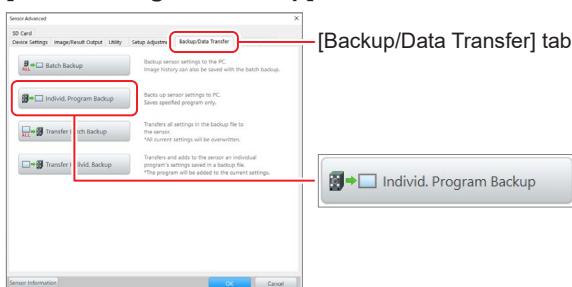
1 Display the main screen in [Run] or [Program].

“Overview of the Screen in [Run] / [Program]” (page 5-3)

2 Press [Advanced Settings].

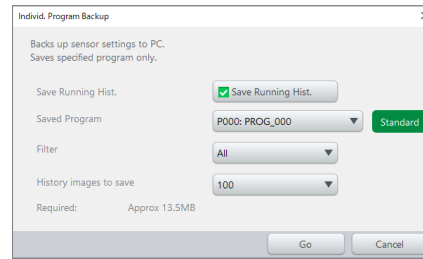


3 Select the [Backup/Data Transfer] tab and press [Individ. Program Backup].



The Individual Program Backup screen opens.

4 Set the individual program backup settings.



● Save Running Hist.

To back up all the images of the running image history in addition to the program settings, place a check mark ON to the [Save Running Hist.] check box.

● Saved Program

Select a program to back up from the drop-down menu.

● Filter

This setting can be set when [Save Running Hist.] is ON. [All] or [NG Only] can be selected for the running image history to be saved.

● History images to save

The maximum number of the image histories to be saved is 100. It can be selected from 20/50/100.

● Required

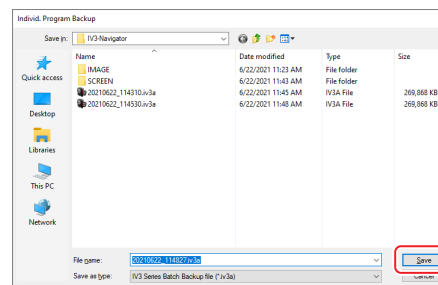
Displays the expected size of the backup file.

5 Press [Go].

Point When the running image history has been saved while in [Run], the images saved object may be updated and deleted during the batch backup. A deleted image is not saved. Because of this, saving while in [Program] is recommended.

The Save As screen opens.

6 Press [Save].



Reference Change the save destination of the file and file name as needed.

The backup completion message opens.

7 Press [OK].

The system returns to the sensor advanced screen.

Saving Images and Screens Displayed on the IV3-Navigator Individually

Using the screen which displays the [Save] button on the image tool bar, the image displayed on the IV3-Navigator can be saved to the PC. An iv3p format file which can be used for master image registration or additional learning will also be saved at the same time.

A screen capture of the IV3-Navigator screen will also be saved at the same time.

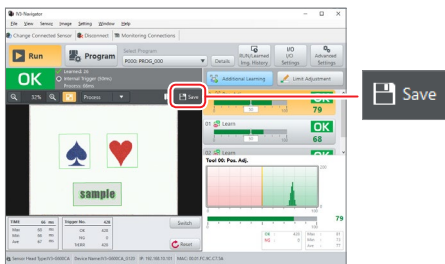
The screens which display the [Save] button are as follows.

- Main screen in [Run]
- Main screen in [Program]
- Settings Navigator
- Limit Adjustment
- Tool Auto Tuning
- Program Details
- Running Image History
- Learned image history

This section explains the procedure for saving images by using an example from the main screen in [Run].

■ Saving procedure

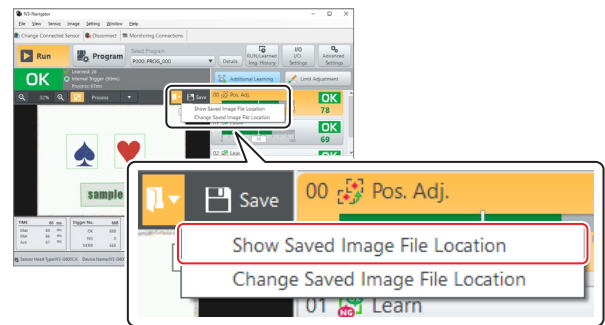
1 Press [Save].



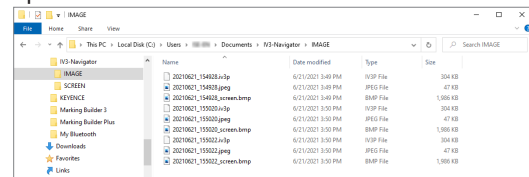
A message opens, and the image file (jpeg format and iv3p format) and image capture file (bmp format) will be saved to the save destination.

■ Confirming the save destination of an image

1 Press [▼] button, and press [Show Saved Image File Location].

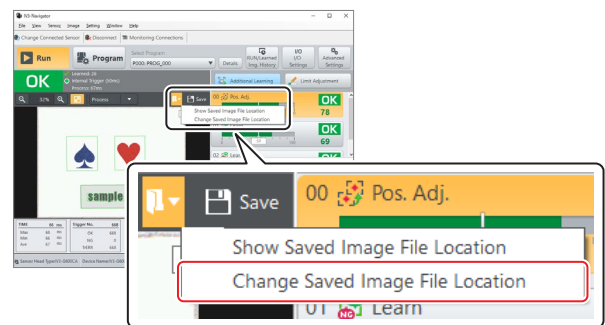


The folder which has been set as the save destination opens.



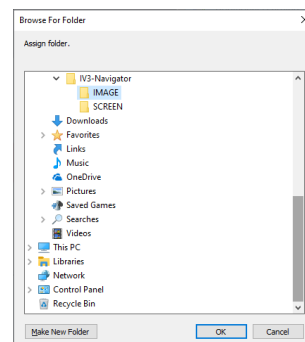
■ Changing the save destination of an image

1 Press [▼] and select [Change Saved Image File Location].



The Browse For Folder screen opens.

2 Specify the desired save destination and press [OK].



Transferring the Backed up Settings to the Sensor

Point

- Operation cannot be cancelled during transmission of the settings data.
- It is recommended to back up the data saved in the sensor in a batch before transferring settings.
 - “Saving the Sensor Settings or the Image History” (page 8-3)
- The image data in the image history will not be transferred.
- The settings file of a different model of the sensor head cannot be transferred.
- When the following functions are enabled, the setting data cannot be transferred to the sensor while the device is in [Run] mode.
 - FTP/SFTP client function
 - Field network/Communication unit (DL)
- In the case of a built-in amplifier model, the settings file of a sensor with a different power supply method cannot be transferred. For instance, a settings file saved from a PoE Power Class 3 sensor cannot be transferred to a sensor with PoE Power Class 6 or a power I/O cable (24 V DC).

Transfer in a Batch

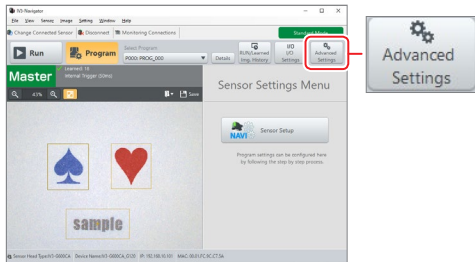
Transfers the setting data (batch backup file) saved in the PC to the sensor.

- “Backing up in a Batch” (page 8-3)
- “Backing up the Program Individually” (page 8-4)

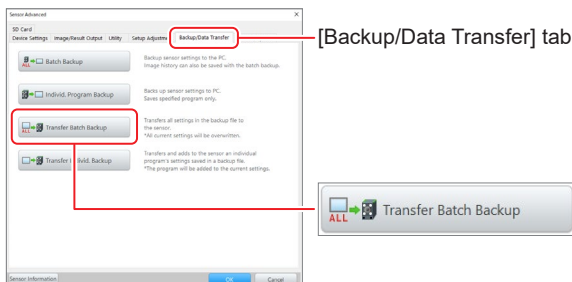
1 Display the main screen in [Run] or [Program].

• “Overview of the Screen in [Run] / [Program]” (page 5-3)

2 Press [Advanced Settings].



3 Select the [Backup/Data Transfer] tab and press [Transfer Batch Backup].

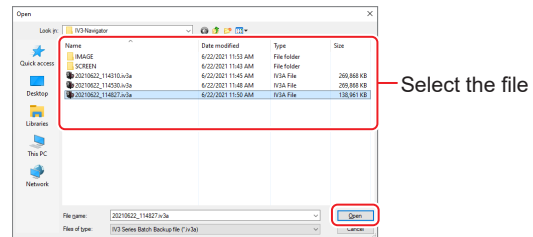


The confirmation screen opens.

4 Press [Yes].

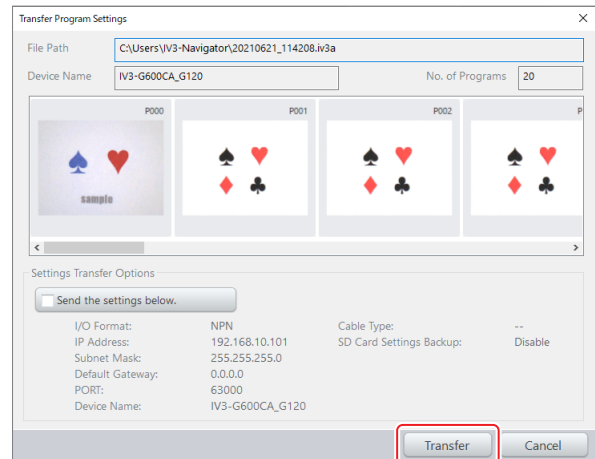
The screen to select the batch backup file opens.

5 Select a batch backup file to be transferred (*.iv3a), and press [Open].



The [Transfer Program Settings] screen opens.

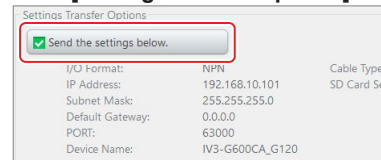
6 Confirm the information of the setting file to be transferred and press [Transfer].



After the transfer of files has completed, the transfer completion message opens.

Point

- If you would like to transfer the I/O polarity (NPN/PNP) and the network settings, check the [Send the settings below.] check box ON for [Setting Transfer Options].



- The setting for [Setting Transfer Options] is reset to OFF after the setting data is transferred or when the setting is canceled.
- When the protocol setting has been changed, connection is terminated and the sensor restarts.

7 Press [OK].

The system returns to the sensor advanced screen.

Reference

When a file was transferred while the [Send the settings below.] check box of [Setting Transfer Options] is checked ON, the connection with the sensor is terminated and the system returns to the Activation Menu screen.

Transferring the program individually

Transfers the program (individual backup file) saved in the PC to the sensor.

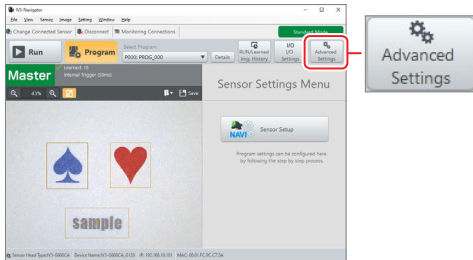
📖 “Backing up in a Batch” (page 8-3)

📖 “Backing up the Program Individually” (page 8-4)

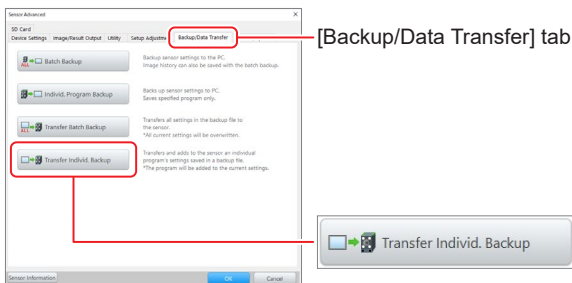
1 Display the main screen in [Run] or [Program].

📖 “Overview of the Screen in [Run] / [Program]” (page 5-3)

2 Press [Advanced Settings].



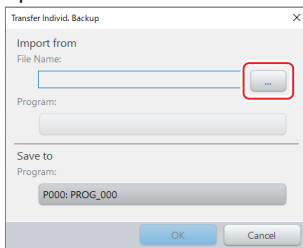
3 Select the [Backup/Data Transfer] tab and press [Transfer Individ. Backup].



The confirmation screen opens.

4 Press [Yes].

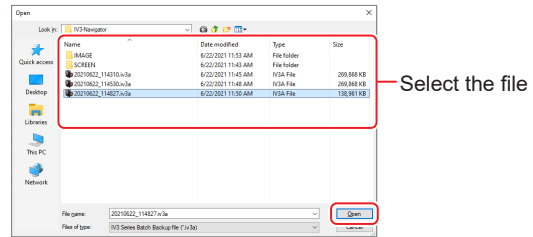
The screen to transfer individual program settings opens.



5 Press [...].

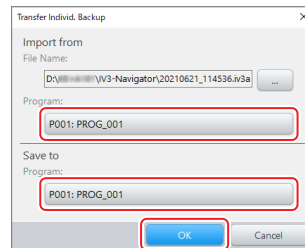
The screen to select the individual backup file opens.

6 Select a batch backup file (*.iv3a) or an individual program backup file (*.iv3a) including the individual program to transfer, and press [Open].



The system returns to the individual program settings transfer screen.

7 Select the number of the source program and the number of the destination program, and press [OK].

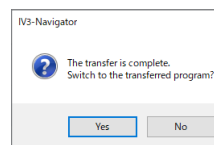


Point When the destination program is already set, the confirmation screen appears. Press [OK].

The source program is transferred to the destination program. When the transfer is completed, a confirmation screen to switch to the transferred program will appear.

8 Press [Yes] or [No].

- Yes Switches to the transfer destination program.
- No The program remains as it was before the transfer.



The system returns to the sensor advanced screen.

Folder Composition and File Naming Rules

● Batch Backup

Batch saves all the settings in the sensor.
All the images in the image history can also be saved along with the settings.

Storage folder	A user-defined folder can be specified. (Default) C:\Users\%(Login user name)\Documents\IV3-Navigator
File name	YYYYMMDD_hhmmss ^{*1,2}
Extension	iv3a

📖 “Backing up in a Batch” (page 8-3)

● Individual Program Backup

Save the settings inside the sensor by individual program.
All the images in the image history can also be saved along with the settings.

Storage folder	A user-defined folder can be specified. (Default) C:\Users\%(Login user name)\Documents\IV3-Navigator
File name	YYYYMMDD_hhmmss ^{*1,2}
Extension	iv3a

📖 “Backing up the Program Individually” (page 8-4)

● Save (save images)

Captured .jpeg image files, files with the format specifically for the IV3 Series, and screen capture files for the IV3-Navigator are simultaneously saved.

Storage folder	A user-defined folder can be specified (Default) C:\Users\%(Login user name)\Documents\IV3-Navigator\IMAGE
File name	YYYYMMDD_hhmmss ^{*1,3} YYYYMMDD_hhmmss_screen ^{*1,4}
Extension	jpeg, iv3p, bmp

📖 “Saving Images and Screens Displayed on the IV3-Navigator Individually” (page 8-5)

- *1 YYYY: Year, MM: Month, DD: Day, hh: Hour, mm: Minute, ss: Second
- *2 Changes to the arbitrary file name and saves it.
- *3 Taken image file. Saved in jpeg format and iv3p format.
- *4 Screen capture file of the IV3-Navigator. Saved in bmp format.



Setting up the SD Card

Insert the SD card into the sensor amplifier to configure various settings such as transferring data and expanding the number of programs.

- Usable SD cards

Ultra-compact model: CA-SD16G
KV-M4G

Built-in amplifier type: IV3-MSD8G

- Supported format : FAT32

NOTICE

- Use the KEYENCE recommended product.
- Close the cover of the SD card slot while in use.
- When removing the SD card, be sure to perform [SD Card Removal] before removing.
- Do not remove the SD card while accessing the SD card. Also, do not turn off the power while accessing the SD card. Otherwise, all or part of the setting data may be lost or damage may occur to the memory.

Point

When formatting the SD card on the PC, configure the settings below. If the format is different, the SD card may not be recognized.

- File system: FAT32
- Allocation unit size: 32 kB

Inserting/Removing the SD Card

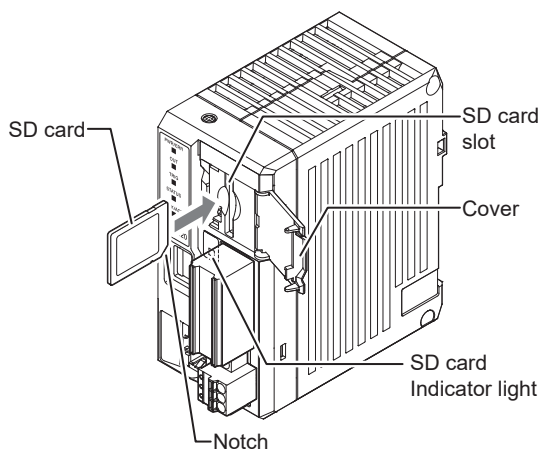
Inserting the SD Card

■ Mounting to the Ultra-Compact Model

- 1 Open the SD card slot cover on the sensor amplifier.
- 2 Insert the SD card into the SD card slot.

Point

- Make sure the notch on the SD card is facing downwards and insert it until you hear a clicking sound.
- Unlock the SD card before use.



- 3 Close the cover.

The SD card indicator light turns on (green).

Point

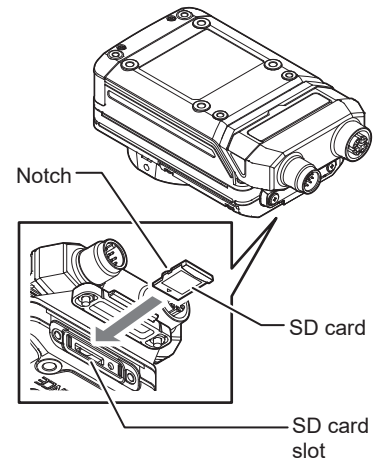
After inserting the SD card, make sure to close the cover. If the cover is left open, the sensor amplifier cannot recognize the SD card.

■ Mounting onto the Built-In Amplifier Type

- 1 Open the SD card slot cover on the sensor.
- 2 Insert the SD card into the SD card slot.

Point

Make sure the notch on the SD card is on the right side and insert it until you hear a clicking sound.



Point

The built-in amplifier type cannot detect whether the cover is open or closed. When the SD card is set, the operation indicator light and the SD card indicator light in the slot part will light up (green).

- 3 Close the cover, and fix the sensor with two fall prevention screws.

- Tightening torque: 0.15 to 0.20 N·m



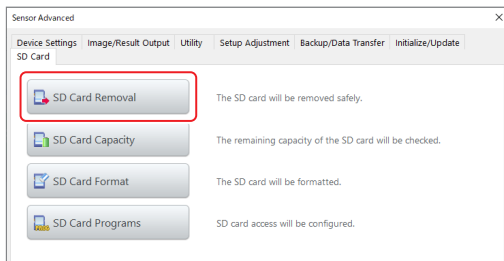
Removing the SD card

- Point**
- Always perform the [SD Card Removal] procedure before removing the SD card.
 - Only when [Advanced Settings] is pressed in the main screen in [Program], the SD card can be removed.
 - To re-recognize an SD card after performing the [SD Card Removal] removal procedure, remove the SD card from the SD card slot, reinsert the card, and then close the cover.
 - For the ultra-compact model, if you do not perform the [SD Card Removal] procedure and you open the SD card cover, the device will stop accessing. This may corrupt data or settings that are being written to the card. Alternatively, the IV3-Navigator may restart.

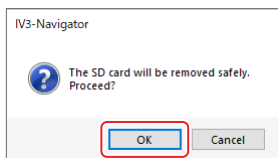
1 Press [Advanced Settings] in the main screen in [Program].

- “Overview of the Screen in [Run] / [Program]” (page 5-3)
- “Sensor Advanced Settings” (page 7-19)

2 Select the [SD Card] tab and press [SD Card Removal].



3 Press [OK] in the confirmation screen.



4 Press [OK].

5 Check that the SD card indicator light has turned off and open the cover.

6 Press the SD card inward to release and remove the card.

- Point**
- When the lock is disengaged, it will make a clicking sound and the SD card can now be removed.

7 Close the cover.

- Built-in amplifier type: tightening torque: 0.15 to 0.20 N·m

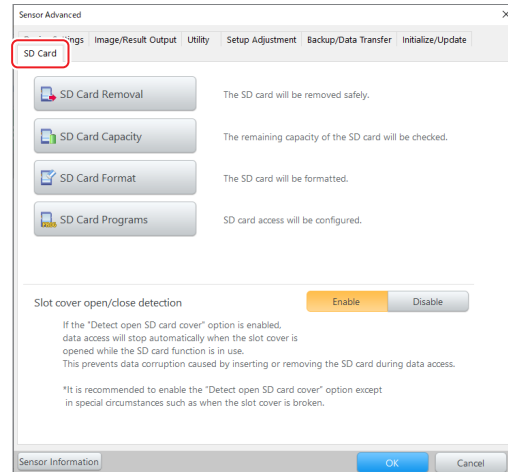
Displaying the SD Card Screen

This section explains how to set the SD card.

1 Press [Advanced Settings] in the main screen in [Program].

- “Overview of the Screen in [Run] / [Program]” (page 5-3)
- “Sensor Advanced Settings” (page 7-19)

2 Select the [SD Card] tab.



Reference The following buttons are enabled when the SD card is inserted:

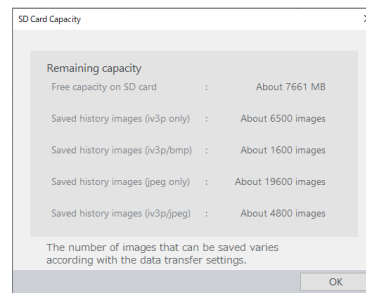
- [SD Card Removal] button
- [SD Card Capacity] button
- [SD Card Format] button
- [SD Card Programs] button

● SD Card Removal

Allows the SD card to be properly remove.
□ “Removing the SD card” (page 8-10)

● SD Card Capacity

Displays the amount of memory available on the SD card.



● SD Card Format

Formats the SD card.
□ “Formatting the SD card” (page 8-11)

● SD Card Programs

Expands the number of available programs on the sensor to a maximum of 128.
□ “Transferring Program Settings” (page 8-11)

● Slot cover open/close detection

Use this button if the SD card slot cover breaks.
□ “Slot cover open/close detection (ultra-compact model only)” (page 8-12)

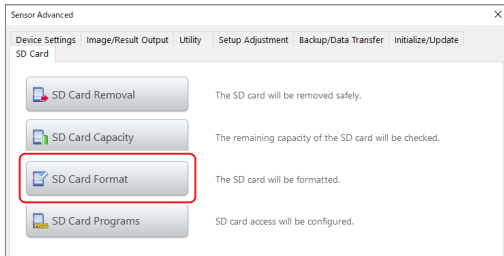
Formatting the SD card

Point If [SD Card Access] (Page 8-11) is set to [Enable] and the [SD Card Format] procedure is performed, the transfer program settings will be disabled.

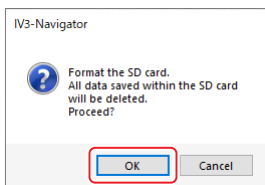
1 Display the [SD Card] screen.

“Displaying the SD Card Screen” (page 8-10)

2 Press [SD Card Format].



3 Press [OK].



4 Once formatting is complete, press [OK].

Reference The SD card will be formatted with the following settings:

- File system: FAT32
- Allocation unit size: 32 kB

5 Press [OK].

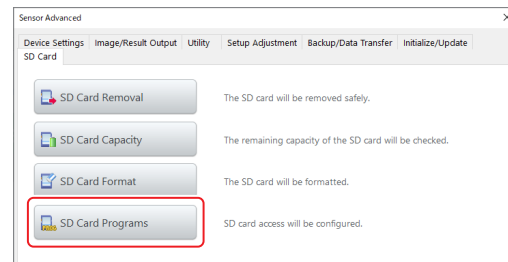
The system returns to the main screen in [Program].

Transferring Program Settings

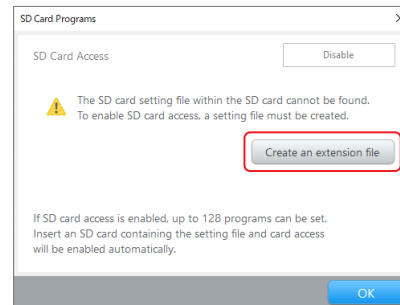
1 Display the [SD Card] screen.

“Displaying the SD Card Screen” (page 8-10)

2 Press [SD Card Programs].



3 Press [Create an extension file].

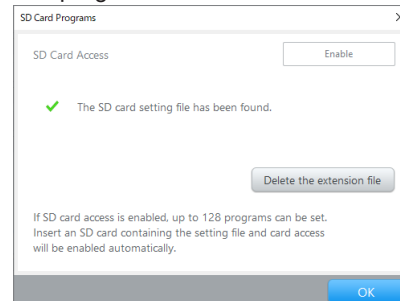


4 Press [Yes] in the confirmation screen.

Once the transfer program settings file is created, the file information screen opens.

5 Press [OK].

The transfer program settings are enabled and up to 128 programs can be set.



Point

- If the expansion file is found on the SD card, [SD Card Access] is automatically enabled.
- To set [SD Card Access] to [Disable], remove the SD card or press [Delete the extension file].
- Expansion files created on a different sensor head model cannot be recognized.

6 Press [OK].

The system returns to the main screen in [Program].

Slot cover open/close detection (ultra-compact model only)

If the SD card slot cover or open/close detection switch breaks, the device the SD card is used on will no longer run.

[Slot cover open/close detection] is a function that enables the device to run by temporarily disabling cover open/close detection (a protective function that stops access to the SD card). Handle the SD card with care.

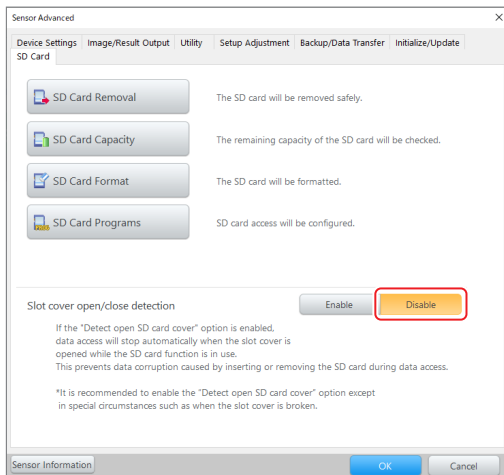
Point In most situations, use the device with this function set to [Enable] (default). Re-enable the function once the device has been repaired.

Reference The built-in amplifier type will not be displayed.

1 Display the [SD Card] screen.

📖 “Displaying the SD Card Screen” (page 8-10)

2 To disable the function [Slot cover open/close detection], press [Disable].



● Enable (default)

Detects whether the SD card slot cover is open or closed.

If the cover is open, the device will stop accessing the SD card.

● Disable

Does not detect whether the SD card slot cover is open or closed.

Even if the cover is open, the device can access the SD card.

3 Press [OK].

The system returns to the main screen in [Program].

Transferring Judgment Results or Judged Images to the SD Card

Overview of the SD Card Data Transfer Function

Automatically transfers the image data and status result information saved in the sensor memory to an SD card.

📖 “Setting up the SD Card” (page 8-9)

Setting up the SD Card Data Transfer Function

1 Insert the SD card into the sensor amplifier.

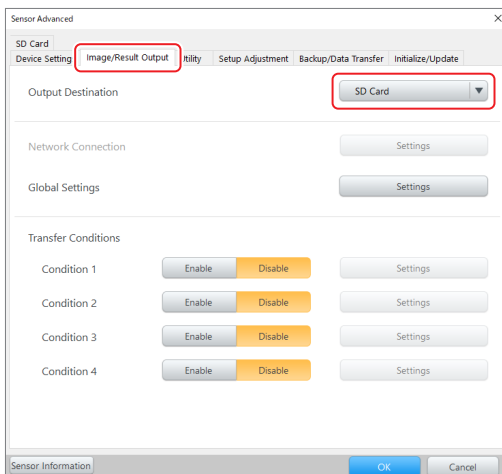
📖 “Inserting the SD Card” (page 8-9)

2 Press [Advanced Settings] in the main screen in [Program].

📖 “Overview of the Screen in [Run] / [Program]” (page 5-3)

📖 “Sensor Advanced Settings” (page 7-19)

3 Select the [Image/Result Output] tab and press [SD Card] from [Output Destination].



📌 Point

- You can select any of [FTP], [SFTP], or [SD Card] as the output destination. You cannot transfer data to all destinations at the same time.
- When you change the output destination from [SD Card], the [Index Upper Limit] and [Create Subfolder] settings are initialized.

4 Configure the SD card data transfer settings.

📖 “Global Settings” (page 8-14)

📖 “Setting the Transfer Conditions” (page 8-15)

📖 “Setting the Transfer Destination Folder and File Names” (page 8-17)

5 Press [OK].

6 Start the run mode.

Once the target is judged, the specified data file is automatically transferred to the SD card.

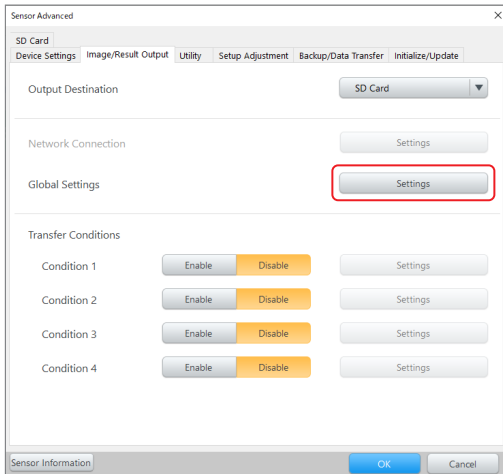
📌 Point

- When the transfer condition is set to [All], adjust the processing time so that all the images can be transferred.
- Setting the “BUSY Output Configuration” (page 7-16) to [Until Data Transfer is Complete] and controlling the trigger with the BUSY output prevents data from being lost while being transferred.
- When the transfer could not be done on time, the data is saved in the internal buffer. The internal buffer can save up to 20 images.
- Image data is transferred in the sequence that the images have been saved to the internal buffer.
- When the remaining capacity of the internal buffer is insufficient, the image data transfer fails. The transfer fails can be output using an SD card transfer error (Page 8-14).
- When the transfer condition is set to [All], confirm that there is sufficient storage on the SD card.



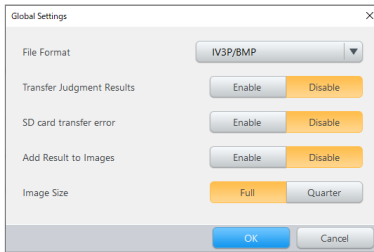
Global Settings

1 Press [Settings] of the Global Settings.



The Global Settings screen appears.

2 Configure the Global Settings.



● File Format

Selects the file saving format for image data. (IV3P, IV3P/BMP, JPEG, IV3P/JPEG)

○ IV3P

Transfers the image data as the format which can be opened by IV3-Navigator. Operation results can be confirmed in the simulator function by using the transferred image data. Moreover, the image data can be converted to BMP by using the IV3P-Converter.

○ BMP

Transfers the image data as the format which can be opened by other applications.

○ JPEG

Transfers the image data as the format which can be opened by other applications. The file size of these images is smaller than a BMP image. However, the image quality will slightly decrease.

● Transfer Judgment Results

To transfer judgment results in a text file simultaneously with the image data, select [Enable]. Judgement results are transferred as a tab delimited text.

Reference The example for displaying the saved results file with Microsoft Excel is as follows.

#	A	B	C
1	Time and Date	2019/2/28	16:04:45
2	Program No.	0	
3	Trigger No.	1	
4	TIME[ms]	144	
5	Total Status	OK	
6	Position Adjustment	OK	87
7	Tool01:Learning	OK	100
8	Tool02:Learning	OK	100

● SD card transfer error

To turn ON the error output and SD card error output function for when an SD card transfer error occurs, press [Enable].

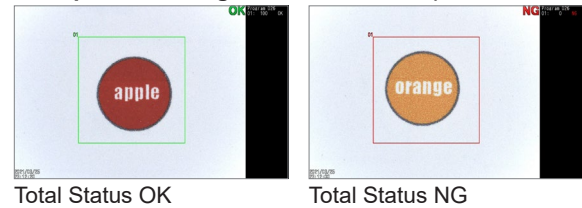
Point The behavior when file transfer fails is as follows:

- An error message opens.
 - SD card access error
 - SD card transfer error (transfer failed)
 - SD card transfer error (insufficient data buffer)
 - The error output and SD card error output function turns ON.
 - SD card access error output is always enabled.
 - To output an SD card transfer error (transfer failed/insufficient data buffer), set this setting to [Enable].
 - To import SD card errors individually, use SD card error output.
 - The sensor indicator light blinks (red).
 - If an error occurs while the device is running, the error condition will continue until the error is cleared.
- Reference** "Clearing Errors" (page 11-13)

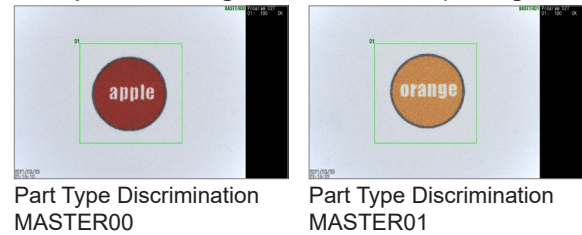
● Add Result to Images

Press [Enable] to add the tool window (frame), total status results (standard mode: OK/NG, sorting mode: master number), program number, matching rate for each tool and status result, and capture date information to the image data to be transferred to the SD card. The setting can be made only when BMP or JPEG are included in the file format.

Example of the image to be transferred (standard mode)



Example of the image to be transferred (sorting mode)



Reference The judgment notation settings (Page 7-23) are not applied.

● Image Size

Selects the saving size for image data.

Criteria Info Addition to Image		Image Size (pixel)	
Enable	Total: 33 tools or less	Full	1520 x 960
		Half	760 x 480
	Total: 34 tools or more	Full	1760 x 960
		Half	880 x 480
Disable	—	Full	1280 x 960
		Half	640 x 480

Reference "Approximate image size to save" (page 8-19)

3 Press [OK].

The system returns to the [Sensor Advanced] screen.

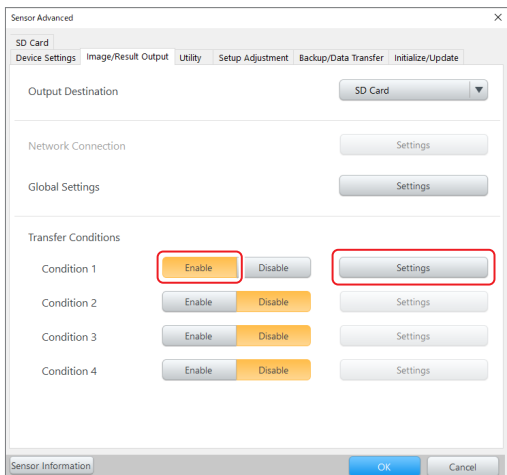
Setting the Transfer Conditions

Up to 4 transfer conditions can be set. The setting contents of each transfer condition are the same.

Point Each transfer condition operates independently. Therefore, if judgment is duplicated, the file may be overwritten.

1 Press [Enable] of the Condition 1 to 4 to be enabled.

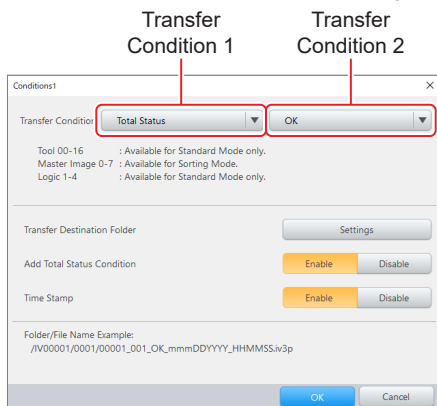
2 Press [Settings] of the enabled condition.



The Transfer Condition screen opens.

3 Set the file transfer conditions.

Select the target image and the status result respectively, and set transfer conditions of the image data.



● Transfer Condition 1 (Target Image)

○ All

Transfers all the images that are judged. If this option is selected, the status conditions cannot be selected.

○ Total Status

Transfers only the images that match the status results, targeting images to which the total status has been processed.

○ Tool 00 to 64 (Standard Mode Only)

Transfers only the images that match the status results, targeting images to which judgment has been processed using a selected tool. This option is enabled for standard mode only.

○ Master 00/Part 0 to Master07/Part 7

- Master 00 to Master 07 (standard mode)
Transfers images that match the status results of detection tools set for the selected master image when multiple master image settings are enabled.
- Part 0 to Part 7 (sorting mode)
Transfers images that match the status results, targeting images to which judgment has been processed based on a selected part type master image.

○ Logic 1 to 4 (Standard Mode Only)

Transfers only the images that match the status results, targeting images to which judgment has been processed using a selected logic. This option is enabled for the standard mode only.



● Transfer Condition 2 (Judgment Result)

○ OK

Transfers images whose status results selected in the transfer condition 1 are OK.

Standard Mode

When multiple master image settings are disabled

- Total status/tool/logic: Transferred when the result is OK
- Master 00: Transferred when the status of all tools is OK
- Master 01-07: Not transferred.

When master image settings are enabled

- Total status/tool/logic: Transferred when the result is OK
- Master 00-07: Transferred when the status of all tools set for the selected master image is OK

Sorting Mode

- Total status: Transferred when matching any part type
- Tool/logic: Not transferred.
- Part 0-7: Transferred when matching the selected part type

○ NG

Transfers images whose status results selected in the transfer condition 1 are NG.

Standard Mode

When multiple master image settings are disabled

- Total status/tool/logic: Transferred when the result is NG
- Master 00: Transferred when the status of any tool is NG
- Master 01-07: Not transferred.

When master image settings are enabled

- Total status/tool/logic: Transferred when the result is NG
- Master 00-07: Transferred when the status for any tool set for the selected master image is NG

Sorting Mode

- Total status: Transferred when not matching any part type
- Tool/logic: Not transferred.
- Part 0-7: Transferred when not matching the selected part type

○ NG/near threshold OK

The following images will be transferred:

- The images where any of the matching rates of the learning tool is close to the threshold, among the images where the judgment results selected in the transfer condition 1 are OK*
- The images whose status results selected in the transfer condition 1 are NG

*Except when "Logic 1 to 4" is selected in the transfer condition 1.

Reference If saving OK images where the matching rates are close to the threshold, the images that should be judged as NG which have been mistakenly judged as OK can be searched.

● Transfer Destination Folder

Sets the transfer destination folder and file name of an image to be transferred to the SD card.

☞ "Setting the Transfer Destination Folder and File Names" (page 8-17)

● Add Total Status Condition

When this is enabled, the program number, total status result (standard mode: OK/NG), or part type discrimination result (sorting mode: M00 to M07/NG) is assigned to the image file name to be transferred to the SD card.

e.g., In the standard mode: filename_001_OK.iv3p

filename_001_NG.iv3p

In the sorting mode: filename_002_M00.iv3p

filename_002_M01.iv3p

● Time Stamp

When this is enabled, the date and time are assigned to the image file name to be transferred to the SD card. The time stamp is provided in the format "YYYYMMDD_hhmmss".

• YYYYMMDD: Date (year, month, and day)

• hhmmss: Time (hour, minute, and second)

e.g., filename_20210106_141510.iv3p

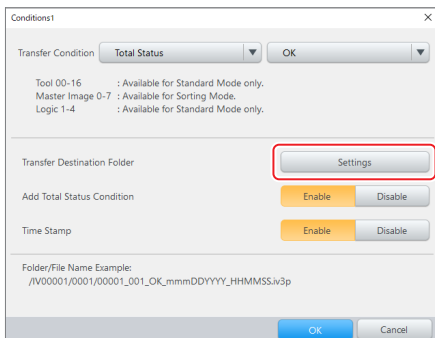
4 Press [OK].

The system returns to the [Sensor Advanced] screen.

Setting the Transfer Destination Folder and File Names

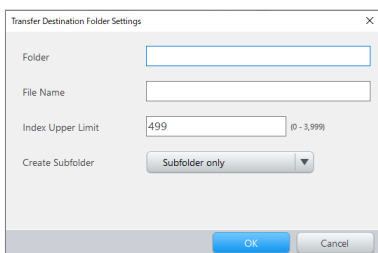
- Reference** For detailed specifications of the transfer destination folder and file name, refer to the following:
- “Details of the transfer destination folder” (page 8-18)
 - “Details of the file name” (page 8-19)

1 Press [Settings] in the Transfer Destination Folder.



The Transfer Destination Folder screen opens.

2 Specify the transfer destination folder and file name on the SD card.



● Folder

Specifies the transfer destination folder of the SD card. (Default: Not set (blank))

Up to 16 characters can be set for the desired folder name.

- Input is not necessary if the image data is to be transferred to the root folder.
- To specify a subfolder, break the name with “/” (one-byte slash).
- If the specified folder does not exist, a new folder will be created.

Set a transfer destination folder name.

- Point**
- “/” (one-byte slash), “.” (one-byte point) and “ ” (one-byte space) cannot be used as the first nor last letter of the folder name.
 - “/” (one-byte slash) cannot be used multiple times in a row.

● File Name

Sets the file name of the transfer files. (Default: Not set (blank))

Up to 16 characters can be set for the file name.

- Point**
- If there is a file with the same name at the transfer destination, that file will be overwritten. When you transfer image data from multiple IV3 Series devices, specify different transfer destinations so that the image data is not overwritten accidentally.
 - If the transfer destination folder is read only or is open, the image data transfer will fail.

● Index Upper Limit

Sets the upper limit of the number of image data that can be transferred to the transfer destination folder to a number between 0 and 3999.

(Default value: 499)

When the file index quantity has reached the index upper limit, the following occurs.

- When the [Create Subfolder] is set to any setting other than [No Sorting with Folders], the folder of the next sequence number is created in the same subfolder (4-digit number). The file index value returns to [0].
- When [Create Subfolder] is set to [No Sorting with Folders], the file index quantity returns to “0”. If there is a file with the same name, that file will be overwritten.

Reference When you change the transfer destination to FTP/SFTP, the settings are initialized.

● Create Subfolder

Select this setting to create a subfolder and sort files.

○ No Sorting with Folders

A subfolder, program number folder, and YYMMDD folder will not be created.

○ Subfolder only (default value)

Only a subfolder will be created.

A program number folder and YYMMDD folder will not be created.

○ Program

A program number folder/subfolder will be created.

