KEYENCE

C22GB

Vision Sensor

IV3 Series

User's Manual
(Control Panel)

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 External Media
9 Connecting to a Network
10 Controlling with the Input/Output Line
11 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.
(4) Regardless of item (3), KEYENCE will not be liable for any effect resulting from the use of this unit.
(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

DANGER	• 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.

WARNING	• 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.

CAUTION	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.

NOTICE	• 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	**• Use this product with the correct supply voltage. Failure to do so may cause product damage.** **• For instructions** **• 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.** **• The enclosure rating of the control panel (IV3-CP50) is IP40. This product is not designed to be waterproof, so use care when operating around water.** **• 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 the LCD panel** **• Do not press the touch panel with the tip of your nail or anything that has a sharp tip such as a pen or a screwdriver. Doing so may cause damage.** **• Do not apply shock to the touch panel or press it with excessive force. Doing so may cause damage.** **• The LCD panel may have some dots that are always lit (bright dots) or ones that are always unlit (black dots). This phenomenon is not a problem.** **• Due to the unique characteristics of the LCD, displaying the same image for a long time may cause an afterimage.** **• For the USB memory** **• Use the KEYENCE recommended product.** **• A USB memory with a security function cannot be used.** **• Unplug the USB memory when turning on or off the power of the IV3 Series.** **• Do not remove the USB memory while it is being written on. Otherwise, all or part of the setting data may be lost or there may be damage to the memory.** **• For external master image registration** **If the external master image registration is to be performed frequently, set [Write to ROM when using Ext. Master Save] of the Input Settings 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.** **• For automatic focus function** **• 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** **• 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.**

Measures to be taken when an abnormality occurs

⚠ WARNING	**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.** **• 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.**

Precautions on installation

⚠ WARNING	**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.** **• Outdoors** **• Altitude above 2500 m (built-in amplifier models)** **• Altitude above 2000 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**

⚠ CAUTION	**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	**• 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** **• 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	IV3-500CA	White LED	Risk Group 1
	IV3-600CA		
	IV3-500MA	Infrared LED	Exempt Group
	IV3-600MA		
AI Lighting unit	IV3-L5C	White LED	Risk Group 1
	IV3-L6C		
	IV3-LG5C		
	IV3-LG6C		
	IV3-L5M	Infrared LED	Exempt Group
	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.

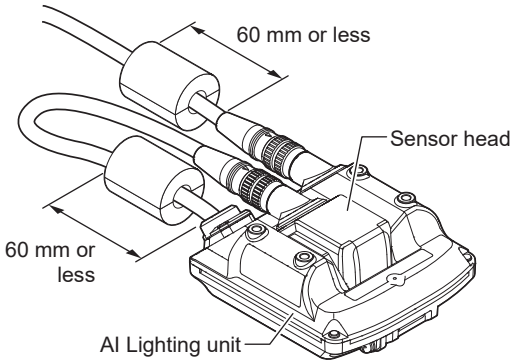
Precautions on Regulations and Standards

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 (IV3-500CA/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-compact model (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 (IV3-500CA/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 2000 m or lower.
- Indoor use only.

❍ AI Lighting unit (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 2000 m or lower. (IV3-LG**)
- Indoor use only.

Version of the IV3 Series

You can download the most recent operation software for the sensor (IV3-G120, IV3-500CA, IV3-500MA, IV3-600CA, IV3-600MA) and control panel (IV3-CP50) 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
R1.20.**	This is the version of this document.

Operation Software for the Control Panel

Version	Description
R1.20.**	This is the version of this document.

Revision history of Software Version

Version	Description
R1.00.**	The initial version.

R1.10.**	• Adds the following functions
	  • 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 (built-in amplifier type)

R1.20.**	• Adds the following functions
	  • 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

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 how to mount the sensor and control panel, and explains connection procedures.
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	External Media	This chapter explains how to set and use the external medias (USB memory and SD card).
9	Connecting to a Network	This chapter explains how to connect and use the network.
10	Controlling with the Input/Output Line	This chapter explains how the input and output terminals control each operation.
11	Specifications	This chapter explains specifications and dimensions.
A	Appendices	This chapter explains error messages and troubleshooting, etc.

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1

Getting Started

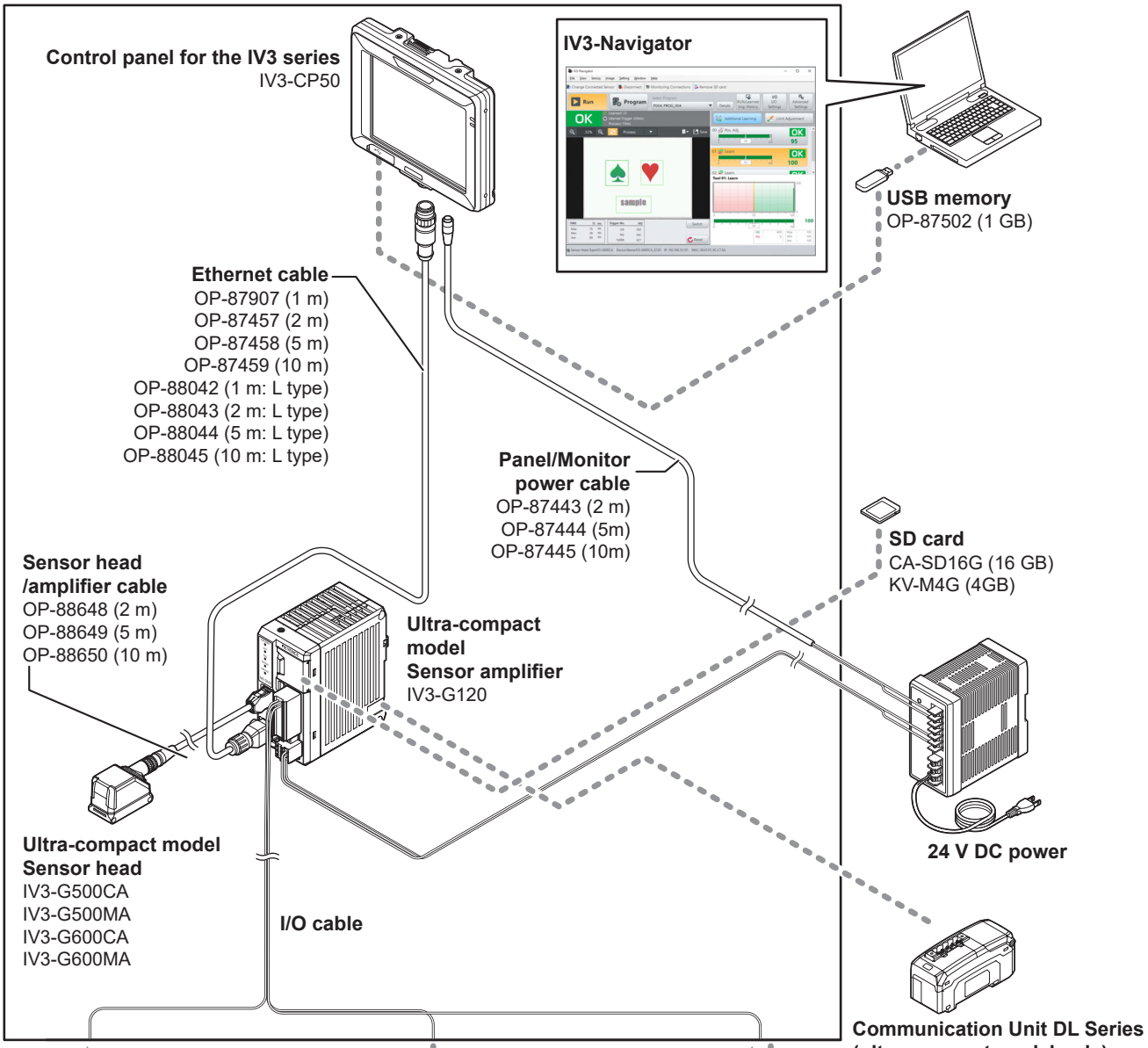
This chapter explains the system configurations and overview of the IV3 Series, how to check package contents, and the name and function of each part.

System Configuration **1-2**
IV3 Series Overview **1-6**
Checking the package contents **1-9**
Name and Function of Each Part **1-14**

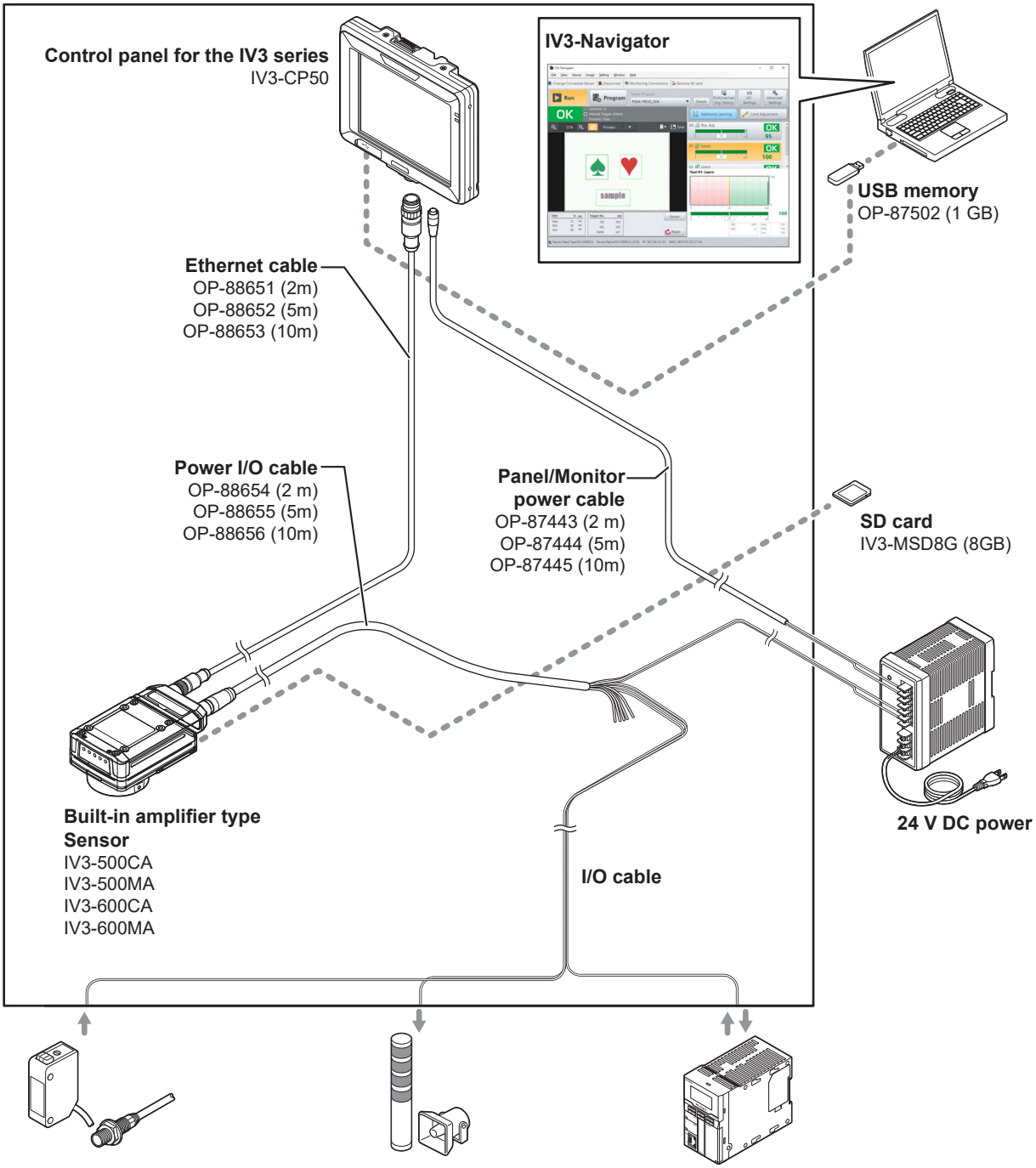
System Configuration

Basic Configurations of the IV3 Series

Basic configuration of the ultra-compact model



Basic configuration of the built-in amplifier type



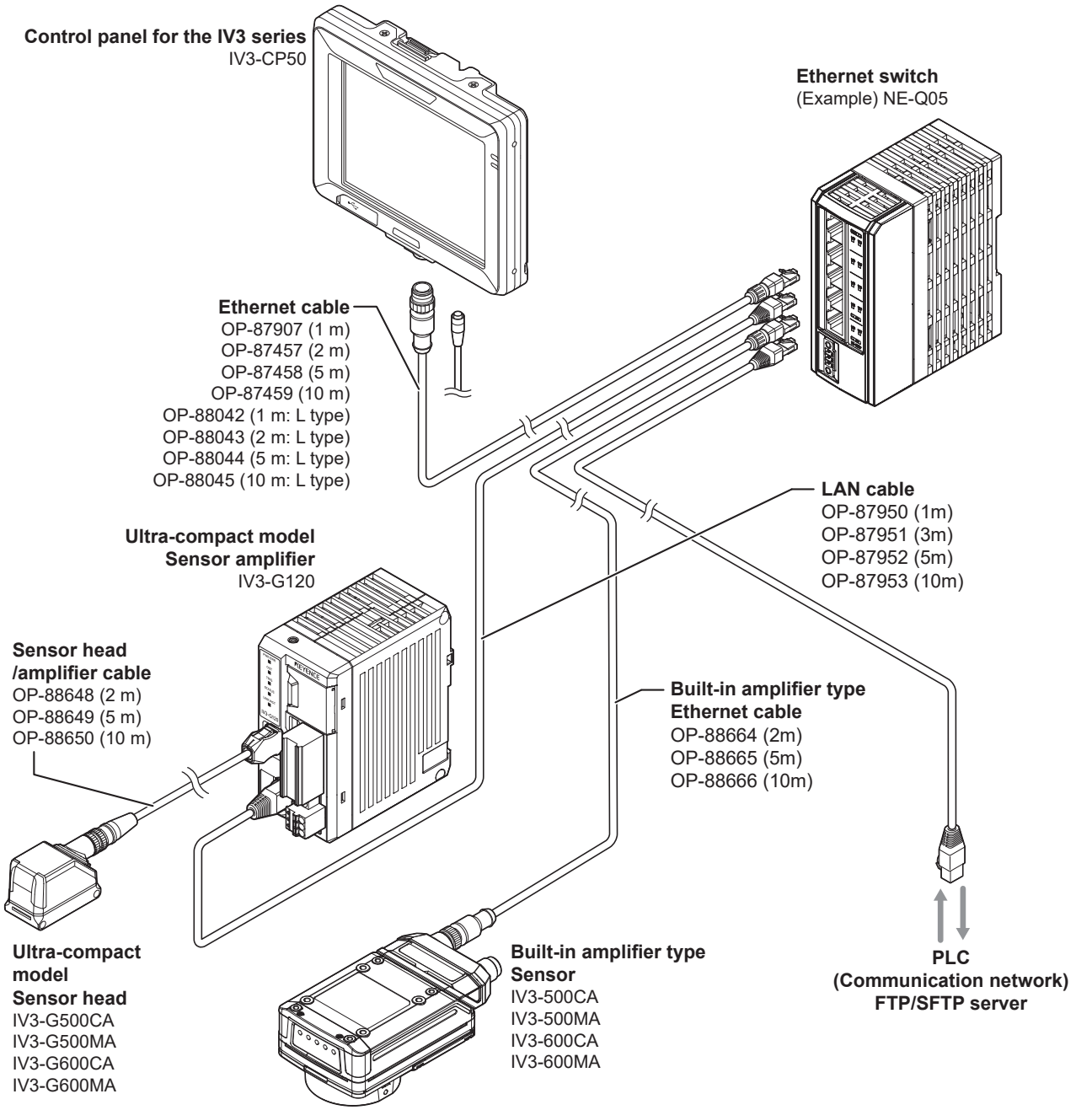
Photoelectric/proximity sensor etc.
Sends a signal to the trigger input and timing input when the target is detected.

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 Control Panel with Multiple Sensors

When Network Connection is selected, the control panel for the IV3 Series can select a single sensor from among multiple sensors and connect with the selected sensor.
* The IV3-CP50 requires a power cable.



NOTICE	**For the method to supply power to the sensor, refer to “Cables” (page 2-18).**

Reference

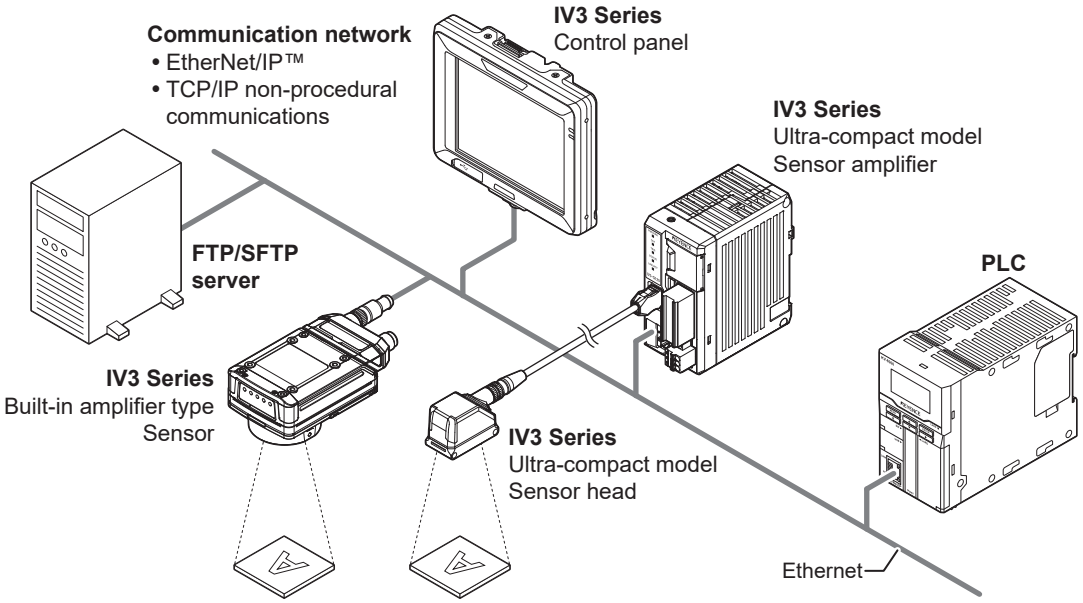
The IV2 Series and IV Series can be connected on a network.

- For details on connecting with the sensor of the IV2 Series, refer to “IV2 Series User’s Manual (Control Panel)”.
- For details on connecting to an IV-HG/IV-H Series sensor, see “IV-HG/IV-H Series User’s Manual (Monitor).”
- For details when connecting an IV-G/IV Series sensor, refer to ”IV- G/IV Series User's Manual (Monitor).”

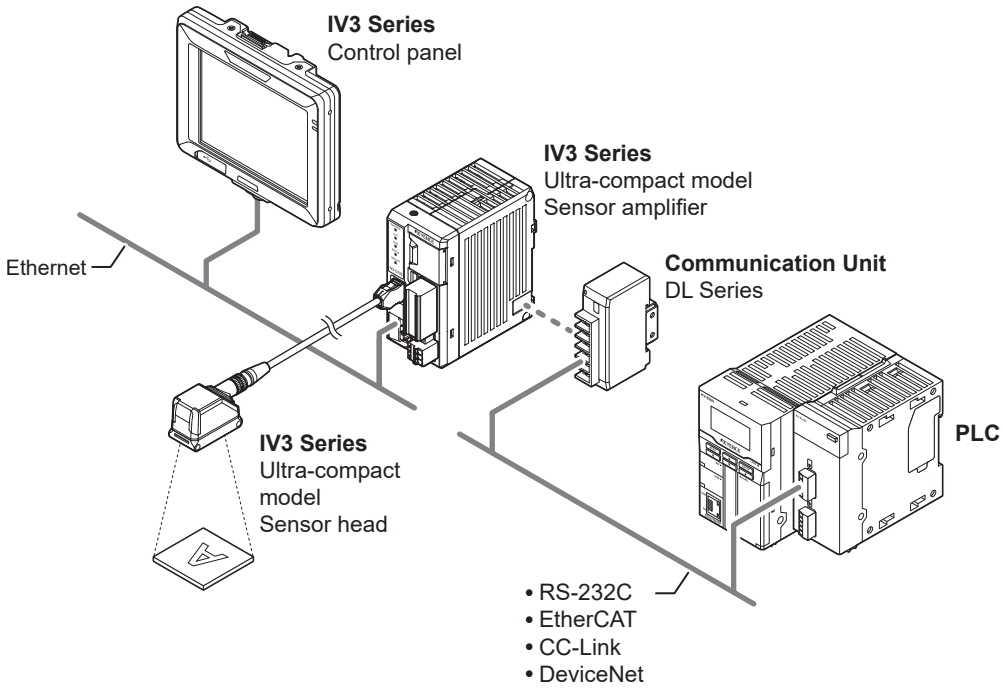
Configuration of the IV3 Series network function

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

- Connecting to FTP/SFTP server to transfer image files and judgment results
- 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)

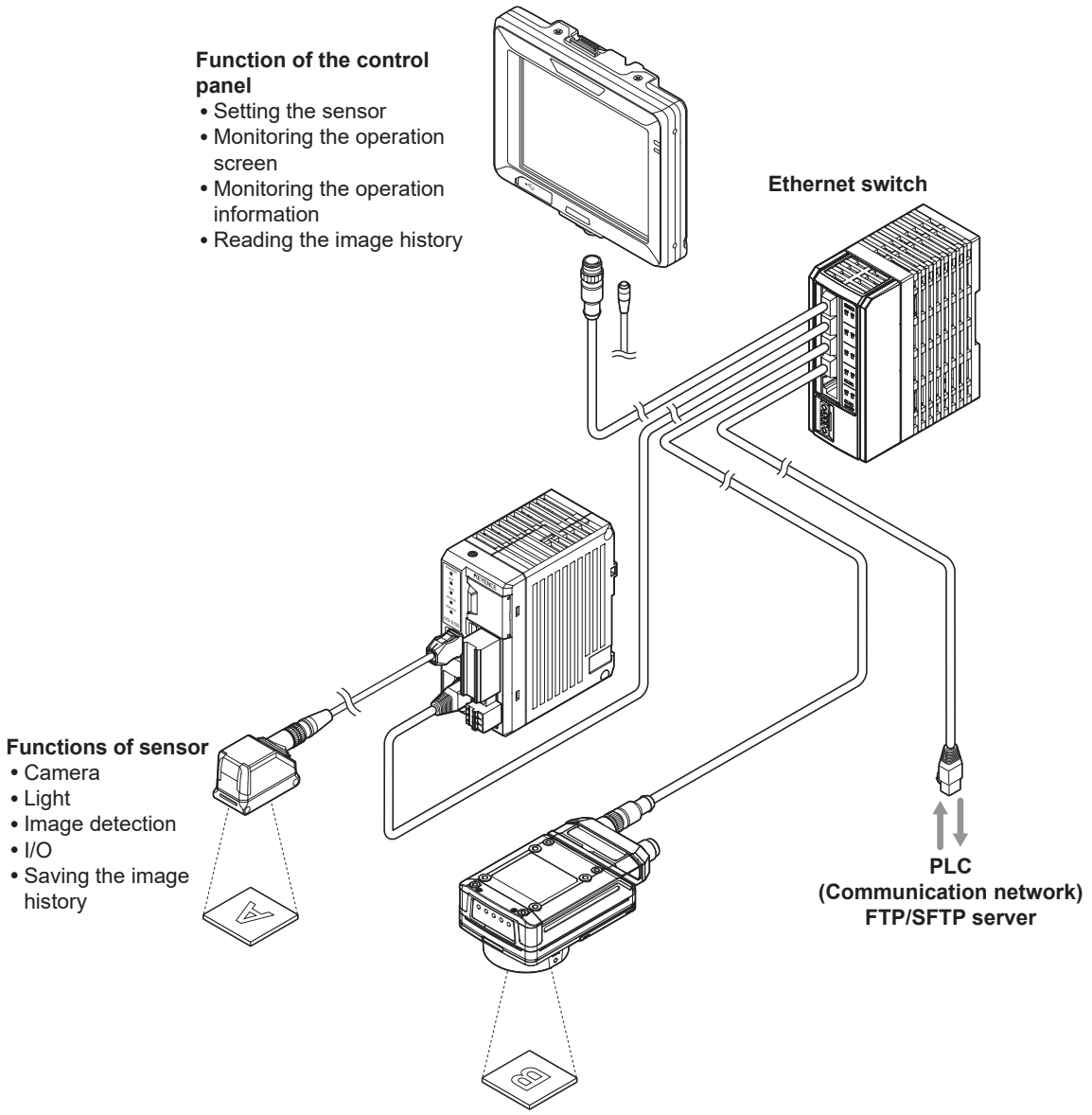


IV3 Series Overview

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.
Sensors connected to the control panel or the PC are connected via an Ethernet connection so that connection with multiple sensors can be performed as well.

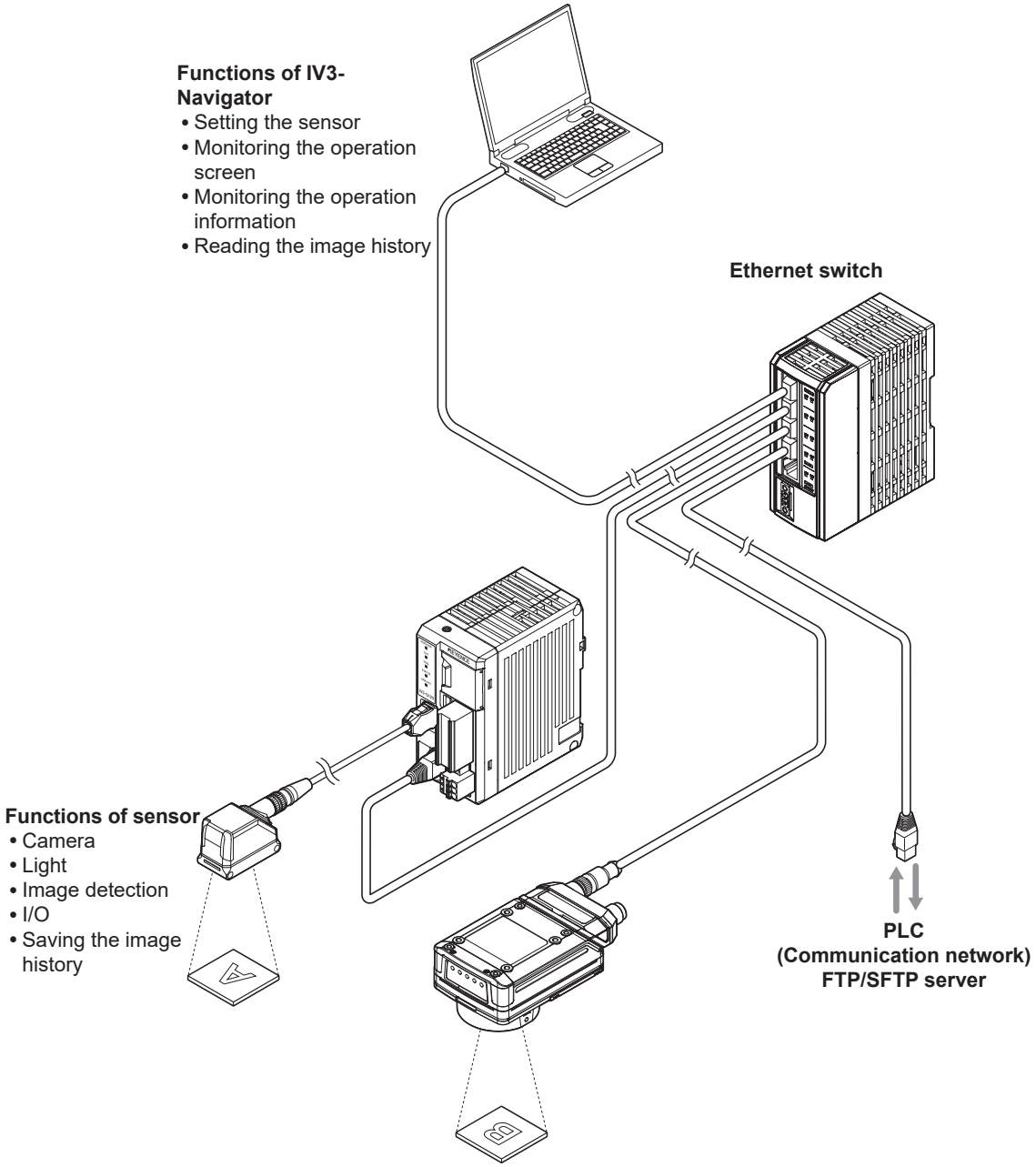
Using with control panel



NOTICE **For the method to supply power to the sensor, refer to “Cables” (page 2-18).**

Using with PC software “IV3-Navigator”

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

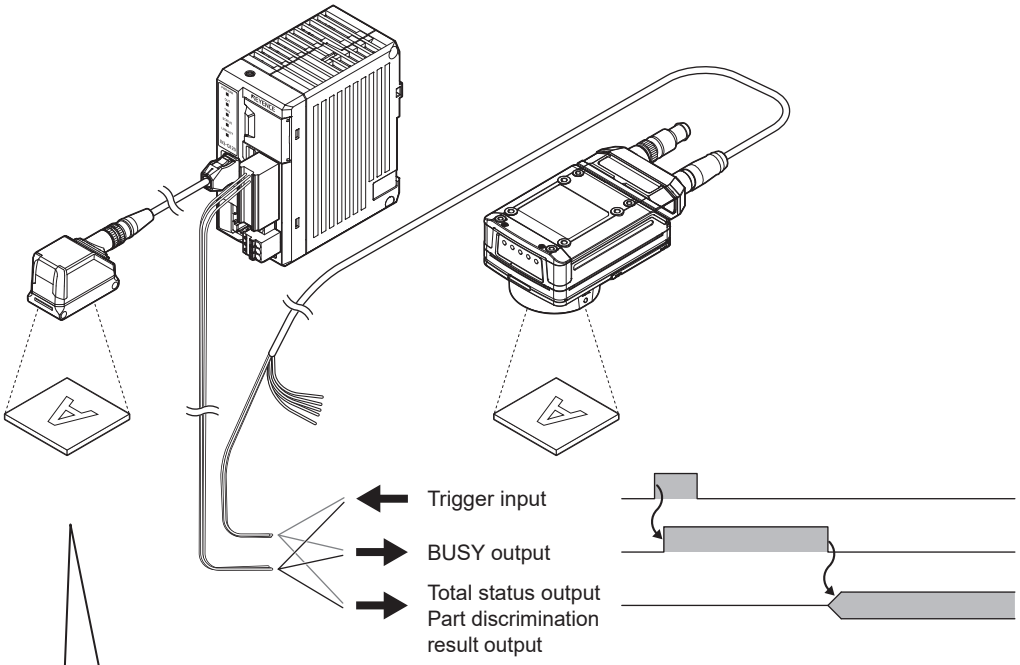


NOTICE	**For the method to supply power to the sensor, refer to “Cables” (page 2-18).**

Reference For details of operations using the PC software, refer to “IV3 Series User’s Manual (PC Software)”.

Judgment processing flow

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



Trigger input

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.

Imaging

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

Tool processing

Standard mode: According to the settings of a detection tool, the image of the target is scanned for detecting whether a target is high or low quality. 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.

Status output

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 part type is assigned is ON.

Save images

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”.

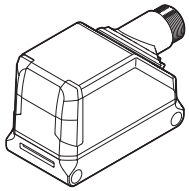
Reference By using the data transfer function, images and judgment results can be transfer to SD cards and FTP/SFTP servers.

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**

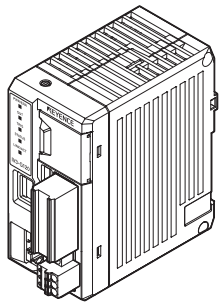


Sensor head x 1

“Name and Function of Each Part” (page 1-14)
“Mounting the Sensor” (page 2-2)
“Cables” (page 2-18)

Ultra-compact model sensor amplifier

- **IV3-G120**



Sensor amplifier x 1

Instruction Manual x 1



LAN port cap
(mounted in the amplifier)

Power terminal block
(mounted in the amplifier)

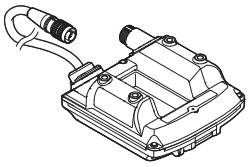
I/O terminal block (mounted in the amplifier)

“Name and Function of Each Part” (page 1-14)
“Mounting the Sensor” (page 2-2)
“Cables” (page 2-18)

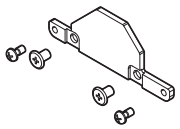
Options for the ultra-compact model

AI Lighting unit

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



AI Lighting unit x 1



Sensor head mounting bracket x 1

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

Mounting screw (M3 x L6) x 2

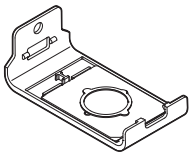
Instruction Manual x 1

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

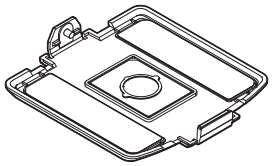
Instruction Manual x 1

“Mounting the polarizing filter for the ultra-compact model (OP-88642/OP-88643)” (page 2-10)

■ Polarizing filter for the AI Lighting unit

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

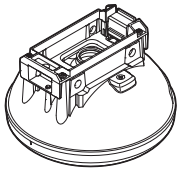
Instruction Manual x 1



“Mounting the polarizing filter for the AI Lighting unit (OP-88646/OP-88647): Ultra-compact model” (page 2-10)

Mounting the dome attachment

- **IV2-GD05**



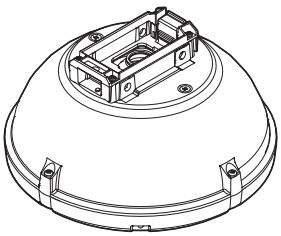
Dome attachment for ultra-compact model (Small)



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)



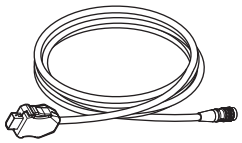
Mounting screw (M4 x L8) x 2
Mounting screw (M4 x L10) x 2
* Double-washer sems screw

Instruction Manual x 1

“Mounting the dome attachment for ultra-compact model (IV2-GD05/IV2-GD10)” (page 2-12)

Sensor head/amplifier cable

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



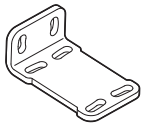
Sensor head/amplifier cable x 1

“Cables” (page 2-18)

Mounting bracket (When not using the AI Lighting unit)

■ Vertical mounting bracket

- **OP-87908**



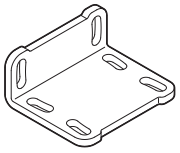
Mounting bracket x 1



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

■ Transverse mounting bracket

- **OP-87909**



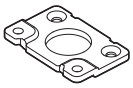
Mounting bracket x 1



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

■ Adjustable bracket

- **OP-87910**



Mounting bracket x 1



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

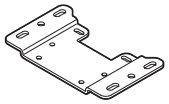


Bracket x 1

Mounting bracket (When using the AI Lighting unit)

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

- **OP-88634**



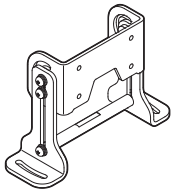
Common mounting bracket x 1



Mounting screw (M3 x L7) x 4

■ Biaxial adjustable mounting bracket for the AI Lighting unit

- **OP-88638**



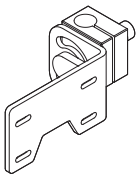
Biaxial adjustable mounting bracket x 1



Mounting screw (M3 x L7) x 4

■ Adjustable bracket for the AI Lighting unit

- **OP-88639**



Adjustable bracket x 1



Mounting screw (M3 x L7) x 4

SD card

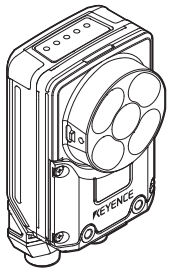
- **CA-SD16G (16 GB)**
- **KV-M4G (4GB)**



SD card × 1

Built-in amplifier type sensor

- **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)



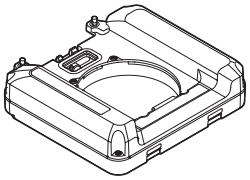
Water proof cap for the Ethernet cable connector x 1 (Attached to the unit)

“Name and Function of Each Part” (page 1-14)
“Mounting the Sensor” (page 2-2)
“Cables” (page 2-18)

Options for the built-in amplifier type

AI Lighting unit

- **IV3-L5C**
- **IV3-L5M**
- **IV3-L6C**
- **IV3-L6M**



AI Lighting unit x 1

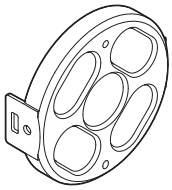
Instruction Manual x 1

“Mounting the AI Lighting unit (for the built-in amplifier type)” (page 2-8)

Polarizing filter

■ Polarizing filter (sensor main unit)

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





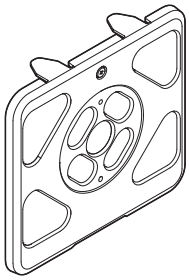
Mounting screw
M2.5 x L5 (double-washer sems) x 2

Instruction Manual x 1

“Mounting the polarizing filter for the built-in amplifier type (OP-88640/OP-88641)” (page 2-11)

■ Polarizing filter for the AI Lighting unit

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

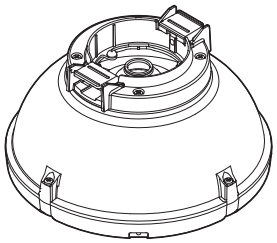


Instruction Manual x 1

“Mounting the polarizing filter for the AI Lighting unit for the built-in amplifier type (OP-88644/OP-88645)” (page 2-11)

Mounting the dome attachment

- **IV3-D10**





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

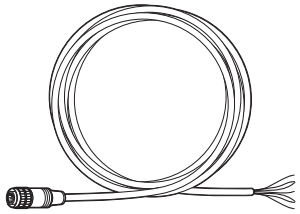
Instruction Manual x 1

Dome attachment for IV3 built-in amplifier type sensor

“Mounting the dome attachment for built-in amplifier type (IV3-D10)” (page 2-14)

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

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



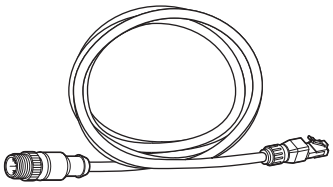
Power I/O cable x 1

“Cables” (page 2-18)

Ethernet cable

■ Ethernet cable (M12 X8pin - RJ-45)

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

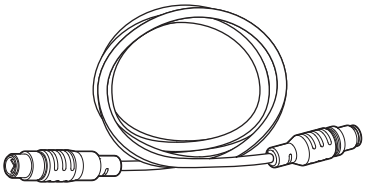


Ethernet cable x 1

“Cables” (page 2-18)

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

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



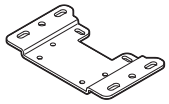
M12-M12 Ethernet cable
(M12 D4pin-M12 X8pin) x1

“Cables” (page 2-18)

Mounting bracket (common when using the AI Lighting unit)

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

• OP-88634



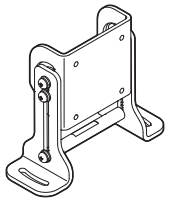
Common mounting bracket x 1



Mounting screw (M3 x L7) x 4

■ Biaxial adjustable mounting bracket

• OP-88635



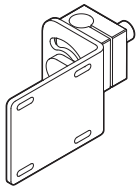
Biaxial adjustable mounting bracket x 1



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)

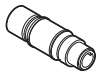


SD Card x 1
Conversion adapter x 1
* Stored in the dedicated case

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

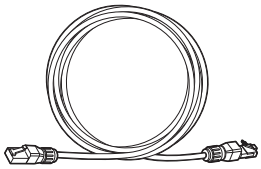


Point **When using the Conversion connector for Ethernet cable (OP-88633), the Ethernet standard is fixed at 100BASE-TX.**

Communication cable

LAN cable (RJ-45 - RJ-45)

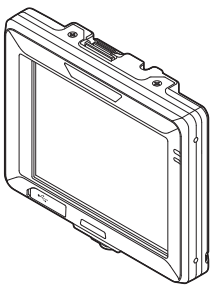
• OP-87950 (1m) **• OP-87951 (3m)**
• OP-87952 (5m) **• OP-87953 (10m)**



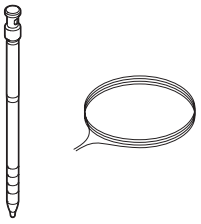
LAN cable (RJ-45 - RJ-45) x 1

Control panel for the IV3 Series

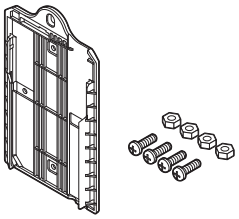
• IV3-CP50



Control panel x 1



Stylus x 1
String for hanging the stylus x 1



Wall mounting adapter x 1
Screw for the adapter (M3 x L10) x 4
Hexagon nut (M3) x 4

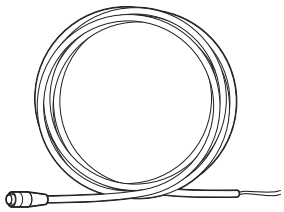
Instruction Manual x 1
Starting Guide x 1

The wall mounting adapter is shipped attached to the control panel.

Control panel options for the IV3 Series

Panel/monitor power cable (M8 4pin - strand wire)

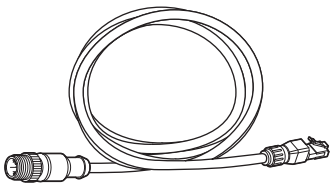
• OP-87443 (2 m) • OP-87444 (5m) • OP-87445 (10m)



Panel/monitor power cable (M8 4pin - strand wire) x 1

Ethernet cable (M12 4pin - RJ-45)

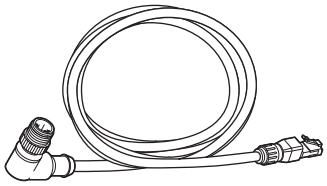
• OP-87907 (1m) • OP-87457 (2m)
• OP-87458 (5m) • OP-87459 (10m)



Ethernet cable (M12 4pin - RJ-45) x 1

L type Ethernet cable (M12 4pin - RJ-45)

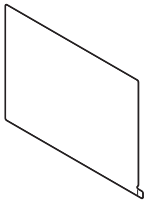
• OP-88042 (1m) • OP-88043 (2m)
• OP-88044 (5m) • OP-88045 (10m)



L type Ethernet cable (M12 4pin - RJ-45) x 1

Protection sheet

• OP-88351



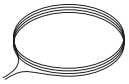
Protection sheet x 2

Stylus

• OP-88352



Stylus x 1

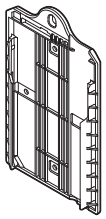


String for hanging the stylus x 1

Same as accessories for the control panel.
Optional parts in case of loss/damage.

Wall mounting adapter

• OP-88349



Wall mounting adapter x 1

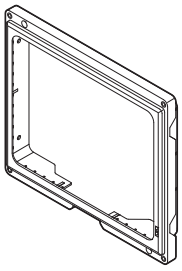


Screw for the adapter
(M3 x L10) x 4
Hexagon nut (M3) x 4

Same as accessories for the control panel.
Optional parts in case of loss/damage.

Control board mounting bracket

• OP-88350



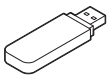
Control board mounting adapter x 1



Mounting screw
(M3 x L8) x 8

USB memory (1GB)

• OP-87502



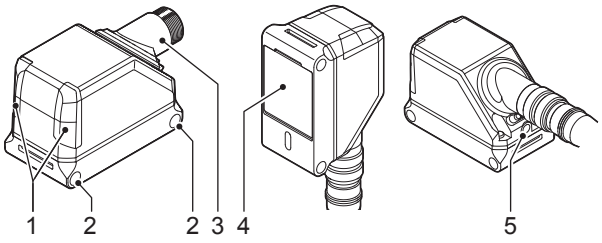
USB memory x 1

Name and Function of Each Part

Ultra-compact model sensor head

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

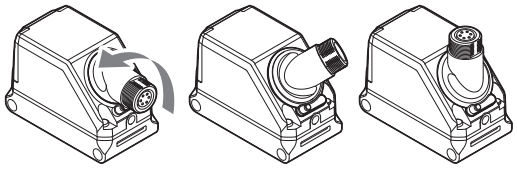
Name and function of each part of the ultra-compact model sensor head



1 Status indicator light
Indicates the operating status of the sensor.
“Operation of the status indicator light: Ultra-compact model sensor head” (page 1-15)

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

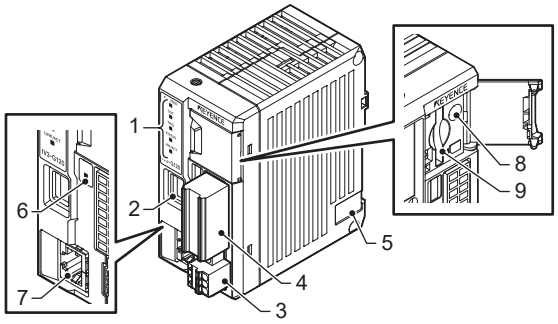
4 Camera and built-in light

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 1-15)

2 Connector for the sensor head/amplifier cable
“Cables” (page 2-18)

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.

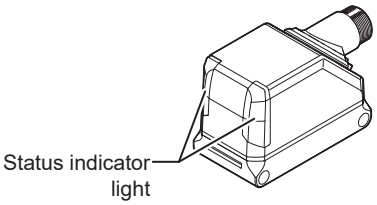
Green (ON)	The SD card is recognized. When the cover is open, the access stops.
Green (Blink)	The SD card is accessed.
(OFF)	The SD card is not mounted, or not recognized.

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.

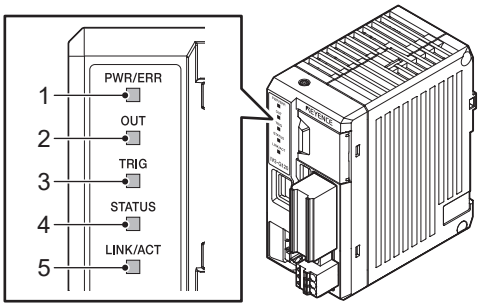
9 SD card slot
Mount the SD card.

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)	• 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)	• “LED Blinking” is requested. Blinks four times a second. • Settings are being restored from the SD card. Blinks once a second.
(OFF)	Power is not supplied.

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)	“LED Blinking” is requested. Blinks four times 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.

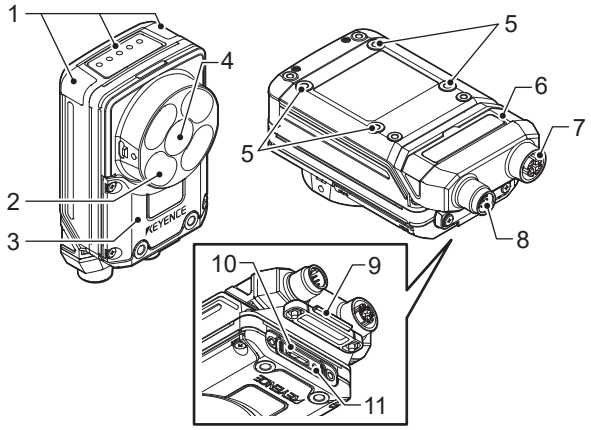
Green (ON)	Normally linked.
Green (Blink)	Normally linked, and the data is sending/receiving.
(OFF)	Sensor is not normally linked.

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

- IV3-500CA
- 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 1-16)

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 2-18)

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 2-18)

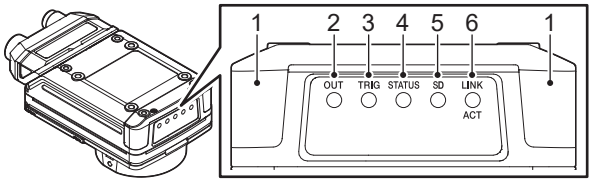
9 SD card cover
Open when inserting/removing the micro SD or using the IP reset switch.
- Tightening torque: 0.15 to 0.20 N·m

10 SD card slot (inside the SD card cover)
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 1-16)

11 IP reset switch (inside the SD card cover)
Used for resetting the IP address assigned to this sensor amplifier.

NOTICE	**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. Tightening torque: 0.45 to 0.55 N·m**

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)	• “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;

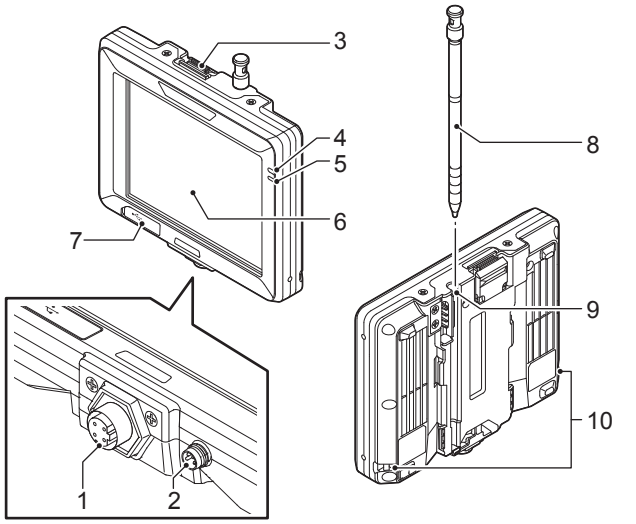
Green (ON)	The SD card is recognized.
(OFF)	The SD card is not mounted or not recognized.

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.

Control panel



1 Connector for Ethernet cable
Connector for connecting the Ethernet cable. Used when connecting with the sensor amplifier or Ethernet switch.
“Cables” (page 2-18)

2 Power connector
Connector for connecting the control panel/monitor power cable.
“Cables” (page 2-18)

3 Unlock button
Push this button when dismounting the control panel from the wall mounting adapter.
“Detaching from the wall mounting adapter” (page 2-16)

4 Indicator light (POWER)
Indicates the operating status of the control panel.
- Green (ON) .....The power is turned ON.
- Red (ON).....Unrecoverable error has occurred on the sensor or control panel.
- Red (Blink) .....Recoverable error has occurred on the sensor or control panel.
- (OFF) .....The power is turned OFF.

For countermeasures when an error occurred, refer to “Error Messages” (page A-9).

5 Indicator light (SENSOR)
Indicates the connecting status to the sensor.
- Green (ON) .....Connected normally to the sensor.
- Green (Slowly blinks) ...Linked normally but it is not properly connected to the sensor.
- (OFF) .....It is not properly connected because it did not link normally.

If the connection with the sensor cannot be established correctly, refer to “Remedy when the Software cannot be Connected with the Sensor” (page A-16).

6 LCD monitor/Stylus
Displays the operation screen and setup screen. Operates by touching the screen with the stylus.

7 USB connecting connector
Port for connecting the USB memory. Connector is protected by a cover.
“Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

8 Stylus
Used to operate the touch-screen.

9 Stylus holder
Stores the stylus.

10 Strap holder
Mounts the strap. Or, hangs the stylus.

2

Installation and Connection

This chapter explains how to mount the sensor and control panel, and also explains connection procedures.

Mounting the Sensor.....2-2
Mounting the control panel 2-15
Cables.....2-18

Mounting the Sensor

About sensor

● Ultra-compact model

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

● Built-in amplifier type

- **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.**

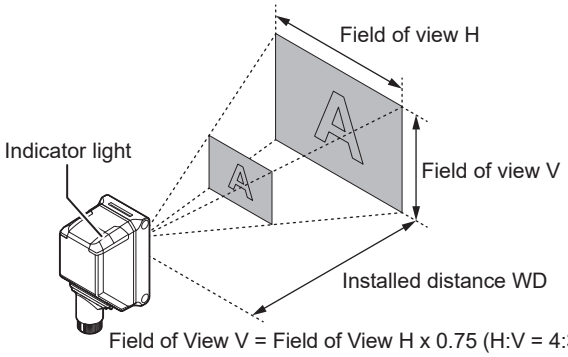
Point

- **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

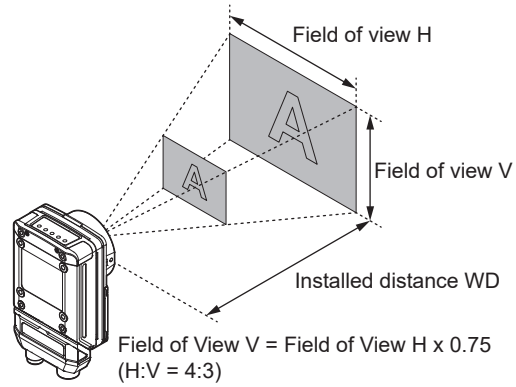


Field of View V = Field of View H x 0.75 (H:V = 4:3)

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
• 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

(mm)

● **Built-in amplifier type**



Model	Installed distance WD	Field of View H	Field of View V
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
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

(mm)

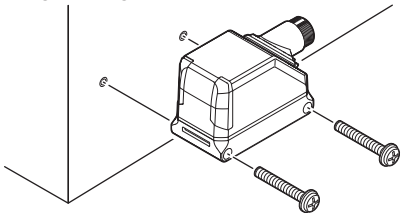
Mounting the ultra-compact model sensor head

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

Mounting the ultra-compact model sensor head

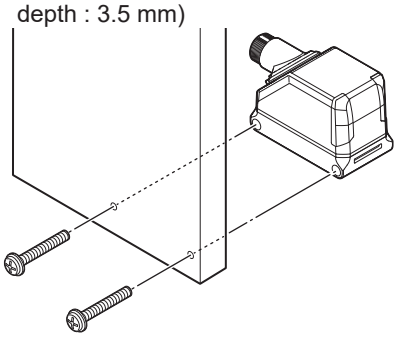
■ When screws are secured from the sensor head

- 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 female (screw depth : 3.5 mm)



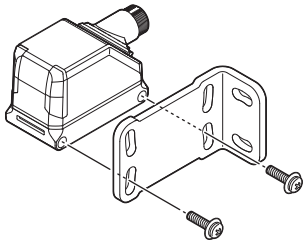
Attaching the optional mounting bracket

■ 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

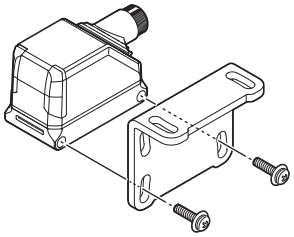


■ Transverse mounting bracket (OP-87909)

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

- Tightening torque: 0.7 to 1.5 N·m

Mounting examples

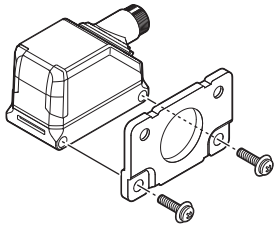


■ Adjustable bracket (OP-87910)

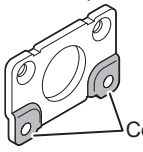
1 Attach the bracket using the screws attached to OP-87910.

• Tightening torque: 0.7 to 1.5 N·m

Mounting examples



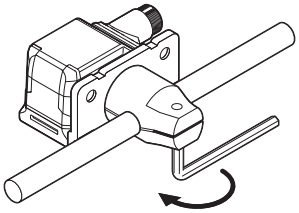
Point Connect the convex parts to the sensor head.



2 Mount the bracket on the support side to fix.

• Tightening torque: 5 N·m

Mounting examples

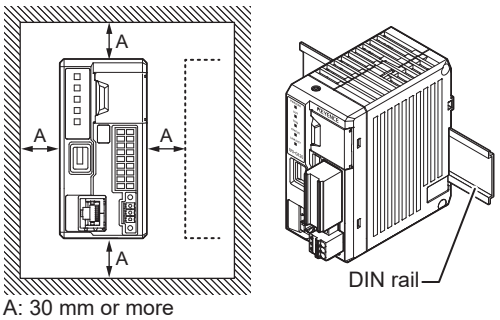


Mounting the ultra-compact model sensor amplifier

NOTICE

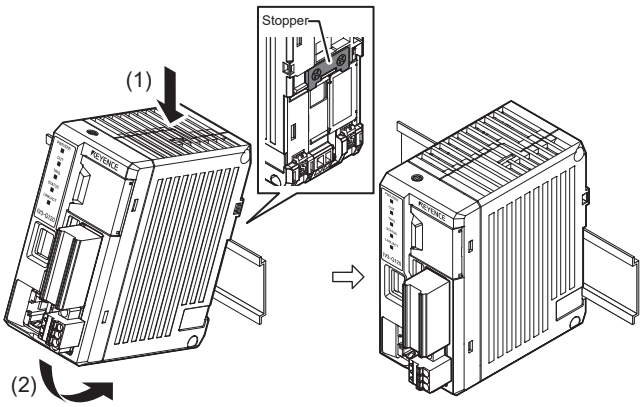
Mount the sensor amplifier as follows for heat release.

- **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.**



A: 30 mm or more

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 dismounting, 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

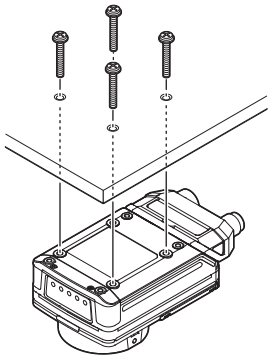
- **IV3-500CA**
- **IV3-500MA**
- **IV3-600CA**
- **IV3-600MA**

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.

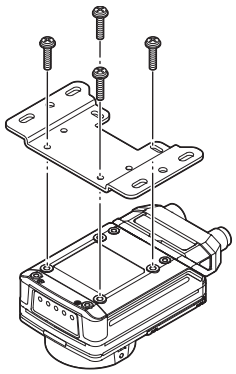
Attaching the optional mounting bracket

■ 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

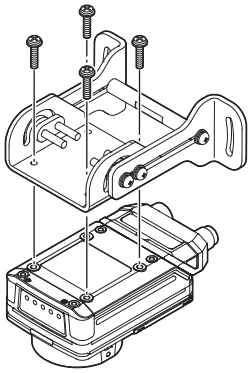


■ Biaxial adjustable bracket (OP-88635)

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

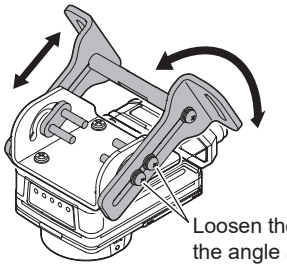
- Tightening torque: 0.5 to 0.7 N·m

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

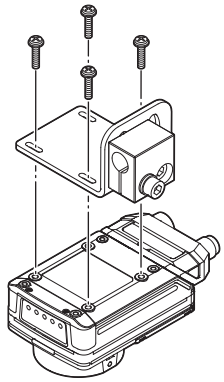


■ Adjustable bracket (OP-88636)

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

- Tightening torque: 0.5 to 0.7 N·m

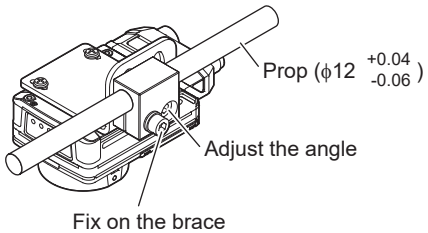
Mounting examples



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.**

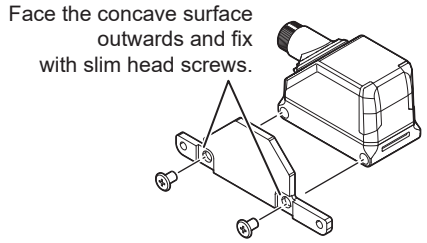
Mounting the AI Lighting unit onto the ultra-compact model sensor head

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

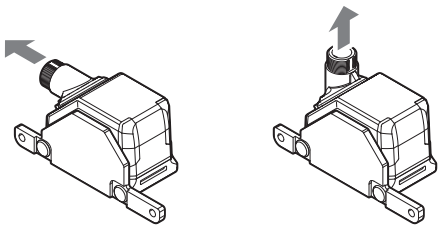
■ Mounting the AI Lighting unit (for the ultra-compact model)

1 **Mount the sensor head onto the head mounting bracket.**

• Tightening torque: 0.6 to 0.8 N·m

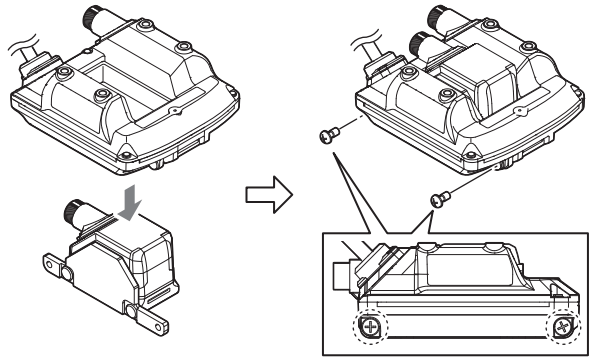


2 **Rotate the head cable connector in the direction the cable will be extracted.**



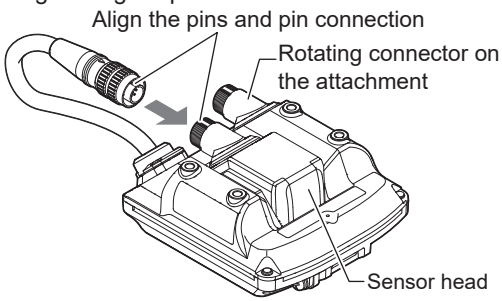
3 **Mount the sensor head from the light side of the AI Lighting unit and then fix to the mounting holes with screws.**

• Tightening torque: 0.5 to 0.7 N·m



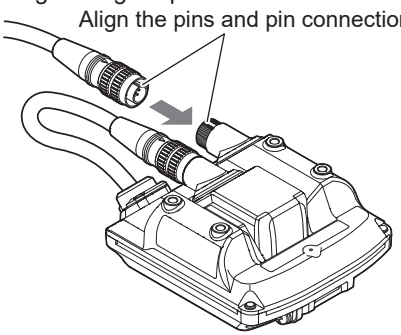
4 **Connect the AI Lighting unit cable to the sensor head.**

• Tightening torque: 0.6 to 0.8 N·m



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



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)

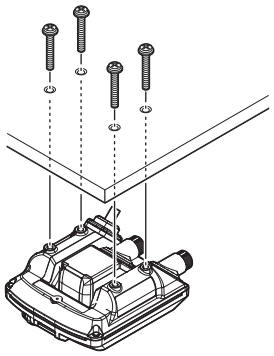
Perform removal in the reverse order.

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



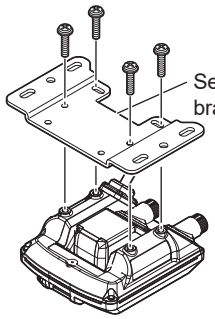
■ Attaching the optional mounting bracket

● 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

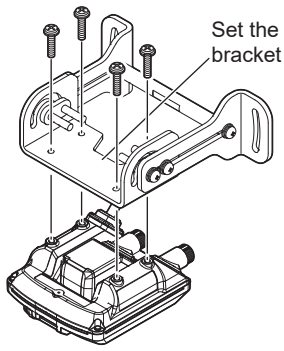


● Biaxial adjustable bracket for the AI Lighting unit (OP-88638)

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

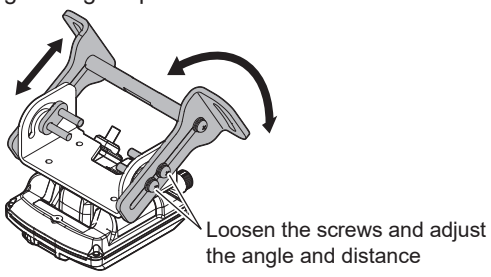
- Tightening torque: 0.5 to 0.7 N·m

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

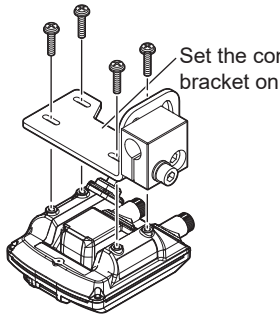


● Adjustable bracket for the AI Lighting unit (OP-88639)

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

- Tightening torque: 0.5 to 0.7 N·m

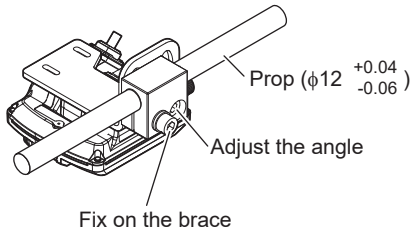
Mounting examples



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

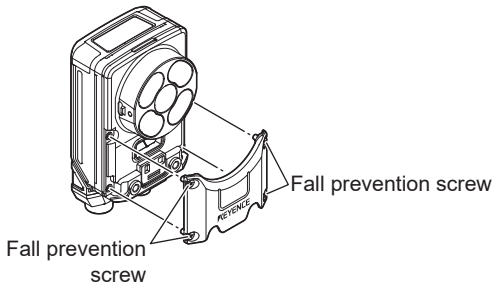


Mounting the AI Lighting unit onto the built-in amplifier type sensor

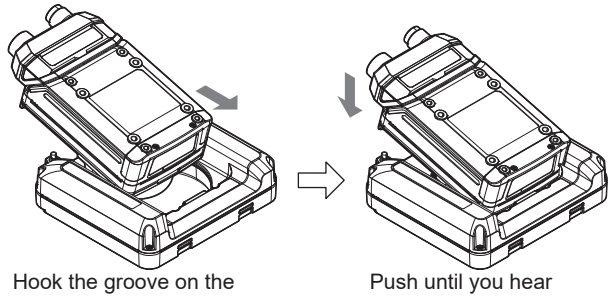
- **IV3-L5C**
- **IV3-L5M**
- **IV3-L6C**
- **IV3-L6M**

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

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



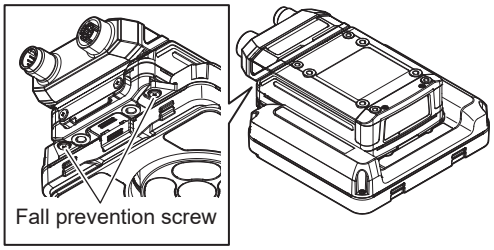
2 Hook the groove on the sensor onto the hook of the AI Lighting unit, and push it in until it makes a clicking sound.



NOTICE	**Make sure that the groove on the sensor is hooked onto the hook of the AI Lighting unit. Failure to do so may cause a product damage.**

3 Fix the sensor with two fall prevention screws.

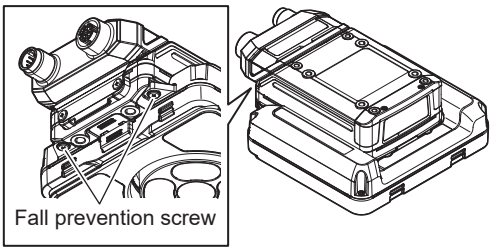
- Tightening torque: 0.15 to 0.20 N·m



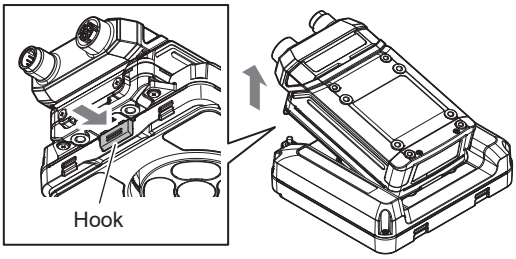
■ Removing the AI Lighting unit (for the built-in amplifier type)

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.

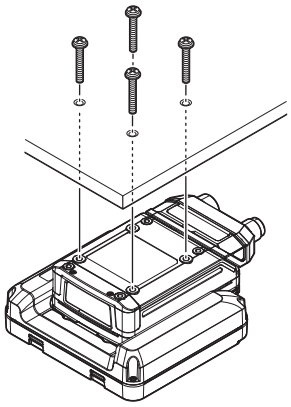
- Tightening torque: 0.15 to 0.20 N·m

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.

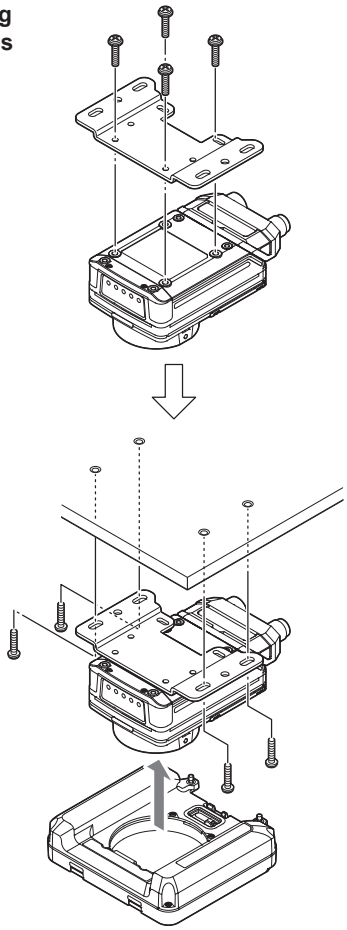
■ Attaching the optional mounting bracket

● Common mounting bracket (OP-88634)

Attach the bracket using the screws included with the common mounting bracket (OP-88634).
After fixing the common mounting bracket to the mounting position, mount the AI Lighting unit onto the sensor.

- Tightening torque: 0.5 to 0.7 N m

Mounting examples

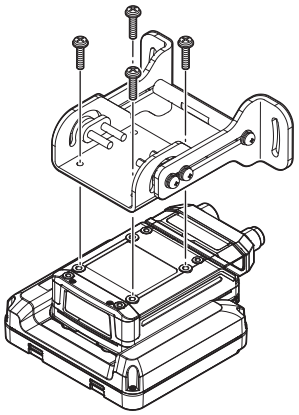


● Biaxial adjustable bracket (OP-88635)

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

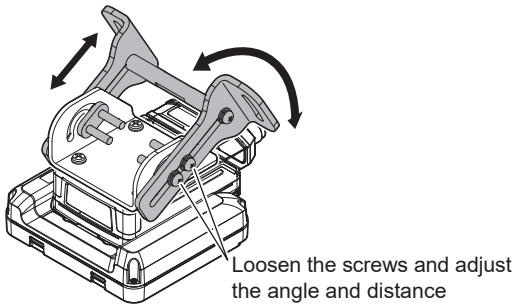
- Tightening torque: 0.5 to 0.7 N·m

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

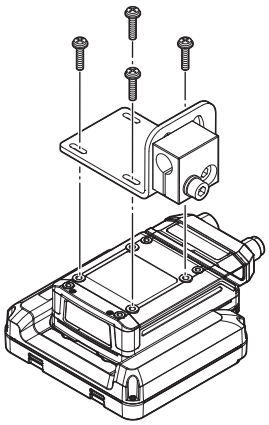


● Adjustable bracket (OP-88636)

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

- Tightening torque: 0.5 to 0.7 N·m

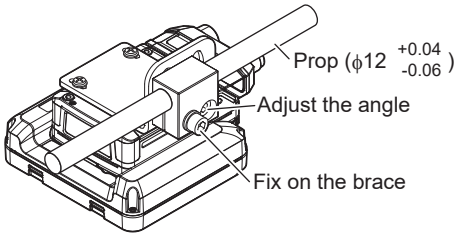
Mounting examples



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

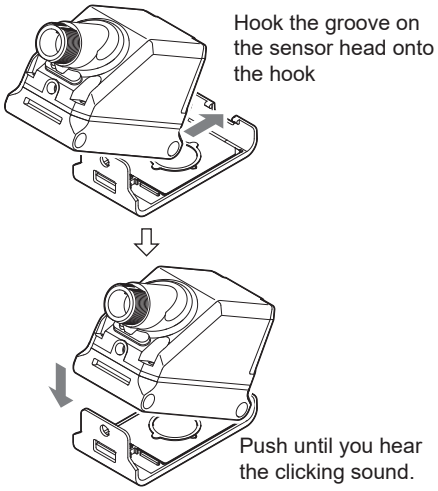


Using the polarizing filter

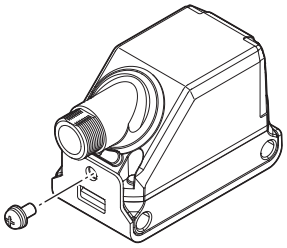
Point **When using the polarizing filter, adjust brightness with the polarization filter attached.**
"Setting the Trigger Options" (page 4-10)

■ 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.**

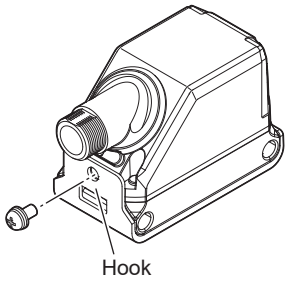


2 **Secure the polarizing filter with the attached screw.**
• Tightening torque: 0.3 to 0.6 N•m



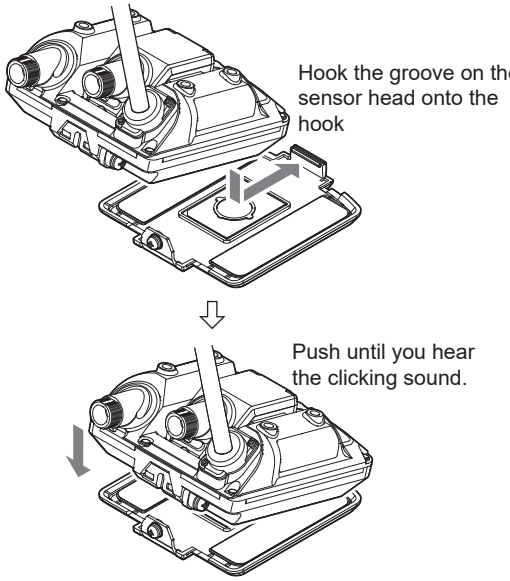
■ Removing the polarizing filter for the ultra-compact model (OP-88642/OP-88643)

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

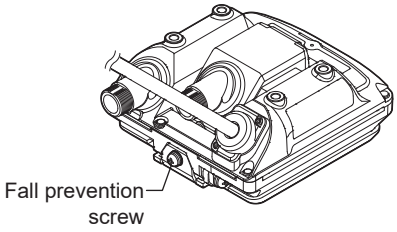


■ Mounting the polarizing filter for the AI Lighting unit (OP-88646/OP-88647): Ultra-compact model

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.**

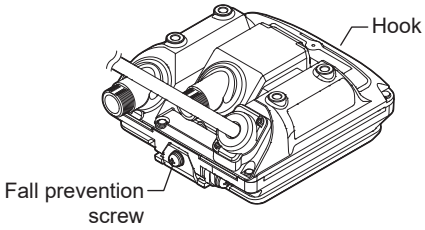


2 **Fix the polarizing filter.**
• Tightening torque: 0.15 to 0.20N•m



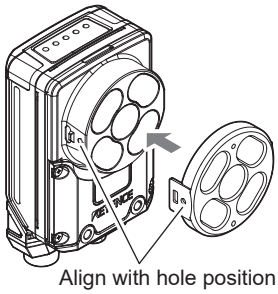
■ Removing the polarizing filter for the AI Lighting unit (OP-88646/OP-88647): Ultra-compact model

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



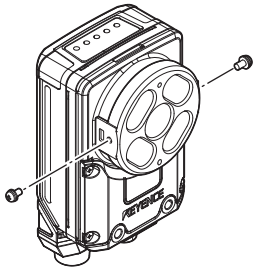
■ Mounting the polarizing filter for the built-in amplifier type (OP-88640/OP-88641)

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



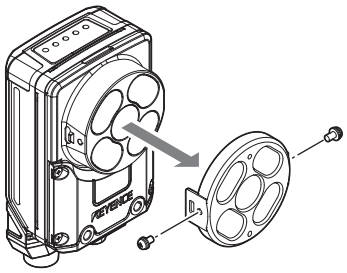
2 **Secure the polarizing filter with the attached screw.**

• Tightening torque: 0.15 to 0.2 N•m



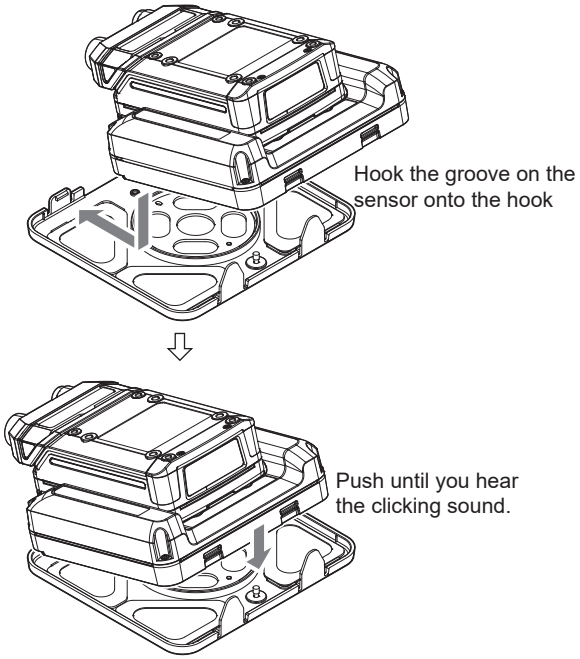
■ Removing the polarizing filter for the built-in amplifier type (OP-88640/OP-88641)

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



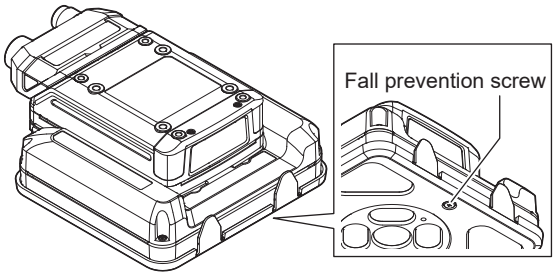
■ Mounting the polarizing filter for the AI Lighting unit for the built-in amplifier type (OP-88644/OP-88645)

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



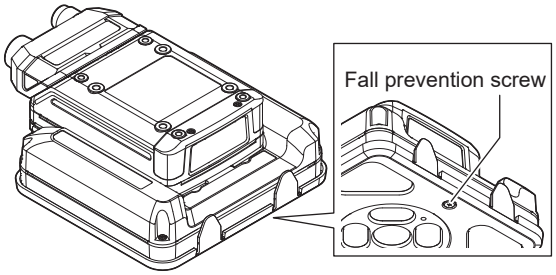
2 **Fix the polarizing filter.**

• Tightening torque: 0.15 to 0.20N•m

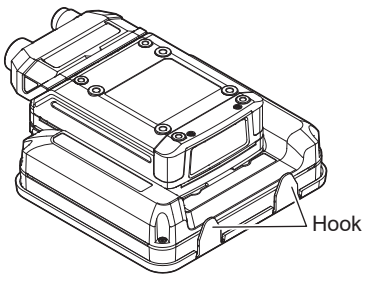


■ Removing the polarizing filter for the AI Lighting unit for the built-in amplifier type (OP-88644/OP-88645)

1 **Loosen the screw on the polarizing filter.**



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



Mounting the dome attachment

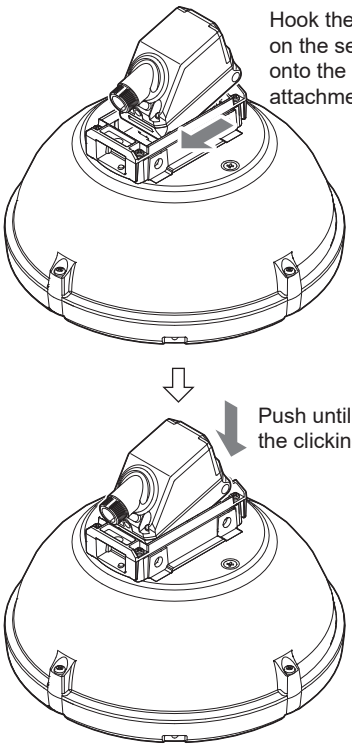
Mounting the dome attachment for ultra-compact model (IV2-GD05/IV2-GD10)

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 7-25)

■ Mounting the dome attachment for ultra-compact model

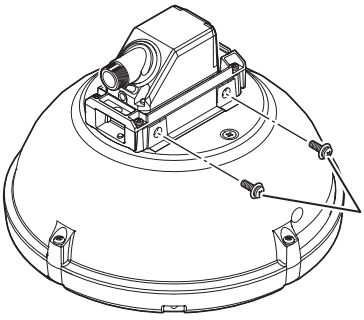
1 **Hook the groove on the sensor head onto the hook of the dome attachment for the IV3 series, and push it in until you hear the clicking sound.**



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

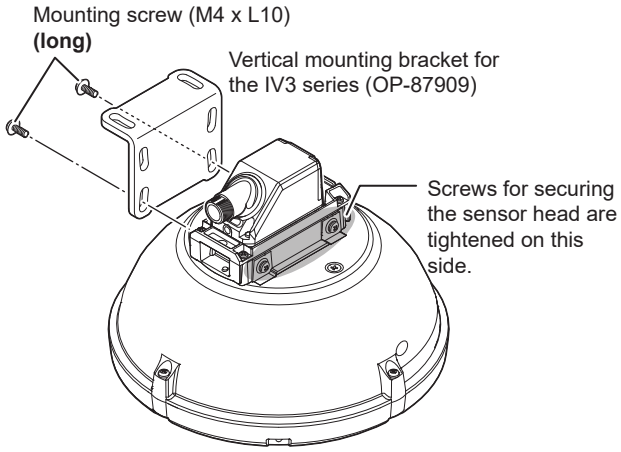


NOTICE
Make sure to fix the dome attachment for the IV3 series with the mounting screws (M4 x L8) to prevent it from falling down.
- **If the attached mounting screws (M4 x L10) or screws with no double-washer sems are used, the sensor head may be damaged.**
- **The attached mounting screws (M4 x L10) 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).**

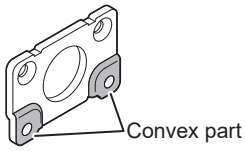
Point
- **Tighten the mounting screws on the one side of the sensor head. If they are to be used on the opposite side, tighten them on the same side.**
- **The mounting method for the IV2-GD10 is described here. The IV-2GD05 can also be mounted in the same way.**

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

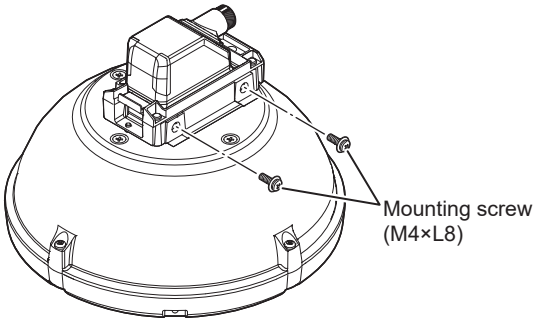
If a sensor head with the dome attachment for the IV3 series attached is to be directly mounted to sheet metal, pay attention to the following items:

- **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.**

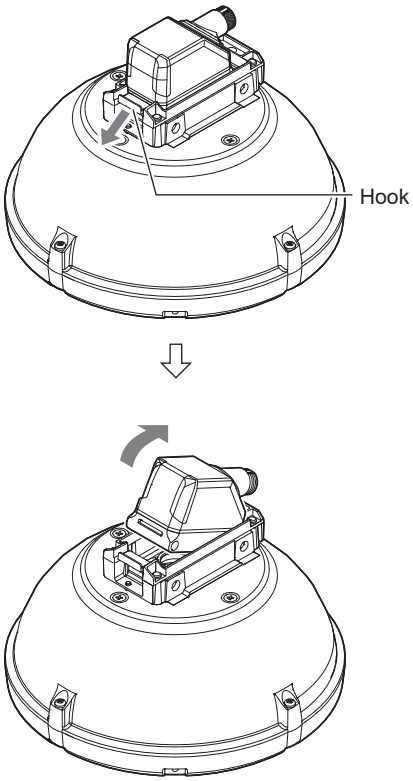
Reference When the dome attachment is used for the wide field of view sensor model of the IV series, the field of view will be narrower than the case when the dome attachment is not used, because an area that cannot be viewed will exist in a corner of the field of view. Confirm that there is no problem before using it.