○ Date

A YYMMDD folder/subfolder will be created.

○ Program/Date

A program number folder/YYMMDD folder/subfolder will be created.

○ Date/Program

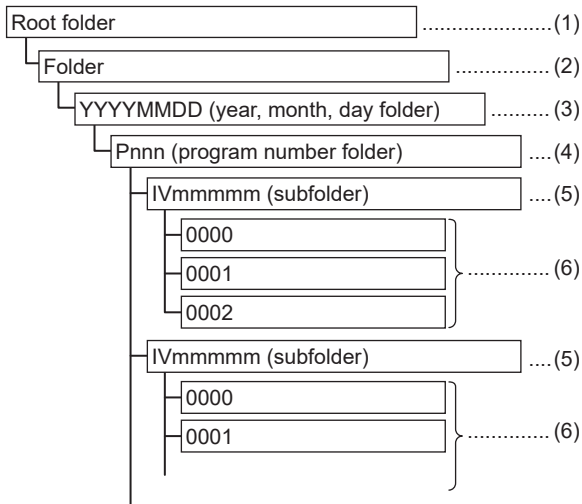
A YYMMDD folder/program number folder/subfolder will be created.

- Point**
- The default for subfolders is “IV00001”.
 - The upper limit is “IV99999”. When the upper limit has been reached, the count continues by returning to “IV00000”.
 - The subfolder name cannot be initialized.
 - The upper limit of the count number of folders in the subfolder is “9999”. When the number exceeds the upper limit, the transfer stops.

3 Press [OK].

The system returns to the [Sensor Advanced] screen.

● **Details of the transfer destination folder**



(1) Root folder

This is the root folder for the SD card.
If [Folder] is not set and [Create Subfolder] is set to [No Sorting with Folders], files will be transferred to the root folder.

(2) Folder

A folder specified in [File Name] (Page 8-17) will be created.
If [Create Subfolder] is set to [No Sorting with Folders], files will be transferred to this folder. If no folder has been set, a folder will not be created.

(3) YYYYMMDD folder

If [Create Subfolder] is set to [Date], [Program/Date], or [Date/Program], a YYYYMMDD folder is created and files can be sorted.

(4) Program number folder

If [Create Subfolder] is set to [Program], [Program/Date], or [Date/Program], a program number folder is created and files can be sorted.
nnn: 000 to 127

(5) Subfolder

If [Create Subfolder] is set to a value other than [No Sorting with Folders], this folder will be created.
Files will be transferred to sequentially numbered folders (6) created directly under this folder.
mmmmm is a sequential number created every time the sensor is restarted or the SD card settings are changed.
Default value: IV00001

(6) Sequentially numbered folder

If [Create Subfolder] is set to a value other than [No Sorting with Folders], this folder will be created. The sequential numbers are "0000" to "9999".
When the number of transferred files reaches the index upper limit (Page 8-17), a new folder with the next sequential number will be created.

Reference

- You can create any YYYYMMDD folder and program number folder. You can also select any hierarchical order.
- You cannot transfer files to program number folders.

● Details of the file name

Setting Items	File name	Sequential number	Program number	Add Total Status Condition	Time stamp	Extension
File name	aaaa	_bbbb	_ccc	_ddd	_YYYYMMDD_hhmmss	.eee

○ Explanation of file names

- aaaaSet file name (Page 8-17). If this setting is blank, a name will not be appended.
- bbbbbThe sequential number every time a file is transferred. This number has a fixed 5 digits when zero suppression is not used. The default value is 00000.
If the index upper limit (Page 8-17) is reached, the number will return to "00000".
- ccc.....The program number. This number has a fixed 3 digits when zero suppression is not used.
- dddIn standard mode The total status result (OK or NG).
In sorting mode part type discrimination result M00 to M07 or NG.
☐ "Add Total Status Condition" (page 8-16).
- YYYYMMDDThe date (year, month, and day) the file is transferred.☐ "Time Stamp" (page 8-16)
- hhmmssThe time (hour, minutes, and seconds) the file is transferred.
- eeeThe following extensions.
bmp: Image file (no compression)
jpeg: Image file (compressed)
iv3p: File format especially for the IV3 Series
txt: A text file with the status result



- The settings to overwrite files with the same name in the same folder every time a file is transferred are as follows:
The file names will become "00000.eee".
 - File Name: Blank
 - Index Upper Limit: 0
 - Create Subfolder: No Sorting with Folders
 - Add Total Status Condition: Disable
 - Time Stamp: Disable
- The settings to save only the most recent desired number of files (e.g., 100) are as follows:
 - Index Upper Limit: 99
 - Create Subfolder: No Sorting with Folders
 - Add Total Status Condition: Disable
 - Time Stamp: Disable

● Approximate image size to save

Criteria	Info Addition to Image	Image Size	IV3P	BMP	JPEG
Enable	Total: 33 tools or less	Full	1204 KB	4300 KB	210 KB
		Half		1070 KB	65 KB
	Total: 34 tools or more	Full		5000 KB	240 KB
		Half		1240 KB	70 KB
Disable	—	Full		3600 KB	160 KB
		Half		900 KB	45 KB

☐ "Image Size" (page 8-14)



Automatically Back Up/Restore the Settings on the SD Card

Overview of the SD Card Settings Backup Function

This function automatically backs up the settings for this device on an SD card. Additionally, the settings automatically backed up on the SD card can be used to restore the settings.

Usage examples:

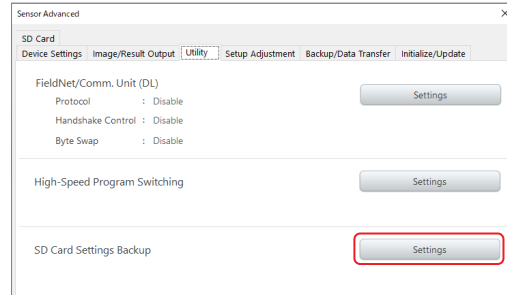
- Restoring settings when the sensor is replaced
- Copying the same settings to multiple sensors (P000 to P031)

Point

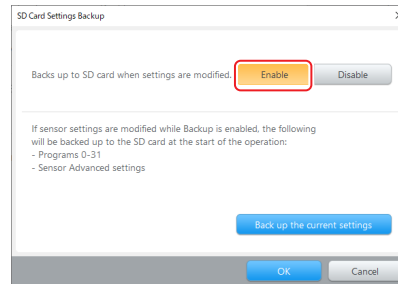
- Backup when settings are updated and restoration when a sensor is replaced are performed automatically. Operation from IV3-CP50 is not necessary.
- A USB memory stick can also be used for backing up and restoring settings.
- To copy settings for sensors that have expansion programs enabled to multiple sensors, use a USB memory stick or IV3-Navigator to backup and transfer the settings. For SD card settings backup, P032 to P127 settings cannot be copied.
- “Saving the Sensor Settings or the Image History” (page 8-3)
- “Transferring the Backed up Settings to the Sensor” (page 8-6)

Setting Up SD Card Settings Backup

- 1 Insert the SD card into the sensor.
- 2 Press [SD Card Settings Backup] on the Sensor Advanced screen.

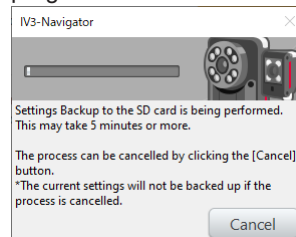


- 3 Set [Backs up to SD card when settings are modified.] to [Enable].



- 4 If the settings have yet to be backed up on the SD card, press [Back up the current settings].

A dialog box appears indicating that backup is in progress.



Press [OK] when a backup completion dialog box appears.

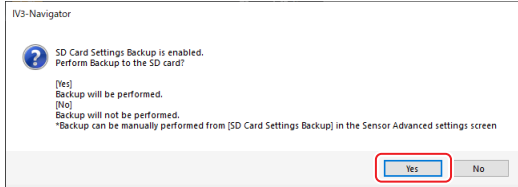
- 5 Press [OK].

Checking Backups When Changing Sensor Settings

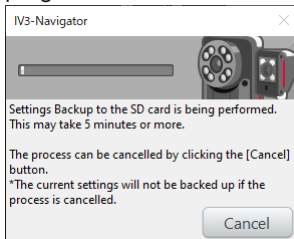
1 After changing sensor settings, go to the run screen.

A dialog box appears confirming backup.

2 Press [Yes].



A dialog box appears indicating that backup is in progress.



Press [OK] when a backup completion dialog box appears.

Point

- If the SD card settings backup is set to [Enable], initializing the sensor (Page 3-12) also initializes the backup files on the SD card. To use an SD card that has not yet been initialized to restore different sensor settings, remove the SD card before initialization.
- If the SD card settings backup is set to [Enable] and the sensor settings are changed with one of the following methods, a backup confirmation dialog box will appear:
 - Settings are changed with Settings Navigator.
 - Additional learning is performed.
 - Program name change, initialization, copying, or import from file is performed on the program details screen.
 - Settings data is transferred.
 - Learning images are deleted and additional learning is performed on the learning history screen or additional learning is performed from a file.
 - Additional learning is performed on the image history screen.
 - Threshold values adjusted during operation are not backed up.
 - 📖 “Adjusting Thresholds for Judgment” (page 6-15)

Restoring Settings from the SD Card

Settings can be restored for the following types of sensors:

- Sensors with the factory default settings
- Sensors that have been initialized

1 Turn off the power to the sensor for which the settings are going to be restored.

2 Insert the SD card with the backed up settings into the sensor.

For an ultra-compact model sensor amplifier, close the SD card cover.

3 Turn on the power to the sensor.

The backed up settings will be automatically restored. While the settings are being restored, the [OUT] indicator light turns orange.

4 Once the settings are restored, the sensor will start.

Once the settings are restored, the control panel and the sensor can be connected.

Point

If restoring settings to multiple sensors, the IP address will conflict. Restore the settings with the sensor disconnected from the network and then initialize the sensor network settings.

MEMO



9

Connecting to a Network

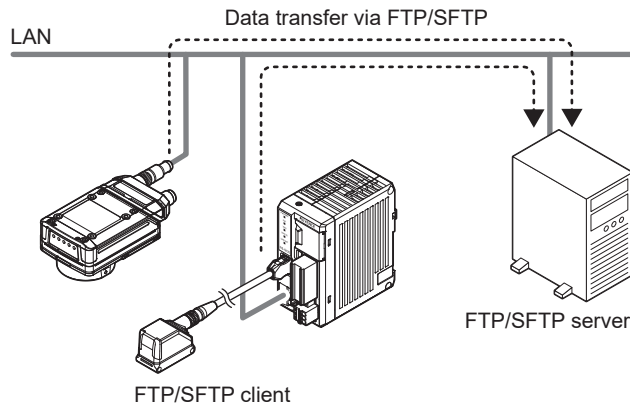
This chapter explains the procedures to connect this device to a network.

Saving Judgment Results and Judged Images to an FTP/SFTP Server	9-2
Connecting to a Field Network.....	9-10
Web monitor.....	9-12

Saving Judgment Results and Judged Images to an FTP/SFTP Server

Overview of the FTP/SFTP Data Transfer Function

Automatically transfers the image data and status result information saved in the sensor memory to an FTP/SFTP server.



Required environment

● Hardware

FTP/SFTP server
(A PC/NAS/PLC or the like that runs FTP/SFTP server software)

Setting up the FTP/SFTP data transfer function

1 Configure the network settings for the sensor.

Set the IP address, subnet mask, and default gateway for the sensor.

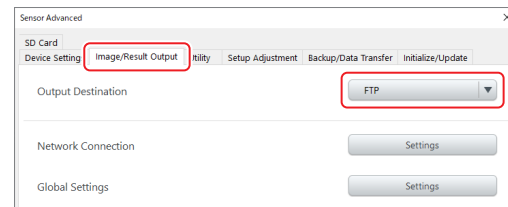
☞ “Changing the Network Settings” (page 7-21)

2 Press [Advanced Settings] in the main screen in [Program].

☞ “Overview of the Screen in [Run] / [Program]” (page 5-3)

☞ “Sensor Advanced Settings” (page 7-19)

3 Select the [Image/Result Output] tab and press [FTP] or [SFTP] from [Output Destination].



Point

- You can select any of [FTP], [SFTP], or [SD Card] as the transfer destination. You cannot transfer data to the all ones at the same time.
- When you change the transfer destination from [FTP] or [SFTP], the [Index Upper Limit] and [Create Subfolder] settings are initialized.

4 Configure the FTP/SFTP data transfer settings.

☞ “Setting the Connection Destination” (page 9-3)

☞ “Global Settings” (page 9-3)

☞ “Setting the Transfer Conditions” (page 9-4)

☞ “Setting the Transfer Destination Folder and File Names” (page 9-6)

☞ “Testing data Transfer via FTP/SFTP” (page 9-9)

5 Press [OK].

The system returns to the main screen in [Program].

6 Start run mode.

Once the target is judged, the specified data file is automatically transferred to the FTP/SFTP server.

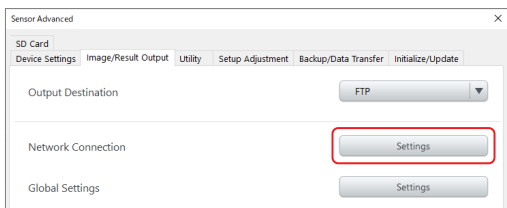
Point

- When the transfer condition is set to [All], adjust the processing time so that all the images can be transferred.
- When the transfer could not be done on time, the data is saved in the internal buffer. The internal buffer can save up to 20 images.
- Image data is transferred in the sequence that the images have been saved to the internal buffer.
- When the remaining capacity of the internal buffer is insufficient, the image data transfer fails.
- When the transfer condition is set to [All], confirm that there is sufficient storage on the FTP/SFTP server.

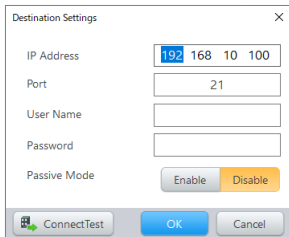
Setting the Connection Destination

Point You only need to configure these settings if the transfer destination is set to [FTP] or [SFTP].

1 Press [Settings] of the Network Connection.



2 Set the network address of the FTP/SFTP server.



● IP Address

Displays the IP address of the FTP/SFTP server. Set a user-defined address.

● Port

Displays the port number.
(Default: 21 for FTP, 22 for SFTP)
Normally, there is no need to change.

● User Name

Input the user name (max.: 48 characters) to log in to the FTP/SFTP server.
(Default: Not set (blank))

● Password

Input the password (max.: 16 characters) to log in to the FTP/SFTP server.
(Default: Not set (blank))

● Passive Mode

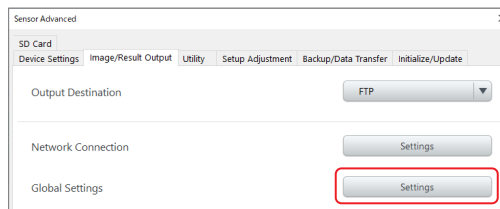
To use the passive mode for FTP, select [Enable]. Note that the passive mode cannot be used for SFTP.

3 Press [OK].

The system returns to the [Sensor Advanced] screen.

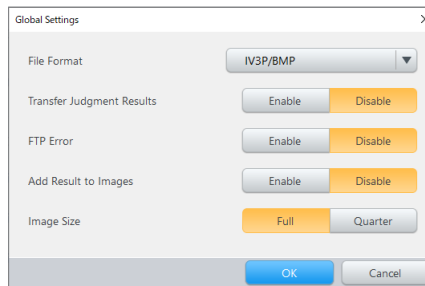
Global Settings

1 Press [Settings] of the Global Settings.



The global settings screen appears.

2 Configure the global settings.



● File Format

Selects the file saving format for image data. (IV3P, IV3P/BMP, JPEG, IV3P/JPEG)

○ IV3P

Transfers the image data as the format which can be opened by IV3-Navigator. Operation results can be confirmed in the simulator function by using the transferred image data. Moreover, the image data can be converted to BMP by using the IV3P-Converter.

○ BMP

Transfers the image data as the format which can be opened by other applications.

○ JPEG

Transfers the image data as the format which can be opened by other applications. The file size of these images is smaller than a BMP image. However, the image quality will slightly decrease.

● Transfer Judgment Results

To transfer judgment results in a text file simultaneously with the image data, select [Enable]. Judgement results are transferred as a tab delimited text.

Reference The example for displaying the saved results file with Microsoft Excel is as follows.

#	A	B	C
1	Time and Date	2019/2/28	16:04:45
2	Program No.	0	
3	Trigger No.	1	
4	TIME[ms]	144	
5	Total Status	OK	
6	Position Adjustment	OK	87
7	Tool01:Learning	OK	100
8	Tool02:Learning	OK	100

● FTP Error

To turn ON the error output when a file transfer failed, press [Enable].

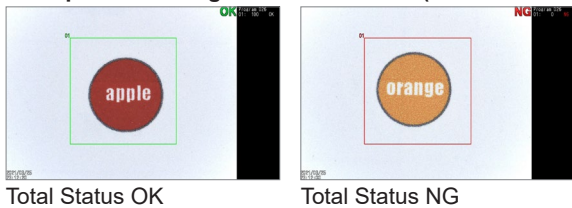
- Point** When this item is set to [Enable], the following occurs if a file transfer fails.
- The following error messages are displayed in response to the causes of failure.
 - FTP Connection Error
 - FTP Transfer Error (Transfer Failed)
 - FTP Transfer Error (Insufficient Data Buffer)
 - “Remedy when data transfer via FTP/SFTP is unavailable” (page A-21)
 - The error output function turns ON.
 - The indicator light of the sensor blinks in red.
 - If “File Transfer Error” has occurred while the sensor is running, the error condition will continue until the error is cleared.
- ☞ “Clearing Errors” (page 11-13)

● Add Result to Image

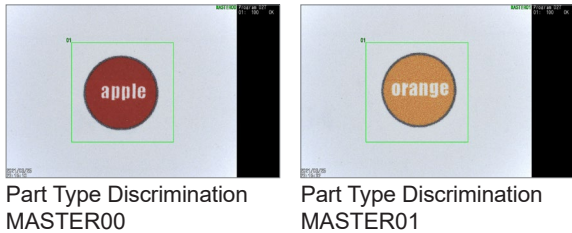
Press [Enable] to add the tool window (frame), total status results (standard mode: OK/NG, sorting mode: master number/NG), program number, matching rate for each tool and status result, and capture date information to the image data to be transferred to the FTP/SFTP server.

The setting can be made only when BMP or JPEG are included in the file format.

Example of the image to be transferred (standard mode)



Example of the image to be transferred (sorting mode)



Reference The judgment notation settings (Page 7-23) are not applied.

● Image Size

Selects the saving size for image data.

Criteria Info Addition to Image		Image Size (pixel)	
Enable	Total: 33 tools or less	Full	1520 x 960
		Half	760 x 480
	Total: 34 tools or more	Full	1760 x 960
		Half	880 x 480
Disable	—	Full	1280 x 960
		Half	640 x 480

☞ “Approximate image size to save” (page 9-8)

3 Press [OK].

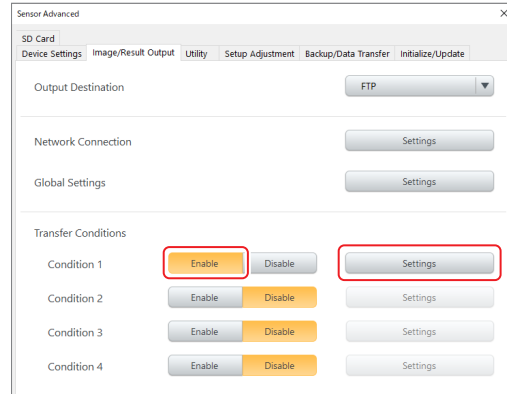
The system returns to the [Sensor Advanced] screen.

Setting the Transfer Conditions

Up to 4 transfer conditions can be set. The setting contents of each transfer condition are the same.

- Point** Each transfer condition operates independently. Therefore, if judgment is duplicated, the file may be overwritten.

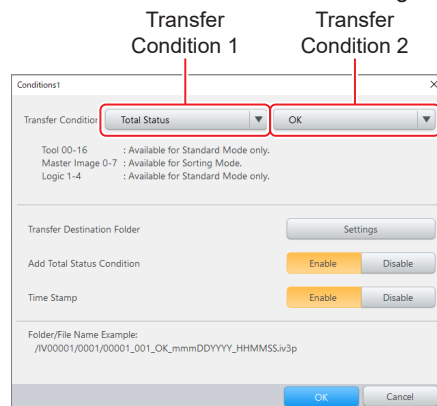
- 1 Press [Enable] of the Condition 1 to 4 to be enabled.
- 2 Press [Settings] of the enabled condition.



The Transfer Condition screen opens.

3 Set the file transfer conditions.

Select the target image and the status result respectively, and set transfer conditions of the image data.



● Transfer Condition 1 (Target Image)

○ All

Transfers all the images that are judged. If this option is selected, the status conditions cannot be selected.

○ Total Status

Transfers only the images that match the status results, targeting images to which the total status has been processed.

○ Tool 00 to 64 (Standard Mode Only)

Transfers only the images that match the status results, targeting images to which judgment has been processed using a selected tool.

This option is enabled for standard mode only.

○ Master 00/Part 0 to Master07/Part 7

• Master 00 to Master 07 (standard mode)

Transfers images that match the status results of detection tools set for the selected master image when multiple master image settings are enabled.

• Part 0 to Part 7 (sorting mode)

Transfers images that match the status results, targeting images to which judgment has been processed based on a selected part type master image.

○ Logic 1 to 4 (Standard Mode Only)

Transfers only the images that match the status results, targeting images to which judgment has been processed using a selected logic.

This option is enabled for the standard mode only.

● Transfer Condition 2 (Judgment Result)

Selects the transfer condition of image data.

○ OK

Transfers images whose status results selected in the transfer condition 1 are OK.

Standard Mode

When multiple master image settings are disabled

• Total status/tool/logic: Transferred when the result is OK

• Master 00: Transferred when the status of all tools, except the position adjustment tool, is OK

• Master 01-07: Not transferred.

When master image settings are enabled

• Total status/tool/logic: Transferred when the result is OK

• Master 00-07: Transferred when the status of all tools set for the selected master image, except the position adjustment tool, is OK

Sorting Mode

• Total status: Transferred when matching any part type

• Tool/logic: Not transferred.

• Part 0-7: Transferred when matching the selected part type

○ NG

Transfers images whose status results selected in the transfer condition 1 are NG.

Standard Mode

When multiple master image settings are disabled

• Total status/tool/logic: Transferred when the result is NG

• Master 00: Transferred when the status of any tool, except the position adjustment tool, is NG

• Master 01-07: Not transferred.

When master image settings are enabled

• Total status/tool/logic: Transferred when the result is NG

• Master 00-07: Transferred when the status of any tool set for the selected master image, except the position adjustment tool, is NG

Sorting Mode

• Total status: Transferred when not matching any part type

• Tool/logic: Not transferred.

• Part 0-7: Transferred when not matching the selected part type

○ NG/near threshold OK

The following images will be transferred:

- The images where any of the matching rates of the learning tool is close to the threshold, among the images where the judgment results selected in the transfer condition 1 are OK*

- The images whose status results selected in the transfer condition 1 are NG

*Except when "Logic 1 to 4" is selected in the transfer condition 1.



If transferring OK images where the matching rates are close to the threshold, the images that should be judged as NG which have been mistakenly judged as OK can be searched.

● Transfer Destination Folder

Sets the transfer destination folder and file name of an image to be transferred to the FTP/SFTP server.

"Setting the Transfer Destination Folder and File Names" (page 9-6)

● Add Total Status Condition

When this is enabled, the program number, total status result (standard mode: OK/NG), or part type discrimination result (sorting mode: M00 to M07/NG) is assigned to the image file name to be transferred to the FTP/SFTP server.

e.g., In standard mode: filename_001_OK.iv3p

filename_001_NG.iv3p

filename_001_--.iv3p *

In sorting mode: filename_002_M00.iv3p

filename_002_M01.iv3p

* When the Program Auto-Switching is set to "Enable" and the NG image is transferred during retry or judgment waiting time. In this case, judgment result on the image is "NG".

● Time Stamp

When this is enabled, the date and time are assigned to the image file name to be transferred to the FTP/SFTP server. The time stamp is provided in the format "YYYYMMDD_hhmmss".

- YYYYMMDD: Date (year, month, and day)

- hhmmss: Time (hour, minute, and second)

e.g., filename_20210106_141510.iv3p

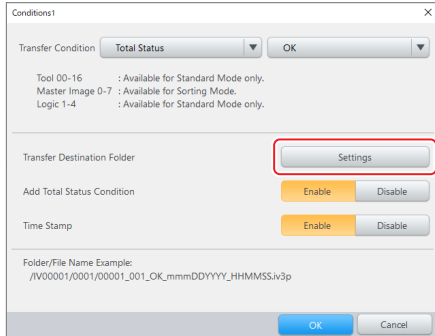
4 Press [OK].

The system returns to the [Sensor Advanced] screen.

Setting the Transfer Destination Folder and File Names

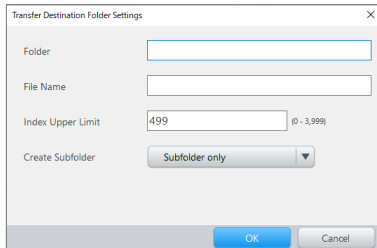
- Reference** For detailed specifications of the transfer destination folder and file name, refer to the following:
- “Details of the transfer destination folder” (page 9-7)
 - “Details of the file name” (page 9-8)

1 Press [Settings] in the Transfer Destination Folder.



The Transfer Destination Folder screen opens.

2 Specify the transfer destination folder and file name on the FTP/SFTP server.



● Folder

Specify the transfer destination folder of the FTP/SFTP server.

(Default: Not set (blank))

Up to 128 characters can be set for the desired folder name.

- Input is not necessary if the image data is to be transferred to the root folder.
- To specify a subfolder, break the name with “/” (one-byte slash).
- If the specified folder does not exist, a new folder will be created.

Set a user-defined transfer destination folder name.

- Point**
- “/” (one-byte slash), “.” (one-byte point) and “ ” (one-byte space) cannot be used as the first nor last letter of the folder name.
 - “/” (one-byte slash) cannot be used multiple times in a row.

● File Name

Sets the file name of the transfer files.

(Default: Not set (blank))

Up to 64 characters can be set for the desired file name.

- Point**
- If there is a file with the same name at the transfer destination, that file will be overwritten. When you transfer image data from multiple IV3 Series devices, specify different transfer destinations so that the image data is not overwritten accidentally.
 - If the transfer destination folder is read only or is open, the image data transfer will fail.

● Index Upper Limit

Sets the upper limit of the number of image data that can be transferred to the transfer destination folder to a number between 0 and 65535.

(Default value: 499)

When the file index quantity has reached the index upper limit, the following occurs.

- When the [Create Subfolder] is set to any setting other than [No Sorting with Folders], the folder of the next sequence number is created in the same subfolder (4-digit number). The file index value returns to [0].
- When [Create Subfolder] is set to [No Sorting with Folders], the file index quantity returns to “0”. If there is a file with the same name, that file will be overwritten.

Reference When you change the transfer destination to FTP/SFTP, the settings are initialized.

● Create Subfolder

Select this setting to create a subfolder and sort files.

○ No Sorting with Folders

A subfolder, program number folder, and YYMMDD folder will not be created.

○ Subfolder only (default value)

Only a subfolder will be created.

A program number folder and YYMMDD folder will not be created.

○ Program

A program number folder/subfolder will be created.

○ Date

A YYMMDD folder/subfolder will be created.

○ Program/Date

A program number folder/YYMMDD folder/subfolder will be created.

○ Date/Program

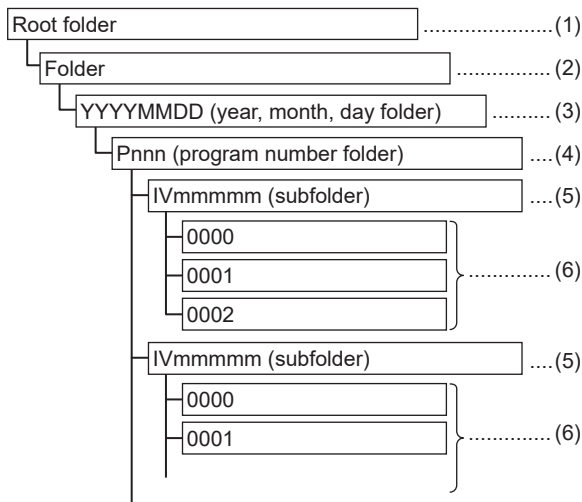
A YYMMDD folder/program number folder/subfolder will be created.

- Point**
- The default for subfolders is “IV00001”.
 - The upper limit is “IV99999”. When the upper limit has been reached, the count continues by returning to “IV00000”.
 - The subfolder name cannot be initialized.
 - The upper limit of the count number of folders in the subfolder is “9999”. When the number exceeds the upper limit, the transfer stops.

3 Press [OK].

The system returns to the [Sensor Advanced] screen.

● **Details of the transfer destination folder**



(1) Root folder

This is the root folder for the FTP/SFTP server.
 If [Folder] is not set and [Create Subfolder] is set to [No Sorting with Folders], files will be transferred to the root folder.

(2) Folder

A folder specified in [File Name] (Page 9-6) will be created.
 If [Create Subfolder] is set to [No Sorting with Folders], files will be transferred to this folder. If no folder has been set, a folder will not be created.

(3) YMMDD folder

If [Create Subfolder] is set to [Date], [Program/Date], or [Date/Program], a YMMDD folder is created and files can be sorted.

(4) Program number folder

If [Create Subfolder] is set to [Program], [Program/Date], or [Date/Program], a program number folder is created and files can be sorted.
 nnn: 000 to 127

(5) Subfolder

If [Create Subfolder] is set to a value other than [No Sorting with Folders], this folder will be created.
 Files will be transferred to sequentially numbered folders (6) created directly under this folder.
 mmmmm is a sequential number created every time the sensor is restarted or the SD card settings are changed.
 Default value: IV00001

(6) Sequentially numbered folder

If [Create Subfolder] is set to a value other than [No Sorting with Folders], this folder will be created. The sequential numbers are "0000" to "9999".
 When the number of transferred files reaches the index upper limit (Page 9-6), a new folder with the next sequential number will be created.

Reference

- You can create any YMMDD folder and program number folder. You can also select any hierarchical order.
- You cannot transfer files to program number folders.

● Details of the file name

Setting Items	File name	Sequential number	Program number	Add Total Status Condition	Time stamp	Extension
File name	aaaa	_bbbb	_ccc	_ddd	_YYYYMMDD_hhmmss	.eee

○ Explanation of file names

- aaaaSet file name (Page 9-6). If this setting is blank, a name will not be appended.
- bbbbbThe sequential number every time a file is transferred. This number has a fixed 5 digits when zero suppression is not used. The default value is 00000.
If the index upper limit (Page 9-6) is reached, the number will return to "00000".
- ccc.....The program number. This number has a fixed 3 digits when zero suppression is not used.
- dddIn standard mode The total status result (OK or NG).
In sorting mode part type discrimination result M00 to M07 or NG.
☐ "Add Total Status Condition" (page 9-5).
- YYYYMMDDThe date (year, month, and day) the file is transferred.☐ "Time Stamp" (page 9-5)
- hhmmssThe time (hour, minutes, and seconds) the file is transferred.
- eeeThe following extensions.
bmp: Image file (no compression)
jpeg: Image file (compressed)
iv3p: File format especially for the IV3 Series
txt: A text file with the status result

☐ Reference

- The settings to overwrite files with the same name in the same folder every time a file is transferred are as follows:
The file names will become "00000.eee".
 - File Name: Blank
 - Index Upper Limit: 0
 - Create Subfolder: No Sorting with Folders
 - Add Total Status Condition: Disable
 - Time Stamp: Disable
- The settings to save only the most recent desired number of files (e.g., 100) are as follows:
 - Index Upper Limit: 99
 - Create Subfolder: No Sorting with Folders
 - Add Total Status Condition: Disable
 - Time Stamp: Disable

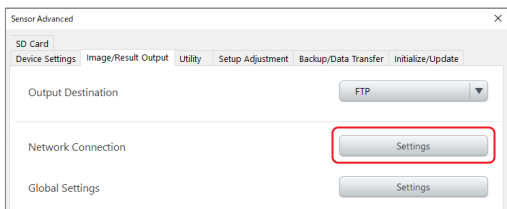
● Approximate image size to save

Criteria	Info Addition to Image	Image Size	IV3P	BMP	JPEG
Enable	Total: 33 tools or less	Full	1204 KB	4300 KB	210 KB
		Half		1070 KB	65 KB
	Total: 34 tools or more	Full		5000 KB	240 KB
		Half		1240 KB	70 KB
Disable	—	Full		3600 KB	160 KB
		Half		900 KB	45 KB

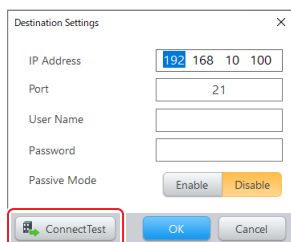
☐ "Image Size" (page 9-4)

Testing data Transfer via FTP/SFTP

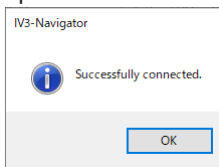
1 Press [Settings] of the Network Connection.



2 Press [Connect Test] to test the connection with the connection destination.



The connection test is performed and the result window opens.



- If “Successfully connected.” is displayed, setting is completed.
- The folder “IV3_Series_FTP_Test” is created in the folder specified for [Folder] on the FTP/SFTP server and the file “IV3_Series_FTP_Test.txt” is transferred.

Reference When the test is executed, the connection with the FTP/SFTP server, the ability to create folders at the transfer destination, and the ability to create data files are tested. The data file will be created in the root folder when all the transfer conditions are disabled, or in the folder on the condition of a smaller number when any of the conditions is enabled.

Point **If data is not transferred properly with the FTP/SFTP client, refer to “Remedy when data transfer via FTP/SFTP is unavailable” (page A-21).**

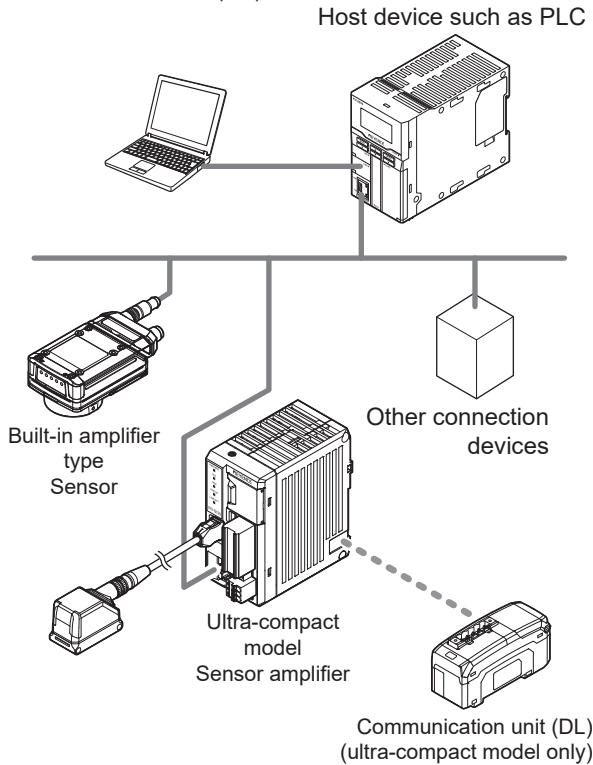
Connecting to a Field Network

Field Network

Communicates with a PLC via a field network and the status result, etc., can be input to the PLC as communication data.

You can select the following communications protocol:

- EtherNet/IP™
- PROFINET
- TCP/IP non-procedural communications
- Communication unit (DL)



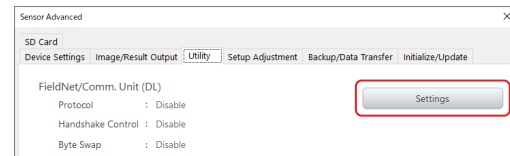
- Point**
- When the protocol setting has been changed, connection is terminated and the sensor restarts.
 - For details of the field network function, refer to [“IV3 Series User’s Manual \(Field Network\)”](#).
 - For details of the communication unit (DL) function, refer to the DL Series User’s Manual.

1 Press [Advanced Settings] in the main screen in [Program].

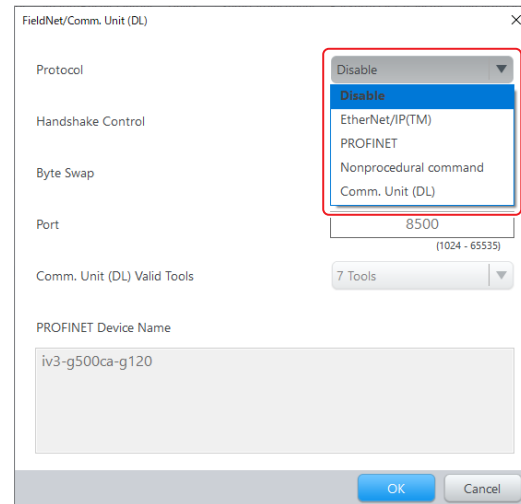
☰ “Overview of the Screen in [Run] / [Program]” (page 5-3)

☰ “Sensor Advanced Settings” (page 7-19)

2 Select the [Utility] tab, and press [Settings] of [FieldNet/Comm. Unit (DL)].



3 Select the protocol.



4 Configure the communications settings.

The settings differ according to the selected protocol.

The screenshot shows a configuration window titled "FieldNet/Comm. Unit (DL)". It contains several settings:

- Protocol:** A dropdown menu set to "EtherNet/IP(TM)".
- Handshake Control:** Two buttons, "Enable" and "Disable", with "Disable" selected.
- Byte Swap:** Two buttons, "Enable" and "Disable", with "Disable" selected.
- Port:** A text input field containing "8500" and a range "(1024 - 65535)" below it.
- Comm. Unit (DL) Valid Tools:** A dropdown menu set to "7 Tools".
- PROFINET Device Name:** A text input field containing "iv3-g500ca-g120".

At the bottom of the dialog are "OK" and "Cancel" buttons.

● EtherNet/IP(TM) or PROFINET

○ Handshake Control

● Disable (default)

Select if the trigger interval is greater than the send cycle (RPI).

A status result can be obtained in real time. In most situations, select [Disable].

● Enable

Select if the trigger interval is less than the send cycle (RPI) and the trigger count is 10 or less. If the status result is not be picked up due to the trigger interval being faster than the send cycle, the status result can be saved up to ten times in the buffer.

○ Byte Swap

You can change the order of storing the characters read by OCR tool and the FTP/SFTP transfer file names into PLC data memory (2 byte) in unit of bytes. Set the order according to the PLC specifications.

● Disable: First byte to Last byte (default)


(Example of string "AB" : 0x4142)

● Enable: Last byte to First byte

(Example of string "AB" : 0x4241)

○ PROFINET Device Name (when PROFINET is selected)

The PROFINET device name can be set (up to 240 alphanumeric characters).

 Up to 128 characters can be set if using the control panel to set the name.

● Nonprocedural command

○ Port

Default value: 8500

Set the port number for the TCP/IP no protocol communications function on the device. In most circumstances, you do not have to change the settings. The port number assigned to IV3-CP50/IV3-Navigator (default: 63000) cannot be used.

● Comm. Unit (DL)

○ Byte Swap

You can change the order of storing the characters read by OCR tool and the FTP/SFTP transfer file names into PLC data memory (2 byte) in unit of bytes. Set the order according to the PLC specifications.

● Disable: First byte to Last byte (default)

(Example of string "AB" : 0x4142)

● Enable: Last byte to First byte

(Example of string "AB" : 0x4241)

○ Comm. Unit (DL) Valid Tools

Select the maximum number of tools available when using the communication unit (DL).

● 7 Tools (default)

Select this setting to communicate with the tool 01 to 06 and position adjustment tool.

● 14 Tools

Select this setting to communicate with the tool 01 to 13 and position adjustment tool.

Point

● No more than 13 tools can be used on the DL series.

● When using a DL series other than DL-RS1A to communicate the standard mode master number and sorting mode total status part type, select [14 Tools].

5 Press [OK].

The confirmation screen opens.

6 Press [OK].

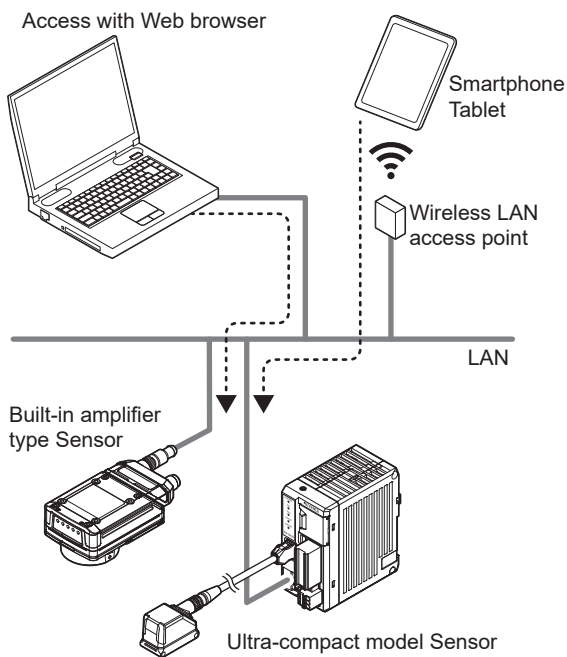
The sensor restarts and the run screen opens.

Web monitor

Overview of the Web monitor function

Use a Web browser (Google Chrome or a similar browser) on a device such as a computer connected to the network to check the image capture and operation history of the sensor.

- Point** The web monitor function has multiple interfaces.
- **Web Monitor:** it can display image capture and operation history.
 - **Web Image:** it can displays image capture only



Required environment

Supported Web browsers	<ul style="list-style-type: none"> • Google Chrome 88 or later • Internet Explorer 11 or later • Microsoft Edge 44 or later • Safari 14 or later
Max. no. of simultaneous connections	2 units *
Languages	English

* When connecting 3 or more units at the same time, the screen update cycle will be slower.

Connection method

1 Configure the network settings for the sensor.

Set the IP address, subnet mask, and default gateway for the sensor.

Use [Network Connection] for the PC and sensor connections.