■ 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.**



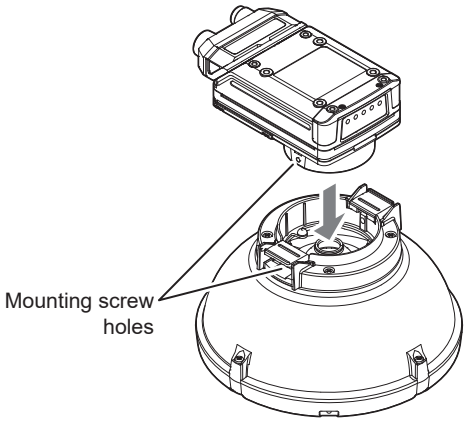
Mounting the dome attachment for built-in amplifier type (IV3-D10)

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 7-25)

■ 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.

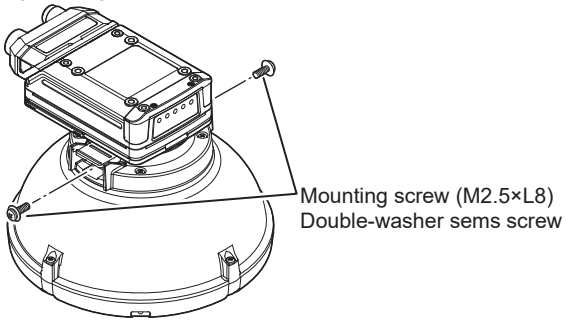


Point

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

2 Fix the dome attachment with attached mounting screws.

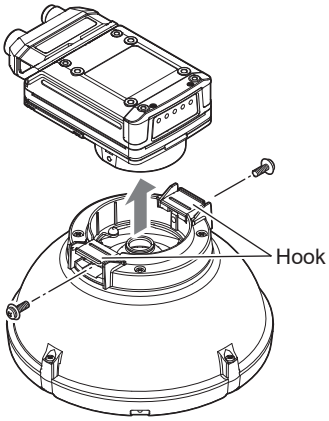
- Tightening torque : 0.15 to 0.20 N·m



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



Mounting the control panel

Mounting to a wall

Use the wall mounting adapter (accessories or OP-88349). Hang the control panel on a hook with the wall mounting adapter mounted to the control panel, or mount the control panel to the wall mounting adapter that is mounted on the wall.

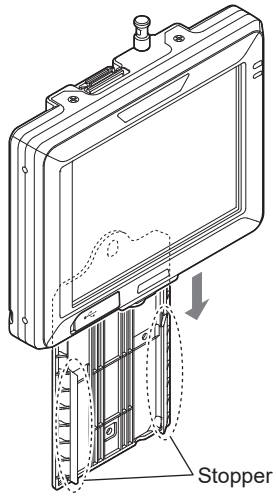
Reference The control panel is shipped installed on the wall mounting adapter.

Hanging on a hook

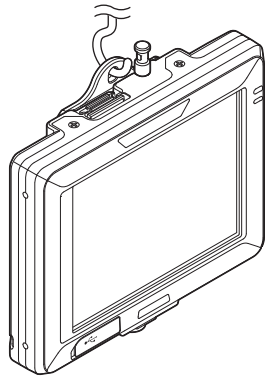
While operating, take the control panel from the hook and hold it in your hands.

1 Mount the control panel to the wall mounting adapter by aligning the stopper of the wall mounting adapter to the groove on the rear control panel.

Slide the control panel down all the way, and confirm that the control panel is locked.



2 Hang the control panel on a hook.



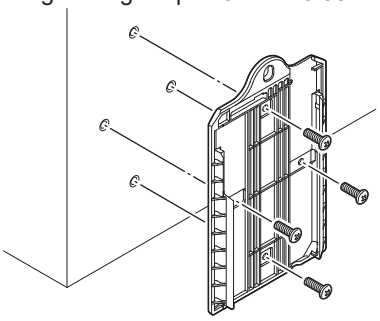
Mounting with the wall mounting adapter

The monitor can be operated using the following methods.
- Remove the control panel from the wall mounting adapter and operate while holding in your hand.
- Operate it while mounted on the wall.

1 Mount the wall mounting adapter to the wall.

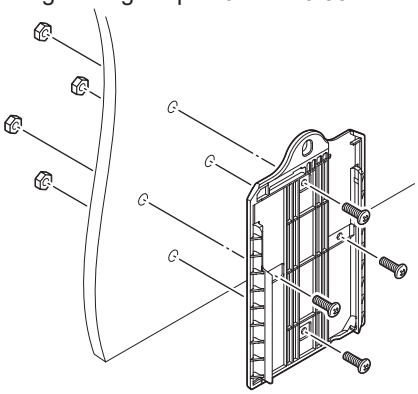
● Mounting by creating a screw hole in the wall

- Screw: M3 x 4
  Use the attached screws.
- Tightening torque: 0.27 to 0.33 N m



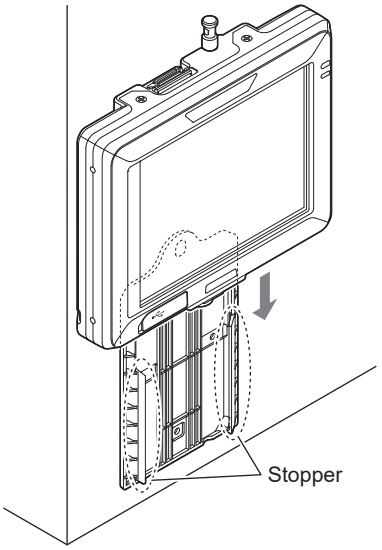
● Mounting by creating a plated through hole on a panel

- Screw: M3 x 4, Nut: M3 x 4
  Use the attached screws and nuts.
- Mountable board thickness: 5 mm or less
- Tightening torque: 0.27 to 0.33 N m



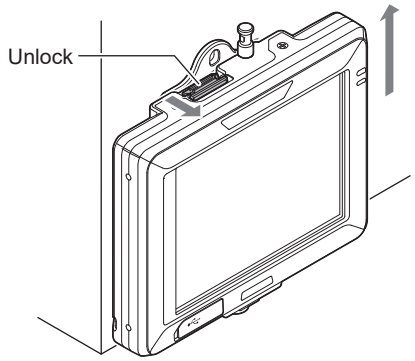
2 Mount the control panel to the wall mounting adapter by aligning the stopper of the wall mounting adapter to the groove on the rear control panel.

Slide the control panel down all the way, and confirm that the control panel is locked.



Detaching from the wall mounting adapter

Unlock the control panel from the wall mounting adapter by pulling it toward the unlock button. Then slide the control panel up to unmount the control panel mounted to the adapter.



Mounting on a control board

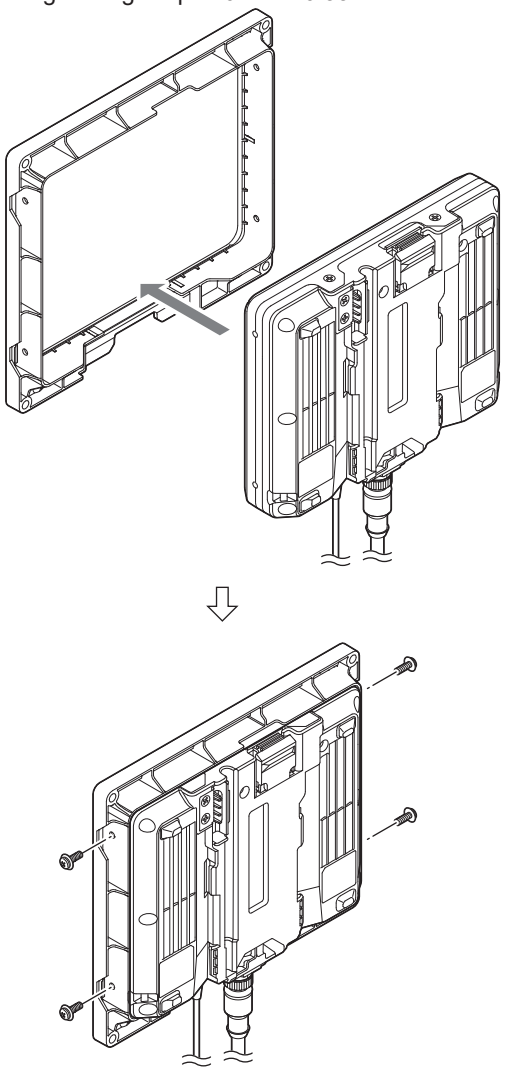
Fix the control panel on a control board or such like to operate it.
Mount the control board mounting adapter (OP-88350) on the control panel to be mounted on the board surface.

1 Connect the power cable and Ethernet cable to the control panel.

“Cables” (page 2-18)

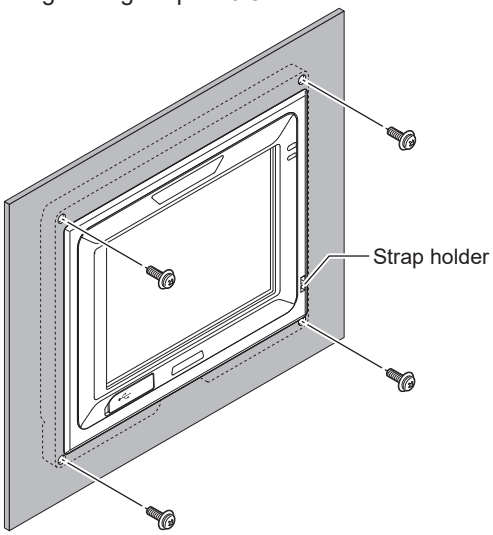
2 Mount the control board mounting adapter on the control panel and fix it with the attached screws.

- Screws: M3, 8 mm long with washers x 4
  Use the attached screws.
- Tightening torque: 0.27 to 0.33 N m



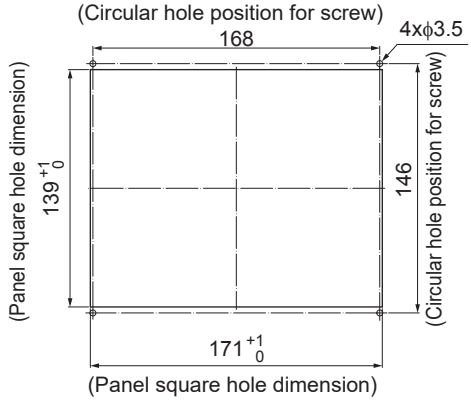
3 Mount the control panel where the control board mounting adapter is installed from the rear side, and fix it with the screws.

- Open the hole for embedding with 139 mm x 171 mm on the board surface.
- Mountable board thickness: 1 to 4 mm
- Screw : M3, 8 mm long, with a washer x4
  Use the attached screws.
- Tightening torque : 0.5 N·m or lower



Reference Stylus can be hung from the strap holder using the hanging string (accessory).

Panel cutting dimensions

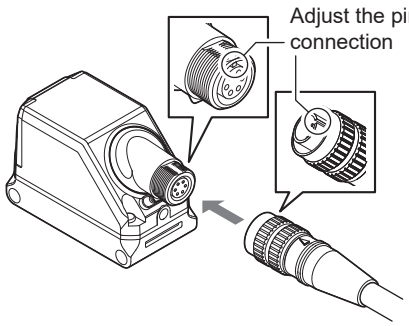


Cables

Wiring the ultra-compact model

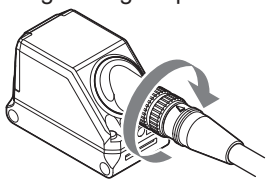
Connecting the sensor head/amplifier cable and sensor head

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.

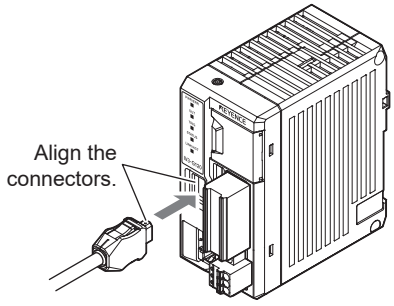
• Tightening torque: 0.6 to 0.8 N·m



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.

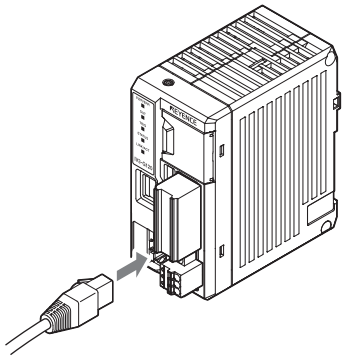


To disconnect the cable, push in the tabs on both sides of the connector and pull out the connector.

Connecting the cable to the sensor amplifier

■ Connecting the Ethernet cable or LAN cable

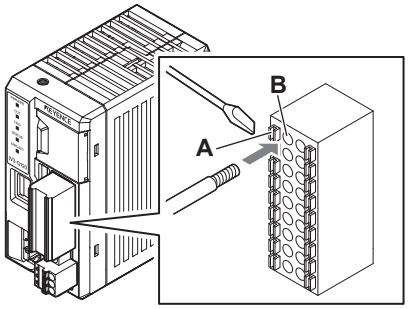
Connect the cable to the sensor amplifier as shown below.



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

■ Wiring the I/O terminal block

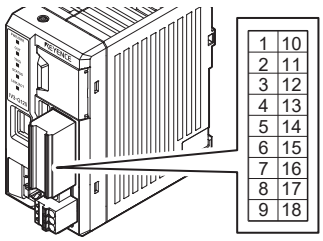
Insert the wire to B by pushing A in with a screwdriver. Pull the wire out slightly to confirm that it is secured.



⚠ CAUTION	**Use a wire with 80°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 mm^2 to 1.5 mm^2 (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	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 16) • 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.**

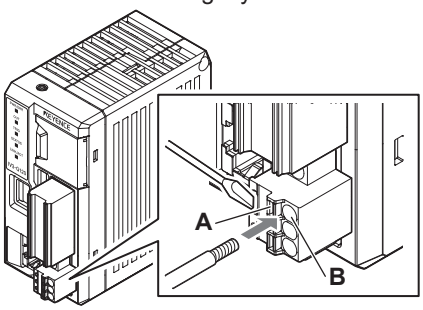
■ Supplying Power to the Sensor Amplifier

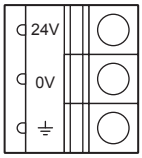
The power terminal block is mounted on the front of the sensor amplifier.

CAUTION	**Use wire whose temperature rating is 80ºC 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.



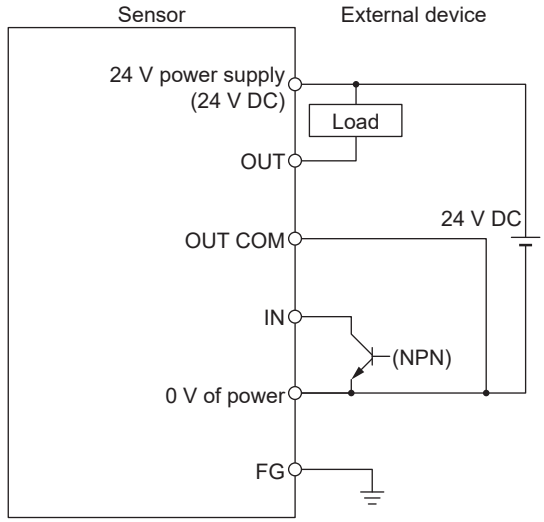


24V	Wire to 24 V DC of the power supply.
0V	Wire to 0 V of the power supply.
⏚	Ground.

■ 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)

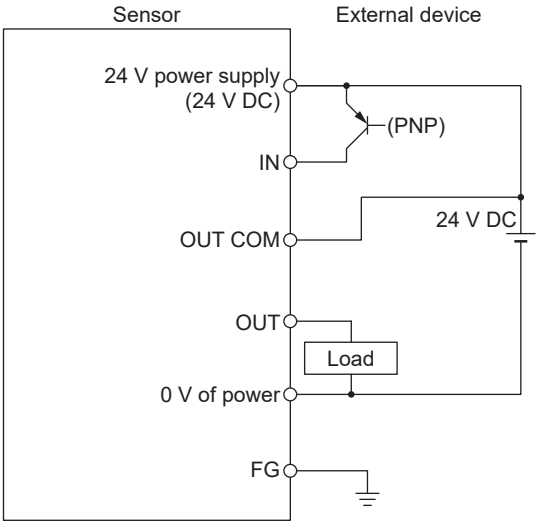
Output circuit
- Maximum rating : 26.4 V, 50 mA
- Remaining voltage : 1.5 V or lower

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

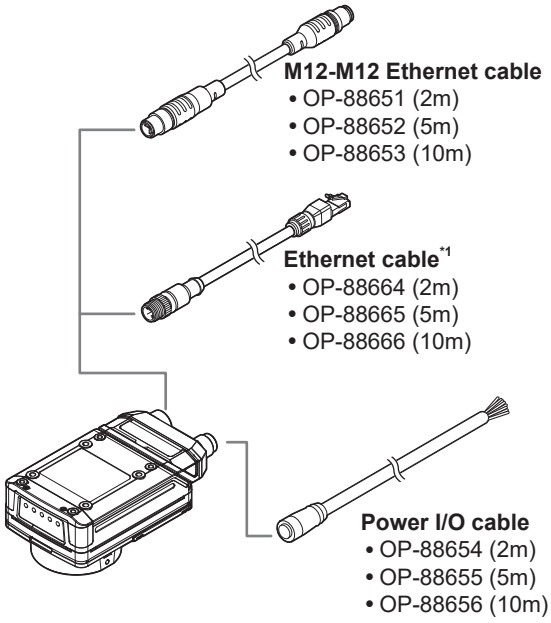
Input circuit: voltage input
- Maximum input rating : 26.4 V
- ON voltage : 18 V or higher
- OFF current : 0.15 mA or lower
- ON current : 2 mA (at 24 V)

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

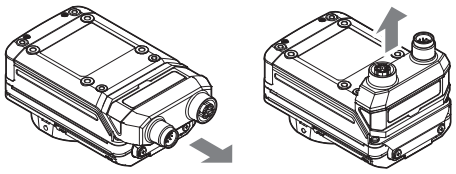


*1 Supports PoE (Power over Ethernet)

Reference "When supplying power with the PoE (Power over Ethernet)" (page 2-23)

Changing the direction of the cable

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



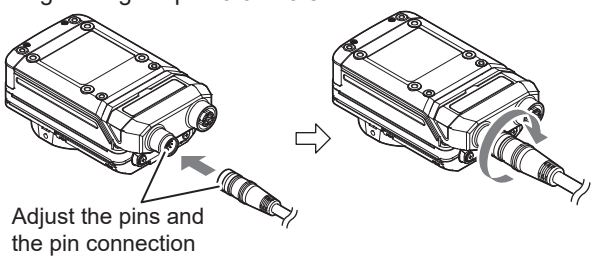
Connecting the cable

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.**

• 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

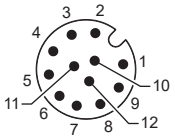
Wiring color	Pin No.	Name	Assigning default value	Description
Brown	1	DC24	-	+ side of power
Blue	2	0V	-	- side of power
Pink	6	IN1	Ext. Trigger ↑	Set external trigger. Rising timing (↑) or falling timing (↓) can be set.
Yellow	4	IN2	OFF	Input assignable function • Program bit0 to bit6 • Clear Error • Ext. Master Save • Stop saving the SD card • OFF (not used) 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 16) • 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)
Light blue	5	IN3	OFF	
Black	9	OUT1	Total Status OK	
White	10	OUT2	BUSY	
Gray	11	OUT3	Error	
Purple	3	I/O1*	OFF	
Green	7	I/O2*	OFF	
Red	8	I/O3*	OFF	
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.

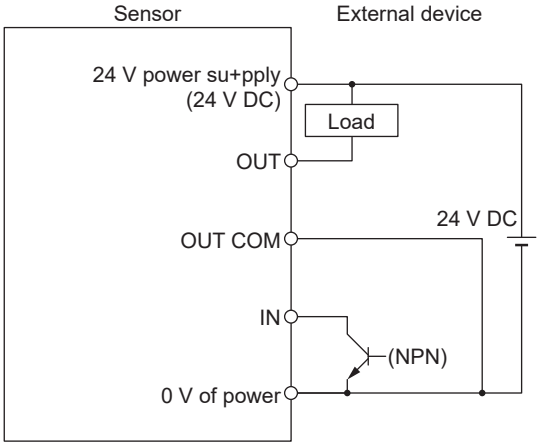
Use it by assigning the optional function to IN1 to IN3, OUT1 to OUT3, and I/O1 to I/O3.
For the method to switch I/O of I/O1 to I/O3, refer to "I/O Mapping (Built-In Amplifier Type)" (page 7-20).

NOTICE	**• 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.**

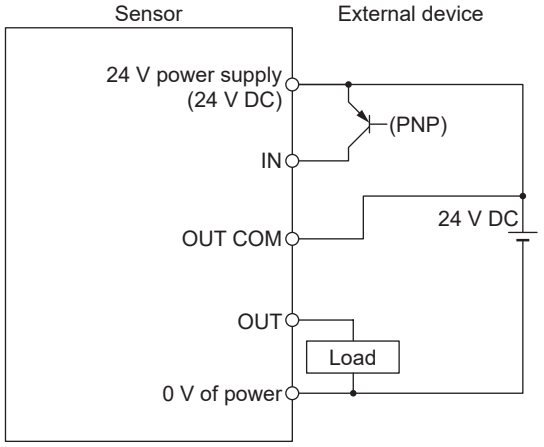
Electrical specifications
Input circuit: non-voltage input
- ON voltage : 2 V or lower
- OFF current : 0.1 mA or lower
- ON current : 2 mA (short circuit)

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.**

● 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.**

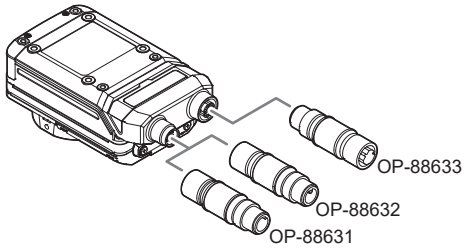
Electrical specifications
Input circuit: voltage input
- Maximum input rating: 30 V
- ON voltage : 18 V or higher
- OFF current : 0.15 mA or lower
- ON current : 2 mA (at 24 V)

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 2-21) .

■ Connect the conversion connector

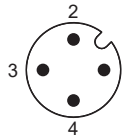


Align the recessed part of the conversion connector with the protruding part of the connector on the sensor side, and connect the conversion connector to the sensor. Then, tighten the connector by turning the screw on the connector in the clockwise direction.

• Tightening torque : 0.6 to 0.8 N·m

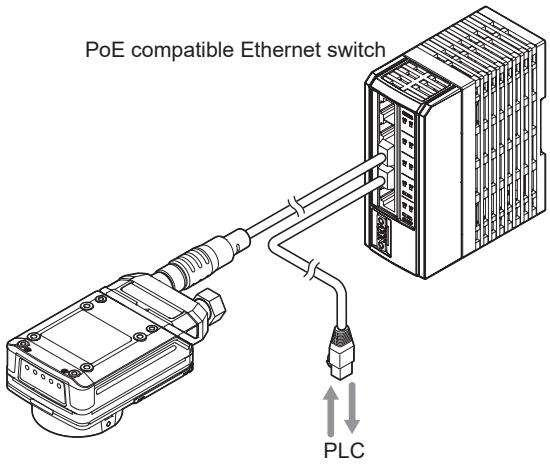
NOTICE	**When connecting the connector, insert it without tipping and tighten it well.** **If the tightening is weak, vibration can loosen the connector and cause bad connections.** **Also, the enclosure rating may not be maintained with loose connection.** *** After tightening the connector screw by 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 7-19) .**

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



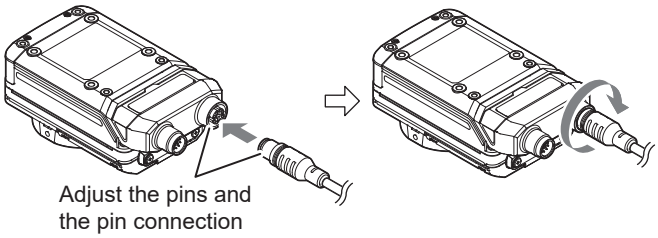
● Specifications of the PoE power supply device

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 6 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 or lower

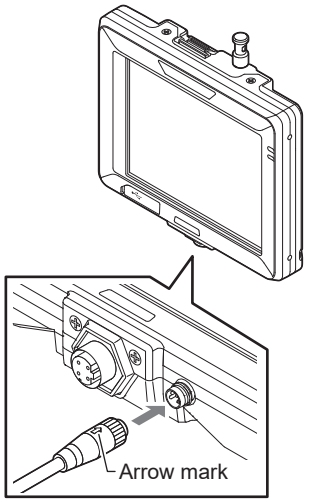


Adjust the pins and the pin connection

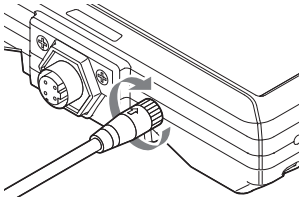
NOTICE	**When connecting the connector, insert it without tipping and tighten it well.** **If the tightening is weak, vibration can loosen the connector and cause bad connections.** **Also, the enclosure rating may not be maintained with loose connection.** *** After tightening the connector screw by 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 power cable of the control panel

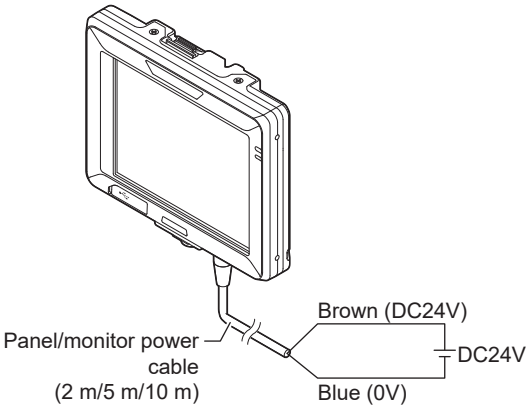
1 **Align the arrow mark of the power cable in the direction of the front of the control panel, and connect the cable to the control panel.**



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



3 **Wire to the power supply.**

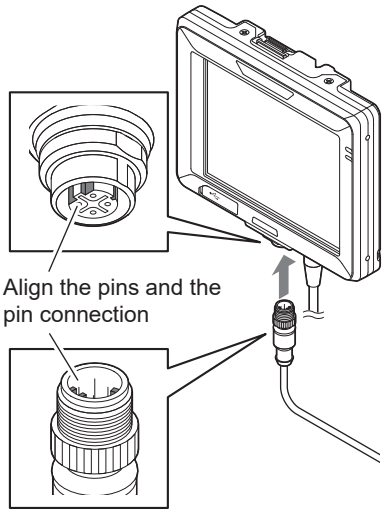


Cable specification Brown/Blue : AWG24

Connecting the Sensor with the Control Panel

Connecting the Ethernet cable with the control panel

Connects the Ethernet cable with the connector of the control panel.



Ethernet cable
OP-87907 (1m)
OP-87457 (2m)
OP-87458 (5m)
OP-87459 (10m)
OP-88042 (1m: L type)
OP-88043 (2m: L type)
OP-88044 (5m: L type)
OP-88045 (10 m: L type)

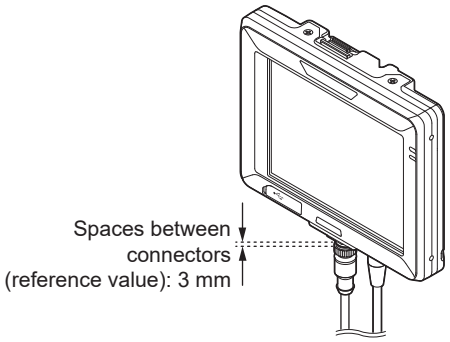
Ethernet cable dedicated for the built-in amplifier type
OP-88651 (2 m)
OP-88652 (5 m)
OP-88653 (10 m)

Reference
- The sensors to which the IV3-CP50 can connect are the IV3 series, IV2 series, and IV series.
- To connect with an IV2 Series sensor, start up in the IV2-CP50 mode.
- To connect with an IV Series sensor, start up in the IV-M30 mode.
- For details on connecting with the sensor of the IV2 Series, refer to “IV2 Series User’s Manual (Control Panel)”.
- For details on connecting with a sensor of the IV-HG/IV-H Series, refer to “IV-HG/IV-H Series User’s Manual (Monitor)”.
- For details when connecting an IV-G/IV Series sensor, refer to ”IV- G/IV Series User's Manual (Monitor).”

Tighten the connector by turning the screw-on connector in the clockwise direction. When you cannot tighten the screw by hand any more, use a tool such as pliers for further tightening. Tightening torque, retorque degree, and acceptable spaces between connectors are shown below.
- Tightening torque : 0.8 to 1.0 N m
- Retightening degree : 5 to 10°
- Spaces between connectors (reference value) : 3 mm

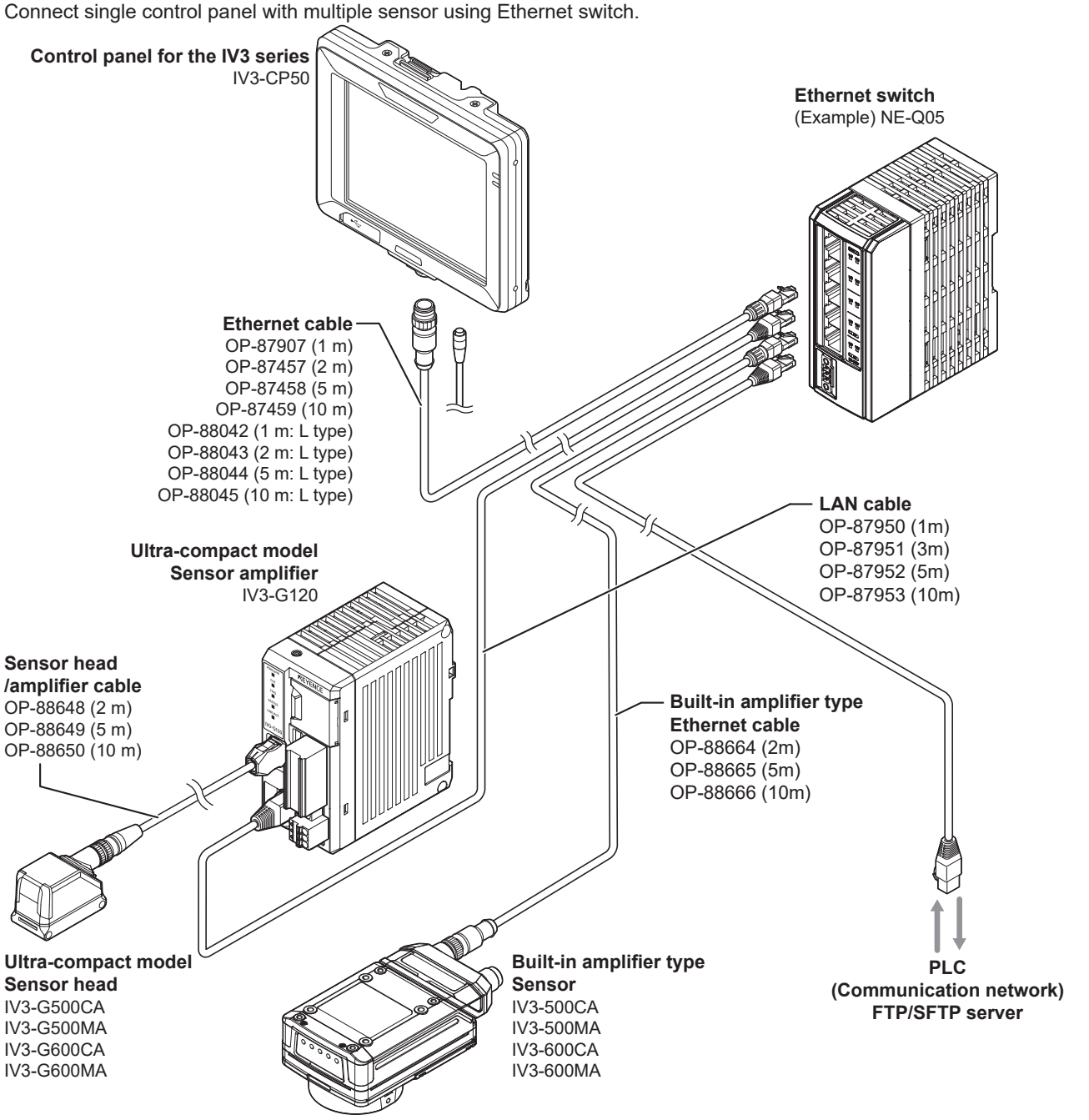
NOTICE	**If the connector cable tightening is weak, vibration may loosen the connector and cause bad connections or cable disconnections. Also, the enclosure rating may not be maintained with loose connection. Properly follow the procedures above and tighten the connector completely.**

Point **Check the spaces between the Ethernet cable connector and the cable connector.**



Connecting to multiple sensors

Connect single control panel with multiple sensor using Ethernet switch.



* The method to connect the control panel with an Ethernet cable is the same as "Connecting the Ethernet cable with the control panel" (page 2-25).

NOTICE	**For the method to supply power to the sensor, refer to "Cables" (page 2-18).**

Reference

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

- The sensors to which the IV3-CP50 can connect are the IV3 series, IV2 series, and IV series.
- To connect with an IV2 Series sensor, start up in the IV2-CP50 mode.
- To connect with an IV Series sensor, start up in the IV-M30 mode.
- For details on connecting with the sensor of the IV2 Series, refer to "IV2 Series User's Manual (Control Panel)".
- For details on connecting with a sensor of the IV-HG/IV-H Series, refer to "IV-HG/IV-H Series User's Manual (Monitor)". Please replace the description of IV-M30 with IV3-CP50.
- For details when connecting an IV-G/IV Series sensor, refer to "IV- G/IV Series User's Manual (Monitor)." Please replace the description of IV-M30 with IV3-CP50.

3

Basic Operation

This chapter explains the contents of the control panel display and operation of the IV3 series, basic operation flow, and operation when turning on the power for the first time.
In addition, this chapter explains the method to change which sensor to connect to, procedures to restore the sensor and control panel to the default factory settings, and the basic operation of the control panel.

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.....3-12
Setting to the factory default.....3-15
Basic operation of the control panel 3-17

Overview of Screen and Operation

This section explains control panel displays and operation.
For details of what can be set on each screen and its operations, refer to the applicable section.

Run screen
Images and judges based on the judgment conditions.
“Starting an Operation” (page 5-2)

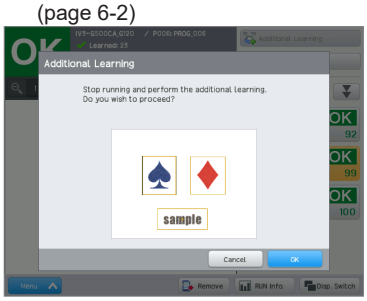
Hide menu



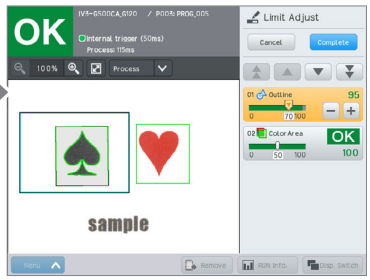
Show menu



Additional Learning (Learning Tool Only)
Perform additional learning of images.
“Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

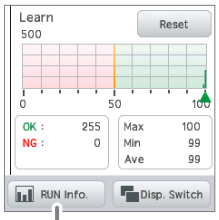


Limit Adjustment
Adjusts the judgment threshold.
“Adjusting Thresholds for Judgment” (page 6-17)

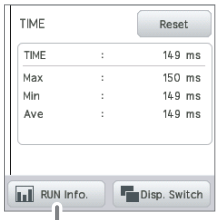


Operation Information
Displays the operation information.
“Displaying the Operation Information” (page 5-6)

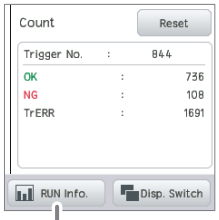
Histogram



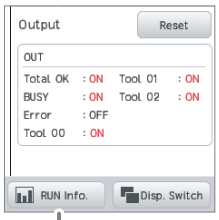
Processing time



Count



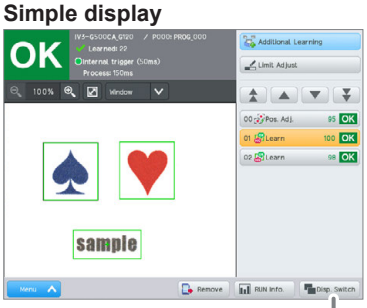
Output monitor



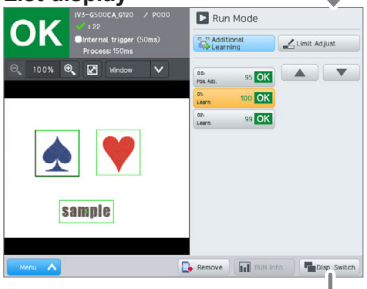
Ⓐ(Back to hide)

Display Method
Switches the display method of the operation screen.
“Display Method” (page 5-9)

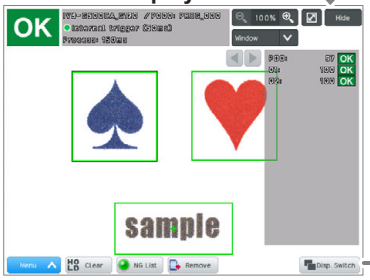
Simple display



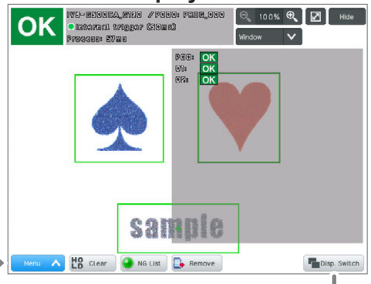
List display



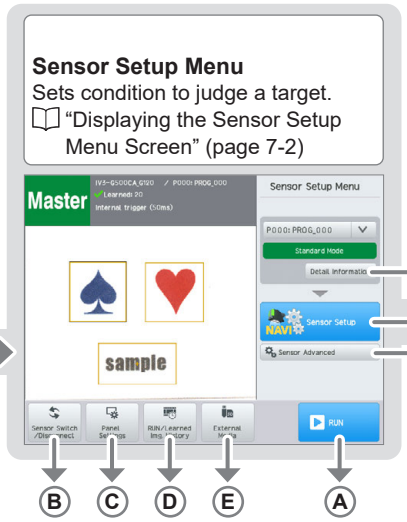
All screen display 1



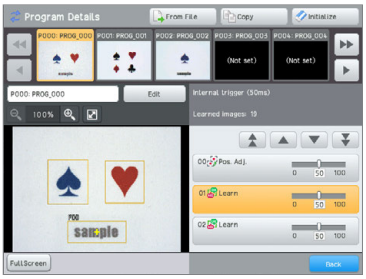
All screen display 2



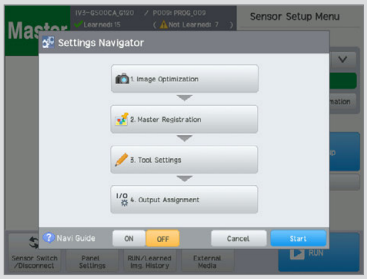
(Back to hide) Ⓐ



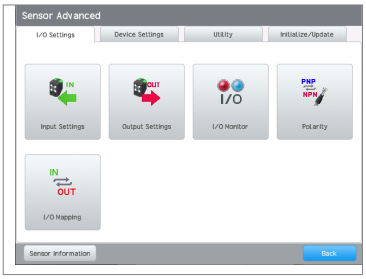
Sensor Setup Menu
Sets condition to judge a target.
“Displaying the Sensor Setup Menu Screen” (page 7-2)



Program Details
Checks or initializes the program.
“Operations that can be performed with the program functions” (page 7-3)



Settings Navigator
Sets the program settings to be used for judgment.
“4 Settings Navigator” (page 4-1)



Sensor Advanced
Controls the sensor advanced settings.
“Setting the Extended Functions of the Sensor” (page 7-13)

Change Connected Sensor
Switches the connected sensor. Or, terminates the sensor connection.
“Switching the Sensor to be Connected” (page 3-12)

B →

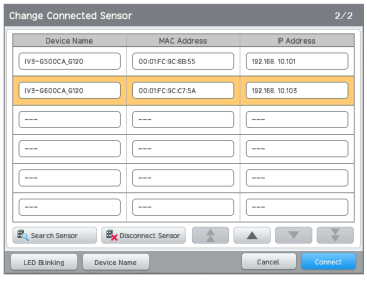
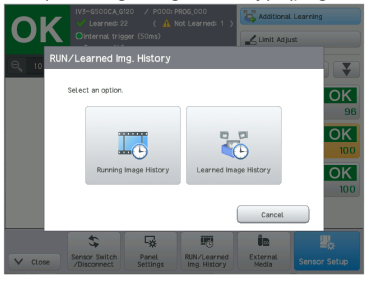


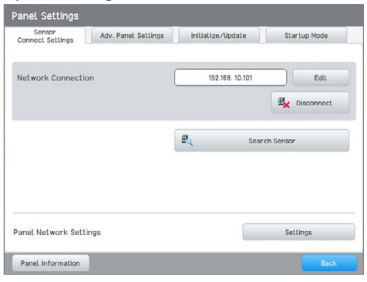
Image History
Opens the running image and learned image history (learning tool only) of the sensor.
“Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-19)

D →



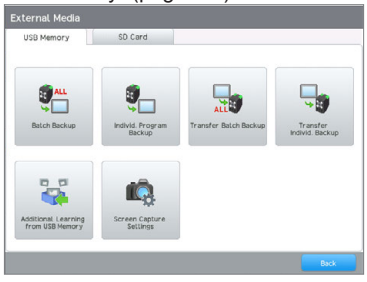
Panel Settings
Sets each function of the control panel.
“Setting Advanced Control Panel Information” (page 7-27)

C →



External Media
Controls the operation for using either USB memory or an SD card.
“Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

E →



Basic operation flow

Mounting, Connecting, and Wiring the Sensor with the Control Panel

Mount the sensor and control panel, and then connect and wire the cable.
“2 Installation and Connection” (page 2-1)

Power turns on

Turn on the power of the sensor and control panel, and then perform the initial startup 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 4-18)

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 4-25)
- 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 4-151)

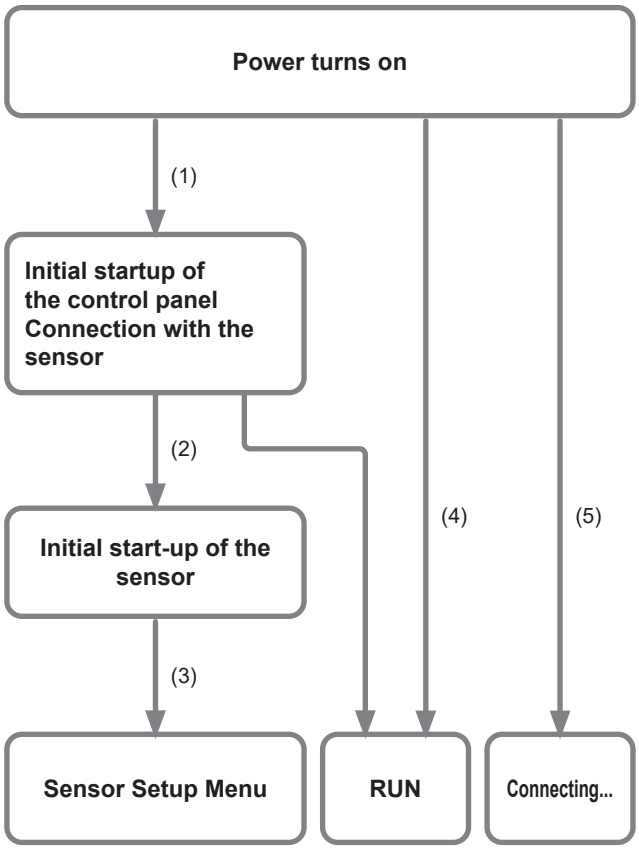
Starting the operation/adjustment

Switch the settings screen to the run screen, and start the operation.
“5 Running” (page 5-1)

If the settings are not appropriate, perform the additional learning or limit adjustment.
“6 Adjusting” (page 6-1)

Operation when the Power is Turned on

Operation flow when the power is turned on



(1) When the power of the control panel is turned on for the first time, set the display language, and date and time.

(2) When the sensor is turned on for the first time, perform the Initial Sensor Setup.
“Operation for Initial Startup of the Sensor” (page 3-10)

(3) The [Sensor Setup Menu] screen opens. Create a program with the Settings Navigator. After being created, operation begins.
“4 Settings Navigator” (page 4-1)

(4) If the control panel and sensor setup has already been performed, move to operation automatically by turning on the power.
“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-16)

Reference The sensor can be independently operated.

Point

Operation when connecting to an IV2 Series sensor

- **The [Startup Mode] tab appears on the panel settings screen. Press [IV2-CP50 Mode].**
- **The control panel restarts in IV2-CP50 mode.**
- **For details on connecting with the sensor of the IV2 Series, refer to “IV2 Series User’s Manual (Control Panel)”.**

Operation when connecting to an IV Series sensor

- **The [Startup Mode] tab appears on the panel settings screen. Press [IV-M30 Mode].**
- **The control panel restarts in IV-M30 mode.**
- **For details when connecting an IV-HG/IV-H Series sensor, refer to ”IV-HG/IV-H Series User’s Manual (Monitor)”.**
- **For details on connecting with a sensor of the IV-G/IV Series, refer to “IV-G/IV Series User’s Manual (Monitor)”.**

Operation for initial startup of the control panel

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

Setting the network address of the control panel

1 Turn on the power of the control panel.

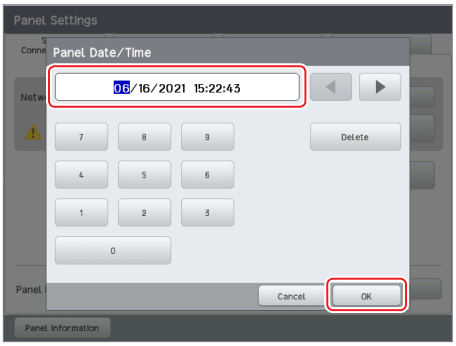
The screen to select the language opens.

2 Select the language to be displayed on the control panel and press [OK].



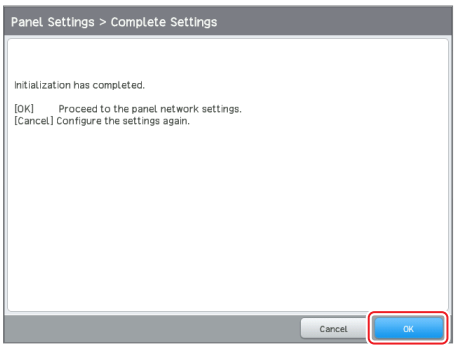
[English] is selected as the default setting.
If a language other than [English] is selected, the [Information] screen opens. Press [OK]. The control panel will restart automatically.

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

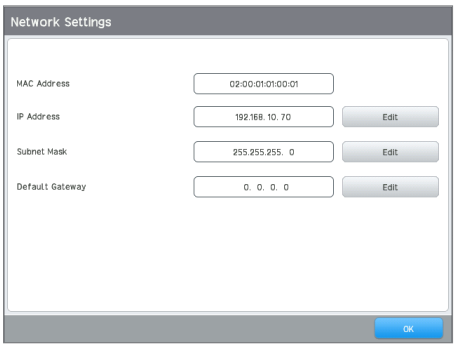


- Move to the item to be set with the ◀/▶ buttons and enter the numbers.
- Press the [Delete] button to reset the display of the selected item.

4 Press [OK].



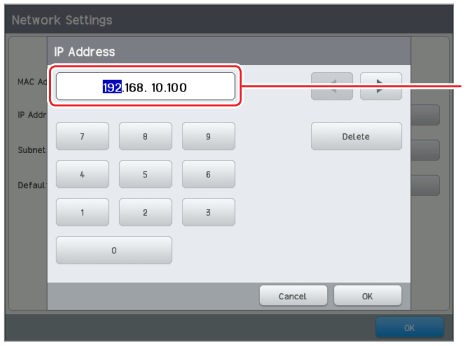
5 Press [Edit] of the IP Address, Subnet Mask, and Default Gateway.



The screen to set each item opens.

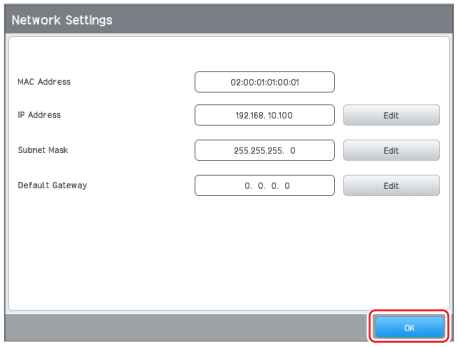
Point **At the initial startup or initialization of the control panel, the control panel starts up with "192.168.10.70" as the IP address.**
If there is a device with the same IP address on the network, change the IP address before connecting the monitor to the network.

6 Set the IP Address, Subnet Mask, and Default Gateway individually, and then press [OK].

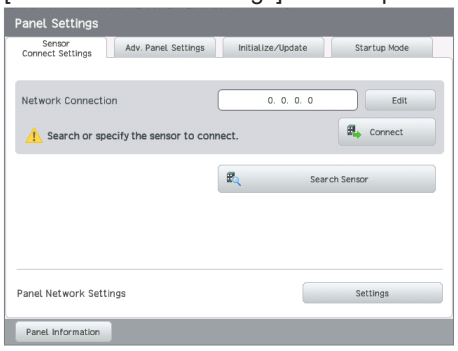


The system returns to the [Network Settings] screen.

7 Press [OK].



The control panel will be restarted to be connected with the sensor automatically.
If the connection to the sensor cannot be done, the [Sensor Connect Settings] screen opens.



There are two ways to set the sensor to be connected. For details, refer to the following sections.

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

  “Searching for a Sensor to be Connected” (page 3-7)

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

  “Specifying Sensor to be Connected by IP Address” (page 3-9)

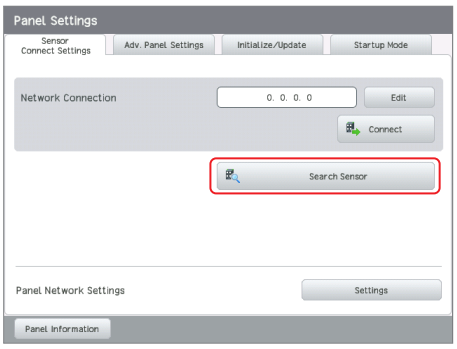
Searching for a Sensor to be Connected

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

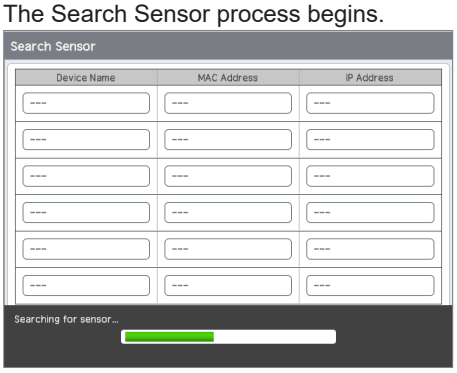
Reference
- The search time is about 10 to 15 seconds.
- Up to 64 sensors can be searched.

1 Turn on the power of the sensor.

2 Press [Search Sensor].



The Search Sensor process begins.

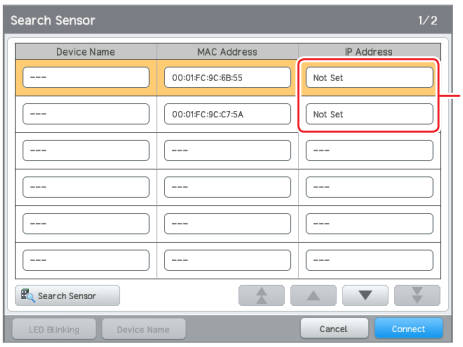


When the searching is finished, the searched result will be displayed.

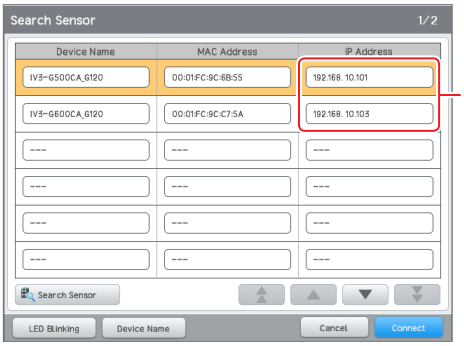
Point

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

● **When a sensor without an IP address is found**



● **When a sensor with an IP address is found**



3 **When multiple sensors are found, select the sensor to be connected with the [▲] or [▼] button.**

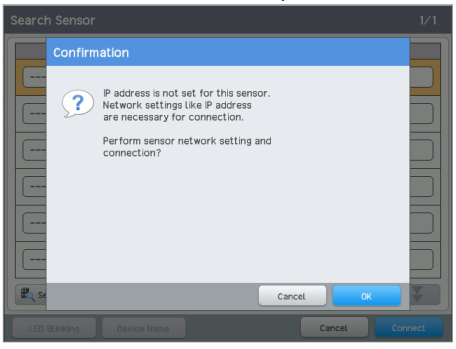
4 **Connect to the sensor.**

● **When connecting to the sensor without an IP address**

Press [Connect].

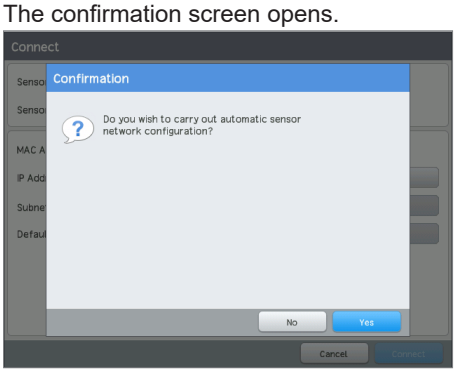


The confirmation screen opens.

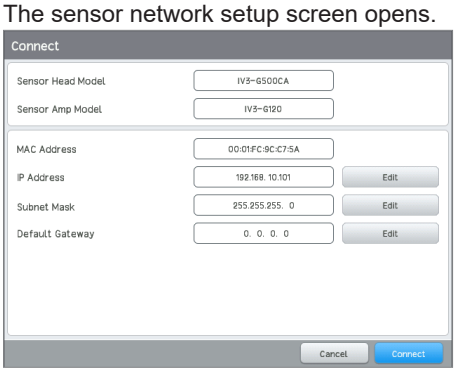


Press [OK].

The confirmation screen opens.

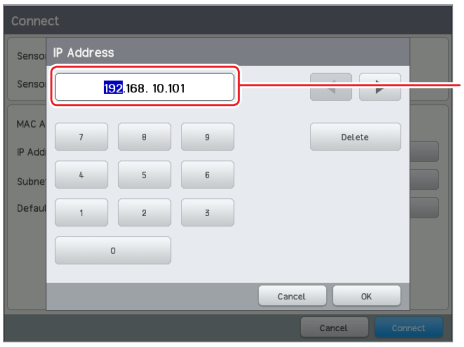


Press [Yes] to automatically configure the sensor network settings to connect to the control panel.
The sensor network setup screen opens.

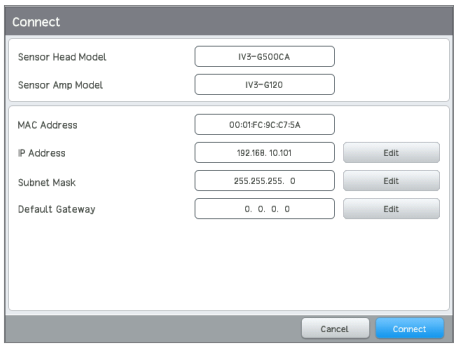


Press each [Edit] of the IP Address, Subnet Mask, and Default Gateway, and set these items individually.

Point **When the IP address of the sensor coincides with that of the control panel, make sure to change it.**



The system returns to the network setup screen for the sensor to be connected.

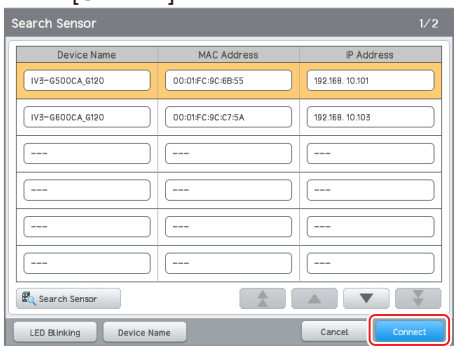


Press [Connect].

- When the control panel is connected with the sensor for the first time, perform the Initial Sensor Setup and set the polarity and time of the sensor.
  Refer to “Operation for Initial Startup of the Sensor” (page 3-10).
- For the second time and beyond that the sensor is connected with the control panel, the operation screen or [Sensor Setup Menu] screen opens.

● When connecting to the sensor with set IP address

Press [Connect].



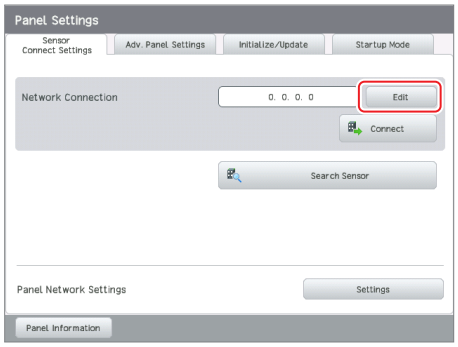
The panel connects to the sensor and the run screen or the [Sensor Setup Menu] screen opens.

Specifying Sensor to be Connected by IP Address

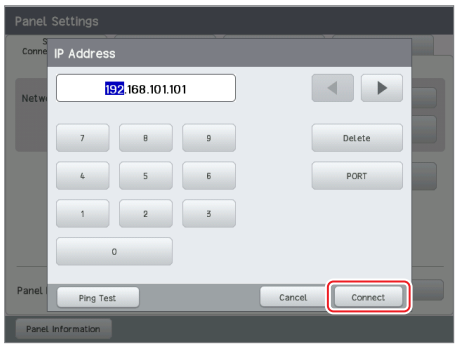
Used when the IP address of the sensor to be connected is defined beforehand.

1 Turn on the power of the sensor.

2 Press [Edit].



3 Enter the IP address of the sensor to be connected and press [Connect].



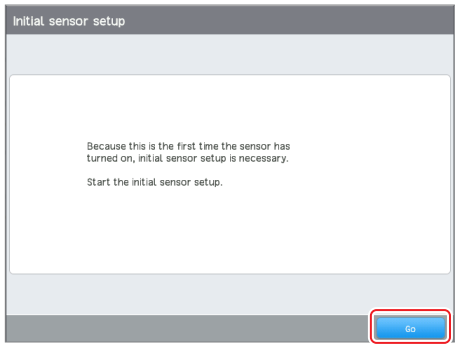
The run screen or the [Sensor Setup Menu] screen opens.

Reference When the connection with the sensor is unavailable, refer to “When the connection cannot be established by specifying the sensor” (page A-17).

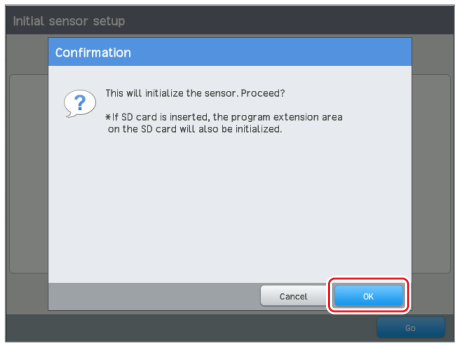
Operation for Initial Startup of the Sensor

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 2-18).

1 Press [Go].



2 Press [OK].

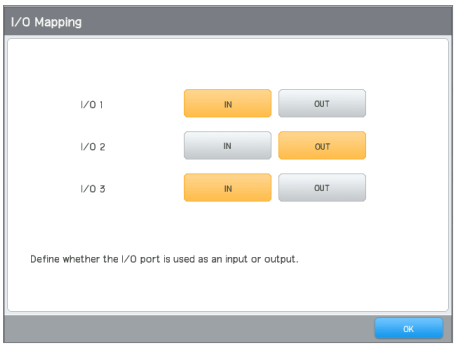


The “Initial sensor setup” begins.
When completed, the [Polarity] screen opens.

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

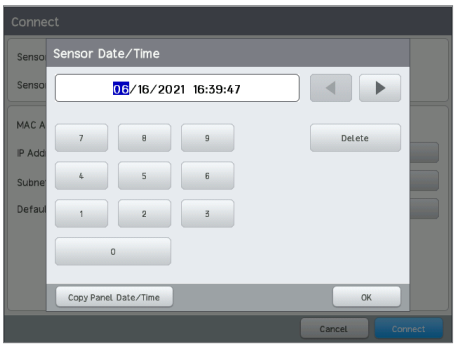


Set the I/O ports only when using Built-in amplifier type sensor.



- **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.

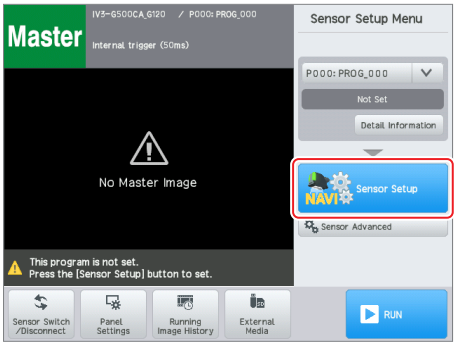
4 Set the current date and time, and press [OK].



- Move to the item to be set with the ◀/▶ buttons and enter the numbers.
- Press the [Delete] button to reset the display of the selected item.
- Press [Copy Panel Date/Time] to use the time that is set in the control panel for the sensor.

The [Sensor Setup Menu] screen opens.

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



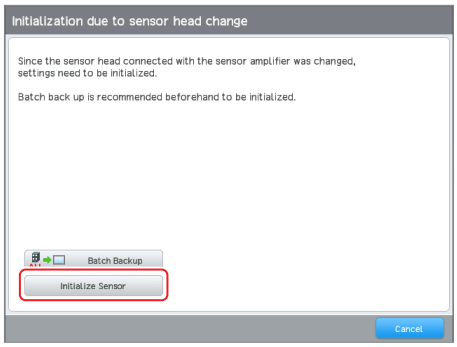
For details, refer to “4 Settings Navigator” (page 4-1).

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. Turn on the control panel and initialize the sensor amplifier following the instructions on the displayed screen.

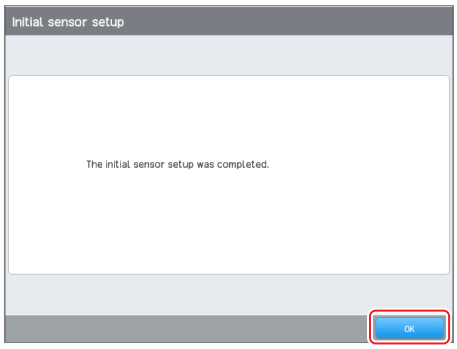
▶ Important **The setting information of the sensor is saved in the sensor amplifier. Before initializing the sensor amplifier, performing [Batch Backup] is recommended.**
For details, refer to “Backing up in a Batch” (page 8-4).

1 Press [Initialize Sensor].



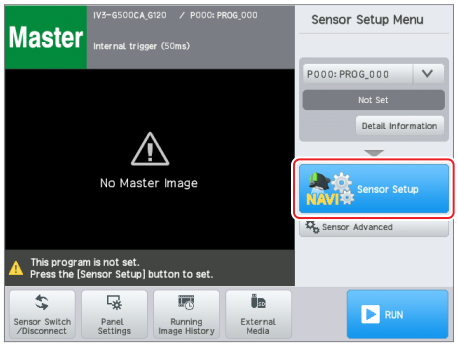
The process to initialize the sensor begins. After initialization is completed, the initialization completion screen opens.

2 Press [OK].



The [Sensor Setup Menu] screen opens.

3 Press [Sensor Setup].

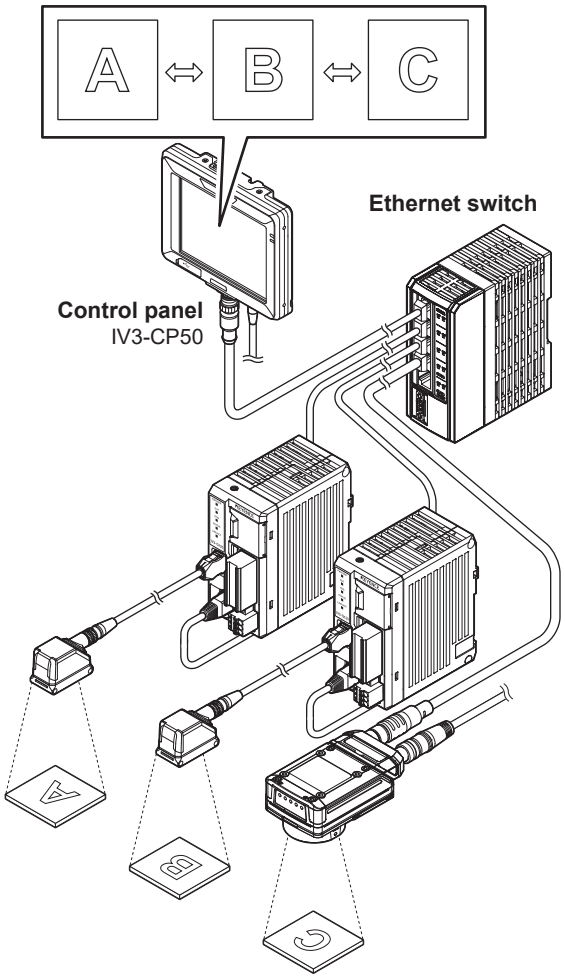


For details of the Settings Navigator, refer to “4 Settings Navigator” (page 4-1).

Switching and Terminating the Sensor to be Connected

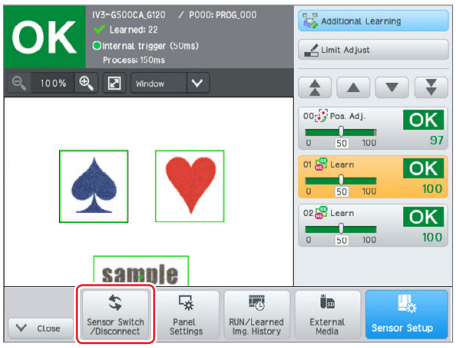
Switching the Sensor to be Connected

When multiple sensors are connected to a control panel, the sensor displayed on the control panel can be changed.



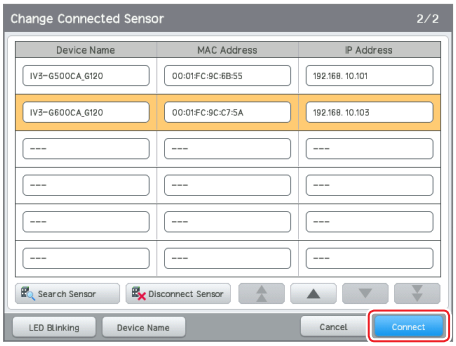
1 **Connect the control panel with the sensor via network connection.**

2 **Display the control panel menu, and press [Sensor Switch/Disconnect].**



The list of sensors connected to the control panel 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 "4 Settings Navigator" (page 4-1).**
- **The sensors displayed on the [Change Connected Sensor] screen are those displayed as the search results of the network search. Sensors added to the network later can be displayed on the list by pressing [Search Sensor].**

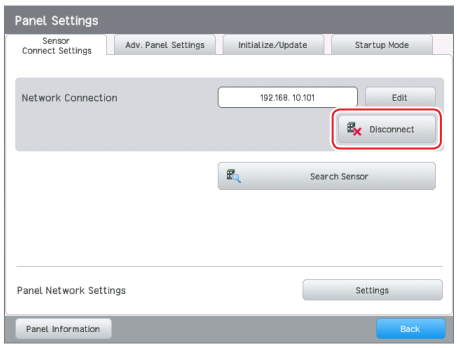
Terminating connection with the sensor

Disconnecting in the [Sensor Connect Settings] screen

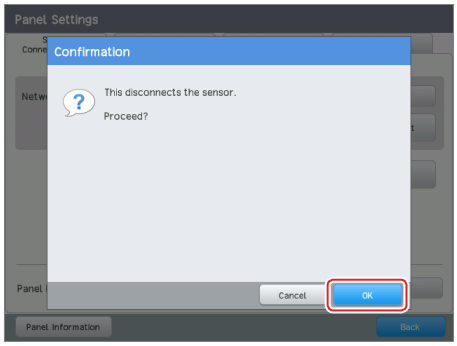
1 **Display the control panel menu and press [Panel Settings].**

“Control panel settings” (page 7-27)

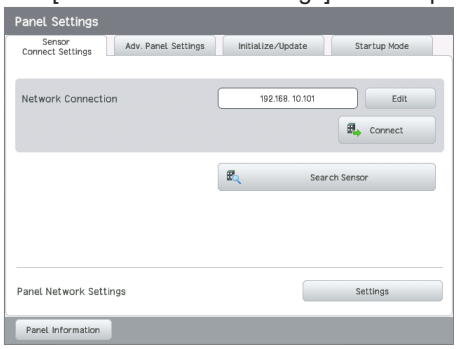
2 **Press [Disconnect] of the [Sensor Connect Settings] tab.**



3 **Press [OK].**



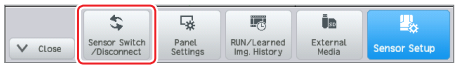
The [Sensor Connect Settings] screen opens.



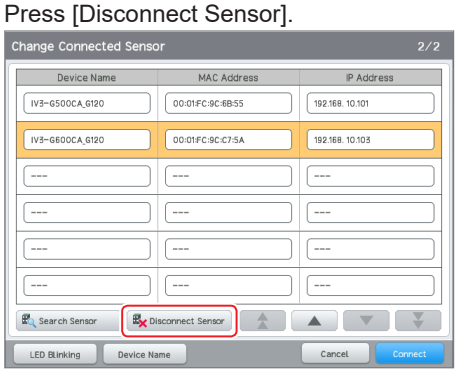
Disconnecting from the [Menu] button

1 **Display the control panel menu, and perform the following.**

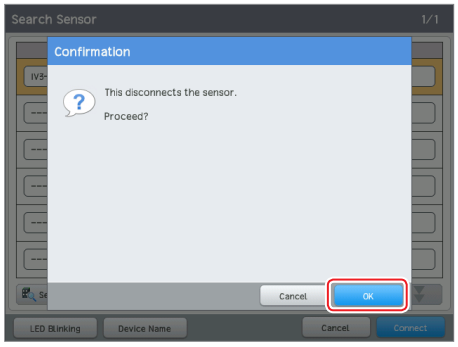
Press [Sensor Switch/Disconnect].



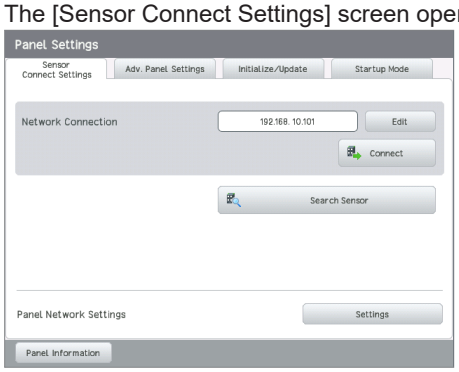
The [Change Connected Sensor] screen opens.
Press [Disconnect Sensor].