- ☐ “Changing the Network Settings” (page 7-21)
- ☐ “Operation for Initial Startup of the IV3-Navigator” (page 3-6)

2 Start the Web browser.

3 Input the following URL into the address bar.

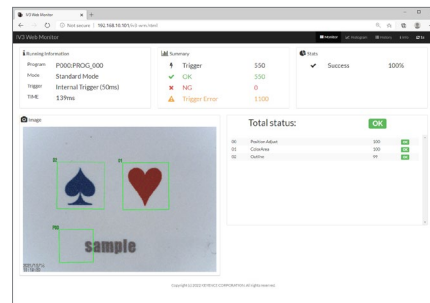
- **Web Monitor:**
http://(IP_address_of_sensor_amplifier)/iv3-wm.html
- **Web Image:**
http://(IP_address_of_sensor_amplifier)/iv3-wm-i.html

If the IP address for the sensor amplifier is 192.168.10.10:

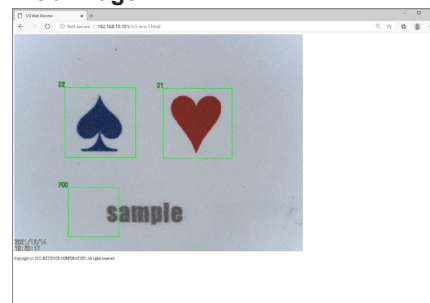
http://192.168.10.10/iv3-wm.html

If connection is successful, the [IV3 Web Monitor] screen appears.

Web Monitor:

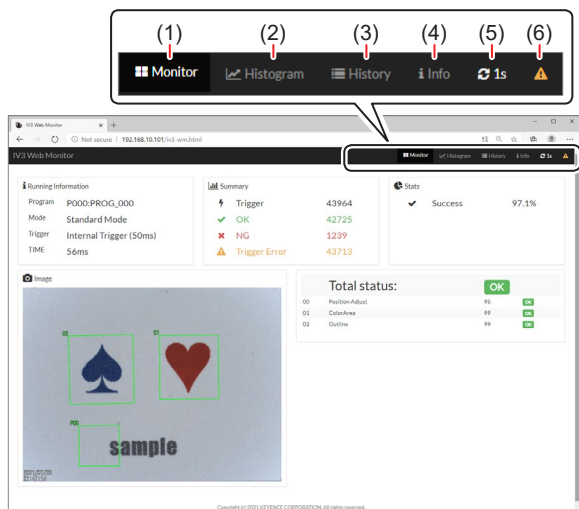


Web Image:



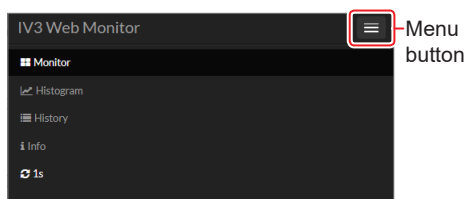
Monitoring screen

Select a screen to monitor information from the sensor.



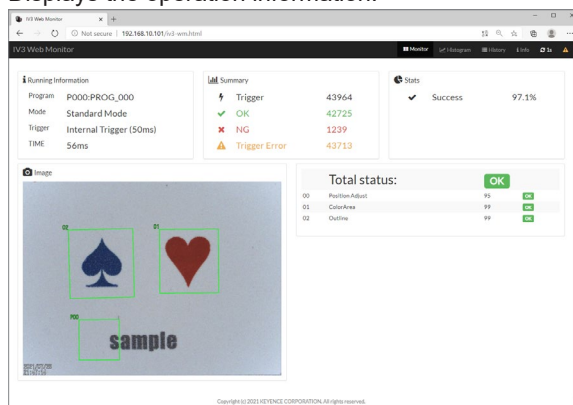
Reference

- For details of the displayed information, see [“Names and Functions of the Screen in \[Run\] / \[Program\]”](#) (page 5-4).
- To reset statistical information, use the IV3-CP50 or IV3-Navigator.
- Responsive Web design is supported. The screen changes in accordance with the displayed device. Select the screen to be displayed on the menu button.



(1) Monitor

Displays the operation information.

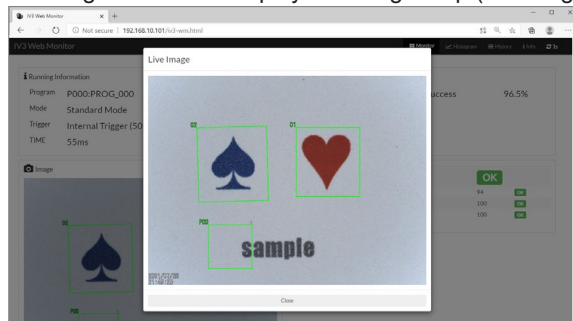


- **Running Information**

Displays the program number, mode (standard or sorting), trigger type, and processing time.

- **Image**

Displays the image and the tool window frame. The processing screen cannot be displayed. Press the image to enlarge the Live image. An image cannot be displayed during setup (No Image).



- **Summary**

Displays the number of triggers, judgment count for OK and NG, and number of trigger errors.

- **Stats**

When standard mode, displays the OK judgment ratio for the statistical information.
When sorting mode, displays the part judgment ratio for the statistical information.

- **Total status**

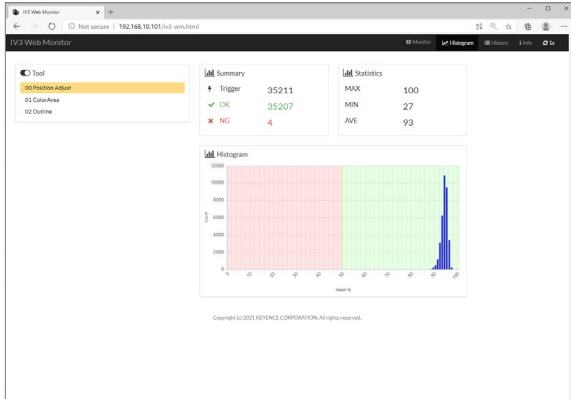
Displays the total status result and the status results of each tool.

(2) Histogram

Check the status results of each tool.

Reference

- For details of the displayed information, see “Tool Information Display” (page 5-10).
- To reset statistical information, use the IV3-CP50 or IV3-Navigator.
- When using sorting mode, histogram of outline, color/brightness average, width, diameter tool are not displayed.



● Tool

Selects the tool to be checked.

● Summary

Displays the number of triggers, judgment count for OK and NG.

● Statistics

Displays the information (MAX, MIN, AVE) for the matching rate.

● Histogram

Displays the histogram of the selected tool.

(3) History

Check the operation result history.

Use the [UpdateView] button to refresh the display.

Point

Automatic update will not be performed regardless of the update frequency setting. Use the [UpdateView] button to refresh the display.

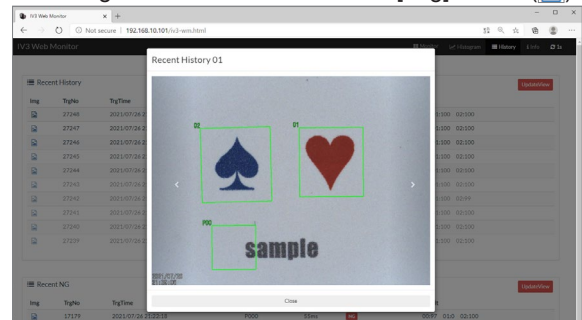
Img	TrgNo	TrgTime	Program	TIME	Total Status	Result
27248	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27247	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27246	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27245	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27244	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27243	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27242	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27241	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27240	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00
27239	2021-07-08 21:59:08	P000	55ms	OK	00:00	02:00

Img	TrgNo	TrgTime	Program	TIME	Total Status	Result
27179	2021-07-08 21:22:39	P000	55ms	NG	00:00	02:00
27178	2021-07-08 21:22:39	P000	55ms	NG	00:00	02:00
27177	2021-07-08 21:22:38	P000	55ms	NG	00:00	02:00
27176	2021-07-08 21:22:38	P000	55ms	NG	00:00	02:00
27175	2021-07-08 21:22:38	P000	55ms	NG	00:00	02:00
27174	2021-07-08 21:22:38	P000	55ms	NG	00:00	02:00
27173	2021-07-08 21:22:37	P000	55ms	NG	00:00	02:00

● Recent History

Displays up to 10 latest status result histories.

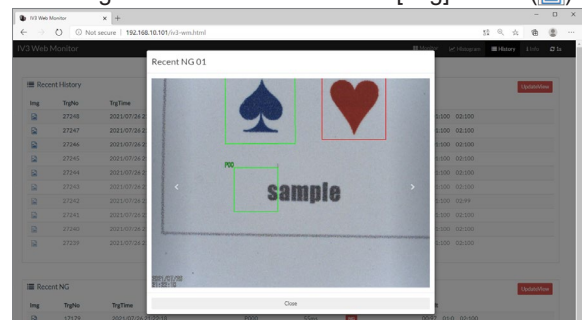
The image can be checked with the [Img] button (🖼️).



● Recent NG

Displays up to 10 histories of the latest status results that were NG.

The image can be checked with the [Img] button (🖼️).






(4) info

Displays the information set in the sensor.

**(5) Update frequency**

Sets the frequency to refresh the displayed information.

	Automatically updates the information once a second.
	Automatically updates the information once every five seconds.
	Stops updates. It is only available on the Web Monitor.

The frequency is fixed for 2 seconds on the Web Image.

(6) Communication timeout

Displayed when a communication timeout occurs.
Check the connection with the sensor amplifier.

MEMO

10

Simulator

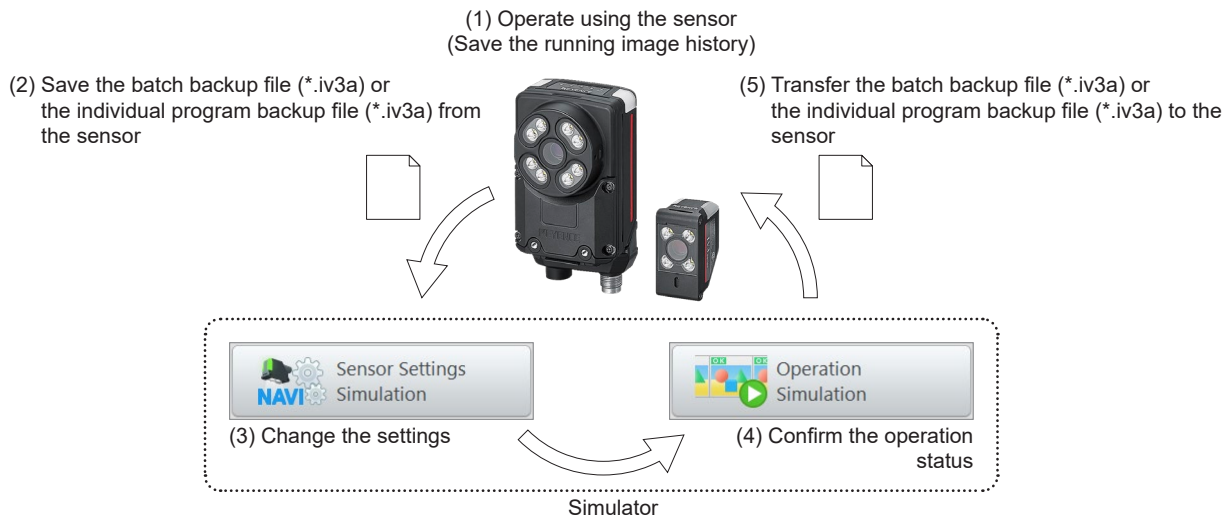
This chapter explains the functions and operations of the Simulator.

Simulator	10-2
Basic operation of simulator	10-3
Names and functions of the screen	10-6
Settings Navigator (Sensor Settings Simulation).....	10-7
Operation Simulation	10-12
Operating from the Menu Bar	10-15

Simulator

The Simulator is a function for checking/changing the program settings with the IV3-Navigator without being connected with the sensor, using a batch backup file (*.iv3a) or an individual program backup file (*.iv3a), and for performing operation simulation based on history images.

It is also possible to transfer the data to the sensor and to perform operation again after changing the setting data with the Simulator.



The three main operations which can be performed with the Simulator function are as follows.

● Sensor Settings Simulation

With no sensor being connected, the settings for the various tools settings etc. can be edited and saved based on the image settings saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a).

Reference The screen to be displayed is the same as the Settings Navigator (Sensor Setup). However, some functions that cannot be used by Simulator are hidden.

● Operation simulation

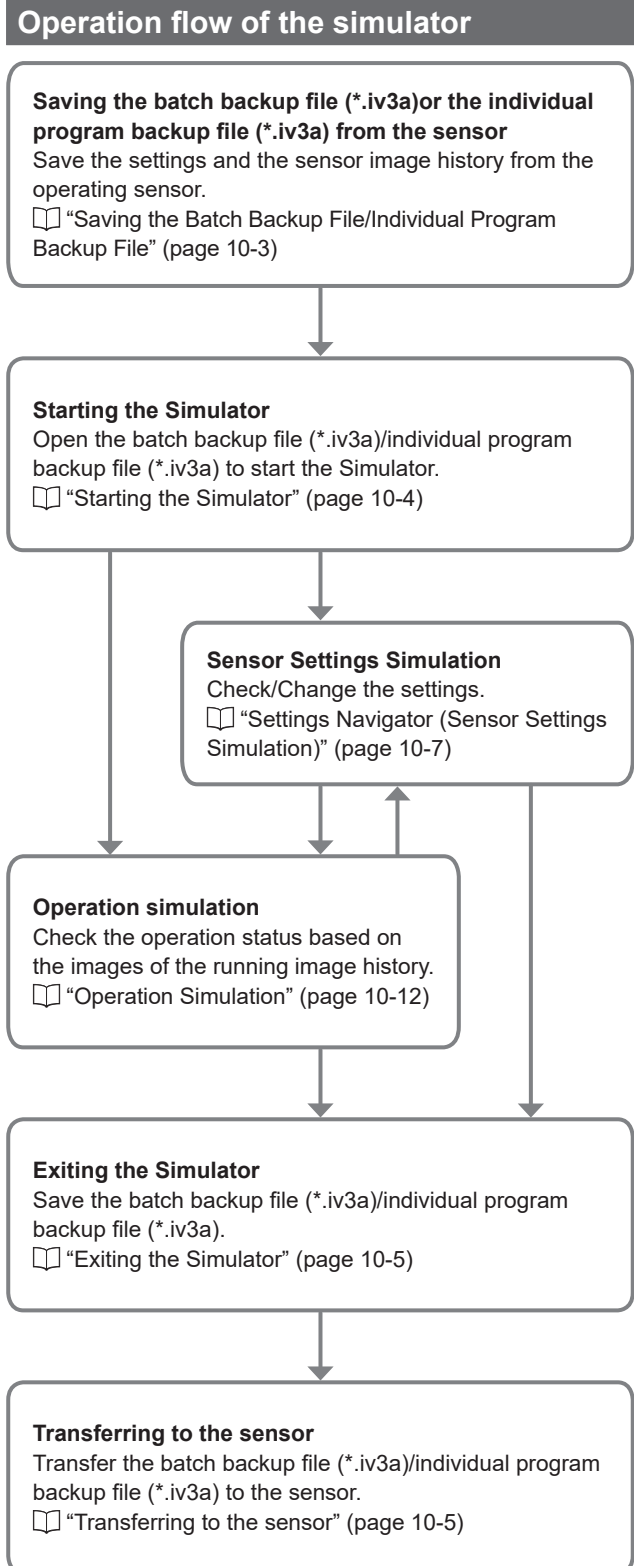
With no sensor connected, the operation results can be checked based on the program and the image history saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a).

It is also possible to perform additional learning for learning tool and adjust the settings by changing the various tools thresholds during simulation.

● Confirming the image history

The image history saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a) can be checked. Moreover, additional learning of the learning tool can be performed by using an image from the image history.

Basic operation of simulator



Saving the Batch Backup File/Individual Program Backup File

1 If performing the "Operation Simulation", save the running image history into the memory of the sensor.

☞ "Confirming the Images Whose Judgment are NG (Running Image History)" (page 5-17)

2 Save the batch backup file (*.iv3a) or the individual program backup file (*.iv3a) from the sensor.

The saved settings are used for the Sensor Settings Simulation.

For use of the "IV Sensor Simulation", also save the image history.

☞ "Backing up in a Batch" (page 8-3)

☞ "Backing up the Program Individually" (page 8-4)

Reference The batch backup file (*.iv3a) or individual program backup file (*.iv3a) can also be saved using a control panel (IV3-CP50). For details, refer to "IV3 Series User's Manual (Control Panel)".

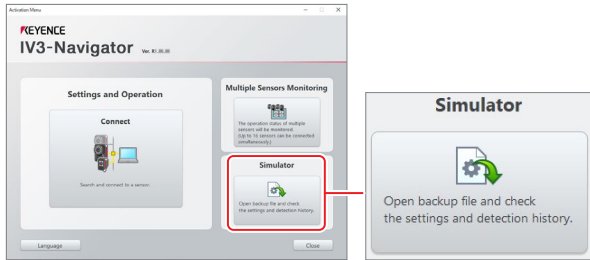
Starting the Simulator

1 Double-click the [IV3-Navigator] icon on the desktop.



The Activation Menu screen opens.

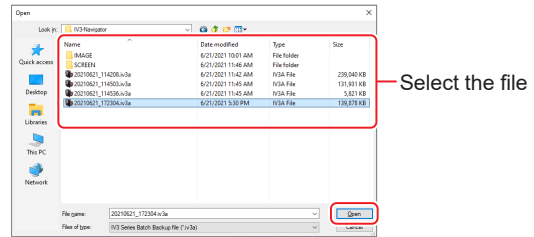
2 Press [Simulator].



- Reference**
- If [Language] is pressed, the Select language screen opens. The display language can be changed to the desired language.
 - The Simulator can be started by opening an iv3a file.

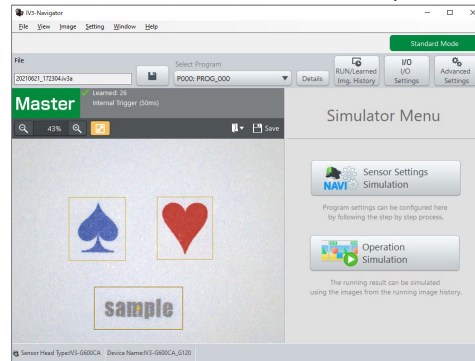
The [Open] screen opens.

3 Select a file and press [Open].



Point Files with the formats other than the iv3a format cannot be used.

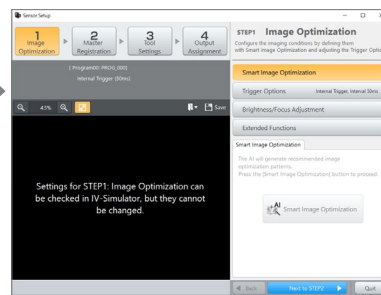
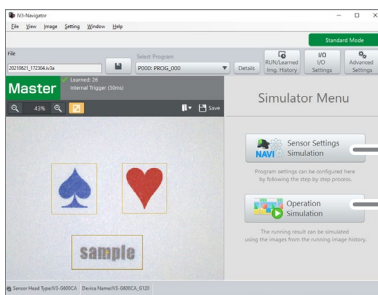
The main screen for the Simulator opens.



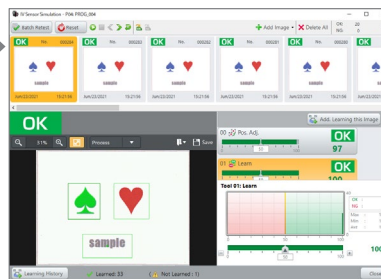
Simulator screen and operation flow

This section explains the screen to be displayed in the Simulator and the operation flow. For details of what can be set on each screen and its operations, refer to the applicable section.

Main screen of the Simulator (Page 10-6)



Settings Navigator (Sensor Setup Simulation) Check/Edit the program settings. (Page 10-7)



Operation Simulation Perform the "Operation Simulation" based on the running image history. (Page 10-12)

Exiting the Simulator

1 The system returns to the main screen for the Simulator.

If the [Sensor Settings Simulation] or [Operation Simulation] is activating, exit it.

2 Select [File] → [Terminate IV3-Simulator] from the menu bar.

When the program setting or image history has been changed, the confirmation dialog to save opens.

3 Press [Yes].

The Batch Backup screen opens.

4 Press [Go].

The Save As screen opens.

5 Press [Save].

Reference Change the save destination of the file and file name as needed.

The changed contents are saved in the batch backup file (*.iv3a)/individual program backup file (*.iv3a), then the software returns to the Activation Menu screen.

Reference If you want to reduce the file size, delete the entire image history with the [RUN/Learned Img. History] on the main screen of the Simulator or the [Delete] button of [Operation Simulation] before saving the file. Only the settings are saved and the file size becomes smaller.

Transferring to the sensor

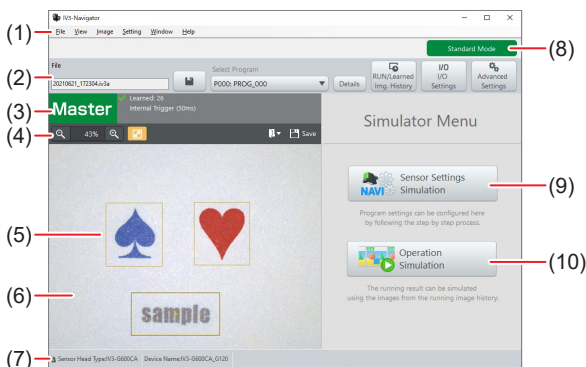
1 Transfer the saved batch backup file or individual program backup file to the sensor.

Reference "Transferring the Backed up Settings to the Sensor" (page 8-6)

Reference The batch backup file (*.iv3a) or individual program backup file (*.iv3a) can also be transferred to the sensor using a control panel (IV3-CP50). For details, refer to "IV3 Series User's Manual (Control Panel)".

Names and functions of the screen

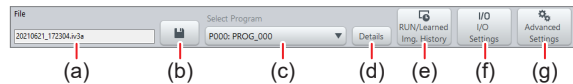
Main Screen of the Simulator



(1) Menu bar

☐ “Operating from the Menu Bar” (page 10-15)

(2) Settings button



No.	button	Function	Ref.
(a)	File name	Displays the file name of the batch backup file (*.iv3a) or individual program backup file (*.iv3a) which is displayed in the Simulator.	-
(b)	Save	Saves the contents set in the Simulator to the batch backup file (*.iv3a) or the individual program backup file (*.iv3a).	10-15
(c)	Program information	Displays the program number and program name. Programs can be switched from the drop-down menu.	7-2
(d)	Details	Displays the Program Details screen.	7-8
(e)	RUN/ Learned Img. History	Displays the running image history and learned image history (Learning tool only) saved in the open batch backup file (*.iv3a) or the open individual program backup file (*.iv3a).	5-17 6-7
(f)	I/O Settings	Displays the I/O Settings screen.	10-17
(g)	Advanced Settings	Displays the sensor advanced settings screen.	10-17

(3) Status bar

Displays the image type (Master/Part), the number of learned images (Learning tool only) and trigger type.

(4) Image tool bar

Displays the tools for controlling the image displayed in the Simulator.

☐ “Operation of the Image Tool Bar” (page 3-13)

(5) Tool window

Displays the set region of the tool set in the program. The tool window selected can be changed by pressing a different tool region.

☐ “Selecting the Display Method of the Tool Window” (page 5-7)

(6) Master image display

Displays the master image registered to the currently selected program.

Reference If the search range of the selected tool is being set to [Partial], the search range will be displayed with a light blue frame. If the position adjustment is set, the search range after position adjustment will be displayed.

(7) Sensor Information

Displays the model and device name (Page 7-21) of the sensor.

(8) Mode

Displays the program mode (Standard Mode/Sorting Mode).

(9) [Sensor Settings Simulation] button

Displays the Settings Navigator (Sensor Settings Simulation) screen.

☐ “Settings Navigator (Sensor Settings Simulation)” (page 10-7)

(10) [Operation Simulation] button

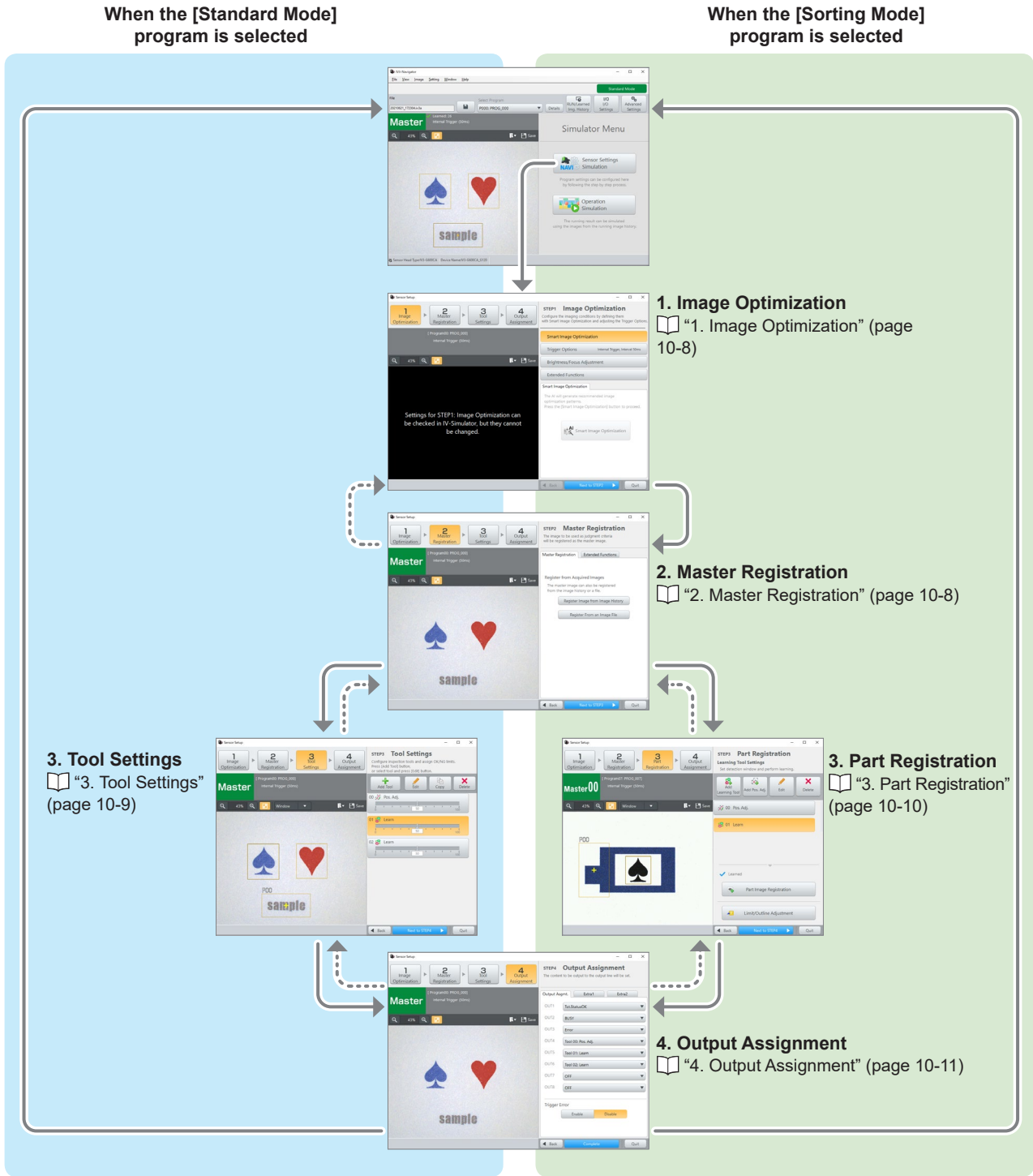
Displays the Operation Simulation screen.

☐ “Operation Simulation” (page 10-12)

Settings Navigator (Sensor Settings Simulation)

Settings Navigator Screen and Operation Flow

This section explains each setting screen to be displayed in the Settings Navigator and the operation flow. For details of the contents which can be set on each setting screen and its operations, refer to the applicable sections.

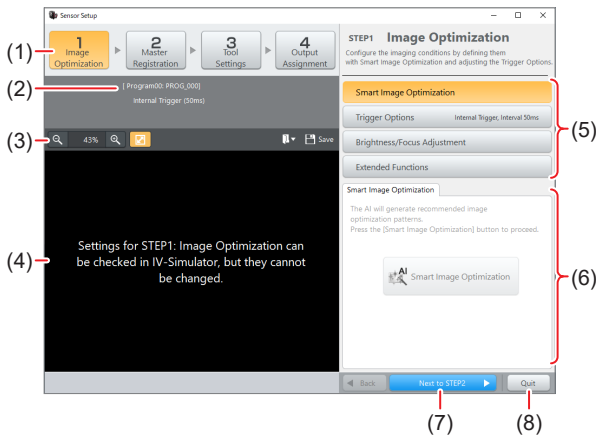


1. Image Optimization

Confirm the Image Optimization settings used for taking an image of a target.

Point In the Settings Navigator of the Simulator, the settings of the Image Optimization can only be confirmed. Image Optimization settings cannot be changed.

Main screen for the Image Optimization



(1) Navigation button

Moves steps in the Settings Navigator.

(2) Title

Displays the program number (Page 7-2), program name (Page 7-10), and trigger type.

(3) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(4) Image display screen

Only displays a message. The image will not be displayed.

(5) Settings button

Displays the settings to be set for Image Optimization.

- ☞ “Settings of Smart Image Optimization” (page 4-9)
- ☞ “Setting the Trigger Options” (page 4-10)
- ☞ “Brightness/Focus Adjustment” (page 4-12)
- ☞ “Advanced settings for image optimization” (page 4-16)

(6) Setting confirmation screen

Displays the settings of the selected menu in the tab format.

(7) [Next to STEP2] button

Proceeds to “2. Master Registration”.

☞ “2. Master Registration” (page 10-8)

(8) [Quit] button

Finishes the Settings Navigator.

☞ “Settings Navigator Screen and Operation Flow” (page 10-7)

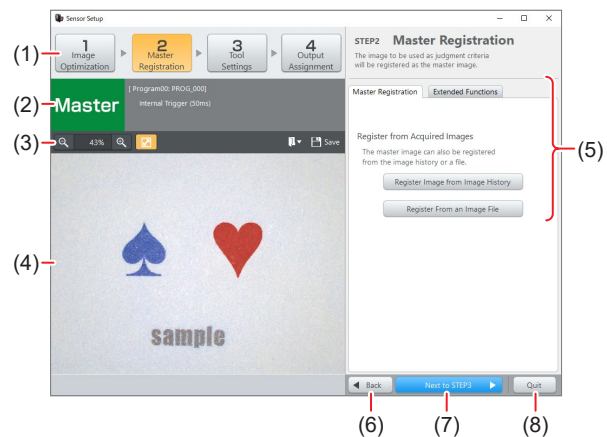
2. Master Registration

Registers a master image used as the reference for judgment. Also, set Brightness Correction.

Point In the Settings Navigator of the Simulator, the following images can be registered as master image.

- The running image history saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a) that are open currently.
- The running image history or master image saved in another batch backup file (*.iv3a) or individual program backup file (*.iv3a).
- Image capture file (*.iv3p)

Main screen for the master registration



(1) Navigation button

Moves steps in the Settings Navigator.

(2) [Image Type] display

☞ “Image Types of the Settings Navigator” (page 4-5)

(3) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(4) Master Image

Displays the master image.

(5) Settings button

Displays the settings used in the Master Registration.

- ☞ “Master Registration from a Running Image History” (page 10-9)
- ☞ “Master Registration Using the File Saved in the PC” (page 10-9)
- ☞ “Advanced settings items for the master registration” (page 4-24)

(6) [Back] button

Returns to the settings screen for Image Optimization.

☞ “1. Image Optimization” (page 10-8)

(7) [Next to STEP3] button

Proceeds to “3. Tool Settings” (Standard Mode) or “3.Part Registration” (Sorting Mode).

- ☞ “3. Tool Settings” (page 10-9)
- ☞ “3. Part Registration” (page 10-10)

(8) [Quit] button

Finishes the Settings Navigator.

☞ “Settings Navigator Screen and Operation Flow” (page 10-7)

Registering the master image

Master Registration from a Running Image History

The image history saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a) is registered as a master image.

Point To perform a master image registration from the image history in a sensor, the image to be registered as a master image in the running image history must be saved in advance.

☞ “Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-17)

For details about steps, refer to ☞ “Register From a Running Image History” (page 4-21).

Master Registration Using the File Saved in the PC

Select a batch backup file (*.iv3a), an individual program backup file (*.iv3a) or an image capture file (*.iv3p) stored in the PC, and register it as the master image.

Point

- Save the image to be registered as the master image into the PC in advance.
- The files which can be registered as a master image are batch backup files (*.iv3a), individual program backup file (*.iv3a) or image capture files (*.iv3p).

☞ “Folder Composition and File Naming Rules” (page 8-8)

- Register images taken with a sensor with the same installation conditions and the same image-related settings (exposure conditions etc.). Otherwise correct judgment may not be possible.

For details about steps, refer to ☞ “Registering from the File Saved in the PC” (page 4-22).

3. Tool Settings

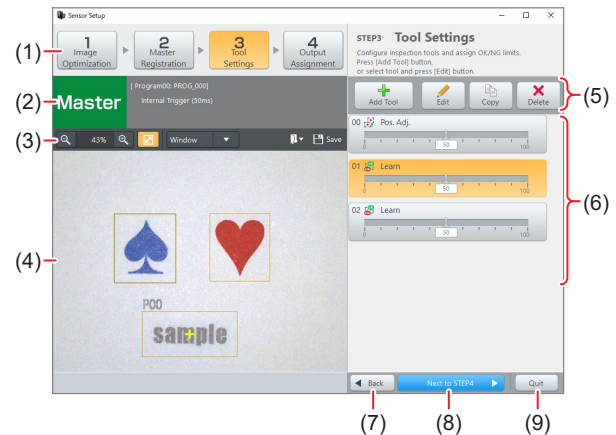
Tools for judgment of the target can be added, edited, copied, and deleted.

☞ “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-28)

Point In the Settings Navigator for the Simulator, the following buttons will not be displayed.

- [Live Adjustment] button for adjustment of the threshold of each tool
- The [LIVE image] button which displays the live image during tool setting.

Main screen for the Tool Settings



(1) Navigation button

Moves steps in the Settings Navigator.

(2) [Image Type] display

☞ “Operation of the Image Tool Bar” (page 3-13)

(3) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(4) Master Image

Displays the master image and tool window. If a search range is set, a tool window which indicates the range (light blue) will be displayed.

(5) Tool settings button

Adds, edits, copies, or deletes the tool.

☞ “Adding/Editing/Copying/Deleting a Tool” (page 4-36)

(6) Tool list

Displays a list of tools set in the program and a threshold for each tool.

(7) [Back] button

Returns to the master registration screen.

☞ “2. Master Registration” (page 10-8)

(8) [Next to STEP4] button

Proceeds to the Output Assignment settings.

☞ “4. Output Assignment” (page 10-11)

(9) [Quit] button

Finishes the Settings Navigator.

☞ “Settings Navigator Screen and Operation Flow” (page 10-7)

3. Part Registration

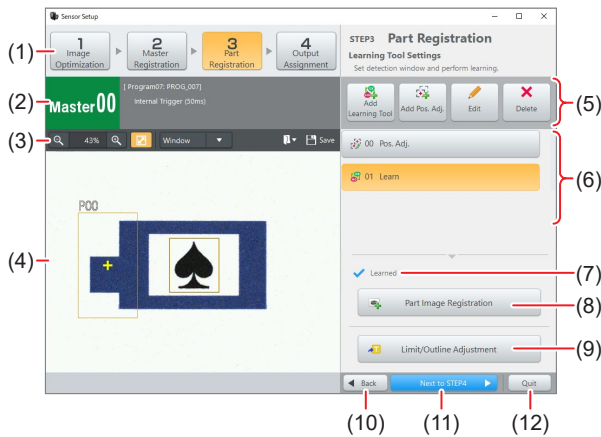
Performs adding/editing/copying/deleting of the tool window and position adjustment window. In addition, registers an image to judge the part type to perform learning.

☞ “3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121)

Point In the Settings Navigator for the Simulator, the following buttons will not be displayed.

- [Live Adjustment] button for [Limit Adjustment] of the position adjustment window

Main Screen for the Part Registration Settings



- (1) **Navigation button**
Moves steps in the Settings Navigator.
- (2) **[Image Type] display**
☞ “Image Types of the Settings Navigator” (page 4-5)
- (3) **Image tool bar**
☞ “Operation of the Image Tool Bar” (page 3-13)
- (4) **Master Image**
Displays the master image, tool window for the learning tool, and position adjustment window for the position adjustment tool. If a search range is set, a tool window which indicates the range (light blue) will be displayed.
- (5) **Tool operation button**
Adds, edits, or deletes the learning tool and position adjustment tool.
- (6) **Tool selection button**
Select the tool to confirm/edit/delete the setting conditions of the detection windows.

(7) Condition Display

Displays the condition of the learning settings.

Display	Status
Learning Tool Not Set	The tool window for the learning tool is not set.
Not learned	The learning for the target to judge the part type has not been completed.
Learned	The target to judge the part type has been learned.
Relearning required	Relearning is needed because of a setting change.

- (8) **[Part Image Registration] button**
Performs the learning for the work to judge the part type.
☞ “Part Image Registration” (page 4-140)
- (9) **[Limit/Outline Adjustment] button**
This button adjusts the threshold for detection tools with the exception of the position adjustment and high speed adjustment tools and adjusts the outline for the outline tool.
☞ “Limit Adjustment” (page 4-145)
☞ “Adjusting the Outline” (page 4-146)
- (10) **[Back] button**
Returns to the master registration screen.
☞ “2. Master Registration” (page 10-8)
- (11) **[Next to STEP4] button**
Proceeds to the Output Assignment settings.
☞ “4. Output Assignment” (page 10-11)
- (12) **[Quit] button**
Finishes the Settings Navigator.
☞ “Settings Navigator Screen and Operation Flow” (page 10-7)

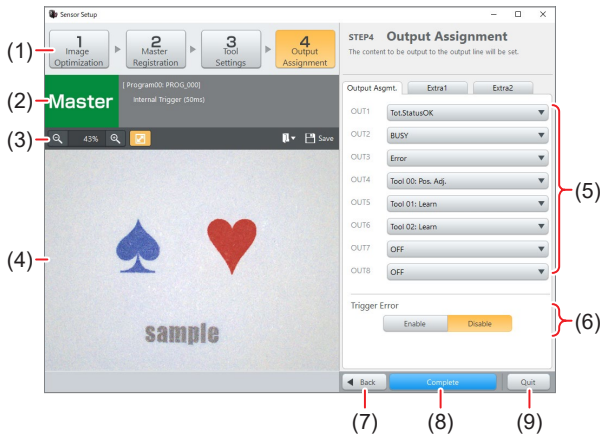
4. Output Assignment

Sets the output items to be assigned to the output line.

☞ “Cables” (page 2-15)

☞ “Chapter 11 Controlling with the Input/Output Line” (page 11-1)

Main screen for the output assignment



(1) Navigation button

Moves steps in the Settings Navigator.

(2) [Image Type] display

☞ “Image Types of the Settings Navigator” (page 4-5)

(3) Image tool bar

☞ “Operation of the Image Tool Bar” (page 3-13)

(4) Master Image

Displays the master image.

(5) Output Assignment button

• [Output Asgmt.] tab

Assigns the output item to each output line.

☞ “Setting the Output Assignment” (page 4-148)

• [Extra1] tab, [Extra2] tab

(can be set only in the standard mode)

Sets the total status conditions, logics, and program auto-switching.

☞ “Total Status Conditions” (page 4-150)

☞ “Logic Settings” (page 4-151)

☞ “Program Auto-Switching” (page 4-152)

(6) [Enable]/[Disable] setting for the trigger error output

Selects whether to enable/disable the output when a trigger error occurs.

☞ “Error Messages” (page A-9)

(7) [Back] button

Returns to the learning settings screen, or tool settings screen.

☞ “3. Tool Settings” (page 10-9)

☞ “3. Part Registration” (page 10-10)

(8) [Complete] button

Finishes the Settings Navigator.

☞ “Settings Navigator Screen and Operation Flow” (page 10-7)

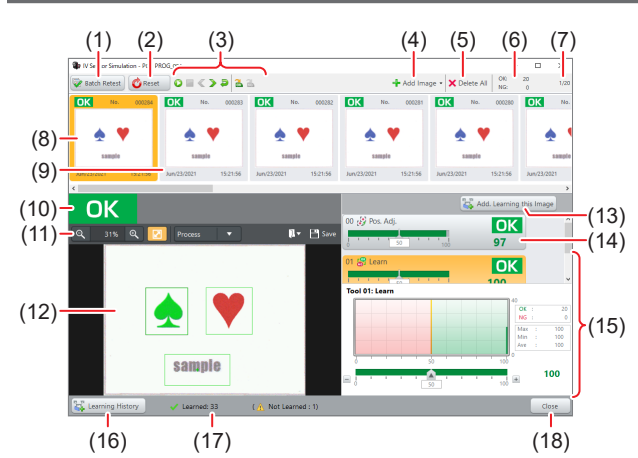
(9) [Quit] button

Finishes the Settings Navigator.

☞ “Settings Navigator Screen and Operation Flow” (page 10-7)

Operation Simulation

Main Screen of the Operation Simulation



(1) [Batch Retest] button

Performs batch operation simulation for all images.

(2) [Reset] button

Resets the result of batch operation simulation for every image. The status result will be [--].

(3) Operating button for operation simulation

	(Play)	Start operation simulation one by one in order from the selected history image.
	(Stop)	Stop the operation simulation being reproduced.
	(Back)	Shift the history image selection one position to the left.
	(Next)	Shift the history image selection one position to the right.
	(Repeat)	When this button is ON, the operation simulation is repeated from the first history image after the operation simulation for the last history image ends. Repeat can be switched ON/OFF during reproduction.
	(Next OK Image)	Transition to the next OK image after the selected history image.
	(Next NG Image)	Transition to the next NG image after the selected history image.

Point When (Next OK Image) / (Next NG Image) is executed after the settings for a threshold have been changed, the judgment result may be changed depending on the simulation result.

(4) [Add Image] button

Add an image to be used for the operation simulation from a batch backup file (*.iv3a), an individual program backup file (*.iv3a) or an image capture file (*.iv3p).

- Point**
 - The image is added to the left (latest position) of the thumbnail image. You cannot add it at a user-defined position.
 - When the number of images reaches 100, the image will be deleted from the oldest one.

(5) [Delete All] button

Deletes all registered image.

(6) Number of OKs/NGs

Displays the number of images for which the judgment result from the operation simulation is OK or NG.