2 **Press [OK].**

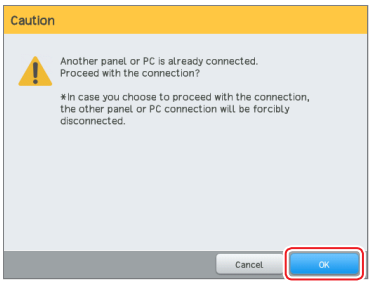


The [Sensor Connect Settings] screen opens.



Connection with a Sensor Currently Connected to Another Device

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



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.

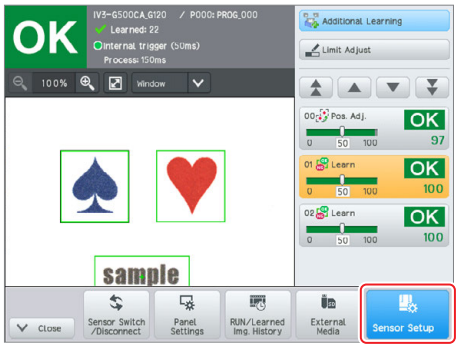
Reference

- The following settings will not be initialized.
  - Polarity (Switching NPN/PNP) (Page 7-19)
  - Cable specification (switching between 12 pin/4 pin) (Page 7-19) (built-in amplifier models only)
  - SD card settings backup (switching between enabled/disabled) (Page 8-23)
  - Network Settings (IP Address / Subnet Mask / Default Gateway / Port number (TCP)) (Page 7-22)
- To initialize the registered programs individually, refer to "Initializing a Program" (page 7-10).

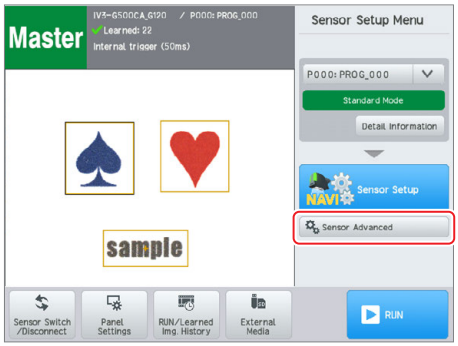
Point

If the SD card settings backup (Page 8-23) 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.

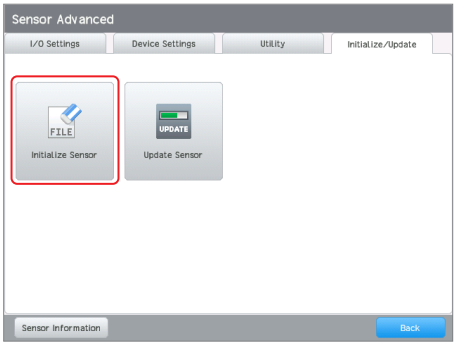
1 Display the control panel menu, and press [Sensor Setup].



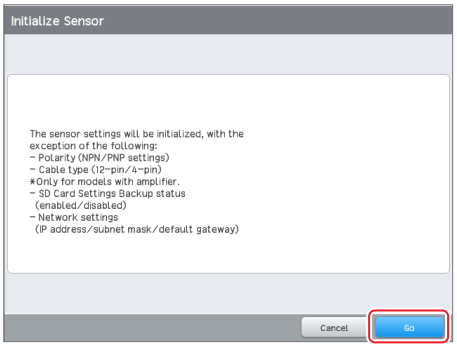
2 Press [Sensor Advanced].



3 Press [Initialize Sensor] of the [Initialize/Update] tab.



4 Press [Go].

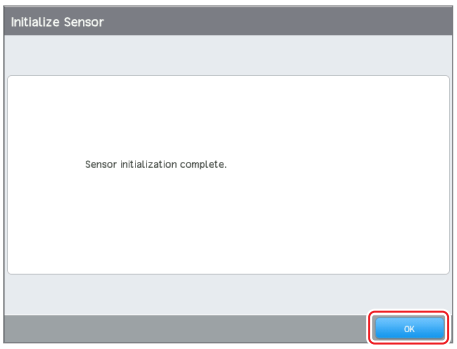


The confirmation screen opens.

5 Press [OK].

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

6 Press [OK].



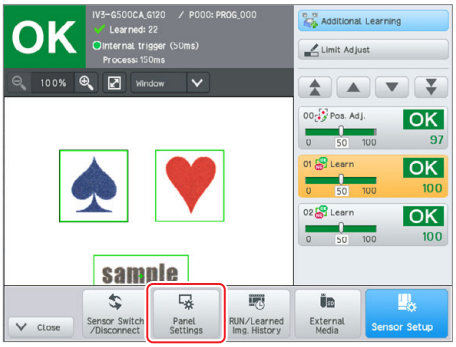
The system returns to the Sensor Advanced screen.

Initialization of the Control Panel

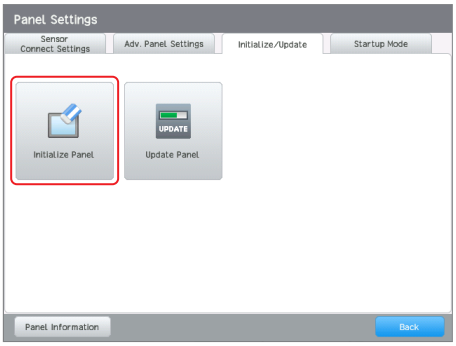
Initializes the information set in the control panel and sets the control panel to the factory default.

Reference The following settings will not be initialized.
- “Language” (page 7-31)
- “Panel Date/Time” (page 7-32)

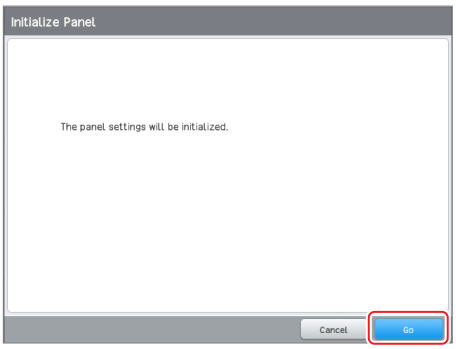
1 Display the control panel menu, and press [Panel Settings].



2 Press [Initialize Panel] of the [Initialize/Update] tab.

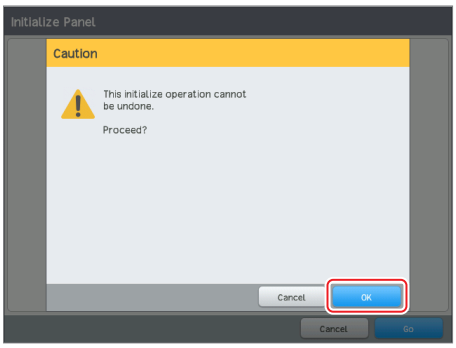


3 Press [Go].



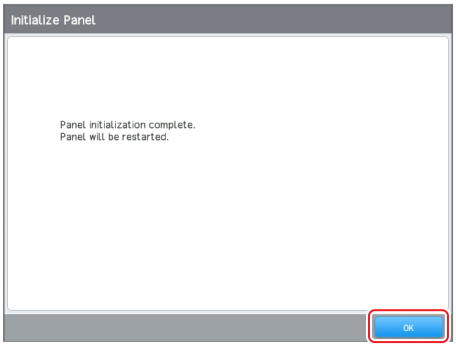
The confirmation dialog opens.

4 Press [OK].



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

5 Press [OK].



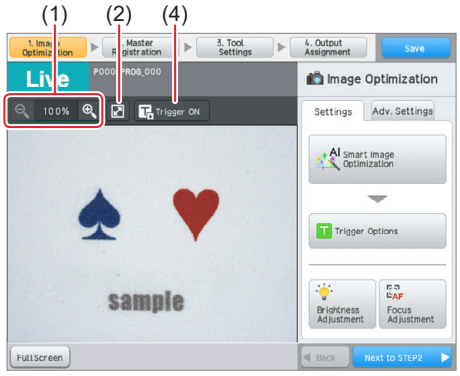
The control panel will re-start.
After restarting, set the display language, date and time, and the connection method with the sensor.
“Operation for initial startup of the control panel” (page 3-6)

Basic operation of the control panel

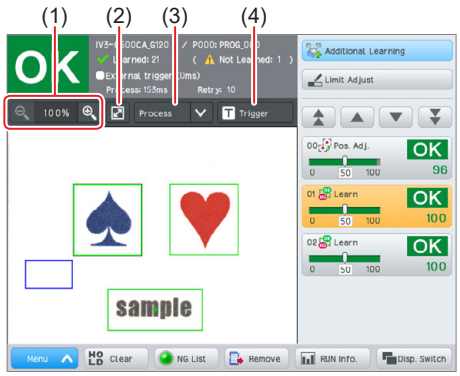
Operation of the Image Tool Bar

This section explains the operation method of the “Image Tool Bar” displayed on the upper part of the image display of the control panel, and the [FullScreen] button displayed at the bottom part.

● Sensor Setup Screen



● Screen while in operation



(1) (Reduce) / (Enlarge) button, display magnification

The display is reduced/enlarged each time you press the button.
Displays the current display magnification.

Reference Enlarging and reducing will be done according to the center of the image.

For operation when enlarging images, refer to the following.
“Operation when Displaying Enlarged Images” (page 3-17)

(2) (Window fit) button

Changes the display magnification to 100%.

(3) Button to switch the display method for tools

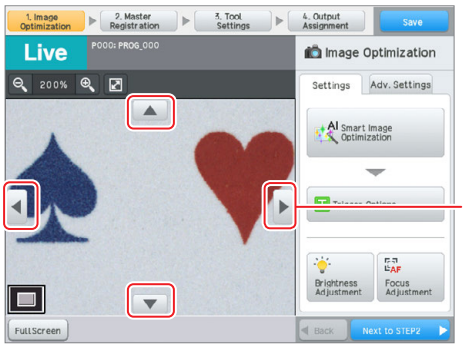
Switches the display method for the tools.
“Selecting the Display Method of the Tool Window” (page 5-11)

(4) [Trigger ON]/[Trigger] button

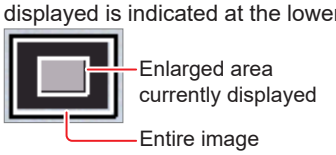
Pressing the button will capture an image using the internal trigger.
“Main Screen for Image Optimization” (page 4-8)

Operation when Displaying Enlarged Images

By pressing the move button, or dragging images while remaining pressed, the image display area will be moved in the direction.

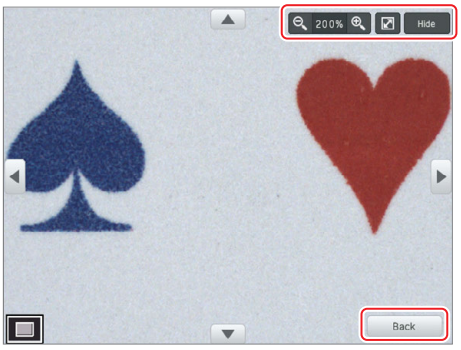


Reference In the enlarged display, the enlarged area currently displayed is indicated at the lower right of the image.



Operation with Full Screen Display of Image

In the full screen display, only the image and image tool bar are displayed.



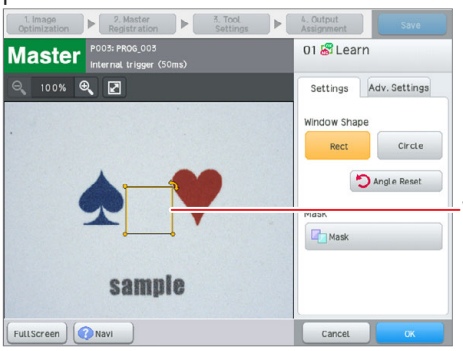
- By pressing [Hide], the image tool bar can be hidden. By pressing [Show], the image tool bar can be displayed again.
- By pressing the [Back] button, the control panel will exit full screen display mode.

Editing the Window

The window displayed when the tool (standard mode) or the part (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 [Learning Tool Settings] of the Settings Navigator.

A window will be displayed at the center of the control panel.

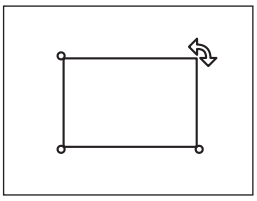


2 Set the window.

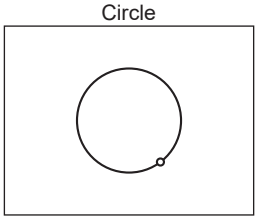
● Selecting the shape of the window

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

□ Rect

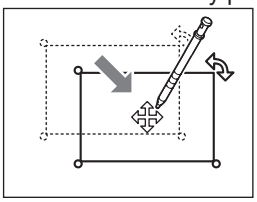


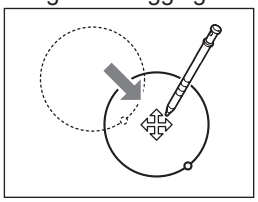
Circle



● Moving the window

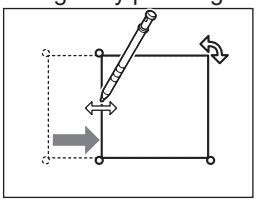
By pressing inside the window, ✥ will be displayed.
Move the window by pressing and dragging it.



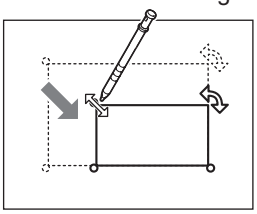


● Changing the size of the window

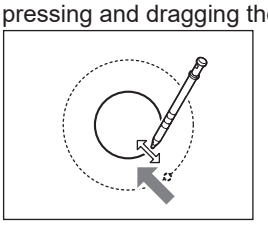
By pressing either side of the window, ↕ or ↔ will be displayed. The height or width of the window can be changed by pressing and dragging it.



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.

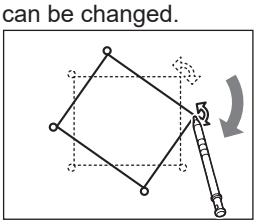


When [○ Circle] is selected in the window shape settings, the size of the circle can be changed by pressing and dragging the outline of the circle.



● 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.



Point

The operations when an image is enlarged by the (Enlarge) button are as follows.

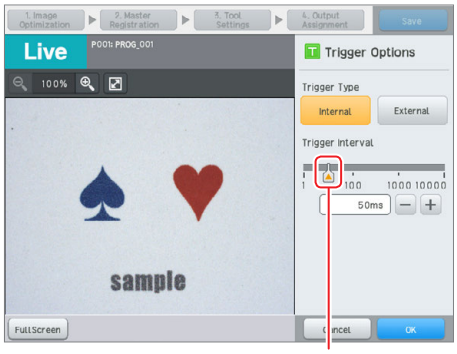
- **Slide the slider while pressing inside the tool window to move the tool window.**
- **Slide the slider while pressing outside the tool window to change the image display position.**

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

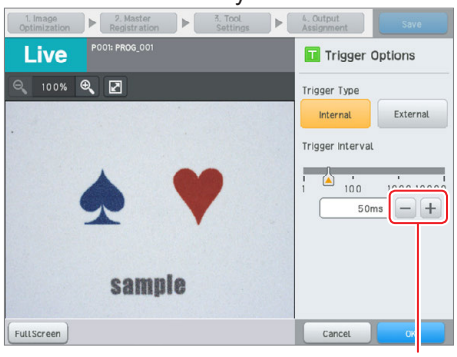
Press the slider, and then slide it to the right or left to set the number.



Slider

Setting by the [-] / [+] button

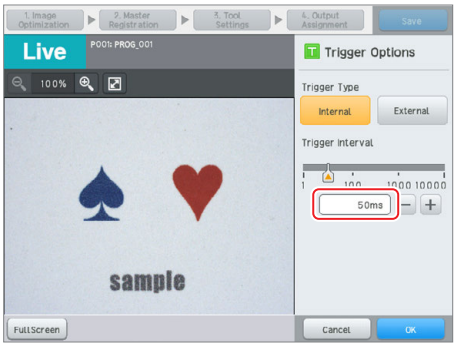
By pressing [-] / [+], the number decreases/increases. By pressing and holding, the number decreases/ increases continuously.



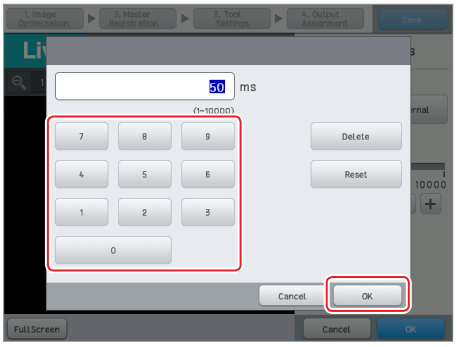
[-]/[+] button

Setting by inputting a value

1 **Press the number field.**



2 **Enter a number and press [OK].**



- By pressing the [Delete] button, the last digit of the number can be deleted.
- By press the [Reset] button, the number before edit can be recovered.

Point **The range to be entered is displayed in the number input screen. A number that exceeds the range to be entered cannot be input.**

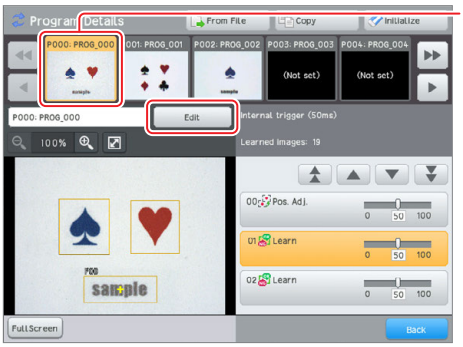
Inputting characters

The programs or tools to be displayed on the control panel can be given a user-defined name.
This section explains how to input characters using the example of [Program Name].

1 On the [Sensor Setup Menu] screen, press [Detail Information].

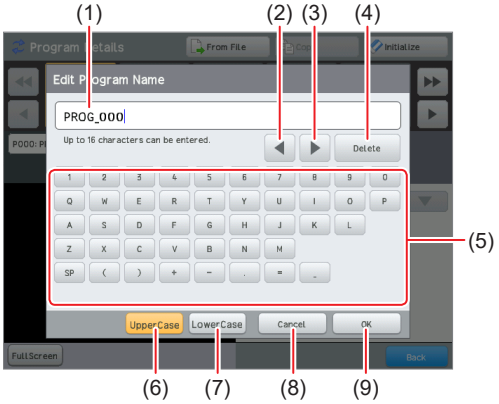


2 Select the program to change the name and press the [Edit] button.



Select the program

3 Edit the program name.



(1) Name

Display the name of the program.

(2) ◀ button

Moves the cursor position to the left.

(3) ▶ button

Moves the cursor position to the right.

(4) [Delete] button

Deletes one character to the left of the cursor.

(5) Character button

Inputs the character that is tapped.
According to the selection of the [Upper-case] or [Lower-case] button, the characters that can be input will be different.

(6) [UpperCase] button

Switches the character to be input to uppercase.

(7) [LowerCase] button

Switches the character to be input to lowercase.

(8) [Cancel] button

Discard the character input contents, and close the character input screen.

(9) [OK] button

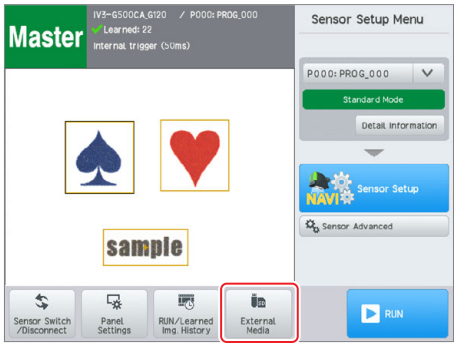
Save the character input contents, and close the character input screen.

4 After editing the name has completed, press [OK].

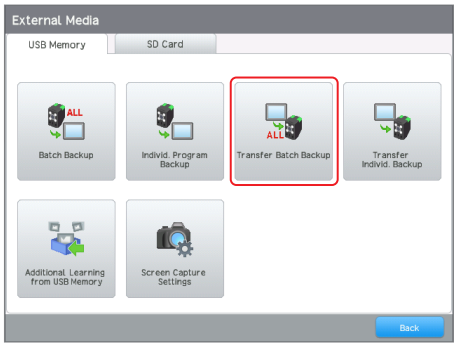
Selecting the File/Folder in the USB Memory

This section explains how to select a file in the USB memory connected to the control panel using an example of [Transfer Batch Backup].

1 Press [External Media] in the [Sensor Setup Menu] screen.



2 Press [Transfer Batch Backup].

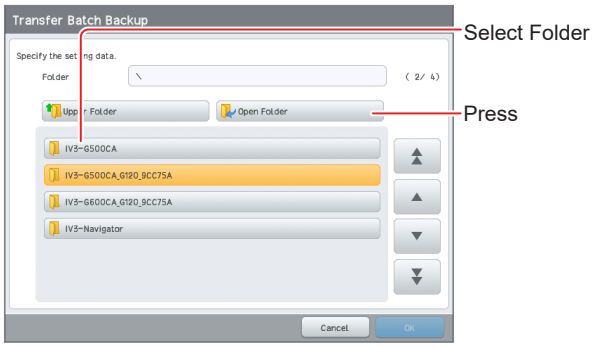


The confirmation screen opens.

3 Press [OK].

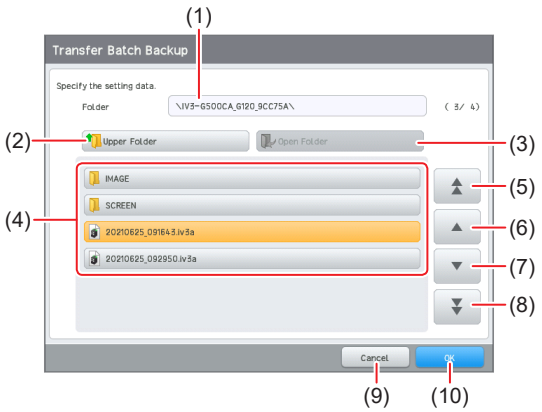
The folder and file in the USB memory are displayed.

4 Select the folder that stores the data and press [Open Folder].



The folder and file stored in the selected folder will be displayed.

5 Select the file to be sent.



(1) Folder display

Displays the path of currently displayed folder.

(2) [Upper Folder] button

By pressing the button, you can go to the upper hierarchy of currently displayed folder.

(3) [Open Folder] button

By pressing the button when selecting a folder, you can open the folder.

(4) File / Folder display

Displays the files and folders stored in the currently displayed folder.

(5) button

Moves to the last page in the folder.

(6) button

Changes which file or folder is selected, moving in the upward direction.

(7) button

Changes which file or folder is selected, moving in the downward direction.

(8) button

Moves to next page in the folder.

(9) [Cancel] button

Cancels the setting and returns to the [External Media] screen.

(10) [OK] button

Determines the file selection.

6 After selecting a file, press [OK] and proceed to the next setting.

MEMO

4

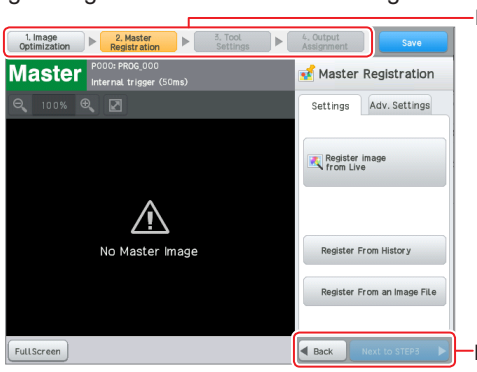
Settings Navigator
(Setting the Status Conditions)

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).....4-18
3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode).....4-25
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).....4-151

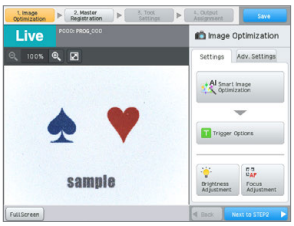
Settings Navigator

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 buttons according to the Settings Navigator guide.



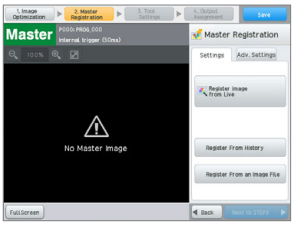
Reference
- In the case of [Standard Mode], step 3 becomes [Tool Settings].
- In the case of [Sorting Mode], step 3 becomes [Part Registration].

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 4-18)



Step 3: Tool settings

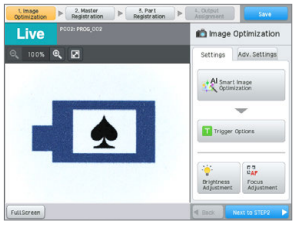
Set tools to judge a target.
Set the tools onto the master image and set the threshold for judgment. Up to 65 detection tools and position adjustment tools in one program can be set.
“3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-25)



Step 4: Output assignment

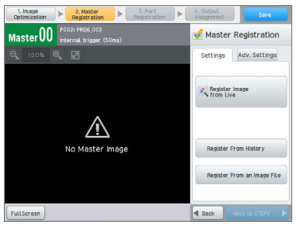
Assign the content to output to each output line.
“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

Flow of the Settings Navigator: Sorting Mode



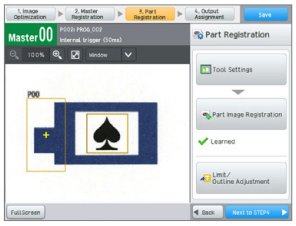
Step 1: Image optimization settings

Set the image optimization settings for clearly imaging a target. Adjust the image settings to clearly define the difference of the target part type.
Set the trigger options, adjust the brightness and camera focal distance.
“1. Image Optimization (Clearly Image a Target)” (page 4-8)



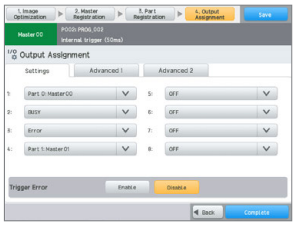
Step 2: Registration of a master image

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 4-18)



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 4-151)

Basic operation of the Settings Navigator

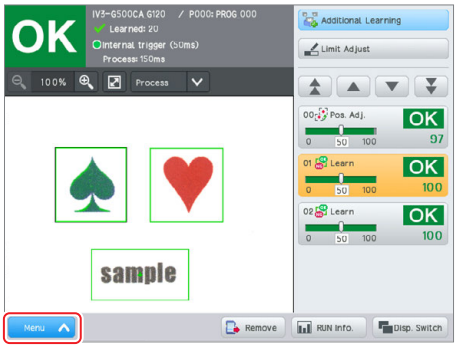
Starting the Settings Navigator

1 Turn on the power of the sensor and control panel.

When the sensor is in one of the following conditions, the [Sensor Setup Menu] screen will be displayed. Proceed to step 5.

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

2 Press [Menu].



The menu bar opens.

3 Press [Sensor Setup].

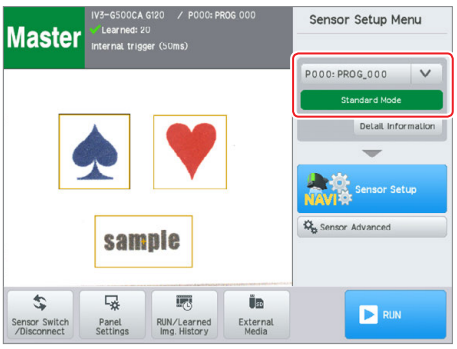


The confirmation screen opens.

4 Press [Yes].

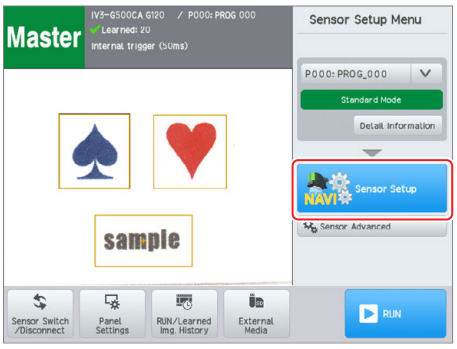
The [Sensor Setup Menu] screen opens.

5 Select the program to be set.



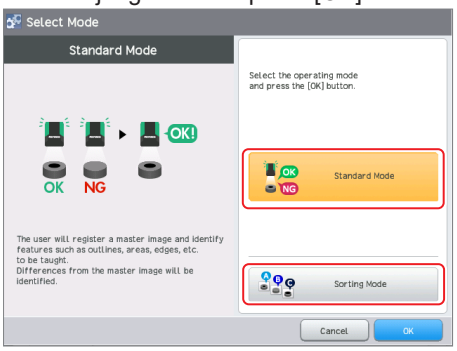
“Changeover for a Target (Program Functions)” (page 7-3)

6 Press [Sensor Setup].

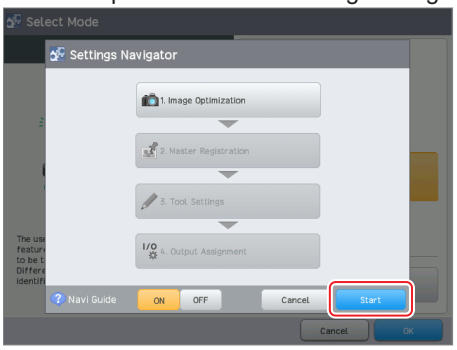


● When a program which has not been set is selected

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



The startup screen of the “Settings Navigator” opens.

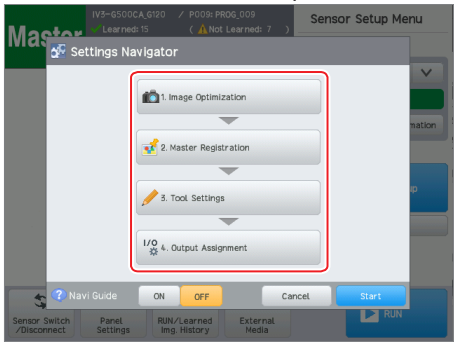


Press [Start] and start setting [1. Image Optimization].

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

● When the program which has been set is selected

The startup screen of the “Settings Navigator” opens. Press the button for the step to be viewed.



The Settings Navigator screen opens.

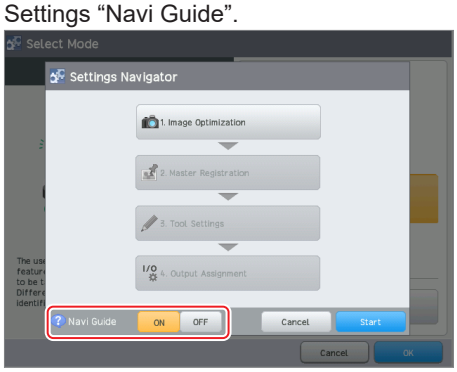
- “1. Image Optimization (Clearly Image a Target)” (page 4-8)
- “2. Master Image Registration (Registering an Image as a Reference)” (page 4-18)
- “3. Tool Settings (Setting the Judgment Method of the Target of Standard Mode)” (page 4-25)(Standard Mode)
- “3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121) (Sorting Mode)
- “4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

Point **When changing the set program from standard mode to sorting mode, or from sorting mode to standard mode, initialize the program once.**

“Initializing a Program” (page 7-10)

● Settings “Navi Guide”

Select [OFF] or [ON] and change the display of the Settings “Navi Guide”.



By selecting [ON], [Settings Navi Guide] opens automatically according to the step progress of the Settings Navigator or operation contents.
[Settings Navi Guide] is displayed automatically only once during the initial setup. By finishing the Settings Navigator and restarting, it will appear again.
By pressing Navi displayed in the screen, [Settings Navi Guide] can be displayed at any time.

Image Types of the Settings Navigator

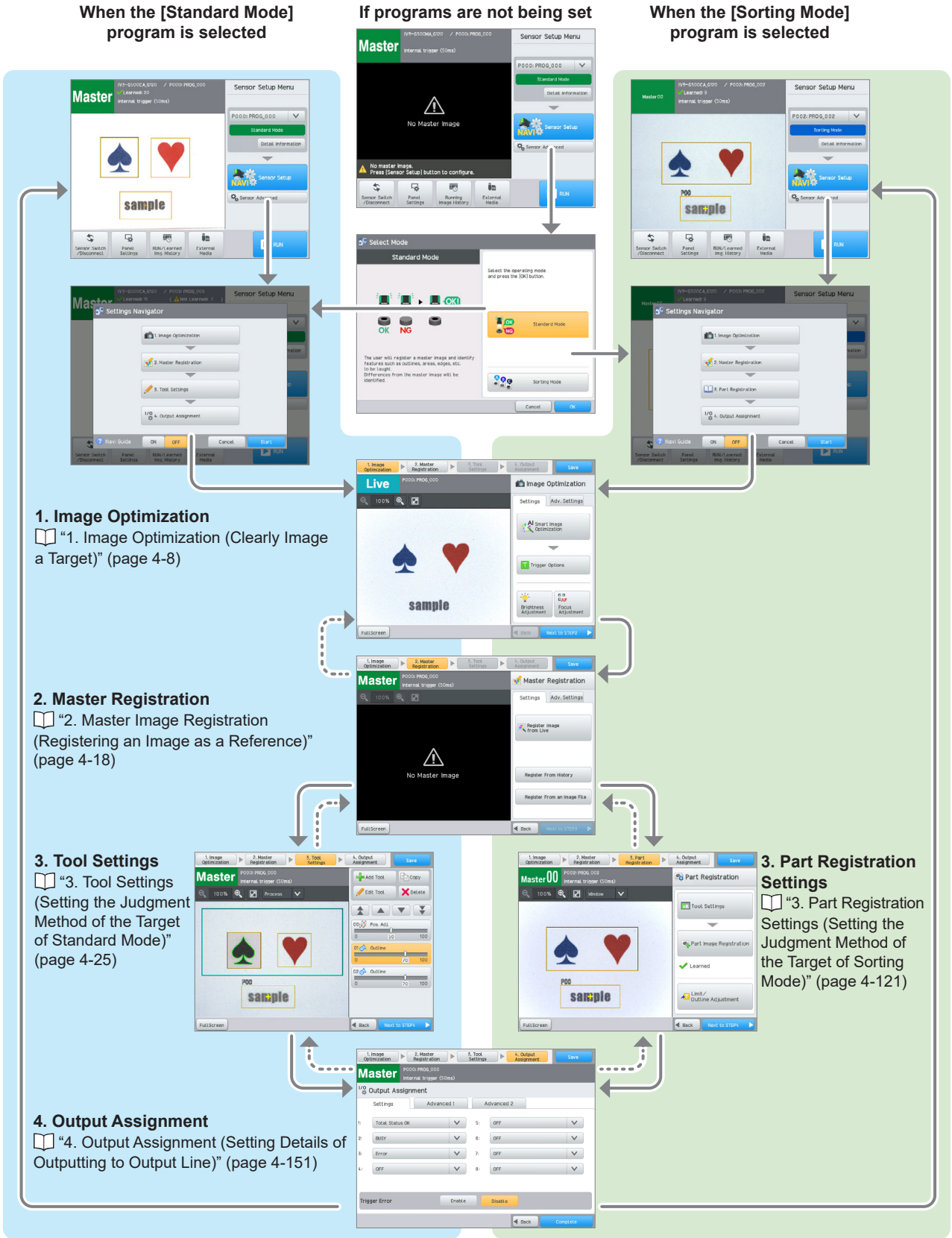
The image types displayed in the Settings Navigator screen are as follows.



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 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 set on each setting screen and its operations, refer to the applicable sections.



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].

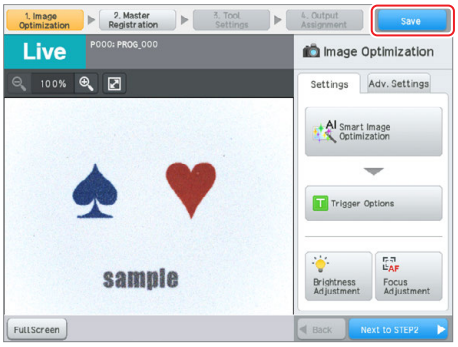
The settings in the Settings Navigator will be saved and the system returns to the [Sensor Setup Menu] screen.

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 the step

1 Press [Save].



● When the required settings are completed

The confirmation dialog to save appears.

● When the required settings are not completed

The confirmation dialog to finish opens.

- By pressing [Yes], the confirmation dialog to save appears.
- By pressing [No], the system returns to the Settings Navigator screen.

Point

The required settings have not been completed yet. Even if [Yes] 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 and the system returns to the [Sensor Setup Menu] screen.

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 settings used for taking an image of the target. Adjust the image 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

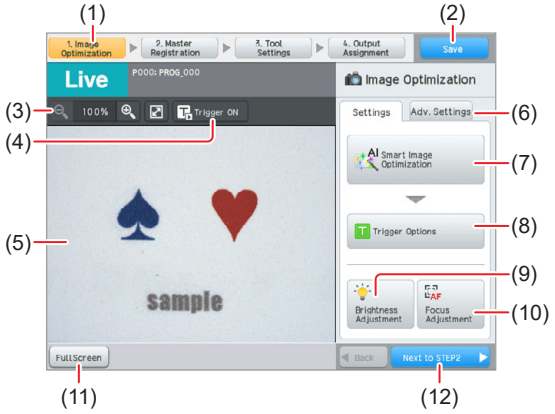
Adjusts the focus of lens. Adjusts for clearly imaging the shape of a target. Auto focus can adjust the focusing position automatically.
“Focus Adjustment” (page 4-14)

Point

When the master image is registered and image optimization other than Trigger Options 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 4-18)

Main Screen for Image Optimization

This section explains the main screen for Image Optimization.



(1) Navigation button
Moves steps in the Settings Navigator.

(2) [Save] button
Finishes the Settings Navigator and returns to the [Sensor Setup Menu] screen.

(3) Image tool bar
“Operation of the Image Tool Bar” (page 3-17)

(4) [Trigger ON] button
If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Enable], the [Trigger ON] button will be displayed.
Pressing the button will capture an image using the internal trigger. Press this button to image a target in a situation where an external trigger cannot be input.
“Internal Trigger Control with IN1 Input” (page 7-17)

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

(6) [Adv. Settings] tab
Displays the advanced settings menu for image optimization.
“Advanced settings for the image optimization” (page 4-15)

(7) [Smart Image Optimization] button
Selects one of the AI-recommended image optimization.
“Settings of Smart Image Optimization” (page 4-9)

(8) [Trigger Options] button
Adjusts the settings for the Trigger Options.
“Setting the Trigger Options” (page 4-10)

(9) [Brightness Adjustment] button
Adjusts brightness.
“Brightness Adjustment” (page 4-12)

(10) [Focus Adjustment] button
Automatically adjusts focus.
“Focus Adjustment” (page 4-14)

(11) [FullScreen] button
“Operation with Full Screen Display of Image” (page 3-17)

(12) [Next to STEP2] button
Proceeds to “2. Master Registration”.
“2. Master Image Registration (Registering an Image as a Reference)” (page 4-18)

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
Focal Point		To determine the optimized image, specifies 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 the Specify Target Area screen. Used when adjusting settings to generate optimized images using AI again.

Setting Smart Image Optimization

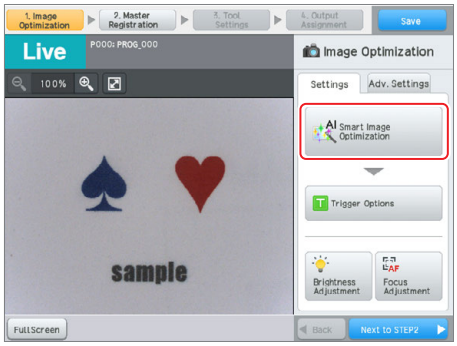
1 Start the Settings Navigator.

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

2 Display the main screen for Image Optimization.

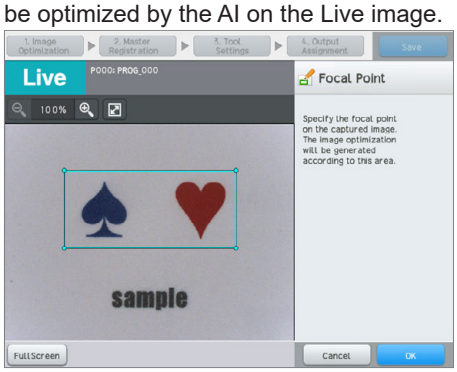
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Smart Image Optimization].



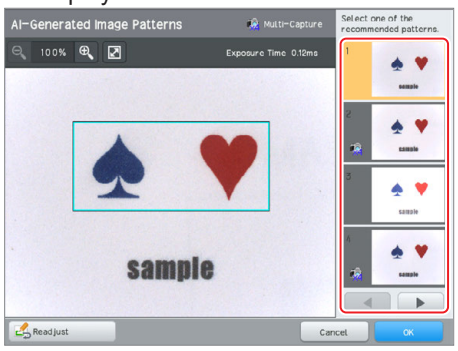
4 Specify the target area.

To determine the optimized image, specify the area 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.**

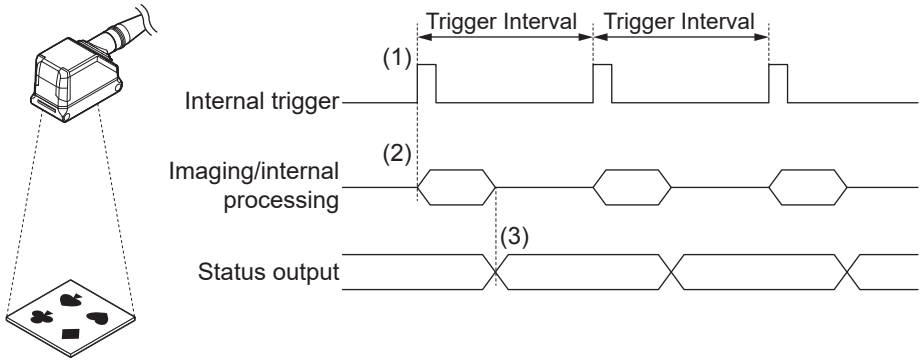
6 Select one optimized image, and press [OK].

The system returns to the main screen for Image Optimization.

Setting the Trigger Options

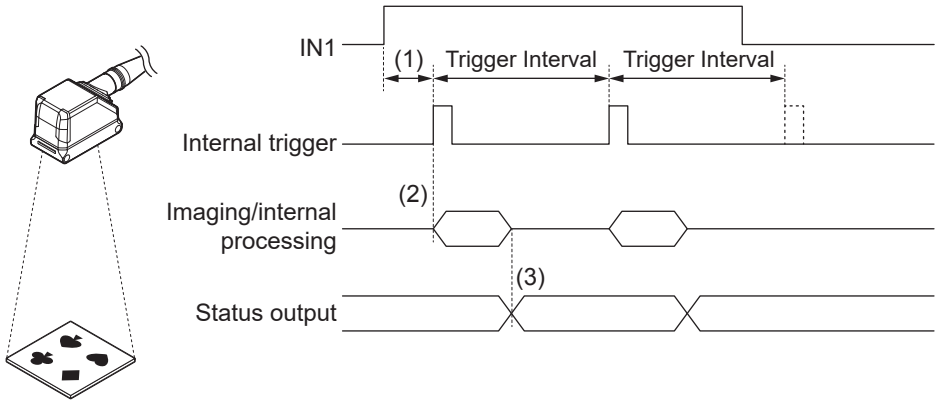
A trigger in this manual indicates the timing to start imaging with the built-in camera of the sensor. In the Trigger Options, set the timing to image a target within the field of view of this device. This device can image a target at any timing and can image continuously.

● 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.

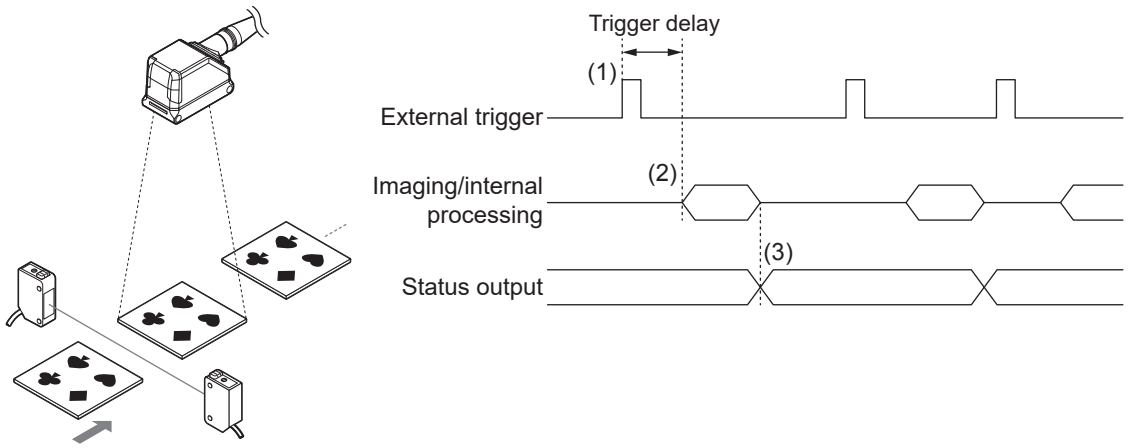
❍ If [Internal Trigger Control with IN1 Input] is set to [Enable]



(1) The trigger will be input within the period of “within internal trigger intervals +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 7-17)

● 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] is selected in the trigger type setting. Set an interval (cycle) at which the sensor automatically images.
Trigger Delay	Set when [External] 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

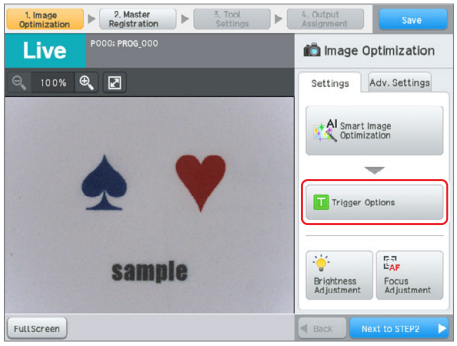
1 Start the Settings Navigator.

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

2 Display the main screen for Image Optimization.

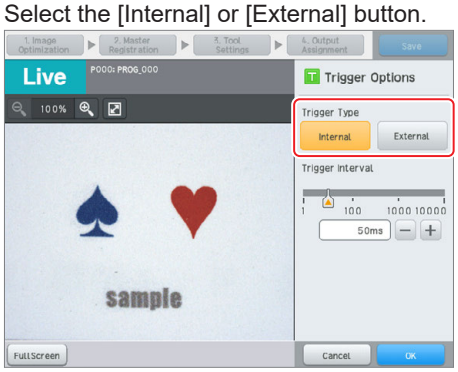
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Press [Trigger Options].



4 Select the trigger type.

Select the [Internal] or [External] button.



Internal (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	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.

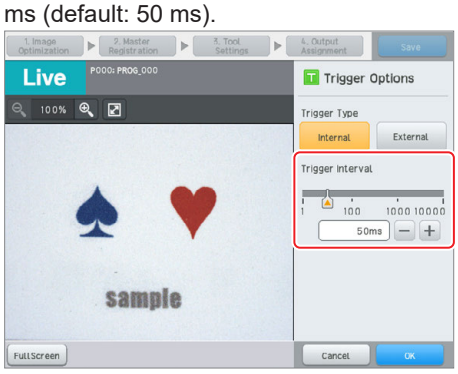
5 Set [Trigger Interval] or [Trigger Delay].

Reference The setting of [Trigger Interval] and [Trigger Delay] can be changed by using the slider or inputting the value.

“Editing Numbers” (page 3-19)

● When [Internal] is selected in step 4

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



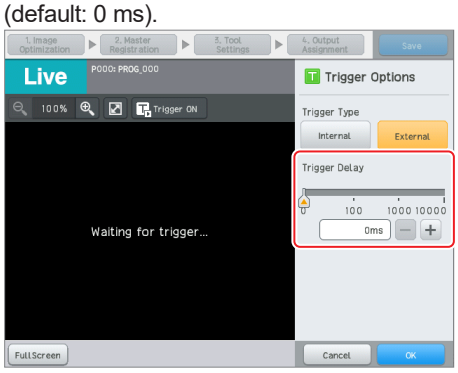
Point

- **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 10-3)
“Error Messages” (page A-9)

● When [External] is selected in step 4

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



6 Press [OK].

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

Brightness Adjustment

When modifying the optimized image selected by Smart Image Optimization, or when performing fine adjustment for the brightness, the brightness adjustment can be set. The target can be imaged with an appropriate brightness by adjusting the light intensity, exposure time, imaging mode, and lighting advanced settings according to the shape and surface condition (color, shininess, material) of the target.

Brightness adjustment settings

Items		Description
Auto 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	Selects imaging mode for sensor.
	Brightness	Adjust brightness of an image manually.
Advanced Lighting	Internal Lighting	Selects ON/OFF on the built-in light of the sensor.
	Ext. Light Unit	Selects ON/OFF for the AI Lighting unit (only when connecting the unit).
	Multi-Capture	Selects whether to perform multiple imaging, and its capture pattern when performed.

Adjusting Brightness

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

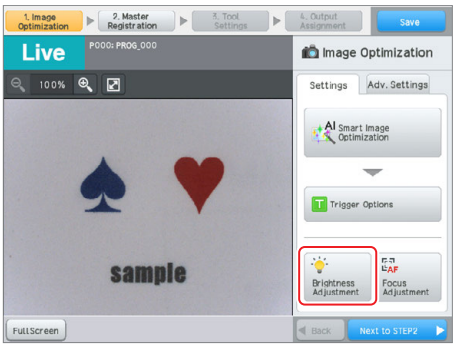
1 Start the Settings Navigator.

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

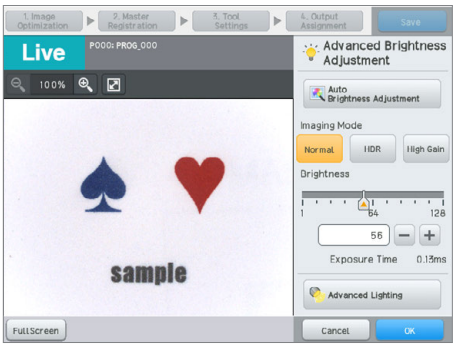
2 Display the main screen for Image Optimization.

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

3 Press [Brightness Adjustment].



4 Adjust the brightness.



● Adjusting brightness automatically

By pressing [Auto 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 [Auto Brightness Adjustment] button are too bright or dark due to the influence of the image brightness other than the specified position.

● Adjusting brightness manually

Adjust the brightness manually according to the combination of the imaging mode and brightness slider.
“Editing Numbers” (page 3-19)

Imaging Mode	• 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 Replace image quality due to high gain.
Brightness	Default value: 20

Reference
- During the auto brightness adjustment, the sensor automatically images a target by inputting the internal trigger regardless of the Trigger Options settings.
- Auto brightness adjustment optimizes the imaging mode and brightness automatically.
- The exposure time will be calculated automatically.

● Performing lighting advanced settings

“Advanced Lighting” (page 4-13)

5 **Press [OK].**

Point **When the master image is registered and settings other than Trigger Options and imaging area are changed, a 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 4-18)

6 **Press [OK].**

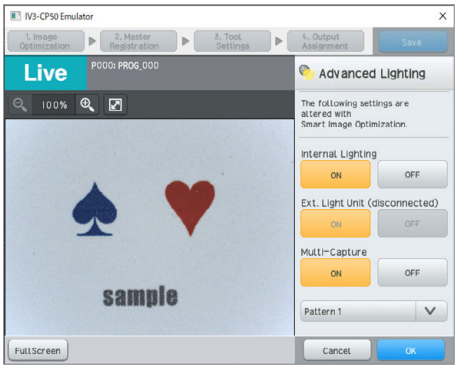
The system returns to the main screen for the Image Optimization.

■ Advanced Lighting

Sets ON/OFF for the internal light, ON/OFF for the AI Lighting unit (only when connecting the unit), multiple imaging ON/OFF, and capture pattern.

1 **Press [Advanced Lighting].**

2 **Set the advanced lighting pattern.**



● Selecting ON/OFF for the internal light

Internal Lighting	• 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 AI Lighting unit

Ext. Light Unit (only when connected)	• ON (default) Turns on the AI Lighting unit. • OFF Turn off the AI Lighting unit.

● Selecting multiple imaging 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	• ON Multiple Imaging is performed. • OFF (default) Multiple Imaging 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 resulted from multi-capture, if the target moves during its capturing, the image will not be combined correctly.**

● Selecting the pattern when turning ON multiple imaging

Pattern 1 to 4	Selects a pattern based on the brightness of the images obtained from multiple imaging.

3 **Press [OK].**

Focus Adjustment

The focus adjustment can be performed when modifying the focus position of the optimized image selected by Smart Image Optimization or when adjusting the focus finely. Adjusts the focusing position for clearly imaging the shape of a target.

Focus adjustment settings

Items	Description
Automatic Focus Adjustment	Adjusts the focusing position automatically.
Manual Focus Adjustment	Adjust the focus position by the slider.

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.**

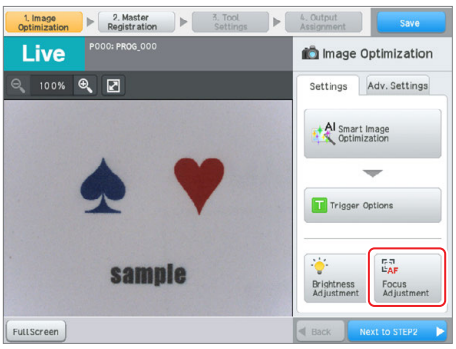
1 Start the Settings Navigator.

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

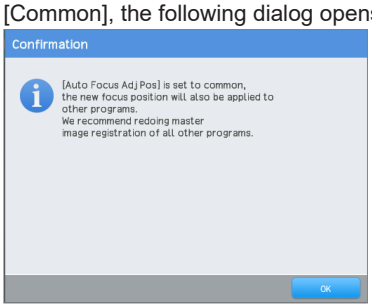
2 Display the main screen for Image Optimization.

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

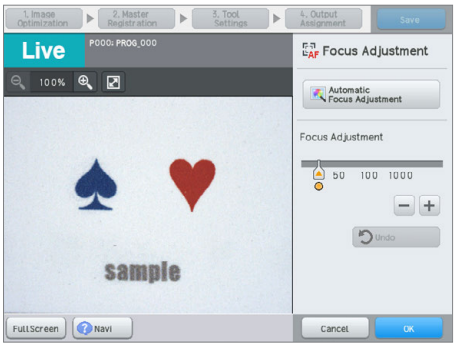
3 Press [Focus Adjustment].



Reference When the [Auto Focus Adj Pos] (Page 7-25) is set to [Common], the following dialog opens.



4 Adjust the focusing position.



● Adjusting the focusing position automatically

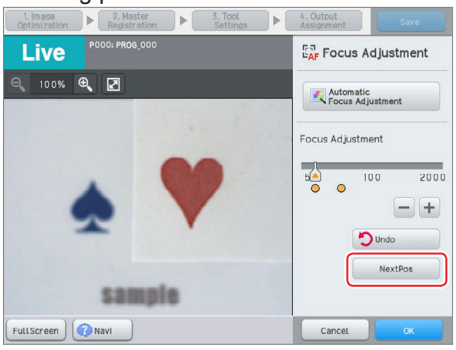
When [Automatic Focus Adjustment] is pressed, the focusing position is adjusted automatically.

● Adjusting the focusing position manually

Adjust the focus position by the slider.
“Editing Numbers” (page 3-19)

● When multiple focusing positions exist

When there are multiple focusing positions, the sensor adjusts to the position closest to the sensor. The available focusing positions will be indicated with (●) mark.
To change the focusing position to a different position, press the [NextPos] button or the indicator (●) of the focusing position.



5 Press [OK].

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

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 4-16) is set, imaging will be performed with the flash lighting.
- Auto adjustment searches the positions that can be focused over the entire area.

Advanced settings for the image optimization

Adjusts the image optimization settings using the advanced settings menu.

Advanced settings items for the image optimization

Items		Description	Ref.
Digital Zoom	Zoom Magnification	Set the magnification of digital zoom.	4-15
	Zoom Area	Specify an area in the sensor's field of view as the zooming area.	
Lighting Mode		Select lighting mode for the light.	4-16
Filter/Correction	Distortion Correction (Wide view type only)	Correct image distortion.	4-16
	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.	

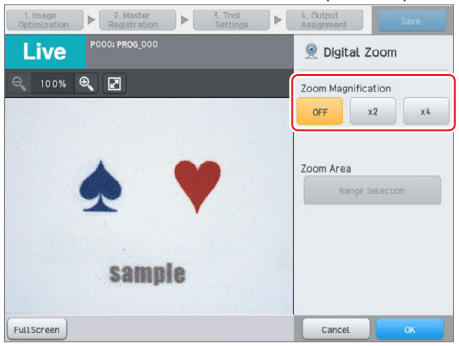
Point **When the master image is registered and the advanced settings for the image optimization are changed, the confirmation message that recommends you to re-register the master image opens. Press [OK] and re-register the master image.**
"2. Master Image Registration (Registering an Image as a Reference)" (page 4-18)

Digital Zoom

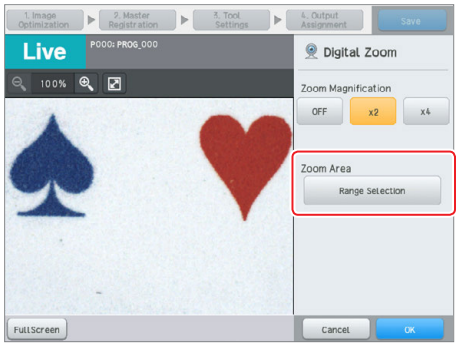
1 Select the [Adv. Settings] tab.
"Main Screen for Image Optimization" (page 4-8)

2 Press [Digital Zoom].

3 Select [Zoom Magnification].
You can select one from OFF (default)/x2/x4.

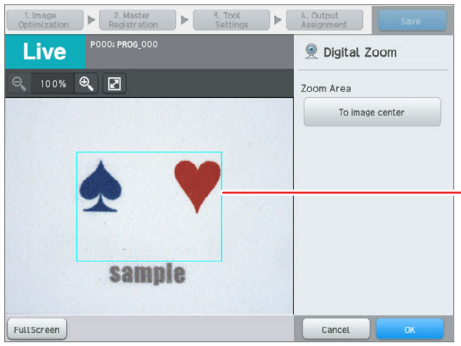


4 Set [Zoom Area] as needed.



● **Zoom Area**

The zoom area for digital zoom is specified.
On the image, create an enclosure around the area you want to zoom.



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.**

5 Press [OK].

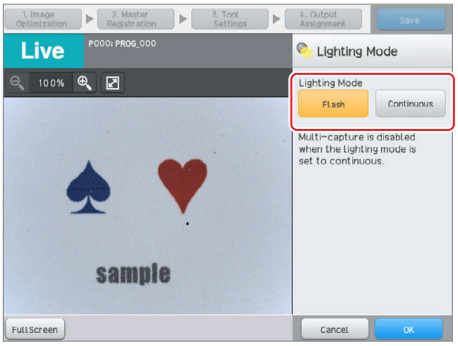
Lighting Mode

1 **Select the [Adv. Settings] tab.**

“Main Screen for Image Optimization” (page 4-8)

2 **Press [Lighting Mode].**

3 **Select the lighting mode.**



Lighting Mode	• Flash (default) The built-in light lights within the exposure 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.**

4 **Press [OK].**

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

Point

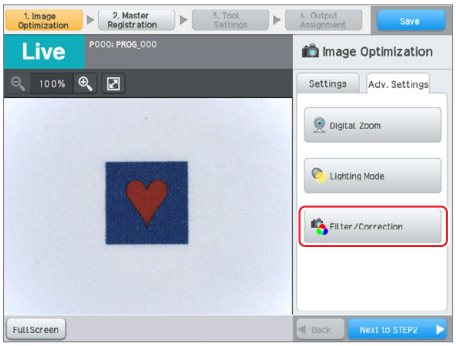
Color filters are not applied to the following:

- **Learning tool**
- **Color Area tool**
- **Color average tool**
- **Color Prohibitation/Brightness Prohibitation tool**
- **Blob Count tool**

1 **Select the [Adv. Settings] tab.**

“Main Screen for Image Optimization” (page 4-8)

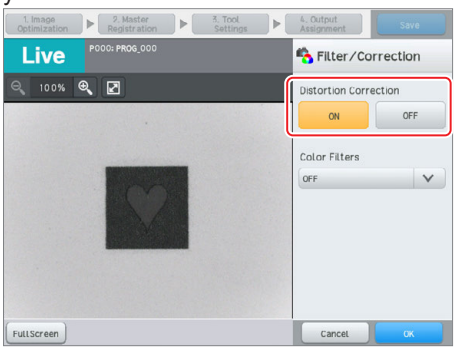
2 **Press [Filter/Correction].**



The image changes to monochrome. In the example in the figure above, the red and blue outlines become unclear.

3 **Select ON/OFF for distortion correction.**

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



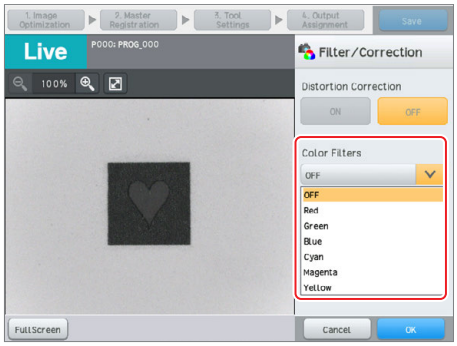
Distortion Correction	• ON (default) The distortion correction is performed. • OFF The distortion correction is not performed.

Point

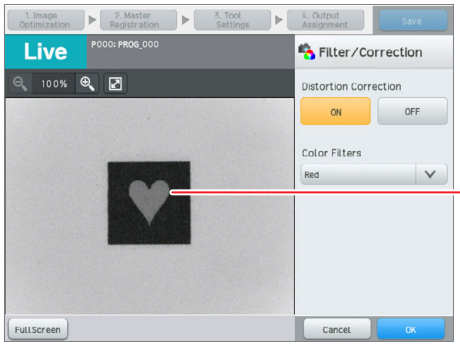
When distortion correction is ON, the processing time may slow down.
For the standard model, it cannot be turned ON.

4 Select the color to apply the color filter.

Select the filter for the color or the complementary color to be detected. Select red here.



The color filter corresponding to the selected color will be applied. The red color becomes brighter and the outline with the blue color becomes clear.



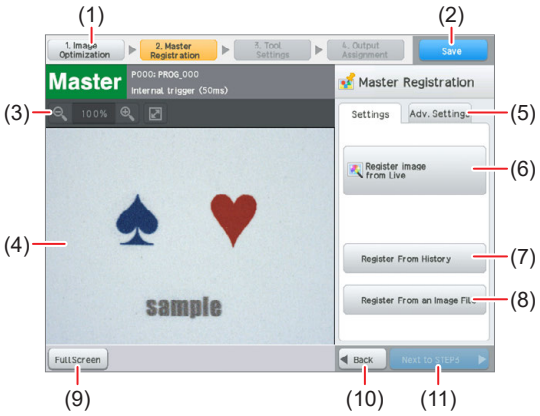
Clarified outline

5 Press [OK].

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

Main screen for Master Registration

This section explains the main screen for the Master Registration.



(1) Navigation button
Moves steps in the Settings Navigator.

(2) [Save] button
Finishes the Settings Navigator and returns to the [Sensor Setup Menu] screen.

(3) Image tool bar
“Operation of the Image Tool Bar” (page 3-17)

(4) Master Image
Displays the master image. If no master image is registered, [No Master Image] will be displayed.

(5) [Adv. Settings] tab
Displays the advanced settings menu for Master Registration.
“Advanced Settings for the Master Image Registration” (page 4-22)

(6) [Register image from Live] button
Registers an image taken by the sensor as the master image.
“Register Live Image as Master” (page 4-18)

(7) [Register From History] button
Registers an image from the image history as the master image.
“Register From a Running Image History” (page 4-19)

(8) [Register From an Image File] button
Registers an image in USB memory as the master image.
“Register From a File Image” (page 4-20)

(9) [FullScreen] button
“Operation with Full Screen Display of Image” (page 3-17)

(10) [Back] button
Returns to the settings screen for Image Optimization.
“1. Image Optimization (Clearly Image a Target)” (page 4-8)

(11) [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 4-25)
“3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121)

Register Live Image as Master

1 Start the Settings Navigator.

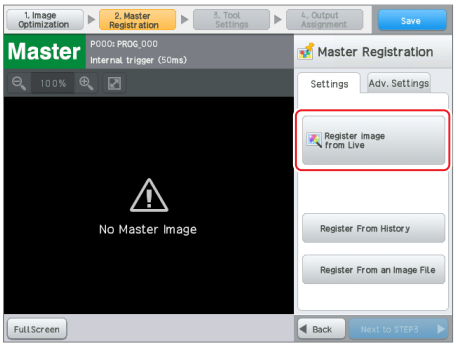
“Starting the Settings Navigator” (page 4-4)

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 image from Live].



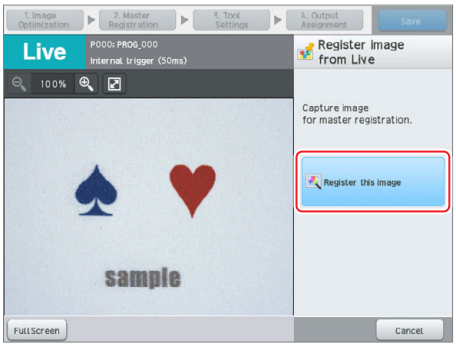
The screen switches to [Live].

5 Image the target.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the external trigger.
If an external trigger cannot be input, press the [Trigger ON] button to take an image of the target with the internal trigger.

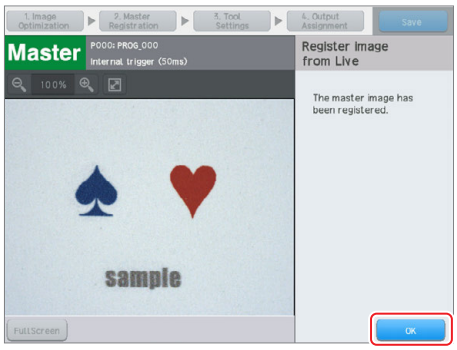


6 Check the displayed taken image and press [Register this image].



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 Registration.

Point

The settings for the disabled outlines (Page 4-46, Page 4-65) 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 Hist.] must be saved.
“Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-19)

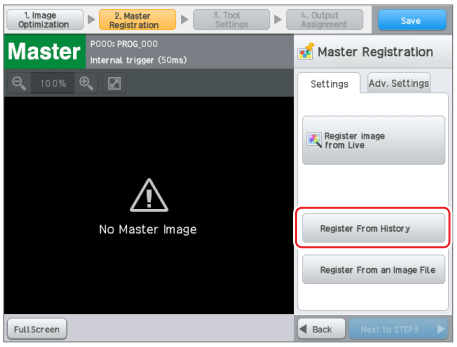
1 **Start the Settings Navigator.**

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

2 **Display the main screen for the Master Registration.**

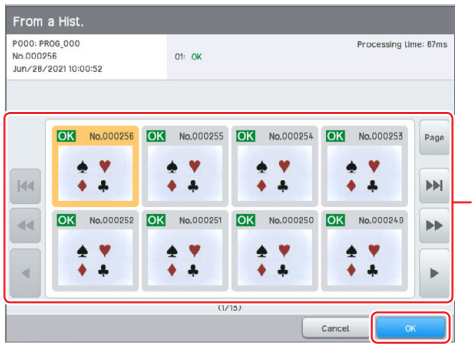
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 **Press [Register From History].**



The [From a Hist.] screen opens.

4 **Select the image and press [OK].**



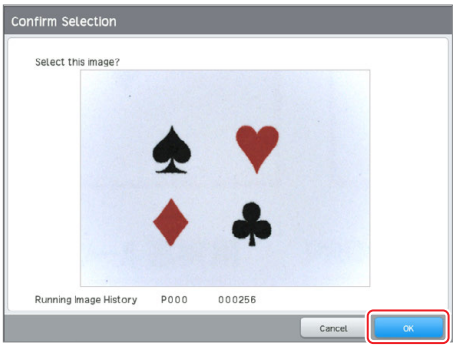
Select the image

Reference

For details of how to operate the screen, refer to “Loading and confirming saved images” (page 5-21).

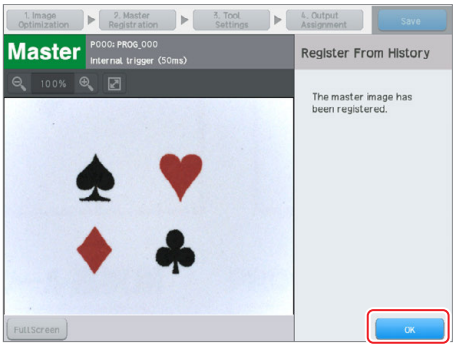
The selected image will be displayed.

5 **Check the displayed image and press [OK].**



The confirmation screen opens.

6 **Press [OK].**



The new master image will be registered and the sensor returns to the main screen for Master Registration.

Register From a File Image

Registers an image in USB memory as the master image.

Point

- **The file to be registered as the master image must be saved in the media.**
- **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).**
  “Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

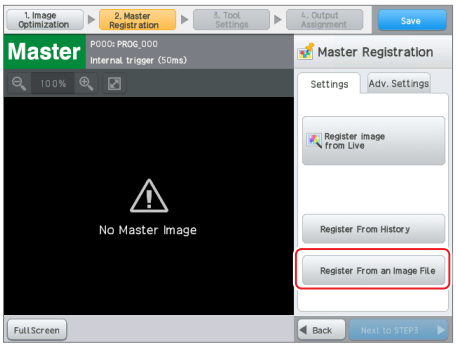
1 **Start the Settings Navigator.**

“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].**



Point

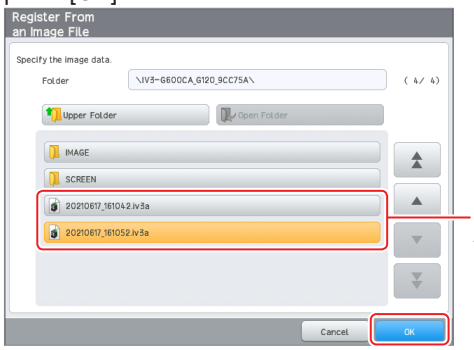
Connect the USB memory to the control panel beforehand.

The data in the USB memory will be displayed.

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

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

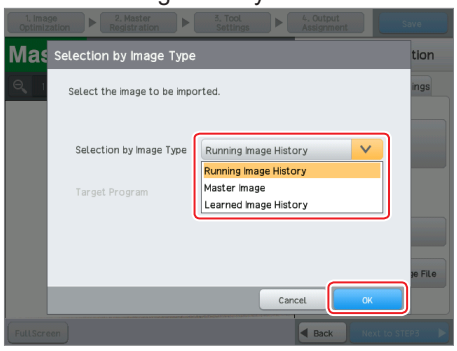
Select the file to be registered as the master image and press [OK].



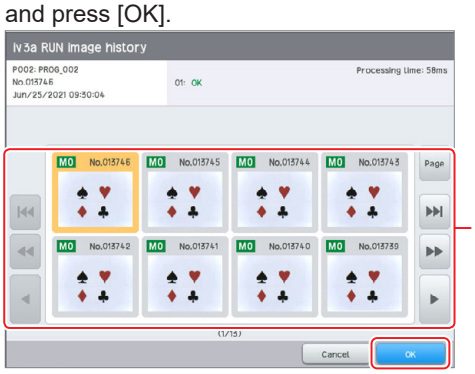
“Selecting the File/Folder in the USB Memory” (page 3-21)

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

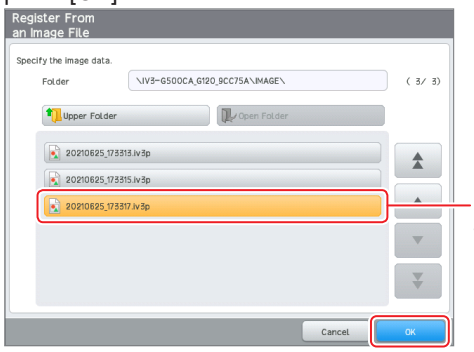


The list of images saved as the selected file image type will be displayed.
Select the image to be registered as the master image and press [OK].



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

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



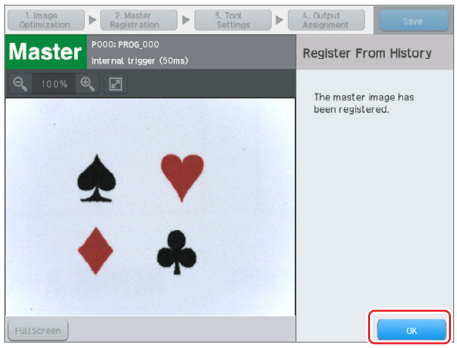
“Selecting the File/Folder in the USB Memory” (page 3-21)

5 Check the displayed image and press [OK].



The confirmation screen opens.

6 Press [OK].



The new master image will be registered and the sensor returns to the main screen for Master Registration.

Advanced Settings for the Master Image Registration

Adjusts the master image registration using the advanced settings menu.

Advanced settings items for the master image registration

Items	Description	Ref.
Brightness Correction	The impact from changes in lighting can be reduced by setting the brightness level for the master image.	4-22
Master image settings	Up to eight master images can be registered. (Standard mode only)	4-23
Master name	The name of each master image can be edited.	4-24

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 is performed for the image registered as master image 0 when master image settings are enabled.**
- **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)**

1 Start the Settings Navigator.

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

2 Display the main screen for the Master Registration.

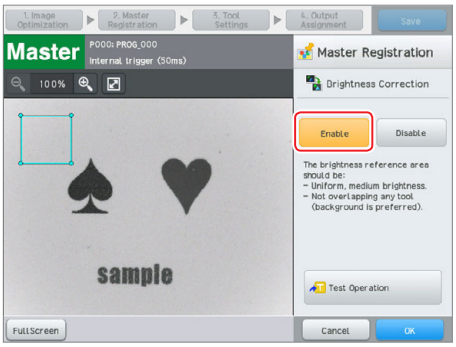
“Settings Navigator Screen and Operation Flow” (page 4-6)

3 Select the [Adv. Settings] tab.

4 Press [Brightness Correction].

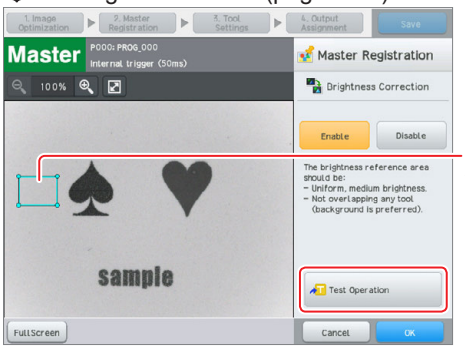
- By pressing [OK] in the explanation dialog for the brightness correction, the brightness correction dialog appears.
- Switches to the master image 0 when master image settings are enabled.

5 Press [Enable].



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

“Editing the Window” (page 3-18)



Region to be the brightness correction standard

Point

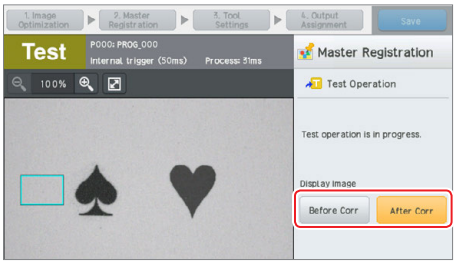
For the region to be a reference of brightness correction, specify the following.

- **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.**

7 Press [Test Operation].

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.

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



9 Press [OK].

The system returns to the brightness correction settings screen.

Reference

- When brightness correction is not to be used, press [Disable] on the screen from step 5.
- 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.

10 Press [OK].

Master Image Settings

1 Start the Settings Navigator.

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

2 Display the main screen for the Master Registration.

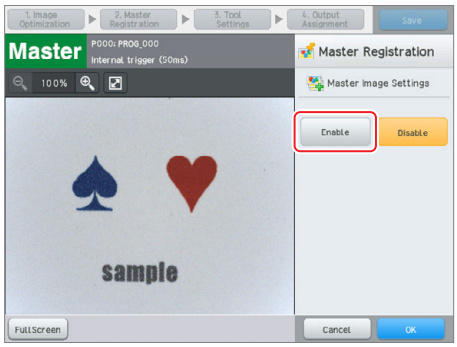
“Settings Navigator Screen and Operation Flow” (page 4-6)

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



The master image settings screen open.

4 Press [Enable].



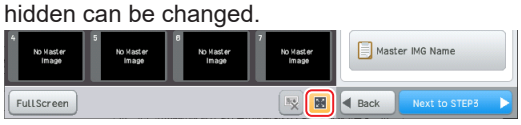
By pressing [Disable], master images other than the master image 0 are deleted.

5 Press [OK].

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

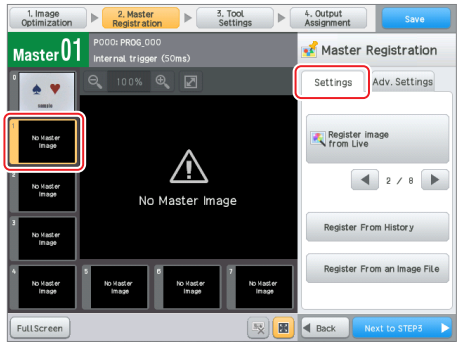


By pressing the "Switch to Display All Master Images <=> Single Master Image" button below the master image, whether the master image list is displayed or hidden can be changed.