(7) Image number

Display the image No. of the images in the Simulator as "(Currently selected image No.)/(Total number of images)".

(8) Thumbnail image (image history)

The image used as the target for operation simulation. Displays the number of triggers, the status result of the operation simulation, and the thumbnail image.

- Reference**
 - For details about the number of triggers, refer to "Statistical Information Display" (page 5-9).
 - Unnecessary images can be deleted ((5) [Delete All] button) and necessary images can be added from a different file ((4) [Add Image] button).
 - In the initial status, the newest image is at the left edge. The history becomes older from left to right.

(9) Image being selected (Orange frame)

Indicates the image currently selected. Operation Simulation is performed automatically for the selected image and the judgment result is displayed.

(10) Status result

Displays the judgment result for operation simulation for the selected thumbnail image.

(11) Image tool bar

"Operation of the Image Tool Bar" (page 3-13)

(12) Magnified display screen

Magnifies the selected thumbnail image.

(13) [Add. Learning this Image] button (learning tool only)

“Additional Learning from the Running Image History” (page 6-6)

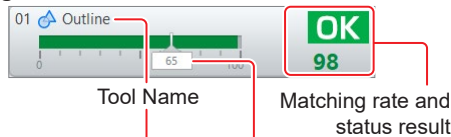
(14) Status gauge

Displays the status results of the tool window set in the program.

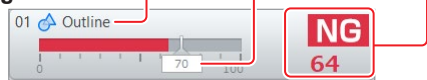
In standard mode

Displays the tool name, status results (OK/NG), a line indicating the threshold, and a value of the matching rate.

• Judge is OK



• Judge is NG

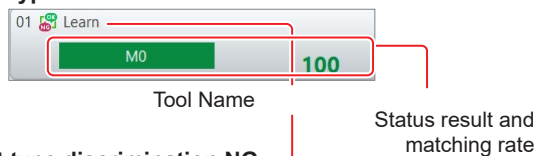


In sorting mode

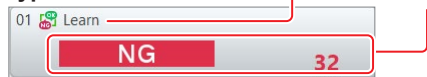
The tool name, status results, and the matching rate value will be displayed except for position adjustment tools. As a status result, the name of the part type (master) will be displayed when the part type discrimination is OK, whereas NG will be displayed when the part type discrimination is NG.

For position adjustment tools, it is the same as that of standard mode.

• Part type discrimination OK



• Part type discrimination NG

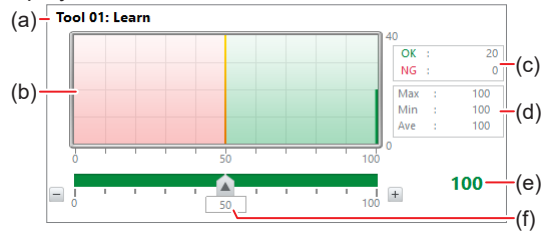


For details about the status results, refer to “Displaying and outputting the status result” (page A-4).

- Reference • Both maximum and minimum values of the distances between all the pitches are displayed in the status gauge of the Pitch tool. Among all of the distances between pitches, the one which deviates the most from the average value is displayed to show the matching rate.
- Threshold is not displayed for the High-Speed Position Adjustment tool.
- If the scaling function is used with the Width/Diameter/Pitch tool, the scaling unit is displayed.
- Threshold is not displayed in the status gauge of OCR tool. When the characters/date is completely matching, the matching rate is indicated with 100. If either the text or date does not match, 0 is displayed.
- If [Shade Contrast] of the OCR tool is set to [Enable], threshold is displayed. The value of the matching rate is associated with the shade contrast of the character/date.

(15) Tool information

Displays the tool name of the selected tool.



(a) Tool information

Displays the tool name of the selected tool.

(b) Histogram

Displays the result of the operation simulation for the selected tool as a histogram (frequency distribution). With the threshold being a border, the range for OK is displayed in green and for NG is displayed in red.

- Horizontal axis Displays the distribution of the matching rate. The display of the range is fixed. It cannot be specified arbitrarily.
- Vertical axis Adjusts automatically according to the maximum value of the frequency. It cannot be specified arbitrarily.

Reference Pitch tool displays the histogram (frequency distribution) of the selected pitches.

(c) Judgment Record

Displays the number of images for OK or NG.

- OKDisplays the number of images for “OK”.
- NGDisplays the number of images for “NG”.

(d) Matching rate information

- MAX.....Displays the maximum value of the matching rate.
- MIN.....Displays the minimum value of the matching rate.
- AVEDisplays the average value of the matching rate.

Reference AVE is not displayed in Edge tool and High-Speed Position Adjustment tool.

(e) Matching rate of the latest judgment process

Displays the matching rate of the latest judgment process. The status result changes according to the setting of the threshold value.

(f) Limit

Displays the threshold of the selected tool. The threshold value can be changed by dragging the slider.

Reference Threshold is not displayed in High-Speed Position Adjustment tool.

(16) [Learning History] button (Learning tool only)

“Additional Learning from the Learned Image History” (page 6-10)

(17) Number of learned images (Learning tool only)

Displays the number of learned images and number of not reflected images.

(18) [Close] button

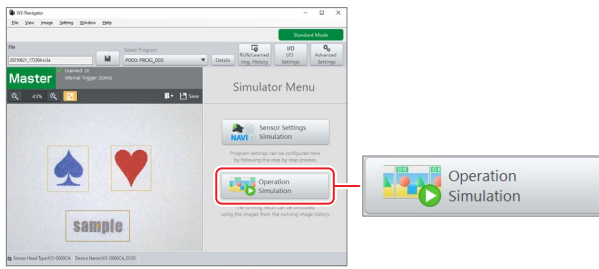
The system returns to the main screen for the Simulator.

Starting the operation simulation

1 Display the main screen for the Simulator.

☞ “Starting the Simulator” (page 10-4)

2 Press [Operation Simulation].

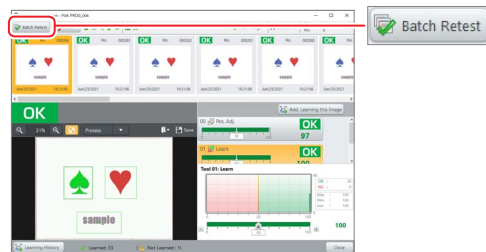


The message dialog opens.

3 Press [OK].

The Operation Simulation screen opens.

4 Perform the Operation Simulation by pressing [Batch Retest].



For operations of the operation simulation, refer to ☞ “Main Screen of the Operation Simulation” (page 10-12).

Point Please perform “Batch Retest” when the setting for “Color Extraction”/”Brightness Extraction” or the setting of the threshold has been changed.

- If this is not done, pay attention to the following items.
- The frequency distribution of the histogram is not displayed correctly (when the setting has been changed, the matching rate may change after retesting).
- The “Number of OKs/NGs” and the “Judgment record” are not updated.

5 After the Operation Simulation is completed, press [Close] at the lower right on the screen.

The system returns to the main screen for the Simulator.

Reference The test results will not be saved. If checking the test results again, perform Operation Simulation (Batch Retest) with the same settings and the same image history.

Operating from the Menu Bar

[File] Menu

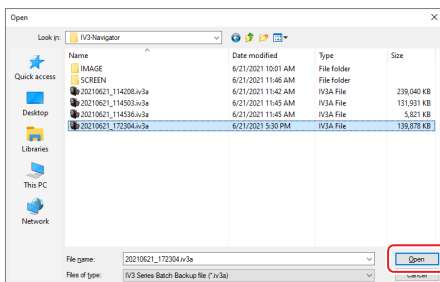
Open file

Open the batch backup file (*.iv3a) or the individual program backup file (*.iv3a) saved in the PC.

1 Select [File] → [Open file] from the menu bar.

The [Open] screen opens.

2 Select a file and press [Open].



Point Files with the formats other than the iv3a format cannot be used.

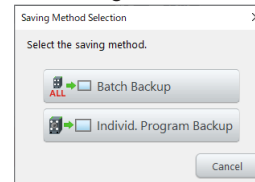
The main screen for the Simulator opens.

Save

Save the contents set in the Simulator to a PC as a batch backup file (*.iv3a) or an individual program backup file (*.iv3a).

1 Select [File] → [Save] from the menu bar.

Press [Batch Backup] or [Individ. Program Backup] on the saving method selection screen.

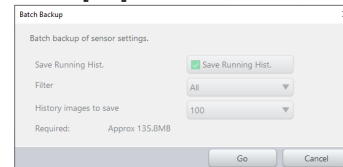


The batch backup screen or individual program backup screen opens.

2 Perform the backup.

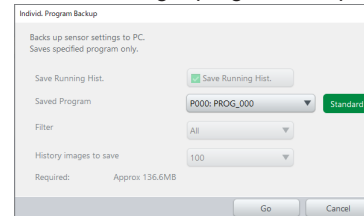
In the case of the batch backup

Press [Go].



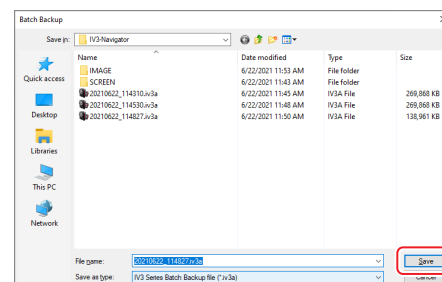
In the case of the individual program backup

Select the target program and press [Go].



The save as screen opens.

3 Press [Save].



Reference Change the save destination of the file and file name as needed.

The save completion message opens.

4 Press [OK].

The system returns to the main screen for the Simulator.

Export

■ Save Program Settings List

Outputs the sensor information held in the IV2-Simulator as tab-delimited text.

📖 "Save Program Settings List" (page 7-27)

Terminate IV3-Simulator

Terminates the Simulator and returns to the Activation Menu screen.

📖 "Exiting the Simulator" (page 10-5)

Exit

Exits the IV3-Navigator.

1 Select [File] → [Exit] from the menu bar.

When the program setting or image history has been changed, the confirmation dialog to save opens.

2 Press [Yes].

The changed contents are saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a), and the IV3-Navigator is closed.

[View] Menu

Operation Simulation Startup Message

Switches whether to show/hide the message when pressing [Operation Simulation].

Select [View] → [Operation Simulation Startup Message] from the menu bar, and then select [Show]/[Hide].

[Image] Menu

Zoom

■ Reduce (Zoom Out)

Reduces the image displayed on the Simulator.

📖 "Reduce (Zoom Out)" (page 7-29)

■ Enlarge (Zoom In)

Enlarges the image displayed on the Simulator.

📖 "Enlarge (Zoom In)" (page 7-29)

■ Fit Window

Displays the image displayed on the Simulator by fitting it to the screen size.

📖 "Fit Window" (page 7-29)

Display Tools

Switches the display method for the tools.

📖 "Display Tools" (page 7-29)

Capture

■ Save Image

Saves the bmp format file of the image displayed in the Simulator and the iv3p format file which can be used for a master image registration or additional learning at the same time.

A screen capture of the IV3-Navigator screen will also be saved at the same time.

Select [Image] → [Capture] → [Save Image] from the menu bar.

■ Show saved image file location

Opens the save destination folder for the captured image.

Select [Image] → [Capture] → [Show saved image file location] from the menu bar.

■ Change saved image file location

Opens the reference screen for the folder and changes the save destination for the captured image.


📖 "Change saved image file location" (page 7-30)

[Setting] Menu

Language

Switches the display language of the IV3-Navigator.

📖 "Language" (page 7-30)

 The displayed language can be switched on the Activation Menu screen of the IV3-Navigator (Page 3-2).

[Window] Menu

Program Details

Display the [Program Details] screen.

Select [Window] → [Program Details] from the menu bar.

📖 “Displaying the [Program Details] screen” (page 7-8)

Running Image History

Display the [Run/Learned Img. History] screen.

Select [Window] → [Running Image History] from the menu bar.

📖 “Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-17)

📖 “Displaying the [Learned image history] screen” (page 6-7)

Reference The following buttons and menus will not be displayed in the running image history screen of the Simulator.

- [Refresh] button
- [Recomm image to learn] button
- [Batch Backup (*.iv3a)] menu

I/O Settings

Displays the [I/O Settings] screen.

Select [Window] → [I/O Settings] from the menu bar.

📖 “Setting the Input and Output Information of the Sensor” (page 7-13)

Reference The [I/O Monitor] tab is not displayed on the I/O Settings screen with Simulator. The [Polarity] cannot be changed and can only be confirmed.

Sensor Advanced

Displays the sensor advanced settings screen.

Select [Window] → [Sensor Advanced] from the menu bar.

📖 “Setting the Advanced Information of the Sensor” (page 7-19)

Reference The following limitations apply for the [Sensor Advanced] screen when using the Simulator.

- The following tabs will not be displayed.
 - Backup/Data Transfer
 - Initialize/Update
 - SD Card
- The setting contents of the sensor saved in the batch backup file (*.iv3a) or the individual program backup file (*.iv3a) can be checked.
- The following settings can be changed.
 - Device Name
 - Security
 - Image/Result Output
 - Utility

[Help] Menu

About

Displays the version information of the IV3-Navigator.

📖 “About” (page 7-31)

MEMO

11

Controlling with the Input/Output Line

This chapter explains how the input / output terminal controls each operation.

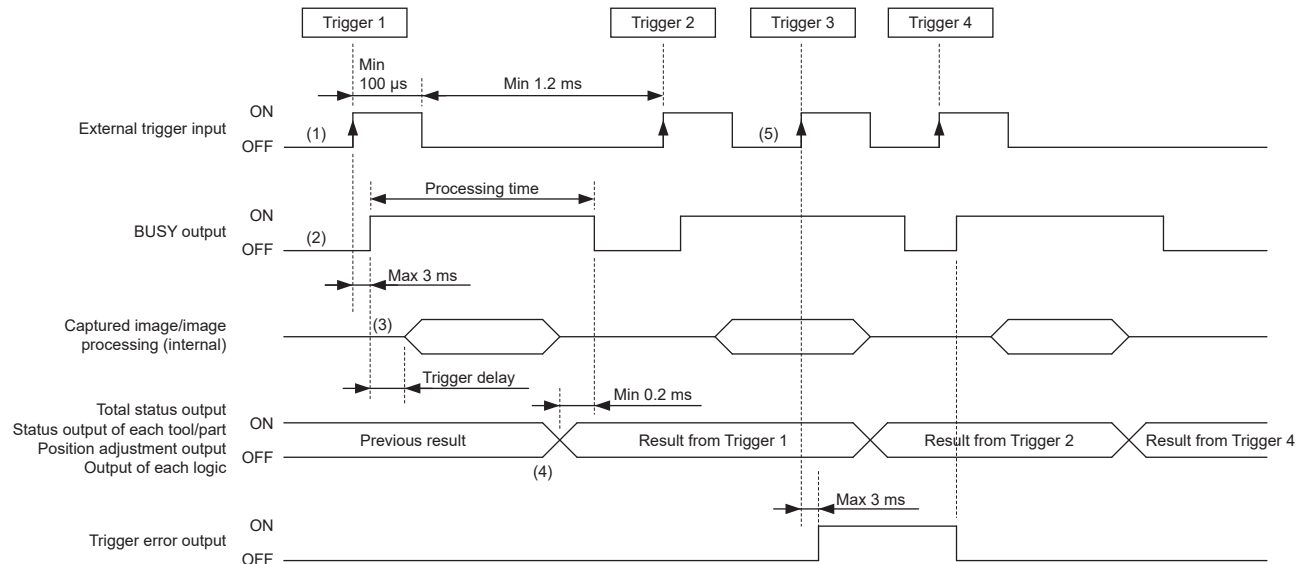
Controlling Timing of Judgment with Triggers.....	11-2
Importing the Status Output (When Program Auto-Switching is “Disable”).....	11-5
Importing the Status Output (When Program Auto-Switching is “Enable”).....	11-8
Changing Over.....	11-10
Registering the Master Image	11-11
Clearing Errors	11-13
Behavior When the Sensor Power is Turned On or Off... ..	11-14
Input Response Time	11-16

Controlling Timing of Judgment with Triggers

For details about triggers, refer to “Setting the Trigger Options” (page 4-10).

External Trigger

When the [Trigger Options] is set to [External Trigger], imaging and judgment are performed when inputting the external trigger. To import the acceptance timing of the external trigger and status output, use the BUSY output.



- (1) Position the target and input external trigger. The shortest input time for the input to be recognized as ON is 100 µs. The shortest possible interval between trigger inputs (where input is OFF) is 1.2 ms.
- (2) BUSY output turns ON. Processing time differs depending on the settings.
- (3) After the trigger delay time (Page 4-11) elapses, the target is imaged and the judgment process is performed.
- (4) After the judgment process is completed, the status output updates and the BUSY output is turned OFF. If [Until Data Transfer is Complete] is set for “BUSY Output Configuration” (page 7-16), the BUSY output is turned OFF after data is transferred to the SD card. Confirm that the BUSY output is turned OFF, then import the status output.
- (5) If the external trigger is input while BUSY is being output, the input is ignored and a trigger error occurs. Trigger 3 is not judged. To output the trigger error, set Trigger Error in the Output Assignment (Page 4-147) under the Settings Navigator to [Enable].

- Use external trigger input and BUSY output to control the timing.

- The ON status of each output is as follows.

When Output Settings (Page 7-15) are [N.O.]: Status with output ON.

When Output Settings (Page 7-15) are [N.C.]: Status with output OFF.

- The ON status of each input indicates the input line is shorted when the Polarity (Page 7-17) is NPN, and indicates that voltage is applied within the input line when the Polarity is PNP.

- The edge used for activating or deactivating timing can be set in the external trigger input settings.

“Input Settings” (page 7-13)

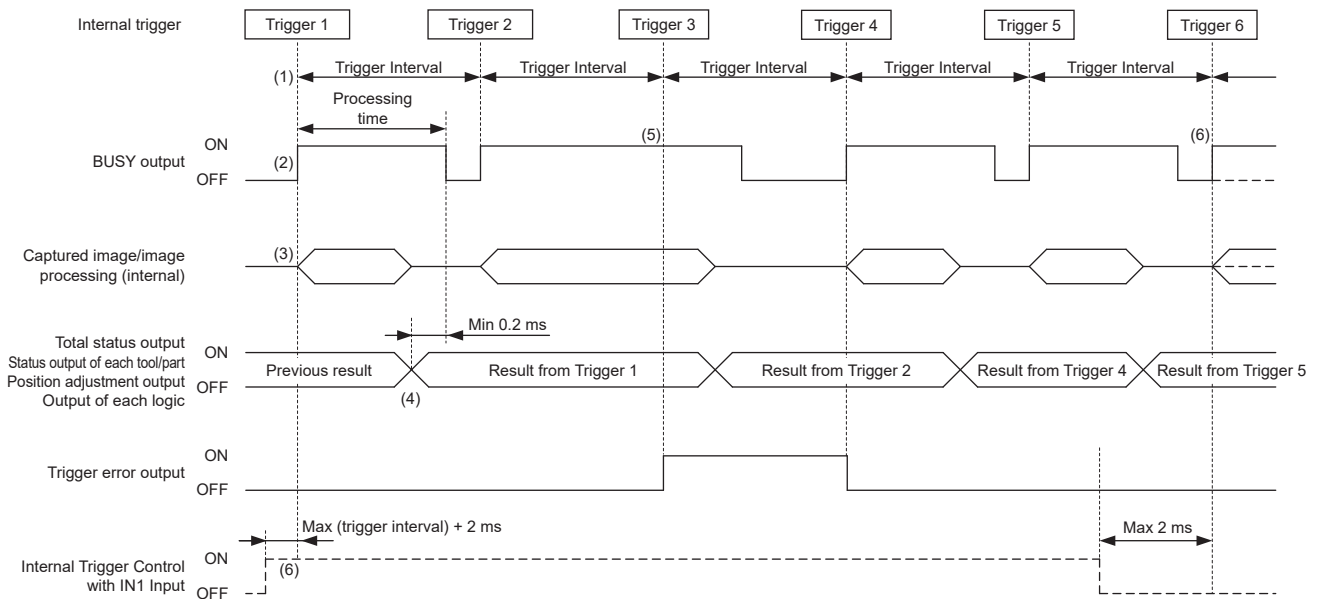
- The trigger error output turns OFF when the next trigger is activated, when the error is cleared, when the program is switched, or when the system moves to the settings screen.

- When the output mode of Output Settings (Page 7-16) is set to [Latching]. For [One-Shot], refer to “Changing the timing of status outputs” (page 11-7).

Internal Trigger

When the [Trigger Options] is set to [Internal Trigger], imaging and judgment are performed at the timing of the set trigger interval. To import the status output, use the BUSY output.

Controlling timing using BUSY output



- (1) Inputs internal trigger at the trigger interval set.
- (2) BUSY output turns ON when the internal trigger occurs. Processing time differs depending on the settings.
- (3) The target is imaged and judged. No trigger delay settings.
- (4) After the judgment process is completed, the status output updates and the BUSY output is turned OFF. If "BUSY Output Configuration" (page 7-16) is set to [Until Data Transfer is Complete], BUSY output is turned OFF after data is transferred to the SD card. Confirm that the BUSY output is turned OFF, then import the status output.
- (5) If the internal trigger is input while BUSY is being output, the input is ignored and a trigger error occurs. Trigger 3 is not judged. To output the trigger error, set Trigger Error in the Output Assignment (Page 4-147) under the Settings Navigator to [Enable].
- (6) If [Internal Trigger Control with IN1 Input] is set to [Enable] (dotted line), the internal trigger stops when IN1 input is OFF. BUSY output does not turn ON for Trigger 6 (dotted line). Additionally, judgment processing is not performed (dotted line). If it is set to [Disable], the internal trigger is always on.

- The ON status of each output is as follows.

When Output Settings (Page 7-15) are [N.O.]: Status with output ON.

When Output Settings (Page 7-15) are [N.C.]: Status with output OFF.

- The trigger error output turns OFF when the next trigger is activated, when the program is switched, or when the system moves to the settings screen.
- When the output mode of Output Settings (Page 7-16) is set to [Latching]. For [One-Shot], refer to "Changing the timing of status outputs" (page 11-7).
- When [Internal Trigger Control with IN1 Input] is set to [Enable], the minimum input ON time is 1 ms and the minimum input OFF time is 1.2 ms.

The actual interval from IN1 input to an internal trigger output is within "set trigger interval + 2ms".



Set the trigger interval longer than the processing time. If the trigger interval is shorter than the processing time, the internal trigger will be input during the processing time, so the trigger error will occur.

Operating in the shortest cycle

To input the internal trigger in the shortest cycle and perform the judgment process, set the trigger interval to 1 ms. Set the Trigger Error in the Output Assignment (Page 4-147) in Settings Navigator to [Disable] and disregard the trigger error.

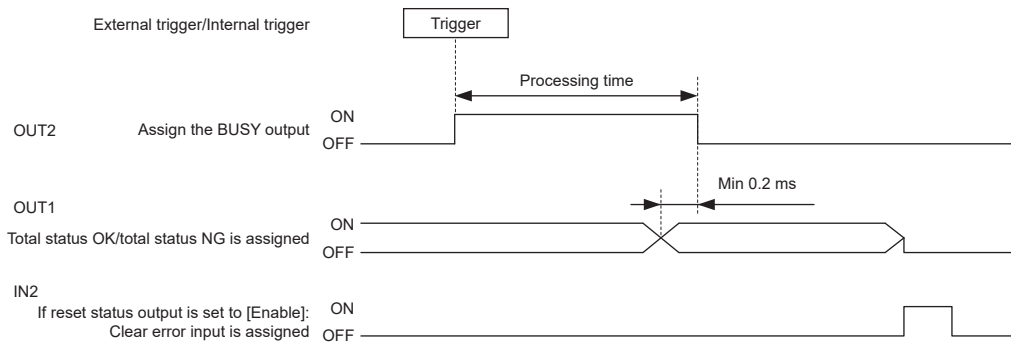
Importing the Status Output (When Program Auto-Switching is “Disable”)

Imports the status output assigned to output lines of the I/O terminal block and power I/O cable. For details about assigning to output lines, refer to [□](#) “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147).

To use program auto-switching, refer to [□](#) “Importing the Status Output (When Program Auto-Switching is “Enable”)” (page 11-8).

Importing the total status OK/total status NG output (standard mode only)

Total status results of multiple detection tools and the position adjustment for the examined target can be checked. The operation is as follows.



- This is an example operation when the output mode of Output Settings (Page 7-16) is set to [Latching]. For [One-Shot], refer to [□](#) “Changing the timing of status outputs” (page 11-7).
- The total status output turns ON when the total status results were OK. The total status NG output turns ON when the total status results were NG.

Reference

The total status conditions can be selected from [All Tools OK], [Any Tool OK] and [Logic 1] to [Logic 4].

• [All Tools OK]

When all of the status results of the detection tools and the adjustment result of the position adjustment result were OK, the total status result is OK.

• [Any Tool OK]

When any of the status results of the detection tools except that of the position adjustment was OK, the total status result is OK.

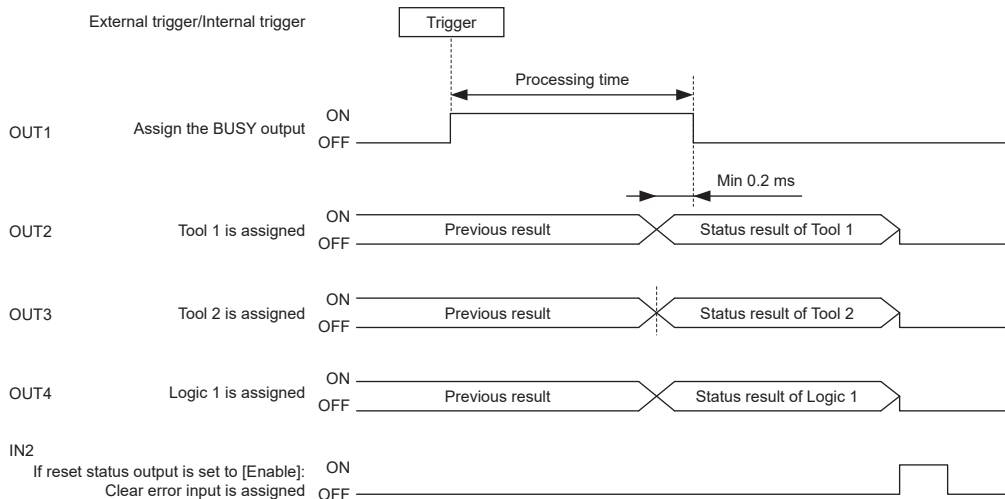
• Logic

When the logical operation result of the set detection tools was OK, the total status result is OK.

- The status result will be kept until the next status result output. However, the output function turns OFF when the program number is switched or an external master image is registered.
- The ON status of each output is as follows.
 - When Output Settings (Page 7-15) are [N.O.]: Status with output ON.
 - When Output Settings (Page 7-15) are [N.C.]: Status with output OFF.
- When [Reset Status Output on Clear Error Execution] is set to [Enable], the status output can be reset with the clear error input.

Importing the individual status output of each detection tool/part type/logic

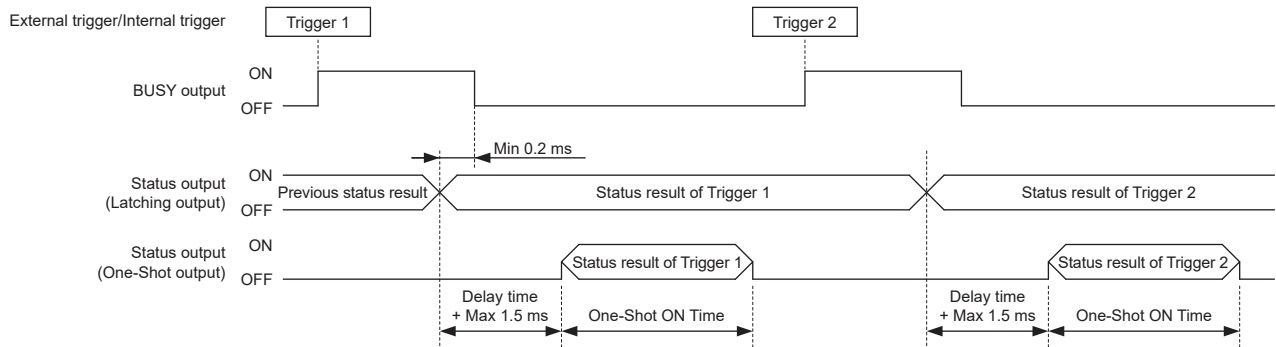
The individual status result of the detection tool/part type and position adjustment for the examined target can be checked. The operation is as follows.



- This is an example operation when the output mode of Output Settings (Page 7-15) is set to [Latching]. For [One-Shot], refer to [“Changing the timing of status outputs”](#) (page 11-7).
- This is an example when the status results of Tool 1, Tool 2, and Logic 1 are to be checked individually in standard mode.
- In the Sorting Mode, Part0 to Part7 will be assigned. The logic cannot be set.
- The status output turns ON when the status result of each tool/logic or part type was OK. Turns OFF when the result was NG or --.
- The ON status of each output is as follows.
 - When Output Settings (Page 7-15) are [N.O.]: Status with output ON.
 - When Output Settings (Page 7-15) are [N.C.]: Status with output OFF.
- The status result will be kept until the next status result output. However, the output function turns OFF when the program number is switched or an external master image is registered.
- When [Reset Status Output on Clear Error Execution] is set to [Enable], the status output can be reset with the clear error input.

Changing the timing of status outputs

The timing of status outputs can be selected from [Latching] which links to judgment and [One-Shot] which outputs for a certain time. For details of how to configure the settings, refer to “Output Settings” (page 7-15).



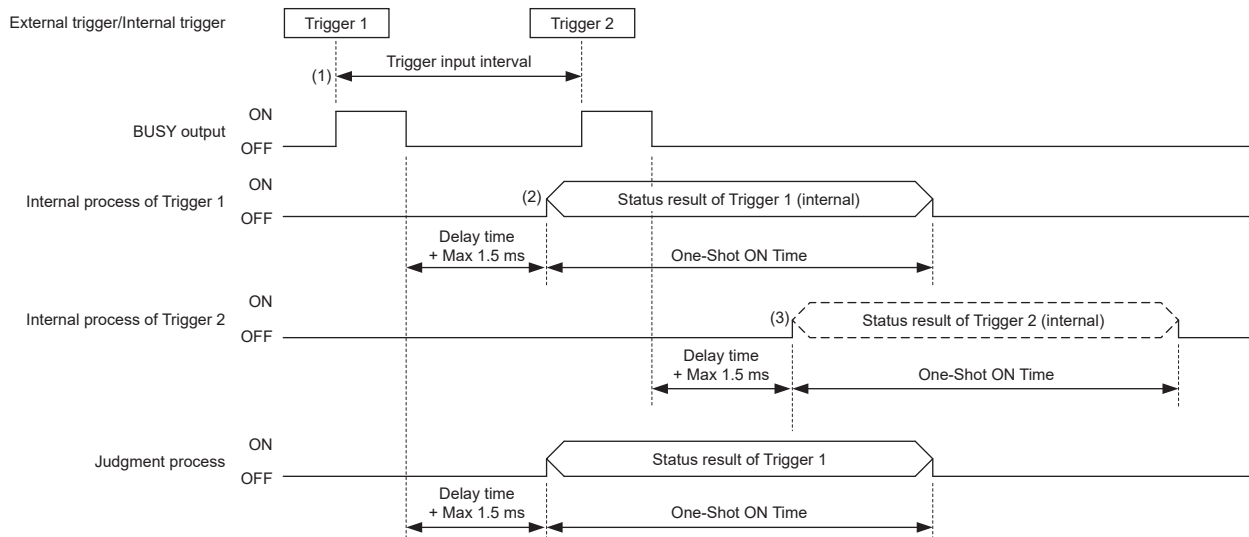
- In case of [Latching], updates the output by linking with judgment.
- In case of [One-Shot], outputs for a set amount of time after the set delay time is passed.
- When the program number is switched or the external master image is registered, the status output turns OFF.

Canceling One-Shot output

To use the One-Shot output function, the following condition needs to be met.

Trigger input interval (trigger interval) > Maximum value of processing time > One-Shot ON Time

If the above condition is not met, the One-Shot output that follows the current One-Shot output is canceled and will not be output.



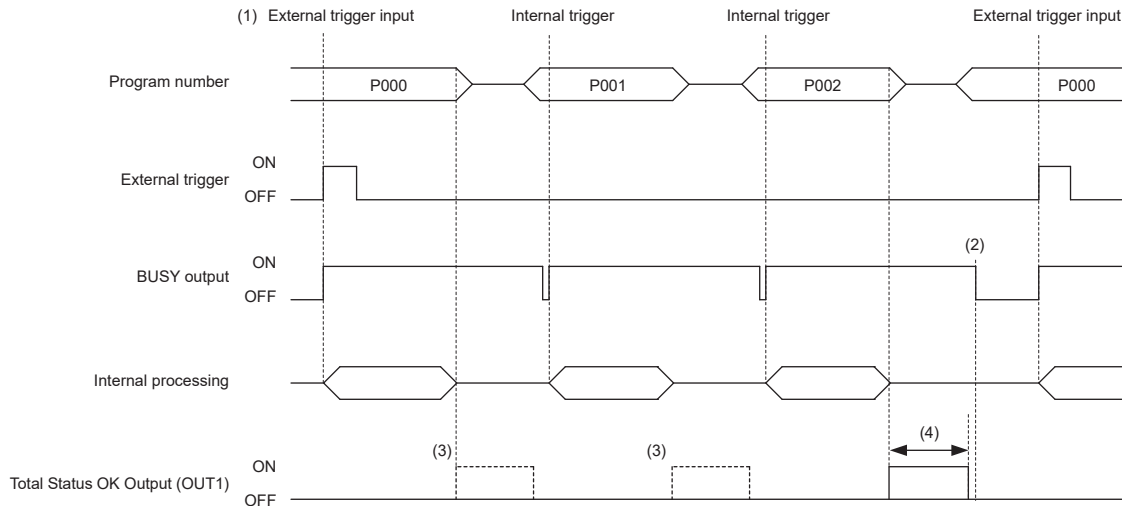
- (1) This is an example of what happens when the trigger input interval is shorter than the One-Shot ON Time.
- (2) Since the previous One-Shot output has been completed, the status result of Trigger 1 can be output as a One-Shot normally.
- (3) Since the previous One-Shot output has not been completed, the status result of Trigger 2 cannot be output as a One-Shot and will be canceled.

Importing the Status Output (When Program Auto-Switching is "Enable")

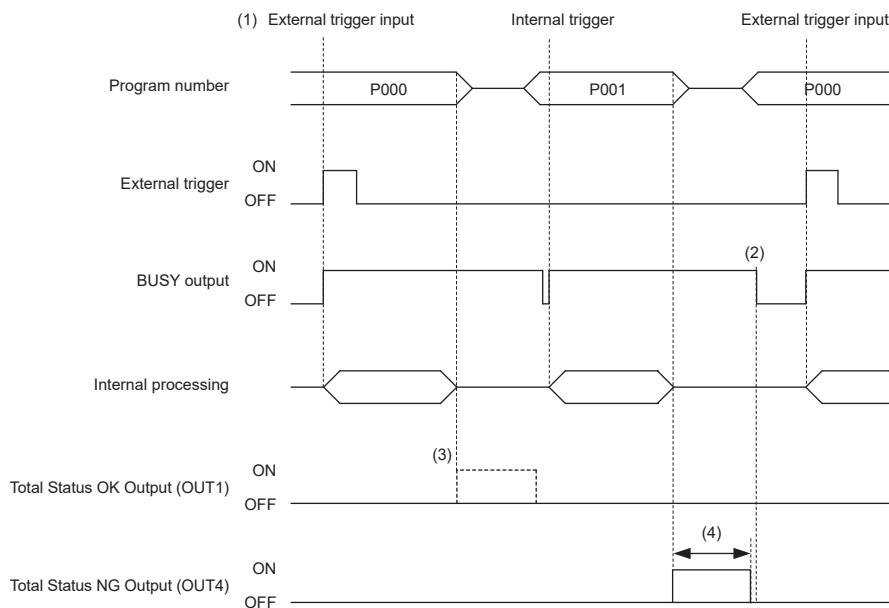
Program auto-switching is a function to change automatically to a pre-set program number according to the status result. If multiple programs are used to perform a single examination, examinations can be performed continuously without controlling the program switching with a PLC etc. For details, refer to ["Using Program Auto-Switching"](#) (page 7-11).

The operation in the setup example of "Using Program Auto-Switching" (page 7-11) is as follows.

When all judgments are OK



When the judgment in the program 001 is NG

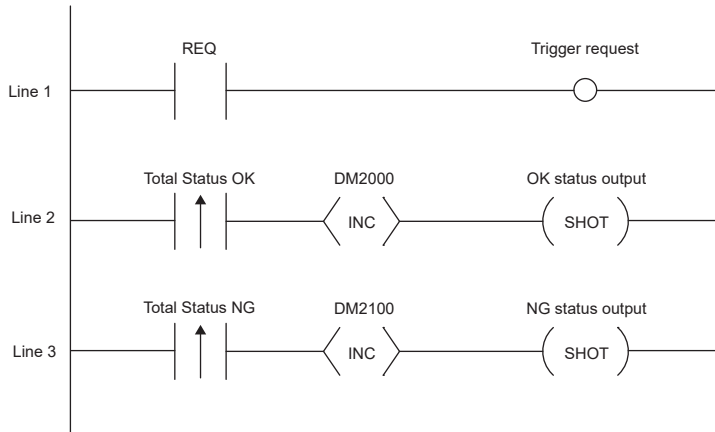


- (1) When the start point program is set as an external trigger and the other programs as internal triggers, the programs other than the start point program will be processed for judgment. Thereafter, the programs will be automatically switched to each switching destination according to the judgment.
- (2) The status output turns OFF before the BUSY output turns OFF. To acquire the total status result, obtain the rising of the total status OK and NG outputs.
- (3) The external output of status results is set by "Output Assignment" for each program. At this point, select "Do not output" for OUT1 of P000 and P001. For OUT1 of P002, select "Total Status OK". For OUT4 of P000 to P002, select "Total Status NG".
- (4) Status output time = Program switching time + Delay time
The time from the determination of judgment to the execution of the program auto-switching can be changed by the delay settings.
If extending the status output ON time and checking the status result on the screen or others, set the required delay time.

["Program Auto-Switching"](#) (page 4-152)

<Reference ladder program>

KEYENCE KV Series



● Line 1

Turn on REQ, and executes the trigger request.

● Line 2/Line 3

Acquire the status result at rising of the total status OK or total status NG. When program auto-switching is "Enable", the ON time of the total status output and total status NG output will be shorter. Therefore, ON time is adjusted using the one-shot circuit in the above reference ladder program. There is also a method to retain the output with a self-holding circuit. Create a ladder program according to the necessary controlling method.

Additionally, the reference ladder above uses an increment instruction to count the number of OKs and NGs. Use it as needed.

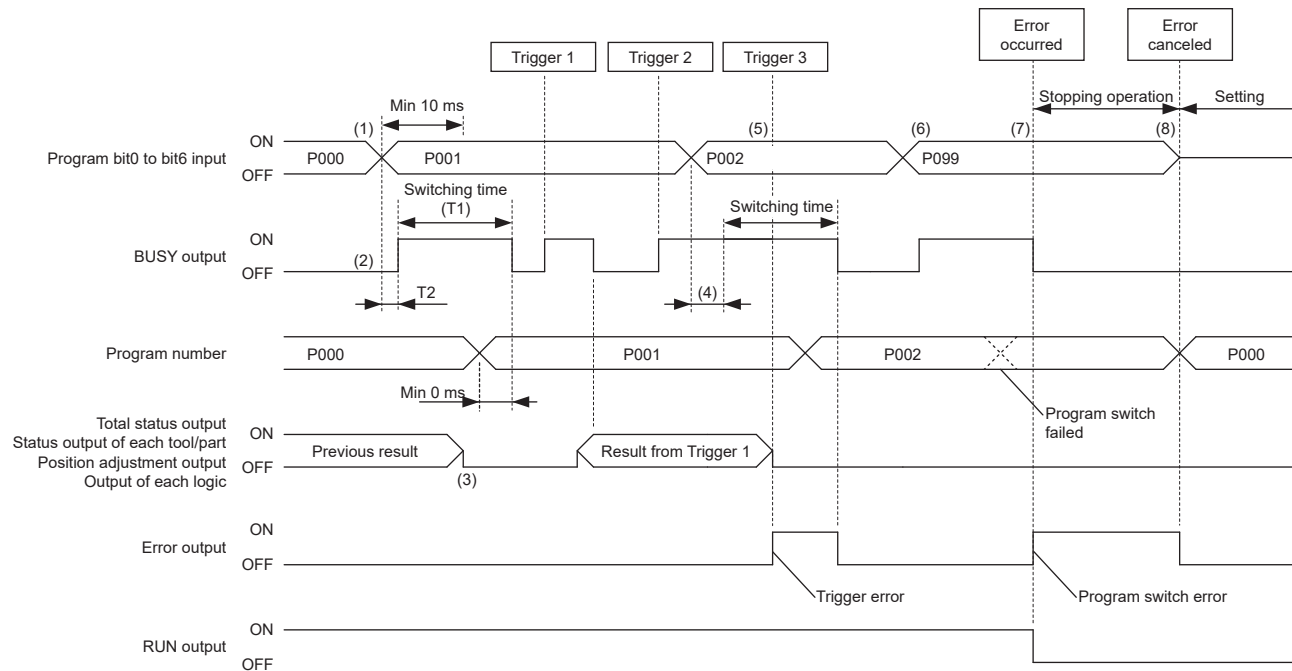
In the reference ladder program above, the number of times OK and NG are recorded in DM2000 and DM2100.

Reference

- The reference ladder program assumes that the trigger option of the start point program is "External Trigger", and the trigger options of other programs are "Internal Trigger".
- The BUSY output cannot be used for importing the status output.

Changing Over

The program set in the sensor can easily be changed by referencing the previously-saved judgment condition (program) with the input lines. For details about program functions, refer to “Changeover for a Target (Program Functions)” (page 7-2).



- (1) Switch the current program by inputting Program bit0 to bit6 and keeping the line active. Minimum input time is 10 ms. “When Setting the [Program Switching Method] to [External Input].” (page 7-6)
- (2) BUSY output turns ON while switching the programs. Switching time differs depending on the settings.
- (3) The output status (Latching output and One-Shot output) turns OFF before the switching program is completed.
- (4) If the program number is switched during a judgment process, the system cancels the judgment process (result of Trigger 2 is not output). The program switching process is delayed because the judgment must be canceled. Delay time depends on the settings.
- (5) If a trigger occurs while switching programs (during the BUSY output), the trigger is ignored and a trigger error occurs. To output the trigger error, set Trigger Error in the Output Assignment (Page 4-147) under the Settings Navigator to [Enable]. In the case of a manual trigger, the trigger is processed after the program switching process has completed.

- For details about T1 and T2, refer to “Input Response Time” (page 11-16).
- Use this function during operation. Programs cannot be switched with the external input during setup.
- The trigger error output turns OFF when the next trigger is activated, when the error is cleared, when the program is switched, or when the system moves to the settings screen.
- If the switched program is set to [Internal Trigger], the time for inputting the trigger after switching the program fluctuates. A delay of one trigger interval may occur.
- Do not use with the external master registration input at the same time. The sequence for switching programs and the external master registration process will vary.
- The response of the image displayed on the IV3-Navigator might be delayed until after switching programs (BUSY output OFF).

Program switch error

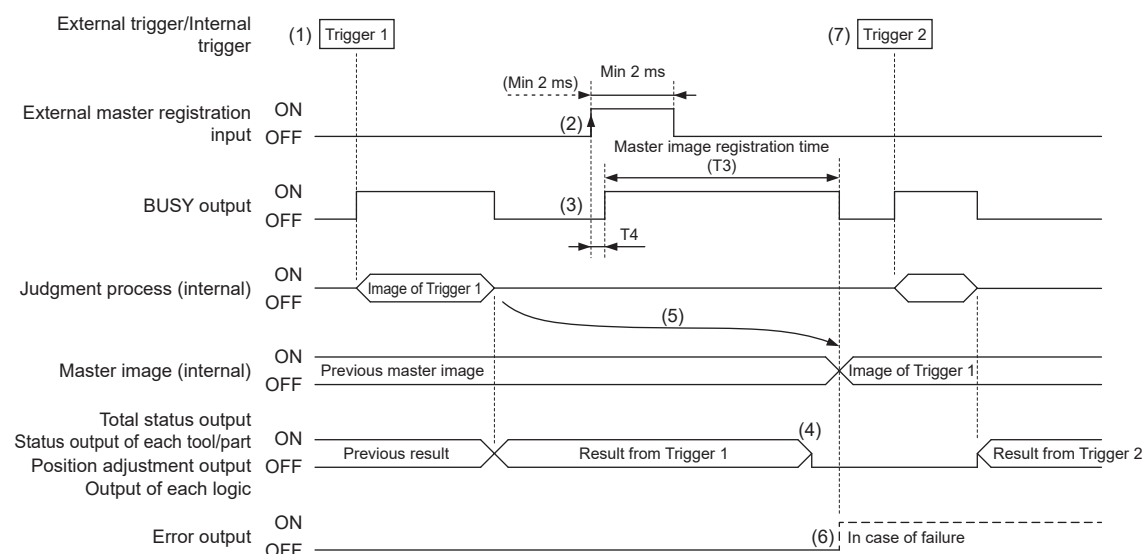
If using the program expansion function for the SD card (Page 8-11), a program switch error occurs when the advanced program information cannot be read from the SD card.

- (6) For example, bit0 to bit6 input changes and switches to P099 when the SD card is removed.
- (7) A program switch error occurs. BUSY output turns OFF and error output turns ON. Run output turns OFF and operation stops. The previous program number will be retained but the device cannot run. Clear error input is disabled. The PWR/ERR indicator light on the sensor amplifier turns ON (red). The sensor head operation indicator light blinks (red).
- (8) Connecting the control panel or IV3-Navigator (IV3-H1) and clearing the error messages cancels the errors and the device changes to the settings screen. Error output turns off. The program number changes to “P000”.

For details about how to clear the program switch error, refer to “How to clear a program switching error” (page 7-5).

Registering the Master Image

The external master registration function can register the master image with using the input line. For details, refer to [2. Master Image Registration \(Registering an Image as a Reference\)](#) (page 4-20).



- (1) Takes an image to be registered as a master image by the external trigger or internal trigger.
- (2) If the BUSY output is OFF, the external master registration input will be input. Minimum ON/OFF input time is 2 ms.
- (3) The BUSY output turns ON and master registration starts. The master registration time depends on the settings.
- (4) The status output (Latching output and One-Shot output) turns OFF before master image registration is completed.
- (5) The image imaged in Trigger 1 will be registered as a master image.
- (6) If the external master image registration fails, the error output turns ON. Check that the external master image registration succeeds with the error output. In case of failure, the image will not be updated from the previous master image. The error output turns OFF when the external master image registration succeeds or by the clear error input.
- (7) After master image registration is completed, the judgment process is performed with the new master image. Trigger 2 judges the target using the image of Trigger 1 as a master image.

- For details about T3 and T4, refer to [“Input Response Time”](#) (page 11-16).
- Use this function during operation. External master image registration cannot be performed during setup.
- If a trigger occurs while registering the master image (during BUSY output), the trigger is ignored and a trigger error occurs. The trigger error output turns OFF when the next trigger is activated, when the program is switched, or when the error is cleared. To output the trigger error, set Trigger Error in the Output Assignment (Page 4-147) under the Settings Navigator to [Enable].
- If the external master registration input is input during the imaging process (BUSY) by the trigger, the system cancels the judgment process (taken image will not be registered). After the process is canceled, the image taken before cancellation is registered as a master image. The master image registration process is delayed by the cancelling process. Delay time depends on the settings.
- Do not change over the programs at the same time that the external master registration input is being performed. The sequence of the external master registration and program switching process will vary.
- When the learning tool or sorting mode is set, this cannot be used.
- Registered as master image 0 when master image settings are set to [Enable]. Images cannot be registered as master images 1 to 7.

● Saving a program (P000 to P031) on the internal sensor ROM

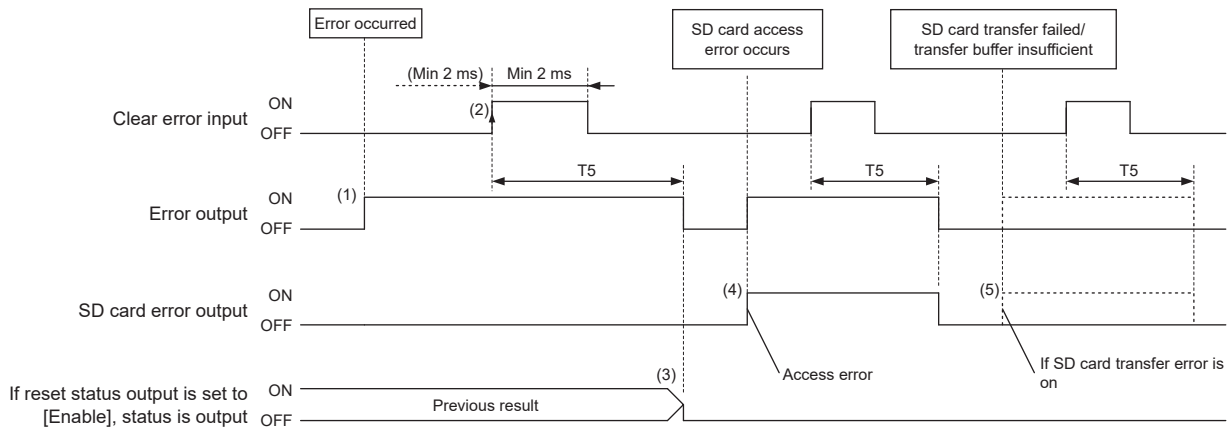
NOTICE	<ul style="list-style-type: none"> If the external master image registration is to be performed frequently, set [Write to ROM when using Ext. Master Save] of the input option to [Disable] to protect the nonvolatile memory of the internal sensor. For details of how to configure the settings, refer to "Input Settings" (page 7-13). 		
	ROM writing settings	Master image is registered externally when power is turned OFF	Number of times that external master image registration can perform (duration)
	Enable	The master image is not deleted. The image can be used as a master image after starting up the device next time.	100,000 times
	Disable	The master image is deleted. External master image registration needs to be performed after starting up the device.	No limit
<ul style="list-style-type: none"> If the setting for writing to ROM is set to [Disable], only the master images of active programs selected in the settings mode is written to ROM. An image for external master registration will not be reflected to the backup file (iv3a) of the batch backup/ individual program backup performed while running. If the setting is set to [Enable], do not turn OFF the power during the master registration time (T3). Otherwise, all or part of the setting data may be lost. 			

● Saving a program (P032 to P127) on an SD card

NOTICE	<p>The operation will be the same as the one when [Write to ROM when using Ext. Master Save] is set to [Disable] for the programs saved in the ROM in the sensor, regardless of the settings of [Write to ROM when using Ext. Master Save].</p>
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Clearing Errors

If an error occurs, the error that is output can be turned OFF using the clear error input.



- (1) If an error occurred, the error output turns ON.
- (2) The error output can be turned OFF by the clear error input. Minimum ON/OFF input time is 2 ms.
- (3) When [Reset Status Output on Clear Error Execution] is set to [Enable], the status output is reset.
- (4) SD card access errors can be output to error output and SD card error output.
- (5) If [SD card transfer error] for the SD card data transfer function is set to [Enable], errors can be output to error output and SD card error output.

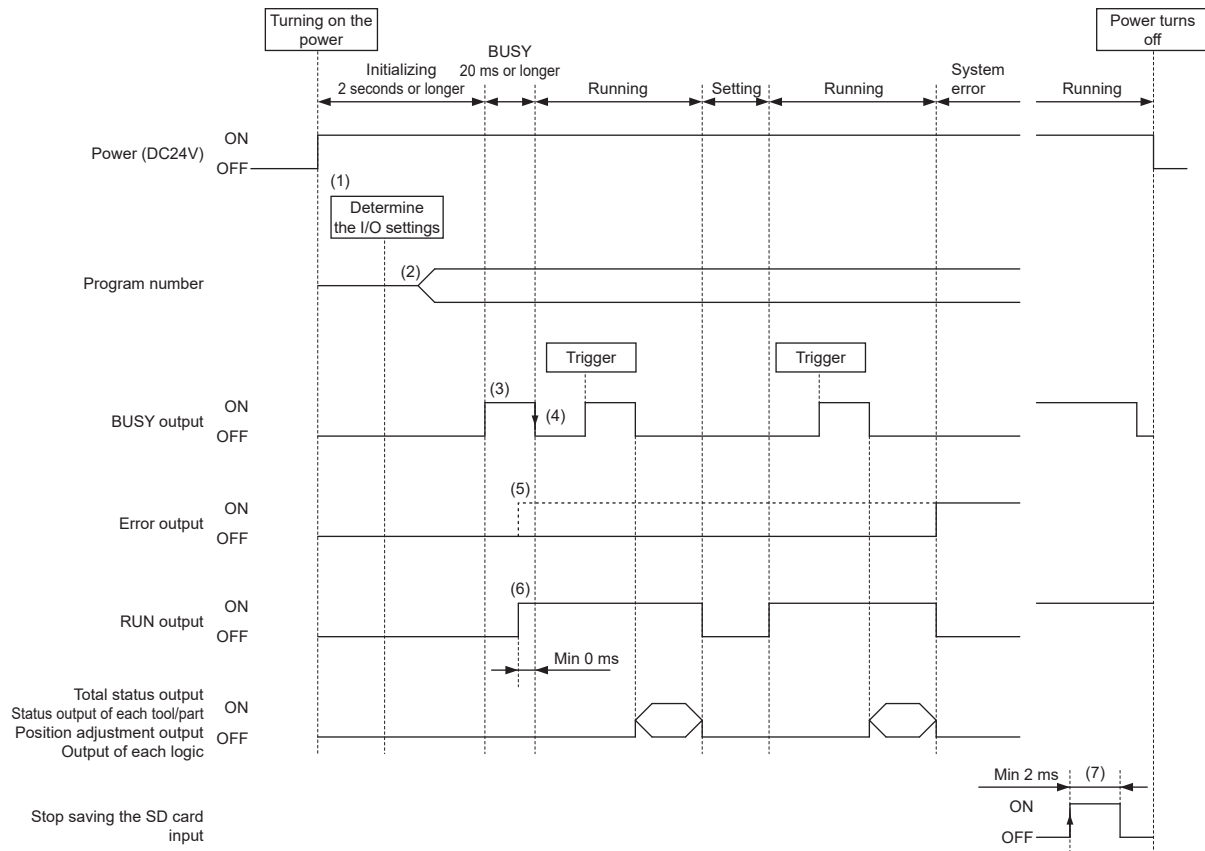
• For details about T5, refer to "Input Response Time" (page 11-16).

Error types that can be output

Error type	Error output ON/OFF	Clear error input	Ref.
System error	Enable	Cannot be cleared	"Error Messages" (page A-9)
Startup memory readout error			
Running program switch error	Enable	Cannot be cleared	"Changeover for a Target (Program Functions)" (page 7-2)
Program switch error at startup	Disable	-	"Changing Over" (page 11-10) "Transferring Program Settings" (page 8-11)
External master registration error	Enable	Can be cleared	"Registering the Master Image" (page 11-11)
SD card access error			
Trigger error	OFF (default)/ ON	Can be cleared	"4. Output Assignment (Setting Details of Outputting to Output Line)" (page 4-147)
FTP error			"Controlling Timing of Judgment with Triggers" (page 11-2)
SD card transfer error			"FTP Error" (page 9-4) "SD card transfer error" (page 8-14)

Behavior When the Sensor Power is Turned On or Off

The device behavior when the power is turned on or off is as follows. Check activation of the BUSY output when starting operation.



- (1) After the power is turned ON, the I/O Settings (NPN or PNP and N.O. or N.C.) will be determined.
 - ☐ “Operation for Initial Startup of the Sensor” (page 3-8)
 - ☐ “Polarity” (page 7-17)
 - ☐ “Output Settings” (page 7-15)
- (2) The program number will be determined. If [Program Switching Method] (Page 7-14) is set to [External Input], the program number is determined according to the condition of the input lines.
- (3) BUSY output turns ON.
 - In case of N.O. output, the output turns from OFF to ON.
 - In case of N.C. output, the output turns from OFF to OFF, so no changes occur.
- (4) The BUSY output turns OFF and the system starts to operate.
 - In case of N.O. output, the output turns from ON to OFF.
 - In case of N.C. output, the output turns from OFF to ON.

By checking the activation of the BUSY output, operation in N.O./N.C. can be checked.
- (5) If the startup error has occurred, the error output turns ON during the BUSY status.
- (6) The RUN output turns ON when the sensor is running with no system error occurring.
- (7) To turn the power off when using data transfer to SD card:
 - Set [BUSY Output Configuration] to [Until Data Transfer is Complete].
 - In the case of an external trigger, check that BUSY output from input of [Stop saving the SD card] has turned off and then turn the power off.
 - In the case of an internal trigger, after input from [Stop saving the SD card], wait five seconds and then turn the power off.
 - Once the current image has been transferred, stop transfer to the SD card. Images in the transfer buffer will be lost.
 - [Stop saving the SD card] is only enabled when the device is running.

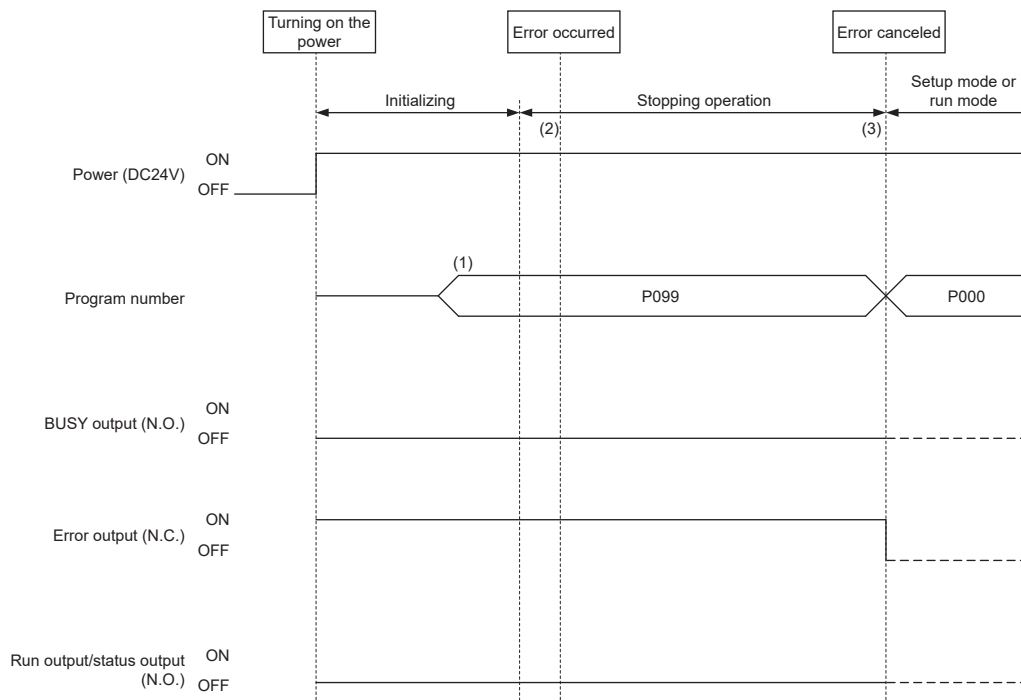
NOTICE

Do not turn off the system power while the SD card is being accessed. Otherwise, all or part of the setting data may be lost or damage may occur to the memory.

- The ON status of each output is as follows.
 - When Output Settings (Page 7-15) are [N.O.]: Status with output ON.
 - When Output Settings (Page 7-15) are [N.C.]: Status with output OFF.
- The RUN output, BUSY output and error output will be output from the output line assigned in output assignment (Page 4-147) for program numbers determined after the power is turned ON. If the outputs are not being assigned, it will not be output.

Program switch error when the power is turned on

Behavior in the case that a program switch error occurs when the power is turned on is as follows.



If using the program expansion function for the SD card (Page 8-11), a program switch error occurs when the advanced program information cannot be read from the SD card.

(1) For example, the power is turned on when the SD card is removed and P099 is selected.

(2) A program switch error occurs. The output (OUT1 to OUT8) does not operate and is OFF regardless of [N.O.] and [N.C.].

(3) You can connect the control panel or IV3-Navigator (IV3-H1) and clear the error message and error output.

If [Program Switching Method] is set to [External Input], the system will move to the settings screen. P000 is selected as the program number.

For [Panel/PC/Network/Auto-Switching], you can select to continue operating the device with P000 or change the system to the settings screen when you clear the error message.

- For details about how to clear the program switch error, refer to "How to clear a program switching error" (page 7-5).
- The ON status of each output is as follows.
 - When Output Settings (Page 7-15) are [N.O.]: Status with output ON.
 - When Output Settings (Page 7-15) are [N.C.]: Status with output OFF.

Input Response Time



The following response times are the typical examples (typ.). The response times may differ depending on the settings or the image processing condition. Control by confirming “BUSY output” to prevent impact from different response times.

Response time for the switch program input

• When not using high-speed program switching

T1 (Switch program time) = A + B + C + E [ms] (typ.)

T2 = 10 [ms] (typ.)

• When using high-speed program switching

T1 (Switch program time) = A + C + 100 [ms] (typ.)

T2 = 10 [ms] (typ.)

Response time for the external master registration input

T3 (Master registration time) = A + B + D + 400 [ms] (typ.)

T4 = 5 [ms] (typ.)

Response time for the error clear input

T5 = 5 [ms] (typ.)

Description for symbols

Symbols	Description	Time
A	Judgment process cancelling time	400 + trigger delay setting time (0 to 10000) [ms] (typ.) Added when a program switching input or external master registration input is input during the judgment process. The “Trigger delay time” is added only when [External Trigger] (Page 4-10) is selected for the trigger type.
B	Tool registration time	Standard Mode Tool registration time = Total of the “Registration time per tool x Number of set tools” Sorting Mode Tool registration time = (Learning tool registration time x Number of set tools) + ((Total of registration time for tools other than the learning tool x Number of set tools) x Number of registered part types) Registration time per tool <ul style="list-style-type: none"> • Learning¹/OCR² 50 [ms] (typ.) • Outline/Position Adjustment (High Speed) 330 [ms] (typ.) • Position Adjustment (High Accuracy) 450 [ms] • Color Area/Area/Color Average/Brightness Average/Color Prohibition/Brightness Prohibition 35 [ms] (typ.) • Blob count 40 [ms] (typ.) • Diameter 55 [ms] (typ.) • EdgePixels 20 [ms] (typ.) • Width/Edge/Pitch/Hi-Sp.Adj (1 axis) 2 [ms] (typ.) • Hi-Sp.Adj (2 axes) 15 [ms] *1: Includes sorting mode. *2: After the power is turned ON, takes 550 ms (typ.) when moving to the program where the OCR has been set for the first time.
C	Auto focus position adjustment time	240 [ms] (typ.) Added only when auto focus-type sensor is used and the [Auto Focus Adj Pos] is set to [Individual]. (Page 7-26).
D	The [Auto Focus Adj Pos] (Page 7-24) is set to [Individual].	5000 [ms] (typ.) ³ <ul style="list-style-type: none"> • [Write to ROM when using Ext. Master Save] (Page 7-14) is set to [Enable]. • A program (P000 to P031) saved on the internal sensor ROM is in use. *3: When multiple masters are used: 5000 + 500 x (Number of registered master images - 1) [ms] (typ.).
E	Program reading time	Standard Mode <ul style="list-style-type: none"> • When not using the learning tool: 1000 [ms] (typ.)⁴ • When using the learning tool: 1400 [ms] (typ.) Sorting Mode: (700 x Number of part types) + 300 [ms] (typ.) *4: When multiple masters are used: 1000 + 500 x (Number of registered master images - 1) [ms] (typ.).

12

Specifications

This chapter explains the specifications and dimensions of the sensor and software.

Specifications	12-2
Dimensions	12-7

Specifications

Ultra-compact model sensor head

Model		IV3-G500CA	IV3-G500MA	IV3-G600CA	IV3-G600MA
Type		Standard		Wide view	
Installed distance ^{*1}		50 mm or more		50 mm or more	
Field of view		Installed distance 50 mm: 22 (H) × 16 (V) mm Installed distance 3000 mm: 1184 (H) × 888 (V) mm		Installed distance 50 mm: 51 (H) × 38 (V) mm Installed distance 3000 mm: 2730 (H) × 2044 (V) mm	
Image sensor		1/2.9 inch color CMOS	1/2.9 inch monochrome CMOS	1/2.9 inch color CMOS	1/2.9 inch monochrome CMOS
Pixel		1280 (H) × 960 (V)			
Focus adjustment		Auto ^{*2}			
Exposure time		12 μs to 9 ms	12 μs to 9 ms ^{*3}	12 μs to 9 ms	12 μs to 9 ms ^{*3}
Light	Light source	White LED	Infrared LED	White LED	Infrared LED
	Lighting method	Pulse /continuous lighting is switchable.	Pulse lighting	Pulse /continuous lighting is switchable.	Pulse lighting
Indicator light		2 (indicate the same status)			
Environmental resistance	Ambient temperature	0 to +50°C (No freezing) ^{*4}			
	Relative humidity	35 to 85 % RH (No condensation)			
	Vibration ^{*5}	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions			
	Shock resistance ^{*5}	500 m/s ² 6 different directions in 3 times			
Enclosure rating ^{*6}		IP67			
Material		Body: zinc diecast, front cover: acrylic, indicator cover: TPU			
Weight		Approx. 75 g (without the AI Lighting unit) Approx. 225 g (with the AI Lighting unit)			

*1 When using the product in a range of 3 m or more, it is recommended to remove the polarization filter.

*2 The focus position can be automatically adjusted at the time of installation. Disabled during the operation. The focus position can be registered by program.

*3 When the AI Lighting unit is mounted, the maximum exposure time is 6.25 ms.

*4 When the temperature exceeds an operating ambient temperature of 40°C, after carrying out the installation stipulated by us, take an appropriate heat dissipation measure, and ensure that the case temperature does not exceed the rating of 65°C. For the case temperature, measure the surface where "IV3 series" is printed.

*5 Except for mounting the dome attachment for (IV2-GD05/IV2-GD10).

*6 Except when the polarizing filter (OP-88642/OP-88643/OP-88646/OP-88647) is mounted.

Ultra-compact model sensor amplifier

Model		IV3-G120
Available mode		Standard mode / Sorting mode
Tool	Mounted tools	Learning, Outline, Color area ^{*1} , Area ^{*2} , Edge pixel, Color average ^{*1} , Brightness average ^{*2} , Width, Diameter, Edge presence, Pitch, OCR, Color prohibit ^{*1} , Brightness prohibit, Position adjustment, High-speed position adjustment (1-axis edge/2-axis edge), Blob count
	Number of tools ^{*3}	Total: 65 tools
Switch settings (programs)		128 programs (with SD card) /32 programs (without SD card)
Image history ^{*4}	Numbers	100 images
	Condition	Selectable between NG only, NG and OK near threshold ^{*5} , and All
Image data transfer	Transfer Destination	SD card, FTP server and SFTP server is selectable
	Transfer format	Selectable between bmp, jpeg, iv3p, and txt, and file names can be modified
	Transfer Condition	Selectable between NG only, NG and OK near threshold ^{*5} , and All
Analysis information ^{*6}	Display Switch	List by tools (judgment results, matching rate, matching bar display)
	Run information	OFF/Histogram/Processing time/Count/Output monitor is switchable Histogram: Histogram, matching rate (MAX, MIN, AVE), numbers of OKs, numbers of NGs Processing time: Processing time (latest value, MAX, MIN, AVE) Count: Trigger numbers, numbers of OKs, numbers of NGs, numbers of trigger errors Output monitor: ON / OFF status for each output

Model		IV3-G120
Other functions	Imaging function	Digital zoom (2×, 4×), HDR, High gain, Color filter ^{*1} , White balance ^{*1} , Brightness correction, AI capture
	Tool functions	Additional Learning, Remove Outline, Mask function, Color extraction/Color exclusion ^{*1} , Color histogram function ^{*1} , Monochrome histogram function ^{*2} , Scaling function
	Utilities	List of NG Sensor Occurrences, NG Hold Function, Test run, I/O monitor, Security settings (Two levels of passwords), Simulator ^{*7} , FTP/SFTP image information addition, multiple position adjustments, multiple master images, high-speed program switching, program auto-switching, Automatic backup and restoration of settings, Change of thresholds while running
Indicator light		PWR/ERR, OUT, TRIG, STATUS, LINK/ACT, SD
Input		No-voltage input/voltage input is switchable For no-voltage input: ON voltage 2 V or lower, OFF current 0.1 mA or lower, ON current 2 mA (short circuit) For voltage input: Maximum input rating 26.4 V, ON voltage 18 V or higher, OFF current 0.15 mA or lower, ON current 2 mA (for 24 V)
	Inputs	8 inputs (IN1 to IN8)
	Function	IN1: External trigger, IN2 to IN8: Enable by assigning the optional functions Assignable functions: Program switching, Clear error, External master image registration, SD card save cancel
Output		Photo MOS relay output, N.O./N.C. Switchable Maximum rating 26.4 V 50 mA, remaining voltage 1.5 V or lower ^{*8}
	Outputs	8 (OUT1 to OUT8)
	Function	Enable by assigning the optional functions Assignable functions: Total judgment (OK/NG), RUN, BUSY, Position adjustment result, Judgment result of each tool, Logical operation result of each tool, Error, SD card error, Part discrimination result, Master status result
Ethernet	Standard	1000BASE-T/100BASE-TX
	Connector	RJ-45 8pin connector
Network function		FTP client, SFTP client
Supported interface	Built-in Ethernet	EtherNet/IP™, TCP/IP non-procedure communication
	Communication unit ^{*9}	EtherCAT, CC-Link, DeviceNet, RS-232C, PROFIBUS
Expanded memory		SD card (SD/SDHC) ^{*10}
Rating	Power voltage	DC 24 V ± 10% (including ripple)
	Consumption current	2.2 A or less (including a communication unit, without the AI Lighting unit, and including the output load) 3.4 A or less (including a communication unit, with the AI Lighting unit, and including the output load)
Environmental resistance	Ambient temperature	0 to +50°C (No freezing) ^{*11}
	Relative humidity	35 to 85% RH (No condensation)
Material		Main unit case: PC I/O terminal block: PA Ethernet connector: Copper alloy + Ni plating DIN rail tab on rear of the main unit: POM Power connector: PA, POM Sensor head connection connector: Zinc + Ni plating, PA Radiator plate on rear of the main unit: Aluminum Nameplate: PC
Weight		Approx. 300 g

*1 Color type only.

*2 Monochrome type only.

*3 Tools can be installed by programs. The number of tools for the detection tools and position adjustment tools combined. For the detection tools, up to 64 tools can be set. The number of detection tools in sorting mode is eight.

*4 Saves to the sensor amplifier's internal memory.

The images saved in the sensor amplifier can be backed up to the USB memory connected to the control panel (IV3-CP50) or to the PC by the PC software for IV3 Series (IV3-H1).

*5 Learning tool only.

*6 Can also be displayed on the control panel (IV3-CP50) or the software for the IV3 Series (IV3-H1).

*7 Usable on the software for the IV3 Series (IV3-H1).

*8 Make sure to keep a total of each output with 160 mA or less.

*9 When a communication unit (DL Series) is connected.

*10 Use the KEYENCE recommended product for the SD card.

*11 When the temperature exceeds an operating ambient temperature of 40°C, after carrying out the installation stipulated by us, take an appropriate heat dissipation measure, and ensure that the case temperature does not exceed the rating of 65°C.

For the case temperature, measure the metal part at the sensor amplifier rear.

Built-in amplifier type sensor

Model	IV3-400CA	IV3-400MA	IV3-500CA	IV3-500MA	IV3-600CA	IV3-600MA	
Type	Narrow view		Standard		Wide view		
Installed distance ^{*1}	400 mm or more		50 mm or more		50 mm or more		
Field of view	Installed distance 400 mm: 58 (H) × 44 (V) mm Installed distance 3000 mm: 464 (H) × 348 (V) mm		Installed distance 50 mm: 22 (H) × 16 (V) mm Installed distance 3000 mm: 1184 (H) × 888 (V) mm		Installed distance 50 mm: 51 (H) × 38 (V) mm Installed distance 3000 mm: 2730 (H) × 2044 (V) mm		
Image sensor	1/2.9 inch color CMOS	1/2.9 inch monochrome CMOS	1/2.9 inch color CMOS	1/2.9 inch monochrome CMOS	1/2.9 inch color CMOS	1/2.9 inch monochrome CMOS	
	Pixel	1280 (H) × 960 (V)					
Focus adjustment	Auto ^{*2}						
Exposure time	12 μs to 10 ms						
Light	Light source	White LED	Infrared LED	White LED	Infrared LED	White LED	Infrared LED
	Lighting method	Pulse/continuous lighting Switchable	Pulse lighting	Pulse/continuous lighting Switchable	Pulse lighting	Pulse/continuous lighting Switchable	Pulse lighting
Tool	Available mode	Standard mode / Sorting mode					
	Available Tool	Learning, Outline, Color area ^{*3} , Area ^{*4} , Edge pixel, Color average ^{*3} , Brightness average ^{*4} , Width, Diameter, Edge presence, Pitch, OCR, Color prohibition, Brightness prohibition, Position adjustment, High-speed position adjustment (1-axis edge/2-axis edge), Blob count					
	Number of tools ^{*5}	Total: 65 tools					
Switch settings (programs)	128 programs (with SD card) / 32 programs (without SD card)						
Image history ^{*6}	Numbers	100 images					
	Condition	NG only / NG and OK near the threshold ^{*7} / All is selectable					
Image data transfer	Transfer Destination	SD card / FTP server and SFTP server is selectable					
	Transfer format	Selectable between bmp, jpeg, iv3p, and txt, and file names can be modified					
	Transfer Condition	NG only / NG and OK near the threshold ^{*7} / All is selectable					
Analysis information ^{*8}	Display Switch	List by tools (judgment results, matching rate, matching bar display)					
	Run information	OFF/Histogram/Processing time/Count/Output monitor is switchable Histogram : Histogram, matching rate (MAX, MIN, AVE), numbers of OKs, numbers of NGs Processing time: Processing time (latest, Max., Min., Ave.) Count : Trigger numbers, numbers of OKs, numbers of NGs, numbers of trigger errors Output monitor : ON / OFF status for each output					
Other functions	Imaging function	Digital Zoom (x2, x4), HDR, High Gain, Color Filters ^{*3} , White balance ^{*3} , Brightness correction, AI Capture					
	Tool functions	Additional learning, Mask outline, Masking function, Color extraction/exclusion ^{*3} , Color histogram function ^{*3} , Monochrome histogram function ^{*4} , Scaling function					
	Utilities	List of NG Sensor Occurrences, NG Hold Function, Test run, I/O monitor, Security settings (Two levels of passwords), Simulator ^{*9} , FTP/SFTP image information addition, multiple position adjustments, multiple master images, high-speed program switching, program auto-switching, Automatic backup and restoration of settings, Change of thresholds while running					
Indicator light	OUT, TRIG, STATUS, LINK/ACT, SD						
Input	Switchable between non-voltage input and voltage input For no-voltage input: ON voltage 2 V or lower, OFF current 0.1 mA or lower, ON current 2 mA (short circuit) For voltage input: Maximum input rating 30 V, ON voltage 18 V or higher, OFF current 0.15 mA or lower, ON current 2 mA (for 24 V)						
	Inputs	6 ports, 3 ports are selectable as IN/OUT					
	Function	IN1: External trigger, IN2, IN3, I/O1 to I/O3: Enable by assigning optional functions Assignable functions: Program switching, Clear error, External master image registration, Stop saving for SD card					

Model	IV3-400CA	IV3-400MA	IV3-500CA	IV3-500MA	IV3-600CA	IV3-600MA
Output	Photo MOS relay output, N.O./N.C. Switchable Maximum rating 30 V 50 mA, remaining voltage 1.5 V or lower ^{*10}					
	Outputs	6 ports, 3 ports are selectable as IN/OUT				
	Function	Enable by assigning the optional functions Assignable functions: Total judgment (OK/NG), RUN, BUSY, Position adjustment result, Judgment result of each tool, Logical operation result of each tool, Error, SD card error, Part discrimination result, Master status result				
Power/I/O	Connector	M12 12pin A code Male connector				
	PoE	PoE power Class 3/4/6 ^{*11}				
Ethernet	Standard	1000BASE-T/100BASE-TX				
	Connector	M12 8pin X code Female connector				
Network function		FTP client, SFTP client				
Supported interface	Built-in Ethernet	EtherNet/IP™, PROFINET ^{*12} , TCP/IP non-procedure communication				
Expanded memory		microSD card (microSD/microSDHC) ^{*13}				
Rating	Power voltage	24 V DC ±10% (including ripple) ^{*14}				
	Consumption current	3.3 A or less (without the AI Lighting unit, and including the output load) 1.8 A or less (AI Lighting unit, and including the output load) ^{*15}				
Environmental resistance	Ambient temperature	0 to +50°C (No freezing) ^{*16}				
	Relative humidity	35 to 85% RH (No condensation)				
	Vibration ^{*17}	10 to 55 Hz; double amplitude 1.5 mm; 2 hours in each of the X, Y, and Z directions				
	Shock resistance ^{*17}	500 m/s ² , 6 times in each of the 3 directions				
	Enclosure rating ^{*18}	IP67				
Material		Main unit case: Aluminum die-casting, PBT, TPU Indicator light cover: TPU Ethernet connector: Aluminum die-casting, LCP Front cover: Acrylic (hard coating)		Power connector: Aluminum die-casting, LCP Nameplate: PET Water proof cap for the Power connector: PC+ABS alloy Water proof cap for the Ethernet connector: PC		
Weight		Approx. 300 g (without the AI Lighting unit) Approx. 495 g (with the AI Lighting unit)				

- *1 When using the product in a range of 3 m or more, it is recommended to remove the polarization filter.
- *2 The focus position can be automatically adjusted at the time of installation. Disabled during the operation. The focus position can be registered by program.
- *3 Color type only.
- *4 Monochrome type only.
- *5 Tools can be installed by programs. The number of tools for the detection tools and position adjustment tools combined. For the detection tools, up to 64 tools can be set. In the sorting mode, 8 judgment tools are arranged.
- *6 Saves to the sensor's internal memory.
The images saved in the sensor can be backed up to the USB memory connected to the control panel (IV3-CP50) or to the PC by the PC software for IV3 Series (IV3-H1).
- *7 Learning tool only.
- *8 Can also be displayed on the control panel (IV3-CP50) or the software for the IV3 Series (IV3-H1).
- *9 Usable on the software for the IV3 Series (IV3-H1).
- *10 Make sure to keep a total of each output with 120 mA or less.
- *11 For PoE power supply devices, IEEE802.3at power Class 4 or higher is recommended when using the AI Lighting unit, and IEEE802.3bt power Class 6 or higher is recommended when not using the AI Lighting unit.
When a device with less than the recommended electricity is used, the operation may be restricted due to electricity restriction.
- *12 Conformance Class B, applicable protocol: LLDP and SNMP
- *13 Use only products recommended by KEYENCE.
- *14 To use OP-88656 (10 m), 24 V DC +25%/-10% (including ripple).
- *15 The peak current is designed to be smaller if the AI Lighting unit is mounted. The peak current is greater if the AI Lighting unit is not mounted
- *16 When the temperature exceeds an operating ambient temperature of 40°C, after carrying out the installation stipulated by us, take an appropriate heat dissipation measure, and ensure that the case temperature does not exceed the rating of 65°C.
For the case temperature, measure the part where the model name is printed at the sensor rear.
- *17 Except for mounting the dome attachment for (IV3-D10).
- *18 Except when the polarizing filter (OP-88640/OP-88641/OP-88644/OP-88645) is mounted.

PC software for IV3/IV2/IV series

Model		IV3-H1
Compatible sensor		IV3 series, IV2 series, IV series
Recording software		For IV3 Series: IV3-Navigator, For IV2 Series: IV2-Navigator, For IV Series: IV-Navigator
System requirements	Interface	Equipped with the Ethernet (1000BASE-T) interface
	OS^{*1}	Windows 11 Home/Pro/Enterprise Windows 10 Home/Pro/Enterprise Windows 7 (SP1 or later) Home Premium/Professional/Ultimate; either OS above needs to be pre-installed
	Supported languages^{*2}	Japanese/English/Simplified Chinese/Traditional Chinese/Korean/German/ Italian/French/Spanish/Portuguese/Czech/Hungarian/Polish/Thai
	Processor	Needs to be compliant with system requirements for OS.
	Memory capacity	4 GB or more
	Required capacity for installation	4 GB or more
	Monitor	Resolution: 1024 × 768 pixel or higher Display color: High Color (16bit) or higher
	Operating conditions	.NET Framework 4.5.2 must be installed ^{*3} Microsoft Visual C++ 2017 Redistributable Package needs to be installed ^{*3} .

*1 Supports 32-bit and 64-bit versions.

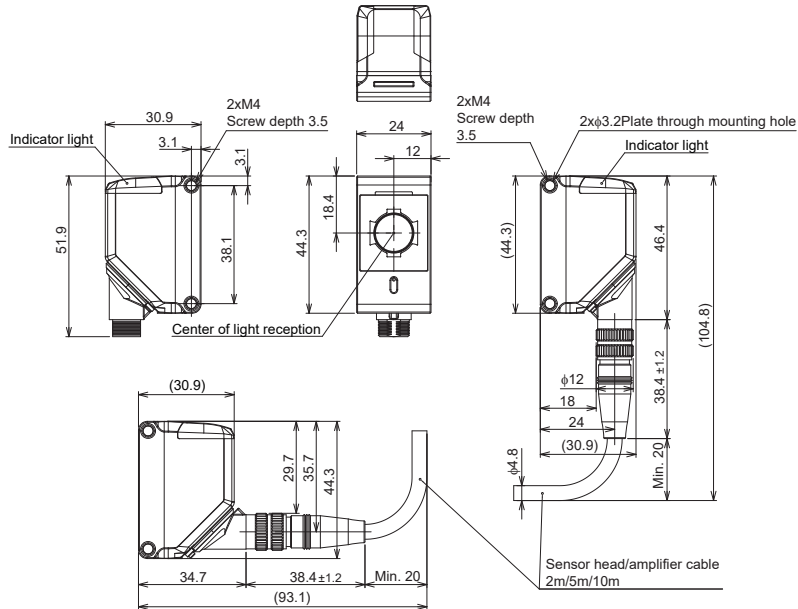
*2 When connected to the IV3 Series. When the IV2 series is connected, the language supported by the IV2-H1 is used and when the IV series is connected, the language supported by the IV-H1 is used.

*3 If this software is not installed, it will be automatically installed when IV3-H1 is installed.