6 Press the [Settings] tab.

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

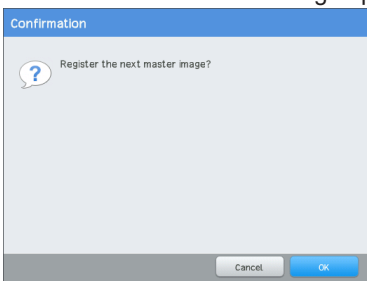


Reference The master image 0 must be registered.

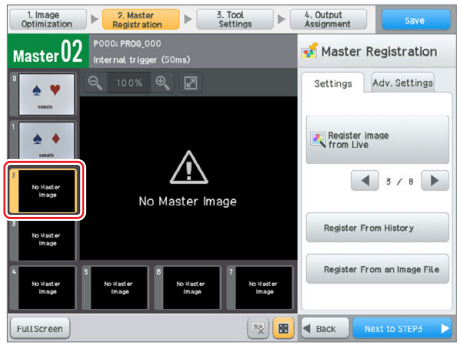
8 Register the master image.

“Register Live Image as Master” (page 4-18)
“Register From a Running Image History” (page 4-19)
“Registration of image saved in a file” (page 4-43)

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 By pressing the [Delete Master Image] button, the master image selected currently can be deleted. However, the master image 0 cannot be deleted.



Master name

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

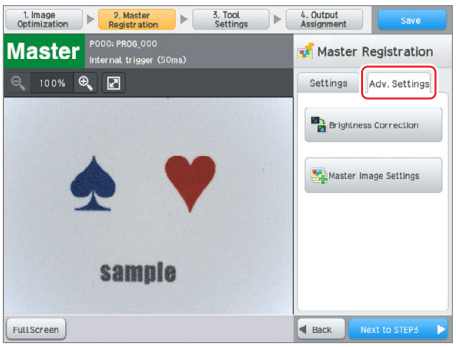
1 Start the Settings Navigator.

“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 [Adv. Settings] 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.

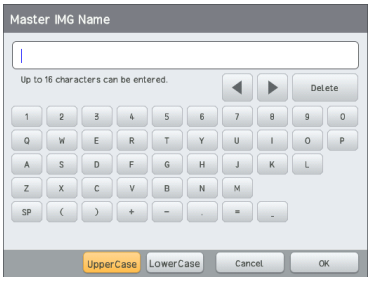
5 Press [Master IMG Name].



6 Edit the master name.

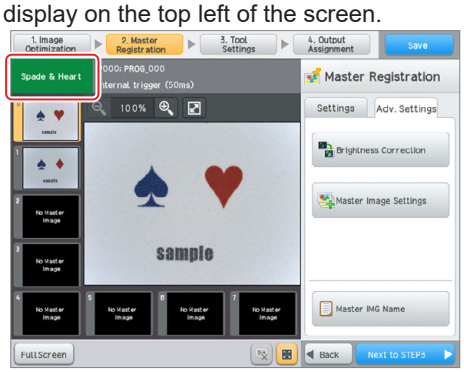
Up to 16 characters in alphanumeric can be set.

“Inputting characters” (page 3-20)



7 Press [OK].

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



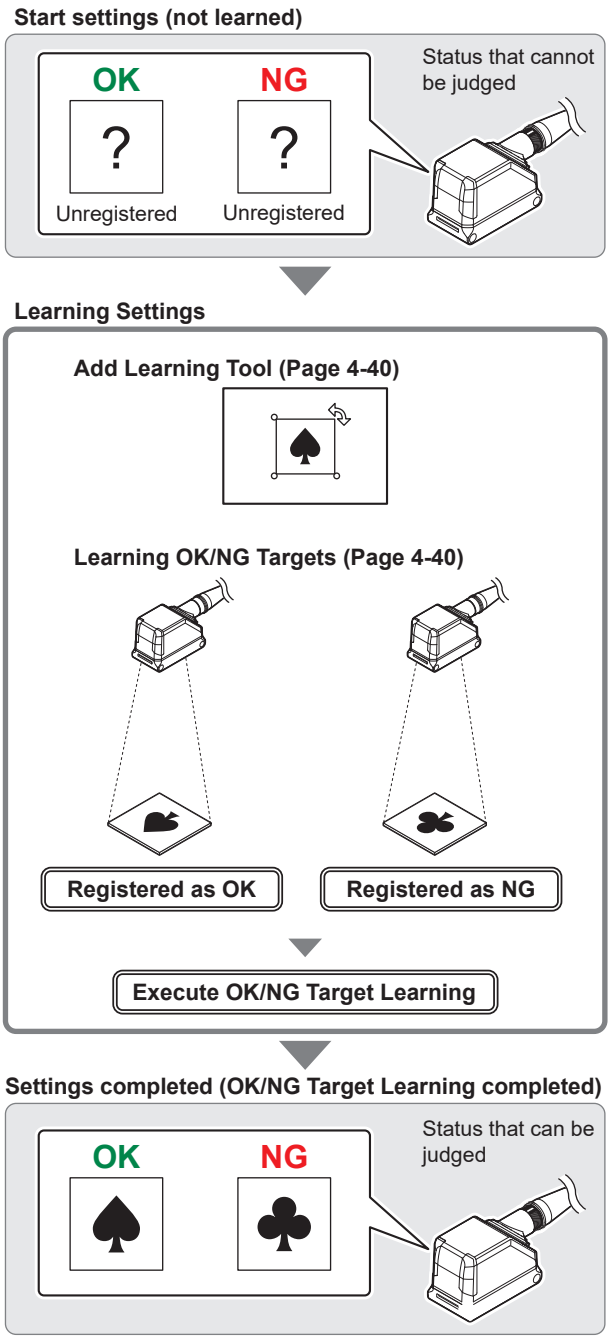
3. Tool Settings

(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

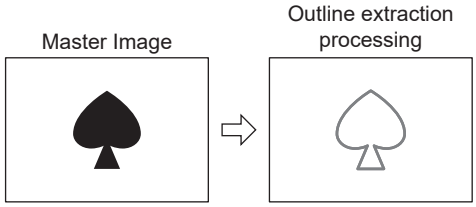
A tool which can automatically recognize the difference between targets by registering "OK" and "NG" images used for learning.
By performing additional learning, stability can be improved as well.
“Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

In the learning tool, learning will be executed after setting the tool windows used to identify OK/NG parts (images where the differences are clear) and registering an “OK” image and an “NG” image.
Up to 16 tool windows and 1 position adjustment window in one program can be judged at a single time.

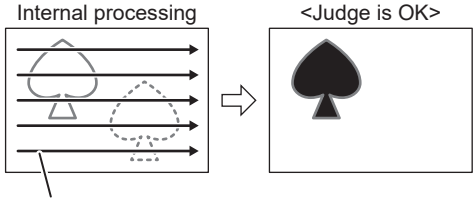
■ Outline tool

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 4-44)

Tool settings

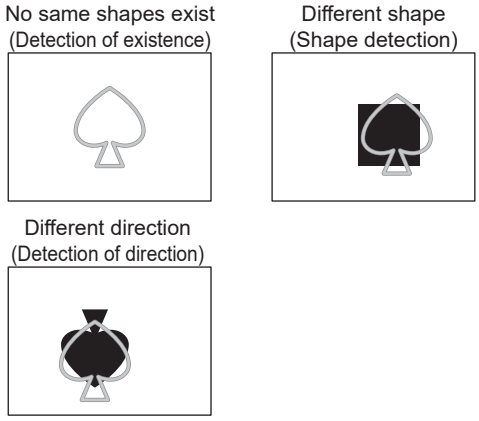


Processing and judgment during an operation



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

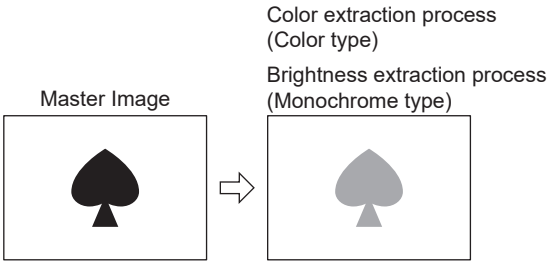


Reference
The matching rate is indicated in 0 to 100.
100 indicates that an outline is completely matched. The matching rate decreases with more non-matching parts.

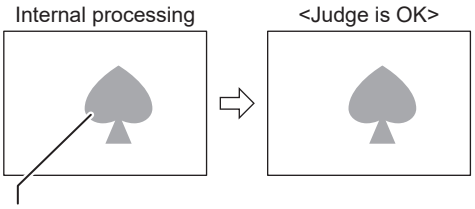
■ Color Area/Area tool

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 4-48)

Tool settings

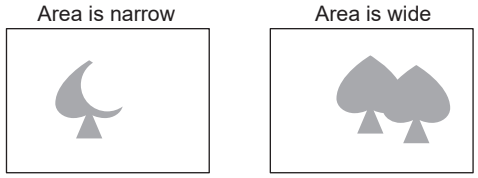


Processing and judgment during an operation



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

Example when the result was NG

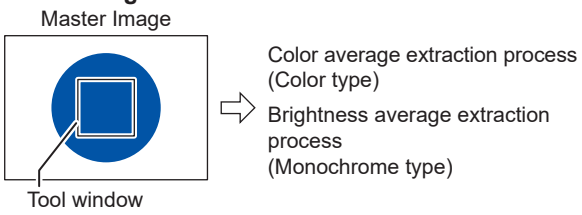


Reference
- The matching rate is indicated in 0 to 100 (default).
  100 indicates that an area is completely matched. The matching rate decreases as the area of a target narrows.
- The setting for the display range and threshold for the matching rate can be changed to 0 to 200 or 0 to 999. Also, a target can be judged by setting an upper limit for the threshold.
  “Upper Limit Settings” (page 4-53)

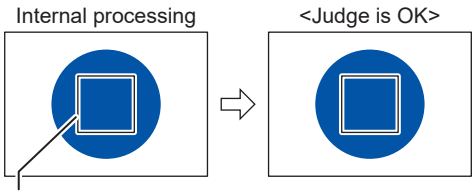
Color/Brightness Average Tool

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 4-56)

Tool settings

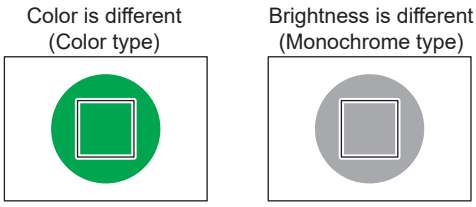


Processing and judgment during an operation



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

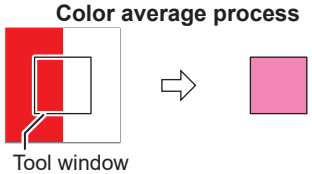
Example when the result was NG



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

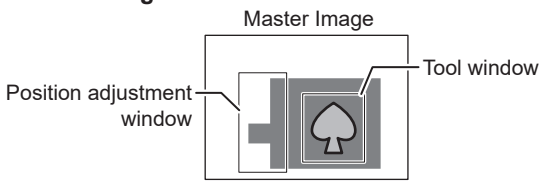


- Using in combination with the external master image registration function enables target changeover of the type of product to be performed easily.
“Input Settings” (page 7-16)
“Registering the Master Image” (page 10-10)

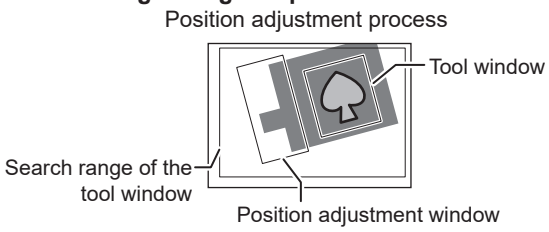
Position Adjustment tool

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 4-63)

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 4-151)
- **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.**

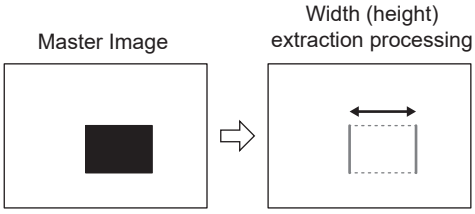
- **In standard mode, multiple position adjustment tools can be set in each program. If multiple position adjustment tools are set, you can set which position adjustment tool will be applied to each detection tool.**

Advanced tools 1

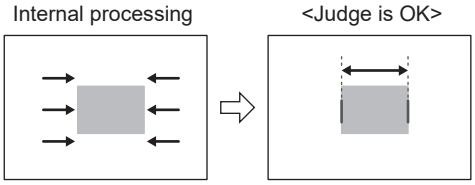
■ Width tool

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 4-68)

Tool settings

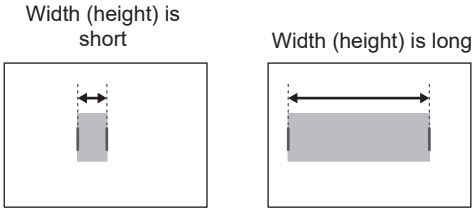


Processing and judgment during an operation



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

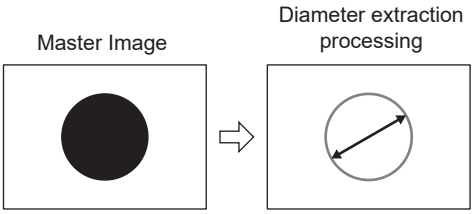


Reference
- The matching rate is indicated in 0 to 200 (default).
  100 indicates that the width is completely matched to the master image.
  The matching rate decreases as the width of a target shortens.
- The setting for the display range and threshold for the matching rate can be changed to 0 to 100 or 0 to 999. If it changes to 0 to 100, set the threshold only for the lower limit.
  “Upper Limit Settings” (page 4-71)

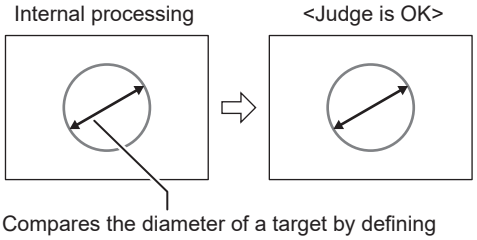
■ Diameter tool

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 4-74)

Tool settings

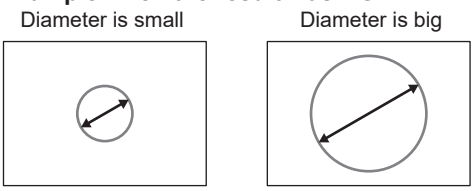


Processing and judgment during an operation



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

Example when the result was NG

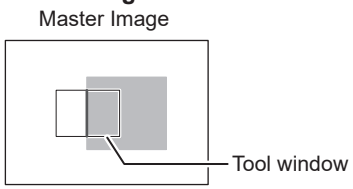


Reference
- The matching rate is indicated in 0 to 200 (default).
  100 indicates that the diameter is completely matched to the master image.
  The matching rate decreases as the diameter of a target decreases.
- The setting for the display range and threshold for the matching rate can be changed to 0 to 100 or 0 to 999. If it changes to 0 to 100, set the threshold only for the lower limit.
  “Upper Limit Settings” (page 4-76)

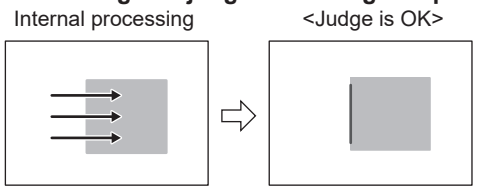
Edge tool

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 4-79)

Tool settings

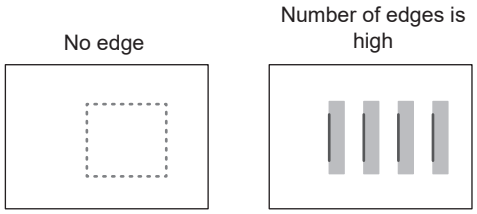


Processing and judgment during an operation



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

Example when the result was NG

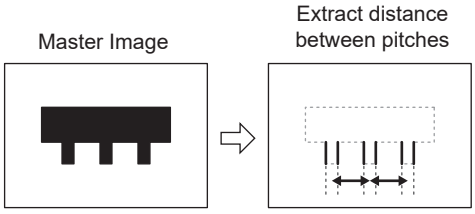


Reference
- Maximum value of the matching rate is adjusted automatically.
  The matching rate is indicated in the number of edges. 0 indicates that there is no edge in the window.
- Up to 320 edges can be counted. Targets with 321 or more edges cannot be counted.
- The setting for the display range and 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 Settings” (page 4-81)

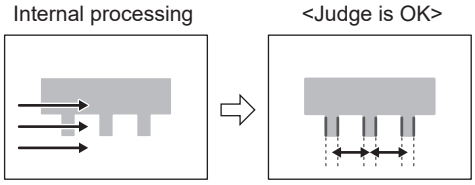
Pitch tool

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 4-84)

Tool settings

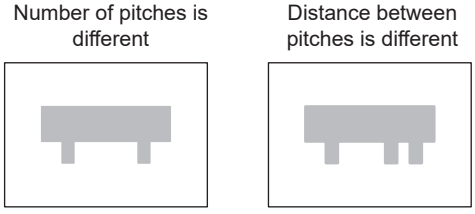


Processing and judgment during an operation



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

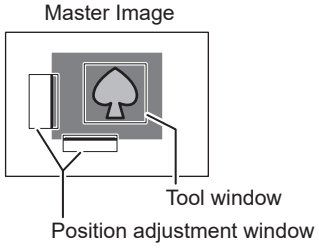


Reference
- The matching rate is indicated in 0 to 200 (default).
  The average value of all the distances between pitches is 100.
  Among all of the distances between pitches, the one which deviates the most from the average value is displayed to show the matching rate.
- Both maximum and minimum values 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.
  “Upper Limit Settings” (page 4-86)

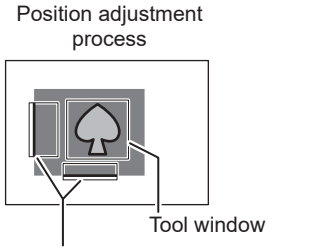
■ High-Speed Position Adjustment (Hi-Sp.Adj) tool

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 (Hi-Sp.Adj) Tool” (page 4-90)

Tool settings



Processing during an operation



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 Hi-Sp.Adj 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 4-151)
- **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.**

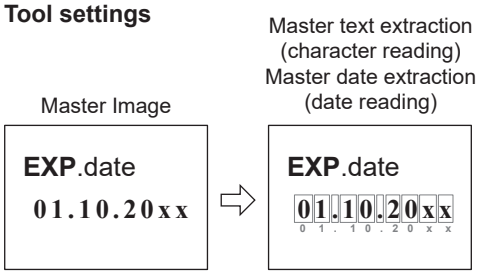
- **In standard mode, multiple Hi-Sp.Adj tools can be set in each program. If multiple Hi-Sp.Adj tool are set, you can set which Hi-Sp.Adj tool will be applied to each detection tool.**

Advanced tools 2

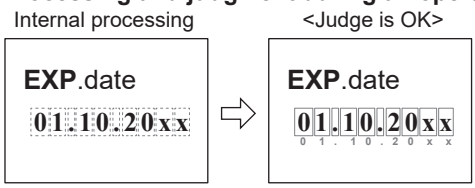
■ OCR Tool

A tool used to determine whether the text and date of the object match the registered “OK” image text and date.
“OCR Tool” (page 4-96)

Tool settings

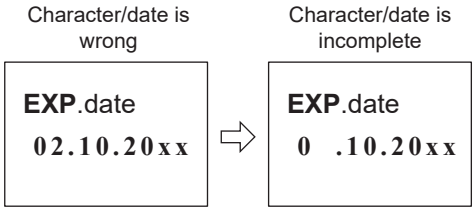


Processing and judgment during an operation



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

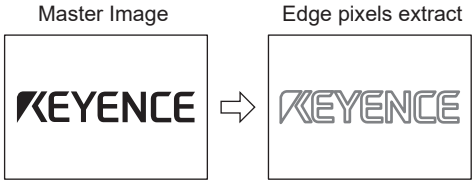


Reference
- The matching rate is indicated as 0 or 100. If all the text or date match, 100 is displayed. If the text or date does not match, or the number of letters does not match, 0 is displayed.
- If the shade contrast function is enabled, the matching rate may vary depending on the color shading,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

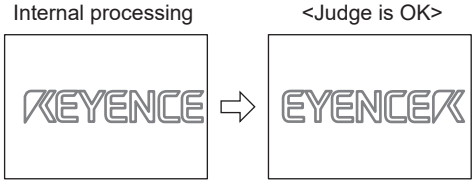
■ EdgePixels tool

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 4-104)

Tool settings

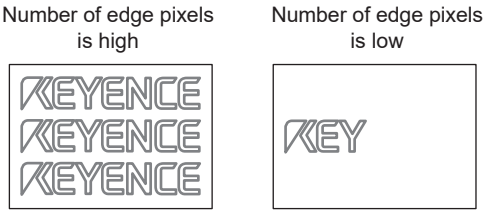


Processing and judgment during an operation



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

Example when the result was NG

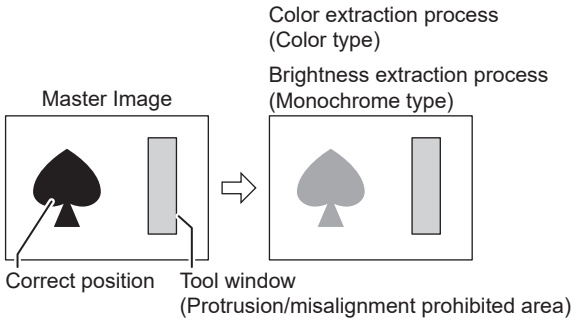


Reference
- The matching rate is indicated in 0 to 100 (default).
  100 indicates that edge pixels are completely matched.
  The matching rate decreases as the edge pixels of a target drop off.
- The setting for the display range and threshold for the matching rate can be changed to 0 to 200 or 0 to 999. Also, a target can be judged by setting an upper limit for the threshold.
  “Upper Limit Settings” (page 4-106)

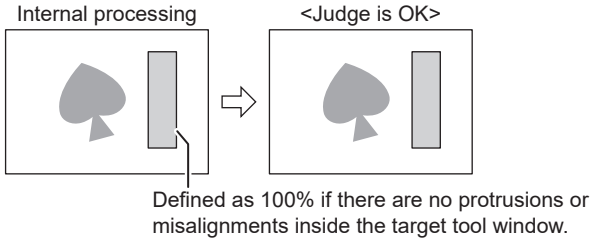
■ Color Prohibition/Brightness Prohibition tool

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 4-108)

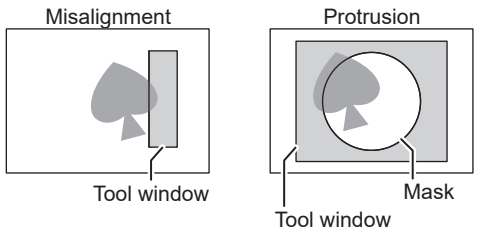
Tool settings



Processing and judgment during an operation



Example when the result was NG

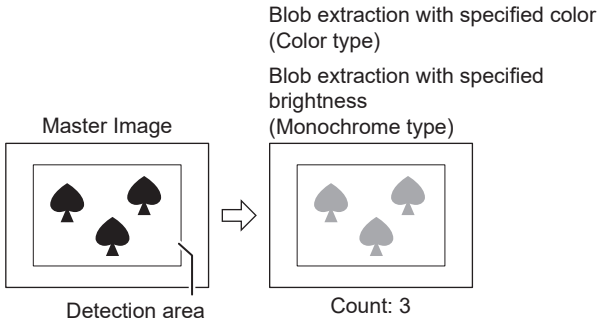


Reference The matching rate is indicated in 0 to 100. 100 indicates that there are no misalignments or protrusions. The matching rate decreases the more the protruded and misaligned area (the area the target enters the protrusion prohibited area) increases.

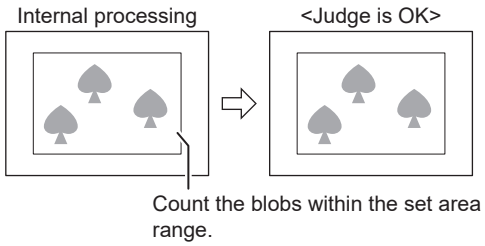
■ Blob Count tool

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 4-113)

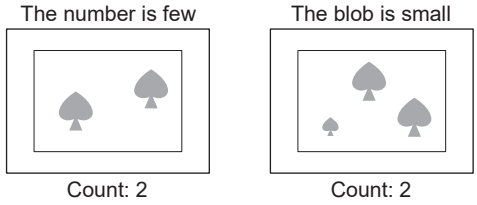
Tool settings



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.

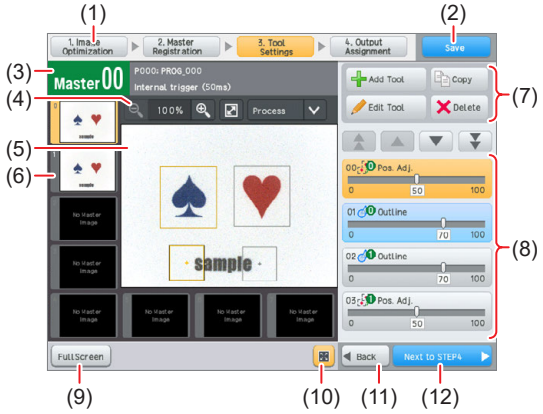
Main screen for the Tool Settings

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) [Save] button

Finishes the Settings Navigator and returns to the [Sensor Setup Menu] screen.

(3) [Image Type] display

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

(4) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(5) Master Image

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

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

Displays the list of all master images.

(7) Tool operation button

Performs adding/editing/copying/deleting tools.
“Adding/Editing/Copying/Deleting a Tool” (page 4-33)

(8) 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.

(9) [FullScreen] button

“Operation with Full Screen Display of Image” (page 3-17)

(10) 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.

(11) [Back] button

Returns to the master registration screen.
“2. Master Image Registration (Registering an Image as a Reference)” (page 4-18)

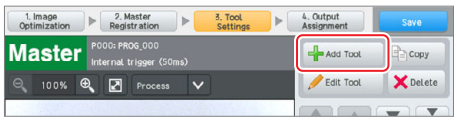
(12) [Next to STEP4] button

Proceeds to the Output Assignment settings.
“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

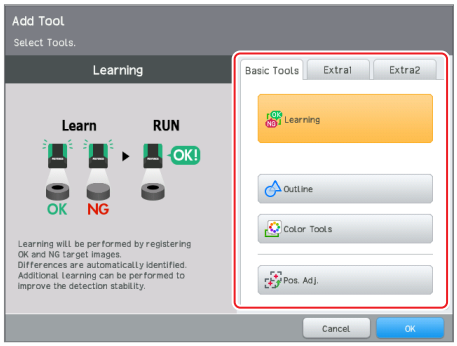
Adding/Editing/Copying/Deleting a Tool

Adding a Tool

1 Press [Add Tool].



2 Press the tool to be added.



3 Set setting items for each tool.

● **Basic Tools**

“Learning tool” (page 4-38)
“Outline tool” (page 4-44)
“Color Area/Area tool” (page 4-48)
“Color/Brightness Average Tool” (page 4-56)
“Position Adjustment Tool” (page 4-63)

● **Extra1**

“Width Tool” (page 4-68)
“Diameter tool” (page 4-74)
“Edge Tool” (page 4-79)
“Pitch tool” (page 4-84)
“High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-90)

● **Extra2**

“OCR Tool” (page 4-96)
“EdgePixels tool” (page 4-104)
“Color Prohibition/Brightness Prohibition tool” (page 4-108)
“Blob Count Tool” (page 4-113)

Editing a tool

1 Select a tool to edit the settings.



2 Press [Edit Tool].



3 Edit setting items for each tool.

● Basic Tools

- “Learning tool” (page 4-38)
- “Outline tool” (page 4-44)
- “EdgePixels tool” (page 4-104)
- “Color Area/Area tool” (page 4-48)
- “Color/Brightness Average Tool” (page 4-56)
- “Position Adjustment Tool” (page 4-63)

● Extra1

- “Width Tool” (page 4-68)
- “Diameter tool” (page 4-74)
- “Edge Tool” (page 4-79)
- “Pitch tool” (page 4-84)
- “High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-90)

● Extra2

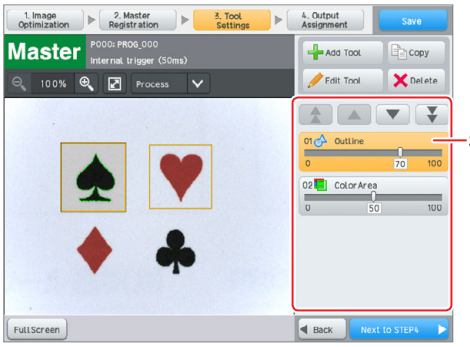
- “OCR Tool” (page 4-96)
- “EdgePixels tool” (page 4-104)
- “Color Prohibition/Brightness Prohibition tool” (page 4-108)
- “Blob Count Tool” (page 4-113)

Copying a tool

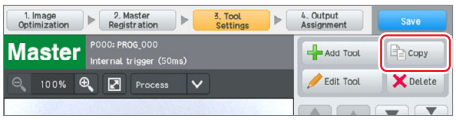
Point

- **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 copy.



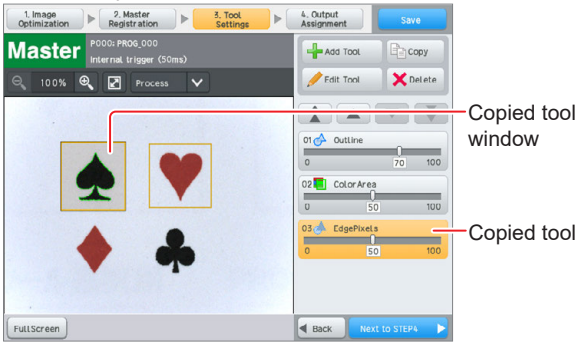
2 Press [Copy].



The [Confirmation] screen opens.

3 Press [OK].

The copied tool window will be selected and displayed on 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 Tool] and adjust the settings of the copied tool.**

● **Basic Tools**

“Learning tool” (page 4-38)
“Outline tool” (page 4-44)
“EdgePixels tool” (page 4-104)
“Color Area/Area tool” (page 4-48)
“Color/Brightness Average Tool” (page 4-56)
“Position Adjustment Tool” (page 4-63)

● **Extra1**

“Width Tool” (page 4-68)
“Diameter tool” (page 4-74)
“Edge Tool” (page 4-79)
“Pitch tool” (page 4-84)
“High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-90)

● **Extra2**

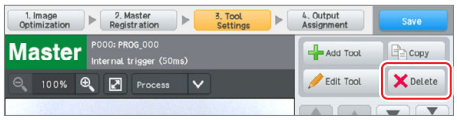
“OCR Tool” (page 4-96)
“EdgePixels tool” (page 4-104)
“Color Prohibition/Brightness Prohibition tool” (page 4-108)
“Blob Count Tool” (page 4-113)

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.

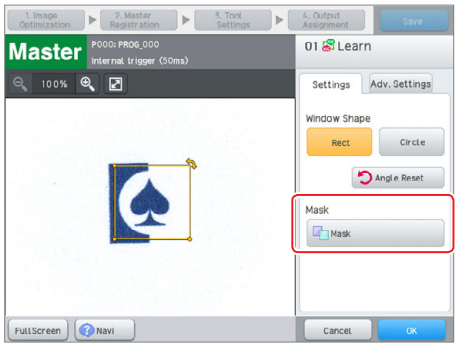
Common Setting Items for the Tool Settings

Mask settings

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

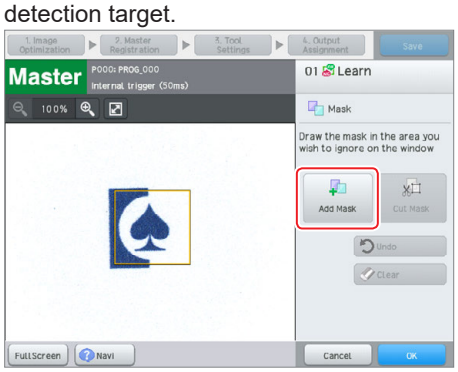
- □ Rect (default): Specifies a rectangular mask region or a mask cutting region.
- ○ Circle: Specifies the area to mask the target or remove from the mask with a circular window.

1 **Press [Mask].**



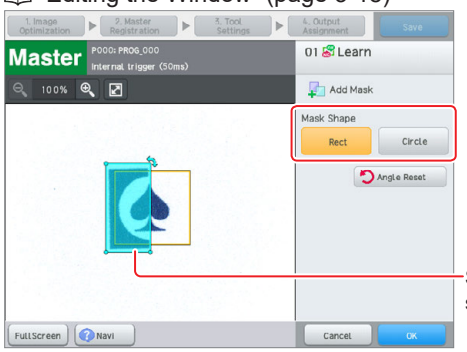
2 **Press [Add Mask].**

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 3-18)



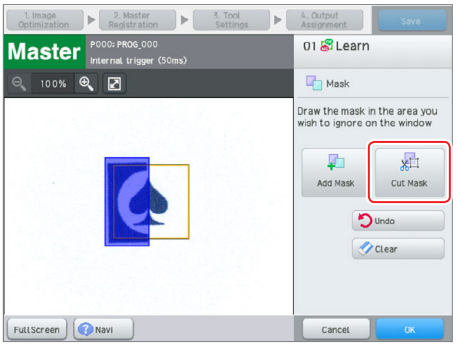
Set the mask shape

4 **Press [OK].**

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

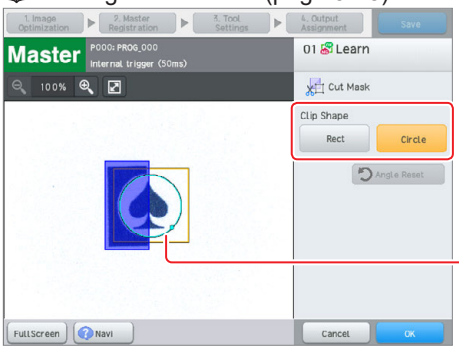
5 **Press [Cut Mask] to cut a mask region.**

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 3-18)



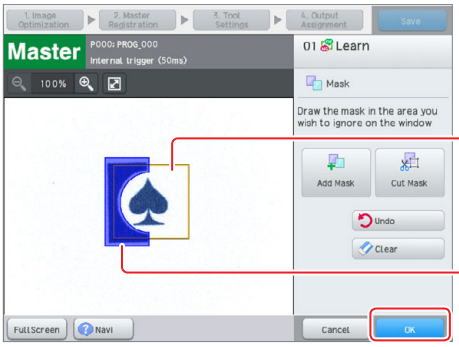
7 **When setting is completed, press [OK].**

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.

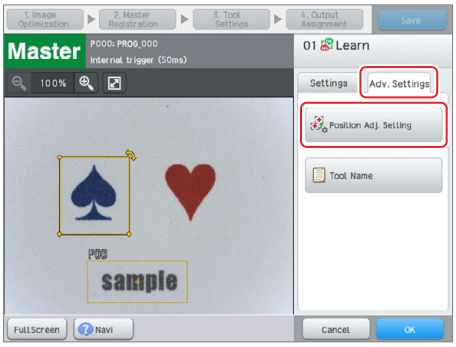
9 **Press [OK].**



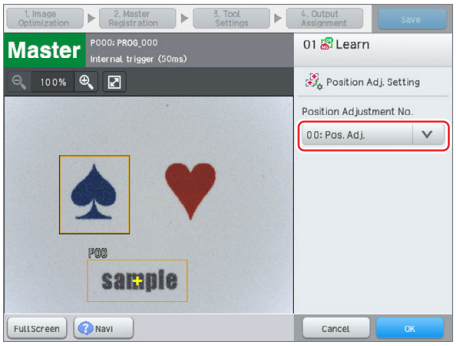
Position Adjustment Setting

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 [Adv. Settings] tab → [Position Adj. Setting] tab of the detection tool.**



2 **Select the number of the Position Adjustment/ High-Speed Position Adjustment tool to be applied from [Posision Adjustment No.].**



When master image settings are disabled

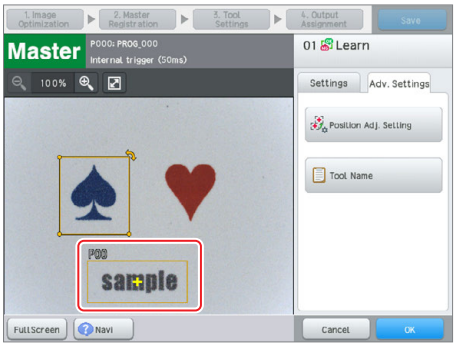
- The default value when setting the Position Adjustment /High-Speed Position Adjustment tool is [00: Pos. Adj.].
- The default value when not setting the Position Adjustment /High-Speed Position Adjustment tool is [00: (Not Set)].
- If [None] is selected, the Position Adjustment/High-Speed Position 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 [None] 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 rule.

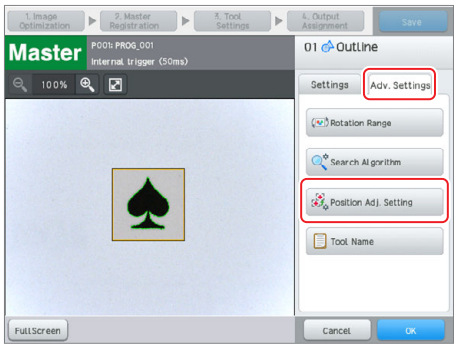


Tool Name

Point **If the display language (Page 7-31) is changed, characters may become unreadable.**

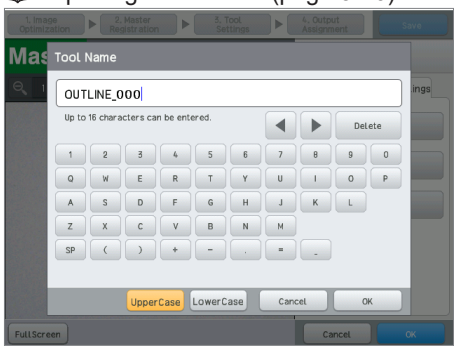
This section explains it using an example of the [Outline] tool.

1 Press the [Adv. Settings] tab, and then [Tool Name].



2 Edit the tool name.

Up to 16 characters in alphanumeric can be set.
“Inputting characters” (page 3-20)

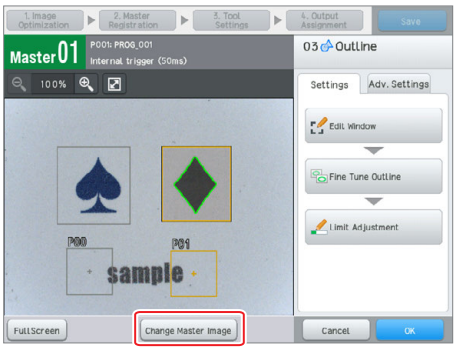


3 Press [OK].

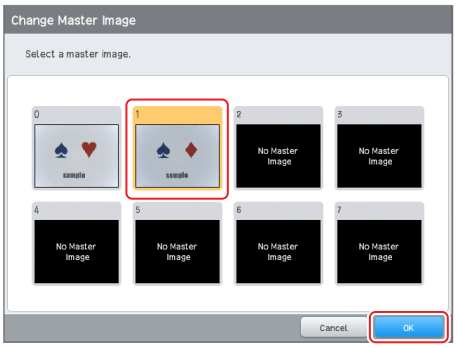
Switch Master Image (only when master image settings are enabled)

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 [Change 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.

Learning tool

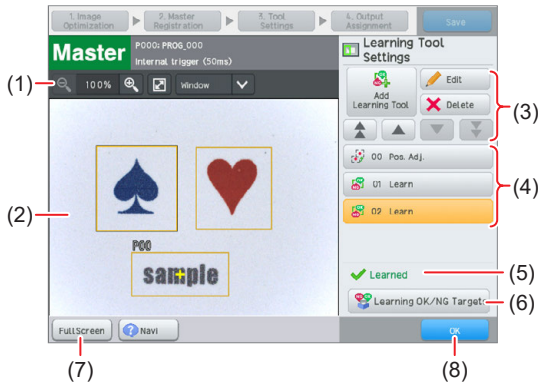
● Setting items for the Learning Tool Settings

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.
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 USB memory.
	From a Hist.	Imports images to be registered as the OK target/NG target from the image history.
	Start Learning	Learns the OK target/NG target.

● 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.	4-36
	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. “5 Running” (page 5-1)	4-37
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.	4-42

Learning Tool Settings screen



(1) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(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 or 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 completed.
Relearning required	Relearning is needed because of a setting change.

(6) [Learning OK/NG Targets] button

Performs the imaging and learning of an OK or NG target.

"OK/NG Target Learning for the Learning Tool" (Page 4-43)

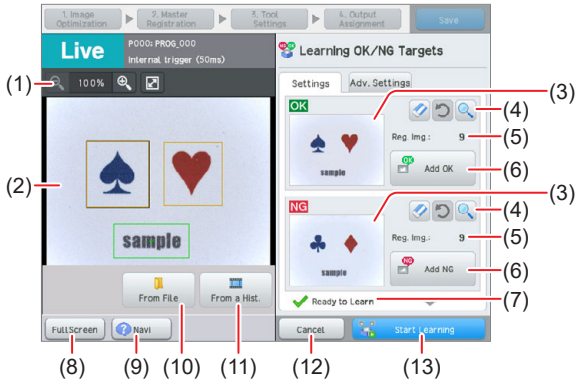
(7) [FullScreen] button

“Operation with Full Screen Display of Image” (page 3-17)

(8) [OK] button

The system returns to the main screen for tool settings.

Learning OK/NG Targets Screen



(1) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

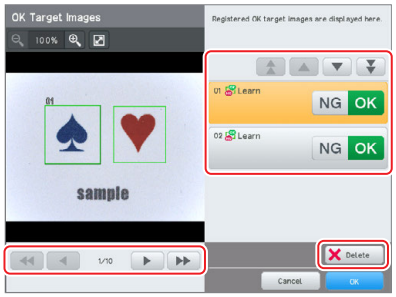
(2) Image taken by the sensor

Displays an image taken by the sensor.

(3) Registered image

Displays the last registered image.

(4) 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. Moreover, OK/NG can be changed per learning tool, and images can be deleted. If multiple images have registered , they can be checked with the move buttons. 

(5) Number of images registered

Displays the number of images registered.

Reference If the Variable Brightness is [ON], by registering the first image, nine images are registered including the brightness change images (eight images).

(6) [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.

(7) Condition Display

Ready to Learn ...OK target and NG target image registration have been completed, and the sensor is ready to start learning.

(8) [FullScreen] button

“Operation with Full Screen Display of Image” (page 3-17)

(9) [Navi] button

Displays the Settings Navigator guide.

(10) [From File] button

Registers an image saved in the USB memory as an OK target or NG target.

“Registration of image saved in a file” (page 4-43)

(11) [From a Hist.] button

Registers an image of the running image history as OK target or NG target.

“Registration of Image from the Image History” (page 4-42)

(12) [Cancel] button

Returns to the main screen of the learning settings.

(13) [Start Learning] button

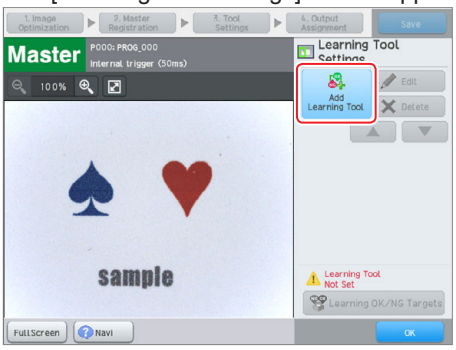
Starts the learning.

Add Learning Tool

1 Add [Learning Tool].

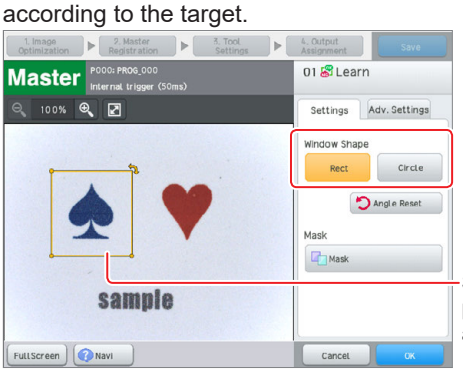
“Adding a Tool” (page 4-33)

The [Learning Tool Settings] screen appears.



2 Press [Add Learning Tool].

The tool window will be displayed on the master image. Select the window shape, position, size, and angle according to the target.



Set the position, size, and angle

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 6-21)
- **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 4-63)

3 Add or Adjust the [Mask] as needed.

“Mask settings” (page 4-35)

4 Perform [Adv. Settings] as needed.

“Position Adjustment Setting” (page 4-36)
“Tool Name” (page 4-37)

5 Press [OK].

The system returns to the [Learning Tool Settings] screen.

OK/NG Target Learning for the Learning Tool

1 Press [Learning OK/NG Targets].

“Learning Tool Settings screen” (page 4-38)

2 Register [OK Target].

- **Registration of Taken Image**

“Registration of Taken Image” (page 4-42)

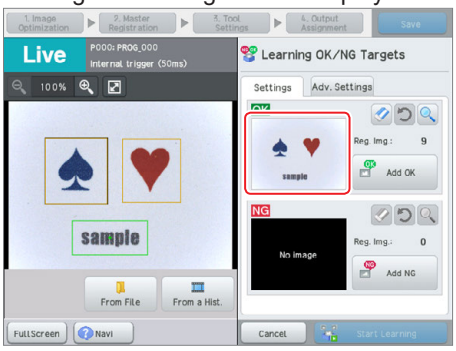
- **Registration of Image from the Image History**

“Registration of Image from the Image History” (page 4-42)

- **Registration of image saved in a file**

“Registration of image saved in a file” (page 4-43)

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.
“Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

3 Register [NG Target].

The registration method is the same as step 2.

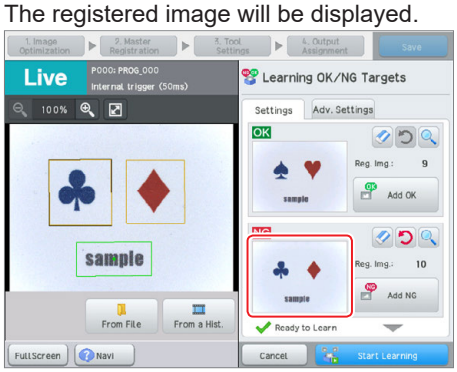
Point

- **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.

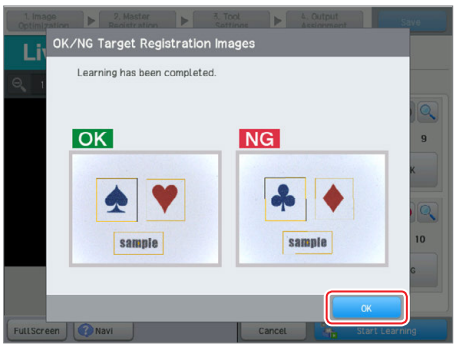
Point

By capturing multiple images of different judgment criteria, the judgment stability will be improved automatically.
“Learning Multiple Images for Stability” (page 6-22)

5 Press [Start Learning].



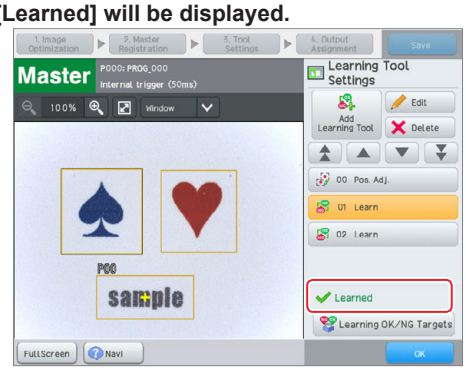
6 Check the registered image and press [OK].



The system returns to the [Learning Tool Settings] screen.

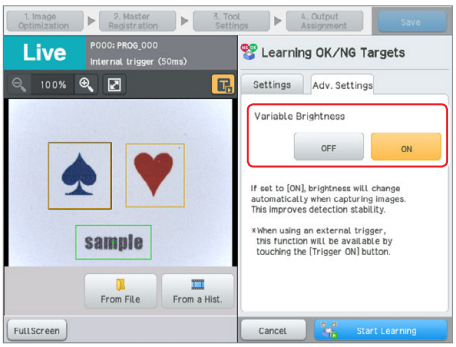
Point

When the learning settings are completed, [Learned] will be displayed.



■ Registration of Taken Image

1 When changing the [Variable Brightness] setting, select [Adv. Settings].

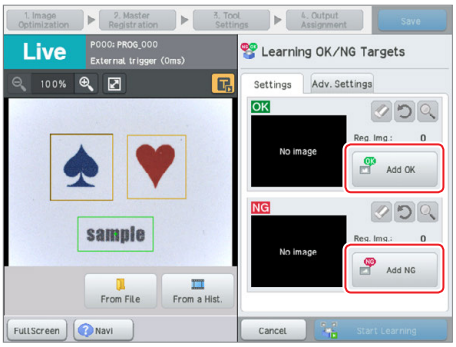


Reference Variable brightness can be ON in the following cases.
- During internal trigger
- When pressing [Trigger ON] with external trigger set to image by using the internal trigger.

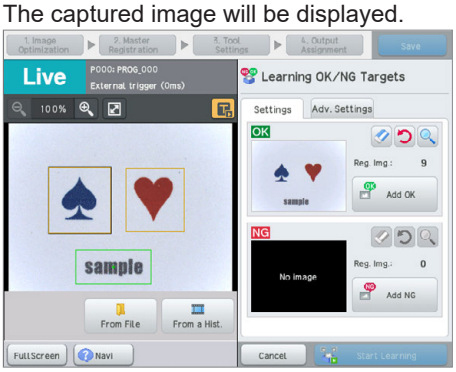
2 Image a target to be registered.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.

3 Press [Add OK] or [Add NG].

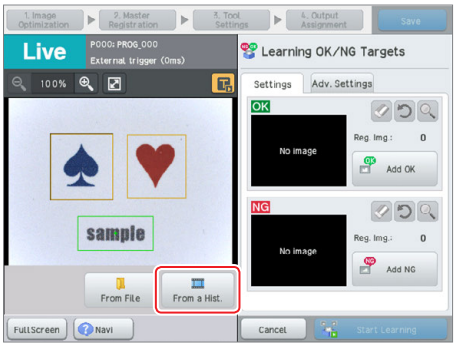


The captured image will be displayed.

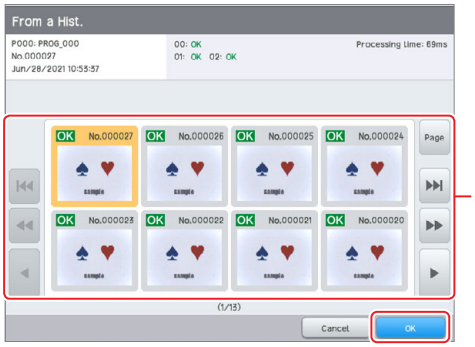


■ Registration of Image from the Image History

1 Press [From a Hist.].

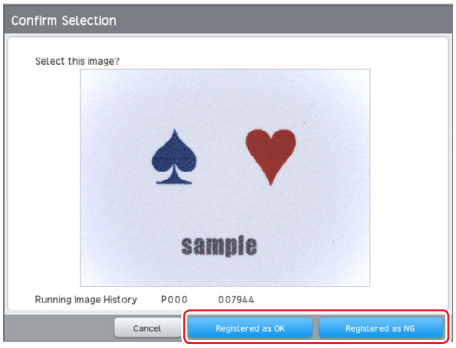


2 Select the image to be registered, and press [OK].



Select the image

3 Press [Registered as OK] or [Registered as NG].



The registered image will be displayed.

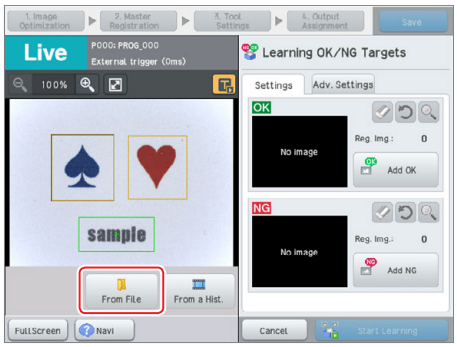


■ Registration of image saved in a file

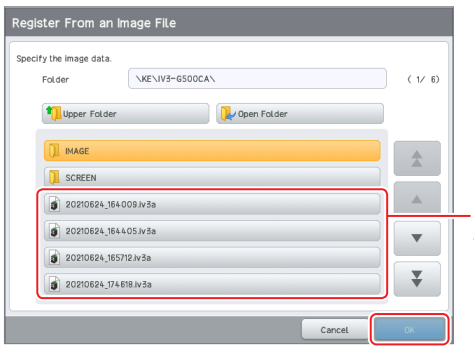
1 Insert the USB memory on which the batch backup files (*.iv3a), individual program backup files (*.iv3a), or image capture files (*.iv3p) are saved into the control panel.

“Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

2 Press [From File].



3 Select the file to be imported, and press [OK].



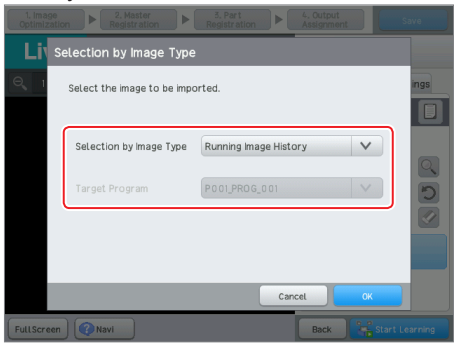
Select the file

“Selecting the File/Folder in the USB Memory” (page 3-21)

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.

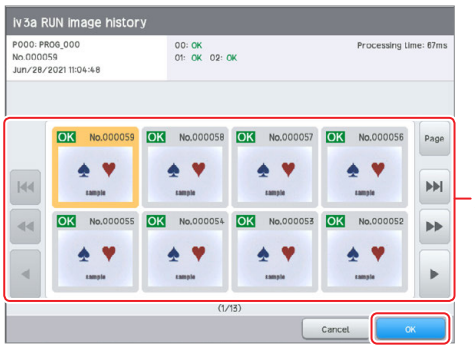
- Running Image History
- Master Image
- Learned Image History

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.

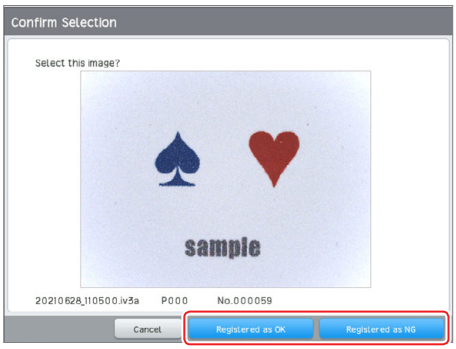
5 Select the image to be registered, and press [OK].



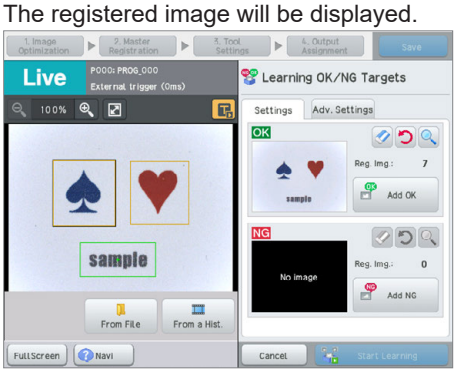
Select the image

The registered image will be displayed.

6 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.

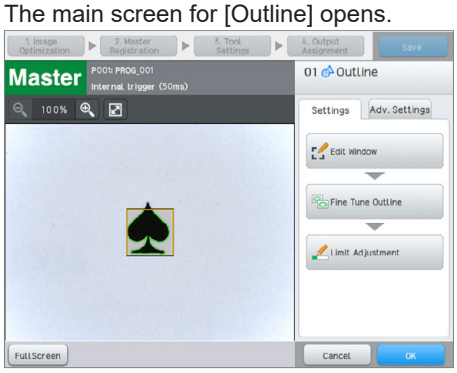
● Setting items for the Outline tool (advanced settings)

Items		Description	Ref.
Rotation Range	Rotation angle range	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. • 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.	4-47
Search Algorithm		The detection mode of the Outline tool can be changed depending on the inspection requirements.	4-47
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Outline tool can be selected.	4-36
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. “5 Running” (page 5-1)	4-37

Setting the Outline tool

1 Add the [Outline] tool.

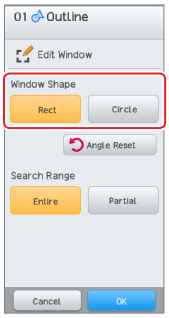
“Adding a Tool” (page 4-33)
The main screen for [Outline] opens.

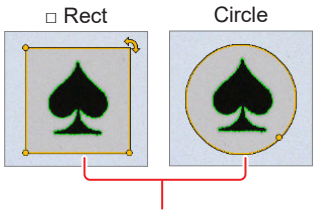


2 Perform [Edit Window].

Reference Pressing the window directly will also allow for editing of the window.

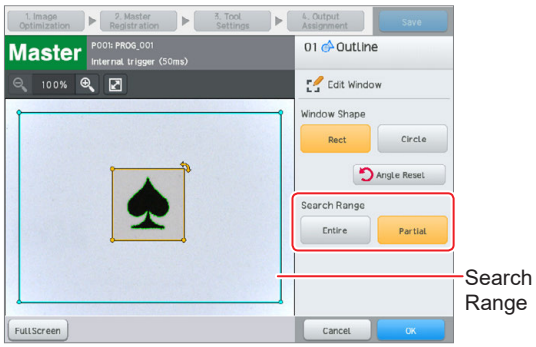
Select the tool window shape, position, size, and angle according to the desired target.





3 Set [Search Range] as needed.

Set the tool window that indicates the search range.



Entire	Specifies the entire imaging area as a search range.
Partial	Specifies the search range as a user-specified size within the imaging area.

Reference
- The search range cannot be rotated.
- By using a narrower area for the search range, the processing time will be shortened.
- The default value is as follows.
  - Without position adjustment: Entire
  - With position adjustment: Partial

4 Press [OK].

The system returns to the main screen of [Outline].

5 Perform [Fine Tune Outline] as needed.

“Remove Outline” (page 4-46)
“Sensitivity” (page 4-46)

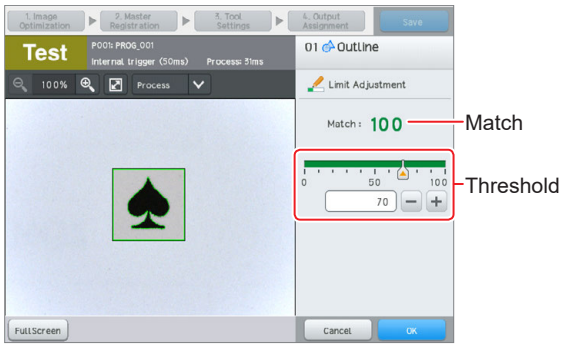
6 Perform [Limit Adjustment].

The sensor changes to Test mode.
Take an “OK” image and an “NG” image.

Reference 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.

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.

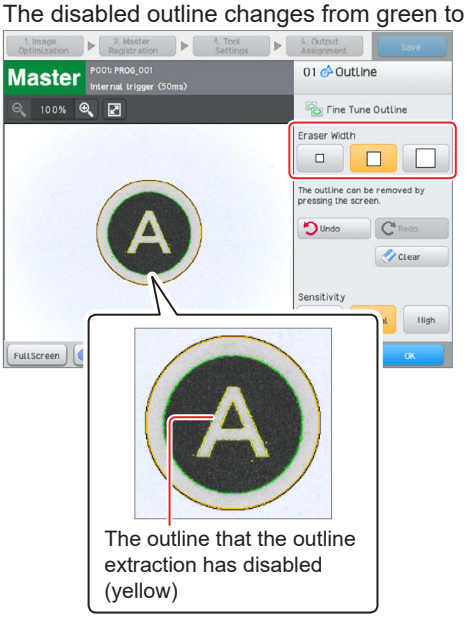
“Selecting the Display Method of the Tool Window” (page 5-11)
“Adjusting Thresholds for Judgment” (page 6-17)
“Matching Rate of the Outline Tool and Position Adjustment Tool” (page A-6)

8 Press [OK] to return to the main screen for the tool settings.

■ Remove Outline

1 Select [Eraser Width], and specify the outline that is not required for judgment by tracing it.

The disabled outline changes from green to yellow.

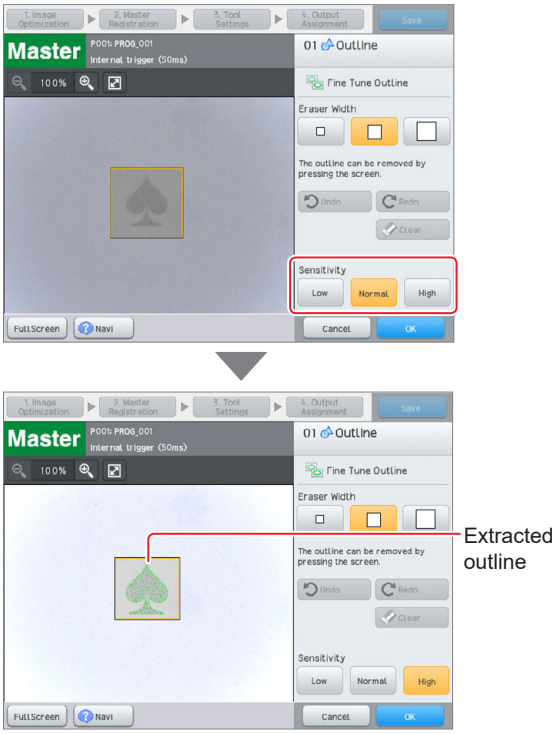


Reference The [Undo] button can be used up to 5 times.

2 Press [OK].

■ Sensitivity

1 Select [Sensitivity] of the outline.



High	Extracts an outline of the image with low contrast. Used when an outline you wish to detect cannot be extracted with Normal or Low sensitivity.
Normal (default value)	Extracts the standard outline.
Low	Reduces the extracted volume of the outline. Used in situations where an outline is not necessary for inspection.

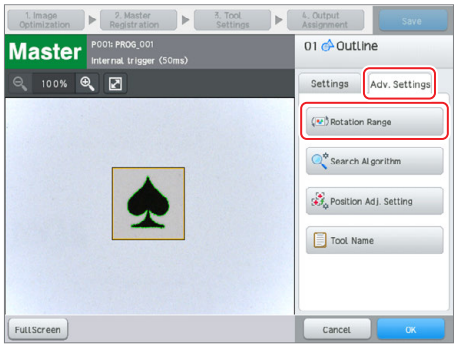
Reference If digital zoom is set to [Zoom Mag: x4], the default value is [High].

2 Press [OK].

Advanced settings for the Outline Tool

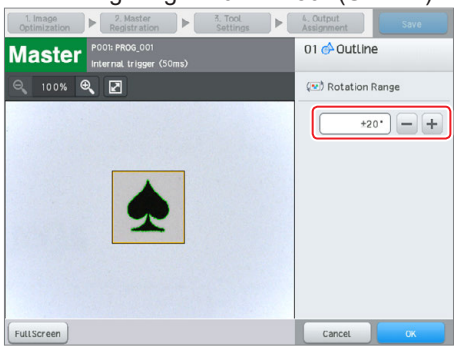
■ Rotation Range

1 **Press the [Adv. Settings] tab, and then [Rotation Range].**



2 **Set [Rotation Range].**

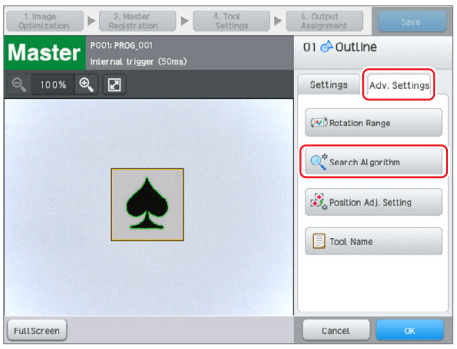
The setting range is 0 to ±180° (Unit: 1°).



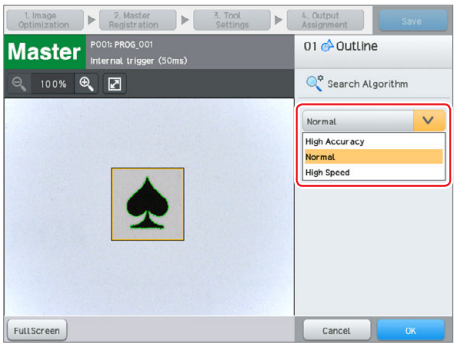
3 **Press [OK].**

■ Search Algorithm

1 **Press the [Adv. Settings] tab, and then [Search Algorithm].**



2 **Select the type of search algorithm.**



High Accuracy	Differences in the outline can be detected with a high degree of accuracy. This is selected when identifying the target where the outline difference is small. Select this when detection is not stable because of a small difference in the matching rate between an “OK” and “NG” image.
Normal	Standard differences in the outline can be detected. Select this when detection is not stable because of the influence of an unnecessary outline other than the target such as the background.
High Speed	Judgment can be performed with high speed. There may be an influence from the background or unnecessary outlines other than the target. Select this to shorten the processing time.

3 **Press [OK].**

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.
	Extract Area		Expands or reduces automatically the extraction area of the color extracted.
	To Live Image		The color range to be extracted can be selected from 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.
	To 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 Settings	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.

● Setting items for the color area/area tool (advanced settings)

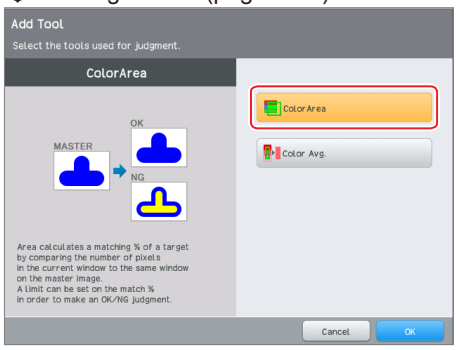
Items		Description	Ref.
Advanced Color Extraction (For color type)		• **Color type** Specifies a color to be extracted using HSV (H: Hue, S: Saturation, V: Brightness).	4-54
Advanced Brightness Extraction (For monochrome type)		• **Monochrome type** Specifies the brightness value to be extracted.	
	To 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%.	4-55
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Color Area/Area tool can be selected.	4-36
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. “5 Running” (page 5-1)	4-37

Setting the Color Area/Area tool

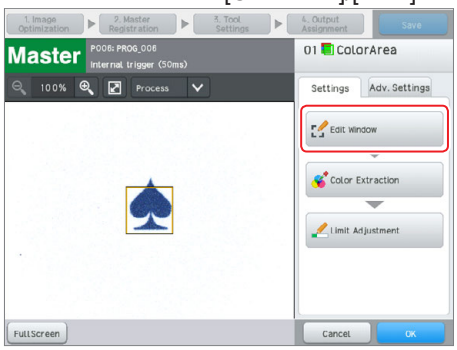
1 Add the [ColorArea] tool (color type) or [Area] tool (monochrome type).

In the screen that appears by selecting [Color Tools], select [ColorArea]/[Area] and press [OK].

“Adding a Tool” (page 4-33)



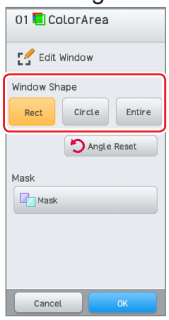
The main screen for [ColorArea]/[Area].

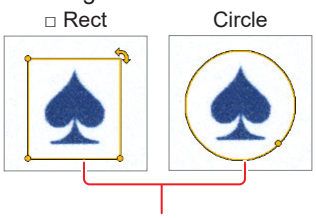


2 Perform [Edit Window].

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 desired target.





Set a position, size, and angle

When [Entire] is selected, the tool window will be hidden.

3 Apply the mask as needed.

Inside the mask region is excluded from an area extraction.

“Mask settings” (page 4-35)

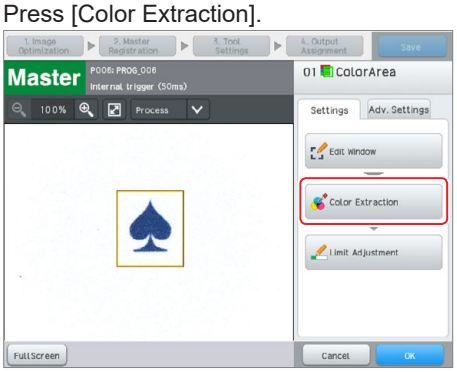
4 Press [OK].

The system returns to the main screen for [ColorArea]/[Area].

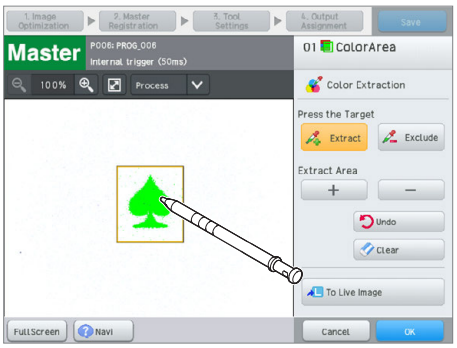
5 Set the area to extract from the target.

● For color type

Press [Color Extraction].



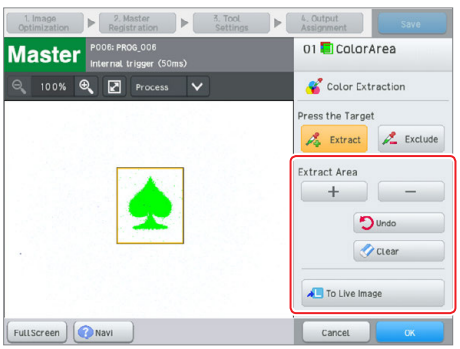
The screen to select a color to be extracted opens. Press the color to be the reference of judgment for the color area.



The color in the pressed place will be extracted.

- If the areas of color that have not been extracted are pressed repeatedly, the extraction range can be adjusted.
- 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 [To Live Image], the range of color can be extracted based on the image saved as the Live Image, the images saved in the image history, or the images saved in the USB memory.

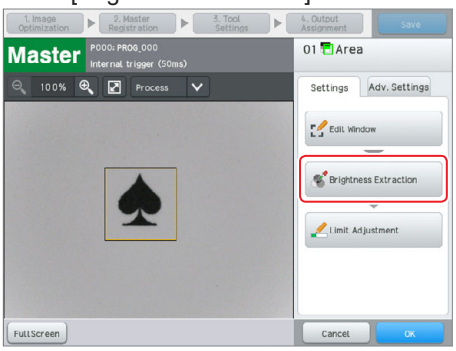
“Adjusting in the Live Image” (page 4-51)



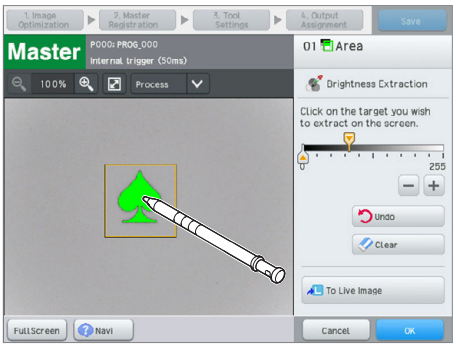
When setting is completed, press [OK].
The system returns to the main screen for [ColorArea].

● For monochrome type

Press [Brightness Extraction].

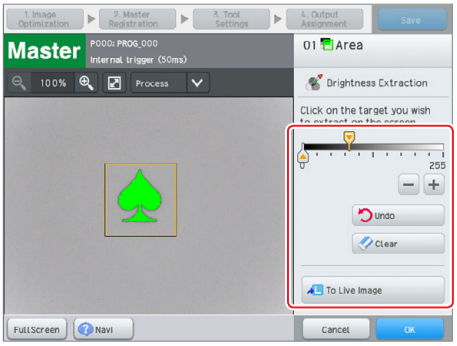


The screen to select brightness to be extracted opens. Press the brightness to be the reference of judgment for the area.



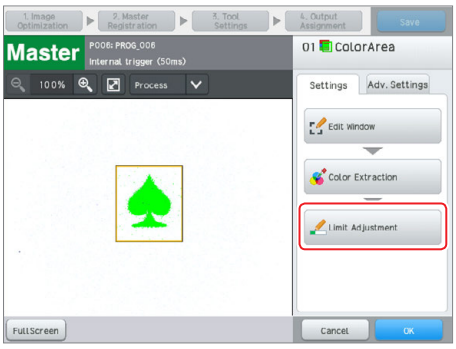
The brightness in the pressed place will be extracted.

- If the brightness of color that have not been extracted are pressed repeatedly, the extraction range can be adjusted.
- Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
  “Setting by the Slider” (page 3-19)
- 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 [To Live Image], the range of the brightness to be extracted can be set with the Live image of the target.



When setting is completed, press [OK].
The system returns to the main screen for [Area].

6 Press [Limit Adjustment].



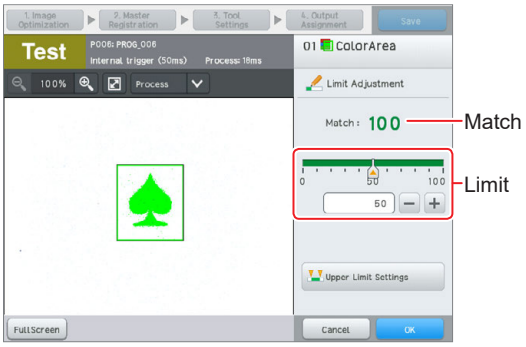
The sensor changes to Test mode.

7 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

9 Adjust the [Upper Limit Settings] as needed.

“Upper Limit Settings” (page 4-53)

10 Press [OK].

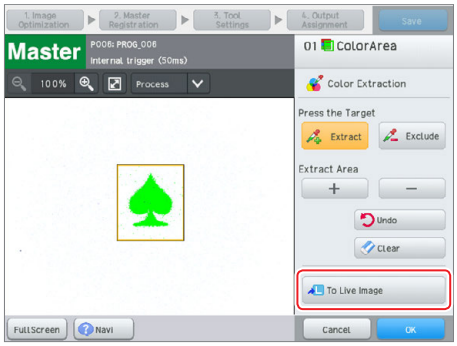
The system returns to the main screen for [ColorArea]/[Area].

11 Press [OK].

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

■ Adjusting in the Live Image

1 Press [To Live Image].

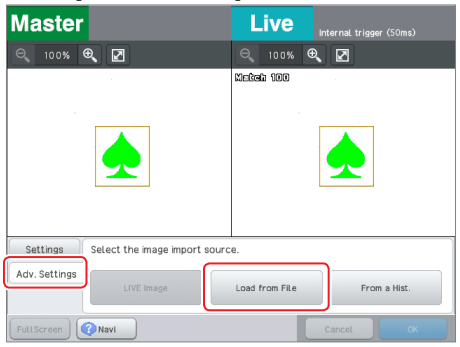


The Master image (left) and LIVE image (right) are displayed.
When adjusting with the LIVE image, go to step 3.

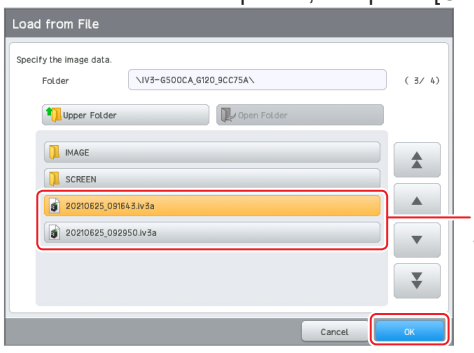
2 When adjusting with images other than the LIVE image, press the [Adv. Settings] tab to import the image.

● When importing from a file saved in USB memory

Press [Load from File].



Select the file to be imported, and press [OK].



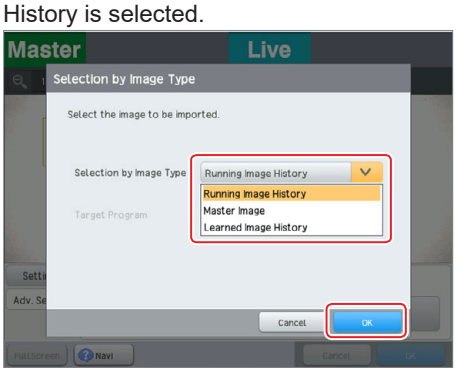
Select the file

“Selecting the File/Folder in the USB Memory” (page 3-21)

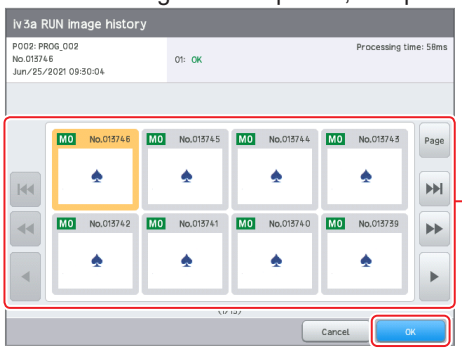
When selecting a batch backup file (*.iv3a) or individual program backup file (*.iv3a), select the image type from the following, and press [OK].

- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.

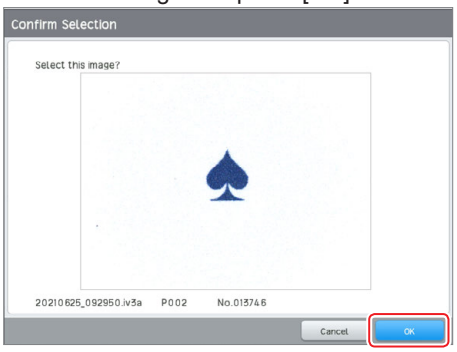


The list of images saved as the selected file image type will be displayed.
Select the image to be imported, and press [OK].