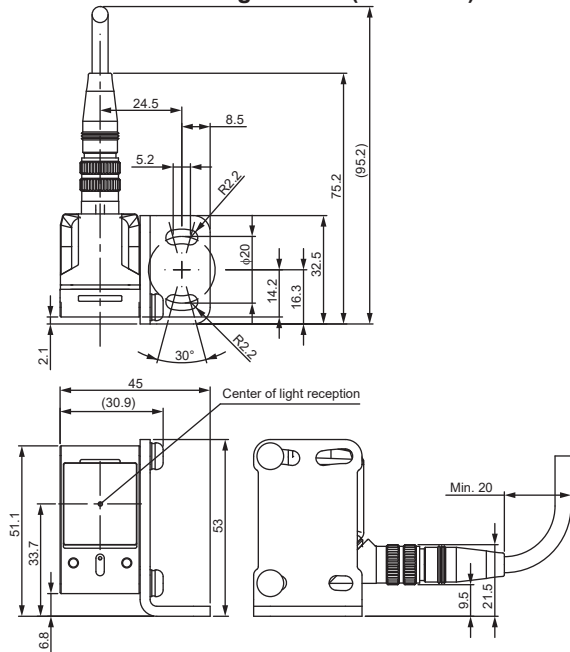
Dimensions

Ultra-compact model sensor head

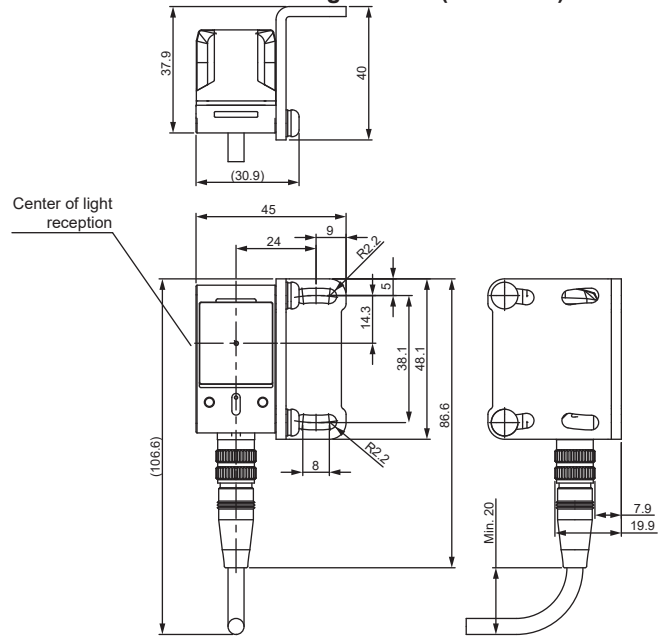
- IV3-G500MA
- IV3-G500CA
- IV3-G600MA
- IV3-G600CA



• With vertical mounting bracket (OP-87908)

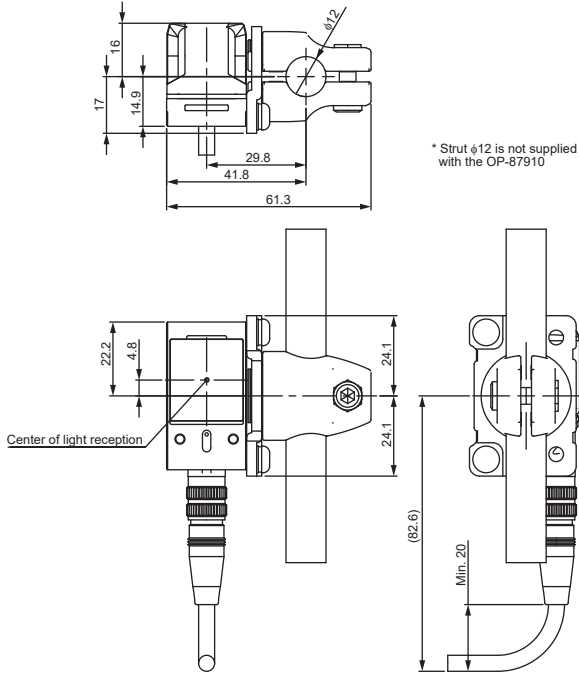


• With transverse mounting bracket (OP-87909)

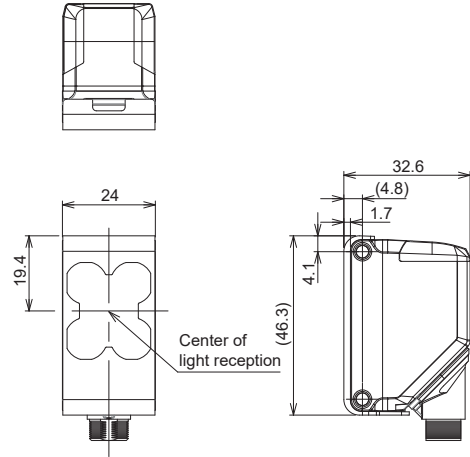


Dimensions

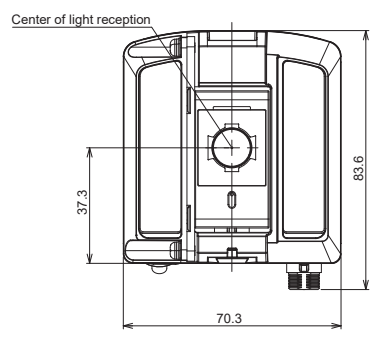
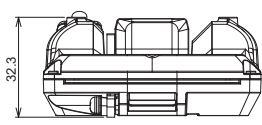
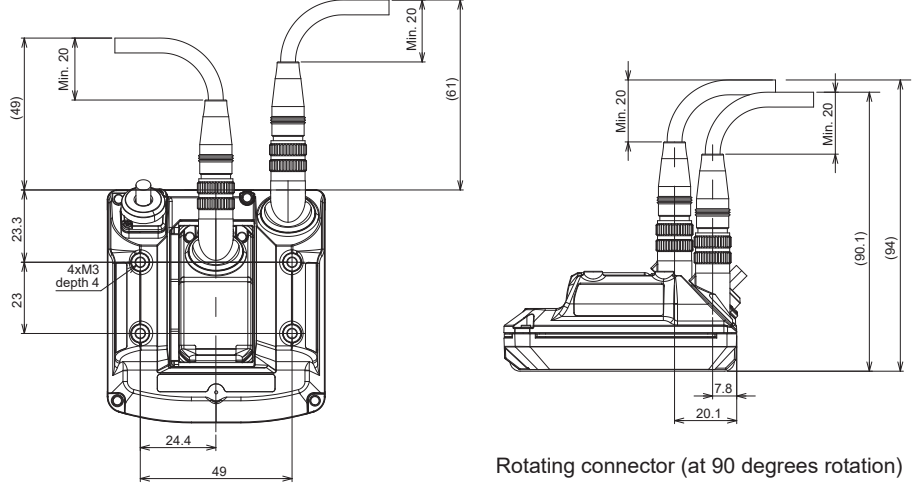
• With adjustable bracket for IV3 Series (OP-87910)



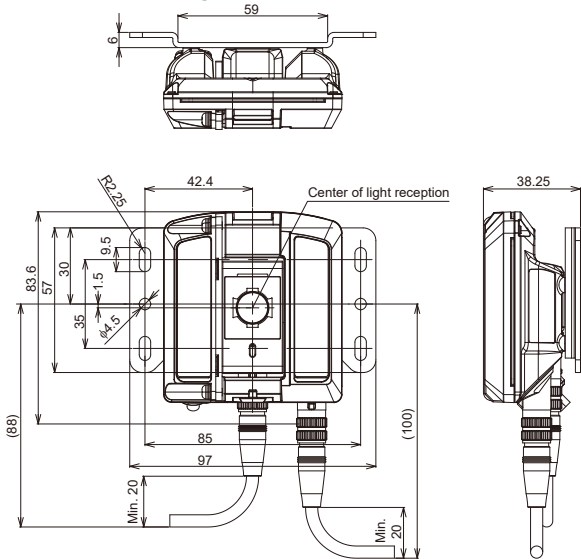
• With the polarizing filter for the ultra-compact model (OP-88642/OP-88643)



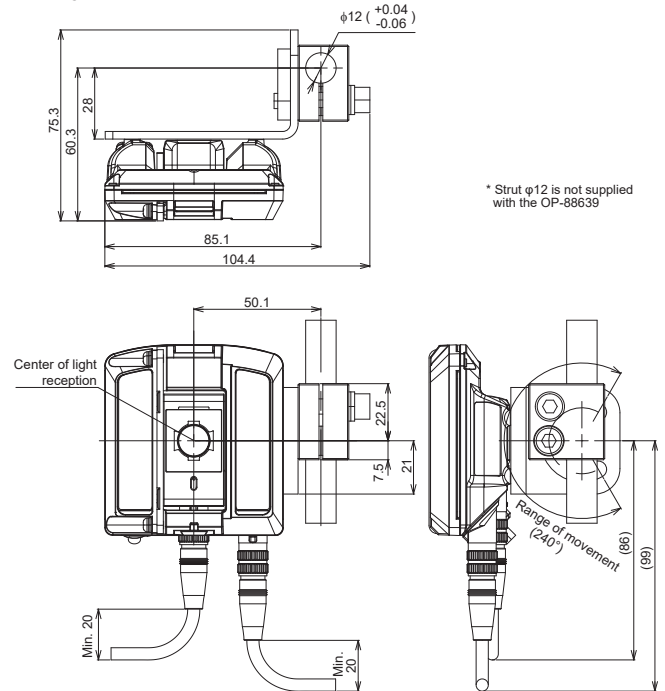
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M)



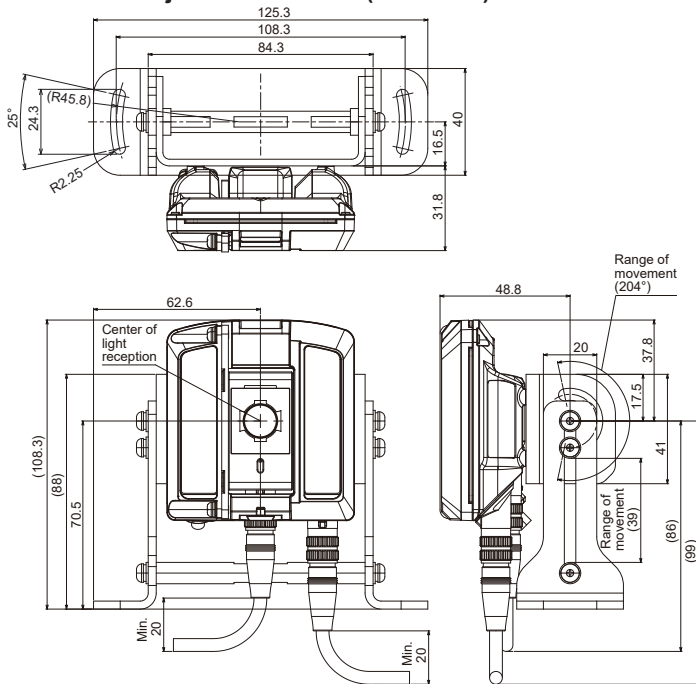
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), common mounting bracket (OP-88634)



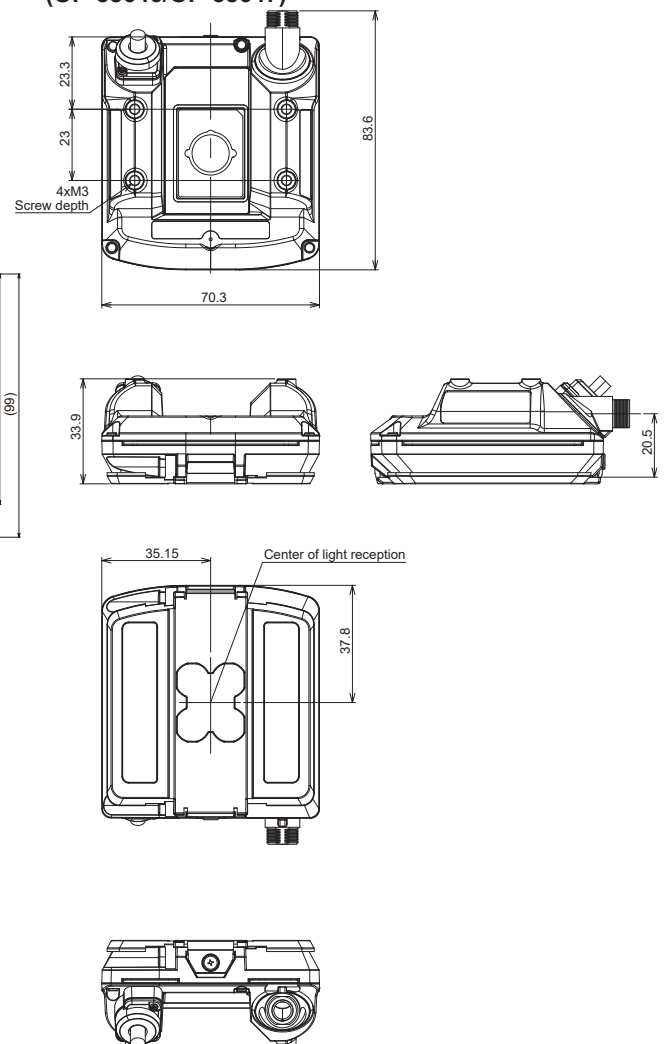
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), adjustable bracket (OP-88639)



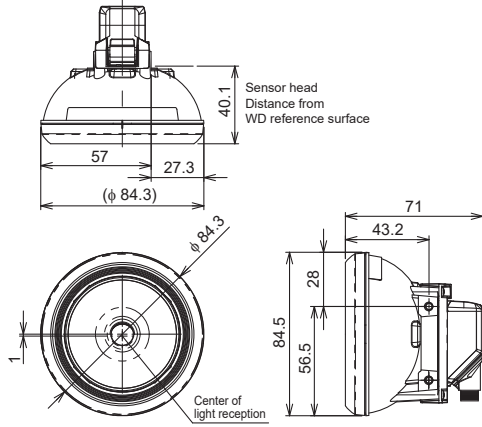
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), biaxial adjustment bracket (OP-88638)



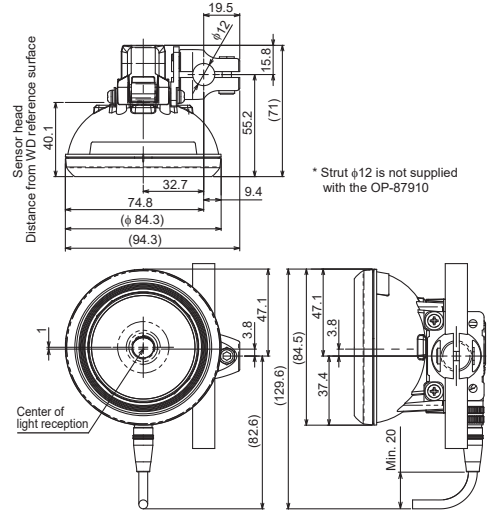
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), polarizing filter for the AI Lighting unit (OP-88646/OP-88647)



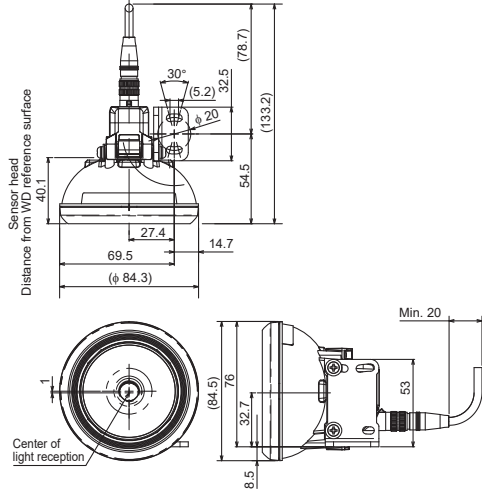
• With the Dome Attachment (IV2-GD05)



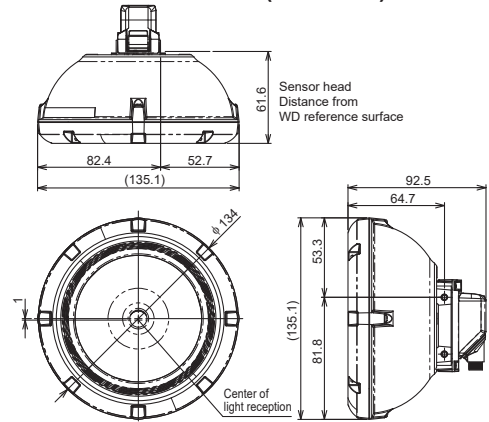
• With the Dome Attachment (IV2-GD05), adjustable bracket (OP-87910)



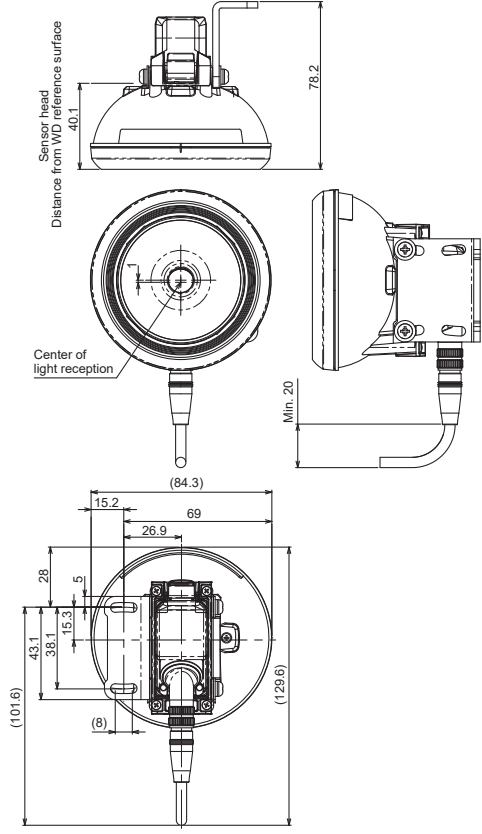
• With the Dome Attachment (IV2-GD05), vertical mounting bracket (OP-87908)



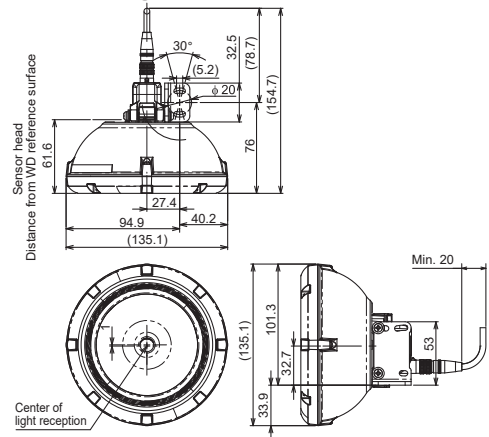
• With the Dome Attachment (IV2-GD10)



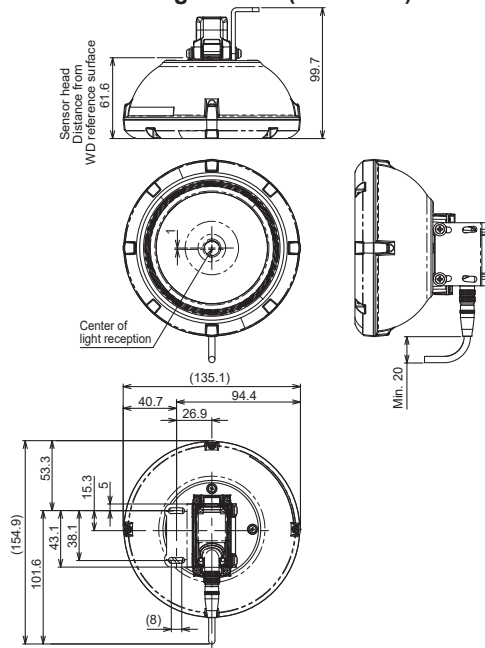
• With the Dome Attachment (IV2-GD05), transverse mounting bracket (OP-87909)



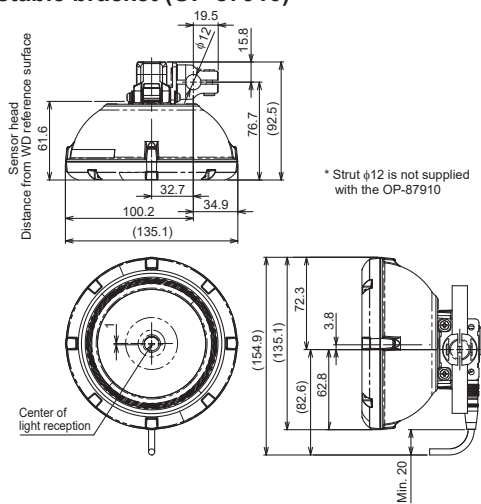
• With the Dome Attachment (IV2-GD10), vertical mounting bracket (OP-87908)



• With the Dome Attachment (IV2-GD10),
transverse mounting bracket (OP-87909)

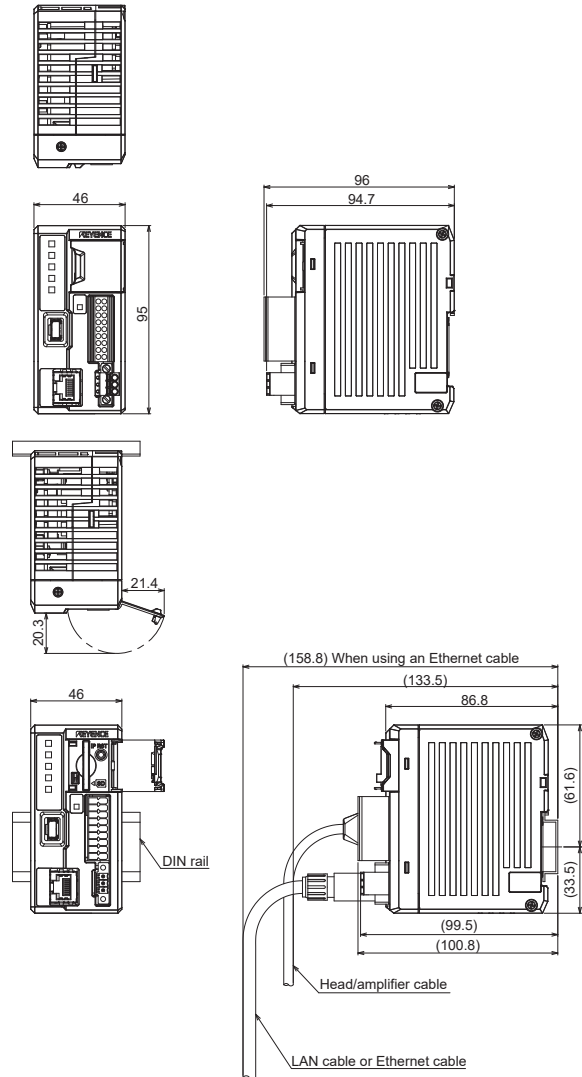


• With the Dome Attachment (IV2-GD10),
adjustable bracket (OP-87910)



Ultra-compact model sensor amplifier

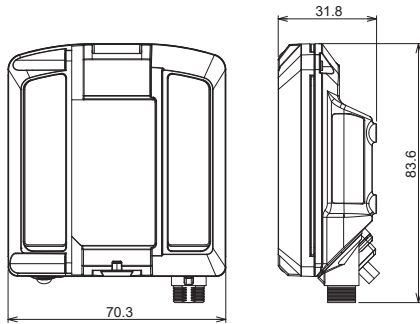
• IV3-G120



Options for the ultra-compact model

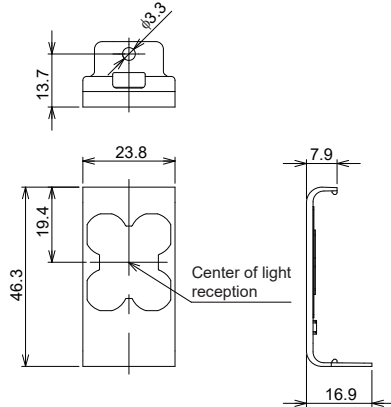
AI Lighting unit

- IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M

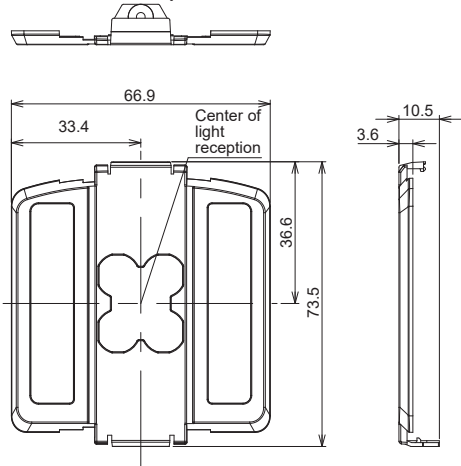


Polarizing filter

- Polarizing filter for the ultra-compact model (OP-88642/OP-88643)

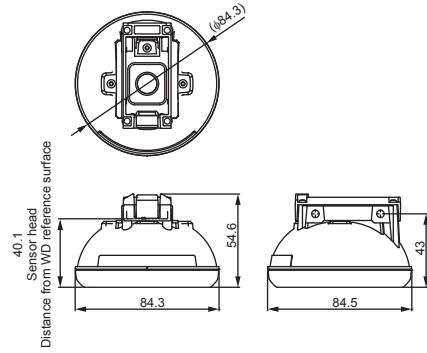


- Polarizing filter for the AI Lighting unit (OP-88646/OP-88647)

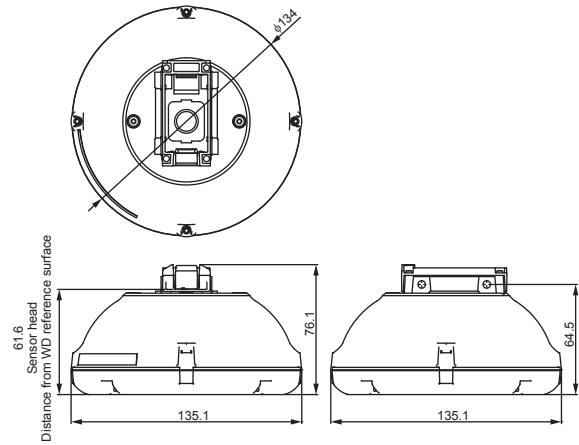


Mounting the dome attachment

IV2-GD05



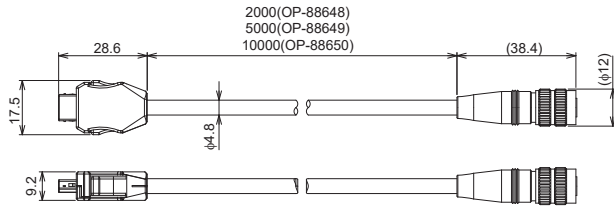
IV2-GD10



Cable (option)

IV3 sensor head/amplifier cable

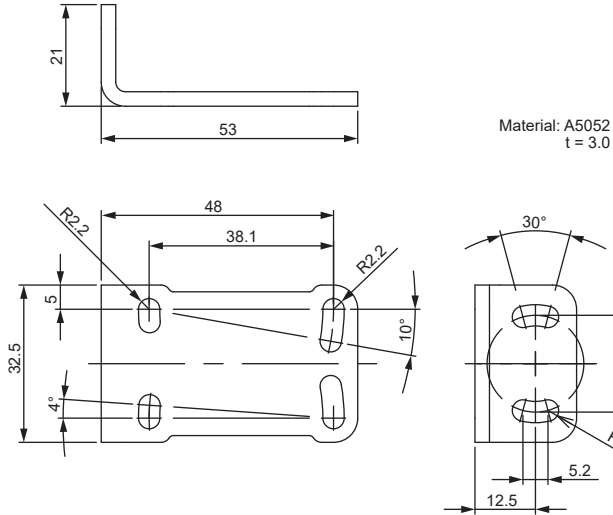
- OP-88648 (2m)
- OP-88649 (5m)
2000(OP-88648)
5000(OP-88649)
10000(OP-88650)
- OP-88650 (10m)



Mounting bracket (option)

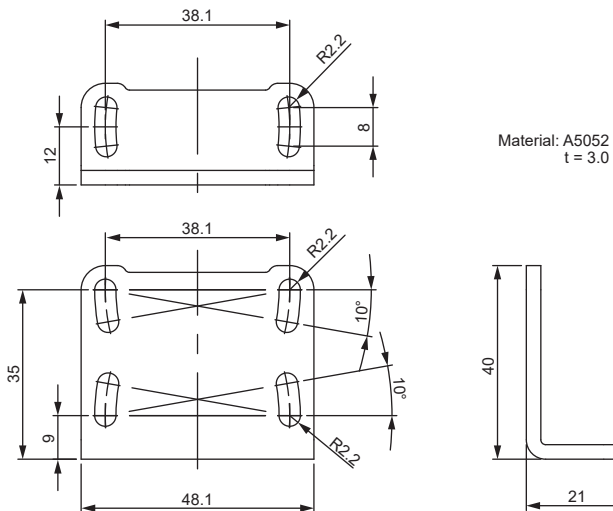
Vertical mounting bracket

- OP-87908



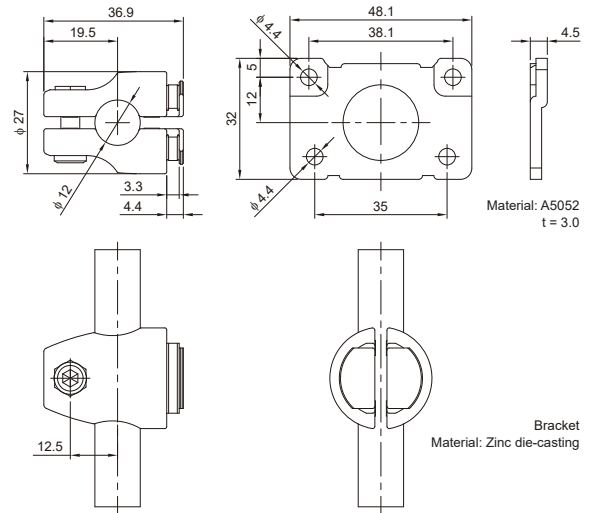
Transverse mounting bracket

- OP-87909



Adjustable bracket

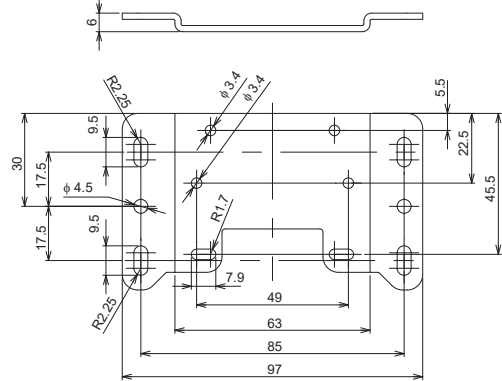
- OP-87910



* Strut $\phi 12$ is not supplied with the OP-87910

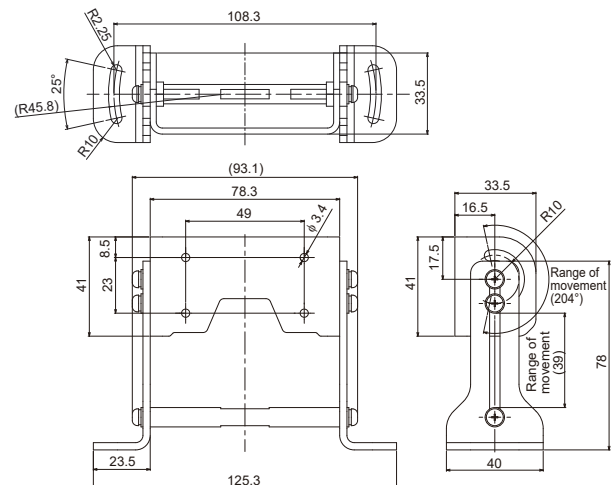
Common mounting bracket (also for the built-in amplifier type)

- OP-88634



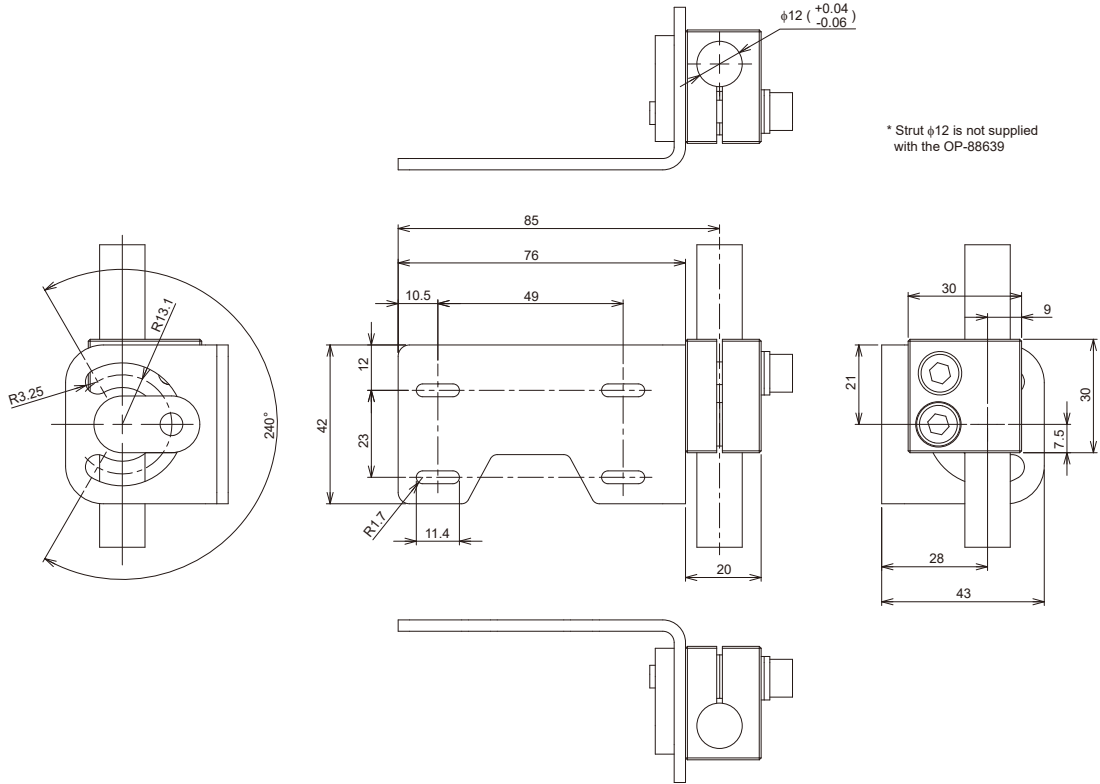
Biaxial adjustable bracket

- OP-88638



Adjustable bracket (for the AI Lighting unit)

• OP-88639



Built-in amplifier type sensor

• IV3-400MA

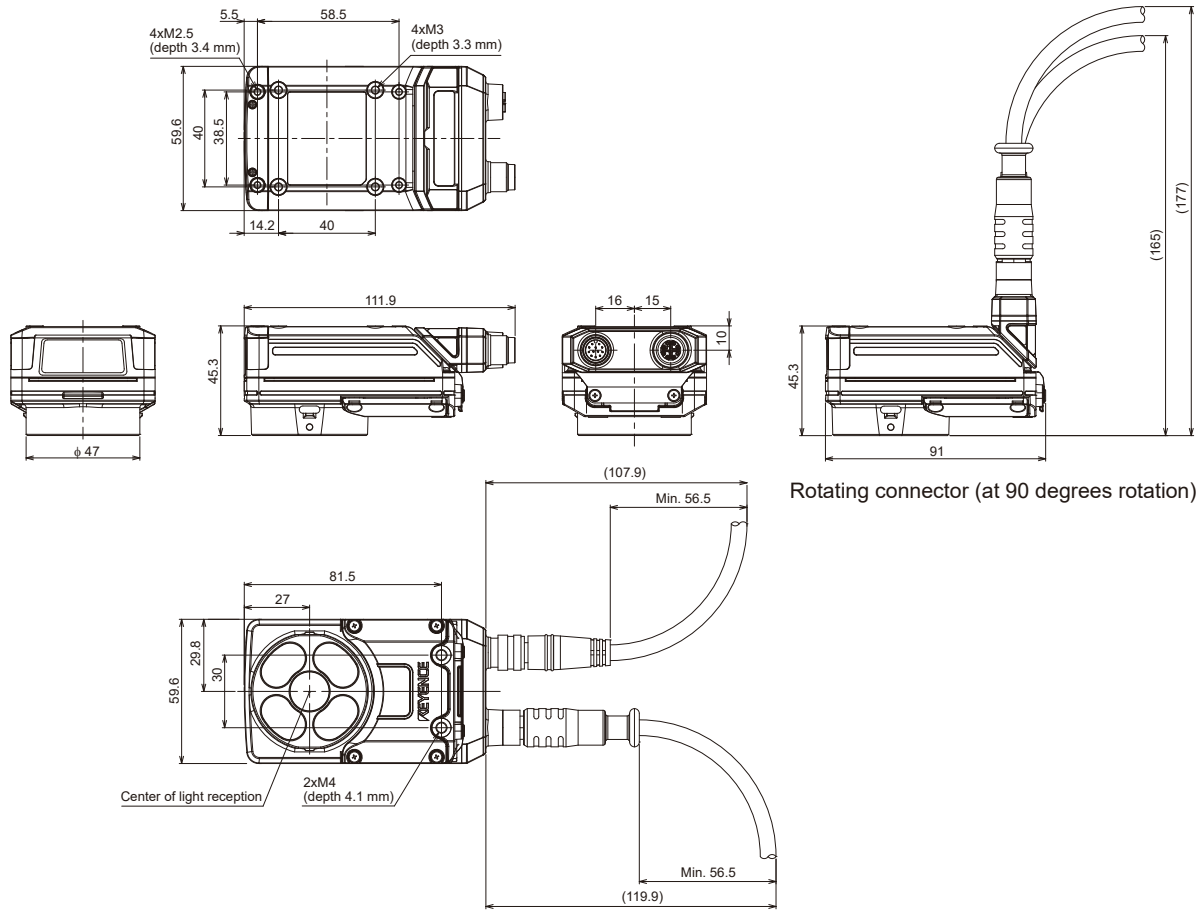
• IV3-400CA

• IV3-500MA

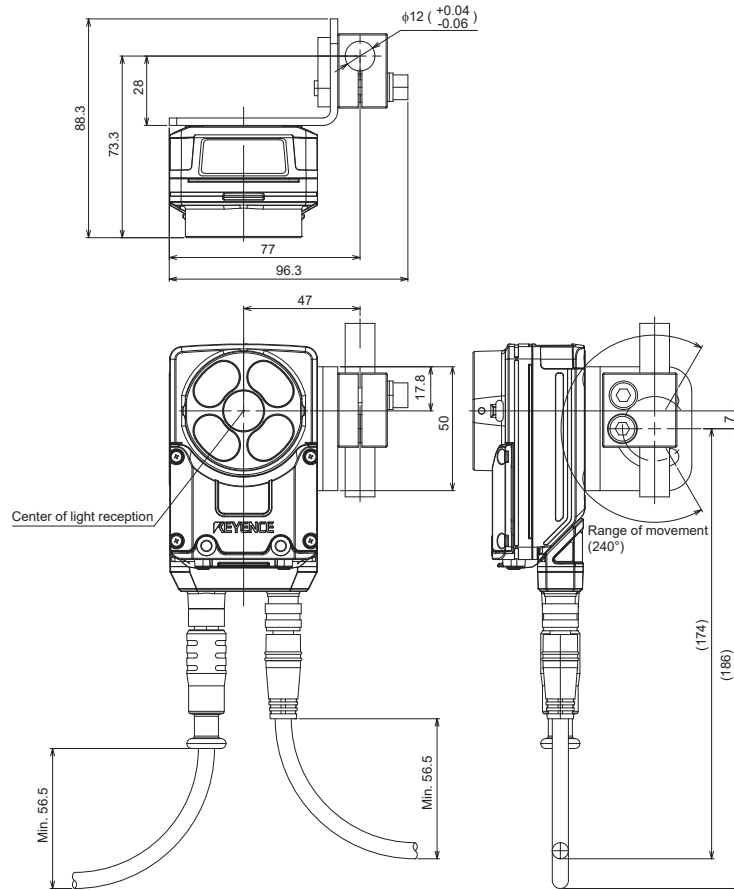
• IV3-500CA

• IV3-600MA

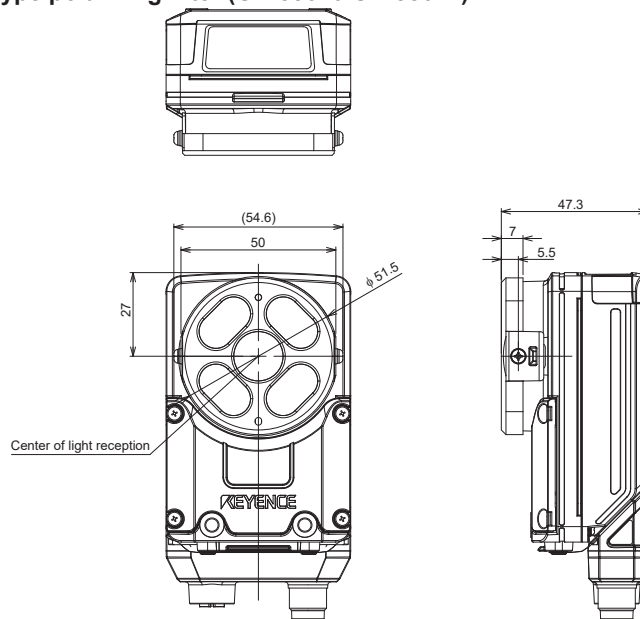
• IV3-600CA



• With the adjustable bracket (OP-88636)

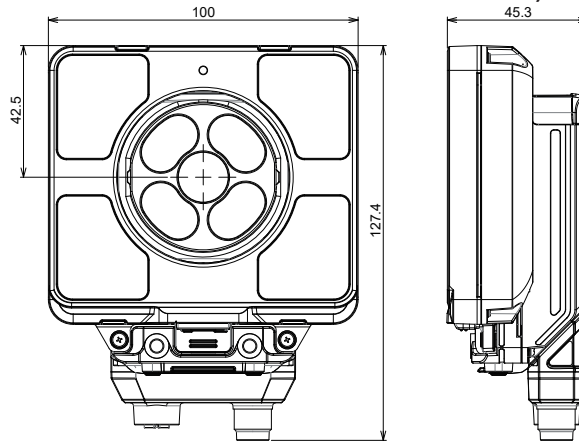


• With the built-in amplifier type polarizing filter (OP-88640/OP-88641)

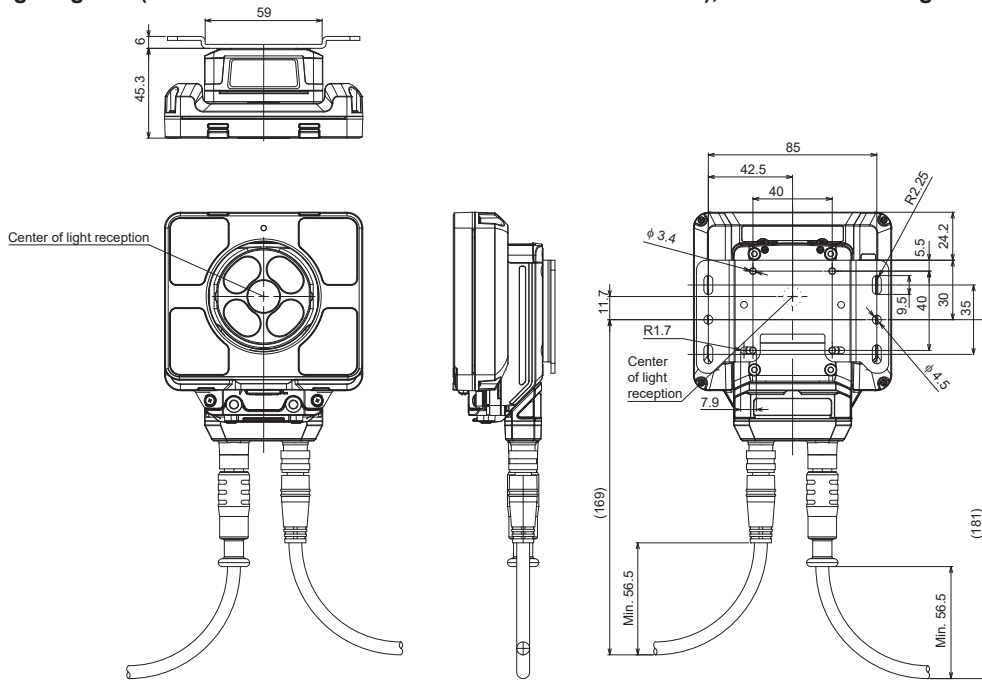


Dimensions

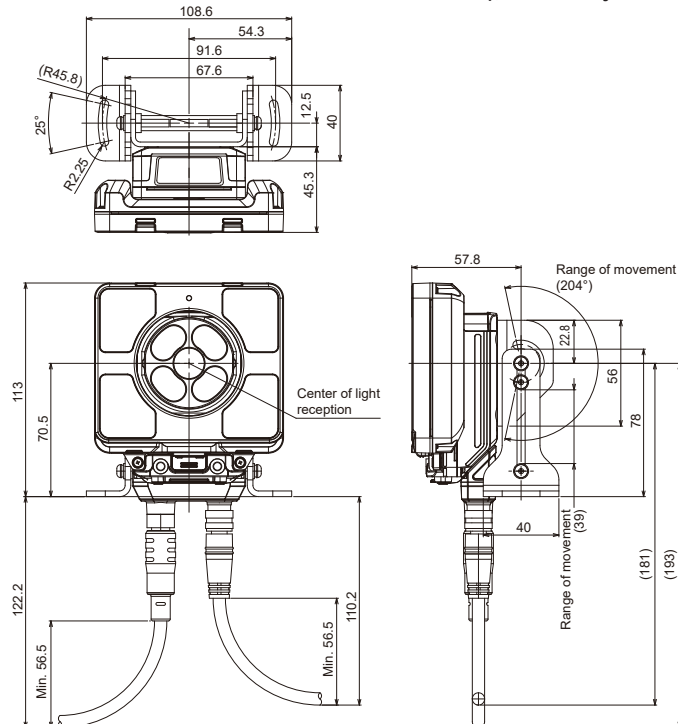
• With the AI Lighting unit (IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M)



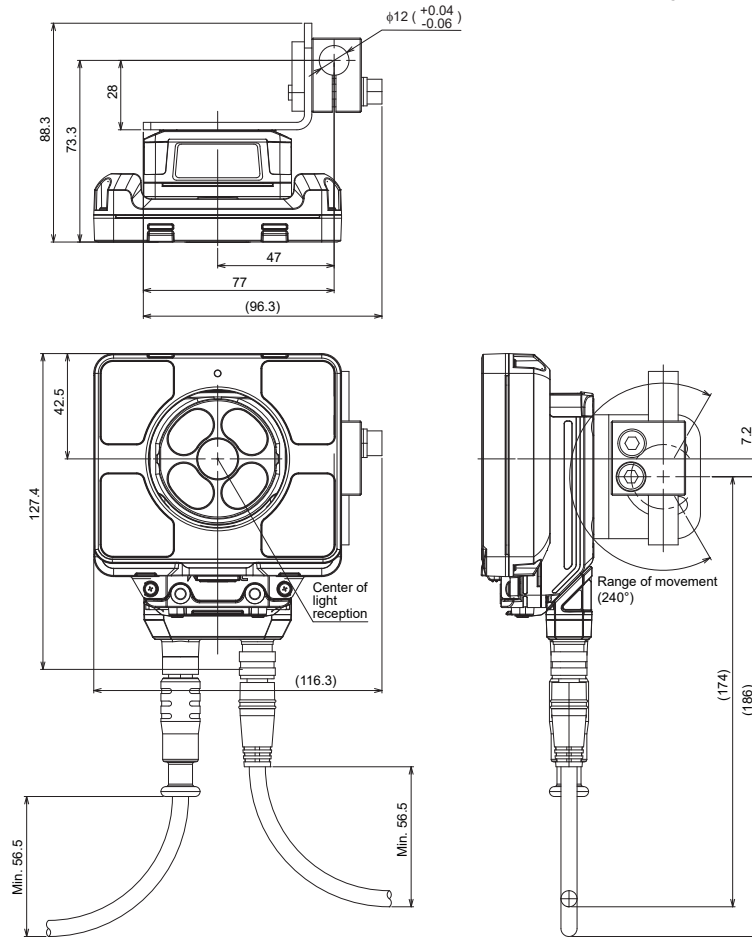
• With the AI Lighting unit (IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), common mounting bracket (OP-88634)



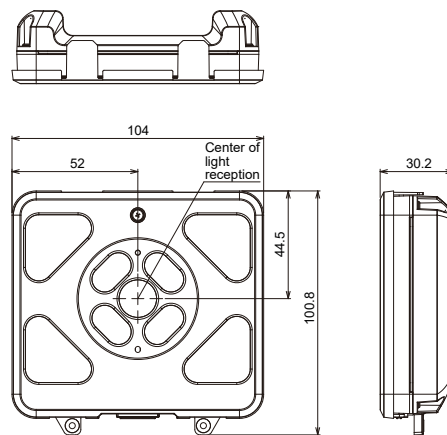
• With the AI Lighting unit (IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), biaxial adjustment mounting bracket (OP-88635)



• With the AI Lighting unit (IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), adjustable bracket (OP-88636)

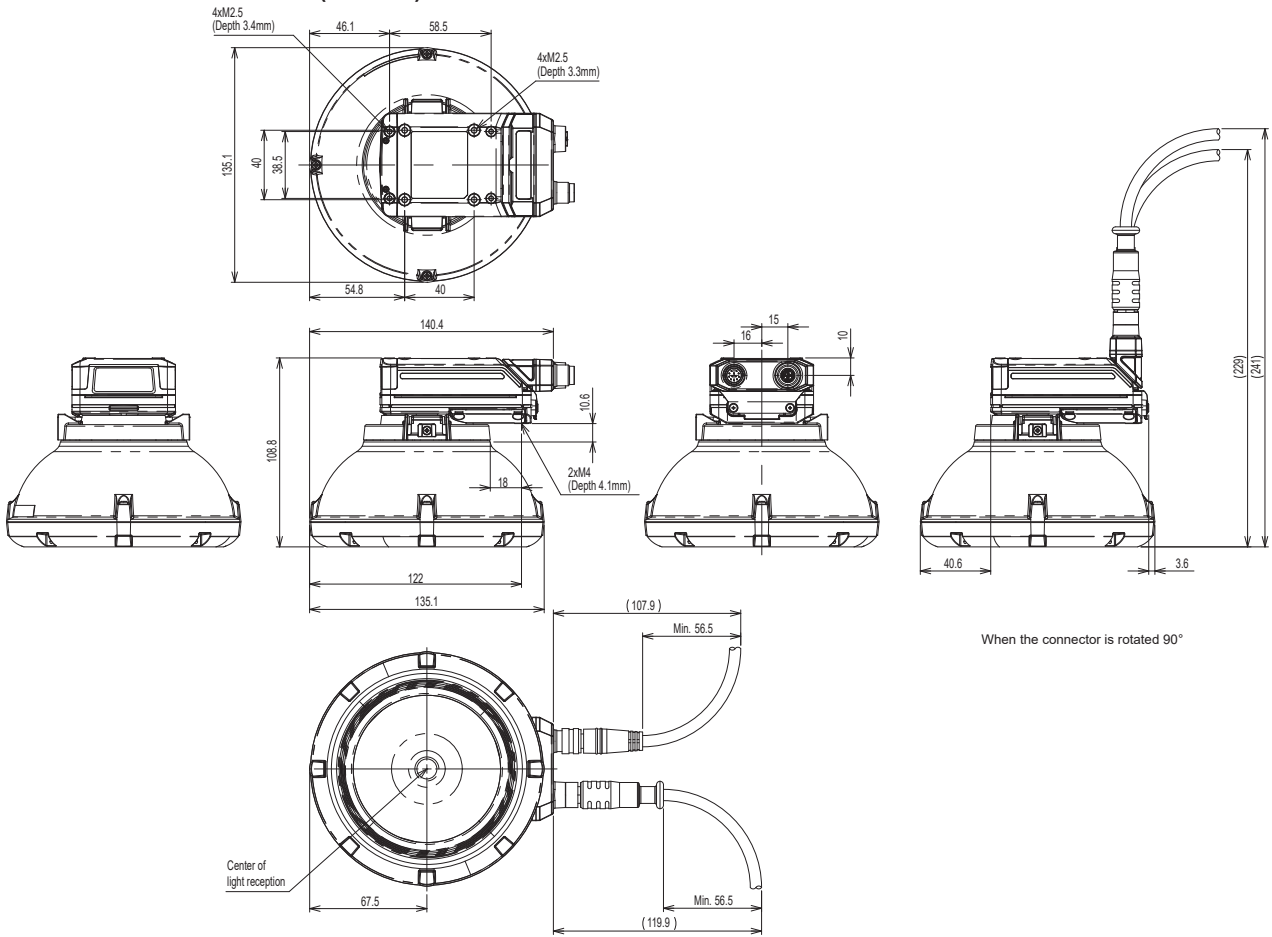


• With the AI Lighting unit (IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), polarizing filter for the AI Lighting unit (OP-88644/OP-88645)



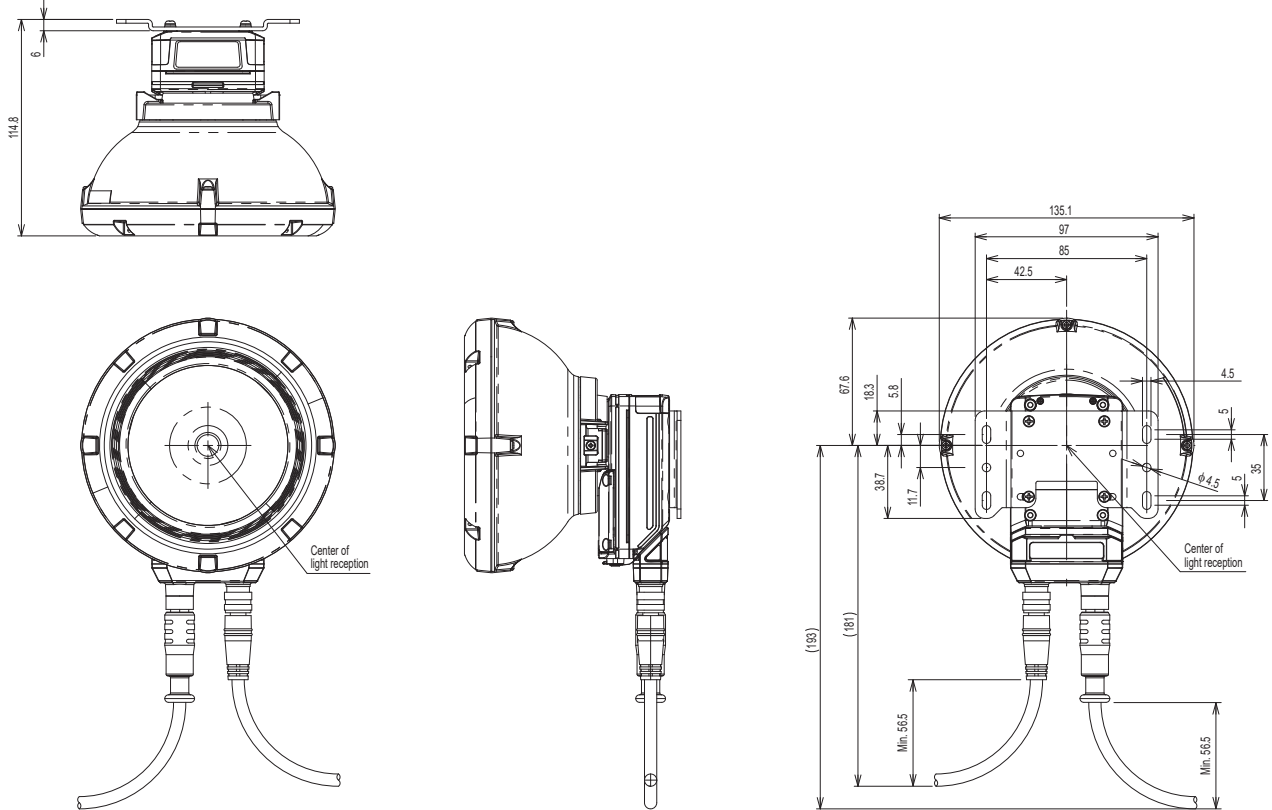
Dimensions

• With the Dome Attachment (IV3-D10)



When the connector is rotated 90°

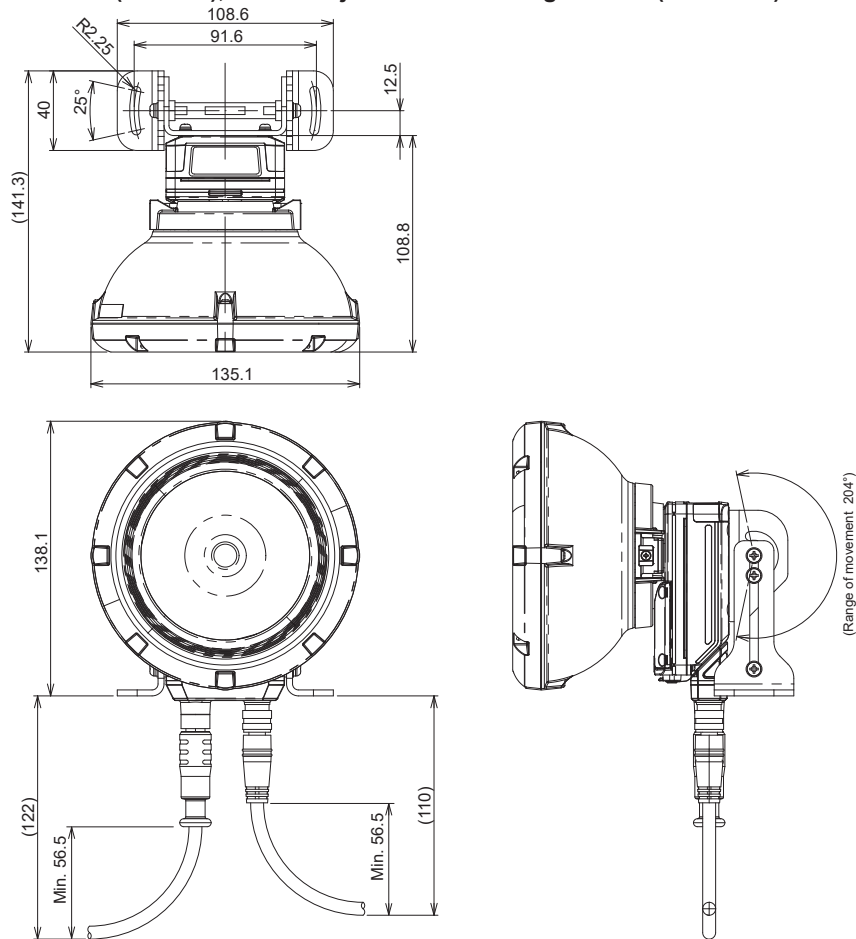
• With the Dome Attachment (IV3-D10), common mounting bracket (OP-88634)



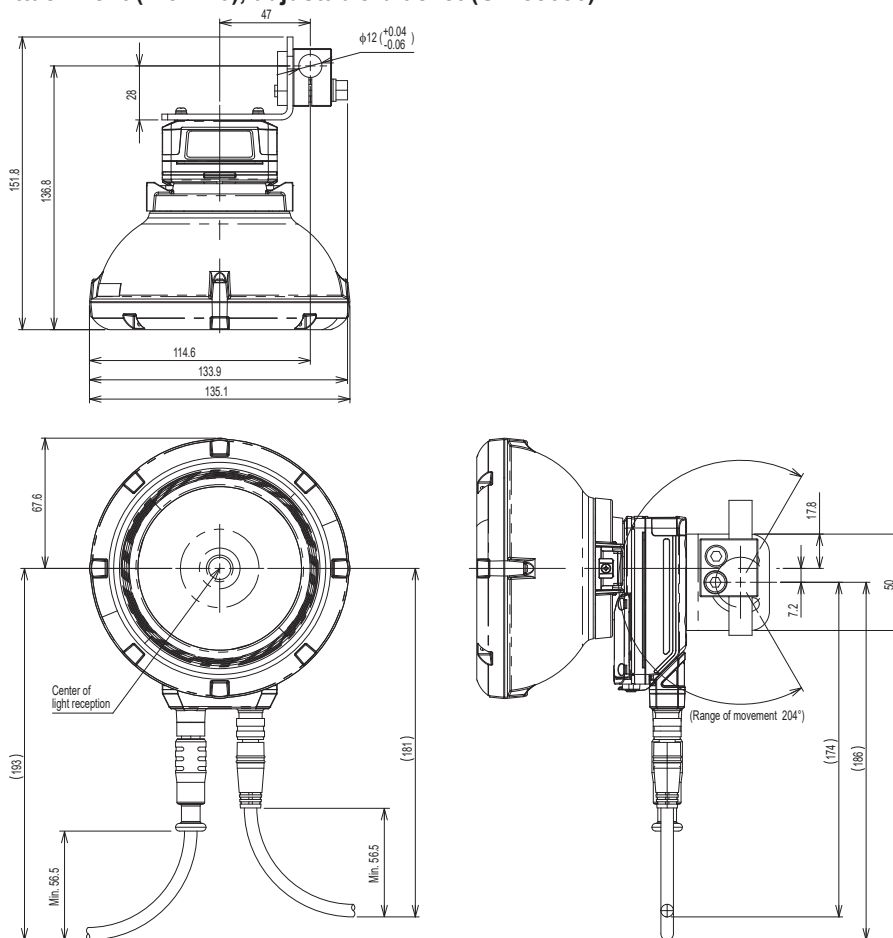
12

Specifications

• With the Dome Attachment (IV3-D10), biaxial adjustment mounting bracket (OP-88635)



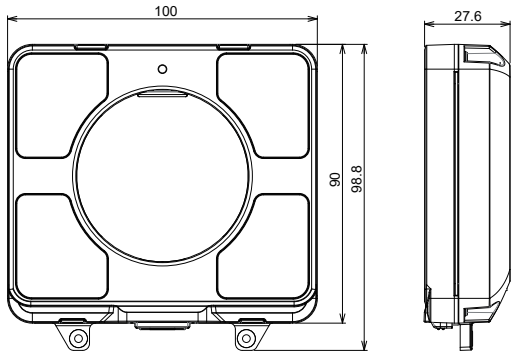
• With the Dome Attachment (IV3-D10), adjustable bracket (OP-88636)



Options for the built-in amplifier type

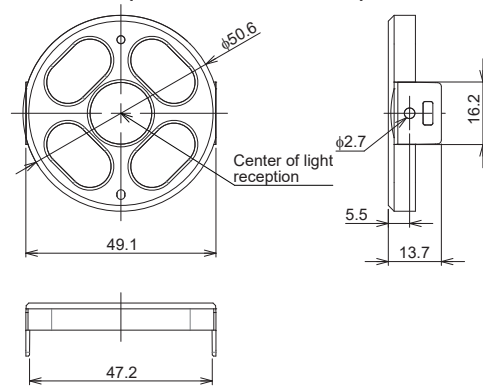
AI Lighting unit

- IV3-L4C/IV3-L4M/IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M

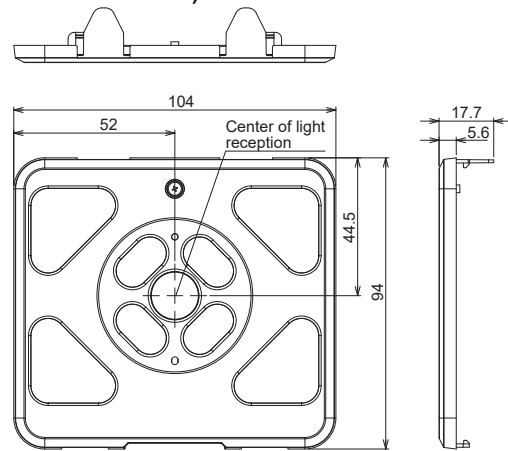


Polarizing filter

- For the sensor (OP-88640/OP-88641)

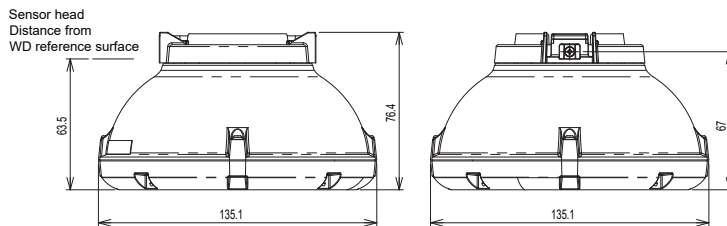
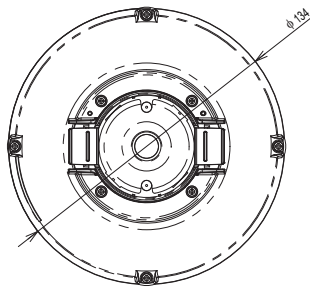


- Polarizing filter for the AI Lighting unit (OP-88644/OP88645)



Dome Attachment

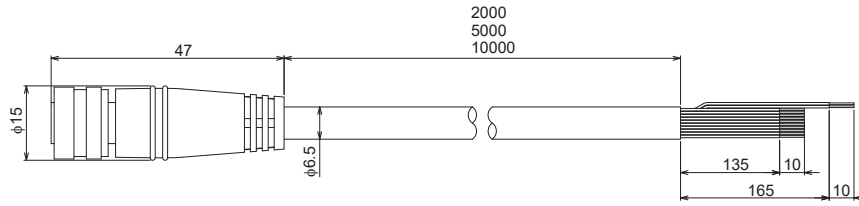
- IV3-D10



Cable

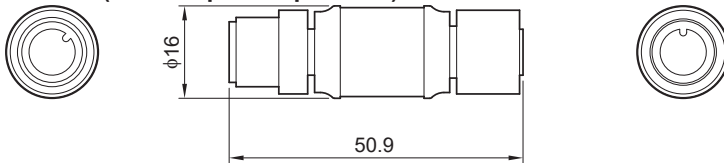
Power I/O cable

- OP-88654 (2m)
- OP-88655 (5m)
- OP-88656 (10m)

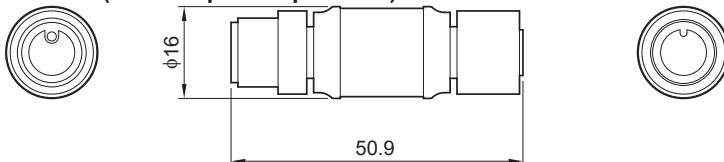


Conversion connector for power I/O cable

- OP-88631 (M12 A12pin - A4pin male)

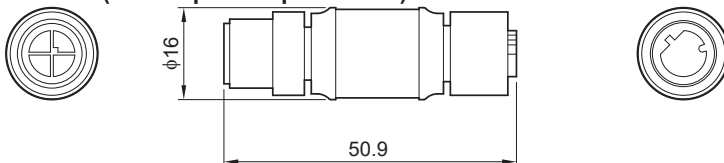


- OP-88632 (M12 A12pin - L5pin male)



Conversion connector for the Ethernet cable

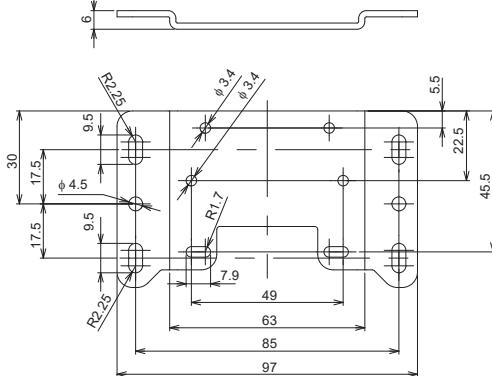
- OP-88633 (M12 X8pin - D4pin female)



Mounting bracket

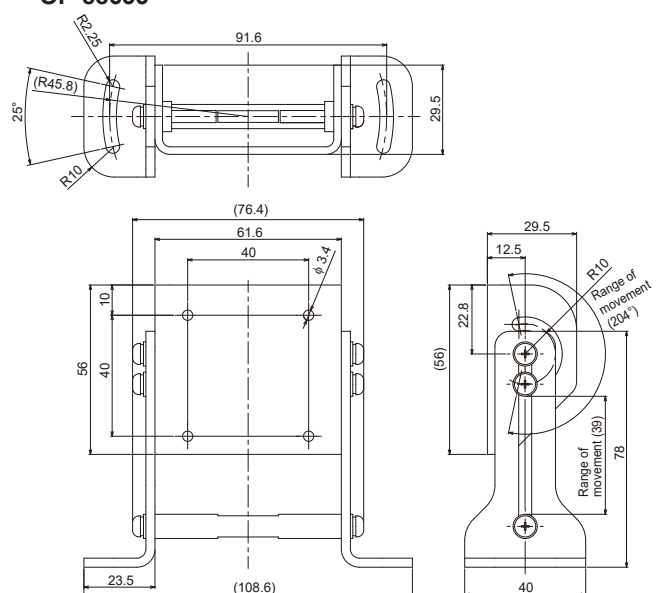
Common mounting bracket (also for the ultra-compact model)

- OP-88634



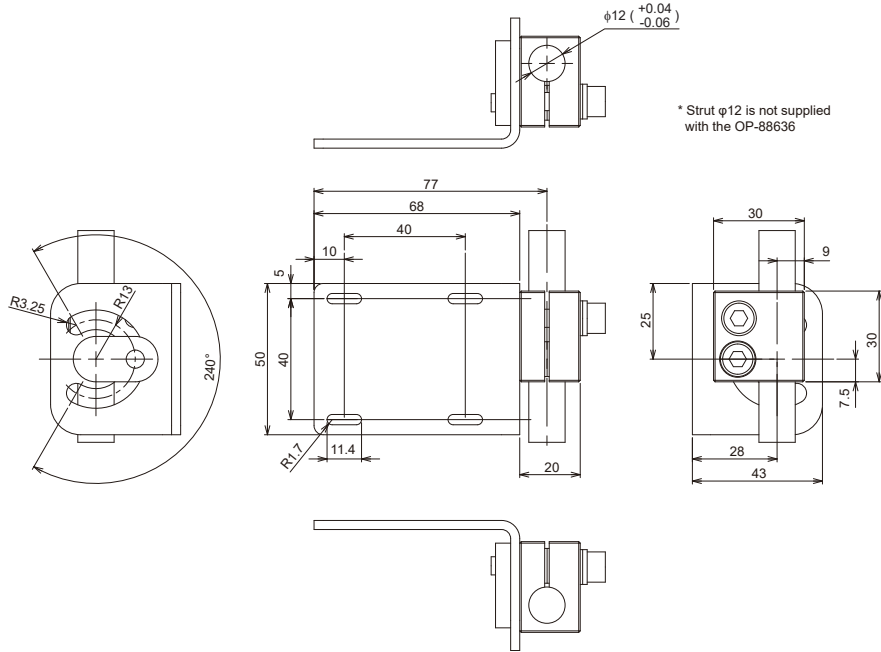
Biaxial adjustable bracket

- OP-88635



Adjustable bracket

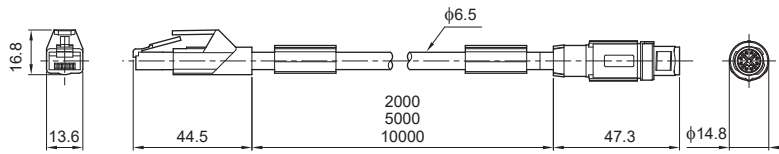
- OP-88636



Communication cable (option)

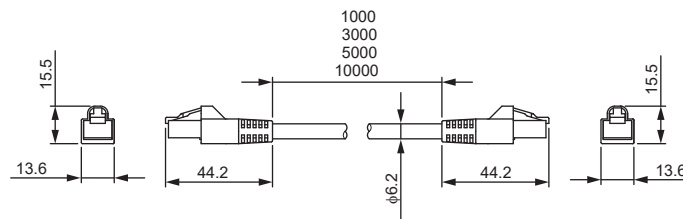
Ethernet cable (dedicated for the built-in amplifier type)

- OP-88664 (2 m)
- OP-88665 (5 m)
- OP-88666 (10 m)



LAN cable

- OP-87950 (1 m)
- OP-87951 (3 m)
- OP-87952 (5 m)
- OP-87953 (10 m)



Appendices

Status Table	A-2
Matching Rate of the Outline Tool and Position	
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Status Table

Status Table

Status	Screen type	Sensor (built-in amplifier)/ Sensor amplifier (ultra-compact model) indicator light				OUT	TRIG		
		PWR/ERR (Ultra-compact model)	Status indicator light (built-in amplifier type) (ultra-compact model head part)						
Starting up	-	Lighting (green)	Blink (green)		Blink (green)	OFF			
Running*2	Waiting for a trigger	RUN	Lighting (green)			OFF			
	Judgment processing					*3	*3	*5	
	Switching programs					*9	*9	OFF	
	Registering the external master image								
Setting	Limit Adjustment	TEST	Blink (green)	Blink (green)	OFF		*5		
	Trigger Options, Master Registration, etc.	LIVE					*13		
	Smart Image Optimization/ Automatically adjusting the brightness						*14		
	Setup Adjustment						OFF		
	I/O Monitor	-					OFF		
	Others								
Error	Trigger error	Running	Blink (red)	Blink (red)	Same as normal				
		Setting			LIVE				
	External master registration error	-	Lighting (red)		OFF	OFF			
	System error								
Startup memory readout error									

✓/× indicates enable/disable of the input.

ON/OFF indicates the following status. The operation differs according to the output setting (N.O./N.C.).

- When N.O. ON : Indicates ON for output.
OFF : Indicates OFF for output.
- When N.C. ON : Indicates OFF for output.
OFF : Indicates ON for output.

- *1 Turns ON if the judgment is OK. Turns OFF if it is NG.
When the total status result is OK, the total status output turns ON.
When the total status result is NG, the total status NG output turns ON.
The total status conditions can be selected from [All Tools OK], [Any Tool OK] and [Logic 1] to [Logic 4].
☐ "Total Status Conditions" (page 4-150)
When the position adjustment is NG, the status of each tool becomes NG.
- *2 The sensor continues running even during the operation of the [Run/Learned Img. History]/ [I/O Settings]/[Advanced Settings] screen in the run screen.
- *3 Indicates the overall status result of the previous judgment process. OK: Lighting (green), NG: Lighting (red)
- *4 Outputs the status result of the previous judgment process.
- *5 Lights (one-shot) according to the input of a trigger (external/internal).
When a trigger delay has been set, it lights before the delay.
- *6 Disregards the input. A trigger error occurs.
- *7 Stops the judgment process and switches over.
- *8 Stops the judgment process and registers the previously taken image as a master image.
- *9 Turns off the light before the process is completed. Until the light turns off, the previous status result will be displayed.
- *10 After the current process is completed, a new input begins.
- *11 Do not use. The processing order becomes indeterminate.
- *12 Turns OFF before the process is completed. Outputs the previous status result until this turns OFF.
- *13 The internal trigger is issued automatically and the image is updated. The Busy output operates.
- *14 The internal trigger is issued automatically and the image is updated.
- *15 While the I/O monitor function is used, only the operation of the I/O lines is confirmed. The assigned functions will not operate.
- *16 The output turns OFF regardless of the output settings (N.O./N.C.) and the polarity (NPN/PNP) settings.

Reference ☐ Additionally, refer to ☐ "Chapter 11 Controlling with the Input/Output Line" (page 11-1).

	Input				Output			
	External trigger	Switching programs	Ext. Master Save	Clear Error	BUSY	Total Status / Total Status NG / Each Tool / Each Logic / Part Type / Pos. Adj. 1	RUN	Error
	x	x	x	x	OFF	OFF	OFF	OFF
	✓	✓	✓	x	OFF	*4	ON	OFF
	*6	*7	*8		ON	*12		
		*10	*11					
		*11	*10					
	✓	x	x	x	Same as while running	OFF	OFF	OFF
	x				*13			
					OFF			
	*15	←	←	←	←	←	←	←
	x	x	x	x	OFF	OFF		OFF
	Same as normal			✓	Same as normal			ON
	x	x	x	x	OFF	OFF	OFF	*16
					*16	*16		



Displaying and outputting the status result

Status	Status of the tool/part type			Total Status ^{*2}		
	Display		Output	Display	Total Status OK Output	Total Status NG Output
	Judgment	Matching rate ^{*1}				
Waiting for a trigger (Not judged) ^{*3}	--	---	OFF	--	OFF ^{*7}	OFF ^{*7}
Judge is OK	OK ^{*5}	0 to 100	ON	OK ^{*6}	ON ^{*7}	OFF ^{*7}
Judge is NG	NG	0 to 100	OFF	NG	OFF ^{*7}	ON ^{*7}
Unable to judge ^{*4}	--	---	OFF	NG	OFF ^{*7}	ON ^{*7}

- *1
 - When the setting scale is changed for the Color Area/Area tool, 0 to 200/0 to 999 can be selected.
 - When the setting scale is changed for the Width/Diameter/Pitch tool, 0 to 100/0 to 999 can be selected.
 - The matching rate of the Edge tool is the number of detected edges. The scales shown below can be selected. 0 to 2/0 to 5/0 to 10/0 to 20/0 to 50/0 to 128/0 to 256/0 to 320
 - The matching rate of the Blob Count tool is the number of counts of detected blobs. The scales shown below can be selected. 0 to 5/0 to 10/0 to 20/0 to 50/0 to 100/0 to 200
 - The matching rate when the scaling function is used with the Width/Diameter/Pitch tool is based on the scaling settings.
 - The cut-off process (Page A-6) may be performed for the Outline tool and Position Adjustment tool.
 - If all the text and date matches, the matching rate for the OCR tool will be displayed as 100. If either the text or date does not match, 0 is displayed. If you set Shade Contrast to [Enable], the matching rate is linked to the text and date shading.
- *2 The total status conditions can be selected from [All Tools OK], [Any Tool OK] and [Logic 1] to [Logic 4].
 "Total Status Conditions" (page 4-150)
- *3 In this status, there has been no trigger input after the power turned ON, after the program number has changed, after the master image registered, after the status output reset, or after a shift from the setting mode to the run mode.
- *4 At the time of using the position adjustment/High-Speed Position Adjustment tool, when the judgment of each tool cannot be determined, the tool becomes "Unable to judge". For details, refer to "Displaying and outputting the status result at the time of position adjustment" (page A-5).
- *5 Displays the part type (master) number in sorting mode.
- *6 Displays the part type (master) name and part type (master) in sorting mode.
- *7 In standard mode only. The total status output cannot be selected in sorting mode.




Displaying and outputting the status result at the time of position adjustment

Position adjustment result	Window protrusion ^{*1}	Display/output	Status of the tool/Part			Total Status ^{*2} (standard mode only)	Total Status NG (standard mode only)
			Pos. Adj./ Hi-Sp.Adj	Outline	Learning/Color Area/ Area/Width/ Diameter/ Edge/ Pitch/OCR/ EdgePixels/ Blob Count		
Succeeded	No	View judgment	OK	OK/NG	OK/NG	OK/NG ^{*3}	/
		Status output	ON	ON/OFF	ON/OFF	*4	*5
		View matching rate	0 to 100	0 to 100	0 to 100 ^{*6}	/	/
	Yes	View judgment	OK	OK/NG	-- ^{*7}	OK/NG ^{*3}	/
		Status output	ON	ON/OFF	OFF	*4	*5
		View matching rate	0 to 100	0 to 100 ^{*8}	---- ^{*7}	/	/
Failed	/	View judgment	NG	--	--	NG	/
	Status output	OFF	OFF	OFF	OFF	ON	
	View matching rate	0 to 100	---	---	/	/	

*1 This is an operation for if the adjusted position of the tool window is protruded from the imaging area at the time that position adjustment succeeded.

For details, refer to  "Matching rate at the time of protrusion" (page A-6).

*2 The total status conditions can be selected from [All Tools OK], [Any Tool OK] and [Logic 1] to [Logic 4].
 "Total Status Conditions" (page 4-150)

*3 Displays the Part (master) number, Part (master) name, or NG in the sorting mode.

*4 When the total status result is OK, the total status OK output turns ON. This cannot be selected in sorting mode.

*5 When the total status result is NG, the total status NG output turns ON. This cannot be selected in sorting mode.

*6 Setting scale can be changed.

The scales shown below are selectable.

- Color Area/Area/Width/Diameter/Pitch/Edge Pixel: 0 to 100/0 to 200/0 to 999


- Edge: 0 to 2/0 to 5/0 to 10/0 to 20/0 to 50

- OCR (when shade contrast is [Enable]): 0 to 100

- Blob Count: 0 to 5/0 to 10/0 to 20/0 to 50/0 to 100/0 to 200

When the scaling function is used with the Width/Diameter/Pitch tool, the matching rate is based on the scaling settings.

*7 The judgment cannot be determined if the adjusted position of the tool window is protruded from the imaging area.

*8 For details on the target's outline which is protruded from the search region, refer to  "Matching rate at the time of protrusion" (page A-6).

A

Matching Rate of the Outline Tool and Position Adjustment Tool

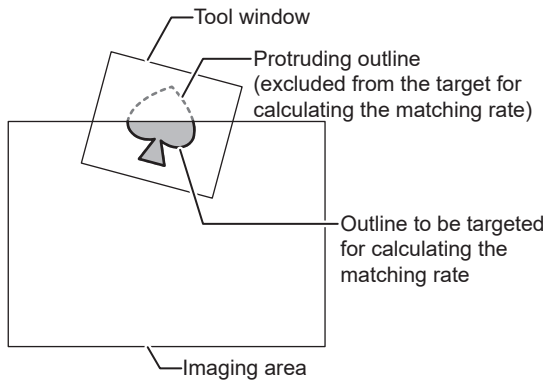
Matching rate at the time of protrusion

● When the matching rate decreases in proportion to the protrusion amount

- With the [Search Range] of the Outline tool set to [Entire]
- With the [Search Range] of the Position Adjustment set to [Entire] and with the [Search Algorithm] set to [High Speed]

When the target outline protrudes from the imaging area, the protruding outline is excluded from the target in regards to calculating the matching rate. The matching rate decreases in proportion to the protrusion amount.

If the target is being protruded from the imaging area, the matching rate will decrease depending on how much the target is protruded from the imaging area.



● When searching for outline within a partial search area.

- With the [Search Range] of the Outline tool set to [Partial]
- With the [Search Range] of the Position Adjustment set to [Partial] and with the [Search Algorithm] set to [High Speed]
- With the [Search Algorithm] of the Position Adjustment set to [High Accuracy]

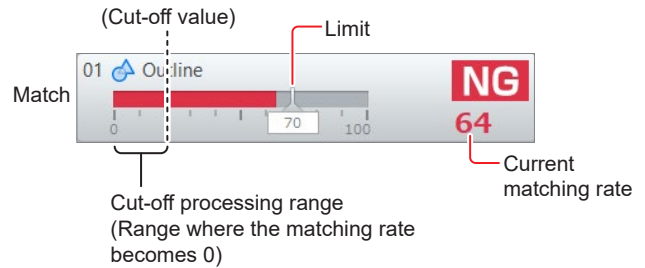
The sensor searches the outline of the target that is in the search range. The matching rate of the target being out of search range will be "0".

Reference When the tool window after position adjustment is protruded from the imaging area, the judgment display of the Learning/Color Area/Area/ColorAverage/Brightness Average/Width/Diameter/Edge/Pitch/OCR/EdgePixels tool/Blob Count becomes -- (Unable to judge) and the status output turns OFF.

Cut-off process of the matching rate

The cut-off process means the process where the outline detection process is ended when no outline exceeding a certain matching rate (cut-off value) below the threshold value is found.

A matching rate which has been cut off becomes 0. Because the cut-off value is linked to the threshold, the cutoff value is also changed when the threshold is changed.



A

Troubleshooting

Symptom	Check point	Remedy	Ref.
The PWR/ERR indicator light of the sensor amplifier is on or blinking in red.	An error has occurred. Check the errors indicated by the lighting or blinking.	Refer to "Error Message".	A-9
The status indicator light is blinking in red. (Built-in amplifier type)			
The power of the sensor does not turn on.	Is the power cable correctly connected?	Connect the power cable correctly.	2-15
	<ul style="list-style-type: none"> Does the voltage or capacity of the power source meet the specification? Has the voltage dropped due to the power cable conductor resistance? 	<ul style="list-style-type: none"> Use a power source of the correct rating. Choose a power cable with consideration to a voltage drop. 	12-2
The image does not display on the IV3-Navigator. or the image is abnormal.	Is the installed distance of the target correct?	Place a target at the correct installed distance. The installed distance depends on the sensor type.	2-2
	Is the sensor view correct?	Place the sensor in such a way that the sensor view matches the target size.	2-2
	Is the focus adjustment correct?	Adjust the focusing position (focus) of the sensor.	4-12
	Is the brightness adjustment correct?	Adjust the brightness of the sensor.	4-12
	Is the target or the sensor vibrating?	Implement anti-vibration measures etc.	-
	Is the multiple imaging set when imaging a moving target?	Set the image optimization again.	-
	Does ambient light affect the image?	Mount the AI Lighting unit.	2-6
		Use brightness correction.	4-24
Is the front cover dirty or damaged?	Implement a shield to prevent the incident of ambient light.	-	
	Clean the front cover. If it is damaged, contact your nearest KEYENCE office.	-	
The image or the status result is not updated.	Is the system in the setting mode?	<ul style="list-style-type: none"> Start run mode Turn on the power of the sensor again. 	5-2
	Is the trigger correctly input?	If a target is to be imaged using an external trigger, input the external trigger. When NPN is selected in the Polarity, the circuit becomes a non-voltage input circuit. When PNP is selected in the Polarity, the circuit becomes a voltage input circuit. Check the cables.	4-10
	All or part of the settings necessary for running have not been completed.	Complete the settings in Settings Navigator.	4-1
	The NG Hold function is used.	Set [NG Hold Function] to [Disable].	5-16
Image update is slow. (during operation/setting)	Is the network connected to the inplant LAN?	The network may be affected by the traffic in the in-plant LAN. Configure a local network and confirm the network connection only for the IV3 Series.	-



Troubleshooting

Symptom	Check point	Remedy	Ref.
The device cannot be operated with the IV3-Navigator.	Is the input screen for the unlock password displayed?	Sensor security is enabled. Input the unlock password.	7-22
	The password is lost and cannot unlock.	Contact your nearest KEYENCE office.	-
The status result is not output.	Is the output line correctly connected?	Correctly connect to the external devices.	2-15
	Is the output setting correctly set?	Set the output line and output settings correctly in the Settings Navigator.	4-147
	Is the system in the setting mode?	Start run mode	5-2
	Is the threshold correctly set?	Set the threshold correctly.	6-15
	Is the tool correctly set?	<ul style="list-style-type: none"> Set the judgment tool correctly. Set the position adjustment tool correctly. 	4-28 4-121
	Is the Polarity correctly set?	Set NPN or PNP according to the circuits of the external devices.	7-17
	Are the N.O. and N.C. correctly set?	Set N.O. (normally open) or N.C. (normally closed) according to the circuits of the external devices.	7-15
An external trigger cannot be input.	Is the trigger condition set to [External Trigger]?	Select [External Trigger] in Trigger Options.	4-10
	Is the input line correctly connected?	Correctly connect to the external devices.	2-15
	Has the input setting been made correctly?	Adjust the input line and input settings correctly in [Input Assignment].	7-14
	Is the Polarity correctly set?	When NPN is selected in the Polarity, the circuit becomes a non-voltage input circuit. When PNP is selected in the Polarity, the circuit becomes a voltage input circuit. Check the cables.	7-17
The program number cannot be changed with the input line.	Has the switching method for the programs been correctly set?	Set the [Program Switching Method] to [External Input].	7-14
	Is the input line correctly connected?	Correctly connect to the external devices.	2-15
	Has the input setting been made correctly?	Adjust the input line and input settings correctly in [Input Assignment].	7-14
	Is the Polarity correctly set?	When NPN is selected in the Polarity, the circuit becomes a non-voltage input circuit. When PNP is selected in the Polarity, the circuit becomes a voltage input circuit. Check the cables.	7-17
	When using P032 to P127, is the SD card correctly inserted?	Insert the SD card correctly and close the cover.	8-9
	Is the program expansion function correctly set?	Set the [SD Card Access] to [Enable].	8-11
IV3-Navigator cannot connect to the sensor.	Check the cables and settings.	Refer to "Remedy when the Monitor cannot be Connected with the Sensor" (Page A-16).	A-15
Image data cannot be transferred via FTP/SFTP.	Check the cables and settings.	Refer to "Remedy when data transfer via FTP/SFTP is unavailable"	A-21
Image data cannot be transferred to the SD card.	Check if the settings are correct and if the SD card is correctly inserted.	Refer to "Remedy when data transfer to the SD card is unavailable"	A-14

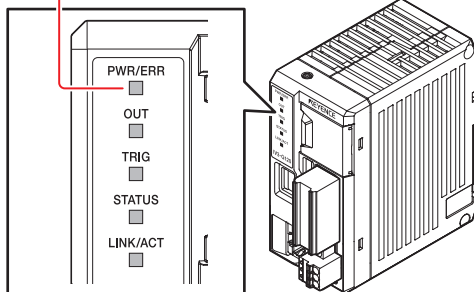
Error Messages

Checking errors by observing the PWR/ERR indicator light and status indicator light

■ Ultra-compact model

For the ultra-compact model, the causes of and remedies for an error can be checked by observing the indicator light.