Select the image

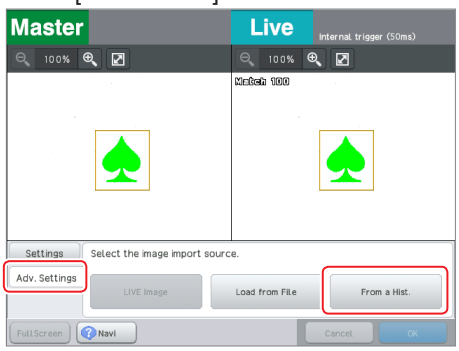
Check the image and press [OK].



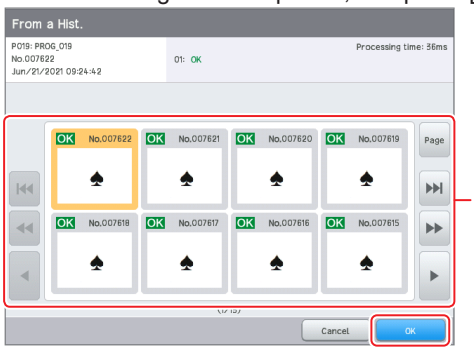
The imported image will be displayed on the right side of the screen.

● When importing from the image history

Press [From a Hist.].

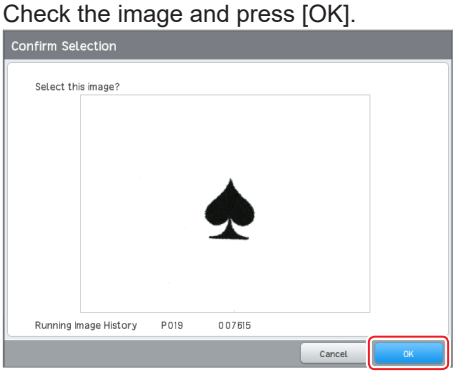


Select the image to be imported, and press [OK].



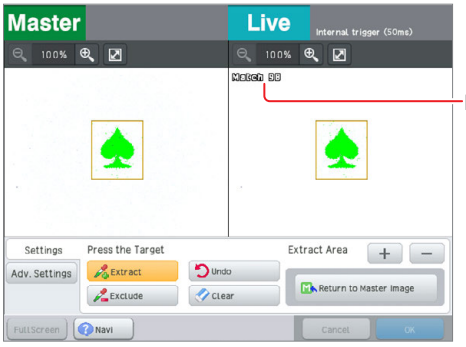
Select the image

Check the image and press [OK].



The imported image will be displayed on the right side of the screen.

3 Adjust the color extraction area by checking the matching rate.



Match

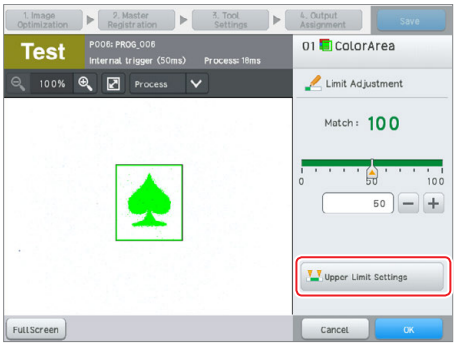
By selecting [Extract] or [Exclude] and pressing an image (Master/Live/Log), you can adjust the color extraction area.

- If [Extract] is selected, and the areas of color that have not been extracted are pressed, extraction area can be added.
- 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.
- When a color extraction is to be performed again, press [Clear] and then press the color to be the reference of judgment.

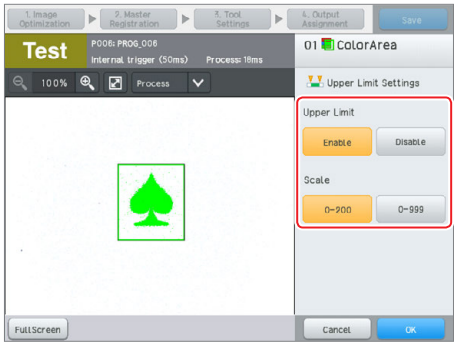
4 After setting is completed, press [Return to Master Image].

■ Upper Limit Settings

1 Press [Upper Limit Settings].



2 Press [Enable] to enable the upper limit threshold and select the scale.



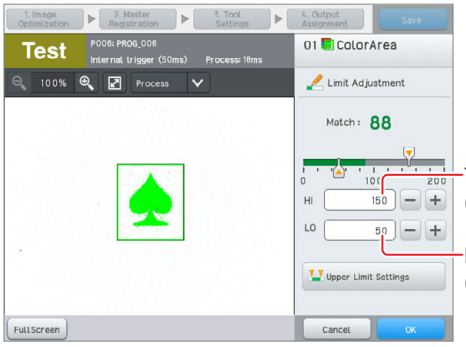
Select the scale according to the range of the matching rate required for judgment.

Disable (default)		Sets the upper and the lower limit of a threshold in a range within 0 to 100.
Enable	0-200 (default)	Sets the upper and the lower limit of a 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.

3 Press [OK].

The slider to set the upper limit and the lower limit of the threshold will be displayed.

4 Adjust the threshold for anomaly detection by checking the matching rate.



Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

5 Press [OK].

The system returns to the main screen for [ColorArea]/[Area].

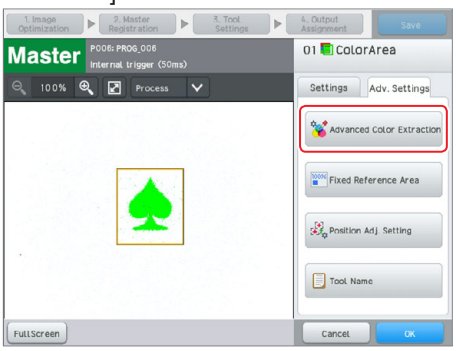
Advanced settings of the Color Area/Area Tool

■ Advanced Color Extraction/Advanced Brightness Extraction

1 **Select the [Adv. Settings] tab.**

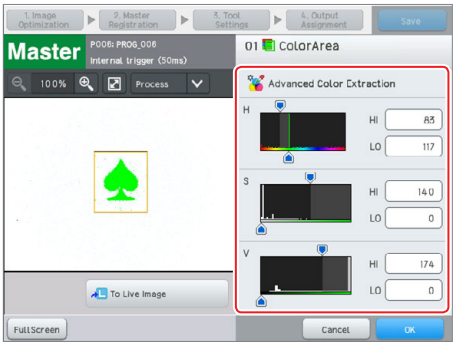
2 **Press [Advanced Color Extraction].**

For monochrome type, press [Adv. Brightness Extraction].



3 **Specify the color or brightness of the extraction target.**

● For color type



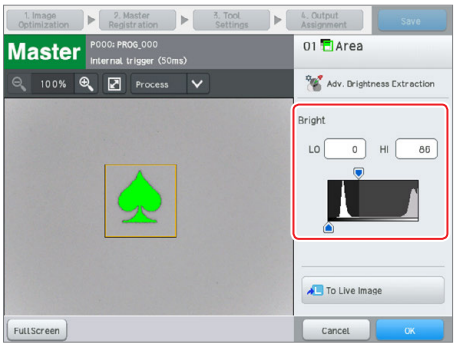
Reference

- 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	Set the upper limit and lower limit for the range of 0 to 359. • **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 V	Set the upper limit and lower limit for the range of 0 to 255. The extraction range of a color is from the lower limit to the upper limit.

- By pressing [To Live Image], the range of color to be extracted can be set with 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.

Light intensity	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 [To Live Image], the range of the brightness to be extracted can be set with the Live image of the target.

4 **When setting is completed, press [OK].**

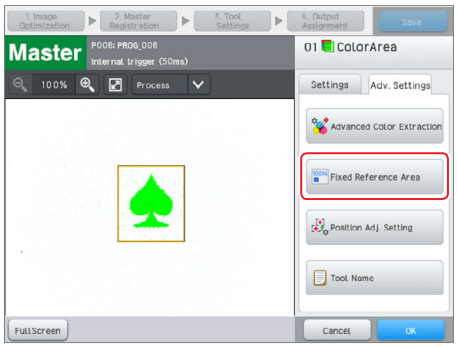
■ Fixed Reference Area

Reference

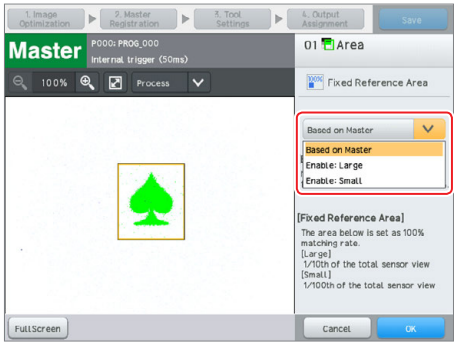
- Select [Enable] if the master image does not contain the color/brightness to be used for judgment.
- "Color Prohibition/Brightness Prohibition tool" (page 4-108) is helpful for judging target protrusions and misalignments.

1 Select the [Adv. Settings] tab.

2 Press [Fixed Reference Area].



3 Adjust the fixed reference area settings.



Based on Master (default)	Matches the area extracted from the master image as the criteria of a rate of 100%.
Enable: Large	Matches 1/10th of the total sensor view as the criteria of a rate of 100%.
Enable: Small	Matches 1/100th of the total sensor view as the criteria of a rate of 100%.

4 Press [OK].

Color/Brightness Average Tool

● Setting Items for the Color/Brightness Average tool

Items			Description
Master Color Settings (For color type) Master Bright. Settings (For monochrome 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.
	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.

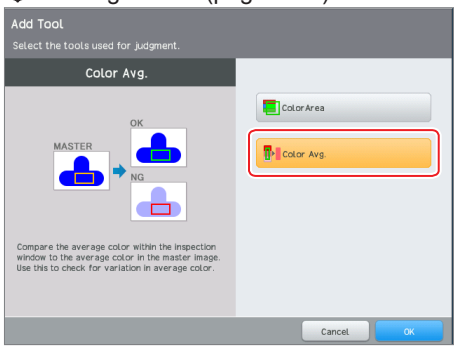
● Setting Items for the Color/Brightness Average tool (advanced settings)

Items		Description	Ref.
Color Range (For color type) Brightness Range (For monochrome type)		• **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.	4-58
	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 in USB memory.	
Specify Mast.Color (For color type) Specify Mast.Bright (For monochrome type)		Selects how to specify the master color/brightness.	4-62
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Color/Brightness Average tool can be selected.	4-36
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. “5 Running” (page 5-1)	4-37

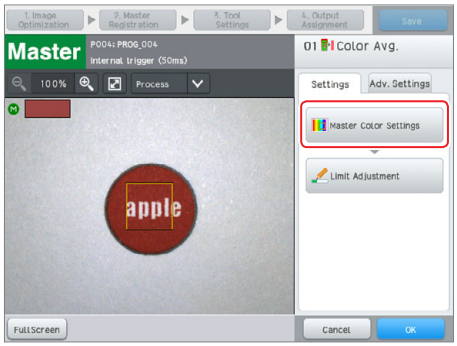
Setting the Color/Brightness Average tool

1 Add the [Color Avg.] tool (color type) or [Bright. Avg.] tool (monochrome type).

In the screen that appears by selecting [Color Tools], select [Color Avg.]/[Bright. Avg.] and press [OK].
“Adding a Tool” (page 4-33)



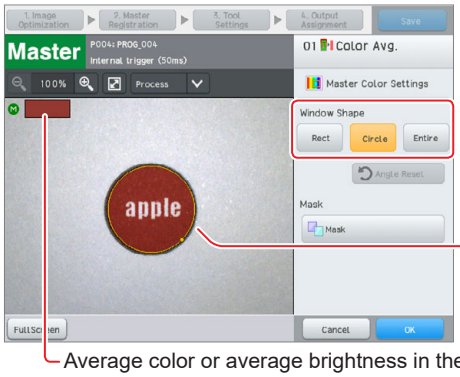
The main screen for [Color Avg.]/[Bright. Avg.] opens.



2 Perform [Master Color Settings] (color type) or [Master Bright. Settings] (monochrome type).

Reference Pressing the window will also allow for setting of the master color settings/master brightness settings.

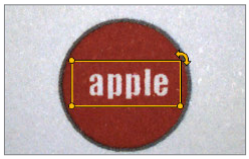
Select the tool window shape, position, size, and angle according to the desired target.
“Editing the Window” (page 3-18)



Set a position, size, and angle

Average color or average brightness in the window is displayed

Rect



Circle



When [Entire] is selected, the tool window will be hidden.

Reference When the window shape is set to [Rect], the angle of the window can be reset by [Angle Reset].

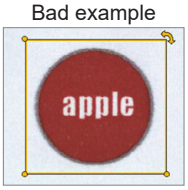
Point

- **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



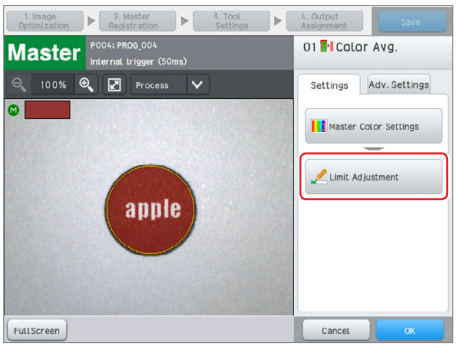
3 Apply the mask as needed.

The area inside the mask area is excluded from average color or average brightness extraction.
“Mask settings” (page 4-35)

4 Press [OK].

The system returns to the main screen for [Color Avg.]/[Bright. Avg.].

5 Press [Limit Adjustment].



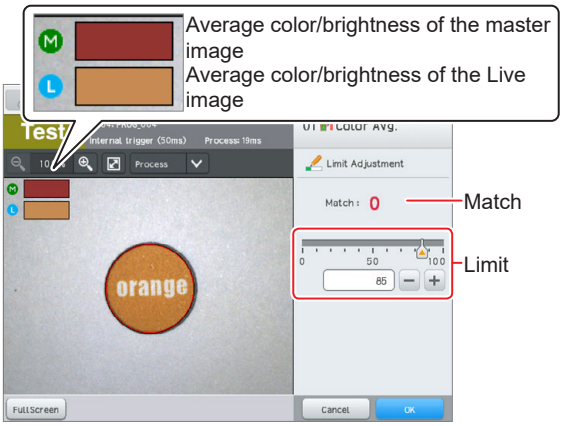
The sensor changes to Test mode.

6 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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 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
- 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.
- The matching rate is 100 when a color or 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.

“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

8 Press [OK].

The system returns to the main screen for [Color Avg.]/[Bright. Avg.].

9 Press [OK].

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

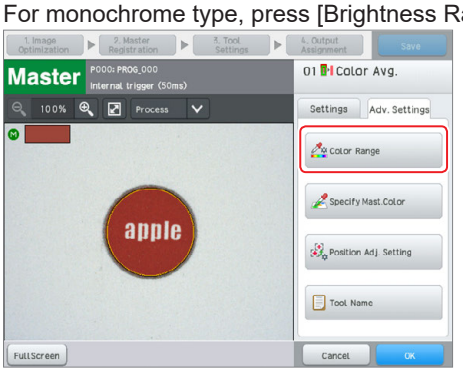
Advanced settings of the Color/Brightness Average tool

■ Color Range Settings /Brightness Range Settings

1 Select the [Adv. Settings] tab.

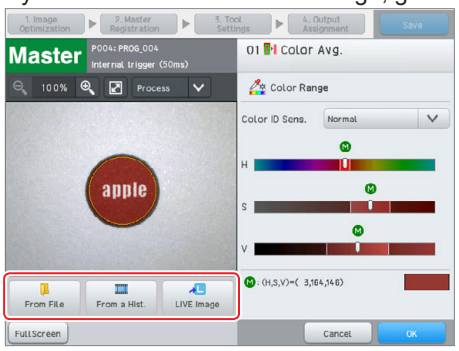
2 Press [Color Range].

For monochrome type, press [Brightness Range].



3 Select an image for which you want to adjust the color/brightness area.

If you want to use the master image, go to step 4.



● 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 For details of how to perform this operation, refer to “When importing from the image history” (page 4-52).

● When importing from a file saved in USB memory

Press [From File] to select the file desired to be imported.

Reference For details of how to perform this operation, refer to “When importing from a file saved in USB memory” (page 4-51).

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.

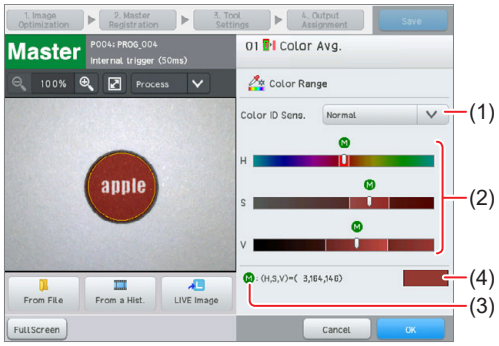
4 Select the color/brightness judgment sensitivity.

● For color type

Point

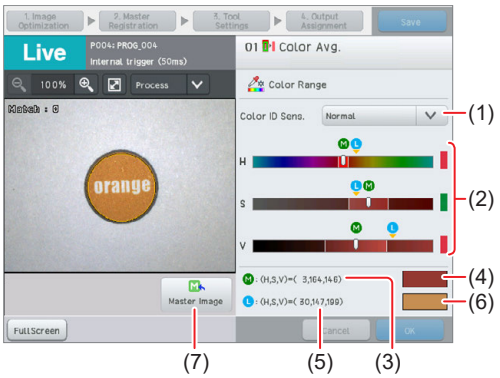
- **Selecting [Hi Sens]/[Normal]/[LowSens] automatically sets the judgment area. (The average color (HSV) value is the center of the master image window.)**
- **To narrow the OK area, select [Hi Sens]. This enables small color differences to be differentiated.**
- **To widen the OK area, select [LowSens]. 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.**

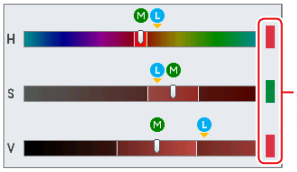
❍ Selecting sensitivity on the master image



No.	Description
(1)	Selects the color judgment sensitivity ([Hi Sens]/[Normal] (default)/[LowSens]/[Manual]).
(2)	The following items are displayed on the bar graph (H/S/V). • (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.

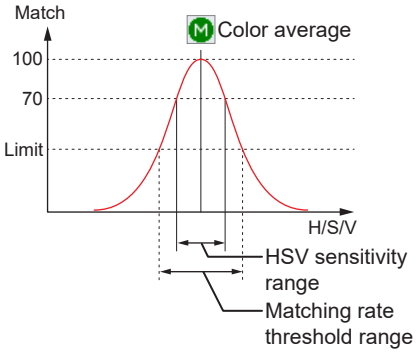
❍ Selecting sensitivity on an image other than the master image



No.	Description
(1)	Selects the color judgment sensitivity ([Hi Sens]/[Normal] (default)/[LowSens]/[Manual]).
(2)	• The following items are displayed on the bar graph (H/S/V). • (Average color value of the master image) • (Average color value of the Live image) • (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.  Status result (Green: OK; red: NG) 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 color of the imported image.
(6)	Displays the average HSV value of the imported image.
(7)	Presses this when setting is completed.

Reference Relationship between the color judgment sensitivity and matching rate

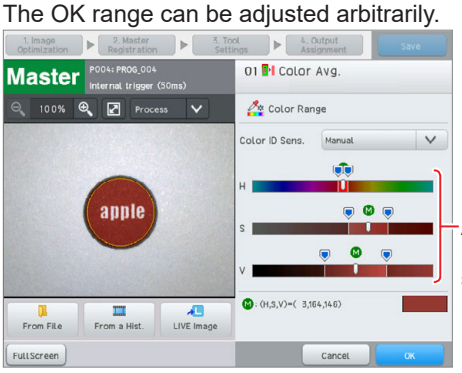
- When the average color of the target matches the average color of the master image, the matching rate is 100. The matching rate decreases as the difference between the average color of the target and master image increases. The sensitivity area is automatically adjusted so that the matching rate becomes 70.



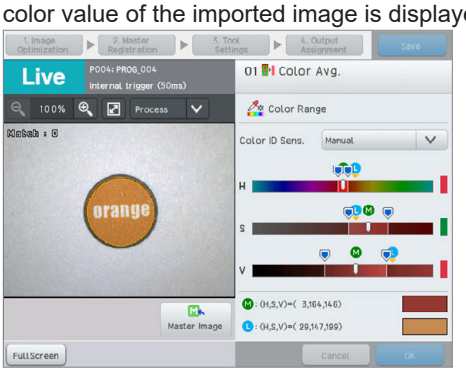
- The color average tool individually calculates the matching rate of H (hue)/S (saturation)/V (brightness) for the target.
- The smallest matching rate for H/S/V calculated individually will be the matching rate for the color average tool.

❍When [Manual] is selected

The OK range can be adjusted arbitrarily.



For an image other than the master image, the average color value of the imported image is displayed.

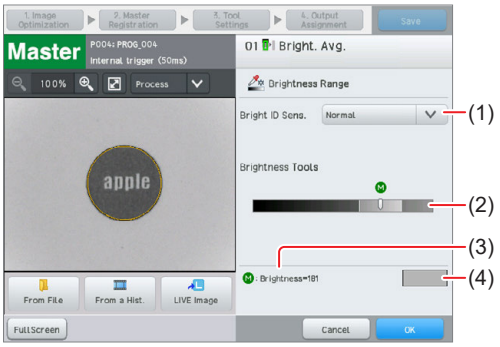


● For monochrome type

Point

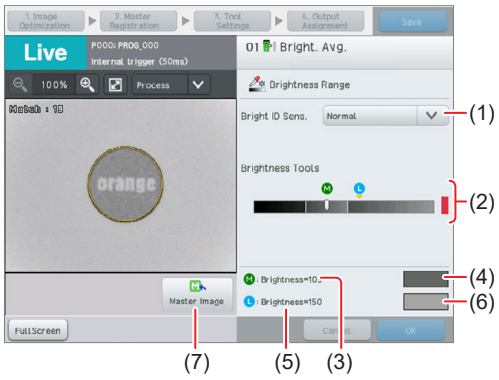
- **Selecting [Hi Sens]/[Normal]/[LowSens] automatically sets the judgment area. (The average brightness value is the center of the master image window.)**
- **To narrow the range of OK brightness, select [Hi Sens]. This enables small brightness differences to be differentiated.**
- **To widen the range of OK brightness, select [LowSens]. 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.**

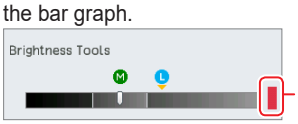
❍Selecting sensitivity on the master image



No.	Description
(1)	Selects the brightness judgment sensitivity ([Hi Sens] / [Normal] (default) / [LowSens]/[Manual]).
(2)	The following items are displayed on the bar graph. • (Average brightness value of the master image) • Solid line (brightness judgment sensitivity area) • Dotted line (threshold area of the brightness average tool) Reference The bar graph scale is from 0 on the left to 255 on the right.
(3)	Displays the average brightness value of the master image.
(4)	Displays the average brightness of the master image.

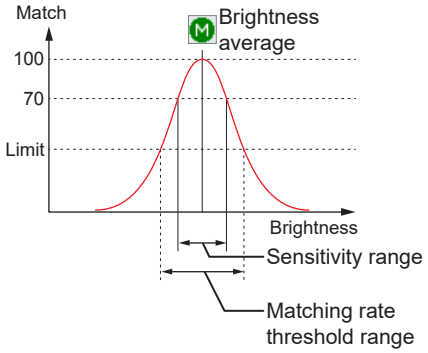
❍Selecting sensitivity on an image other than the master image



No.	Description
(1)	Selects the brightness judgment sensitivity ([Hi Sens] / [Normal] (default) / [LowSens]/[Manual]).
(2)	• The following items are displayed on the bar graph. • (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.  Status result (Green: OK; red: NG) Reference The bar graph scale is from 0 on the left to 255 on the right.
(3)	Displays the average brightness value of the master image.
(4)	Displays the average brightness of the master image.
(5)	Displays the average brightness of the imported image.
(6)	Displays the average brightness of the imported image.
(7)	Presses this when setting is completed.

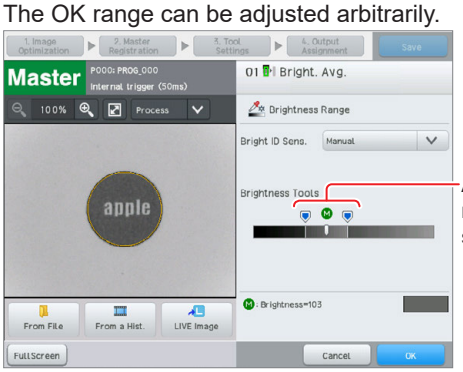
Reference Relationship between the brightness judgment sensitivity and matching rate

- 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.

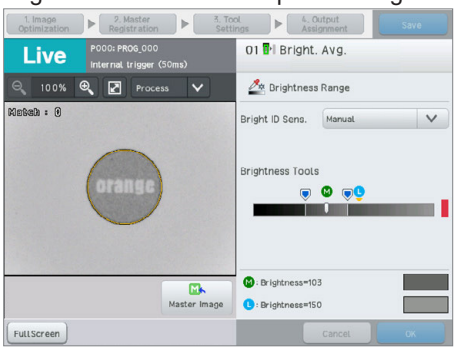


❍When [Manual] is selected

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.



5 When setting is completed, press [OK].

The system returns to the main screen for the extended functions settings.

6 Press the [Settings] tab.

The system returns to the main screen for [Color Avg.]/[Bright. Avg.].

■ Specify Mast.Color/Specify Mast.Bright

1 Select the [Adv. Settings] tab.

2 Press [Specify Mast.Color] (color type) or [Specify Mast.Bright] (monochrome type).

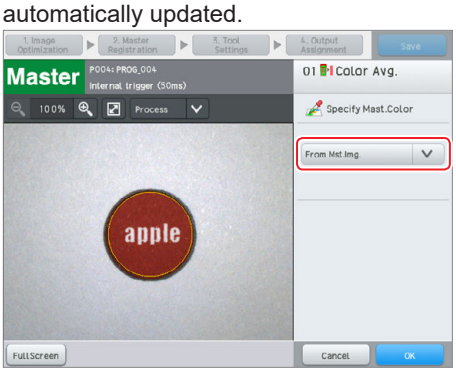


3 Selects how to specify the master color/ brightness.

> **Point** **When updating the master color/brightness registered for the master image registration, select [From Mst.Img.].**

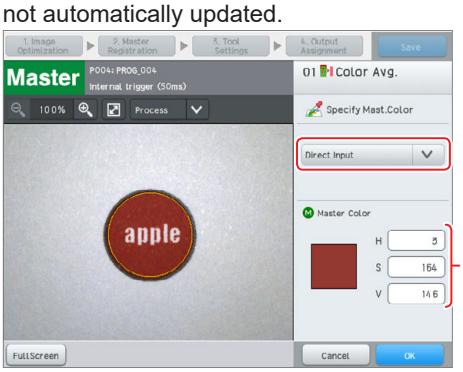
● From Mst.Img. (default)

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.



Enter a value

4 When setting is completed, press [OK].

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.

● Setting items for the Position Adjustment tool (Advanced Settings)

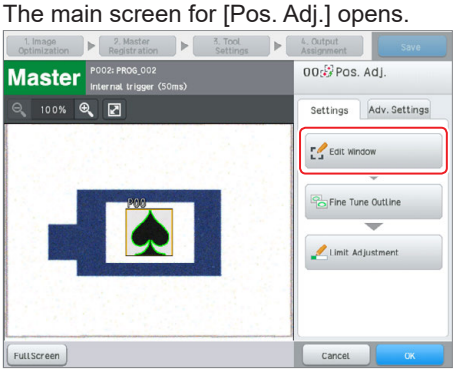
Items	Description	Ref.
Rotation Range	Sets the range of rotation to adjust the position for the target. The status result of the position adjustment is NG and position is not adjusted if the angle of rotation of the target exceeds its rotation range. • If the rotation range is set wide, the acceptable 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.	4-66
Search Algorithm	The algorithm used to search for the Position Adjustment tool can be adjusted depending on the inspection requirements.	4-67

Setting of the Position Adjustment tool

1 Adds the position adjustment tool.

“Adding a Tool” (page 4-33)

The main screen for [Pos. Adj.] opens.

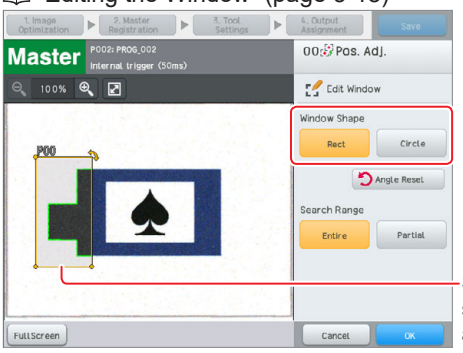


2 Press [Edit Window].

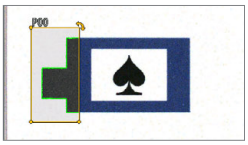
Reference Pressing the window directly will also allow for editing of the window.

Select the tool window shape, position, size, and angle according to the desired target.

“Editing the Window” (page 3-18)



□ Rect



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 6-23)

3 Set a search range as needed.

“Search Range Settings” (page 4-65)

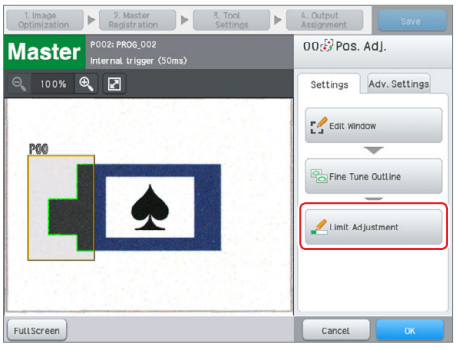
4 Press [OK].

The system returns to the main screen for [Pos. Adj.].

5 Adjust the outline as needed.

“Settings for Disabling Outlines” (page 4-65)
“Setting a Sensitivity” (page 4-66)

6 Press [Limit Adjustment].

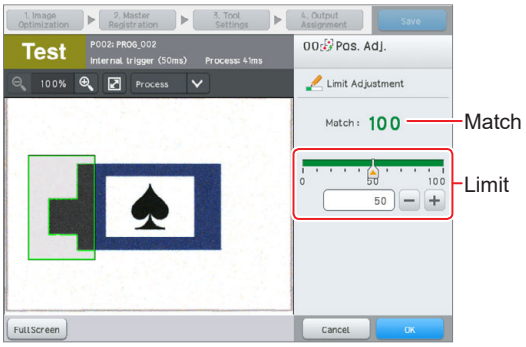


The sensor changes to Test mode.

7 Image the target.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

9 When setting is completed, press [OK].

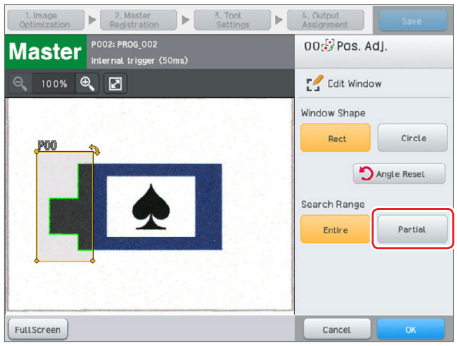
The system returns to the main screen for [Pos. Adj.].

10 Press [OK].

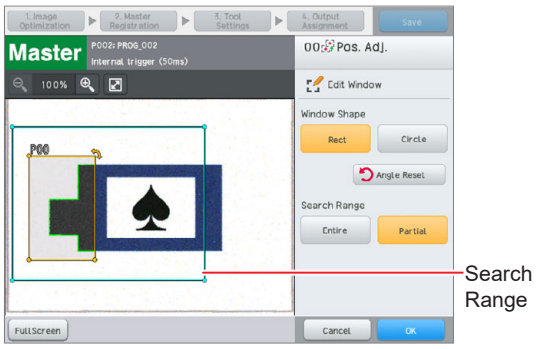
The system returns to the main screen for the tool settings.

■ Search Range Settings

1 Press [Partial].



2 Set the tool window to indicate the search range.



“Editing the Window” (page 3-18)

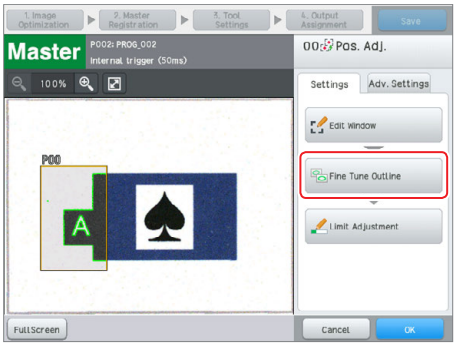
Reference The search range cannot be rotated.

3 Press [OK].

The system returns to the main screen for [Pos. Adj.].

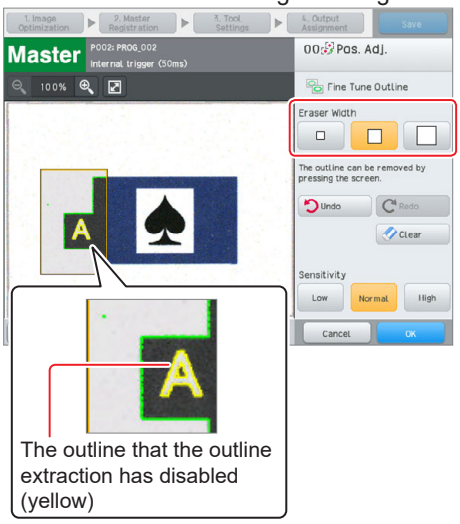
■ Settings for Disabling Outlines

1 Press [Fine Tune Outline].



2 Select [Eraser Width], and specify the outline that is not required for judgment by tracing it.

The disabled outline changes from green to yellow.



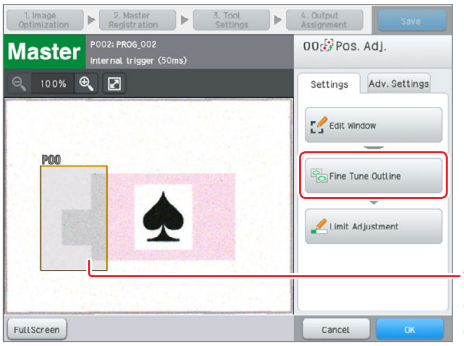
Reference The [Undo] button can be used up to 5 times.

3 Press [OK].

The system returns to the main screen for [Pos. Adj.].

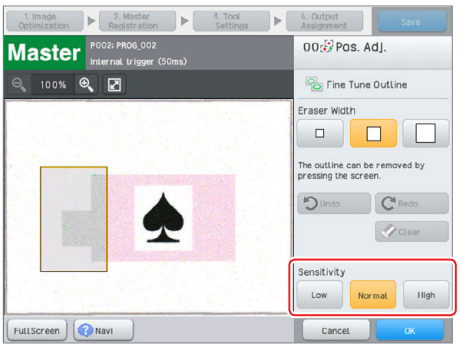
■ Setting a Sensitivity

1 Press [Fine Tune Outline].



The outline cannot be extracted

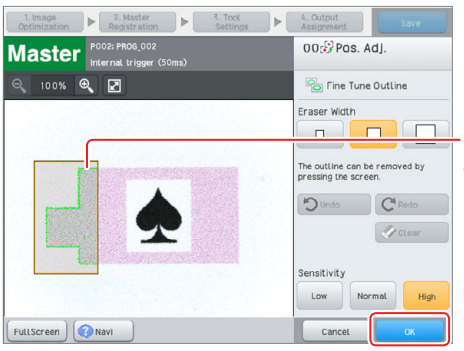
2 Select [Sensitivity] of the outline.



High	Extracts an outline of the image with low contrast. Used when an outline you wish to detect cannot be extracted with Normal or Low sensitivity.
Normal (default value)	Extracts the standard outline.
Low	Reduces the extracted volume of the outline. Used in situations where an outline is not necessary for inspection.

Reference If digital zoom is set to [Zoom Mag: x4], the default value is [High].

3 Press [OK].



Extracted outline

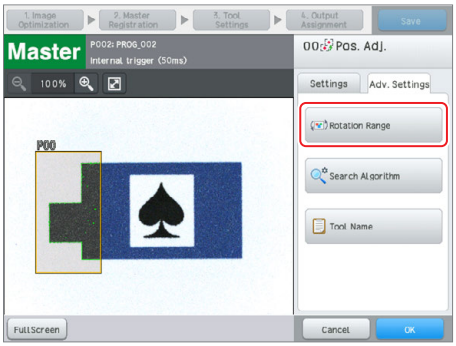
The system returns to the main screen for [Pos. Adj.].

Advanced Settings for the Position Adjustment Tool

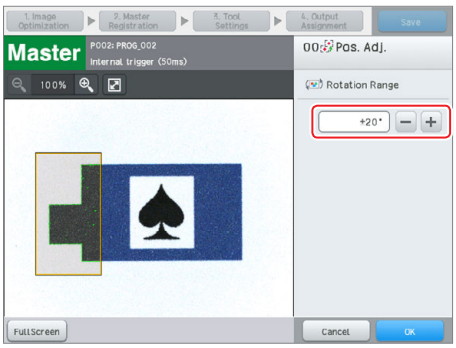
■ Rotation Range

1 Select the [Adv. Settings] tab.

2 Press [Rotation Range].



3 Set the rotation range of the Position Adjustment tool.



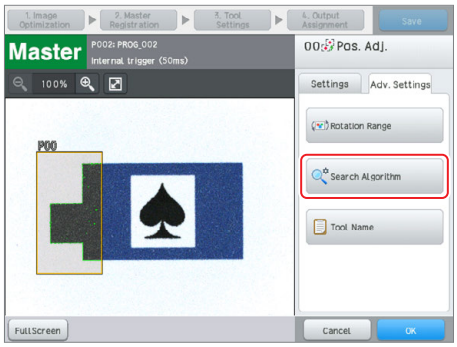
“Editing Numbers” (page 3-19)

4 Press [OK].

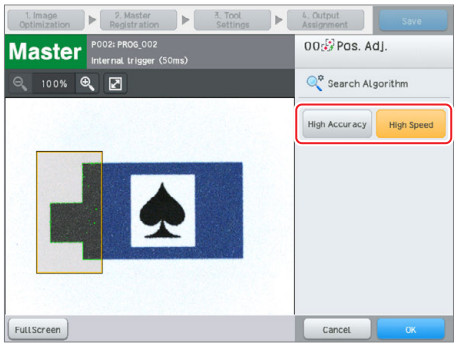
■ Search Algorithm

1 **Select the [Adv. Settings] tab.**

2 **Press [Search Algorithm].**



3 **Select the type of search algorithm (High Accuracy/High Speed).**



High Accuracy	Position adjustment can be performed with high accuracy. Misalignment of the position adjustment can be decreased.
High Speed (default)	Position adjustment can be performed faster than in high accuracy mode.

Point

- **Select [High Accuracy] when detection is not stable because the position of the tool window after position adjustment does not match the target position.**
- **Select [High Speed] to shorten the processing time.**

4 **When setting is completed, press [OK].**

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.
Edge Sensitivity Auto 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.
		To 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 turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.
	Upper Limit Settings	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.

● Setting items for the Width tool (advanced settings)

Items		Description	Ref.
Edge Sensitivity Manual Adjustment		Manually adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	4-71
	To Live Image	The edge sensitivity can be adjusted from the Live image of the target.	
	Edge Sensitivity Auto Adjustment	Automatically adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	
Width Extraction Method		Select the method used to extract the target width.	4-72
Scaling	Scaling	Sets scaling. Set when length is being used for anomaly detection instead of the matching rate.	4-73
	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.	4-36
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. “5 Running” (page 5-1)	4-37

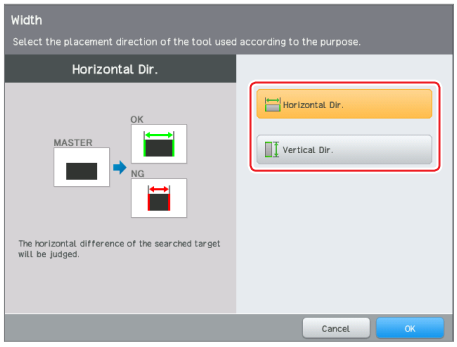
Setting the Width tool

1 **Select the [Extra1] tab, and add the [Width] tool.**

“Adding a Tool” (page 4-33)

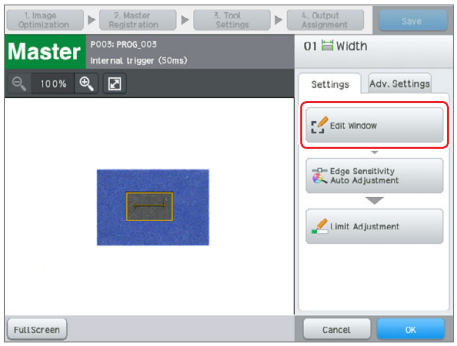
Displays the Width tool direction selection screen.

2 **Press [Horizontal Dir.]/[Vertical Dir.].**

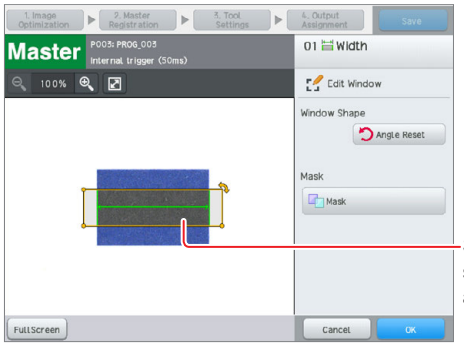


The main screen for [Width] opens.

3 **Press [Edit Window].**



4 **Set the position, size, and angle of tool window in according to the target.**



“Editing the Window” (page 3-18)

5 **Apply the mask as needed.**

The area inside the mask region is excluded from the width detection target.

“Mask settings” (page 4-35)

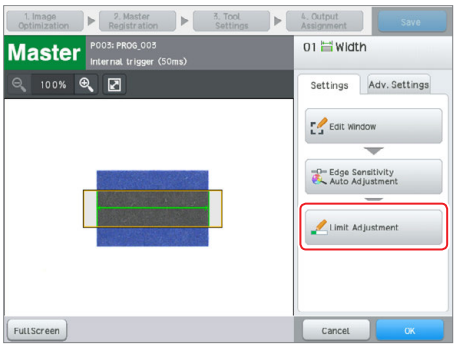
6 **Press [OK].**

The system returns to the main screen of [Width].

7 **Perform Edge Sensitivity Auto Adjustment as needed.**

“Edge Sensitivity Auto Adjustment” (page 4-70)

8 **Press [Limit Adjustment].**



The sensor changes to Test mode.

9 **Change [Upper Limit Settings] as needed.**

“Upper Limit Settings” (page 4-71)

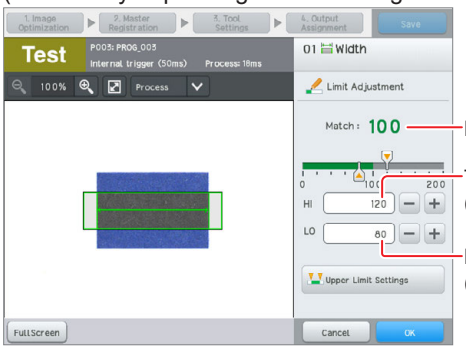
10 **Take an “OK” image and a “NG” image.**

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.

11 **Adjust the threshold for anomaly detection by checking the matching rate.**

● If [Upper Limit] is [Enable]

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).



Reference

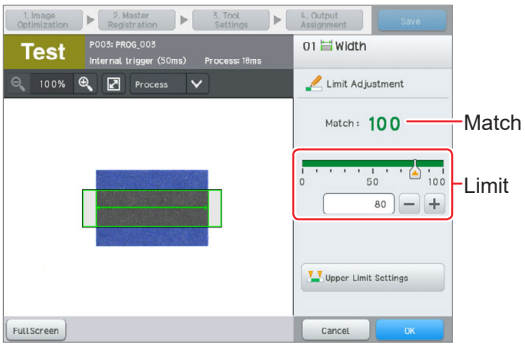
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- A matching rate of 100 indicates that the target width is completely matched to the master image. The matching rate becomes smaller with a narrower width 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.

“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

● If [Upper Limit Settings] is [Disable]

The setting range is 0 to 100, and the default value is 80. (These vary depending on the scaling settings).

<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 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.

“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

12 **Press [OK].**

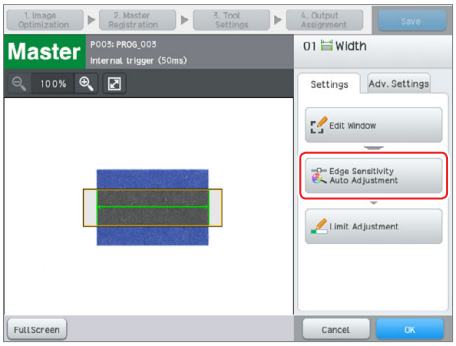
The system returns to the main screen of [Width].

13 **Press [OK].**

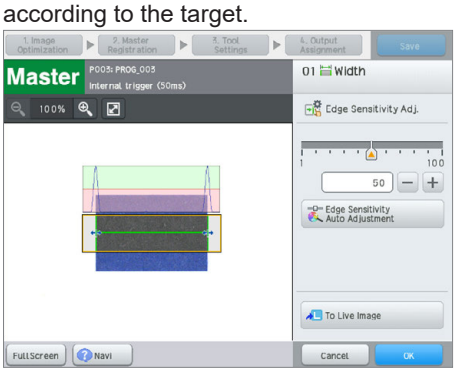
The system returns to the main screen for the tool settings.

■ Edge Sensitivity Auto Adjustment

1 **Press [Edge Sensitivity Auto Adjustment].**



The edge sensitivity will be adjusted automatically according to the target.



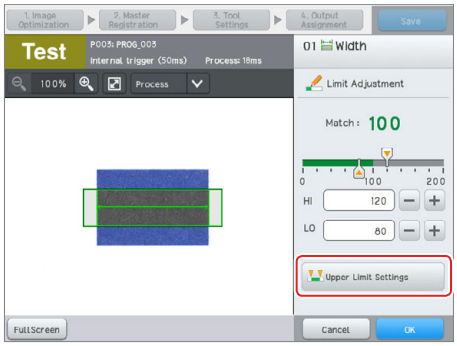
Reference
- The edges that are options for width detection are displayed as yellow. The distance between the green edges is defined as matching rate 100 of the Width tool.
- If the distance between edges changes, press the green edge and adjust its position. The yellow edges can be selected as the target edges.
- When adjusting the edge sensitivity manually, refer to “Edge Sensitivity Manual Adjustment” (page 4-71).

2 **Press [OK].**

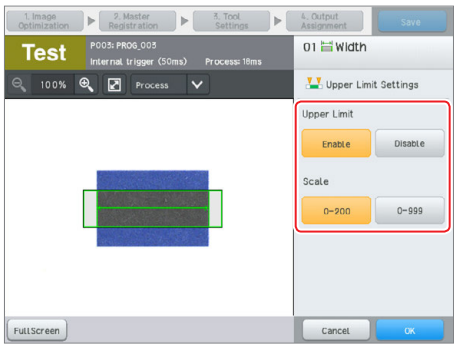
The system returns to the main screen of [Width].

■ Upper Limit Settings

1 Press [Upper Limit Settings].



2 Set the upper limit settings.



Select the scale according to the range of the matching rate required for judgment.

Disable (default)		Sets the upper and the lower limit of a threshold in a range within 0 to 100.
Enable	0-200 (default)	Sets the upper and the lower limit of a 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.

3 Press [OK].

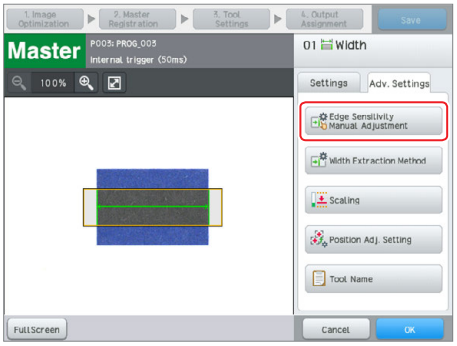
The system returns to the limit adjustment screen.

Advanced settings for the width tool

■ Edge Sensitivity Manual Adjustment

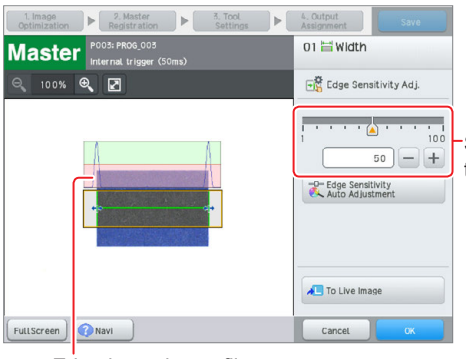
1 Select the [Adv. Settings] tab.

2 Press [Edge Sensitivity Manual Adjustment].



3 Adjust the edge sensitivity threshold value used to extract a width by checking the edge intensity profile displayed on the image.

The setting range is 1 to 100, and the default value is 50.



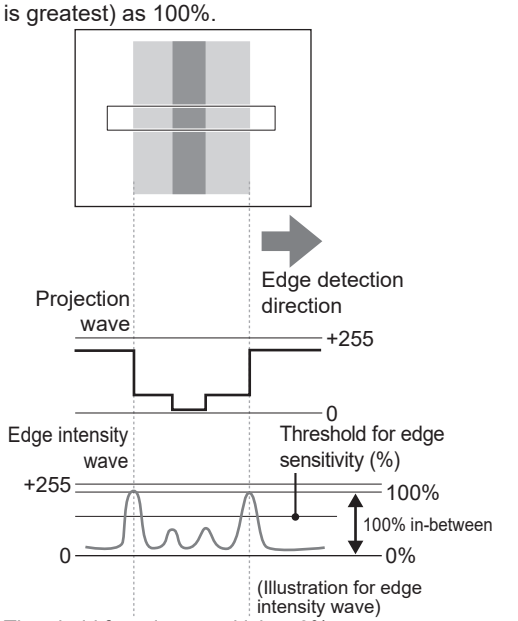
Reference

- The sensitivity limit can be adjusted by pressing the red line up or down.
- Press [To Live Image] to adjust edge sensitivity threshold value using the target Live image.
- Press [Edge Sensitivity Auto Adjustment] to adjust the edge sensitivity threshold according to the target automatically.

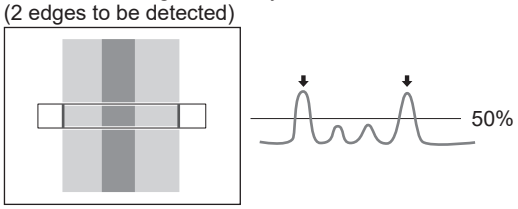
4 Press [OK].

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

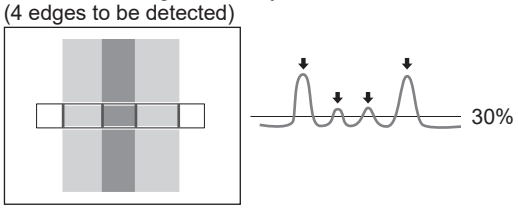
Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



Threshold for edge sensitivity 50%
(2 edges to be detected)



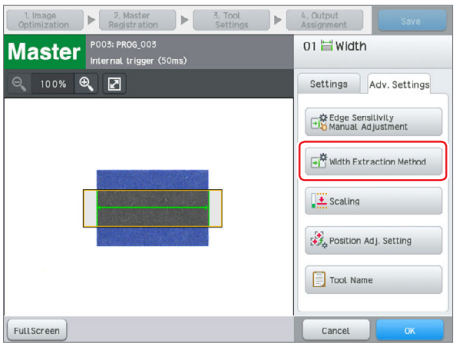
Threshold for edge sensitivity 30%
(4 edges to be detected)



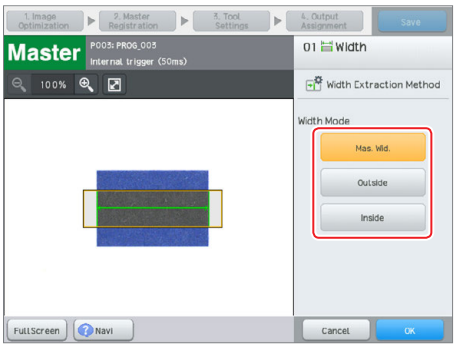
■ Width Extraction Method

1 Select the [Adv. Settings] tab.

2 Press [Width Extraction Method].

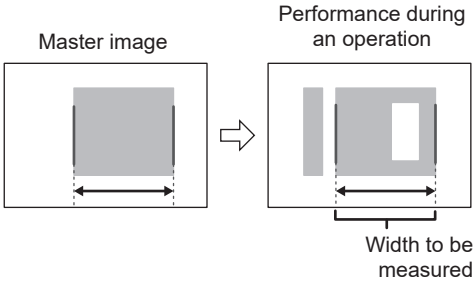


3 Select [Width Extraction Method].

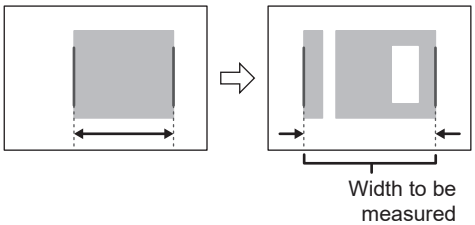


Point

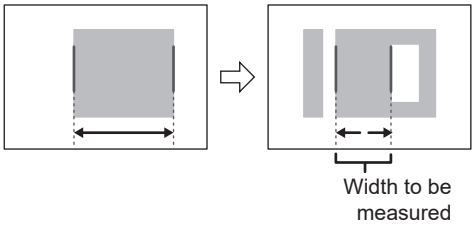
- **When extracting the width which is similar to the one registered in the master image, select [Mas. Wid.].**



- **When extracting the outer-most width of the tool window, select [Outside].**



- **When extracting the inner-most width of the tool window, select [Inside].**



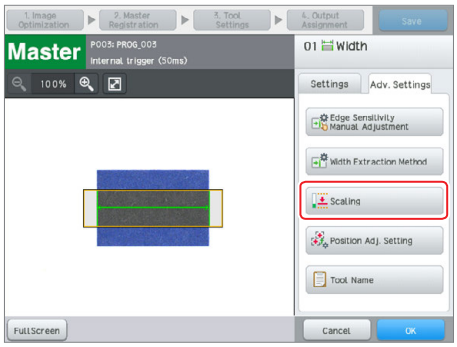
4 Press [OK].

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

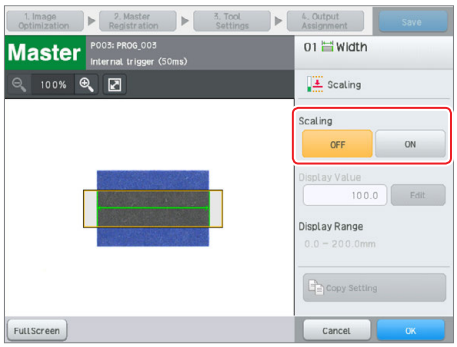
■ Scaling

1 Select the [Adv. Settings] tab.

2 Press [Scaling].



3 Press [ON].



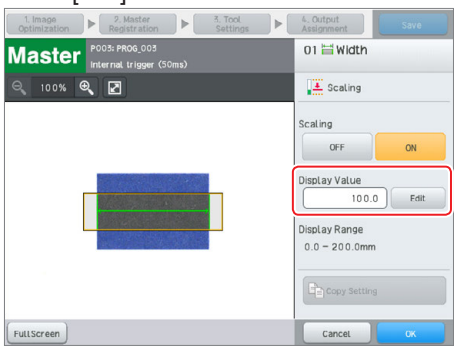
Point

- **If scaling is ON, the display range and the setting scale (x2 or x10) of the threshold adjustment will be automatically adjusted.**
- **If scaling is ON, the threshold can be adjusted by 0.1 mm.**

4 Set scaling.

● When the scaling settings are changed

Press [Edit].



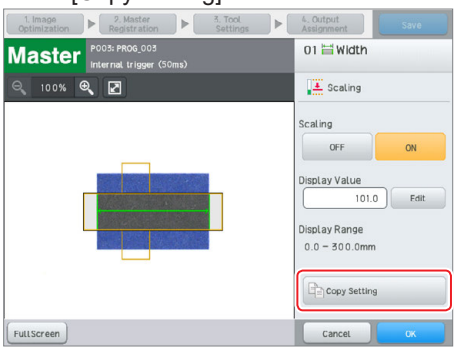
Enter a display value and press [OK].
The setting range is 0.05 to 9999 (maximum input digits: 4), and the default value is 100.0.
“Editing Numbers” (page 3-19)

Point

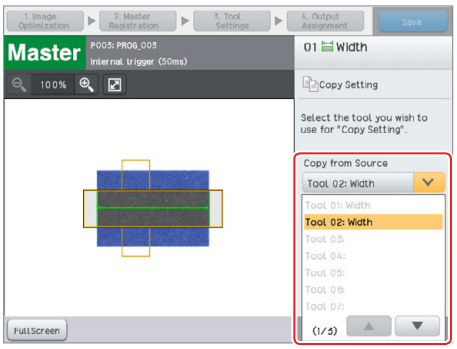
The scaling display value can be adjusted by 0.05 mm.

● When copying scaling settings

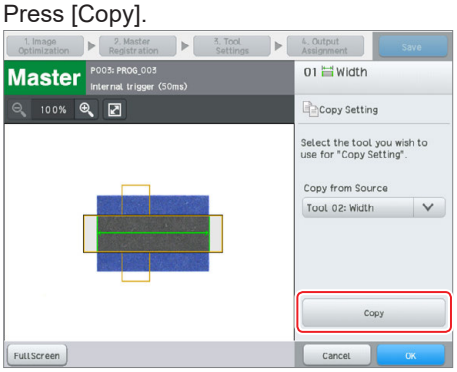
Press [Copy Setting].



Select the source tool.



Press [Copy].



The confirmation screen opens.

5 Press [OK].

Return to the [Copy Setting] screen.

6 Press [OK].

Return to the [Scaling] setting screen.

7 Press [OK].

The confirmation screen opens.

8 Press [OK].

The system returns to the main screen of [Width].

Point

If the scaling value of the source tool is changed, copy the scaling settings again.

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	Ext. Sens		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 turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.
	Upper Limit Settings	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.

● Advanced settings of the Diameter tool

Items		Description	Ref.
Adv. Diameter Extraction	Diameter Mode	Select the method used to extract the target diameter.	4-76
	Bright/Dark Direction	Selects the direction for which the tool detects the target edge.	
Scaling	Scaling	Sets scaling. Set when length is being used for anomaly detection instead of the matching rate.	4-78
	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.	4-36
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. “5 Running” (page 5-1)	4-37

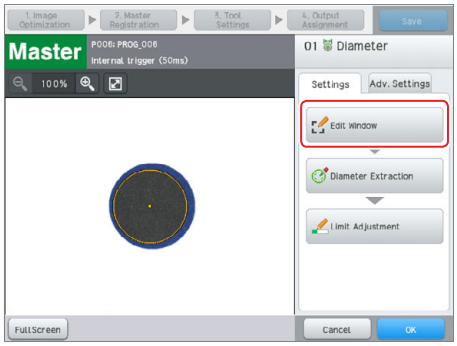
Setting the Diameter tool

1 **Select the [Extra1] tab, and add the [Diameter] tool.**

“Adding a Tool” (page 4-33)

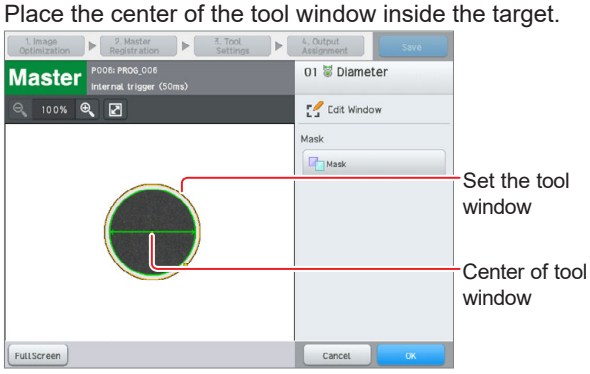
The main screen for [Diameter] opens.

2 **Press [Edit Window].**



3 **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 3-18)

Reference The sensor detects circles from the center of tool window towards outside.

4 **Apply the mask as needed.**

The area inside the mask region is excluded from the diameter detection target.

“Mask settings” (page 4-35)

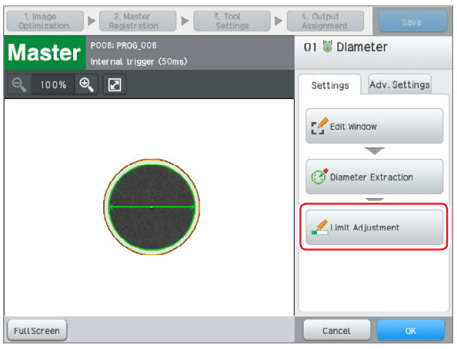
5 **Press [OK].**

The system returns to the main screen of [Diameter].

6 **Perform extraction diameter extraction as needed.**

“Diameter Extraction Settings” (page 4-76)

7 **Press [Limit Adjustment].**



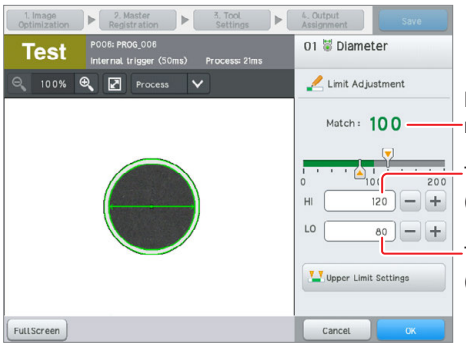
The sensor changes to Test mode.

8 **Take an “OK” image and a “NG” image.**

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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 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.
- A matching rate of 100 indicates that the target diameter is completely matched to the master image diameter. The matching rate is a value proportional to the diameter used in the master image. 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

10 **Set [Upper Limit Settings] as needed.**

“Upper Limit Settings” (page 4-76)

11 **When setting is completed, press [OK].**

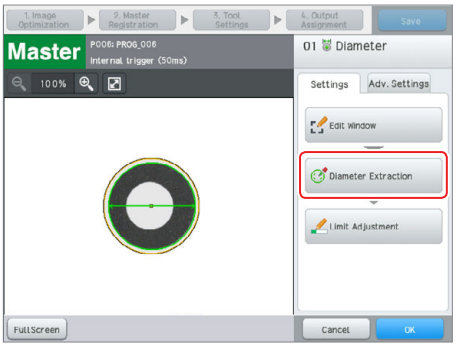
The system returns to the main screen of [Diameter].

12 **Press [OK].**

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

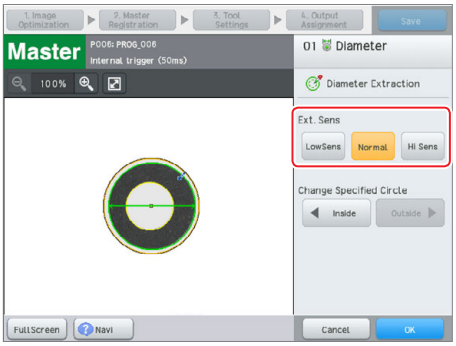
■ Diameter Extraction Settings

1 Press [Diameter Extraction].



The Settings Navigator guide opens.
Press [OK].

2 Select [Ext. Sens] of a diameter.



Hi Sens	Makes it easier to extract the diameter of an image with low contrast and low roundness. Used when a diameter desired for detection cannot be extracted.
Normal (default)	Extracts the standard diameter.
LowSens	Reduces the extracted diameter volume. Used when diameters other than the desired diameter for inspection are extracted.

3 Press [◄ Inside]/[Outside ►] of "Change Specified Circle", and select the circle with the diameter to be used for inspection.

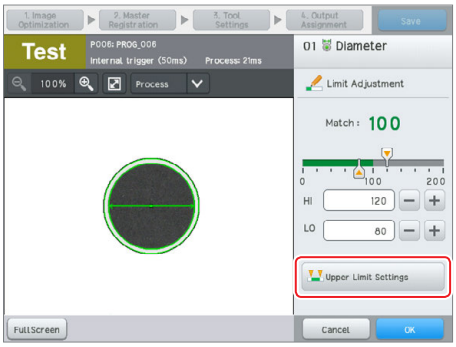
Reference The circle used for diameter extraction is displayed in green color.
You can also press the yellow candidate circle to select the circle for diameter extraction.

4 Press [OK].

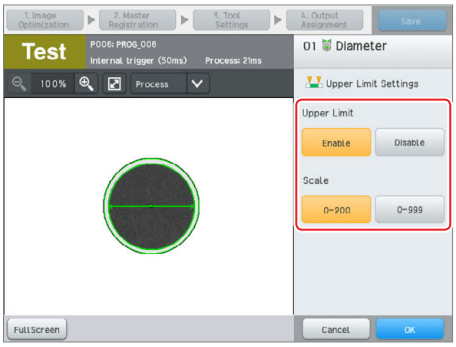
The system returns to the main screen of [Diameter].

■ Upper Limit Settings

1 Press [Upper Limit Settings].



2 Set the upper limit settings.

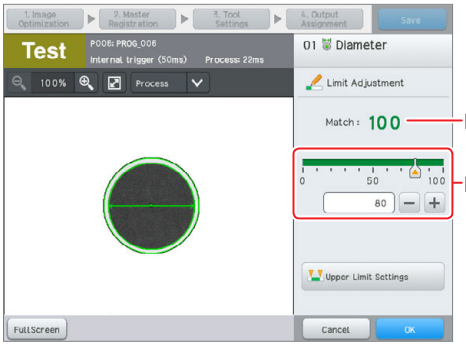


● When changing the setting scale

Press [0-999] for the setting scale, and press [OK].

● When upper limit is disabled

Press [Disable] of the upper limit, and press [OK].
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 the target diameter is completely matched to the master image diameter. The matching rate is a value proportional to the diameter used in the master image. 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.

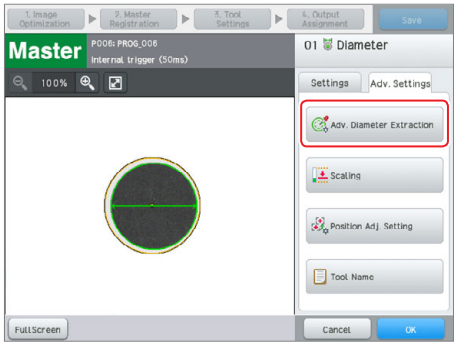
"Selecting the Display Method of the Tool Window" (page 5-11)
"Editing Numbers" (page 3-19)
"Adjusting Thresholds for Judgment" (page 6-17)

Advanced settings for the Diameter tool

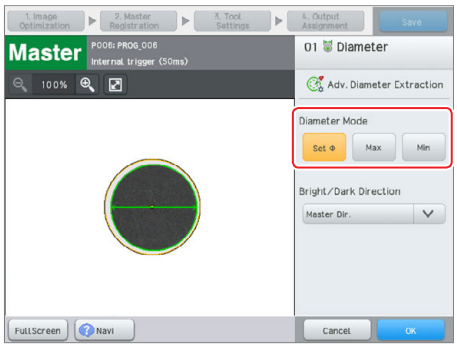
■ Advanced Diameter Extraction

1 Select the [Adv. Settings] tab.

2 Press [Adv. Diameter Extraction].

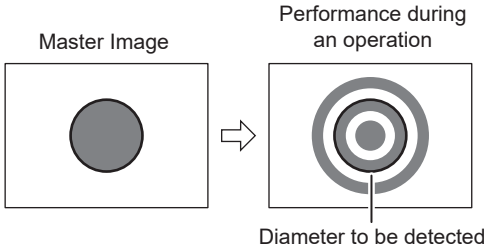


3 Select the diameter mode.

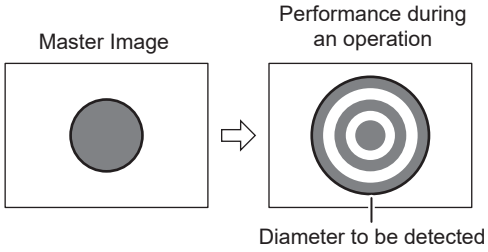


Point

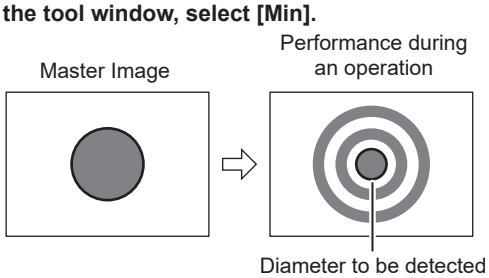
- **If the circle desired is the one whose diameter is similar to the circle specified inside the tool window, select [Set Φ].**



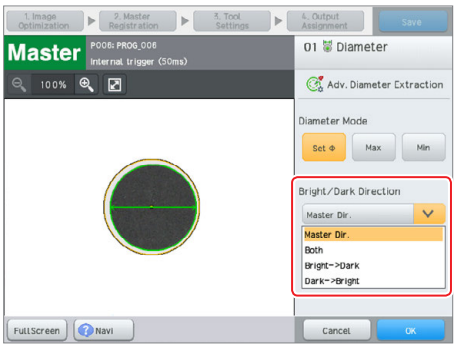
- **When extracting the largest circle inside the tool window, select [Max].**



- **When extracting the smallest circle inside the tool window, select [Min].**

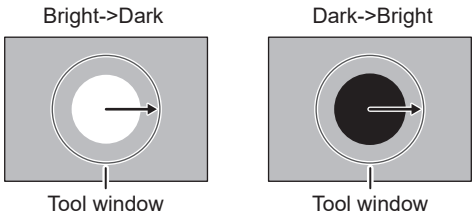


4 Select bright/dark direction.



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.

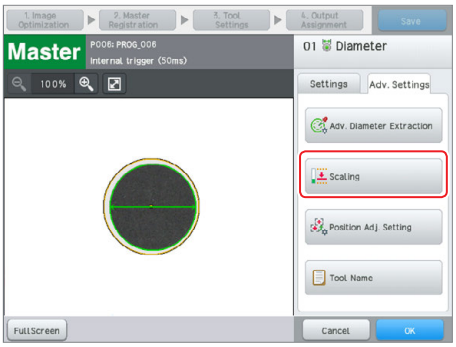
5 Press [OK].

The system returns to the main screen of [Diameter].

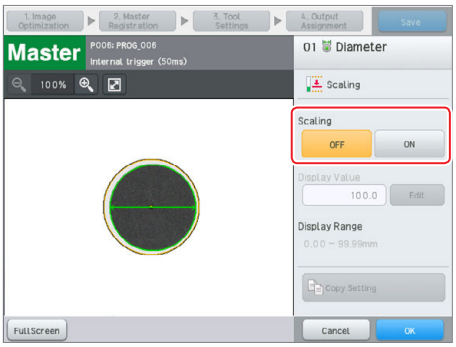
■ Scaling

1 Select the [Adv. Settings] tab.

2 Press [Scaling].



3 Press [ON].



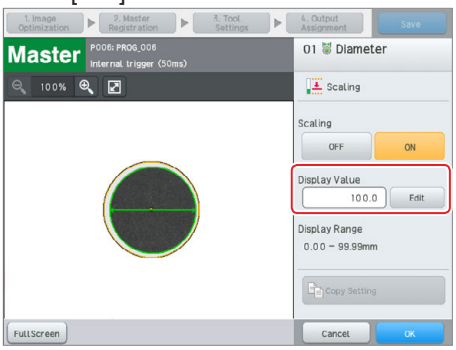
Point

- **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.**

4 Set scaling.

● When the scaling settings are changed

Press [Edit].



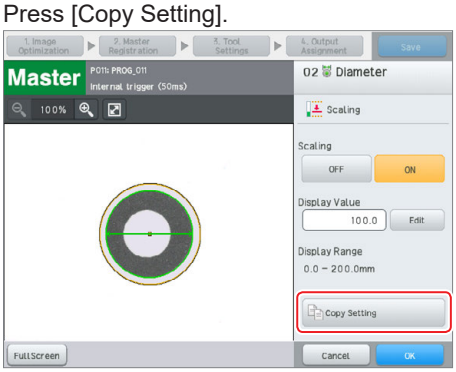
Enter a display value and press [OK].
“Editing Numbers” (page 3-19)

Point

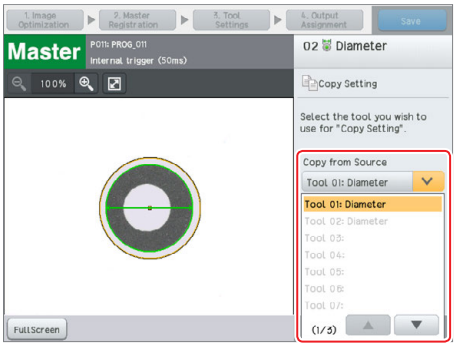
- **The scaling display value can be adjusted by 0.05 mm.**
- **A matching rate of 100 indicates that the target diameter is completely matched to the master image diameter. The matching rate is a value proportional to the diameter used in the master image.**

● When copying scaling settings from another tool

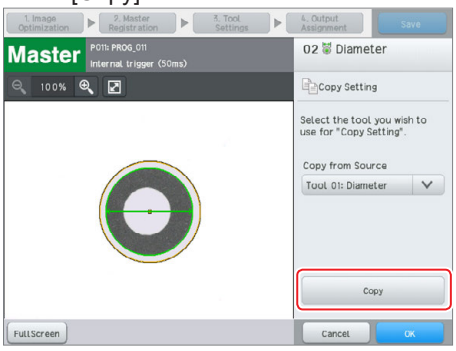
Press [Copy Setting].



Select the source tool.



Press [Copy].



The confirmation screen opens.

5 Press [OK].

Return to the [Copy Setting] screen.

6 Press [OK].

Return to the [Scaling] setting screen.

7 Press [OK].

The confirmation screen opens.

8 Press [OK].

The system returns to the main screen of [Diameter].

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. The area inside the mask region is excluded from the edge detection target.
		Add Mask	
Edge Sensitivity Auto Adjustment			Automatically adjusts the sensitivity which detects the edge.
	Manual adjustment		Manually adjusts the sensitivity which detects the edge.
		To 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 Settings	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.

*1 The matching rate is the number of edges.

● Setting items for the Edge tool (advanced settings)

Items		Description	Ref.
Edge Sensitivity Manual Adjustment		Manually adjust the sensitivity which detects the edge.	4-82
	To Live Image	The edge sensitivity can be adjusted from the Live image of the target.	
	Edge Sensitivity Auto Adjustment	Automatically adjust the sensitivity which detects the edge.	
Edge Detection	Bright/Dark Direction	Select the bright/dark direction which detects a target edge.	4-83
	Fine Edge Mode	Set this when the space between edges is narrow.	
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Edge tool can be selected.	4-36
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. “5 Running” (page 5-1)	4-37

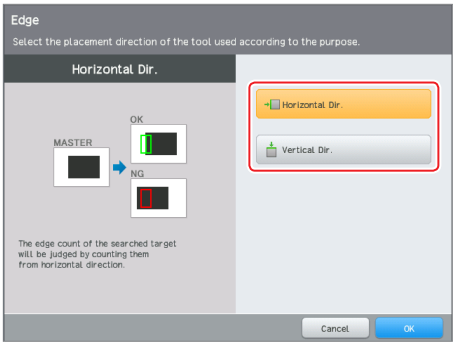
Setting the Edge tool

1 **Select the [Extra1] tab, and add the [Edge] tool.**

“Adding a Tool” (page 4-33)

Displays the Edge tool direction selection screen.

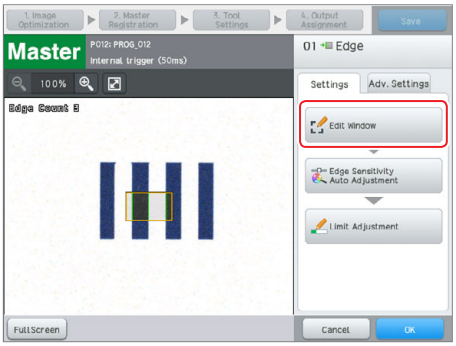
2 **Press [Horizontal Dir.]/[Vertical Dir.].**



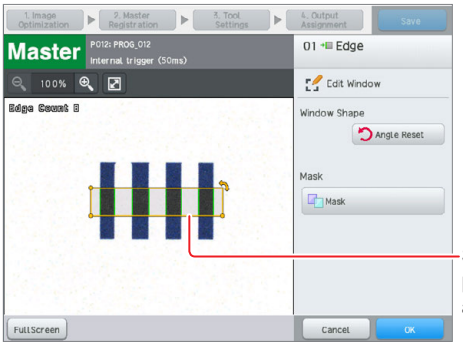
Reference For [Horizontal Dir.], the edges are detected from the left to the right side of the tool window; for [Vertical Dir.], the edges are detected from the top to the bottom.

The main screen for [Edge] opens.

3 **Press [Edit Window].**



4 **Set the position, size, and angle of tool window in according to the target.**



Set the position, size, and angle

“Editing the Window” (page 3-18)

5 **Apply the mask as needed.**

Inside the mask region is excluded from an edge detection target.

“Mask settings” (page 4-35)

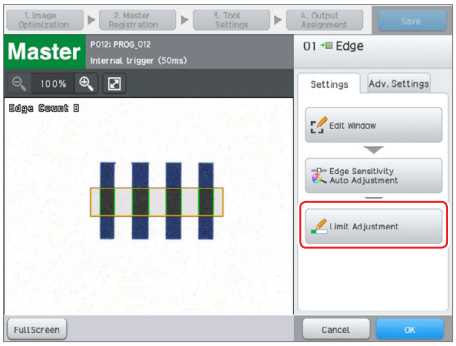
6 **Press [OK].**

The system returns to the main screen for [Edge].

7 **Perform Edge Sensitivity Auto Adjustment as needed.**

“Edge Sensitivity Auto Adjustment” (page 4-81)

8 **Press [Limit Adjustment].**



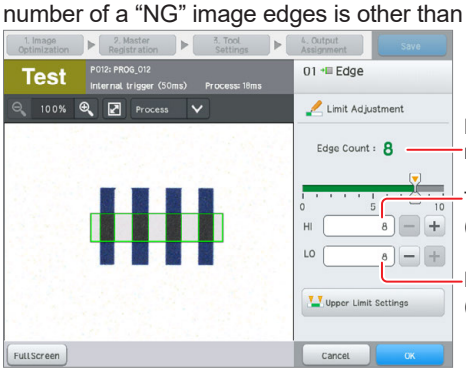
The sensor changes to Test mode.

9 **Take an “OK” image and a “NG” image.**

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.

10 **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.



Matching rate

Threshold (upper limit)

Limit (lower limit)

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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

11 **Set [Upper Limit Settings] as needed.**

“Upper Limit Settings” (page 4-81)

12 **When setting is completed, press [OK].**

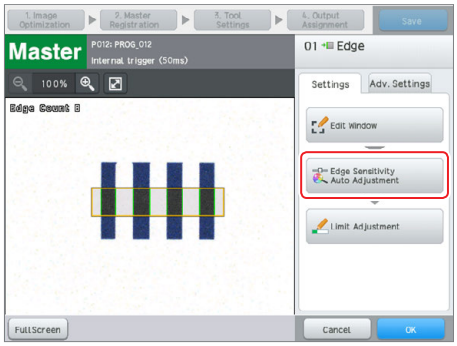
The system returns to the main screen for [Edge].

13 **Press [OK].**

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

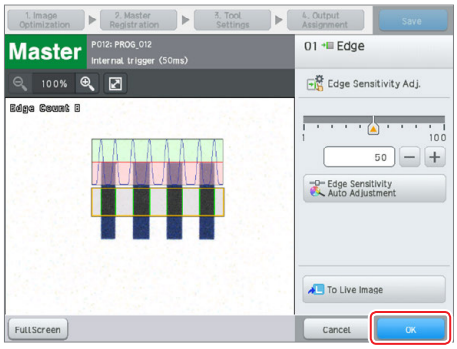
■ Edge Sensitivity Auto Adjustment

1 Press [Edge Sensitivity Auto Adjustment].



The edge sensitivity will be adjusted automatically according to the target.

2 Press [OK].

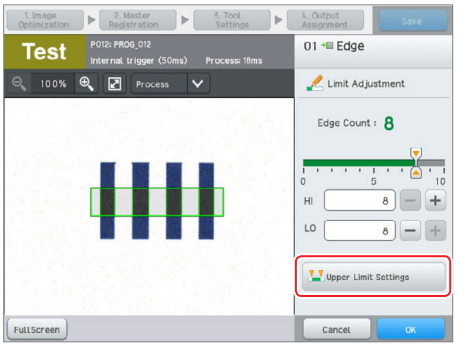


The system returns to the main screen for the Edge tool settings.

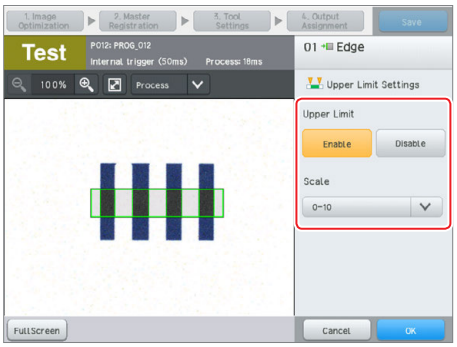
Reference The edge sensitivity can also be adjusted manually as well.
“Edge Sensitivity Manual Adjustment” (page 4-82)

■ Upper Limit Settings

1 Press [Upper Limit Settings].

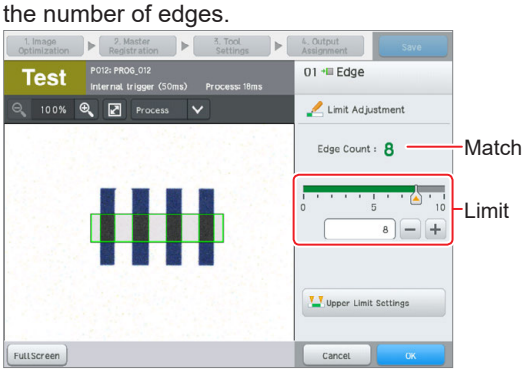


2 Set the upper limit settings.



● When upper limit is disabled

Press [Disable] of the upper limit, and press [OK].
Adjust the threshold for anomaly detection by checking the number of edges.



Reference The target is judged OK when the number of edges is larger than the threshold value, and NG when it is smaller.
“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

● When changing the setting scale

Select the setting scale and press [OK].
Adjust the threshold for anomaly detection by checking the number of edges.

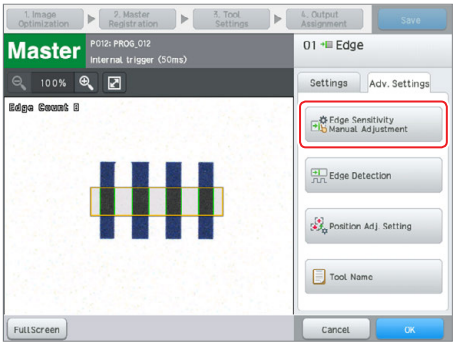
Reference The target is judged OK when the number of edges is within a threshold range, and NG when it is outside the range.
“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

Advanced settings of the Edge tool

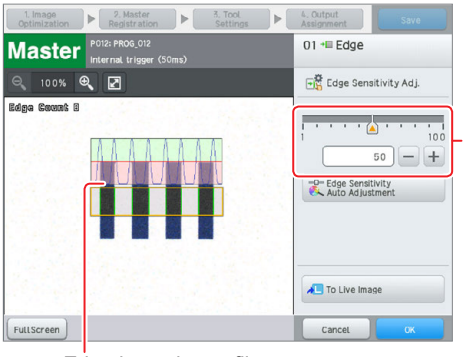
■ Edge Sensitivity Manual Adjustment

1 **Select the [Adv. Settings] tab.**

2 **Press [Edge Sensitivity Manual Adjustment].**



3 **Adjust the edge sensitivity threshold value used to extract edges by checking the edge intensity profile displayed on the image.**

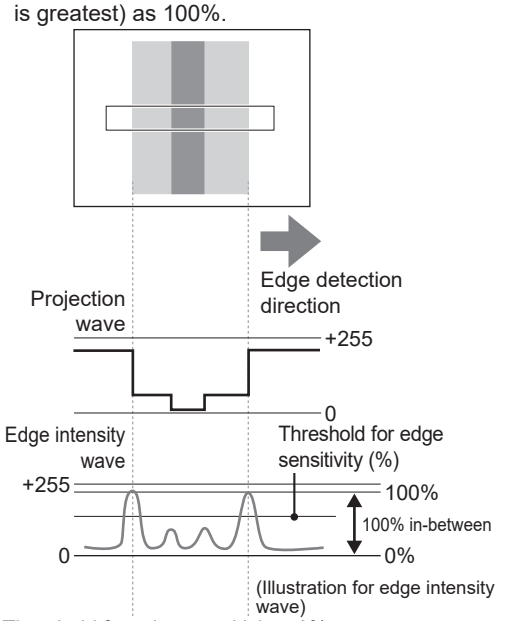


Reference
- The sensitivity limit can be adjusted by pressing the red line up or down.
- Press [To Live Image] to adjust edge sensitivity threshold value using the target Live image.
- Press [Edge Sensitivity Auto Adjustment] to adjust the threshold for edge sensitivity automatically.

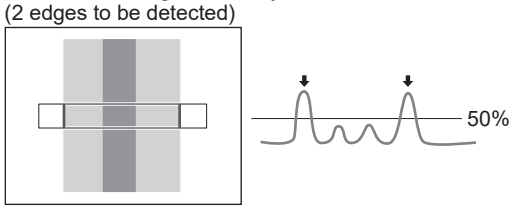
4 **Press [OK].**

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

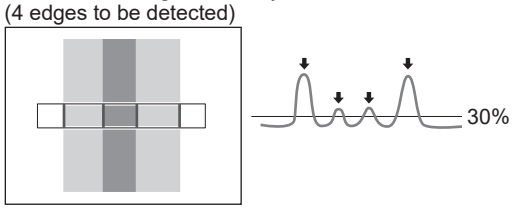
Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



Threshold for edge sensitivity 50%
(2 edges to be detected)



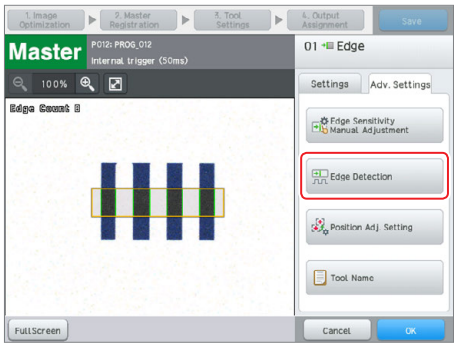
Threshold for edge sensitivity 30%
(4 edges to be detected)



■ Edge Detection

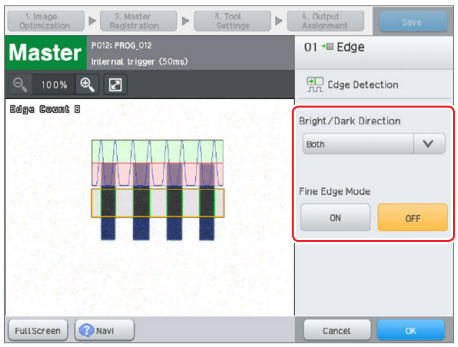
1 Select the [Adv. Settings] tab.

2 Press [Edge Detection].



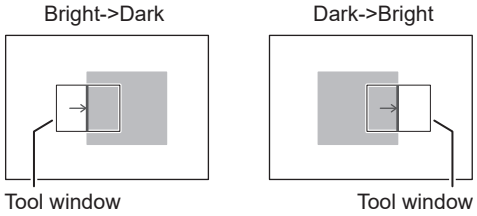
The Settings Navigator guide opens.
Press [OK].

3 Select the edge detection method.



● 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

Select [ON] when edges can not be differentiated because the space between the edges is too narrow.

4 Press [OK].

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.
Edge Sensitivity Auto 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.
		To 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.
	Upper Limit Settings	Scale	Select the scale for the threshold according to the range of matching rates requires for judgment.

● Setting items for the Pitch tool (advanced settings)

Items		Description	Ref.
Edge Sensitivity Manual Adjustment		Manually adjust the sensitivity that detects the edge that will become the standard of reference for pitch extraction. 1 to 100 (default: 50)	4-87
	To Live Image	The edge sensitivity can be adjusted from the Live image of the target.	
	Edge Sensitivity Auto Adjustment	Automatically adjust the sensitivity that detects the edge that will become the standard of reference for pitch extraction.	
Pitch Extraction Method	Bright/Dark Mode	Select the method to extract the target pitch.	4-88
	Meas. Mode	Select the measuring method for the pitch extracted from a target.	
	Narrow Pitch Mode	Set when pitch width is narrow.	
Scaling	Scaling	Sets scaling. Set when length is being used for anomaly detection instead of the matching rate.	4-89
	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.	4-36
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. “5 Running” (page 5-1)	4-37

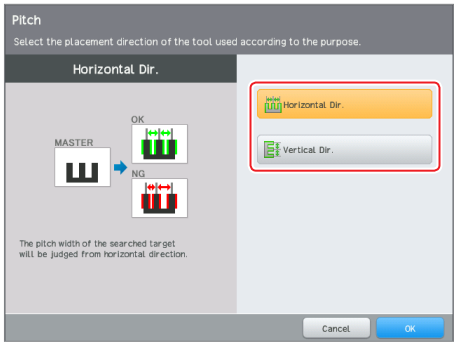
Setting the Pitch tool

1 **Select the [Extra1] tab, and add the [Pitch] tool.**

“Adding a Tool” (page 4-33)

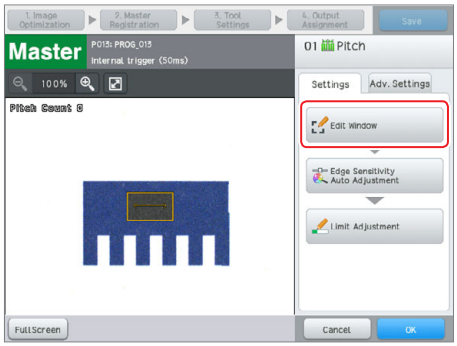
Displays the Pitch tool direction selection screen.

2 **Press [Horizontal Dir.]/[Vertical Dir.].**

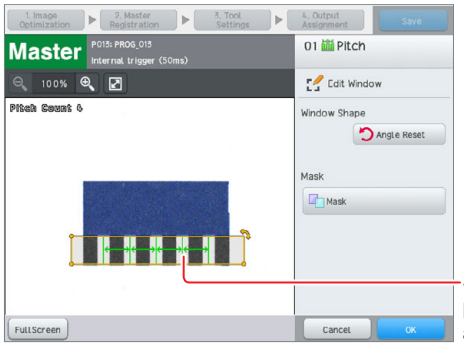


The main screen for [Pitch] opens.

3 **Press [Edit Window].**



4 **Set the position, size, and angle of tool window in according to the target.**



Set the position, size, and angle

“Editing the Window” (page 3-18)

5 **Apply the mask as needed.**

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

“Mask settings” (page 4-35)

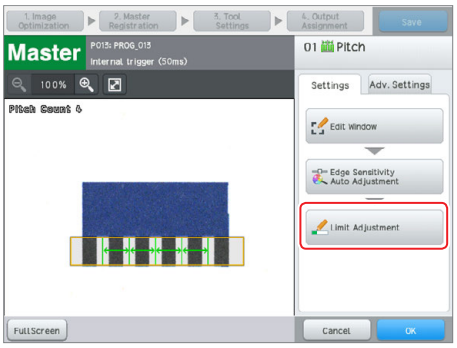
6 **Press [OK].**

The system returns to the main screen for [Pitch].

7 **Perform Edge Sensitivity Auto Adjustment as needed.**

“Edge Sensitivity Auto Adjustment” (page 4-86)

8 **Press [Limit Adjustment].**



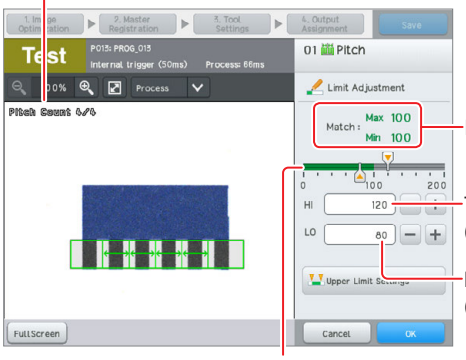
The sensor changes to Test mode.

9 **Take an “OK” image and a “NG” image.**

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.

10 **Adjust the threshold for anomaly detection by checking the matching rate.**

Current number of pitches/number of registered pitches in master image



Matching rate

Threshold (upper limit)

Limit (lower limit)

Status gauge
MAX matching rate (Upper)
MIN matching rate (Lower)

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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

11 **Set [Upper Limit Settings] as needed.**

“Upper Limit Settings” (page 4-86)

12 **When setting is completed, press [OK].**

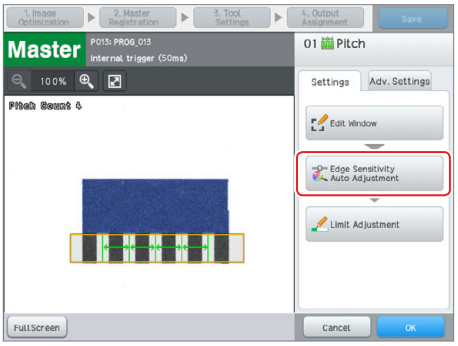
The system returns to the main screen for [Pitch].

13 **Press [OK].**

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

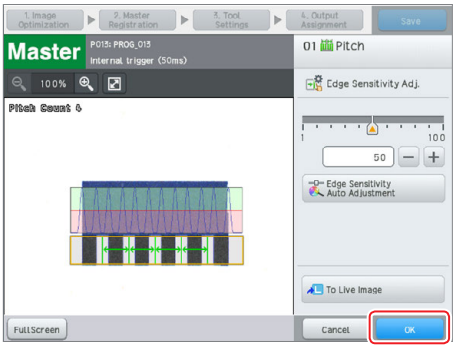
■ Edge Sensitivity Auto Adjustment

1 Press [Edge Sensitivity Auto Adjustment].



The edge sensitivity will be adjusted automatically according to the target.

2 Press [OK].

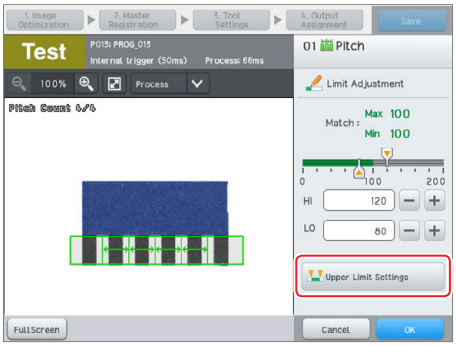


The system returns to the main screen for Width tool settings.

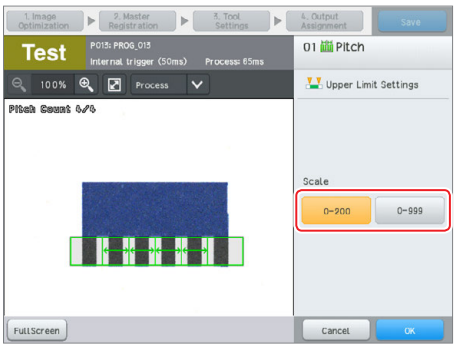
Reference The edge sensitivity can also be adjusted manually as well.
“Edge Sensitivity Manual Adjustment” (page 4-87)

■ Upper Limit Settings

1 Press [Upper Limit Settings].



2 Change the setting scale and press [OK].



3 Adjust the threshold for anomaly detection by checking the matching rate.

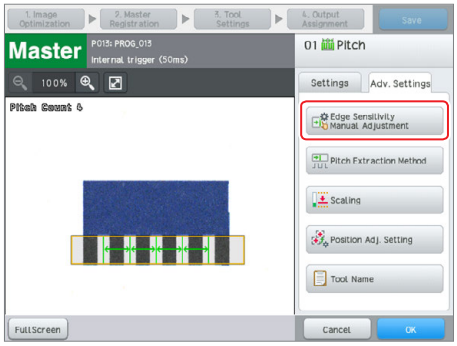
Reference The target is judged OK when the matching rate is within a threshold range, and NG when it is outside the range.
“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

Advanced settings of the Pitch tool

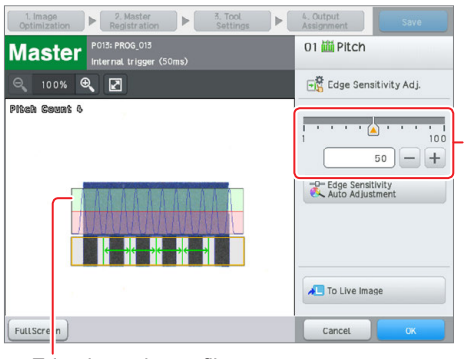
■ Edge Sensitivity Manual Adjustment

1 **Select the [Adv. Settings] tab.**

2 **Press [Edge Sensitivity Manual Adjustment].**



3 **Adjust the edge sensitivity threshold value used to extract pitches by checking the edge intensity profile displayed on the image.**



Reference

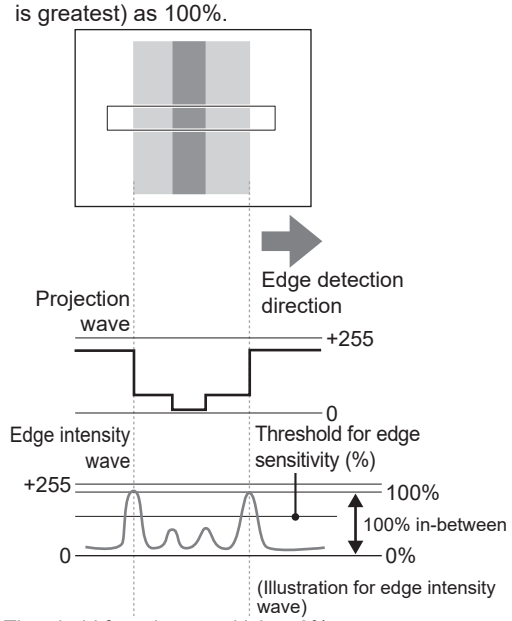
- The sensitivity limit can be adjusted by pressing the red line up or down.
- Press [To Live Image] to adjust edge sensitivity threshold value using the target Live image.
- Press [Edge Sensitivity Auto Adjustment] to adjust the edge sensitivity threshold according to the target automatically.

4 **Press [OK].**

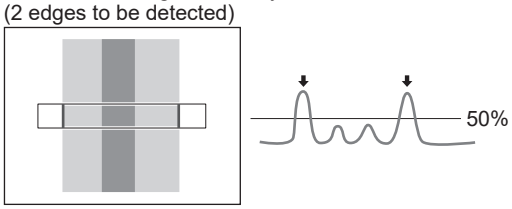
The system returns to the main screen for [Pitch].

Reference

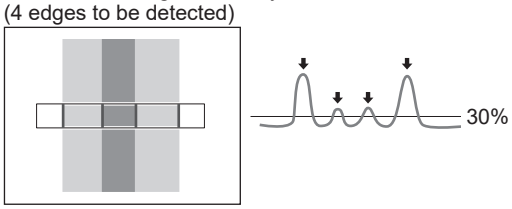
The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



Threshold for edge sensitivity 50%
(2 edges to be detected)



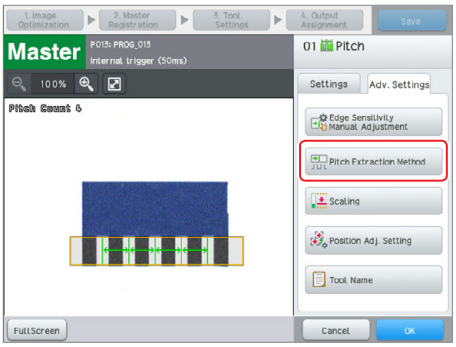
Threshold for edge sensitivity 30%
(4 edges to be detected)



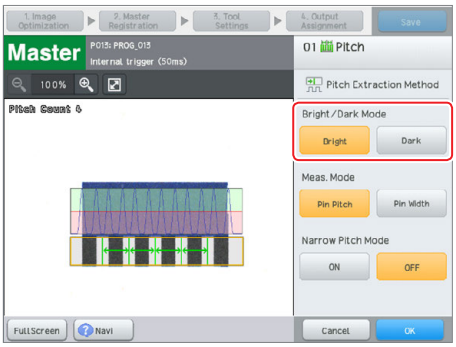
■ Pitch Extraction Method

1 Select the [Adv. Settings] tab.

2 Press [Pitch Extraction Method].

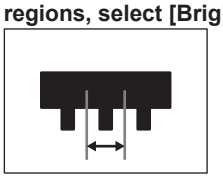


3 Select [Bright/Dark Mode].



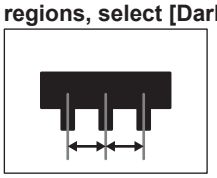
Point

- **When extracting pitches between bright regions, select [Bright].**



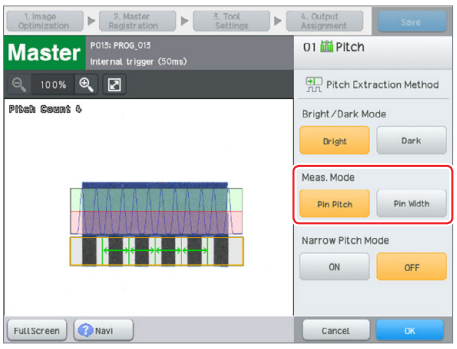
Number of pitches 1

- **When extracting pitches between dark regions, select [Dark].**



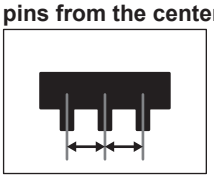
Number of pitches 2

4 Select a measurement mode.



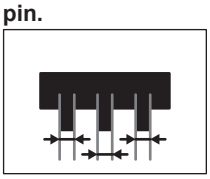
Point

- **[Pin Pitch]: Measures the pitch between pins from the center point of the pin.**



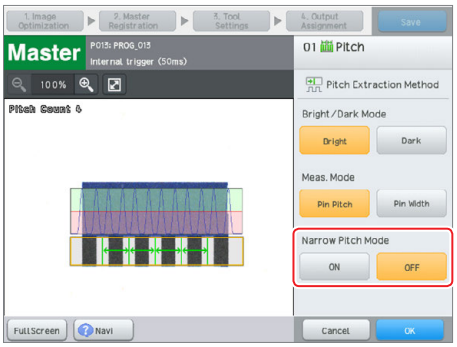
Number of pitches 2

- **[Pin Width]: Measures the width of each pin.**



Number of pitches 3

5 Set [Narrow Pitch Mode] as needed.



Reference If [ON] is selected, pitches can be extracted even when the pitch width is narrow.

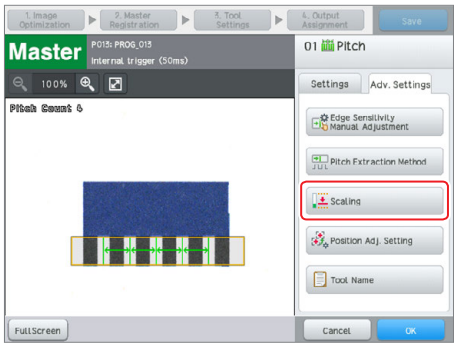
6 Press [OK].

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

■ Scaling

1 Select the [Adv. Settings] tab.

2 Press [Scaling].



3 Press [ON].



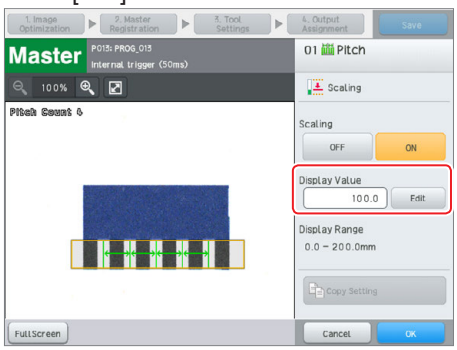
Point

- **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.**

4 Set scaling.

● When the scaling settings are changed

Press [Edit].



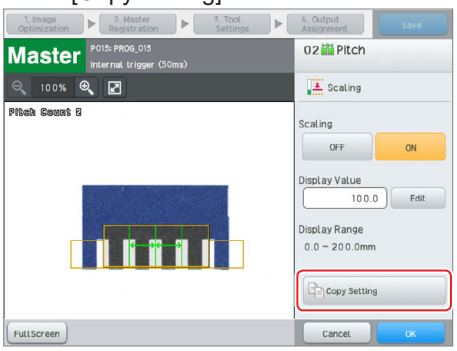
Enter a display value and press [OK].
“Editing Numbers” (page 3-19)

Point

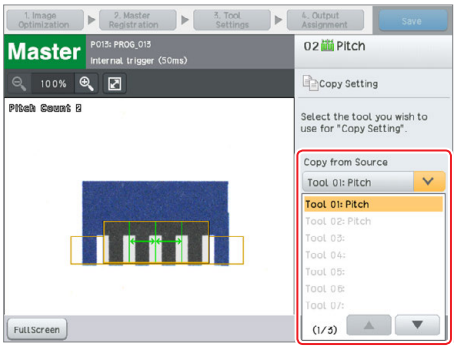
The scaling display value can be adjusted by 0.05 mm.

● When copying scaling settings

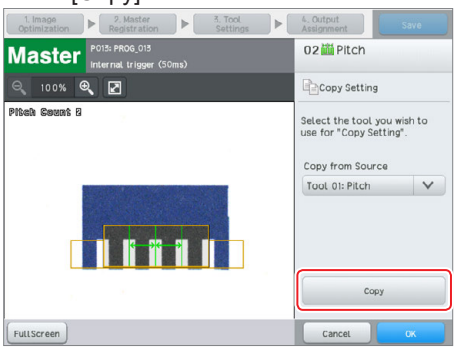
Press [Copy Setting].



Select the source tool.



Press [Copy].



The confirmation screen opens.

5 Press [OK].

Return to the [Copy Setting] screen.

6 Press [OK].

Return to the [Scaling] setting screen.

7 Press [OK].

The confirmation screen opens.

8 Press [OK].

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

Point

If the scaling value of the source tool is changed, copy the scaling settings again.

High-Speed Position Adjustment (Hi-Sp.Adj) Tool

● Setting items for the Hi-Sp.Adj tool

❍1-Ax. Adj

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.
Edge Sensitivity Auto Adjustment			Automatically adjusts the sensitivity which detects the edge.
	Manual adjustment		Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)
		To Live Image	The edge sensitivity can be adjusted from the Live image of the target.
Test Operation			Changes to Test mode, used to check that the position adjustment has been performed correctly.

❍2-Ax. Adj

Items				Description
Axis:X	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 Auto Adjustment			Automatically adjusts the sensitivity which detects the edge.
		Manual adjustment		Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)
			To Live Image	The edge sensitivity can be adjusted from the Live image of the target.
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 Auto Adjustment			Automatically adjusts the sensitivity which detects the edge.
		Manual adjustment		Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)
			To 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.

● Setting items for the Hi-Sp.Adj 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 Sensitivity Manual Adjustment		Manually adjust the sensitivity which detects the edge. 1 to 100 (default: 50)	4-94
	To Live Image	The edge sensitivity can be adjusted from the Live image of the target.	
	Edge Sensitivity Auto Adjustment	Automatically adjust the sensitivity which detects the edge.	
Edge Detection		Selects the bright/dark direction which detects a target edge.	4-95

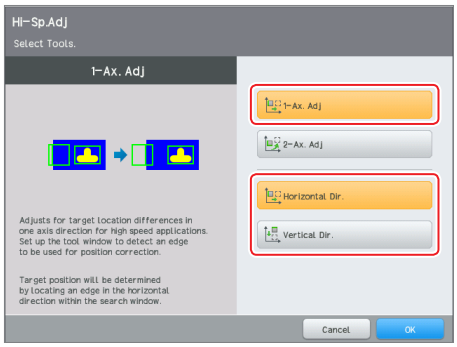
Setting the Hi-Sp.Adj tool

■ 1-Axis Adjustment

1 **Select the [Extra1] tab, and add the [Hi-Sp.Adj] tool.**

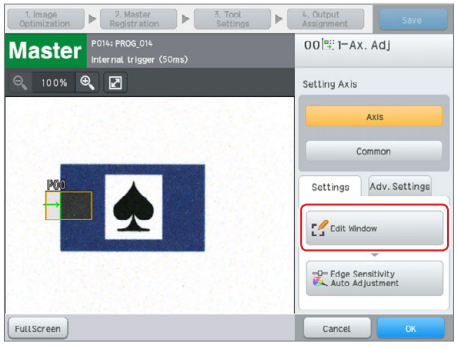
“Adding a Tool” (page 4-33)

2 **Select [1-Ax. Adj]. Press [Horizontal Dir.] or [Vertical Dir.], and press [OK].**



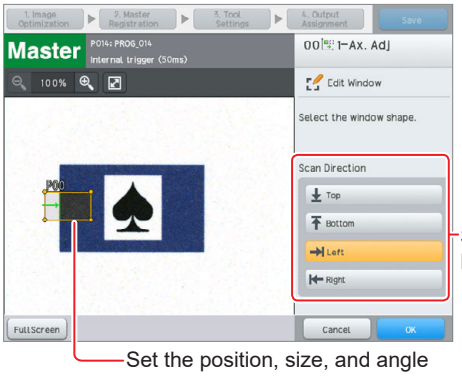
The main screen for [1-Ax. Adj] opens.

3 **Press [Edit Window].**

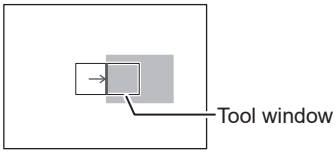


Reference Pressing the tool window directly will enable the sensor to proceed to the following procedure as well.

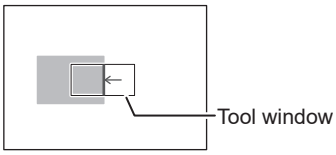
4 **Select the detection direction, and Set the position and size of the tool window according to a target.**



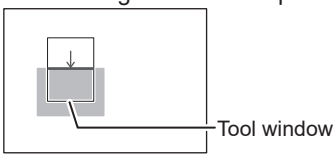
- Detection direction: Left (default)
  Detects edges from the left side of window to the right side.



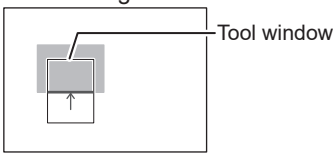
- Scan Direction: Right
  Detects edges from the right side of window to the left side.



- 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.



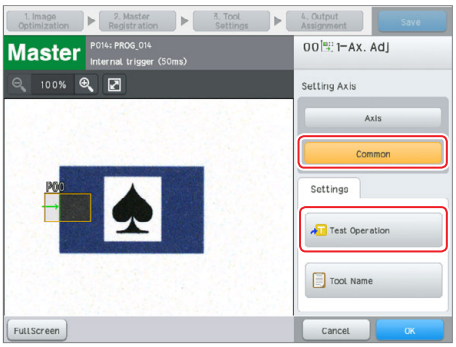
5 **Press [OK].**

The system returns to the main screen for [1-Ax. Adj].

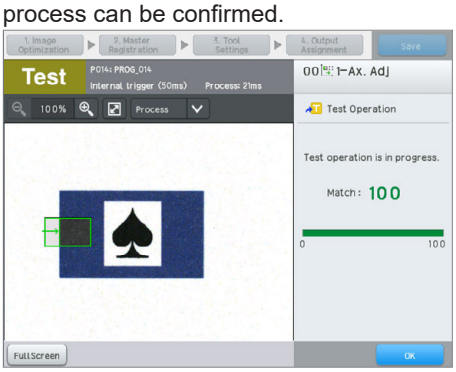
6 Perform Edge Sensitivity Auto Adjustment as needed.

“Edge Sensitivity Auto Adjustment” (page 4-93)

7 Press [Common], then press [Test Operation].



The sensor changes to Test mode.
Position correction is performed and the edge detection process can be confirmed.



8 Press [OK].

The system returns to the main screen for [1-Ax. Adj].

9 Press [OK].

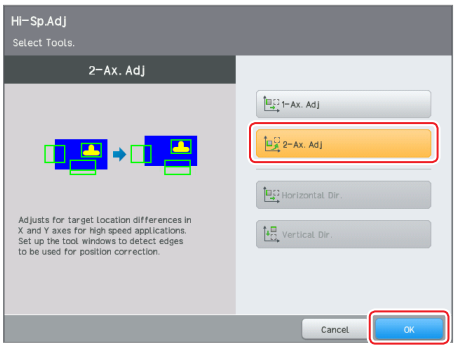
The system returns to the main screen for the tool settings.

■ 2-Axis Adjustment

1 Select the [Extra1] tab, and add the [Hi-Sp.Adj] tool.

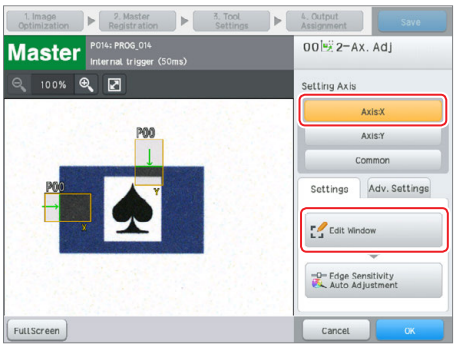
“Adding a Tool” (page 4-33)

2 Select the [2-Ax. Adj] button, and press [OK].



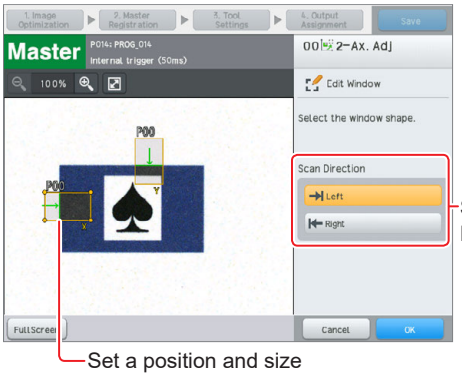
The main screen for [2-Ax. Adj] opens.

3 Press [Axis:X], and press [Edit Window].



Reference Pressing the tool window directly will enable the sensor to proceed to the following procedure as well.

4 Select the detection direction, and set the position and size of the tool window according to a target.



5 Press [OK].

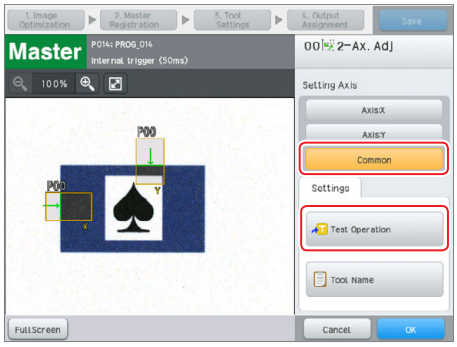
The system returns to the main screen for [2-Ax. Adj].

6 **Press [Setting Axis: Axis:Y], and perform steps 3 to 5 for the Y axis.**

7 **Perform Edge Sensitivity Auto Adjustment as needed.**

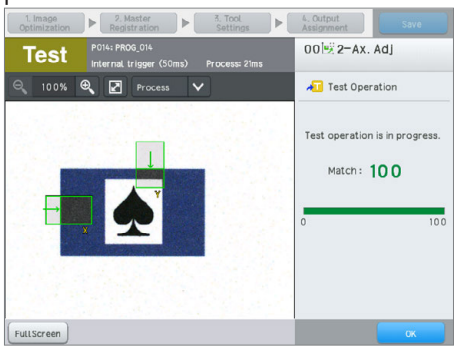
“Edge Sensitivity Auto Adjustment” (page 4-93)

8 **Select [Common], then press [Test Operation].**



The sensor changes to Test mode.

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].

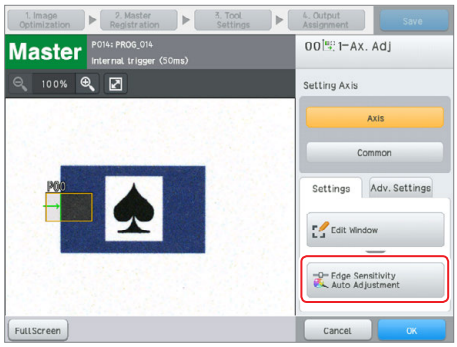
10 **Press [OK].**

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

■ Edge Sensitivity Auto Adjustment

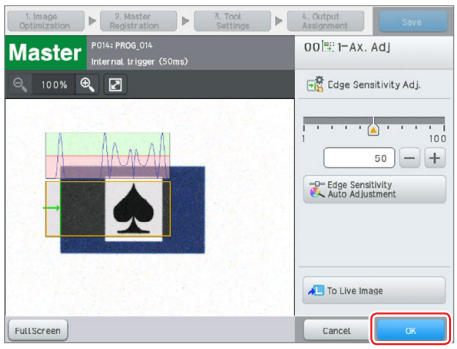
1 **For [2-Ax. Adj], select an axis to set.**

2 **Press [Edge Sensitivity Auto Adjustment].**



The edge sensitivity will be adjusted automatically according to the target.

3 **Press [OK].**



The system returns to the main screen for [1-Ax. Adj] or [2-Ax. Adj].

Reference The edge sensitivity can also be adjusted manually as well.

“Edge Sensitivity Manual Adjustment” (page 4-94)

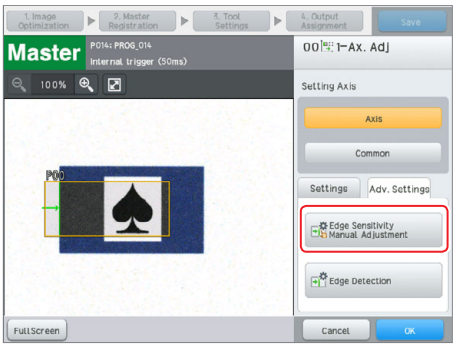
Advanced settings for the High-Speed Position Adjustment tool

■ Edge Sensitivity Manual Adjustment

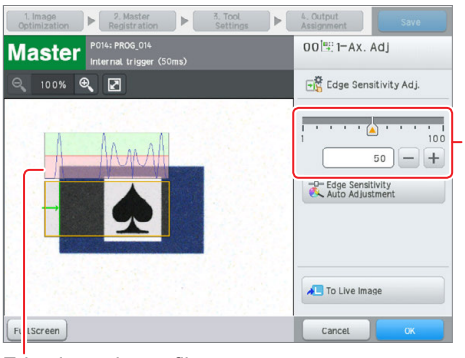
1 **Select the [Adv. Settings] tab.**

2 **For [2-Ax. Adj], select an axis to set.**

3 **Press [Edge Sensitivity Manual Adjustment].**



4 **Adjust the edge sensitivity threshold value used to extract edges by checking the edge intensity profile displayed on the image.**



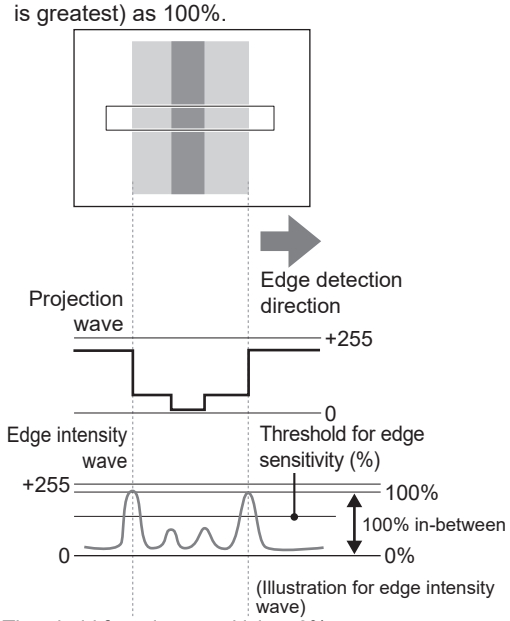
Edge intensity profile

Reference
- The sensitivity limit can be adjusted by pressing the red line up or down.
- Press [To Live Image] to adjust edge sensitivity threshold value using the target Live image.
- Press [Edge Sensitivity Auto Adjustment] to adjust the edge sensitivity threshold according to the target automatically.

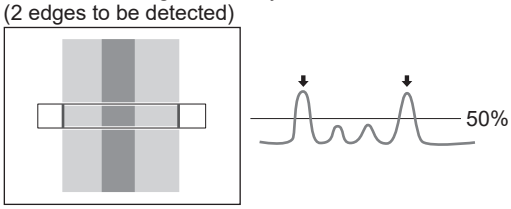
5 **Press [OK].**

The system returns to the main screen for [Hi-Sp.Adj].

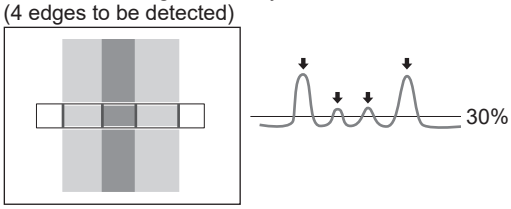
Reference The edge intensity threshold indicates the ratio of edge recognition taking the edge intensity maximum value (where the contrasting density is greatest) as 100%.



Threshold for edge sensitivity 50%
(2 edges to be detected)



Threshold for edge sensitivity 30%
(4 edges to be detected)

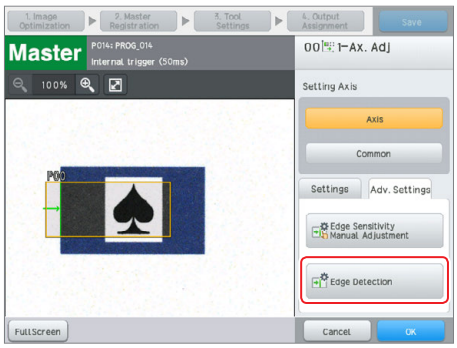


■ Edge Detection

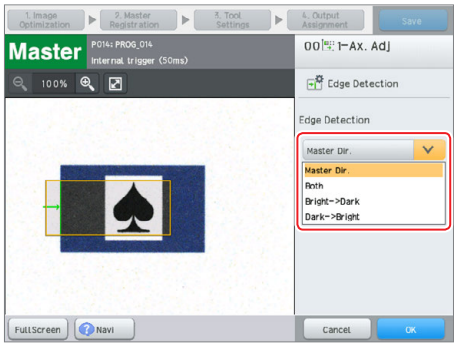
1 **Select the [Adv. Settings] tab.**

2 **For [2-Ax. Adj], select an axis to set.**

3 **Press [Edge Detection].**

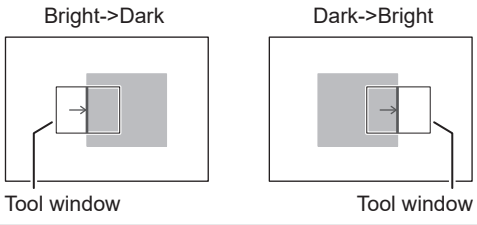


4 **Select bright/dark direction.**



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].**



5 **Press [OK].**

The system returns to the main screen for [Hi-Sp.Adj].

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.
		Char. 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. Up to 16 characters can be set.
	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 (Date)	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.
			Allowable 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 Operation				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].

● 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	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.	4-103
		Print Type	Set this when [Read Dot Printing] 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.	4-36
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. “5 Running” (page 5-1)	4-37

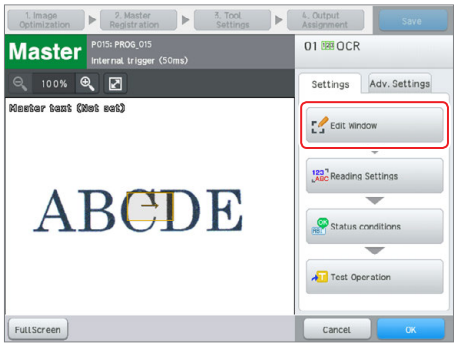
Setting the OCR tool

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 4-33)
The main settings screen for [OCR] opens.

2 Press [Edit Window].



Reference — Pressing the tool window directly will proceed to step 3 as well.

3 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 3-18)

4 Apply the mask as needed.

The area inside of the mask region is excluded from character recognition.
“Mask settings” (page 4-35)

5 Press [OK].

The character string that was selected to be the master text is read and the system returns to the main screen for [OCR].

6 Configure the reading settings.

“Reading Settings” (page 4-98)

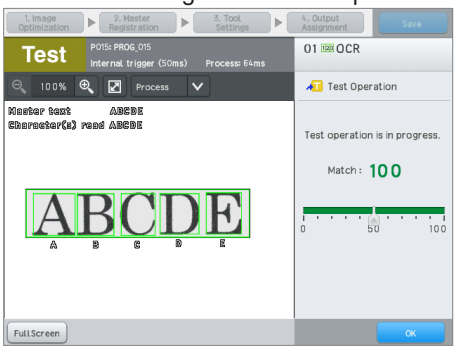
7 Adjust the status conditions as necessary.

“Setting the Status Conditions” (page 4-99)

8 Press [Test Operation].



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.

9 Press [OK].

The system returns to the main screen for [OCR].

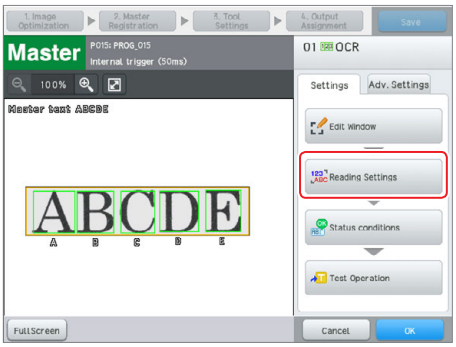
10 Press [OK].

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

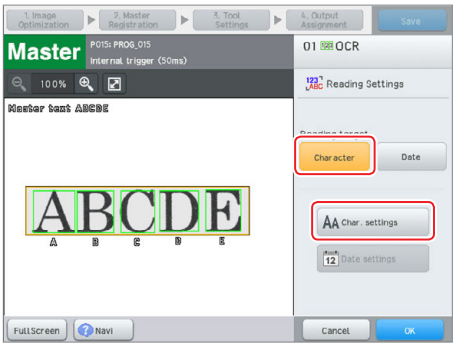
■ Reading Settings

● To read text

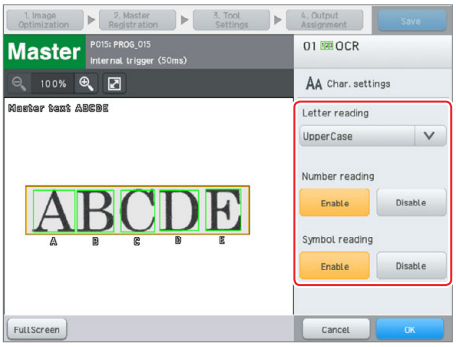
1 **Press [Reading Settings].**



2 **Check that the reading target is set to [Character] and press [Char. settings].**



3 **Set whether to read letters, numbers, and/or symbols.**



Letter reading	Disable, UpperCase (default value), and Upper/Lower letters can be selected.
Number reading	Enable (default value) or disable can be selected.
Symbol reading	Enable (default value) or disable can be selected.

4 **When setting is completed, press [OK].**

The system returns to the screen to set [Reading Settings].

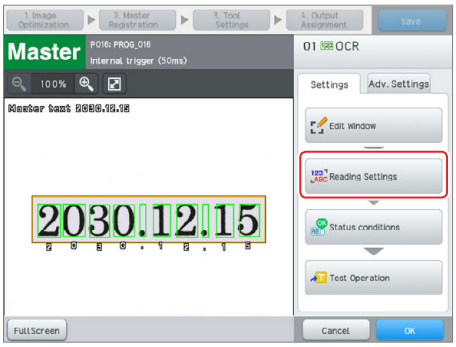
5 **Press [OK] to read the character string that will be set as the master text.**



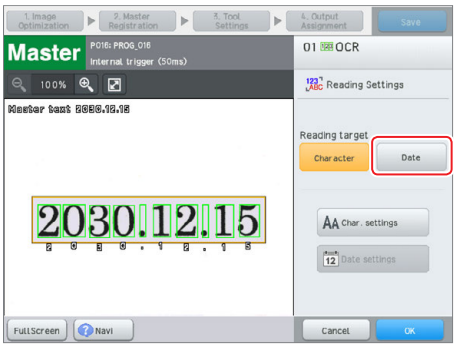
The character string that was selected to be the master text is read and the system returns to the main screen for [OCR].

● To read the date

1 **Press [Reading Settings].**

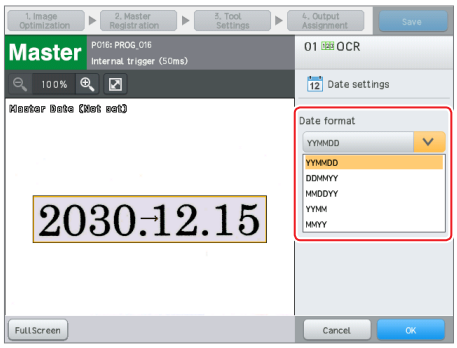


2 **Press [Date].**



Reference Check that the reading target is set to [Date] and press [Date settings].

3 Set [Date format] for the reading target.



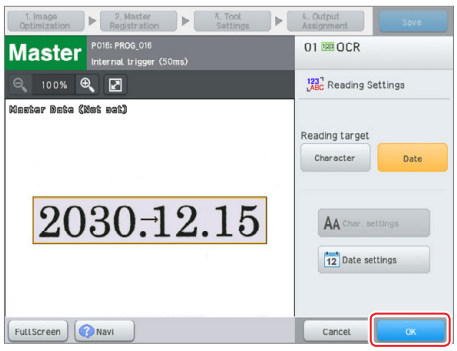
Point

Set the date format to match that of the reading target.
Dates that differ from the set date format will not be read.

4 When setting is completed, press [OK].

The system returns to the screen to set [Reading Settings].

5 Press [OK] and read the date that you want to set as the master text.

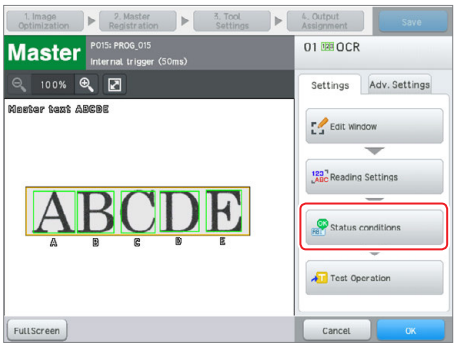


The date that was selected to be the master is read and the system returns to the main screen for [OCR].

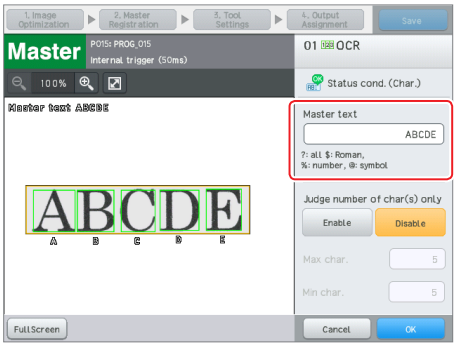
■ Setting the Status Conditions

● To read text

1 Press [Status conditions].



2 Edit [Master text] if necessary.



“Inputting characters” (page 3-20)

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.

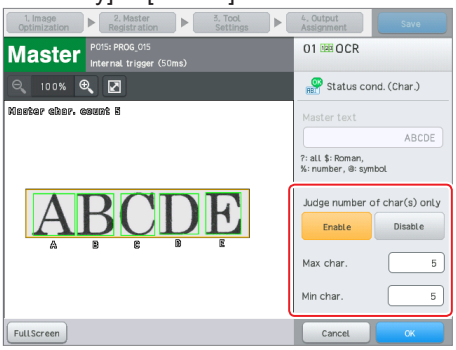
? : Judges all letters, numbers, and symbols as OK.
$: Judges all letters as OK.
% : Judges all numbers as OK.
@ : Judges all symbols as OK.

[Arbitrary characters] usage example

- **Master text: AB$DE**
  ABCDE : OK
  ABFDE : OK
  AB5DE : NG
- **Master text: AB?DE**
  ABCDE : OK
  ABFDE : OK
  AB5DE : OK

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 [Judge char. num. only] to [Enable].

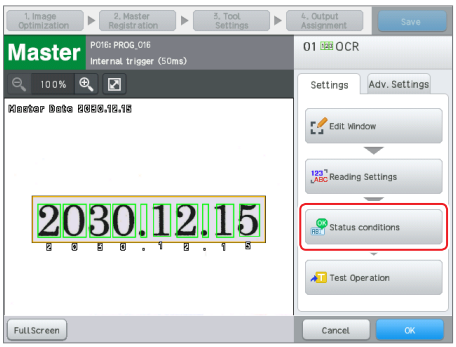


4 When setting is completed, press [OK].

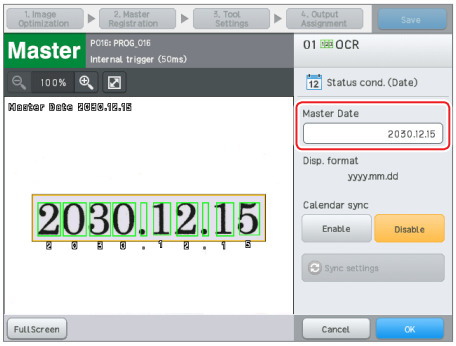
The system returns to the main screen for the OCR tool settings.

● To read the date

1 Press [Status conditions].



2 Edit the master date if necessary.



“Inputting characters” (page 3-20)

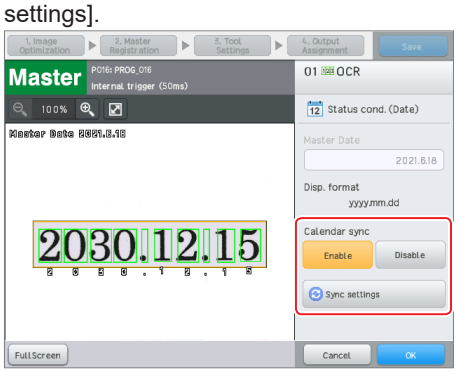
Point

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.

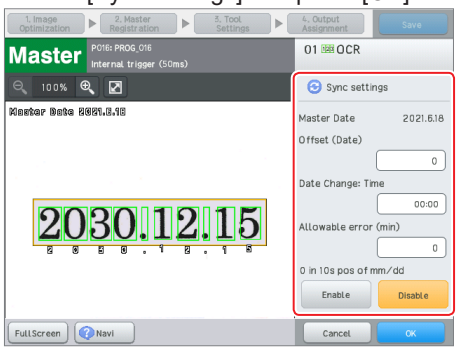
3 Set [Calendar sync] as necessary.

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.

Select [Enable] for the calendar sync, and press [Sync settings].



Set the [Sync settings] and press [OK].



● Offset (Date)

Offsets the master date by the desired number of days away from the current date on the sensor.

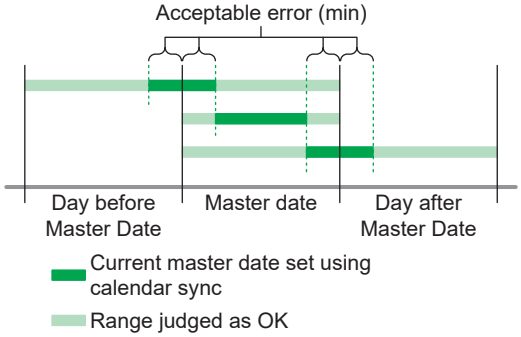
● Date Change: Time

Delays the time that the master date changed 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”.

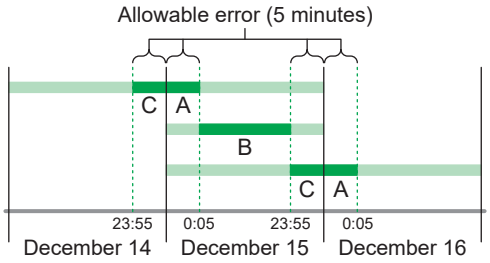
● Allowable error (min)

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 [Allowable 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].

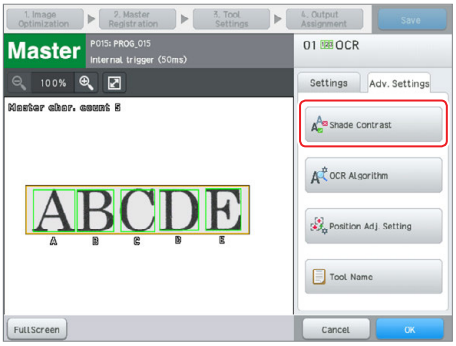
The system returns to the main screen for the OCR tool settings.

Advanced settings for the OCR tool

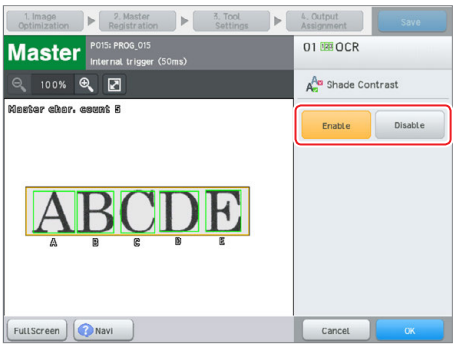
■ Shade Contrast

1 **Select the [Adv. Settings] tab.**

2 **Press [Shade Contrast].**



3 **Press [Enable].**



Point **If shade contrast is enabled, the threshold for anomaly detection (Matching Rate) can be adjusted on the test run screen.**
“Test Operation (when shade contrast is set to [Enable])” (page 4-102)

4 **Press [OK].**

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

● Test Operation (when shade contrast is set to [Enable])

1 **Press the [Settings] tab, then [Test Operation].**



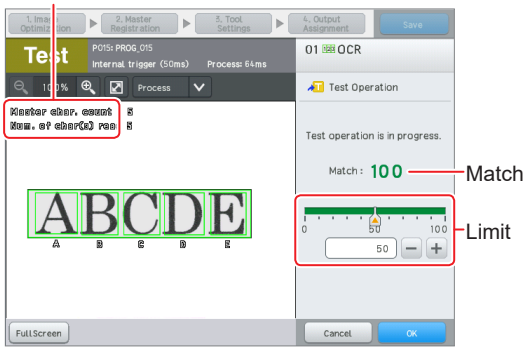
The sensor changes to the test operation.

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] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.

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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

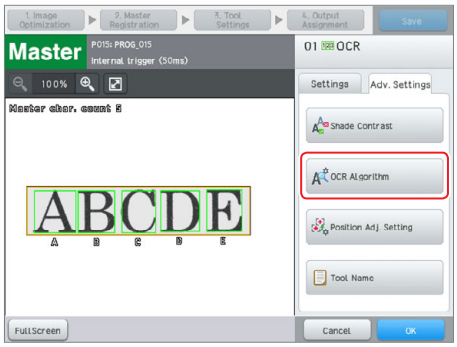
4 **When setting is completed, press [OK].**

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

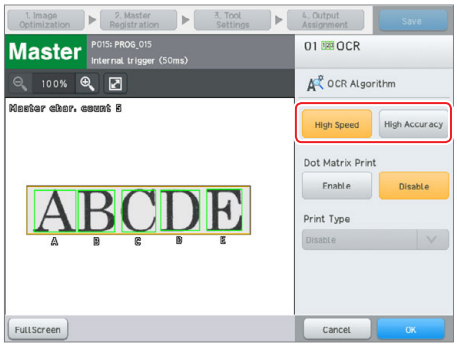
■ OCR Algorithm

1 **Select the [Adv. Settings] tab.**

2 **Press [OCR Algorithm].**



3 **Select the type of OCR algorithm (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.**

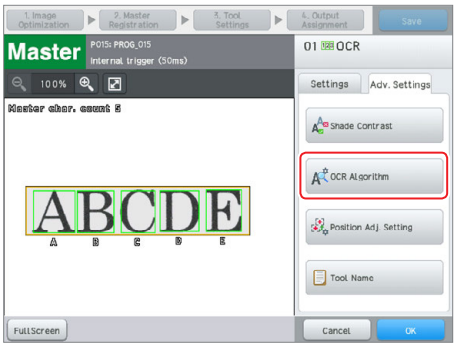
4 **When setting is completed, press [OK].**

The character string that was selected to be the master text is read and the system returns to the main screen for the OCR tool settings.

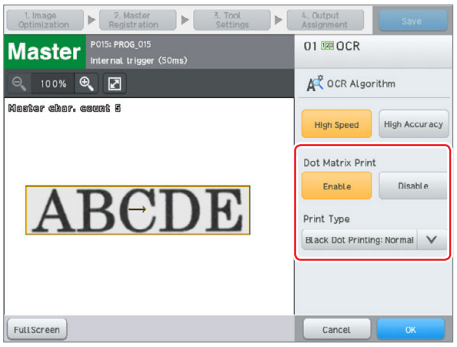
■ Dot Matrix Print

1 **Select the [Adv. Settings] tab.**

2 **Press [OCR Algorithm].**



3 **If dot matrix printing recognition is not stable, set [Dot Matrix Print].**



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 [MidSens].**

4 **When setting is completed, press [OK].**

The character string that was selected to be the master text is read and the system returns to the main screen for the OCR tool settings.

EdgePixels tool

● Setting items for the EdgePixels tool

Items			Description
Edit Window	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 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.
Edge Sensitivity Adj.			Sets the extraction sensitivity for the edge pixels tool according to the target.
	To 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 Settings	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.

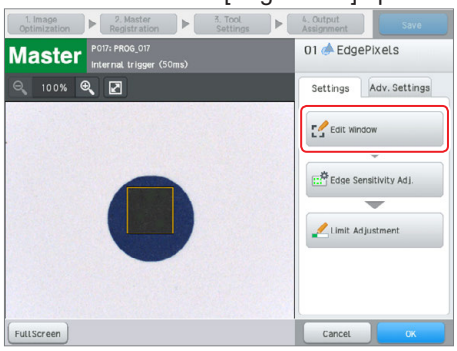
● Setting items for the EdgePixels tool (advanced settings)

Items	Description	Ref.
Fixed Reference Area	Select a condition which the matching rate of the EdgePixels tool is 100%.	4-107
Position Adjustment Setting	The Position Adjustment/High-Speed Position Adjustment tool to be applied to the EdgePixels tool can be selected.	4-36
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. “5 Running” (page 5-1)	4-37

Setting the EdgePixels tool

1 Select the [Extra2] tab, and add the [EdgePixels] tool.

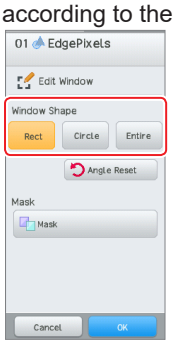
“Adding a Tool” (page 4-33)
The main screen for [EdgePixels] opens.

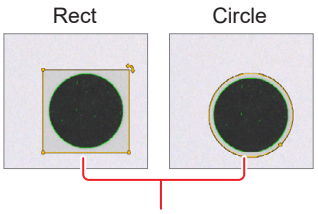


2 Perform [Edit Window].

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 desired target.





When [Entire] is selected, the tool window will be hidden.

3 Apply the mask as needed.

The area inside the mask region is excluded from an edge pixels extraction target.
“Mask settings” (page 4-35)

4 Press [OK].

The system returns to the main screen for [EdgePixels].

5 Perform [Edit Sensitivity Adj.] as needed.

“Edge Sensitivity Adjustment” (page 4-106)

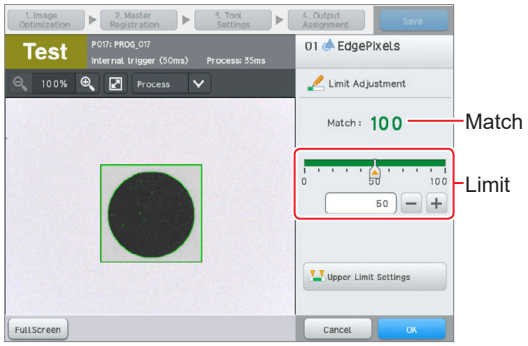
6 Press [Limit Adjustment].

The sensor changes to Test mode.
Take an “OK” image and an “NG” image.

Reference 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.

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 the number of edge pixels in an image matches the edge pixels of the master image. The edge pixels become smaller with a lower number of edge pixels and larger with a higher number of edge pixels. 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

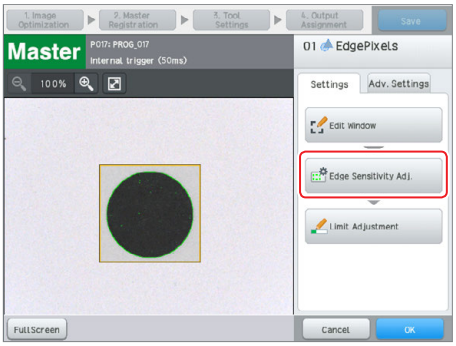
8 Set the upper limit as needed.

“Upper Limit Settings” (page 4-106)

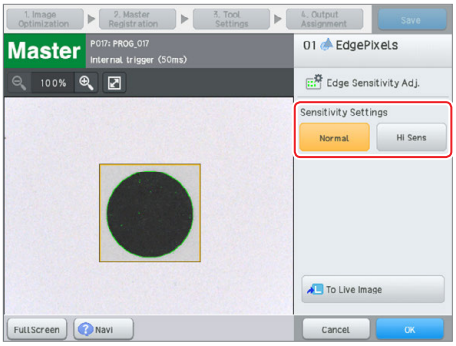
9 Press [OK] to return to the main screen for the tool settings.

■ Edge Sensitivity Adjustment

1 Press [Edge Sensitivity Adj.].



2 Select the extraction sensitivity of the edge pixels.



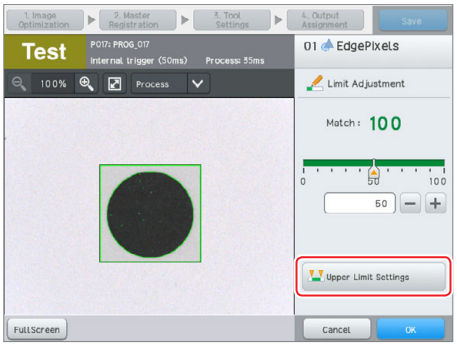
Normal (default)	Extracts the edge pixels from the target with standard sensitivity.
Hi Sens	Increase the volume of edge pixels extracted from the target. Used when the edge pixels desired to detect cannot be extracted.

Reference When [To Live Image] is pressed, the extraction sensitivity of the edge pixels can be adjusted from the target Live image.

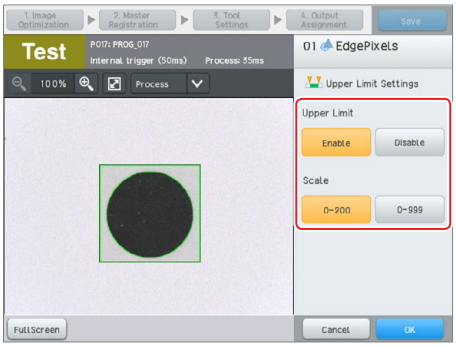
3 Press [OK].

■ Upper Limit Settings

1 Press [Upper Limit Settings].



2 Press [Enable] to enable the upper limit threshold and select the scale.



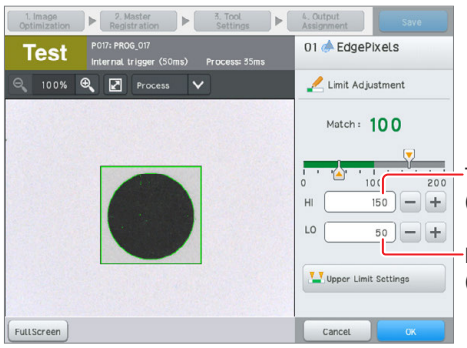
Select the scale according to the range of the matching rate required for judgment.

Disable (default)		Sets the upper and the lower limit of a threshold in a range within 0 to 100.
Enable	0-200 (default)	Sets the upper and the lower limit of a 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.

3 Press [OK].

The slider to set the upper limit and the lower limit of the threshold will be displayed.

4 **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 matching rate is 100 when the number of edge pixels in an image matches the edge pixels of the master image. The edge pixels become smaller with a lower number of edge pixels and larger with a higher number of edge pixels. 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

5 **Press [OK].**

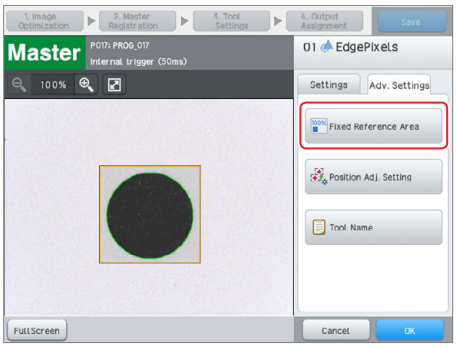
■ Fixed Reference Area

Reference

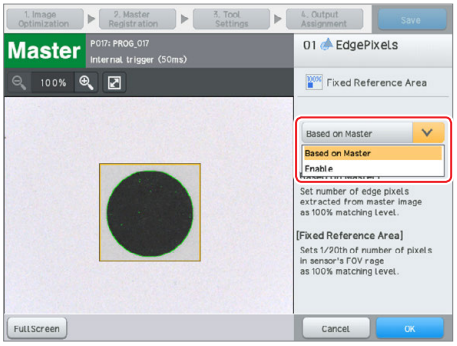
Select [Enable] if the master image does not contain the edge pixels to be judged.

1 **Select the [Adv. Settings] tab.**

2 **Press [Fixed Reference Area].**



3 **Adjust the fixed reference area settings.**



Point

- **When the number of edge pixels extracted from the master image is to be used as the reference for judgment, select [Based on Master].**
- **When 1/20th of number of pixels in the sensor’s FOV range is to be used as the reference for judgment, select [Enable].**



4 **Press [OK].**

Color Prohibition/Brightness Prohibition tool

● Setting items for the Color Prohibition/Brightness Prohibition Tool

Items				Description
Edit Window	Window Shape			Select 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.
	To 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.
	To Live Image			The brightness range can be extracted from the Live image of the target.
Threshold/ Sensitivity Adjustment	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%.

● Setting items for the Color Prohibition/Brightness Prohibition tool (advanced settings)

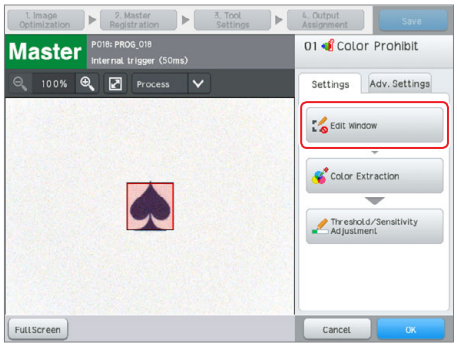
Items		Description	Ref.
Advanced Color Extraction Settings (For color type)		Specifies a color to be extracted using HSV (H: Hue, S: Saturation, V: Brightness).	4-112
Adv. Brightness Extraction (For monochrome type)		Specifies the brightness value to be extracted.	
	To Live Image	A color or brightness 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.	4-36
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. “5 Running” (page 5-1)	4-37

Setting the Color Prohibition/Brightness Prohibition tool

1 Select the [Extra2] tab and add the [Color Prohibit/Bright. Prohibit] tool.

“Adding a Tool” (page 4-33)
The main screen for [Color Prohibit/Bright. Prohibit] opens.

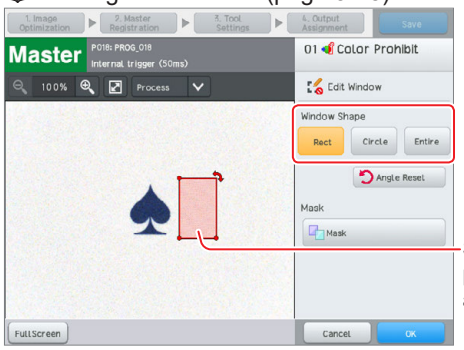
2 Press [Edit Window].



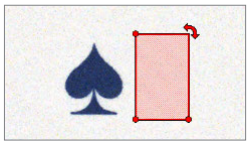
Reference Pressing the window directly will also allow for editing of the window.

3 Select the tool window shape, position, size, and angle according to the desired target.

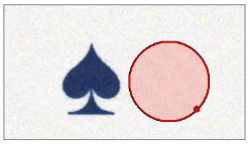
“Editing the Window” (page 3-18)



Rect



Circle



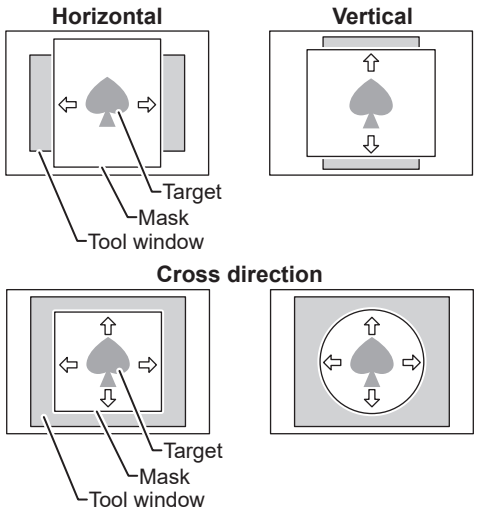
When [Entire] is selected, the tool window will be hidden.

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 being a color/brightness Prohibition detection target.
“Mask settings” (page 4-35)

Point **Using the tool in conjunction with mask settings enables misalignments and protrusions in various directions to be detected.**



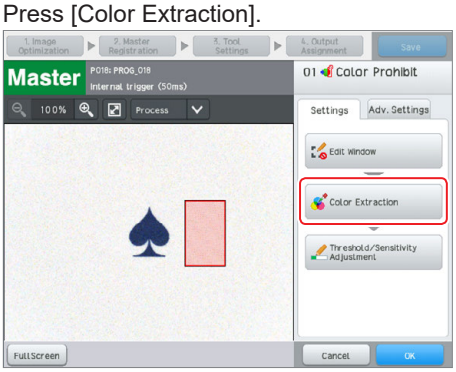
5 Press [OK].

The system returns to the main screen for [Color Prohibit/Bright. Prohibit].

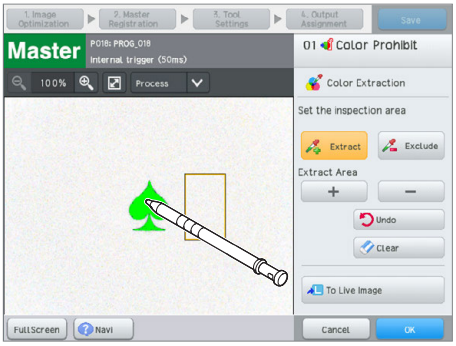
6 Set the area from the target to be extracted.

● For color type

Press [Color Extraction].