PWR/ERR indicator light



The indicator light on the sensor head blinks (red) when the light on the sensor amplifier is ON (red) or blinking (red).

PWR/ERR indicator light status		Cause	Remedy
Green	ON	Operation is in progress.	-
	Blink	Setting in progress. Operation stopped. If the light turns off periodically, the power supply rating may be insufficient.	- • Use a power source of the correct rating.
Red	ON	A system error occurred.	<ul style="list-style-type: none"> • Cycle the power of this device. • If the same error occurs, contact your nearest KEYENCE office.
		A startup memory read error occurred. <ul style="list-style-type: none"> • A data abnormality occurred due to noise or because the power switched OFF while writing was in progress. 	<ul style="list-style-type: none"> • Initialize the settings. • If the same error occurs, contact your nearest KEYENCE office.
	Blink	An error occurred in switching the advanced program at the time of startup or during operation.	Refer to "Checking error messages on the IV3-Navigator" (page A-11).
Red	Blink	A trigger error occurred. The judgment process is not performed. An external trigger is input when [Trigger Accept Timing] is set to [Send after BUSY Output OFF] and the busy output is ON. Otherwise, the internal trigger interval is faster than the processing time.	<ul style="list-style-type: none"> • A trigger error can be fixed using one of the following procedures. <ul style="list-style-type: none"> • Next normal trigger input • Clear Error input • Switching the program number • Proceeding to the settings screen of the sensor • Set the trigger interval of the internal trigger to a value that is longer than the processing time (calculate the data transfer time when [BUSY Output Configuration] is set to [Until Data Transfer is Complete]). • An error will not occur if the Trigger Error is set to [Disable] described in output assignment for the Settings Navigator (Page 4-147).
		An error occurred in switching the advanced program during setup.	Refer to "Checking error messages on the IV3-Navigator" (page A-11).
		An external master image registration error (with no registered master image) occurred. The master image is not updated. <ul style="list-style-type: none"> • The image to be registered as a master image was not imaged. • The work memory is insufficient. 	<ul style="list-style-type: none"> • An external master image registration error can be fixed using one of the following procedures. <ul style="list-style-type: none"> • Successful in next external master image registration • Clear Error input • Switching the program number • Proceeding to the settings screen of the sensor • Taking an image to be registered as a master image and registering it as an external master image. • Deleting one or more detection tools.

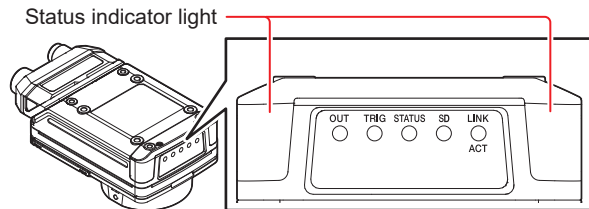
Error Messages

PWR/ERR indicator light status		Cause	Remedy
Red	Blink	An external master image registration error (with registered master image) occurred. The following errors occurred even though the image was updated and registered as a master image. <ul style="list-style-type: none"> For the new master image, the outline cannot be extracted with the outline tool. For the new master image, the area cannot be extracted with the Color Area/Area tool. For the new master image, the edge cannot be extracted with the Width/Diameter/Edge/Pitch/Edge Pixel tool. When the learning tool (including sorting mode) is set, the external master image registration cannot be used. 	<ul style="list-style-type: none"> An external master image registration error can be fixed using one of the following procedures. <ul style="list-style-type: none"> Successful in next external master image registration Clear Error input Switching the program number Proceeding to the settings screen of the sensor Checking that the image to be registered and the detection tools/position adjustment settings are applicable.
		An SD card error occurred. The following errors occurred. <ul style="list-style-type: none"> Accessing the SD card has failed. Transfer to the SD card failed. 	Refer to “Remedy when data transfer to the SD card is unavailable” (page A-14).
		An FTP error occurred. The following errors occurred. <ul style="list-style-type: none"> Connection with the FTP/SFTP server failed. Transfer to the transfer destination folder failed. The transfer speed could not catch up to the sensor processing speed. 	An FTP error can be fixed using one of the following procedures. <ul style="list-style-type: none"> Press [OK] on the Error screen Clear Error input Resolve the causes of transfer failure.
OFF		Power is not supplied to this device.	<ul style="list-style-type: none"> Connect the power cable correctly. Use a power source of the correct rating.

Reference Errors in a state that the PWR/ERR indicator light lights in red or blinks in red turn the error output ON.
 “Cables” (page 2-15)
 “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)

Built-in amplifier type

For the built-in amplifier type, the status indicator light blinks in red when an error occurs.





Status of the status indicator light		Cause	Remedy
Green	ON	The total status result and part type discrimination are OK.	-
	Blink	Under startup or setting in progress. Operation stopped. If the light turns off periodically, the power supply rating may be insufficient.	<ul style="list-style-type: none"> Use a power source of the correct rating.
Red	ON	The total status result and part type discrimination are NG.	-
	Blink	An error has occurred. The Status indicator light on the built-in amplifier type blinking in red means the same as when the PWR/ERR indicator light of the ultra-compact model lights or blinks in red.	For the causes of and remedies for this error, refer to those of the PWR/ERR indicator light of the ultra-compact model. “Ultra-compact model” (page A-9)
OFF		Power is not supplied to this device.	<ul style="list-style-type: none"> Connect the power cable correctly. Use a power source of the correct rating.

Reference Errors in the status indicator light blinks in red turn the error output ON.
 “Cables” (page 2-15)
 “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-147)


Checking error messages on the IV3-Navigator

Message	Cause	Remedy	Output/ Indicator
<p>A system error occurred on the sensor.</p> <p>Turn on the power of the sensor again. If not turned on, contact local service center.</p>	<p>A system error occurred in the sensor.</p> <ul style="list-style-type: none"> It is possible that a fault occurred inside the sensor. 	<ul style="list-style-type: none"> Turn on the power of the sensor again. If the same error occurs, contact your nearest KEYENCE office. 	*1
<p>Failed to read nonvolatile memory at sensor startup.</p> <p>Turn on the sensor power again or initialize the sensor. After this message is closed, the [Initialize] button will be displayed.</p>	<p>A memory read error occurred when the sensor started.</p> <ul style="list-style-type: none"> A data error occurred. It is possible that the power was switched OFF during writing, or noise was picked up. 	<ul style="list-style-type: none"> Initialize the settings following the instructions on the screen. Turn on the power of the sensor again. Do not turn OFF the power while saving the settings. If the same error occurs, contact your nearest KEYENCE office. 	*1
<p>Initialization is necessary because sensor program xx is corrupt.</p> <p>After this message is closed, the [Initialize] button for program xx will be displayed.</p>	<p>A memory read error occurred when the sensor started.</p> <ul style="list-style-type: none"> A data error occurred during the execution of program number xx. It is possible that the power was switched OFF during writing, or noise was picked up. 	<ul style="list-style-type: none"> Initialize the settings following the instructions on the screen. Turn on the power of the sensor again. Do not turn OFF the power while saving the settings. If the same error occurs, contact your nearest KEYENCE office. 	*1
<p>Trigger error</p>	<p>A trigger error occurred. Judgment processing has not been executed.</p> <ul style="list-style-type: none"> If a target is to be imaged using an external trigger, the external trigger was input during a BUSY status. If a target is to be imaged using an internal trigger, the trigger interval was shorter than the processing time. 	<ul style="list-style-type: none"> A trigger error can be fixed using one of the following procedures. <ul style="list-style-type: none"> Next normal trigger input Clear Error input Switching the program number Proceeding to the settings screen of the sensor Do not input the external trigger during a BUSY status. Set the trigger interval of the internal trigger to a value that is longer than the processing time. An error will not occur if the Trigger Error is set to [Disable] described in output assignment for the Settings Navigator (Page 4-147). 	*2
<p>Some tools can not be judged correctly because of insufficient outline extraction amount as a result of "Ext. Master Save". (Matching rate is 0.) Check tool configuration.</p> <p>Some tools can not be judged correctly because area is 0 as a result of "Ext. Master Save". (Matching rate is 0.) Check tool configuration.</p> <p>Some tools can not correctly judged because the edge extraction amount as a result of the "Ext. Master Save" is not sufficient. (Matching rate is 0.) Check tool configuration.</p> <p>Brightness adjustment area is not adjustable as a result of "Ext. Master Save". Check configuration of brightness adjustment.</p> <p>External master registration failed because the learning tool is set to the program.</p>	<p>An external master image registration error (with registered master image) occurred. The following errors occurred even though the image was updated and registered as a master image.</p> <ul style="list-style-type: none"> For the new master image, the outline cannot be extracted with the outline tool. For the new master image, the area cannot be extracted with the Color Area/Area tool. For the new master image, the edge cannot be extracted with the Width/Diameter/Edge/Pitch/Edge Pixel tool. The brightness correction cannot be performed correctly for the new master image. When the learning tool (including sorting mode) is set, the external master image registration cannot be used. 	<ul style="list-style-type: none"> An external master image registration error can be fixed using one of the following procedures. <ul style="list-style-type: none"> Successful in next external master image registration Clear Error input Switching the program number Proceeding to the settings screen of the sensor Checking that the image to be registered and the detection tools/position adjustment settings are applicable. Adjusting the brightness of the image to be registered properly. 	*2

Error Messages

Message	Cause	Remedy	Output/Indicator		
External master registration failed because the image has not been captured.	An external master image registration error (with no registered master image) occurred. The master image is not updated. <ul style="list-style-type: none"> The image to be registered as a master image was not imaged. The work memory is insufficient. 	<ul style="list-style-type: none"> An external master image registration error can be fixed using one of the following procedures. <ul style="list-style-type: none"> Successful in next external master image registration Clear Error input Switching the program number Proceeding to the settings screen of the sensor Taking an image to be registered as a master image and registering it as an external master image. Deleting one or more detection tools. 	*2		
External master registration failed due to insufficient work memory.					
An application error occurred.	An application failure occurred.	<ul style="list-style-type: none"> Reinstall the IV3-Navigator (IV3-H1). Replace the PC. If the same error occurs, contact your nearest KEYENCE office. 			
Registry access failed.	A failure of the registry information occurred.	<ul style="list-style-type: none"> Restart the PC. Reinstall the IV3-Navigator (IV3-H1). 			
Network adapter not found	<ul style="list-style-type: none"> Ethernet cable is not connected to the PC. The network adapter is not correctly connected to the PC. 	Refer to  "Remedy when the Software cannot be Connected with the Sensor" (page A-15).			
Sensor cannot be found.	Searching the sensor failed.				
Data transfer to sensor fails.	Connection is not possible because data transmission to the sensor has failed.				
Communication timeout to sensor occurred.	Connection is not possible because there is no response from the sensor.				
Network connection to sensor can not be performed.	Connection is not possible because the IV-Navigator is not correctly connected with the sensor.				
The connection with the sensor will be cut in order to connect with another panel or PC.	The connected sensor has been disconnected, because it was connected from another control panel or PC.			Reconnect to the sensor when it is ready to connect.	
Failed to write file.	Saving the file to the specified save destination has failed.			<ul style="list-style-type: none"> Specify the save destination correctly. Confirm the access privileges of the save destination. 	
Failed to access the file or folder.	Accessing to the specified file or folder failed.	<ul style="list-style-type: none"> Confirm the access privileges of the save destination. Change the attribute of the readonly folder. 			
Disk space is insufficient.	Saving is not possible because the amount of free space in the specified save destination is insufficient.	Delete a file to make an enough space for the save destination.			
FTP Connection Error	Connection with the FTP/SFTP server failed.	Refer to  "Remedy when data transfer via FTP/SFTP is unavailable" (page A-21).	*2		
FTP Transfer Error (Transfer Failed)	Data transfer to the transfer destination folder failed.				
FTP Transfer Error (Insufficient Data Buffer)	Data which is larger than the remaining storage of the FTP/SFTP buffer has been created and the transfer failed.				
No server found.	Connection with the SFTP server failed.				
Does not match the server settings. Review those settings as well as other related settings. (Key exchange algorithm)					
Does not match the server settings. Review those settings as well as other related settings. (Host key algorithm)					

A

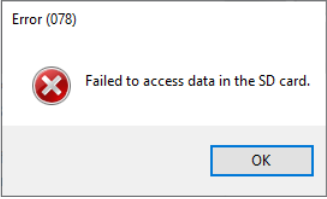
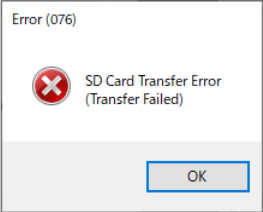
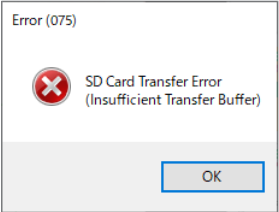
Message	Cause	Remedy	Output/Indicator
Does not match the server settings. Review those settings as well as other related settings. (Cryptographic algorithm)	Connection with the SFTP server failed.	Refer to  "Remedy when data transfer via FTP/SFTP is unavailable" (page A-21).	*2
Does not match the server settings. Review those settings as well as other related settings. (MAC algorithm)			
The sensor head and sensor amplifier are not compatible with each other. Connect the correct sensor head and sensor amplifier.	A sensor head of the IV and IV2 Series has been connected with the sensor amplifier of the IV3 Series.	Connect the IV3 Series sensor head.	
The sensor head is not connected to the sensor amplifier. Connect the sensor head to the sensor amplifier, and then turn the power on again. If not turned on, contact local service center.	The sensor head is not connected.	Connect the sensor head.	
A connection cannot be established with number **. Check the following items. - The correct sensor IP address is specified. - Power supply for the sensor. - Network connection. - PC network settings.	Connection with the sensor failed.	Check the following items. • Specify the correct IP address of the sensor. • Power supply for the sensor. • Network connection. • PC network settings.	
The system will return to the sensor setup menu because the program file selected by external input cannot be found. * The program number will change to P000. To start operation, set a valid program number for the destination program or change the program switching method.	An error occurred in switching the advanced program (external input) at the time of startup.	Clear the error message. The error is cleared and the system moves to the setting screen. Thereafter, perform the following operations: • Make the system re-recognize the SD card that stores the correct advanced program. • Select between P000 and P031 by external input.	*3
The system will return to the sensor setup menu because the program file selected previously cannot be found. * The program number will change to P000.	An error occurred in switching the advanced program (panel/PC/communication) at the time of startup.	Clear the error message. The error is cleared and the system moves to the setup or run screen. Thereafter, perform the following operations: • Make the system re-recognize the SD card that stores the correct advanced program. • Select between P000 and P031. • When clearing the error message, operation can be selected to continue with P000 or move to the setting screen.	*3
The system will return to the sensor setup menu because the selected program file cannot be found. * The program number will change to P000. To start operation, set a valid program number for the destination program or change the program switching method.	An error occurred in switching the advanced program during operation.	Clear the error message. The error is cleared and the system moves to the setting screen. Thereafter, perform the following operations: • Make the system re-recognize the SD card that stores the correct advanced program. • Select between P000 and P031.	*1
As the previously selected program file cannot be found, The program number will change to P000.	A setup error of the advanced program occurred during setup.	Make the system re-recognize the SD card that stores the correct advanced program.	*2
Accessing the data in the SD card failed.	Accessing the data in the SD card failed.	Refer to "Remedy when data transfer to the SD card is unavailable" (page A-14).	*2
SD card transfer error (Transfer failure)	Data transfer to the transfer destination folder failed.		
SD card transfer error (Insufficient data buffer)	Data which is larger than the remaining storage of the transfer buffer has been created and the transfer failed.		

*1 Error output from the sensor: ON, PWR/ERR indicator light of the sensor: ON (red), Status indicator light: Blinking (red)

*2 Error output from the sensor: ON, PWR/ERR indicator light of the sensor: Blinking (red), Status indicator light: blinking (red)

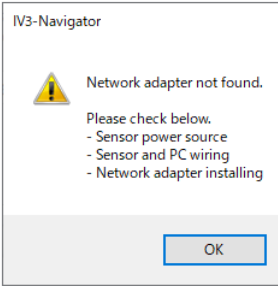
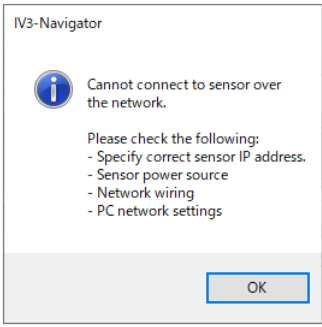
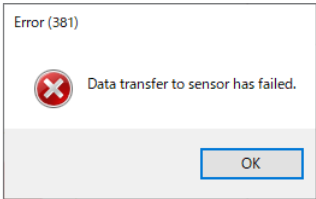
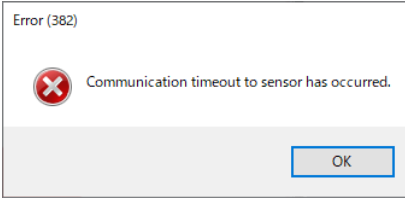
*3 Error output from the sensor: Does not operate, PWR/ERR indicator light of the sensor: ON (red), Status indicator light: blinking (red)

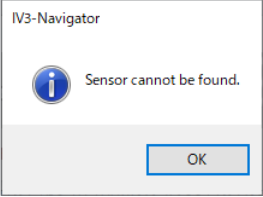
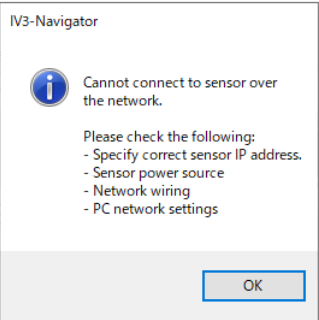
Remedy when data transfer to the SD card is unavailable

Status	Remedy
 <p>Accessing the data in the SD card failed.</p>	<ul style="list-style-type: none"> • Do not remove the SD card while it is being accessed. • Format the SD card. • Replace the SD card. • There may be influence from noise.
 <p>Data transfer to the transfer destination folder failed.</p>	<ul style="list-style-type: none"> • Check the amount of free space. • Remove the SD card from the SD card slot, re-insert it, and then close the cover. Check that the SD card indicator light is on.
 <p>Data which is larger than the remaining storage of the transfer buffer has been created and the transfer failed.</p>	<ul style="list-style-type: none"> • Increase the trigger cycle of the sensor. <ul style="list-style-type: none"> □ “Setting the Trigger Options” (page 4-10) • Control the trigger using the busy output. In doing do, set the timing of busy output to “Until Data Transfer is Complete.” <ul style="list-style-type: none"> □ “BUSY Output Configuration” (page 7-16)

Remedy when the Software cannot be Connected with the Sensor

Remedy when connection via a network is unavailable

Status	Remedy
 <p>IV3-Navigator</p> <p>Network adapter not found.</p> <p>Please check below.</p> <ul style="list-style-type: none"> - Sensor power source - Sensor and PC wiring - Network adapter installing <p>OK</p> <p>Connection is not possible even by pressing [Connect] in the Activation Menu.</p>	
 <p>IV3-Navigator</p> <p>Cannot connect to sensor over the network.</p> <p>Please check the following:</p> <ul style="list-style-type: none"> - Specify correct sensor IP address. - Sensor power source - Network wiring - PC network settings <p>OK</p> <p>Connection is not possible even by pressing [Connect] in the Network connection screen.</p>	<ul style="list-style-type: none"> • Press [OK] and close the message. • Setup the network adapter correctly in the PC. • Supply power to the sensor and the network equipment. • Correctly connect with the sensor and the network equipment. <ul style="list-style-type: none"> □ “Connecting the sensor and PC” (page 2-21) • On the Network connection screen, select the correct network adapter. • Press [Search Sensor] and search a sensor. <ul style="list-style-type: none"> □ “Searching for a Sensor to be Connected” (page 3-6) If the connection cannot be established, refer to □ “When the connection cannot be established by searching for the sensor” (page A-16). • Input the IP address of the sensor to be connected and press [Connect] to connect. <ul style="list-style-type: none"> □ “Specifying Sensor to be Connected by IP Address” (page 3-7) If the connection cannot be established, refer to □ “When the connection cannot be established by specifying the sensor” (page A-16).
 <p>Error (381)</p> <p>Data transfer to sensor has failed.</p> <p>OK</p>  <p>Error (382)</p> <p>Communication timeout to sensor has occurred.</p> <p>OK</p> <p>Connection became impossible after connection was established.</p>	<ul style="list-style-type: none"> • The PC firewall (Windows firewall or commercially-available security software) may be blocking IV3-Navigator communications. Disable the firewall or allow IV3-Navigator communications.

Status	Remedy
 <p>The sensor was not found using the [Search Sensor] button on the Network connection screen.</p>	<p>When the connection cannot be established by searching for the sensor</p> <ul style="list-style-type: none"> • Supply power to the sensor and the network equipment. • Correctly connect with the sensor and the network equipment. <ul style="list-style-type: none"> ☐ “Connecting the sensor and PC” (page 2-21) • Confirm that the IP address of the PC does not coincide with that of the sensor or another device. Also, correctly set the subnet mask and the default gateway. <ul style="list-style-type: none"> ☐ “Confirming/Setting the IP address of the PC” (page A-19) • On the Network connection screen, select the correct network adapter. • The PC firewall (Windows firewall or commercially-available security software) may be blocking IV3-Navigator communications. Disable the firewall or allow IV3-Navigator communications. • Confirm that the IP address of the sensor does not coincide with that of the PC or another device. Also, reset (initialize) the network setting for the sensor. <ul style="list-style-type: none"> ☐ “Operation for Initial Startup of the IV3-Navigator” (page 3-6) ☐ “Confirming/Setting the IP address of the sensor” (page A-19) ☐ “Initializing the Network Settings (IP Reset Switch)” (page A-23) • The following conditions are required for a successful sensor search. <ul style="list-style-type: none"> • The subnet masks of the sensor and PC are matched. • The sensor network setting is not set or the IP address is not duplicated.
 <p>Connection is not possible even by inputting the IP address into the Network connection screen and pressing [Connect].</p>	<p>When the connection cannot be established by specifying the sensor</p> <ul style="list-style-type: none"> • Supply power to the sensor and the network equipment. • Correctly connect with the sensor and the network equipment. <ul style="list-style-type: none"> ☐ “Connecting the sensor and PC” (page 2-21) • Specify the correct IP address of the sensor. • If the sensor IP address has not been set, establish a connection using the [Search Sensor] button. <ul style="list-style-type: none"> ☐ “Searching for a Sensor to be Connected” (page 3-6) • Confirm that the IP address of the PC does not coincide with that of the sensor or another device. Also, correctly set the subnet mask and the default gateway. <ul style="list-style-type: none"> ☐ “Confirming/Setting the IP address of the sensor” (page A-19) • On the Network connection screen, select the correct network adapter. • The PC firewall (Windows firewall or commercially-available security software) may be blocking IV3-Navigator communications. Disable the firewall or allow IV3-Navigator communications. • Confirm that the IP address of the sensor does not coincide with that of the PC or another device. Also, correctly set the subnet mask and the default gateway. <ul style="list-style-type: none"> Also, reset (initialize) the network setting for the sensor. <ul style="list-style-type: none"> ☐ “Operation for Initial Startup of the IV3-Navigator” (page 3-6) ☐ “Confirming/Setting the IP address of the sensor” (page A-19) ☐ “Initializing the Network Settings (IP Reset Switch)” (page A-23)

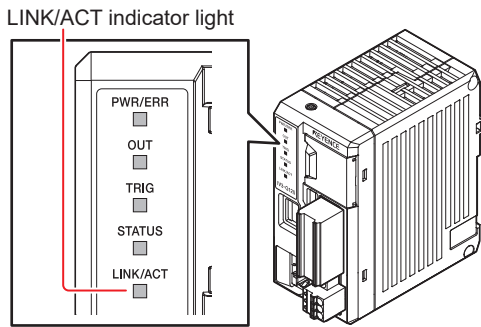


Confirming the status by observing the indicator light of the sensor

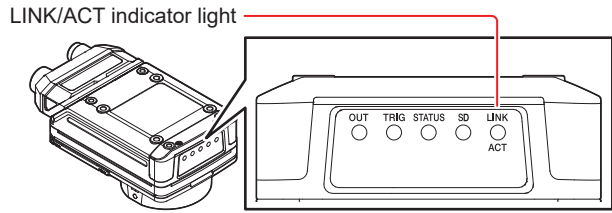
LINK/ACT (link/activity) indicator light

Displays the link status with the network.

Ultra-compact model amplifier



Built-in amplifier type



LINK/ACT indicator light status		Status	Remedy
Green	ON	Correct link with the PC or the Ethernet switch.	Link is normal. When connection to the IV3-Navigator is not possible, check the STATUS indicator light.
	Blink	Correct link with the PC or the Ethernet switch. Data is being sent and received.	
OFF		Incorrect link with the PC or the Ethernet switch. <ul style="list-style-type: none"> Power is not supplied to this unit or the connection target. The cable is not connected correctly. 	<ul style="list-style-type: none"> Supply power to the sensor. Supply power to the PC or the Ethernet switch of the connection target. Connect the cable correctly.

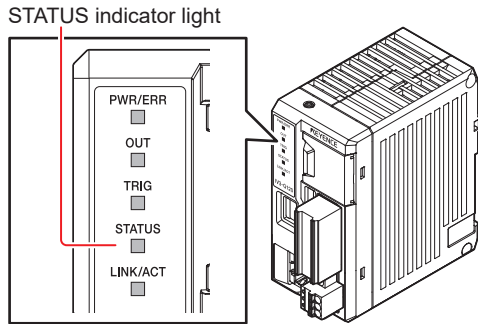


STATUS indicator light

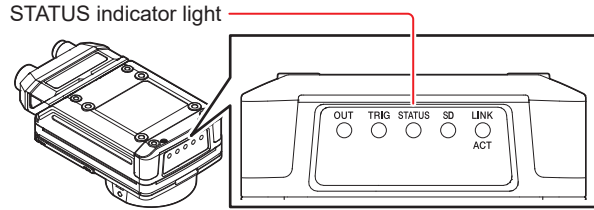
Indicates the connection status with the IV3-Navigator.

Confirm that the LINK/ACT indicator light is green (lighting) or green (blinking) and then check the STATUS indicator light.

Ultra-compact model amplifier



Built-in amplifier type



STATUS		Status	Remedy
Status of the indicator light			
Green	ON	The IV3-Navigator is connected correctly to the sensor amplifier. Connection with the IV3-Navigator has been established by acquiring the IP address.	-
	Blink	No correct connection with the PC. The sensor IP address has been acquired, but connection with the IV3-Navigator has not been established.	☞ "Remedy when connection via a network is unavailable" (page A-15)
OFF		The sensor amplifier is not correctly connecting to the PC. The IP address of the sensor has not been acquired.	☞ "Remedy when connection via a network is unavailable" (page A-15)

If the light is ON (red), the IP address coincides or a network loop is detected.

Reference

- The communication timeout time is 1 minute.
- During the timeout interval after an error has occurred, the screen may fail to refresh while the STATUS indicator light is on or may not accept an operation.
- During the timeout interval, devices other than the previously connected PC cannot be connected.

Other methods for confirmation

Confirming the existence of the sensor from the PC

Whether or not the sensor is correctly connected can be confirmed by sending a ping command from the PC to the sensor to be connected.

1 Select [Windows System] → [Command Prompt] from the [Start] menu of Windows.

The Command Prompt screen opens.

2 Input “pingΔ(IP address of the sensor)” (Δ indicates a “space”) and press the [Enter] key.

```
Administrator: C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.

C:\Users>ping 192.168.10.10
```

3 Confirm the sent result of the ping command.

● If correctly connected with a target sensor

The responded time from the sensor (input IP address) will be displayed, and [0% loss] will be displayed.

● If not connected with a target sensor

A message which indicates failure in sending the ping command will be displayed, and [100% loss] will be displayed.

4 After the confirmation, close the Command Prompt screen.



Point

- Note that when the ping command is executed to a device other than a sensor, the confirmation will succeed if there is a response to the ping command.
- Confirmation is not possible for a direct connection.

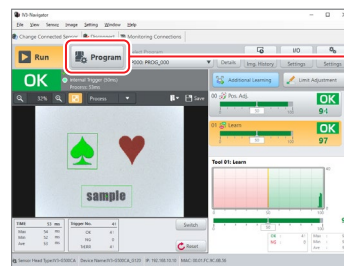
Confirming/Setting the IP address of the PC

- For details of how to confirm/set the IP address of the PC, refer to “Changing the PC Settings (IP Address Setting)” (page 2-24).
- Confirm that the IP addresses of the PC/sensor/other network device do not coincide with each other. Also, confirm that the subnet mask and default gateway are correctly set.

Confirming/Setting the IP address of the sensor

Confirms the IP address of the sensor connected to the PC and the network.

1 Press [Program].

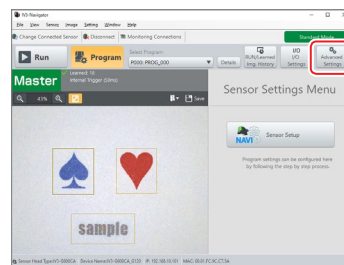


The confirmation screen opens.

2 Press [OK].

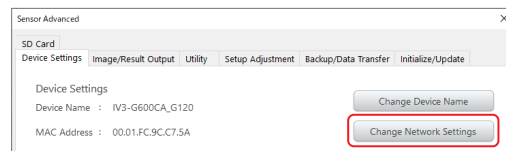
The IV3-Navigator switches to the main screen in [Program].

3 Press [Advanced Settings].



The Advanced Sensor Settings screen opens.

4 Select the [Device Settings] tab and press [Change Network Settings].



The Network Settings screen opens.

5 Confirm the IP address of the sensor.

- When the IP address of the sensor is to be changed, set an arbitrary IP address and press [OK].
- Confirm that the IP addresses of the sensor/PC/other network device do not coincide with each other. Also, confirm that the subnet mask and default gateway are correctly set.
- When [Reset] is pressed, the setup values for the [IP Address], [Subnet Mask], and [Default Gateway] will be reset and [Not Set] will be displayed. [PORT] will be 63000.

6 Press [OK] and exit from the network settings.

7 Exit the IV3-Navigator.

8 Turn OFF the sensor power, and turn it ON again.

9 Start the IV3-Navigator, and connect the IV-3 Navigator with the sensor.

● If the IV-3 Navigator can be connected with the sensor

The run screen opens.

● If the IV-3 Navigator cannot be connected with the sensor

The sensor setup menu screen opens. Set the connection method etc. and connect it with the sensor.

☞ "Remedy when connection via a network is unavailable" (page A-15)

Checking the router settings

When a router is used, confirm that the following port is opened.

Sensor: 63000 (default value)

Reference For the setting methods of the sensor port number, refer to the following.

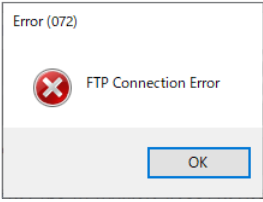
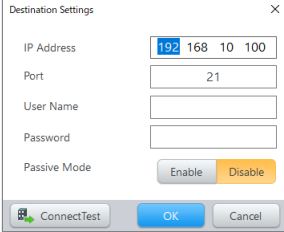
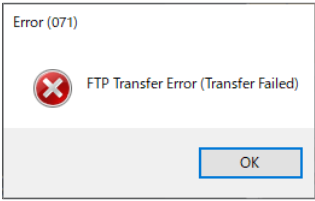
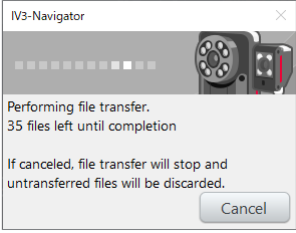
☞ "Changing the Network Settings" (page 7-21)

- The FTP/SFTP port number can be changed on the server. It is generally 20 and 21 for the FTP port, and 22 for the SFTP port.
- Confirm the firewall software on the PC whether the port is available or not.

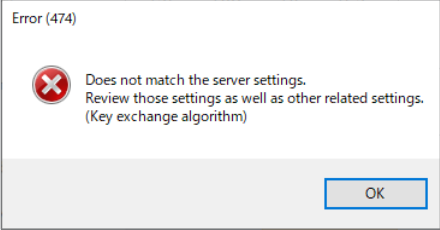
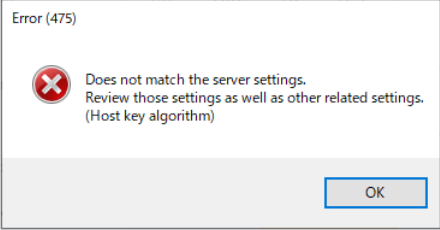
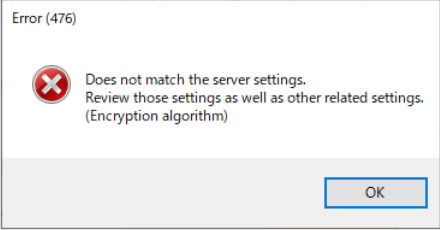
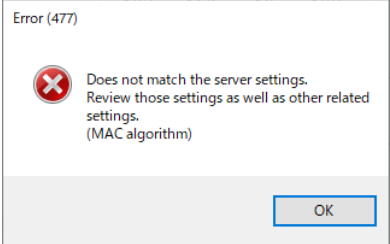
Checking the firewall settings

- If the Windows Security Alert dialog box opens and the IV3-Navigator is blocked by the Windows firewall, press [Allow access].
- Confirm that the application or port to be used are enabled in the firewall software of the PC. To allow the port number to be used, refer to ☞ "Checking the router settings" (page A-20).

Remedy when data transfer via FTP/SFTP is unavailable

Status	Remedy
 <p>Connection with the FTP/SFTP server failed.</p>	<ul style="list-style-type: none"> • Confirm the IP address of the FTP/SFTP server and set it correctly. • Confirm the port number of the FTP/SFTP server and set it correctly. • Moreover, confirm the firewall software on the PC whether the port is available or not. • Confirm the user name for logging in to the FTP/SFTP server and set it correctly. • Confirm the password for logging in to the FTP/SFTP server and set it correctly.  <p>“Setting the Connection Destination” (page 9-3)</p>
 <p>Data transfer to the transfer destination folder failed.</p>	<ul style="list-style-type: none"> • Authorization for accessing the transfer destination folder is not granted. Acquire the access authorization of the transfer destination folder and perform the operation again. • Confirm that there is no file with the same name as the transfer destination folder name which has been set. If a file with the same name exists, change the file name or change the transfer destination folder. • When the PC was switched from the [Run] screen to the [Program] screen, the screen is switched to the [Program] screen after the transfer of data has finished.  <p>Pressing [Cancel] during transfer will forcibly finish the transfer.</p>
 <p>Data which is larger than the remaining storage of the FTP/SFTP buffer has been created and the transfer failed.</p>	<ul style="list-style-type: none"> • Change the trigger cycle of the sensor. • Confirm the stress status of the network. <p>“Setting the Trigger Options” (page 4-10)</p>
 <p>Connection with the SFTP server failed.</p>	<ul style="list-style-type: none"> • Confirm the IP address of the SFTP server and set it correctly. • Confirm the port number of the SFTP server and set it correctly. • Moreover, confirm the firewall software on the server whether the port is available or not. • Confirm the user name for logging in to the SFTP server and set it correctly. • Confirm the password for logging in to the SFTP server and set it correctly.

Remedy when the Software cannot be Connected with the Sensor

Status	Remedy
 <p>Connection with the SFTP server failed.</p>	<ul style="list-style-type: none"> • Review the SFTP server setting of the key exchange algorithm (KexAlgorithms).
 <p>Connection with the SFTP server failed.</p>	<ul style="list-style-type: none"> • Review the SFTP server setting of the host key algorithm (HostKeyAlgorithms).
 <p>Connection with the SFTP server failed.</p>	<ul style="list-style-type: none"> • Review the SFTP server setting of the cryptographic algorithm (Ciphers).
 <p>Connection with the SFTP server failed.</p>	<ul style="list-style-type: none"> • Review the SFTP server settings of the MAC algorithm (Macs).



Initializing the Network Settings (IP Reset Switch)

The network settings such as the IP address can be initialized to the factory default by means of the IP reset switch of the sensor. In addition, a fixed IP address can be assigned.

- Point**
- The IP reset switch is used when joining a sensor used in another network to a new network, or when trouble occurs during connection.
 - Do not initialize a correctly connected sensor. The connection will be interrupted.

Settings after initialization

● The factory default settings

The settings are initialized to the factory default. Normally, the initialization to the factory default will be performed.

Setting Items	Settings after initialization
Communication speed	1000/100 Mbps Automatically switches
IP address setting method	UDP (User Datagram Protocol)
IP Address	0.0.0.0 ^{*1, *2}
Subnet Mask	0.0.0.0 ^{*2}
Default Gateway	0.0.0.0 ^{*2}

*1 Do not assign an IP address except through the IV3-Navigator.

*2 In the Network Settings screen of the sensor, [Not Set] is displayed.

☞ "Changing the Network Settings" (page 7-21)

● Fixed IP address

Assigns the fixed IP address (192.168.10.10). This is used when the sensor amplifier cannot be searched because the factory default settings are blocked by firewalls, etc.

Setting Items	Settings after initialization
Communication speed	1000/100 Mbps Automatically switches
IP Address	192.168.10.10
Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0

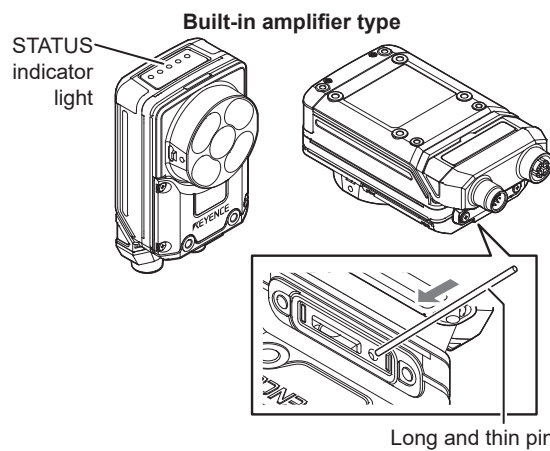
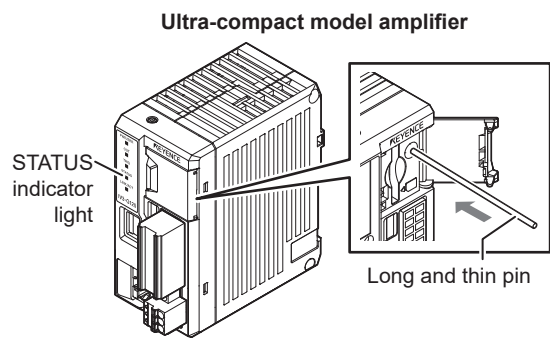
- Point**
- Set an IP address of the PC to be connected (IV3-Navigator) to the IP address of the same network. (e.g., 192.168.10.1)
 - To assign an arbitrary IP address, perform initialization with the fixed IP address (192.168.10.10), then connect the IV3-Navigator and change it to a desired IP address.

☞ "Changing the Network Settings" (page 7-21)

- Do not connect multiple sensor amplifiers to the same network and initialize them at the same time. IP address overlapping will occur.
- Confirm that no device with IP address 192.168.10.10 is connected to the same network. IP address overlapping will occur.

Initializing the network settings

- 1 Insert a long and thin pin (1 to 2 mm in diameter) and press the IP reset switch for about 3 seconds with the power on.



● The factory default settings

Press the switch for about 3 seconds. The STATUS indicator light will blink twice (orange) and then turn off. The settings are initialized to the factory default.

● Fixed IP address

Press the switch for about 10 seconds. Continue to press and hold the switch even after the factory settings have been initialized after about 3 seconds. After about 10 seconds, the STATUS indicator light will blink twice in orange and then blink in green. The fixed IP address (192.168.10.10) will be assigned.

A

MEMO

A

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