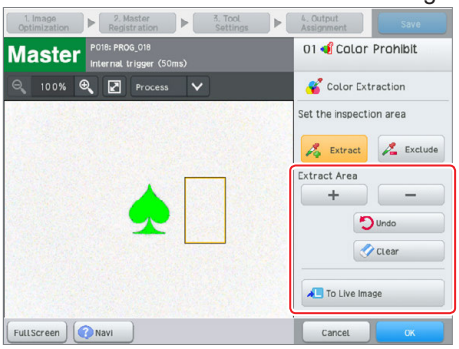


The screen to select a color to be extracted opens. Press the color to be the judgment reference for detection.



The color in the pressed place will be extracted.

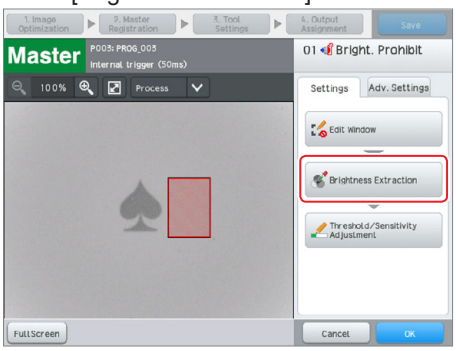
- If the areas of color that have not been extracted are pressed repeatedly, the extraction range can be adjusted.
- Press [Exclude] to specify the color to exclude from the extracted color.
- Press the [+]/[-] of the extraction area adjustment, and the range of color to be extracted can be expanded/reduced.
- To re-extract the color, press [Clear] and then press the color to be the reference of judgment again.
- By pressing [To Live Image], the range of color to be extracted can be set with the Live image of the target.



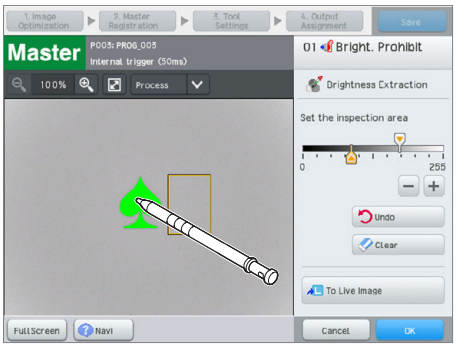
When setting is completed, press [OK].
The system returns to the main screen for [Color Prohibit/Brightness Prohibit].

● For monochrome type

Press [Brightness Extraction].

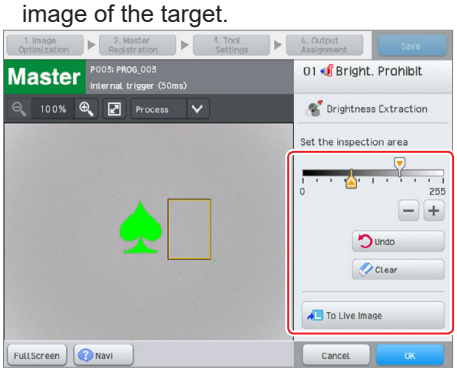


The screen to select brightness to be extracted opens. Press the brightness to be the judgment reference for detection.



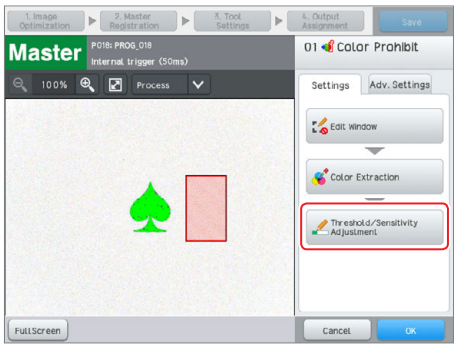
The brightness in the pressed place will be extracted.

- If the brightness of color that have not been extracted are pressed repeatedly, the extraction range can be adjusted.
- Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
  “Editing Numbers” (page 3-19)
- To re-extract the brightness, press [Clear] and then press the brightness to be the reference of judgment again.
- By pressing [To Live Image], the range of the brightness to be extracted can be set with the Live image of the target.



When setting is completed, press [OK].
The system returns to the main screen for [Color Prohibit/Brightness Prohibit].

7 Press [Threshold/Sensitivity Adjustment].

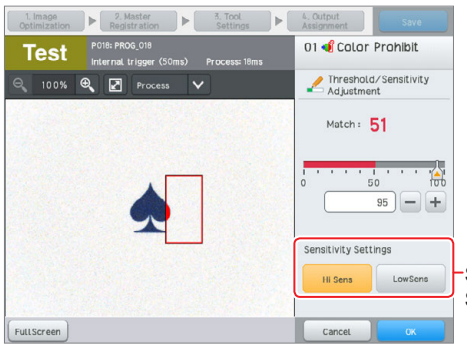


The sensor changes to the test operation.

8 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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 Select a sensitivity for the matching rate.



Sensitivity Settings

● Hi Sens (default)

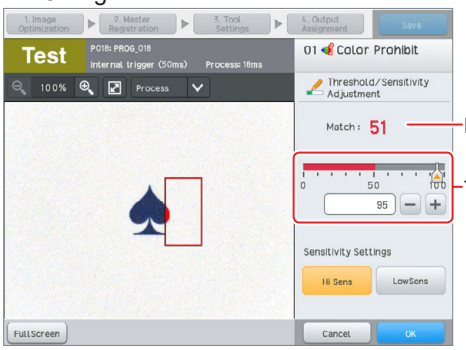
If [1/600th of the total sensor view] area in the tool window protrudes, the matching rate is 0%. The sensitivity to detect the protrusion increases.
Select this setting when you do not want to allow protrusions or deviations.

● LowSens

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.

10 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.



Match

Threshold

Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- The matching rate is indicated as 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.

“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

11 When setting is completed, press [OK].

The system returns to the main screen for [Color Prohibit/Brightness Prohibit].

12 Press [OK].

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

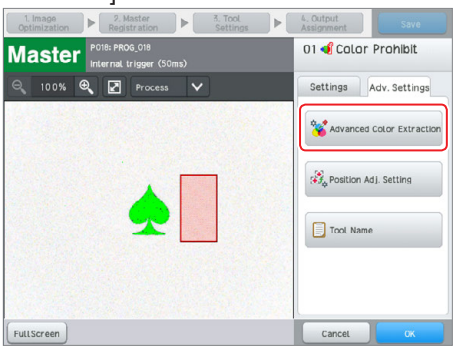
Advanced Settings for the Color Prohibition/ Brightness Prohibition Tool

■ Advanced Color Extraction/Advanced Brightness Extraction

1 **Select the [Adv. Settings] tab.**

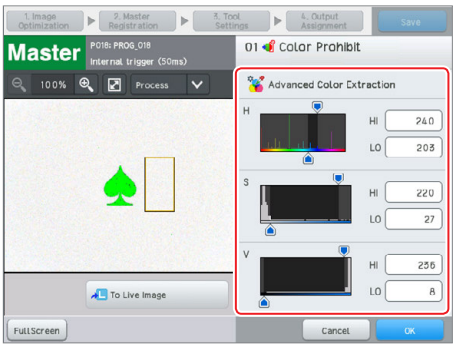
2 **Press [Advanced Color Extraction].**

For monochrome type, press [Adv. Brightness Extraction].



3 **Specify the color or brightness of the extraction target.**

● For color type



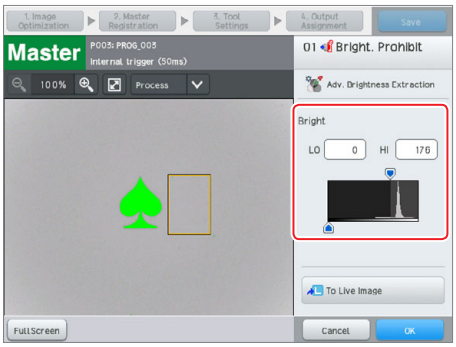
Reference

- 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	Set the upper limit and lower limit for the range of 0 to 359. • **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 [To Live Image], the range of color to be extracted can be set with 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 [To Live Image], the range of the brightness to be extracted can be set with the Live image of the target.

4 **Press [OK].**

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.
	Extract Area	Expands or reduces automatically the extraction area of the color extracted.
	To Live Image	The color range to be extracted can be selected from 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.
	To 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.

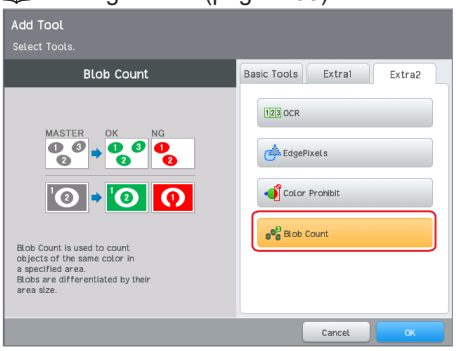
● Setting items for the Blob Count tool (advanced settings)

Items		Description	Ref.
Advanced Color Extraction (For color type) Adv. Brightness Extraction (For monochrome type)		• **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
	To 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
Boundary Exclusion		Sets whether to count or exclude the target that protrudes from the window.	4-120
	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.	
Position Adjustment Setting		The Position Adjustment/High-Speed Position Adjustment tool to be applied to the Blob Count tool can be selected.	4-36
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. “5 Running” (page 5-1)	4-37

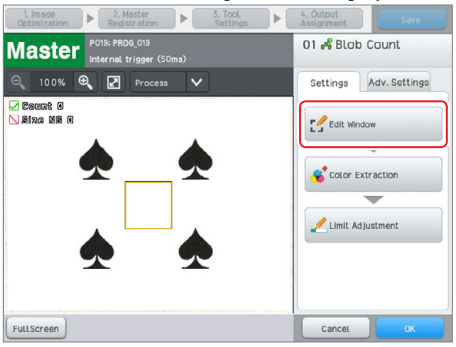
Setting the Blob Count tool

1 Select the [Extra2] tab, and add the [Blob Count] tool.

“Adding a Tool” (page 4-33)



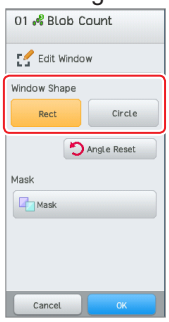
The main screen for [Blob Count] opens.

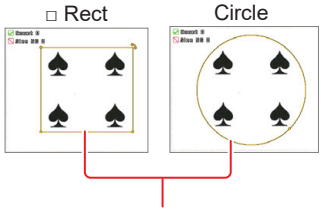


2 Perform [Edit Window].

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 desired target.





Set the position, size, and angle

3 Apply the mask as needed.

The area inside the mask region is excluded from the blob count.

“Mask settings” (page 4-35)

4 Press [OK].

The system returns to the main screen for [Blob Count].

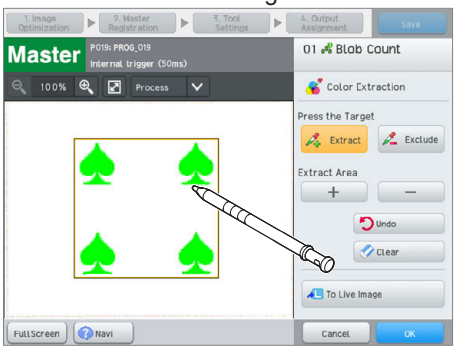
5 Set the area to extract from the target.

● For color type

Press [Color Extraction].



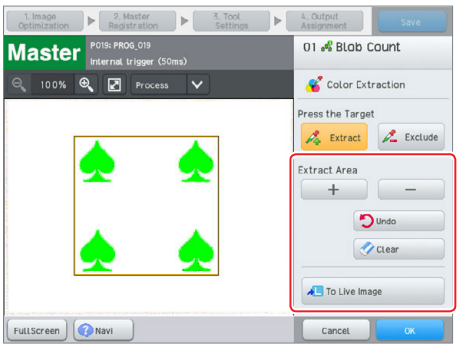
The screen to select a color to be extracted opens.
Press the color of the target to be counted.



The color in the pressed place will be extracted.

- If the areas of color that have not been extracted are pressed repeatedly, the extraction range can be adjusted.
- 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 [To Live Image], the range of color can be extracted based on the image saved as the Live Image, the images saved in the image history, or the images saved in the USB memory.

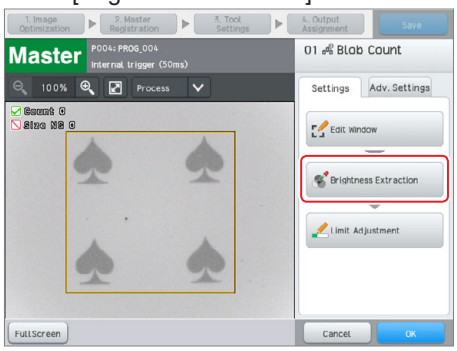
“Adjust in the Live Image” (page 4-116)



When setting is completed, press [OK].
The system returns to the main screen for [Blob Count].

● For monochrome type

Press [Brightness Extraction].

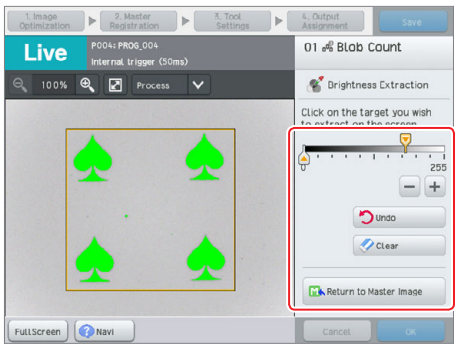


The screen to select brightness to be extracted opens.
Press the brightness of the target to be counted.



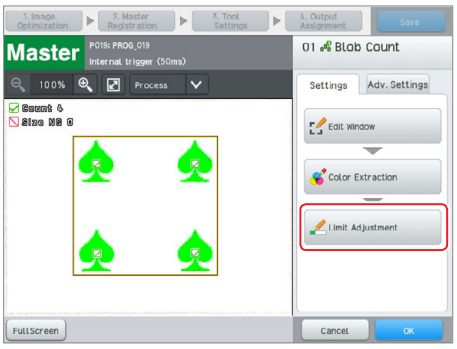
The brightness in the pressed place will be extracted.

- If the brightness of color that have not been extracted are pressed repeatedly, the extraction range can be adjusted.
- Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
  “Setting by the Slider” (page 3-19)
- 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 [To Live Image], the range of the brightness to be extracted can be set with the Live image of the target.



When setting is completed, press [OK].
The system returns to the main screen for [Blob Count].

6 Press [Limit Adjustment].

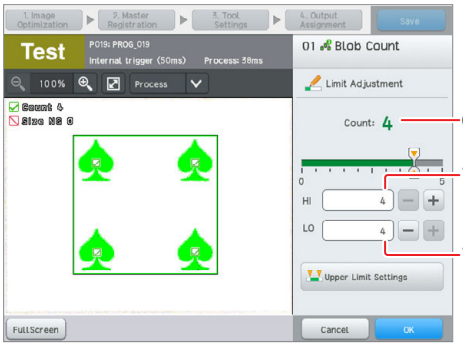


The sensor changes to the test operation.

7 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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 anomaly detection by checking the count.



Count

Threshold (upper limit)

Threshold (lower limit)

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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

9 Adjust the [Upper Limit Settings] as needed.

“Upper Limit Settings (Count)” (page 4-118)

10 Press [OK].

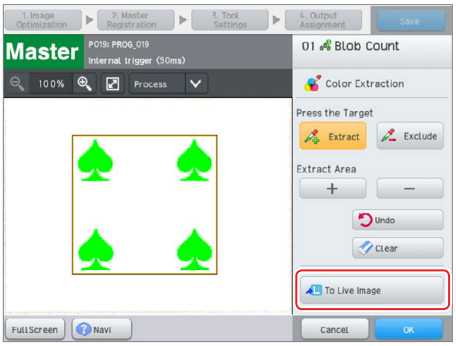
The system returns to the main screen for [Blob Count].

11 Press [OK].

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

■ Adjust in the Live Image

1 Press [To Live Image].

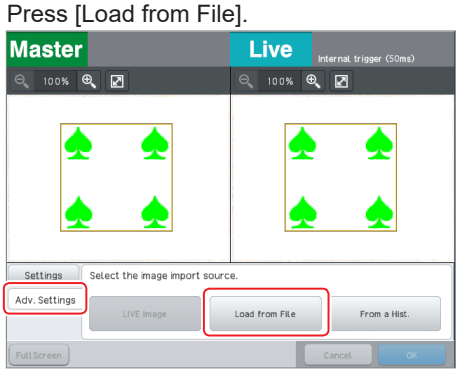


The Master image (left) and LIVE image (right) are displayed.
When adjusting with the LIVE image, go to step 3.

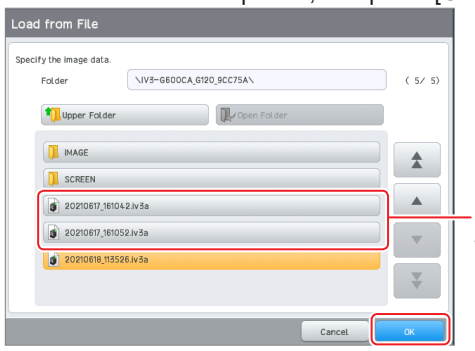
2 When adjusting with images other than the LIVE image, press the [Adv. Settings] tab to import the image.

● When importing from a file saved in USB memory

Press [Load from File].



Select the file to be imported, and press [OK].



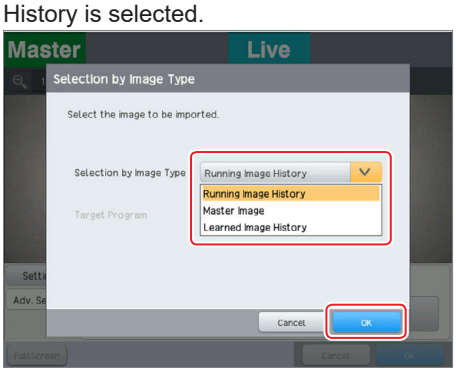
Select the file

“Selecting the File/Folder in the USB Memory” (page 3-21)

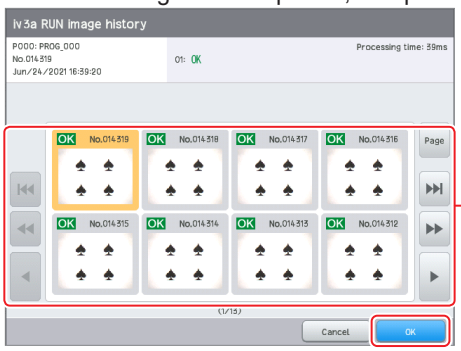
When selecting a batch backup file (*.iv3a) or individual program backup file (*.iv3a), select the image type from the following, and press [OK].

- Running Image History
- Master Image
- Learned Image History

Select the target program when the Learned Image History is selected.

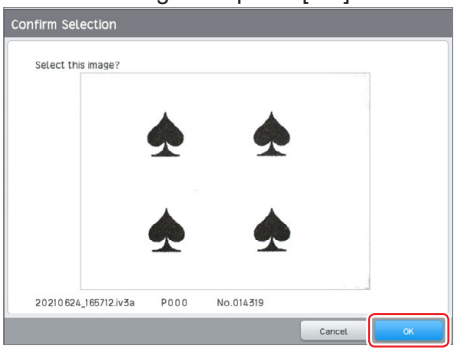


The list of images saved as the selected file image type will be displayed.
Select the image to be imported, and press [OK].



Select the image

Check the image and press [OK].



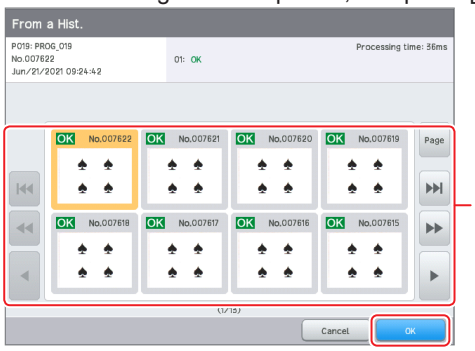
The imported image will be displayed on the right side of the screen.

● When importing from the image history

Press [From a Hist.].

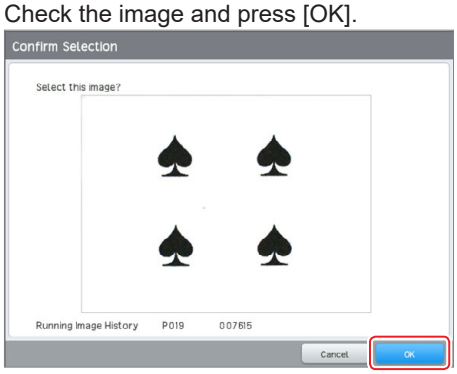


Select the image to be imported, and press [OK].



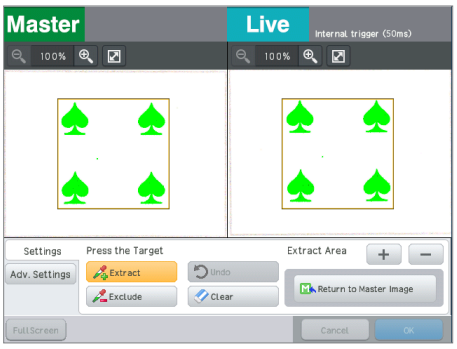
Select the image

Check the image and press [OK].



The imported image will be displayed on the right side of the screen.

3 Adjust the color extraction area.



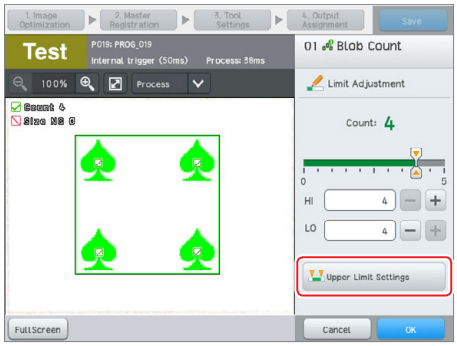
By selecting [Extract] or [Exclude] and pressing an image (Master/Live/Log), you can adjust the color extraction area.

- If [Extract] is selected, and the areas of color that have not been extracted are pressed, extraction area can be added.
- 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.
- When a color extraction is to be performed again, press [Clear] and then press the color to be the reference of judgment.

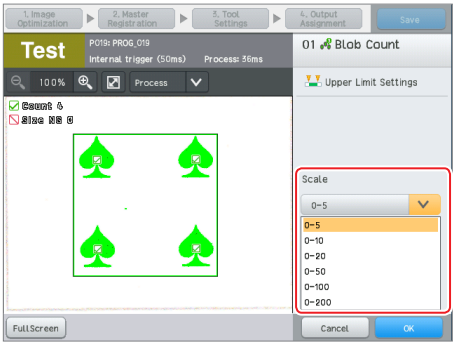
4 After setting is completed, press [Return to Master Image].

■ Upper Limit Settings (Count)

1 Press [Upper Limit Settings].



2 Select the scale for the upper limit threshold.



Select the scale according to the range of the count required for judgment.

3 Press [OK].

The system returns to the [Limit Adjustment] screen.

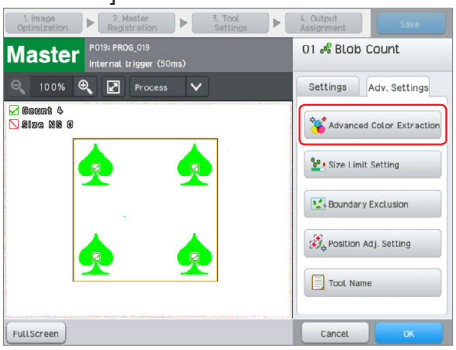
Advanced settings for the Blob tool

■ Advanced Color Extraction/Advanced Brightness Extraction

1 Select the [Adv. Settings] tab.

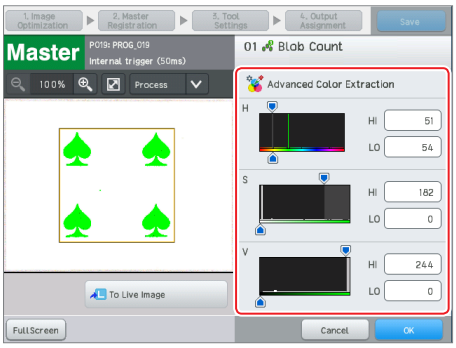
2 Press [Advanced Color Extraction].

For monochrome type, press [Adv. Brightness Extraction].



3 Specify the color or brightness of the extraction target.

● **For color type**



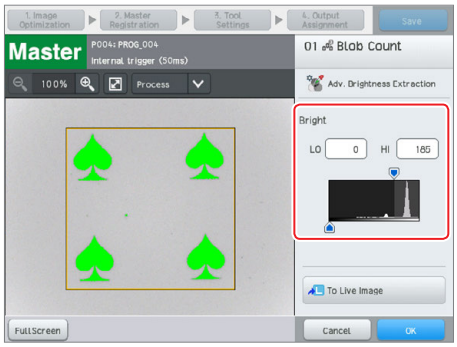
Reference

- 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	Set the upper limit and lower limit for the range of 0 to 359. • **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. The extraction range of a color is from the lower limit to the upper limit.
V	

- By pressing [To Live Image], the range of color to be extracted can be set with 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.

Bright	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 [To Live Image], the range of the brightness to be extracted can be set with the Live image of the target.

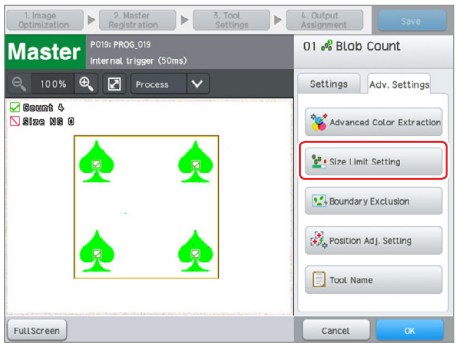
4 Press [OK].

The system returns to the advanced settings for [Blob Count].

■ Size Settings

1 Select the [Adv. Settings] tab.

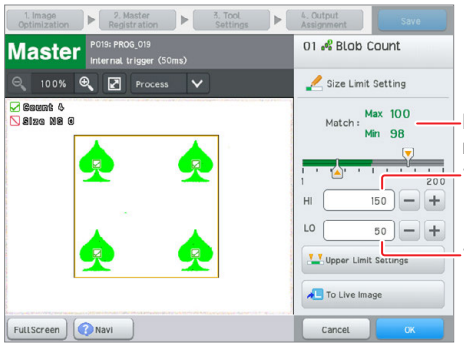
2 Press [Size Limit Setting].



3 Press [To 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] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.
- When pressing [Return to Master Image], it returns to the master image display.

4 Adjust the threshold for anomaly detection by checking the matching rate.



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 5-11)
- "Editing Numbers" (page 3-19)
- "Adjusting Thresholds for Judgment" (page 6-17)

5 Adjust the [Upper Limit Settings] as needed.

"Upper Limit Settings (Size Settings)" (page 4-120)

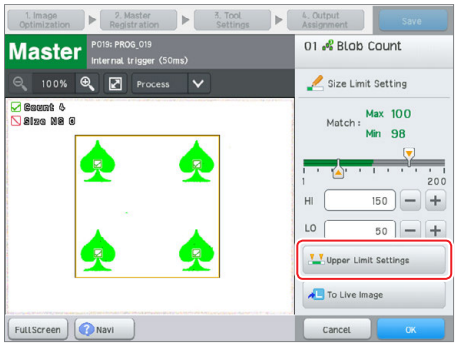
6 When the Live image is displayed, pressing [Return to Master Image] returns to the master image display.

7 Press [OK].

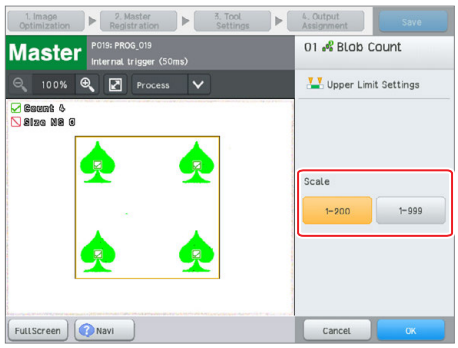
The system returns to the advanced screen for [Blob Count].

■ Upper Limit Settings (Size Settings)

1 Press [Upper Limit Settings].



2 Select the scale for the upper limit threshold.



Select the scale according to the range of the matching rate required for judgment.

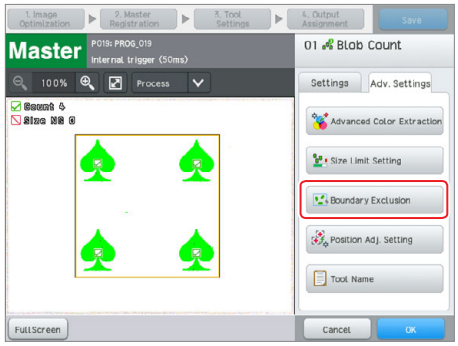
3 Press [OK].

The system returns to the [Size Settings] screen.

■ Protrusion Exclusion

1 Select the [Adv. Settings] tab.

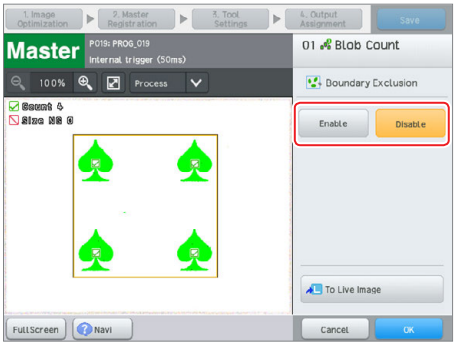
2 Press [Boundary Exclusion].



3 Press [To 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] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.
- When pressing [Return to Master Image], it returns to the master image display.

4 Select enable or disable for excluding the protrusion.



Select the scale according to the range of the matching rate required for judgment.

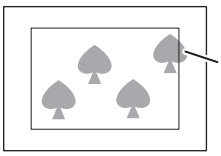
5 When the Live image is displayed, pressing [Return to Master Image] returns to the master image display.

6 Press [OK].

The system returns to the advanced screen for [Blob Count].

Reference When "enabling" the protrusion exclusion, the target that protrudes beyond the window is not counted.

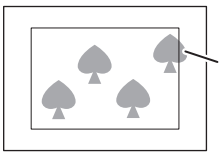
Enable



The target that protrudes from the window is not counted.

Count: 3

Disable



The target is counted when its size within the window is within the size setting range.

Count: 4

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 4-25).

Sorting mode enables multiple varieties (up to eight) to be registered and which part type the target matches to be judged.

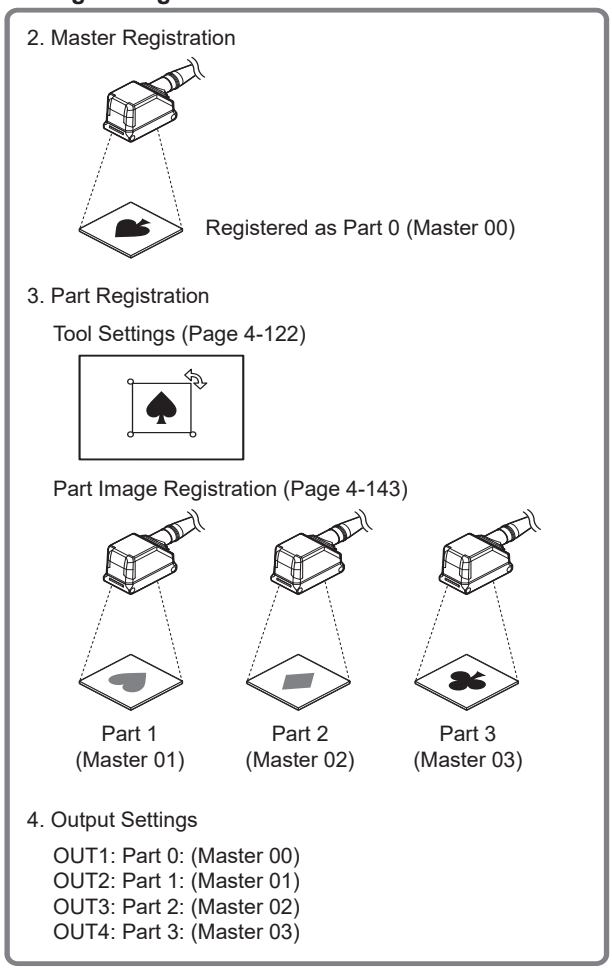
An example usage of sorting mode:
- Judge multiple part types
- Rank the same part type
- Basic object phase discrimination

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).

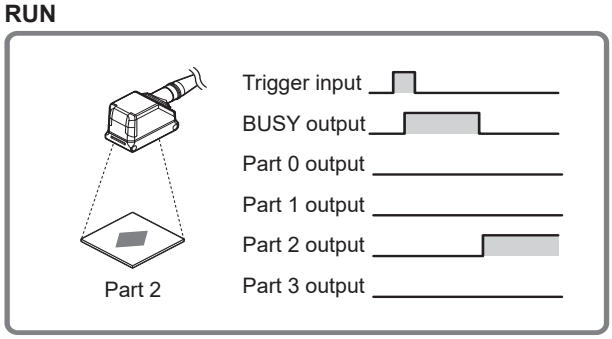
Workflow for Setting and Running Sorting Mode

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 4-25)
“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 4-26)
“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 4-27)
“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 4-27)
“Position Adjustment Tool” (page 4-132)

Advanced tools 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 4-28)
“Width Tool” (page 4-134)

■ Diameter tool

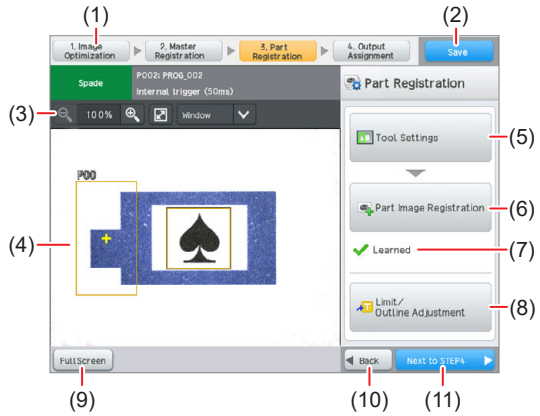
A detection tool to calculate the diameter of the target based on the diameter of a registered part type. Judges a part type by setting the threshold for the diameter.
“Diameter tool” (page 4-28)
“Diameter Tool” (page 4-137)

■ High-Speed Position Adjustment (Hi-Sp.Adj) 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 (Hi-Sp.Adj) tool” (page 4-30)
“High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-139)

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) [Save] button

Finishes the Settings Navigator and returns to the [Sensor Setup Menu] screen.

(3) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(4) Master Image

Displays the master image, tool window for the detection tool, and position adjustment window for the position adjustment tool.

(5) [Tool Settings] button

Sets the detection tool and position adjustment tool.
“Adding/Editing/Copying/Deleting a Tool” (page 4-123)

(6) [Part Image Registration] button

Performs the imaging and learning for the target to judge the part type.
“Procedure to Register Part Image” (page 4-145)

(7) 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.

(8) [Limit/Outline Adjustment] button

This button adjusts the threshold for detection tools with the exception of the position adjustment and Hi-Sp.Adj tools and adjusts the outline for the outline tool.
“Limit Adjustment” (page 4-149)
“Adjusting the Outline” (page 4-150)

(9) [FullScreen] button

“Operation with Full Screen Display of Image” (page 3-17)

(10) [Back] button

Returns to the master image registration screen.
“2. Master Image Registration (Registering an Image as a Reference)” (page 4-18)

(11) [Next to STEP4] button

Proceeds to the Output Assignment settings.
“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

Adding/Editing/Copying/Deleting a Tool

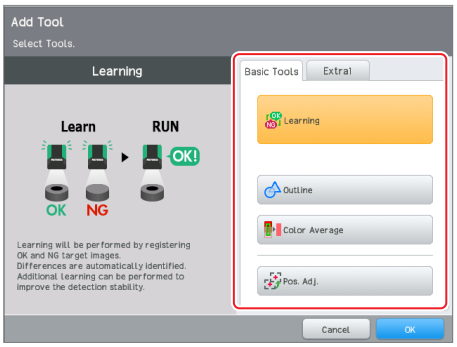
Adding a Tool

1 Press [Tool Settings].

2 Press [Add Tool].



3 Press the tool to be added.



4 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)

● **Extra1**

“Width Tool” (page 4-134)
“Diameter Tool” (page 4-137)
“High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-139)

Editing a tool

1 **Press [Tool Settings].**

2 **Select a tool to edit the settings.**



3 **Press [Edit Tool].**



4 **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)

● Extra1

“Width Tool” (page 4-134)
“Diameter Tool” (page 4-137)
“High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-139)

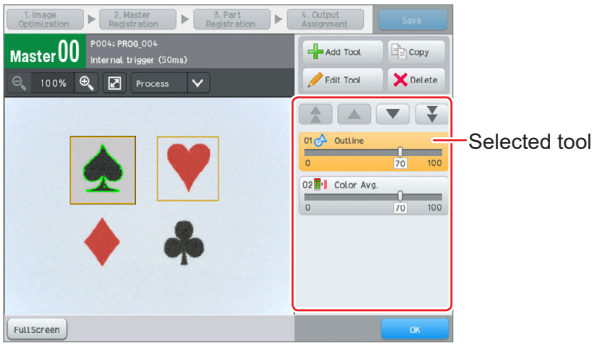
Copying a tool

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 **Press [Tool Settings].**

2 **Select a tool to copy.**



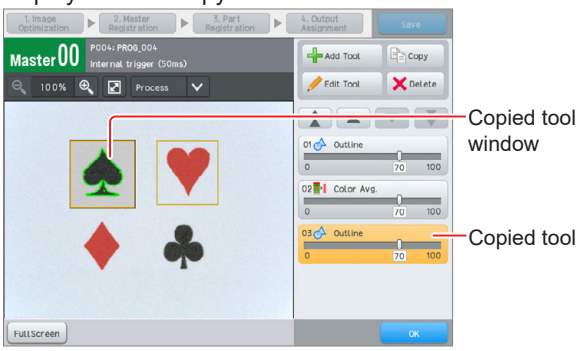
3 **Press [Copy].**



The [Confirmation] screen opens.

4 **Press [OK].**

The copied tool window with the 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.

5 **Press [Edit Tool] 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)

● Extra1

“Width Tool” (page 4-134)
“Diameter Tool” (page 4-137)
“High-Speed Position Adjustment (Hi-Sp.Adj) Tool” (page 4-139)

Deleting a tool

1 **Press [Tool Settings].**

2 **Select a tool to be deleted.**



3 **Press [Delete].**



The [Confirmation] screen opens.

4 **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 4-35)

Tool Name

The tool name can be edited. Up to 16 characters in alphanumeric can be set.

“Tool Name” (page 4-37)

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 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.	4-35

● Setting items for Add Learning Tool (advanced settings)

Items	Description	Ref.
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. “5 Running” (page 5-1)	4-37

Procedure for adding a learning tool for the part type settings

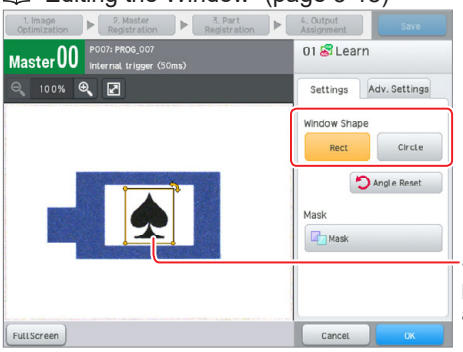
1 Add [Learning Tool].

“Adding a Tool” (page 4-123)
The main screen for [Learning] opens.

Point **Only one learning tool can be set. Multiple learning tools cannot be set.**

2 Select the tool window shape, position, size, and angle according to the desired target.

“Editing the Window” (page 3-18)



Set the position, size, and angle

Point
- **The tool window size should be set according to the size of the image where the difference varieties is clear.**
  “Optimizing the Size of the Tool Window” (page 6-21)
- **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 4-35)

4 Edit [Tool Name] as needed.

“Tool Name” (page 4-37)

5 Press [OK].

The system returns to the main screen of [Part Registration].

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.	4-45
	Sensitivity	The outline extraction sensitivity can be selected according to the target quality.	
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.	4-45

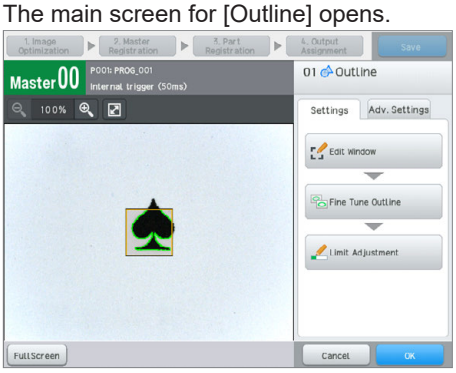
● Setting items for the Outline tool (advanced settings)

Items		Description	Ref.
Rotation Range	Rotation angle range	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. • 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.	4-47
Search Algorithm		The detection mode of the Outline tool can be changed depending on the inspection requirements.	4-47
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. “5 Running” (page 5-1)	4-37

Setting the Outline tool

1 Add the [Outline] tool.

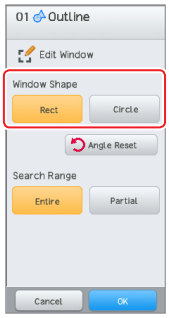
“Adding a Tool” (page 4-123)
The main screen for [Outline] opens.

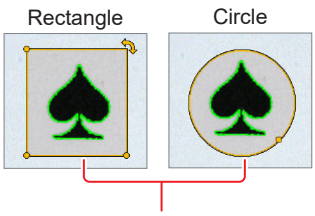


2 Perform [Edit Window].

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 desired target.

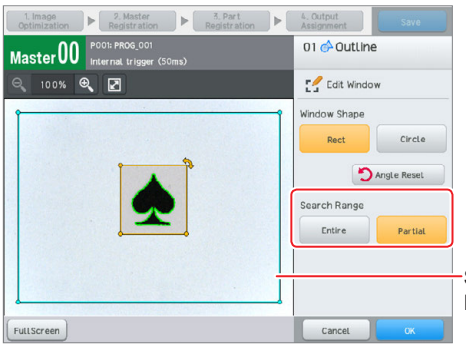




Set a position, size, and angle

3 Set [Search Range] as needed.

Set the tool window to indicate the search range.



Search Range

Entire	Specifies the entire imaging area as a search range.
Partial	Specifies the search range as a user-specified size within the imaging area.

Reference
- The search range cannot be rotated.
- By using a narrower area for the search range, the processing time will be shortened.
- The default value is as follows.
  - Without position adjustment: Entire
  - With position adjustment: Partial

4 Press [OK].

The system returns to the main screen of [Outline].

5 Perform [Fine Tune Outline] as needed.

“Remove Outline” (page 4-46)
“Sensitivity” (page 4-46)

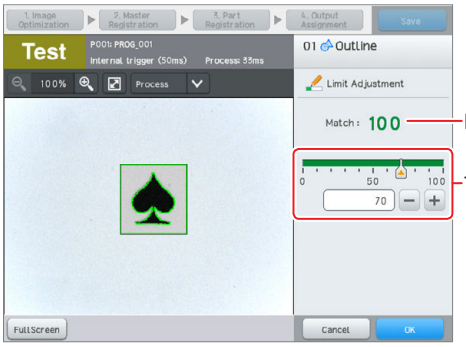
6 Perform [Limit Adjustment] as needed.

The sensor changes to Test mode.
Capture the part type.

Reference 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.

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.



Matching rate

Threshold

Reference
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- 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 5-11)
“Adjusting Thresholds for Judgment” (page 6-17)
“Matching Rate of the Outline Tool and Position Adjustment Tool” (page A-6)

8 Press [OK] to return 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.”**
“Procedure for adding a learning tool for the part type settings” (page 4-126)

Color/Brightness Average Tool

● Setting Items for the Color/Brightness Average tool

Items			Description	Ref.
Master Color Settings (For color type) Master Bright. Settings (For monochrome 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.	
	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.	4-35
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.	4-57

● Setting Items for the Color/Brightness Average tool (advanced settings)

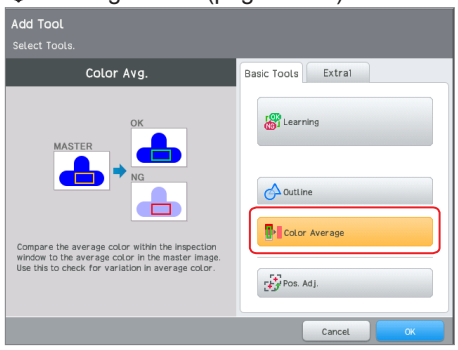
Items		Description	Ref.
Color Range (For color type) Brightness Range (For monochrome type)		• **Color type** Specifies the judgment sensitivity for the color extracted from the master image. • **Monochrome type** Specifies the judgment sensitivity for the brightness extracted from the master image.	4-58
	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 in USB memory.	
Specify Mast.Color (For color type) Specify Mast.Bright (For monochrome type)		Selects how to specify the master color/brightness. In Sorting mode, only [From Mst.Img.] can be selected.	4-62
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. “5 Running” (page 5-1)	4-37

Setting the Color/Brightness Average tool

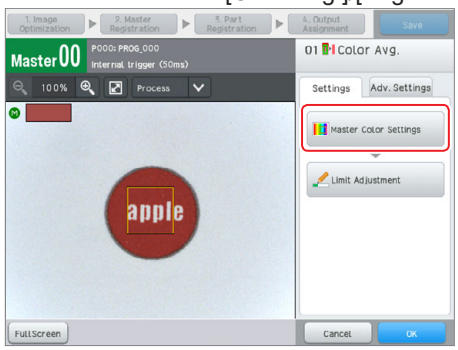
1 Add the [Color Avg.] tool (color type) or [Bright. Avg.] tool (monochrome type).

On the [Add Tool] screen, select [Color Avg.]/[Bright. Avg.] and press [OK].

“Adding a Tool” (page 4-123)



The main screen for [Color Avg.]/[Bright. Avg.] opens.

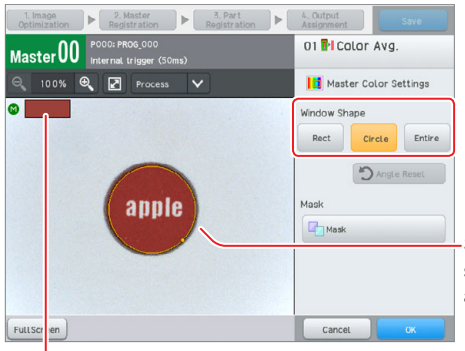


2 Perform [Master Color Settings] (color type) or [Master Bright. Settings] (monochrome type).

Reference Pressing the window will also allow for setting of the master color settings/master brightness settings.

Select the tool window shape, position, size, and angle according to the desired target.

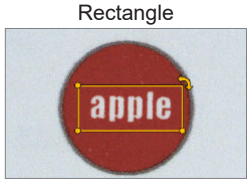
“Editing the Window” (page 3-18)



Set a position, size, and angle

Average color or average brightness in the window is displayed

Rectangle



Circle



When [Entire] is selected, the tool window will be hidden.

Reference When the window shape is set to [Rect], the angle of the window can be reset by [Angle Reset].

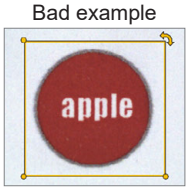
Point

- **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.**

Good example



Bad example



3 Apply the mask as needed.

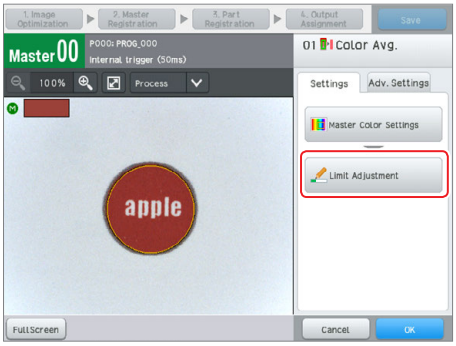
The area inside the mask area is excluded from average color or average brightness extraction.

“Mask settings” (page 4-35)

4 Press [OK].

The system returns to the main screen for [Color Avg.]/[Bright. Avg.].

5 Press [Limit Adjust].



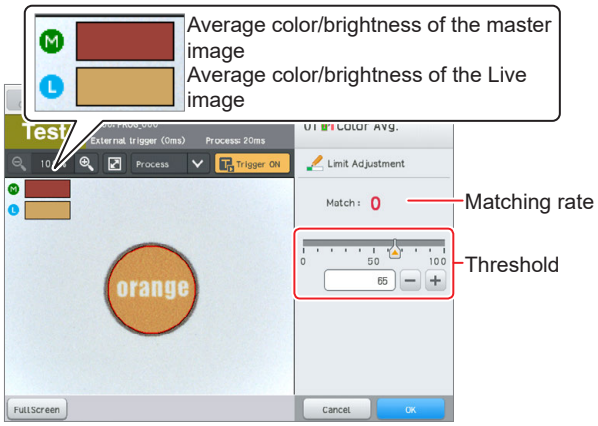
The sensor changes to Test mode.

6 Capture the part type.

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.

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

- 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.
- The matching rate is 100 when a color or 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.

“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

8 Press [OK].

The system returns to the main screen for [Color Avg.]/[Bright. Avg.].

9 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.”
“Procedure for adding a learning tool for the part type settings” (page 4-126)

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 outline. By using a narrower area for the search range, the processing time will be shortened.	4-65
Fine Tune Outline	Eraser Width	Unnecessary outlines which interfere with a stable position adjustment can be removed from the inspection area. The disabled outlines can be specified by tracing the extracted outline.	4-65
	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 turns to Test mode so that the thresholds can be adjusted to the applicable value for operation.	4-64

● Setting items for the Position Adjustment tool (Advanced Settings)

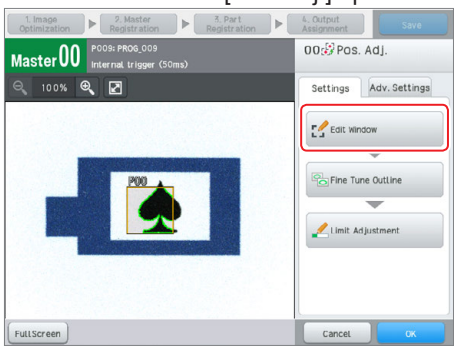
Items		Description	Ref.
Rotation Range	Rotation angle range	Sets a range to adjust the position to the rotating direction. If the angle of the target exceeds the position adjustment's rotation range, the status result of the position adjustment will be NG and adjustment will not occur. • If the rotation 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.	4-47
Search Algorithm		The position adjustment capability of the position adjustment window can be selected depending on the target.	4-47
Tool Name		A user-defined name such as a name of a target can be set to the position adjustment window. Tool names can be checked on the run screen. “5 Running” (page 5-1)	4-37

Setting of the Position Adjustment tool

Point **Only one position adjustment tool can be set in Sorting mode. Multiple position adjustment tools cannot be set.**

1 Adds the position adjustment tool.

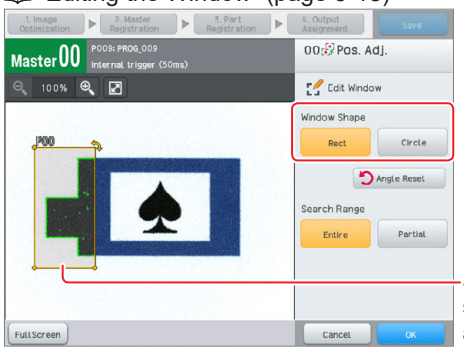
“Adding a Tool” (page 4-123)
The main screen for [Pos. Adj.] opens.



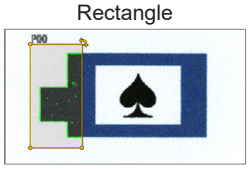
2 Press [Edit Window].

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 desired target.
“Editing the Window” (page 3-18)



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 6-23)

3 Set a search range as needed.

“Search Range Settings” (page 4-65)

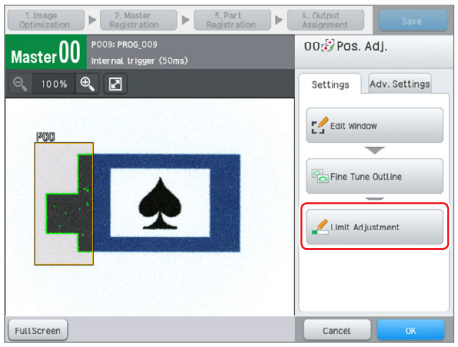
4 Press [OK].

The system returns to the main screen for [Pos. Adj.].

5 Adjust the outline as needed.

“Settings for Disabling Outlines” (page 4-65)
“Setting a Sensitivity” (page 4-66)

6 Press [Limit Adjust].

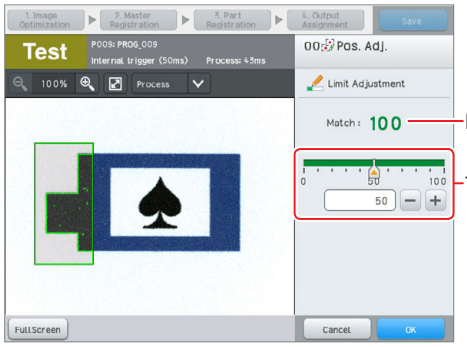


The sensor changes to Test mode.

7 Image the target.

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.

8 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

9 When setting is completed, press [OK].

The system returns to the main screen for [Pos. Adj.].

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.	4-35
Edge Sensitivity Auto Adjustment			Automatically adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	4-69
	(Manual adjustment)		Manually adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	
		To 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.	4-69
	Upper Limit Settings	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.	

● Setting items for the Width tool (advanced settings)

Items		Description	Ref.
Edge Sensitivity Manual Adjustment		Manually adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	4-71
	Edge Sensitivity Auto Adjustment	Automatically adjust the sensitivity that detects the edge that will become the standard of reference for width extraction.	
	To Live Image	The edge sensitivity can be adjusted from the Live image of the target.	
Width Extraction Method		Select the method used to extract the target width.	4-72
Scaling	Scaling	Sets scaling. Set when length is being used for part type judgment instead of the matching rate. Scaling is required in Sorting Mode.	4-73
	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.	
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. “5 Running” (page 5-1)	4-37

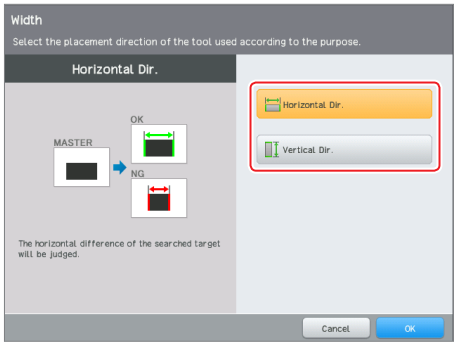
Setting the Width tool

1 **Select the [Extra1] tab, and add the [Width] tool.**

“Adding a Tool” (page 4-123)

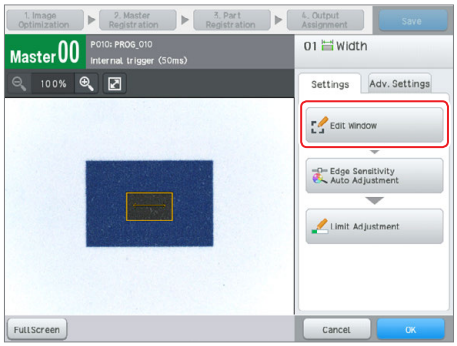
Displays the Width tool direction selection screen.

2 **Press [Horizontal Dir.]/[Vertical Dir.].**

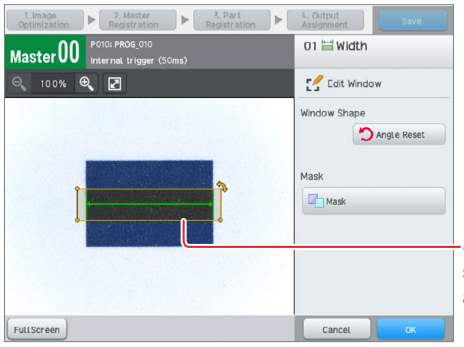


The main screen for [Width] opens.

3 **Press [Edit Window].**



4 **Set the position, size, and angle of tool window according to the target.**



Set a position, size, and angle

“Editing the Window” (page 3-18)

5 **Apply the mask as needed.**

The area inside the mask region is excluded from the width detection target.

“Mask settings” (page 4-35)

6 **Press [OK].**

The system returns to the main screen of [Width].

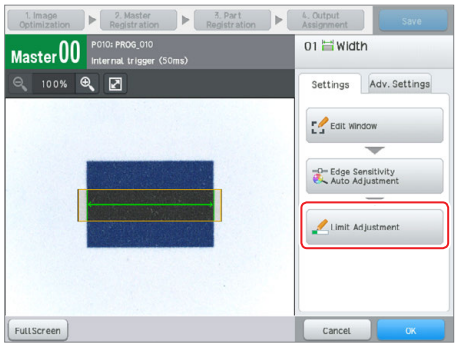
7 **Perform Edge Sensitivity Auto Adjustment as needed.**

“Edge Sensitivity Auto Adjustment” (page 4-70)

8 **Set scaling.**

“Scaling” (page 4-73)

9 **Press [Limit Adjust].**



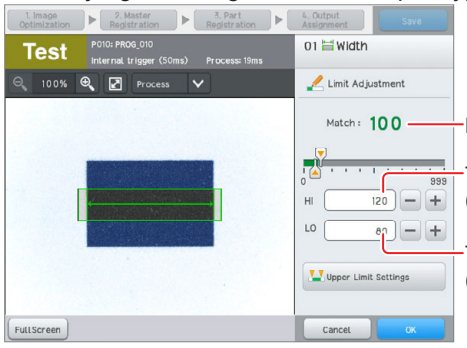
The sensor changes to Test mode.

10 **Capture the part type.**

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.

11 **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

- 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 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.

“Selecting the Display Method of the Tool Window” (page 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

12 **Press [OK].**

The system returns to the main screen of [Width].

13 **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."
"Procedure for adding a learning tool for the part type settings" (page 4-126)

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.	4-35
Diameter Extraction	Ext. Sens		Selects the sensitivity for diameter extraction according to the target.	4-76
	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.	4-75
	Upper Limit Settings	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.	

● Advanced settings for the Diameter tool

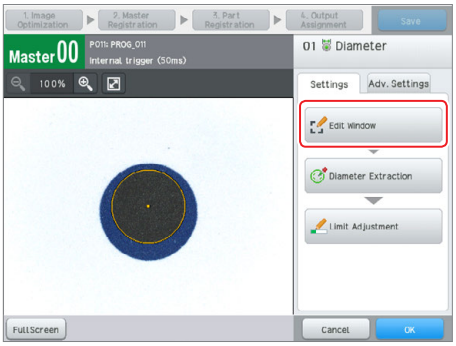
Items		Description	Ref.
Adv. Diameter Extraction	Diameter Mode	Select the method used to extract the target diameter.	4-76
	Bright/Dark Direction	Selects the direction for which the tool detects the target edge.	
Scaling	Scaling	Sets scaling. Set when length is being used for part type judgment instead of the matching rate. Scaling is required in Sorting Mode.	4-78
	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.	
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. “5 Running” (page 5-1)	4-37

Setting the Diameter tool

1 Select the [Extra1] tab, and add the [Diameter] tool.

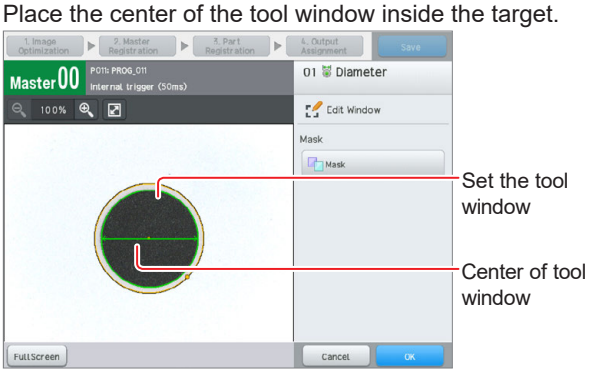
“Adding a Tool” (page 4-123)
The main screen for [Diameter] opens.

2 Press [Edit Window].



3 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 3-18)

Reference The sensor detects circles from the center of tool window towards outside.

4 Apply the mask as needed.

The area inside the mask region is excluded from the diameter detection target.
“Mask settings” (page 4-35)

5 Press [OK].

The system returns to the main screen of [Diameter].

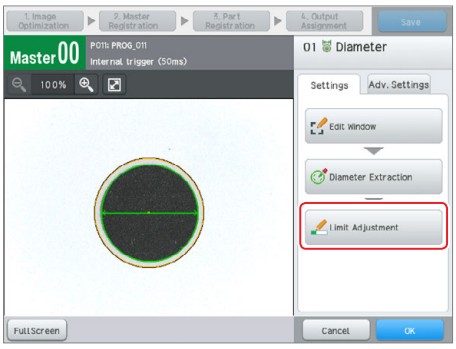
6 Perform extraction diameter extraction as needed.

“Diameter Extraction Settings” (page 4-76)

7 Set scaling.

“Scaling” (page 4-78)

8 Press [Limit Adjust].



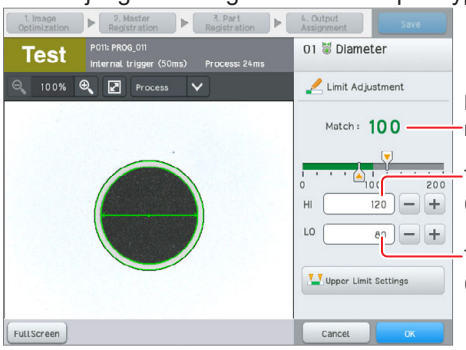
The sensor changes to Test mode.

9 Capture the part type.

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.

10 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.
- A matching rate of 100 indicates that the target diameter is completely matched to the master image diameter. The matching rate is a value proportional to the diameter used in the master image. 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 5-11)
“Editing Numbers” (page 3-19)
“Adjusting Thresholds for Judgment” (page 6-17)

11 When setting is completed, press [OK].

The system returns to the main screen of [Diameter].

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.”
“Procedure for adding a learning tool for the part type settings” (page 4-126)

High-Speed Position Adjustment (Hi-Sp.Adj) Tool

● Setting items for the Hi-Sp.Adj 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 Auto Adjustment		Automatically adjusts the sensitivity which detects the edge.	4-93
		Edge Sensitivity Adjustment	Manually adjusts the sensitivity which detects the edge. 1 to 100 (default: 50)	
		To 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.	4-91
	Tool Name		A user-defined name such as a name of a target can be set to the position adjustment window. Tool names can be checked on the run screen. “5 Running” (page 5-1)	

● Setting items for the Hi-Sp.Adj 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 Sensitivity Manual Adjustment		Manually adjusts the sensitivity that detects the edge. 1 to 100 (default: 50)	4-94
	Edge Sensitivity Auto Adjustment	Automatically adjusts the sensitivity which detects the edge.	
	To Live Image	The edge sensitivity can be adjusted from the Live image of the target.	
Edge Detection		Selects the bright/dark direction that detects a target edge.	4-95

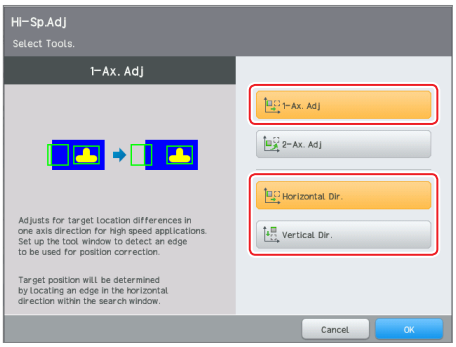
Setting the Hi-Sp.Adj tool

■ 1-Axis Adjustment

1 **Select the [Extra1] tab, and add the [Hi-Sp.Adj] tool.**

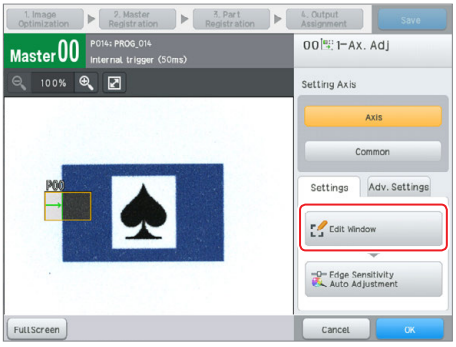
“Adding a Tool” (page 4-123)

2 **Select [1-Ax. Adj]. Press [Horizontal Dir.] or [Vertical Dir.], and press [OK].**



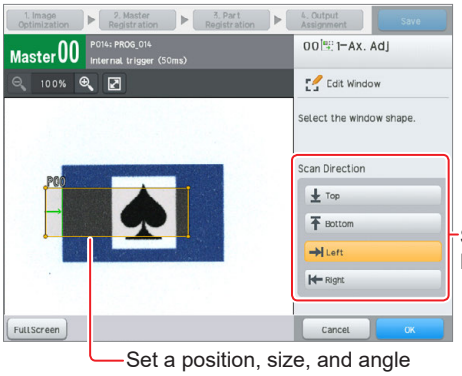
The main screen for [1-Ax. Adj] opens.

3 **Press [Edit Window].**

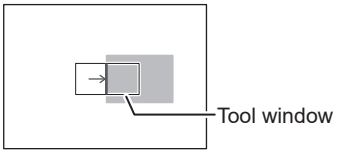


Reference Pressing the tool window directly will enable the sensor to proceed to the following procedure as well.

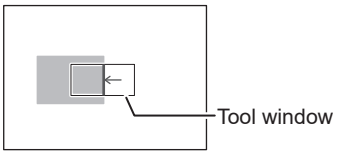
4 **Select the detection direction, and Set the position and size of the tool window according to a target.**



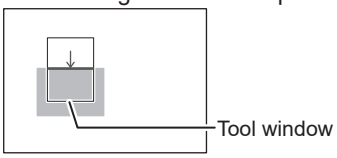
- Detection direction: Left (default)
  Detects edges from the left side of window to the right side.



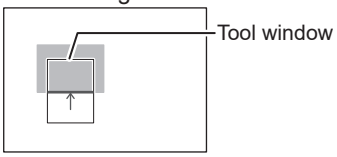
- Scan Direction: Right
  Detects edges from the right side of window to the left side.



- 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.



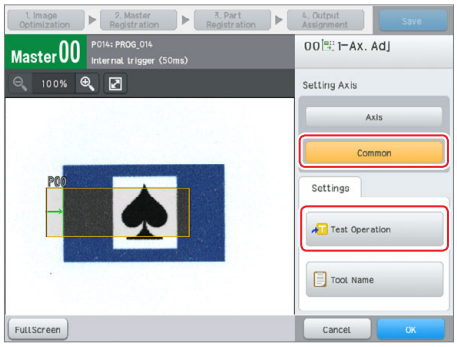
5 **Press [OK].**

The system returns to the main screen for [1-Ax. Adj].

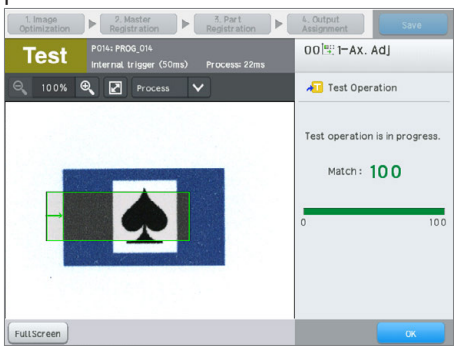
6 **Perform Edge Sensitivity Auto Adjustment as needed.**

“Edge Sensitivity Auto Adjustment” (page 4-93)

7 **Select [Common], and then press [Test Operation].**



The sensor changes to Test mode.
Position correction is performed and the edge detection process can be confirmed.



8 **Press [OK].**

The system returns to the main screen for [1-Ax. Adj].

9 **Press [OK].**

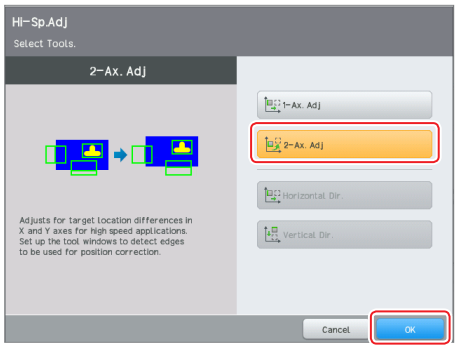
The system returns to the main screen for the tool settings.

■ 2-Axis Adjustment

1 **Select the [Extra1] tab, and add the [Hi-Sp.Adj] tool.**

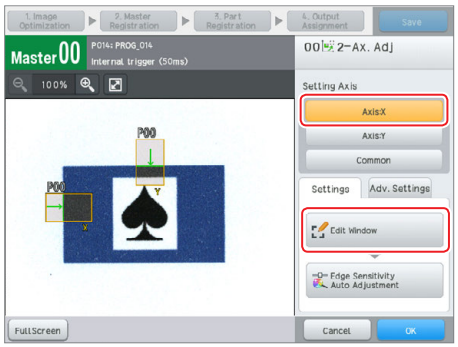
“Adding a Tool” (page 4-33)

2 **Select the [2-Ax. Adj] button, and press [OK].**



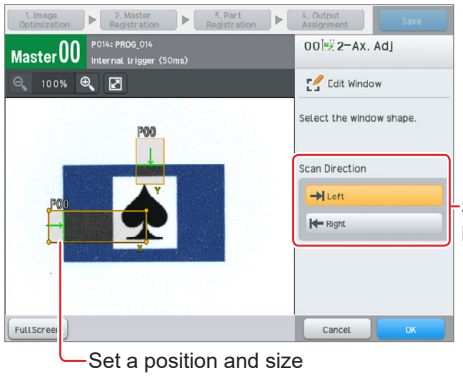
The main screen for [2-Ax. Adj] opens.

3 **Press [Axis:X], and press [Edit Window].**



Reference — Pressing the tool window directly will enable the sensor to proceed to the following procedure as well.

4 **Select the detection direction, and set the position and size of the tool window according to a target.**



5 **Press [OK].**

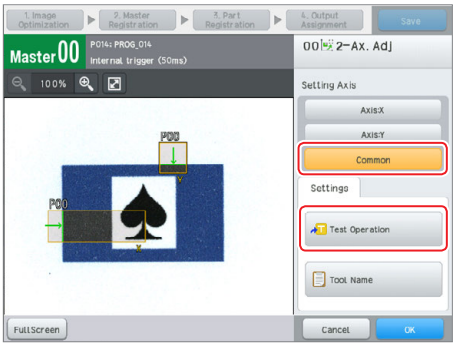
The system returns to the main screen for [2-Ax. Adj].

6 **Press [Setting Axis: Axis:Y], and perform steps 3 to 5 for the Y axis.**

7 **Perform Edge Sensitivity Auto Adjustment as needed.**

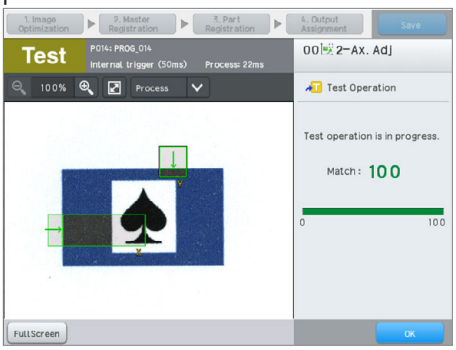
“Edge Sensitivity Auto Adjustment” (page 4-93)

8 **Select [Common], and then press [Test Operation].**



The sensor changes to Test mode.

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 **Press [OK].**

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

Part Image Registration

● Setting items for the part image registration

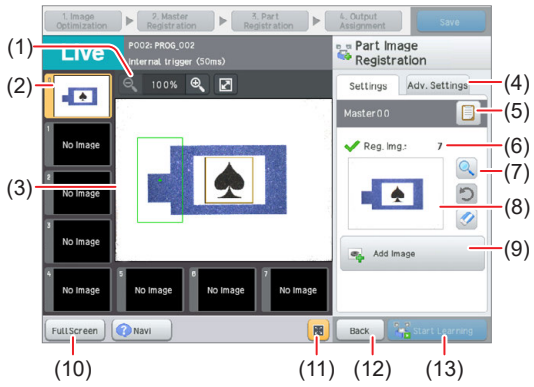
Items	Description	Ref.
Add Master	Up to 8 part types can be added.	4-145
Part Name	Master names for each Part Type can be edited.	4-145
Add Image	Registers Live images as the target to judge the part type.	4-146
Start Learning (When the learning tool is set)	Learns the target to judge the part type.	4-145

● Setting items for the part image registration (Advanced settings)

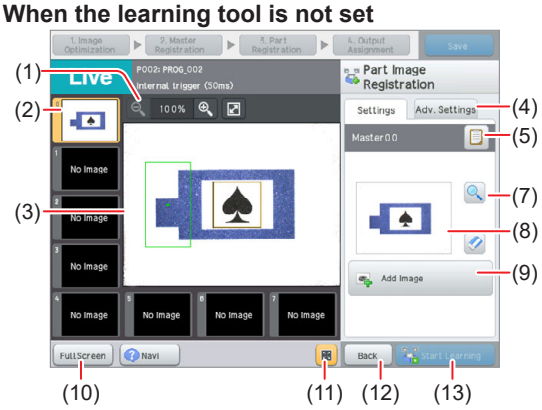
Items	Description	Ref.
Variable Brightness (When the learning tool is set)	Sets whether to register multiple images of different brightness when registering the target to judge the part type. To use variable brightness, the target must not be moving.	4-146
From File	Imports images to be registered as the target to judge the part type from the file saved in the USB memory.	4-147
From a Hist.	Imports images to be registered as the target to judge the part type from the image history.	4-147

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 3-17)

(2) Part list

Displays the added part type images.

(3) Image taken by the sensor

Displays an image taken by the sensor.

(4) [Settings]/[Adv. Settings] tab

Switches between the settings tab and advanced settings tab.

(5) [Master Name] button

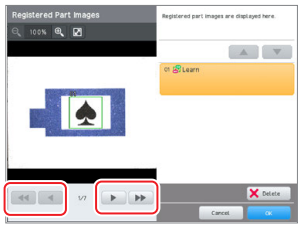
Edits the master names (part type names) of each part type.

(6) Number of images registered (when only the learning tool is set)

Displays the number of images registered.

Reference If the Variable Brightness is [ON], by registering the first image, seven images are registered including the brightness change images (six images).

(7) Operation buttons

	Deletes all registered images. An image registered in Master0 cannot be deleted because it is linked with a master image.
	Deletes the last registered image.
	The registered image can be expanded and checked. When registering multiple images, they can be confirmed with the move buttons. 

(8) Registered image

Displays the last registered image.

(9) [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.

(10) [FullScreen] button

“Operation with Full Screen Display of Image” (page 3-17)

(11) Added part type display or hide button

Controls whether to display or hide the added part type image.

(12) [Back] button

The system returns to the main screen of the part registration settings.

(13) [Start Learning] button (when the learning tool is set)

Starts the learning.
Once learning completes, part image registration will end.

[OK] button (when the learning tool is not set)

Ends part image registration.

Procedure to Register Part Image

1 Press [Part Image Registration].

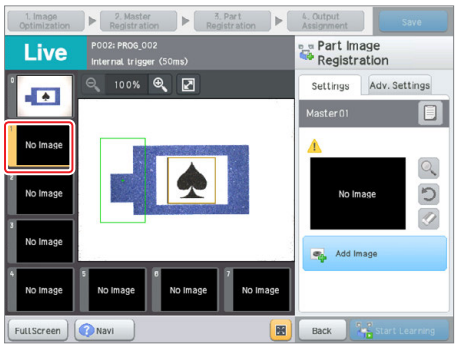
“Main Screen for the Part Registration Settings” (page 4-123)

2 Select Part1.

Selects Part1 from the Part list.

Point

- **For Part0 a master image is automatically registered. When changing the image of Part0 register another master image 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 4-146)

- **Registration of Image from the Image History**

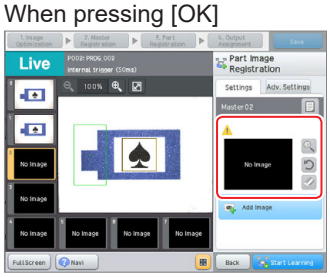
“Registration of Image from the Image History” (page 4-147)

- **Registration of image saved in a file**

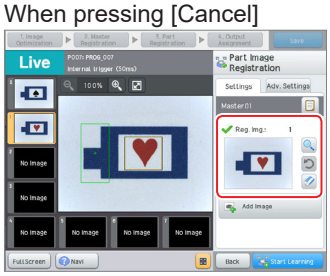
“Registration of image saved in a file” (page 4-147)

If the next part type image is not registered, a confirmation screen to switch to the next part type image will appear. By pressing [OK], the next unregistered part type image appears.

When pressing [OK]



When pressing [Cancel]



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 6-22)

5 Add Part2 to 7 as needed.

Up to 7 part types can be added.

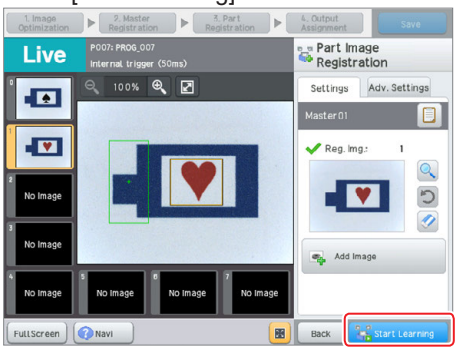
6 Register the images for each part type.

Registers an image as the target to judge the part type. The registration method is the same as step 3 to 4.

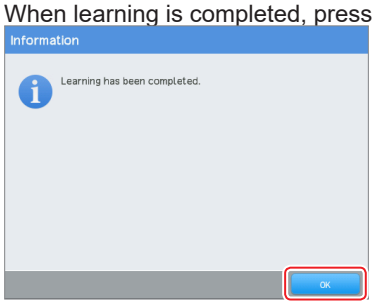
7 Press [Start Learning] or [OK].

- **When the learning tool is set**

Press [Start Learning].



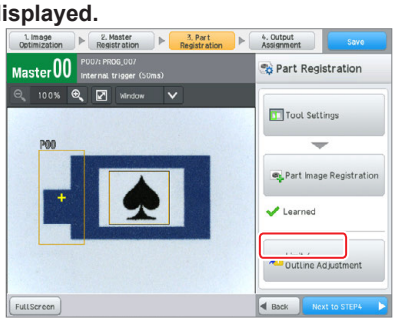
When learning is completed, press [OK].



The system returns to the main screen of [Part Registration].

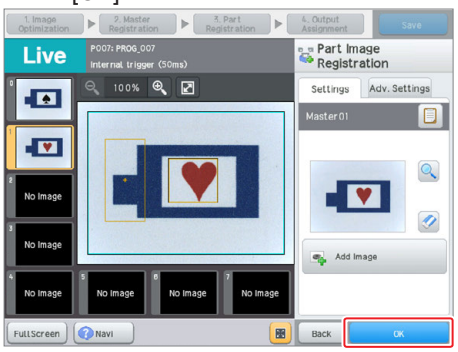
Point

If the learning tool is set and the part registration settings complete, [Learned] will be displayed.



● When the learning tool is not set

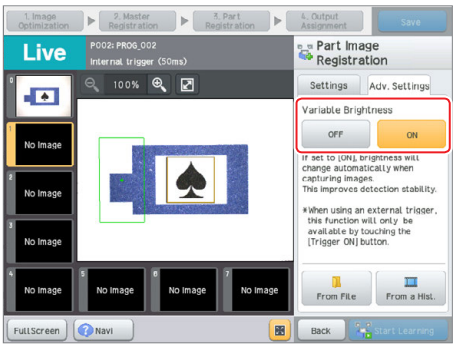
Press [OK].



The system returns to the main screen of [Part Registration].

■ Registration of Taken Image

1 When changing the [Variable Brightness] setting, select the [Adv. Settings] tab.



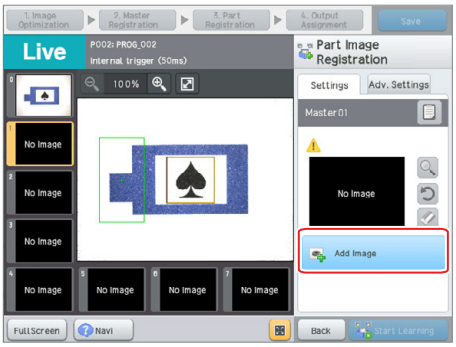
Reference Variable brightness can be ON in the following cases.

- During internal trigger
- When pressing [Trigger ON] with external trigger set to image by using the internal trigger.

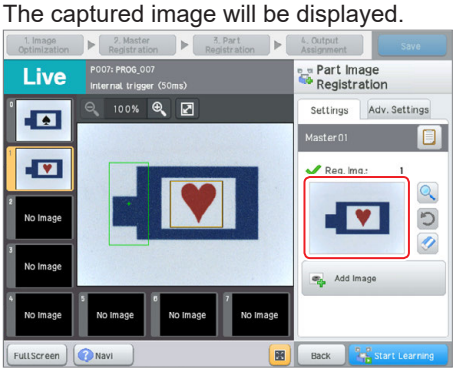
2 Image a target to be registered.

If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input the 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.

3 Select [Settings] tab and press [Add Image].

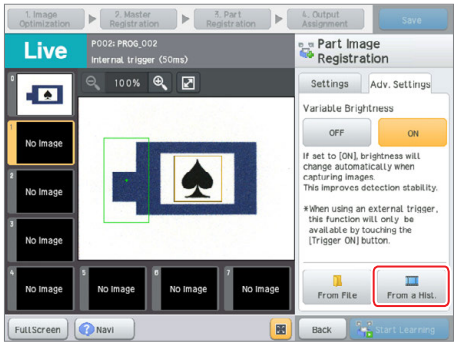


The captured image will be displayed.

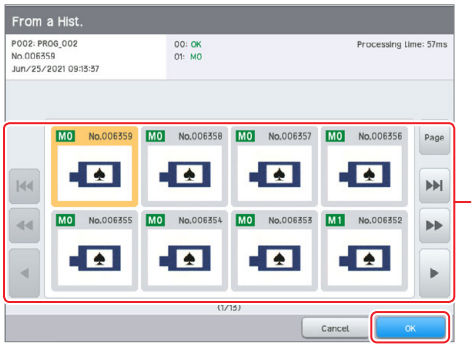


■ Registration of Image from the Image History

1 **Select [Adv. Settings] tab and select [From a Hist.].**

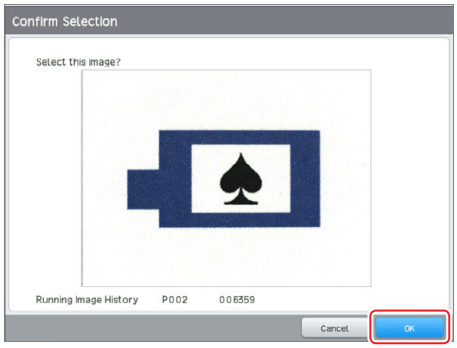


2 **Select the image to be registered, and press [OK].**

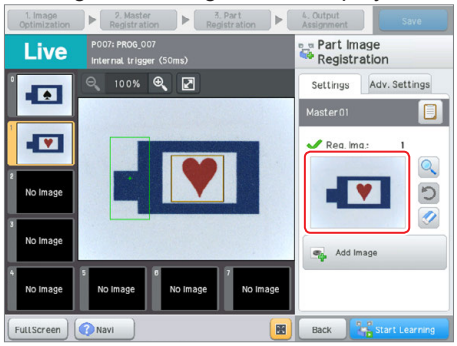


Select the image

3 **Press [OK].**



The registered image will be displayed.

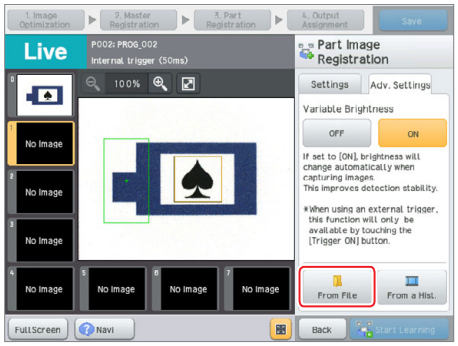


■ Registration of image saved in a file

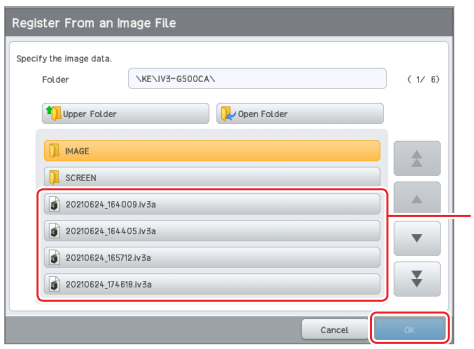
1 **Insert the USB memory on which the batch backup files (*.iv3a), individual program backup files (*.iv3a), or image capture files (*.iv3p) are saved into the control panel.**

“Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

2 **Select [Adv. Settings] tab and press [From File].**



3 **Select the file to be imported, and press [OK].**



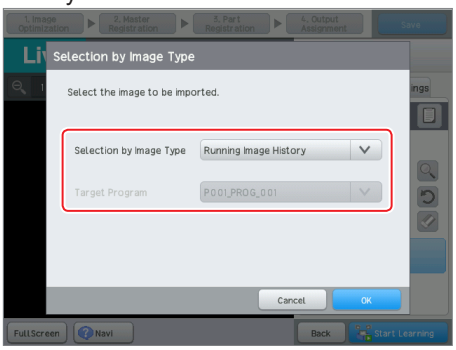
Select the file

“Selecting the File/Folder in the USB Memory” (page 3-21)

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.

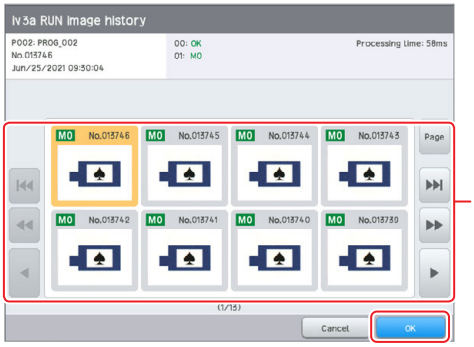
- Running Image History
- Master Image
- Learned Image History

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.

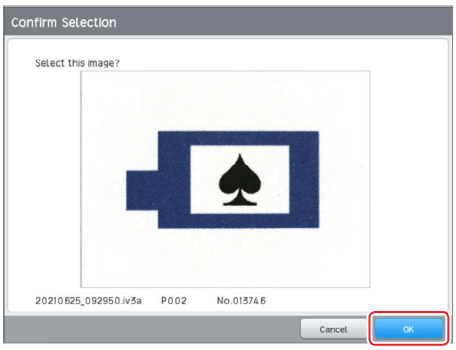
5 Select the image to be registered, and press [OK].



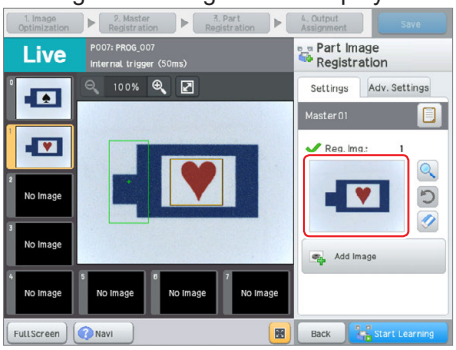
Select the image

The registered image will be displayed.

6 Press [OK].



The registered image will be displayed.

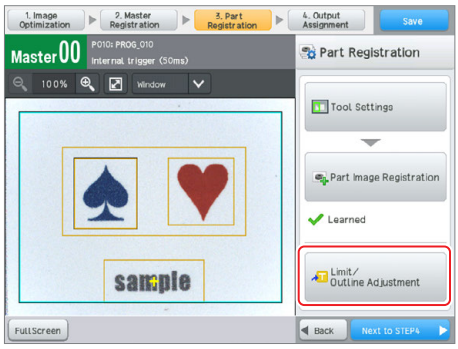


Limit/Outline Adjustment

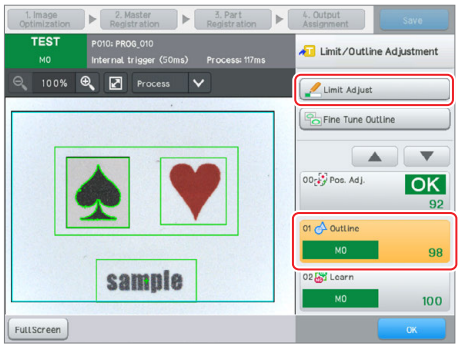
The threshold for each part type registered in the detection tool can be adjusted. Additionally, the outline for each part type registered in the outline tool can also be adjusted. Note that the threshold for the position adjustment/high-speed adjustment tool cannot be adjusted.

Limit Adjustment

1 Press [Limit/Outline Adjustment] on the part type settings screen.

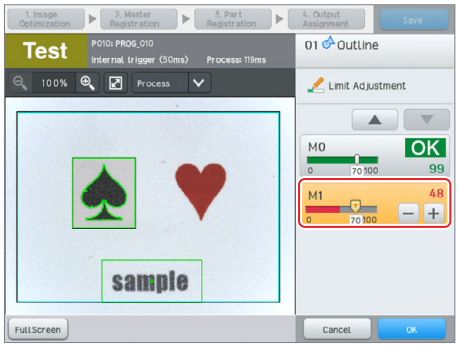


2 Select the detection tool and then press [Limit Adjust].



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.

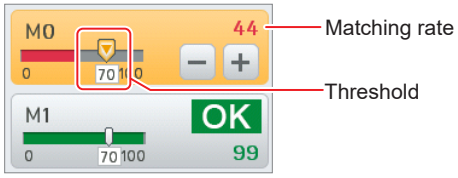
If [Trigger Options] is set to [External] or [Internal Trigger Control with IN1 Input] is set to [Enable], input an external trigger.
If the external trigger cannot be input, press [Trigger ON] to take an image of the target by temporarily using the internal trigger.

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 6-17)

● Width tool/Diameter tool

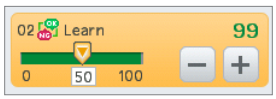
- The width tool sets the range of the width to be judged as the same part type.
  “Setting the Width tool” (page 4-135)
- The diameter tool sets the range of the diameter as the same part type.
  “Setting the Diameter tool” (page 4-138)

● 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)

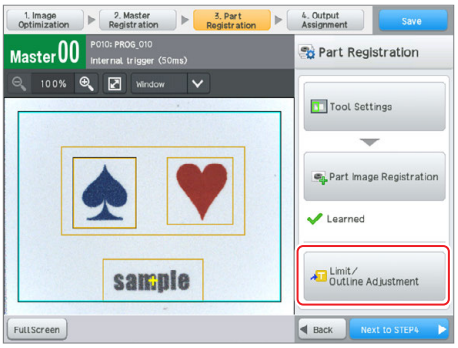


The matching rate of either part type appears. The part type is not displayed. Adjust the threshold so that all part types are “OK” and part type images that are not registered are “NG”.

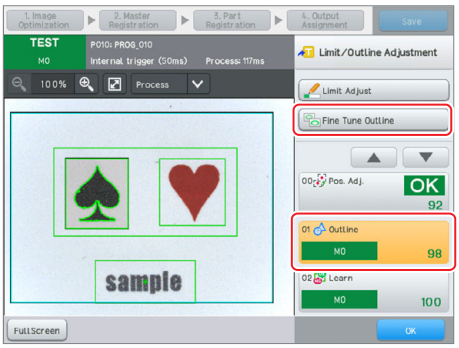
6 Press [OK] to return to the threshold/outline adjustment screen.

Adjusting the Outline

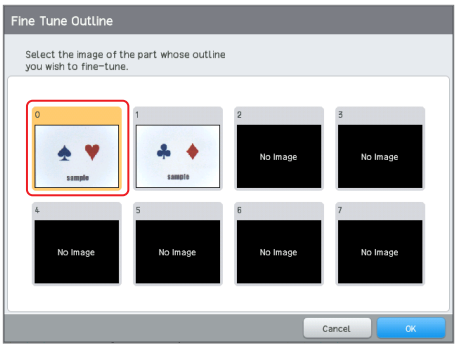
1 **Press [Limit/Outline Adjustment] on the part type settings screen.**



2 **Select the outline tool and then press [Fine Tune Outline].**

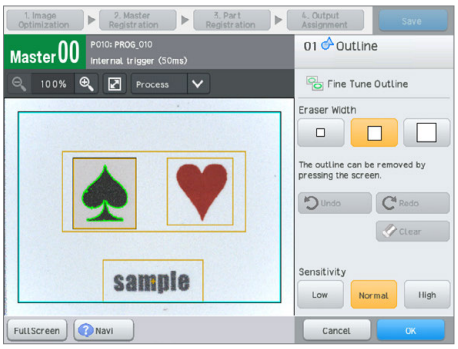


3 **Select the part type image for which the outline is to be adjusted, and press [OK].**



0 to 7 displayed on the screen represents Part 0 to Part 7.

4 **Adjust outline removal and sensitivity.**



“Remove Outline” (page 4-46)
“Sensitivity” (page 4-46)

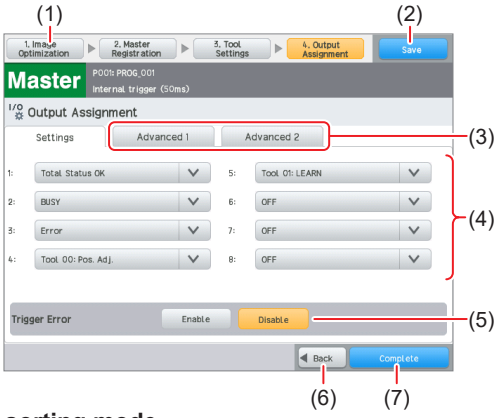
5 **Press [OK] to return to the threshold/outline adjustment screen.**

4. Output Assignment (Setting Details of Outputting to Output Line)

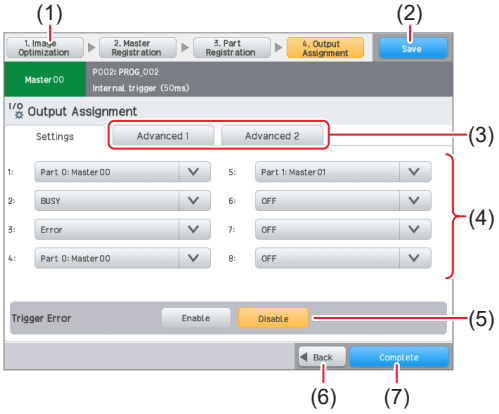
Set the output items to be assigned to the output line.
“Cables” (page 2-18)
“10 Controlling with the Input/Output Line” (page 10-1)

Main Screen for the Output Assignment

In standard mode



In sorting mode



(1) Navigation button
Moves steps in the Settings Navigator.

(2) [Save] button
Finishes the Settings Navigator and returns to the [Sensor Setup Menu] screen.

(3) [Advanced 1] tab, [Advanced 2] tab (can be set only in the standard mode)
Sets the total status conditions, logics, and program auto-switching.
“Advanced Settings for the Output Assignment” (page 4-153)

(4) Output assignment button
Assigns the output item to each output line.

(5) [Enable]/[Disable] button for the trigger error output
Selects whether to enable/disable the output when a trigger error occurs.
“Error Messages” (page A-9)

(6) [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 4-25)
“3. Part Registration Settings (Setting the Judgment Method of the Target of Sorting Mode)” (page 4-121)

(7) [Complete] button
Finishes the Settings Navigator.
“Finishing the Settings Navigator” (page 4-7)

Setting range of the Output Assignment

● In standard mode

Setting range	Description
OFF	Do not output. Output will be constantly OFF.
Total Status OK	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: • All Tools OK • Any Tool OK • Logic 1 • Logic 2 • Logic 3 • Logic 4
Total Status NG	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. • 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. • 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]. • Trigger error • FTP error • SD card transfer error
SD card error	The output turns ON when the following errors occur. • 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 judgment tool and position adjustment tool are OK, the output function turns ON.
Master 00 to 07	• 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.
Part 0 to 7	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. • 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. • 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]. • Trigger error • FTP error • SD card transfer error
SD card error	The output turns ON when the following errors occur. • SD card access error • SD card transfer error (when settings are [Enable])

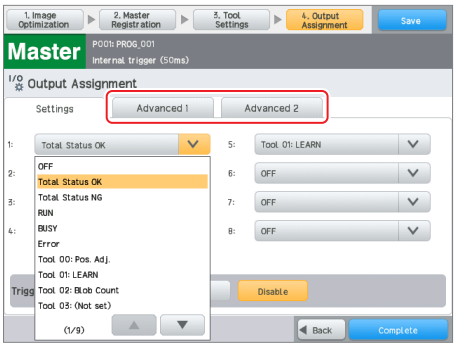
● Default value

Ultra-compact model	Built-in amplifier type	Standard Mode	Sorting Mode
OUT1		Total Status OK (N.O.)	Part 0 (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 7-18)
- The input cable assignment can be changed.
  “Input Settings” (page 7-16)
- 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 8-17)

Setting the Output Assignment

1 Press the item name of an output line and select the output item.



2 Select [Enable]/[Disable] for the trigger error output.

3 Finishes the Settings Navigator.

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

Advanced Settings for the Output Assignment

● Setting Items of the Output Assignment (Advanced 1)

The advanced settings of the output assignment are enabled only in standard mode. Even though it will be displayed in sorting mode, it cannot be changed.

Items		Description	Ref.
Total Status Conditions		Selects a condition for the total status result. The total status result is determined according to the selected condition.	4-154
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.	4-155
	Logic	Selects the operation method for the logic settings.	

● Setting Items of the Output Assignment (Advanced 2)

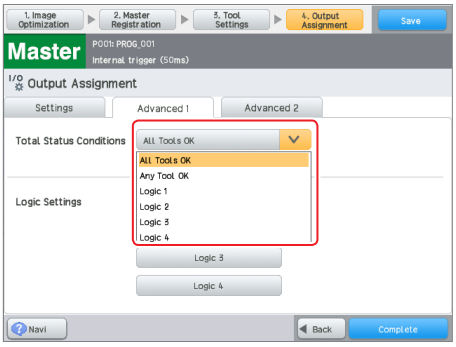
Items		Description	Setting range	Ref.
Program Auto-Switching		Switches the program automatically according to the total status result.	• **Enable** Enables the program auto-switching. • **Disable (default)** Disables the program auto-switching.	4-156
Destination Program	If Total Status OK (Standard Mode)	Selects the switching destination program when the total status is OK.	• **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).		
	If Total Status NG	Selects the switching destination program when the total status is NG.		
	Switching Delay	Sets the delay time when switching.	• **0 to 10000 ms (default: 3000 ms)**	
NG Confirmation Timing		Selects the timing to judge as total status NG.	• **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.	
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 [Advanced 1] tab.

“Main Screen for the Output Assignment” (page 4-151)

2 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.

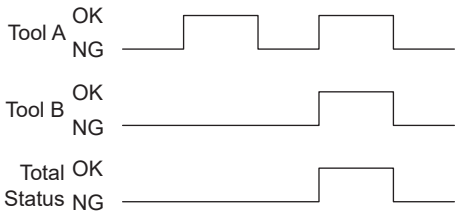


Image of total status output when the total status condition is [All Tools OK]

● Any Tool OK

When any of the detection tools are OK, the total status output turns ON.

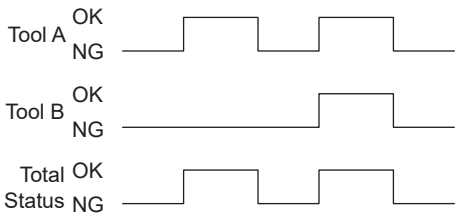


Image of total status output when the total status condition is [Any Tool OK]

Point **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.

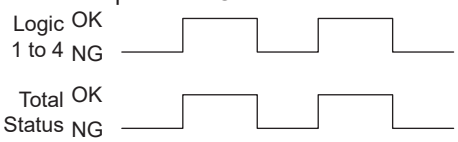


Image of total status output when the total status condition is [Logic 1 to 4]

Point

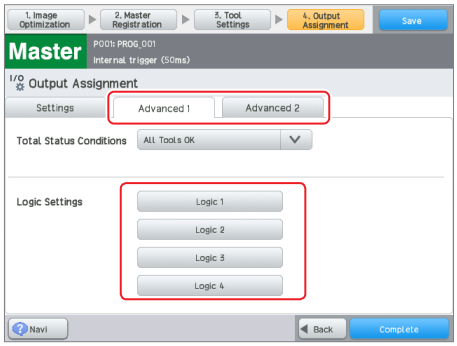
- **When the position adjustment is the status result of each tool is NG.**
- **If the Learning/Area/Edge Pixel/Width/Diameter/Edge/Pitch/OCR/Blob Count tool window protrudes from the imaging area when position adjustment succeeds, the tool cannot be judged and the status result is NG.**

Logic Settings

1 Select the [Advanced 1] tab.

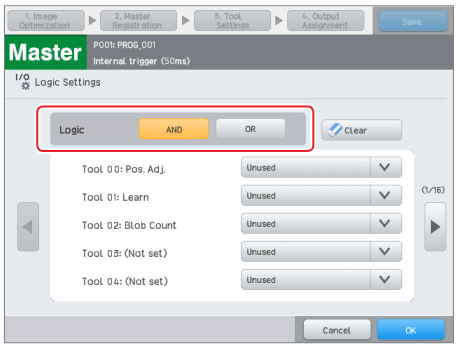
“Main Screen for the Output Assignment” (page 4-151)

2 Tap the number to which the logic judgement condition is to be defined.



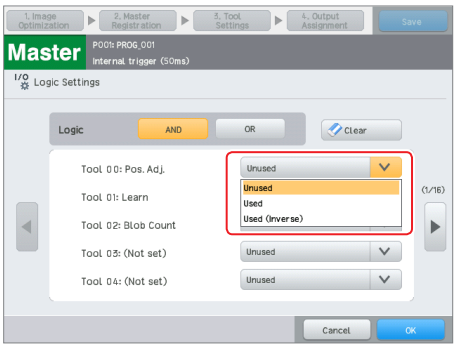
Reference When an undefined detection tool has been defined to a logic, [An undefined tool is selected.] is displayed on the right side of the logic number .

3 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.

4 Select items to be integrated into the logic.



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.

The status result of the logic is calculated from OK/NG of all of the items which [Used] or [Used (Inverse)] has been set.

Point
- **Items where [Used] are selected will be checked with red color.**
- **Items where [Used (Inverse)] are selected will be checked with blue color.**



● Logic : AND

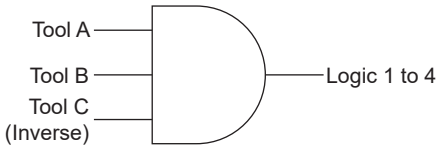


Image of logic output when the Logic is [AND]

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

● Logic : OR

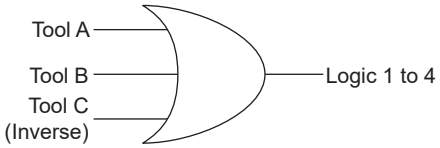


Image of logic output when the Logic is [OR]

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 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 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.

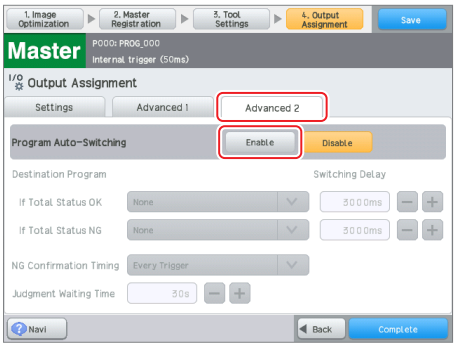
5 When setting is completed, press [OK].

The system returns to the main screen for the Output Assignment.

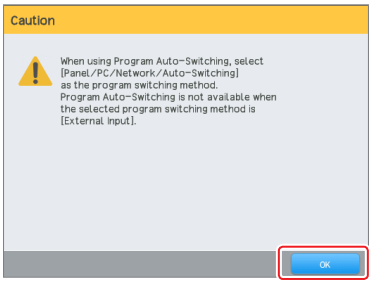
Program Auto-Switching

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 10-7)

1 Select the [Advanced 2] tab and press [Enable] of program auto-switching.



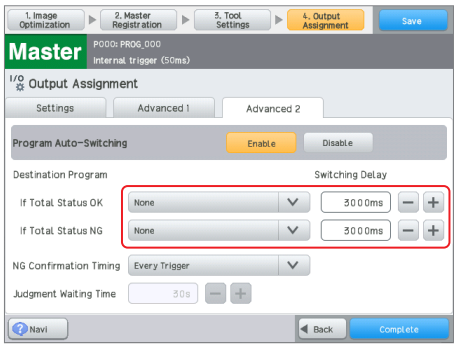
2 Press [OK] in the confirmation screen.



Change the program switching method to [Panel/PC/ Network/Auto-Switching].
“Program Switching Method” (page 7-16)

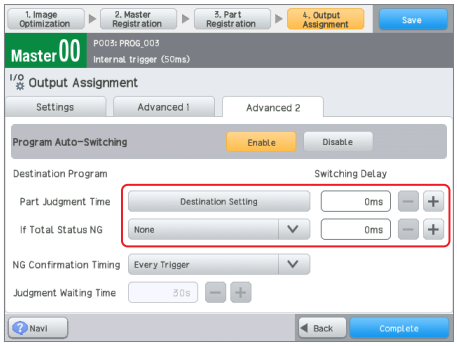
3 Select the switching destination program.

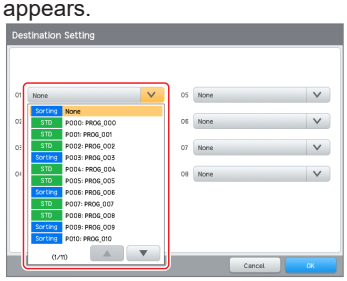
● In standard mode



If Total Status OK	Selects the switching destination program when the total status is OK.
If Total Status NG	Selects the switching destination program when the total status is NG.
Switching Delay	The delay time (default: 3000 ms) for switching can be set.

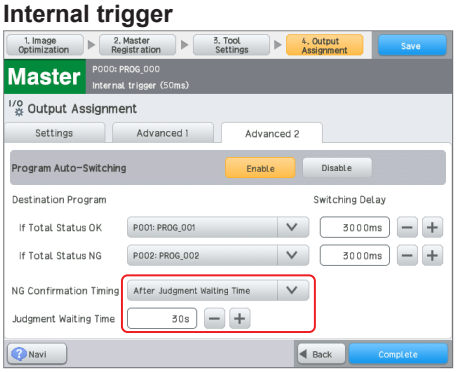
● In sorting mode



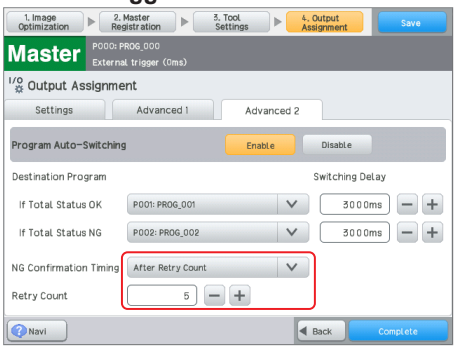
Part Judgment Time	Press [Destination Setting] to select the switching destination program for each part type when the total status is OK on the destination setting screen that appears. 
If Total Status NG	Selects the switching destination program when the total status is NG.
Switching Delay	The delay 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: • Every trigger (default) • After Judgment Waiting Time (at internal trigger only) • After retry count (at external trigger only)
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].
Retry count (at external trigger only)	Specifies the retry count (default: 5) when the NG confirmation timing is [After Retry Count].

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 7-25)

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 Operation Screen.....5-3
Names and Functions of the Operation Screen 5-4
Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences Function)...5-14
Holding the Image of the Sensor on which NG Occurred (NG Hold Function).....5-18
Confirming the Images Whose Judgment are NG (Running Image History).....5-19

Starting an Operation

Starts operation according to the program created with the Settings Navigator.

Reference The sensor can be independently operated.

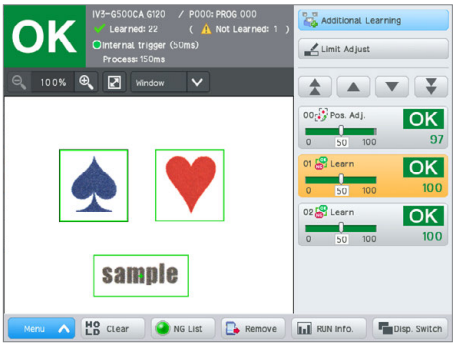
Turning on the power and starting operation

1 Turn on the power of the sensor and control panel.

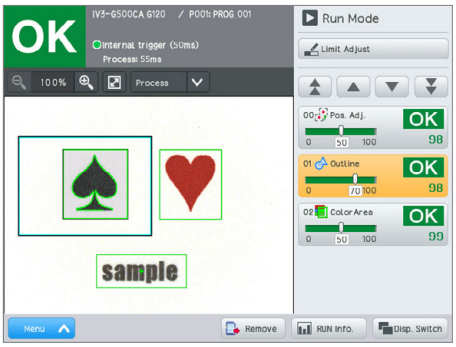
Reference When the power of the control panel is turned on for the first time, the initial settings screen opens.
“Operation when the Power is Turned on” (page 3-5)

2 Confirm that the operation screen opens on the control panel.

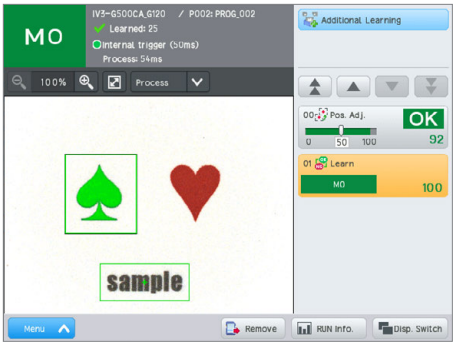
● **For a [Standard Mode] (including the learning tool) program**



● **For a [Standard Mode] (not including the learning tool) program**



● **For a [Sorting Mode] program**



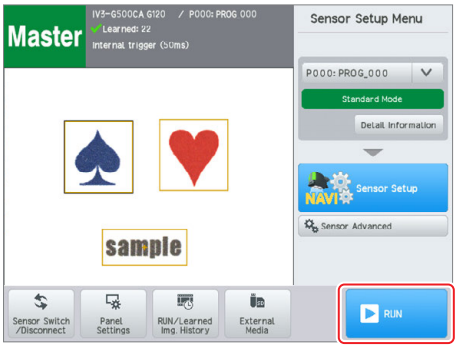
Point **If the image or status result does not update, refer to “Troubleshooting” (page A-7).**

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].



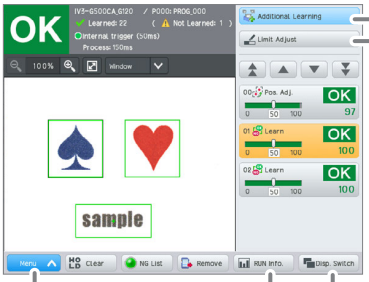
The run screen opens and the operation starts.

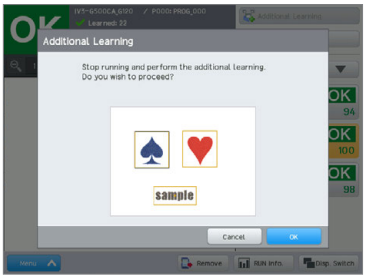
Point **If the image or status result does not update, refer to “Troubleshooting” (page A-7).**

Overview of the Operation Screen

Additional Learning (Learning Tool Only)
Perform additional learning of images.
"Auto Adjustment by the Additional Learning (Learning Tool Only)" (page 6-2)

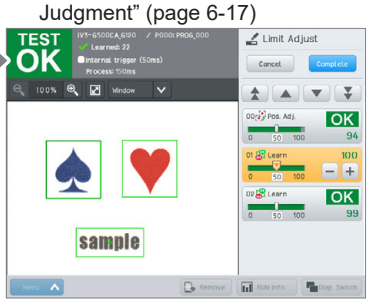
Run screen





Show/Hide of the menu display

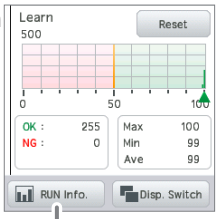
Limit Adjustment
Adjusts the judgment threshold.
"Adjusting Thresholds for Judgment" (page 6-17)



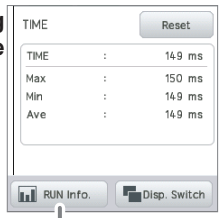
Operation Information
Displays the operation information.
"Displaying the Operation Information" (page 5-6)

Display Method
Switches the display method of the operation screen.
"Display Method" (page 5-9)

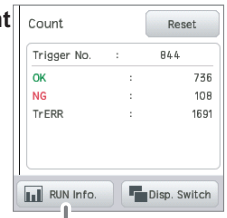
Histogram



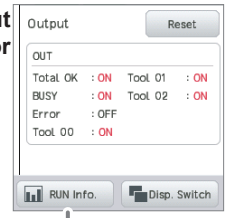
Processing time



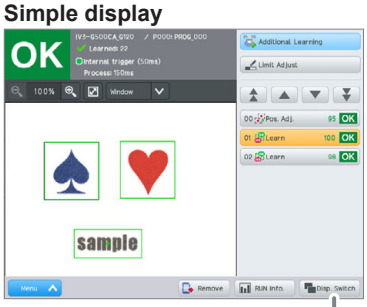
Count



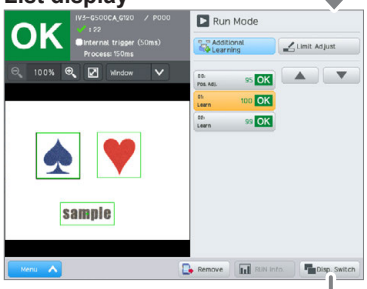
Output monitor



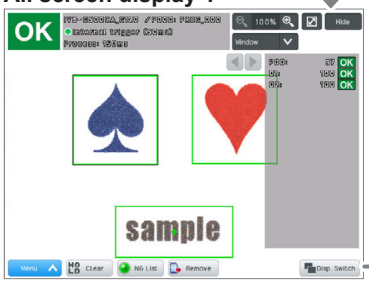
Simple display



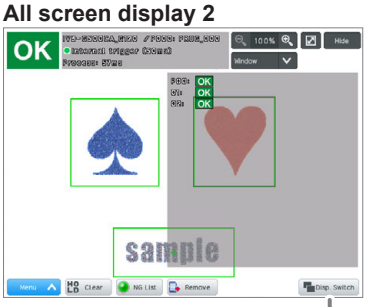
List display



All screen display 1



All screen display 2

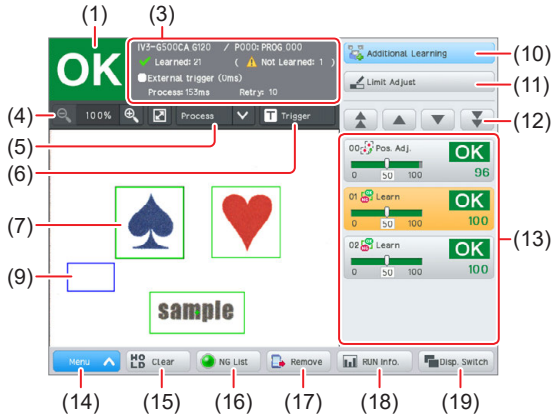


Names and Functions of the Operation Screen

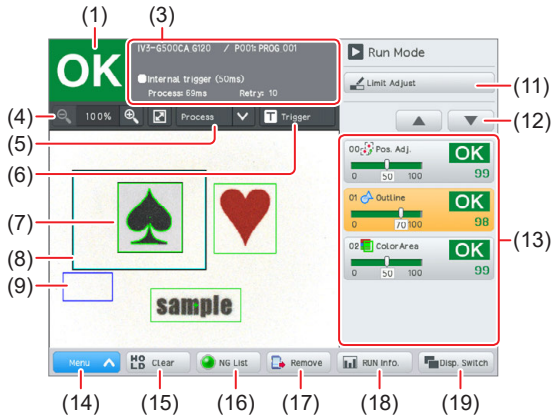
In the operation screen, the displayed items will be different depending on the mode of the program used and whether to include a learning tool.

Run screen

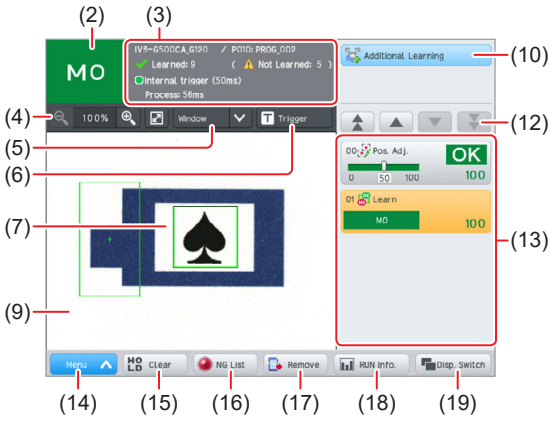
● For a [Standard Mode] (including the learning tool) program



● For a [Standard Mode] (not including the learning tool) program



● For a [Sorting Mode] program



(1) OK/NG display

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].

OK	Displayed when the total status result is OK.
NG	Displayed when the total status result is NG.
NG HOLD	Displayed when the total status result is NG while the NG Hold Function is set to [ON]. Holds the image when judged as NG.

Reference OK/NG can be changed to user-defined characters such as PASS/FAIL.

PASS FAIL

(2) Part (master) number/Part (master) name display

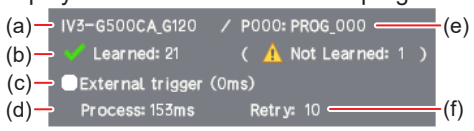
For sorting mode, displays a part (master)/part (master) name that is the target to be judged.

MO	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.
00 SPADE	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.
NG	Displayed when the position adjustment results or part type discrimination results are all NGs.
NG HOLD	Displayed when the position adjustment result or part type discrimination result is NG while the NG Hold Function is set to [ON]. Holds the image when judged as NG.

"(5) [Master Name] button" (page 4-144)

(3) Program information

Displays the information set in the program.



No.	Items	Reference
(a)	**Sensor device name** Displays the sensor device name.	7-20
(b)	**Number of learned images (displayed only when the Learning tool is included)** Displays the number of learned images and number of not reflected images.	6-9
(c)	**Trigger type (trigger interval/trigger delay)** • For the internal trigger: Displays the trigger interval in brackets. • For the external trigger: Displays the trigger delay time in brackets.	4-10
(d)	**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 7-18), the ON-delay time is not included.	-
(e)	**Program number Program name** Displays the program number and program name of the selected program.	7-3 7-8
(f)	**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.	4-156

(4) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(5) Display method of the tool window

Selects the display method of the tool window.

“Selecting the Display Method of the Tool Window” (page 5-11)

(6) [Trigger] button

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1 Input] is set to [Enable], the [Trigger ON] button will be displayed. Outputs the trigger once for each press of the button. This button is used when an external trigger cannot be input.
The button can be set to be displayed or hidden.

“Language” (page 7-31)

(7) Tool window

Displays a tool region that has been set. A tool region with a green frame has a status result of OK and one with a red frame has a status result of NG.
The tool window selected can be changed by pressing a different tool region directly.

“Selecting the Display Method of the Tool Window” (page 5-11)

(8) 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.

“Selecting the Display Method of the Tool Window” (page 5-11)

(9) Brightness correction region

When the brightness correction is set, the brightness correction region will be displayed with a blue frame.

(10) [Additional Learning] button (displayed only when the Learning tool is included)

Performs the additional learning of images displayed on the screen.

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

(11) [Limit Adjustment] button (standard mode only)

Manually adjusts the tool threshold.

“Adjusting Thresholds for Judgment” (page 6-17)

(12) Selection button

Changes the selected tool window in the direction that was selected.

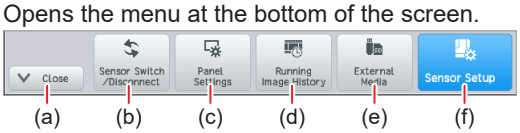
(13) Tool list

Displays the tool list for the items set in the program. The content that is displayed differs depending on the screen display method.

“Selecting the Display Method of the Tool Window” (page 5-11)

(14) [Menu] button

Opens the menu at the bottom of the screen.



No.	Name/function	Reference
(a)	**[Close]** Closes the menu.	-
(b)	**[Sensor Switch/Disconnect]** The [Sensor Switch/Disconnect] button is used to change the sensor to which the control panel is connected. In addition, the control panel and the sensor can be disconnected.	3-12 3-13
(c)	**[Panel Settings]** Configures the control panel settings.	7-27
(d)	**[Running Image History] or [Running/Learned Image History]** Displays the running image history and learned image history (only when the Learning tool is included).	5-19 6-11
(e)	**[External Media]** Displays the settings menu for the USB memory and SD card.	8-1
(f)	**[Sensor Setup]** The sensor exits Run Mode and the [Sensor Setup Menu] screen is displayed.	4-1

Reference

If the security has been set on the sensor, the [Sensor Setup] button will be displayed as shown below.



“Security” (page 7-21)

(15) [HOLD Clear] button

When the [NG Hold Function] is [ON] and the screen is held after the sensor detects a NG target, this button releases the NG Hold.

“Holding the Image of the Sensor on which NG Occurred (NG Hold Function)” (page 5-18)

(16) [NG List] button

When the function [List of NG Sensor Occurrences] is used and a sensor on which a NG has occurred is registered on the list, the button will be displayed. The number of NG occurrences on the sensor registered is displayed.

“Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences Function)” (page 5-14)

(17) [Remove] button

Enables the SD card to be removed. This button is displayed when an SD card is inserted.

(18) [RUN Info.] button

Opens and displays the operation information of the sensor in the lower right of the screen.

“Displaying the Operation Information” (page 5-6)

(19) [Disp. Switch] button

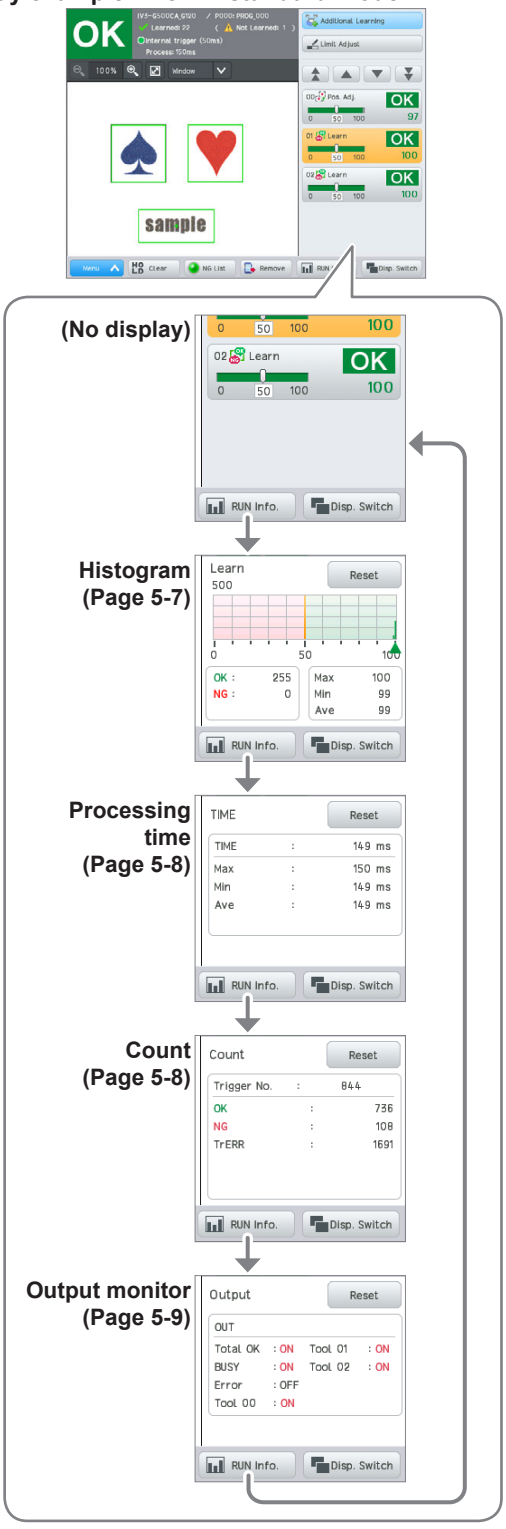
Switches the display method of the operation screen.

“Display Method” (page 5-9)

Displaying the Operation Information

The operation information (histogram/processing time (maximum/minimum/average)/count/output monitor) can be displayed in the lower right of the control panel by pressing [RUN Info.].
The display is switched each time you press on the button.

Display example when in standard mode

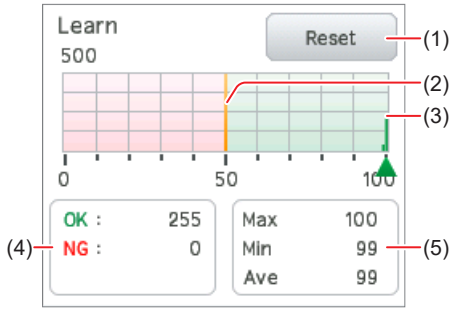


Point

- **If the display method is “Simple Display” or “All Screen Display”, the operation information cannot be displayed.**
- **When in sorting mode, the histogram can only be displayed for the position adjustment and learning tools.**

Reference The processing time/number of triggers/histogram 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 /blob count tool is enabled/disabled or when the setting scale is changed by the user.
- When switching the scaling settings on the width/diameter/pitch tool.
- When the program is switched.
- When settings in the menu of the [Program] tab in the Sensor Advanced settings are changed.
- When the sensor is initialized.

Histogram



(1) [Reset] button

Resets the histogram, processing time, and count.

(2) 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.

(3) 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.
- ▲.....Displays the matching rate of the latest judgment process.

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.**

(4) 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.

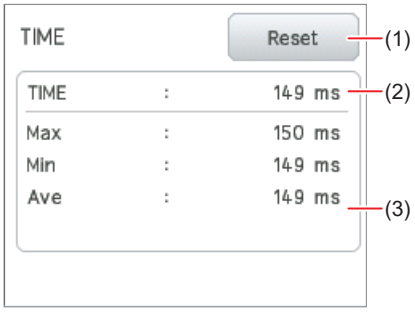
(5) Matching rate information

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.

Processing time



(1) [Reset] button

Resets the histogram, processing time, and count.

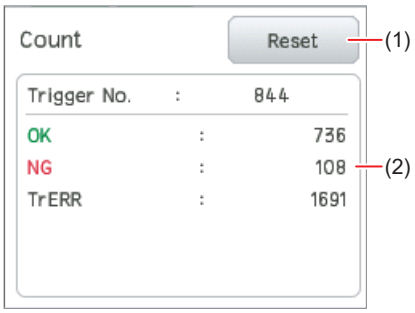
(2) TIME

Displays information related to the processing time.

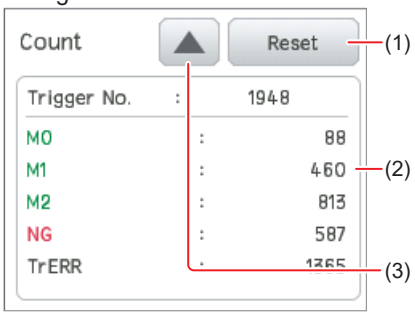
TIME	Displays the processing time of the latest judgment process.
Max	Displays the maximum value of the processing time.
Min	Displays the minimum value of the processing time.
Ave	Displays the average value of the processing time.

Count

In standard mode



In sorting mode



(1) [Reset] button

Resets the histogram, processing time, and count.

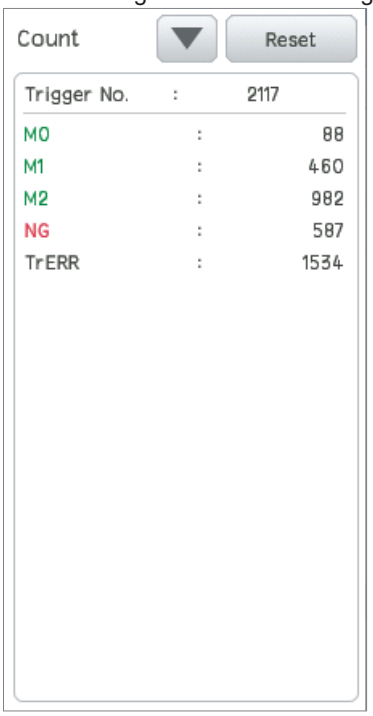
(2) Count

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 standard mode)
Part type	Displays the number of triggers issued for each part type in sorting mode.
NG	Displays the number of triggers issued with the total status or part type discrimination NG.
TrERR	Displays the number of triggers issued as error triggers.

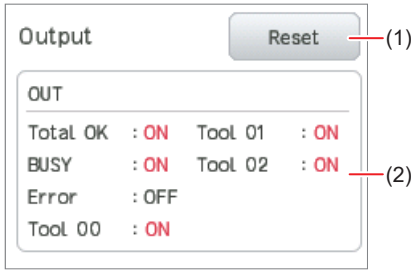
(3) Count display switch button (sorting mode only)

Changes the count display to a large screen.
Pressing the button again returns to the original screen.

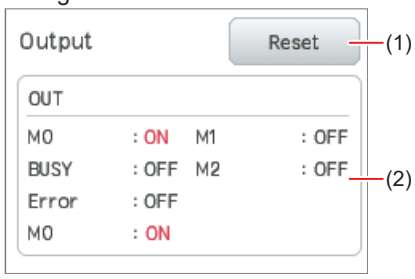


Output Monitor

In standard mode



In sorting mode



(1) [Reset] button

Resets the histogram, processing time, and count.

Reference Pressing the button does not reset [Output Monitor].

(2) OUT

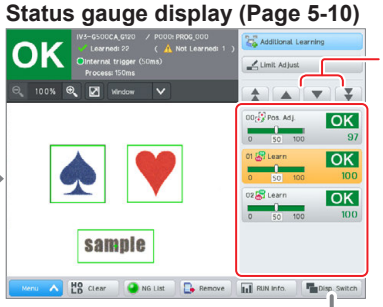
Displays the operating status of the items assigned in [Output Assignment] (Page 4-151) of [Sensor Setup].

Reference
- Displays the logical operation status of each item.
- 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

Display Method

By pressing [Disp. Switch], the display method of the tool information on the right side of the control panel can be switched.
The display is switched each time you press on the button.

Status gauge display (Page 5-10)

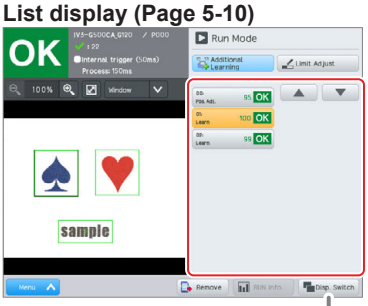


Selection button

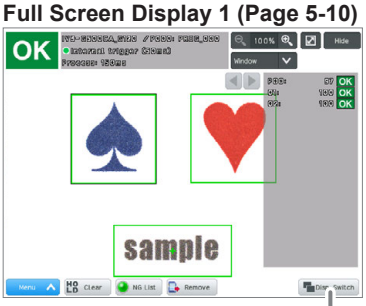
Simple display (Page 5-10)



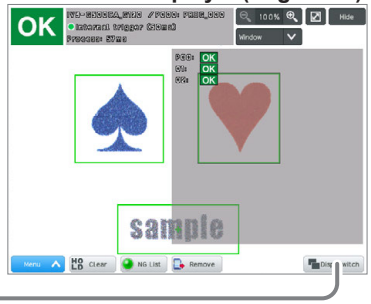
List display (Page 5-10)



Full Screen Display 1 (Page 5-10)



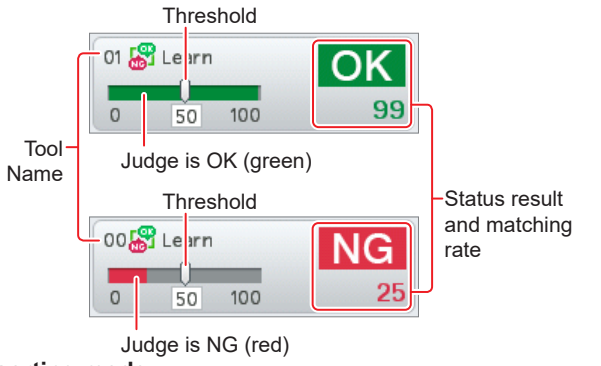
Full Screen Display 2 (Page 5-10)



Status Gauge Display

Displays the status results of up to four tool windows set in the program with a bar graph indicating the matching rate.
If the number of detection windows/tool windows exceeds 4, the other results can be scrolled through for display with the selection button.
Displays the tool name, status results (OK/NG), part (master) name (sorting mode), a line indicating the threshold, and a value of the matching rate.

In standard mode



In sorting mode



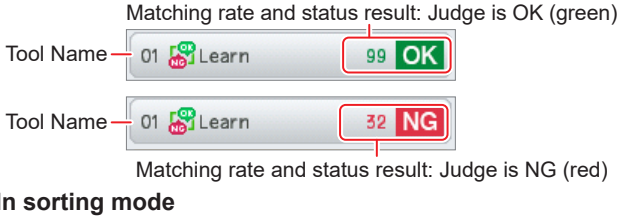
Reference

- 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 Hi-Sp.Adj 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.

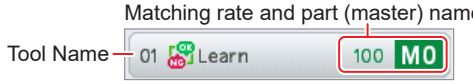
Simple display

Displays the status results of up to 8 tool windows set in the program.
If the number of detection windows/tool windows exceeds 8, the other results can be scrolled through for display with the selection button.
Displays status results (OK/NG), the part (master) name (in sorting mode), and the value of the matching rate.

In standard mode



In sorting mode



List display

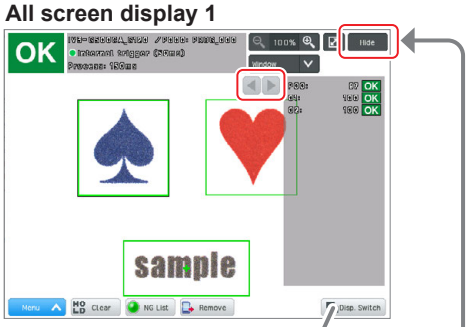
Displays the status results of up to 16 tool windows set in the program. If the number of detection windows/tool windows exceeds 16, the other results can be scrolled through for display with the selection button.



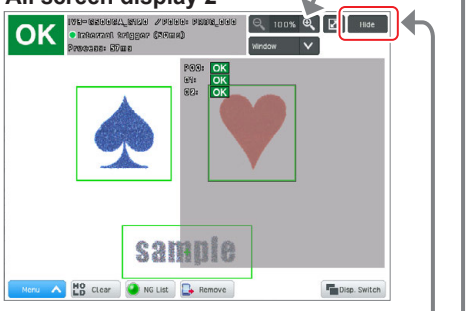
All screen display

Enlarges the image on the sensor to the full screen size of the control panel and displays the image.
In Full Screen Display 1, up to 16 matching rate and status results can be displayed at the same time. If the number exceeds 16, the other results can be displayed with the change page button. In Full Screen Display 2, the matching rate and status results for all tools are displayed in a list.
The device name of the sensor, program number/program name, processing time, matching rate and status result of the tool window, and the presence of the image tool bar can be selected to be hidden or shown.

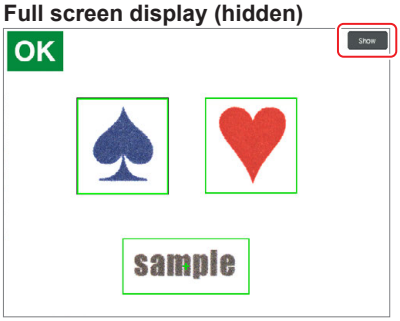
All screen display 1



All screen display 2



Full screen display (hidden)

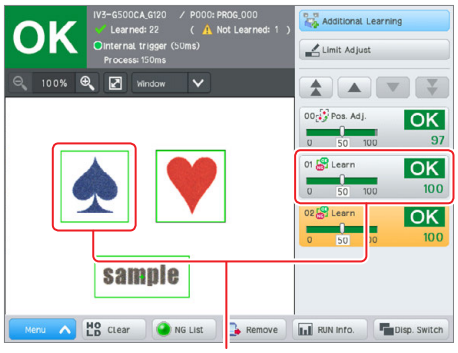


Selecting the Tool Window

The method for selecting the tool window is as follows.

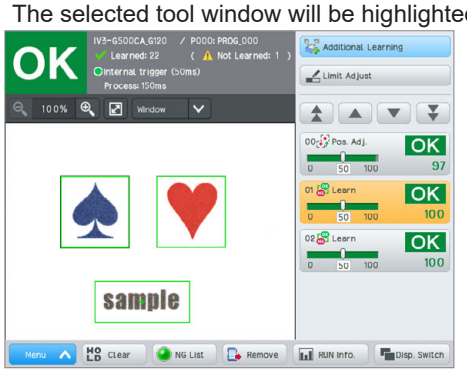
- Pressing to select the status result of the tool window on the right side of the control panel (if the display is not “All Screen”)
- Press to select the tool window displayed on the image of the sensor.

1 Press the status result on the right side of the control panel, or the tool window displayed on the image of the sensor.



Press either one

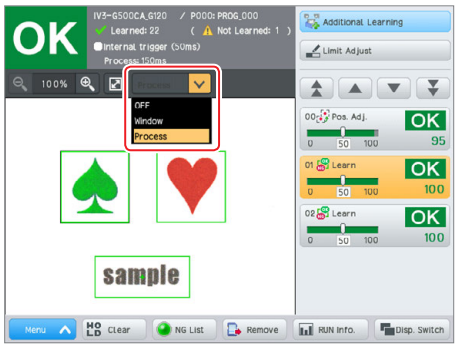
The selected tool window will be highlighted.



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.

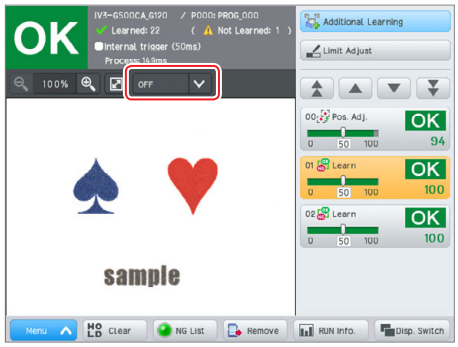


The display method of the tool window changes according to the selected menu.

“Display Methods of Tools (Learning Tool)” (page 5-12)
“Display Methods of Tools (Other Than the Learning Tool)” (page 5-13)

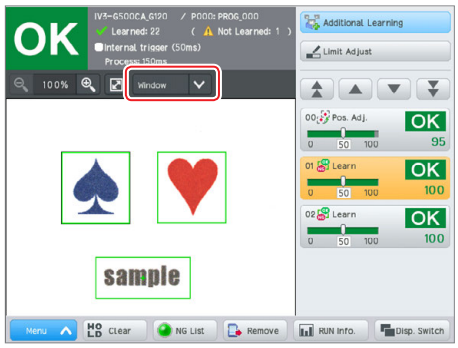
Display Methods of Tools (Learning Tool)

● 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.

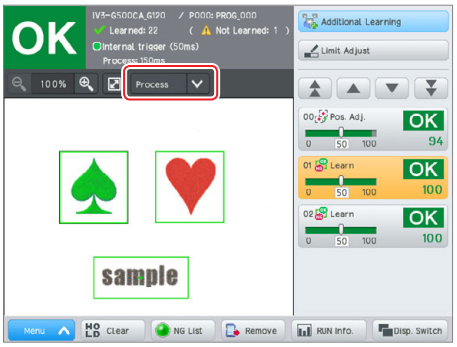
❍ Non-selected tool window

- 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 matching rate between the target and learned OK target (or NG target) is low, it may not be displayed.
- The display range/density is rough indication. It should be treated as reference information.

❍ Selected position adjustment window

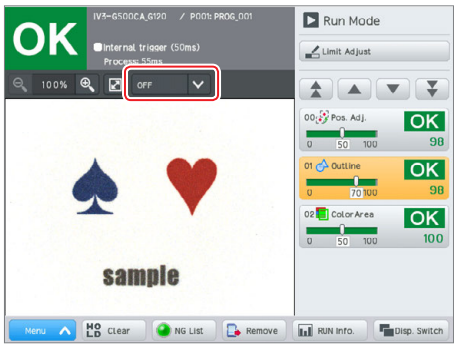
Indicates the recognized outline with a series of points in green (OK) or red (NG).

❍ 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)

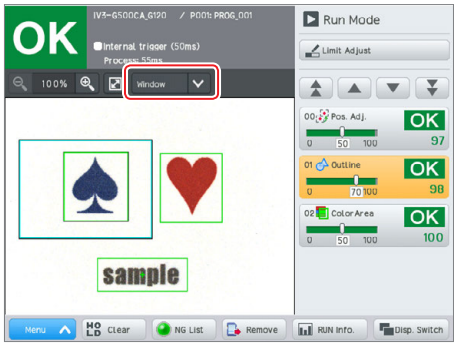
Display Methods of Tools (Other Than the Learning Tool)

● OFF



All the tool windows and search ranges become hidden.

● Window



❍ Selected tool 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.

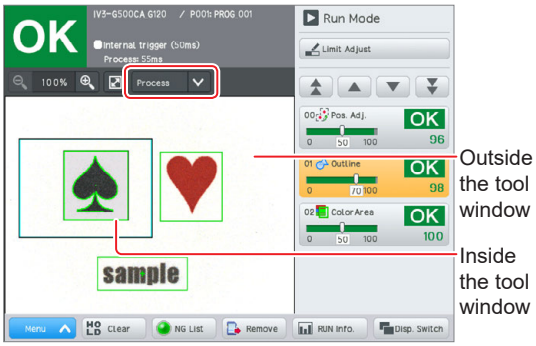
❍ Non-selected tool window

- 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

- Outline/Position Adjustment/Width/Diameter/Edge/Pitch/High-Speed Position Adjustment/EdgePixels tool
  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/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 blobs, 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 blobs.

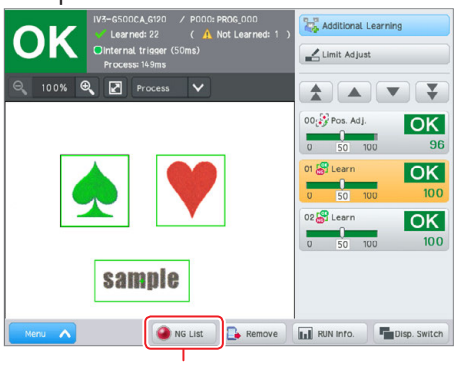
❍ If brightness correction has been set

The inside of the tool window is displayed with the corrected brightness when selected. (For tools subject to brightness correction only)

Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences Function)

Overview of the List of NG Sensor Occurrences function

By using the [List of NG Sensor Occurrences] function, [NG List] blinks (red) when a NG occurs on a sensor connected to the control panel while in Run mode.



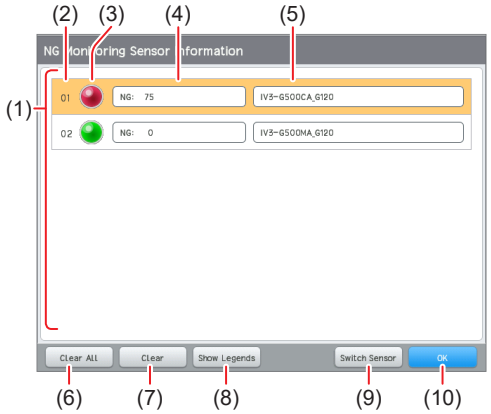
[NG List]

Pressing [NG List] displays the list of sensors connected to the control panel and their NG statuses can be confirmed.

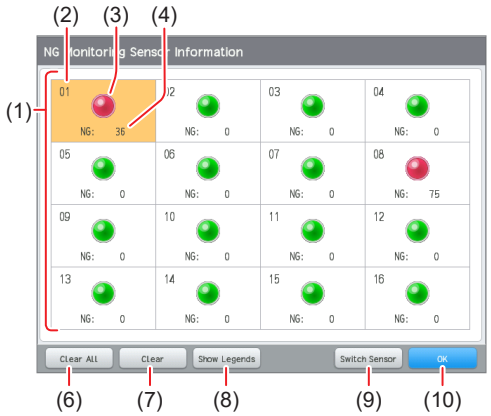
Point

- **Only the sensors which have been registered as targets for NG sensor monitoring are displayed in the list.**
- **[NG Monitoring Sensor Information] can only be displayed while the system is running.**
- **The IV3 Series, IV2 Series and IV Series can be mixed and confirmed on the list.**

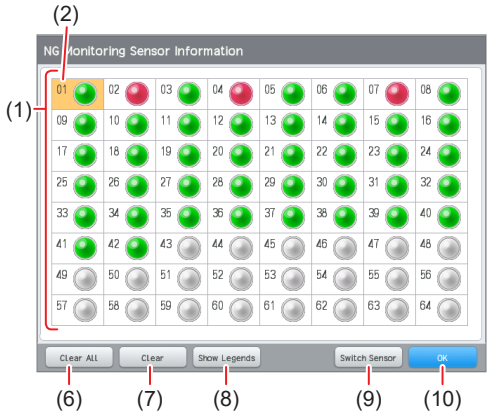
● When the number of sensors registered is 7 or less



● When the number of sensors registered is 8 or more to 16 or less



● When the number of sensors registered is 17 or more to 64 or less



(1) Sensor list

Displays the sensors registered on the [List of NG Sensor Occurrences]. The sensor displayed on the control panel is highlighted in orange.

(2) Sensor number

Displays the number of the sensors registered on the [List of NG Sensor Occurrences].

(3) Indicator light

Displays the status of the sensors registered on the [List of NG Sensor Occurrences].

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 [NG Monitoring Sensor Information] 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.

(4) Status

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.
CONNECT ERR	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.

(5) Device Name

Displays the device name assigned to the sensor.

(6) [Clear All] button.

Clears the NG occurrence status of all the sensors registered on the [List of NG Sensor Occurrences].

(7) [Clear] button.

Clears the NG occurrence status of the sensor selected on [NG Monitoring Sensor Information].

(8) [Show Legends] button

Displays the legend for the indicator light.

(9) [Switch Sensor] button

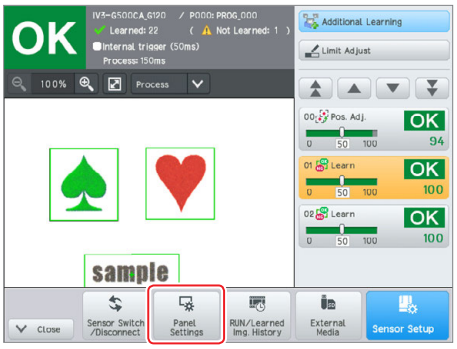
Connects to the selected sensor and displays the sensor's image on the control panel. If the sensor on which NG occurred is selected, it can change to that sensor.

(10) [OK] button

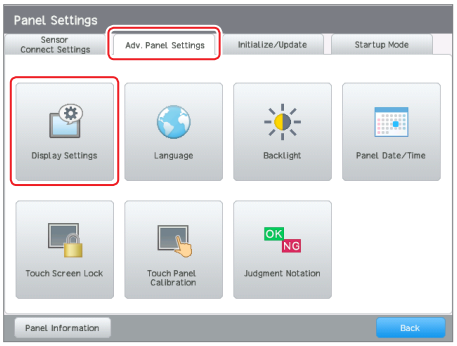
Closes the [NG Monitoring Sensor Information]screen.

Setting [List of NG Sensor Occurrences]

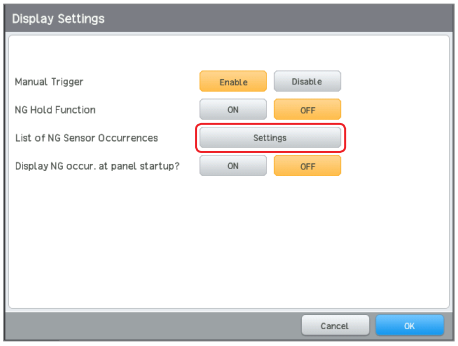
1 **Display the control panel menu, and press [Panel Settings].**



2 **Select the [Adv. Panel Settings] tab, and press [Display Settings].**



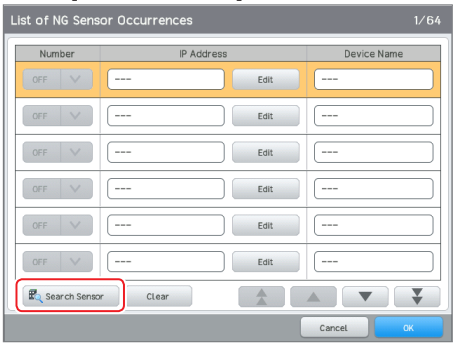
3 **Press [Settings].**



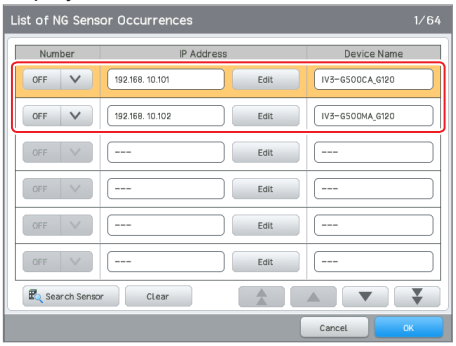
4 Register sensors on [List of NG Sensor Occurrences].

● When searching for a sensor and registering it

Press [Search Sensor].

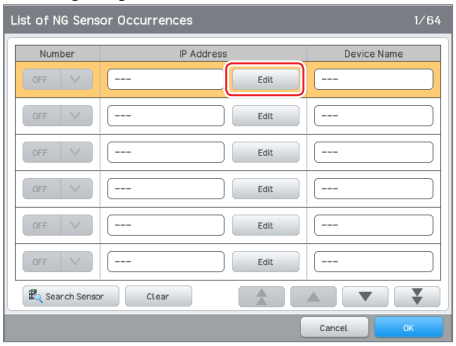


Searching starts and the search results will be displayed.

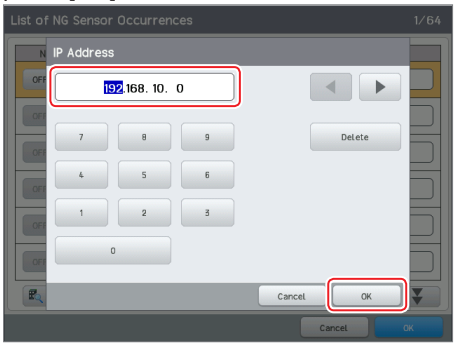


● When registering by specifying the IP Address of the sensor

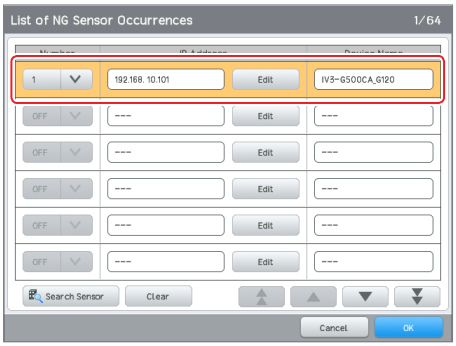
Press [Edit].



Enter the IP address of a sensor to be registered and press [OK].



The sensor of the specified IP address will be registered on the list.

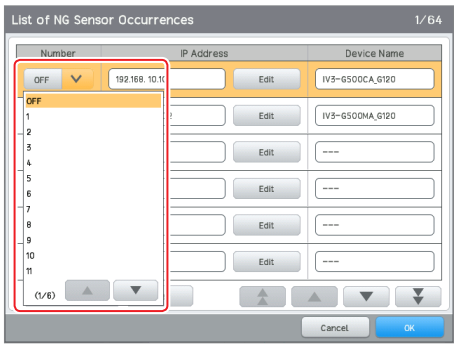


Reference The number displayed on the [List of NG Sensor Occurrences] is automatically assigned.

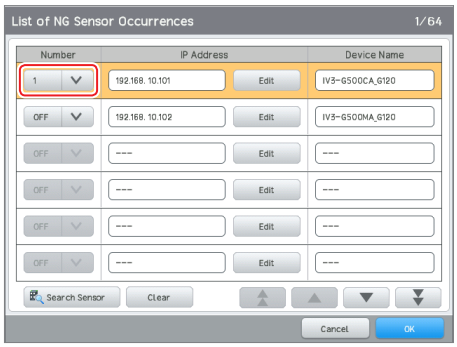
5 Press the number of the sensor (default value: OFF) displayed on [List of NG Sensor Occurrences] and select number.

Reference

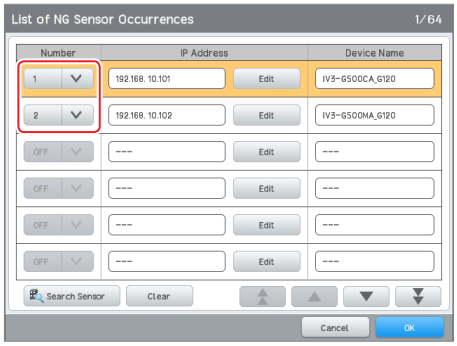
- Numbers will be displayed on [List of NG Sensor Occurrences] in the selected order.
- If the sensor was registered by specifying the IP address, the number is automatically assigned. Change the number as needed.



The selected number will be registered.



6 Repeat step 5 to register the number of sensors for [List of NG Sensor Occurrences].



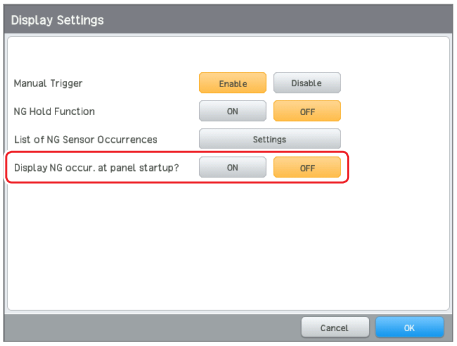
Point

- **Up to 64 sensors can be registered on [List of NG Sensor Occurrences]. Press [▲]/[▼] to select a sensor detected.**
- **To initialize [List of NG Sensor Occurrences], press [Clear].**

7 Press [OK].

The system returns to the Display Settings screen.

8 To display the [List of NG Sensor Occurrences] screen at startup of the control panel, set [Display NG occur. at panel startup?] to [ON].



9 Press [OK].

Returns to the [Panel Settings] screen.

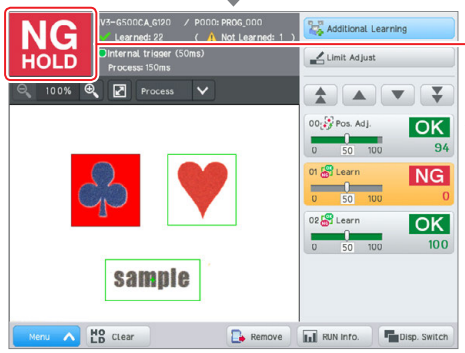
Holding the Image of the Sensor on which NG Occurred (NG Hold Function)

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 control panel.
The image when the NG occurred can be confirmed.



NG occurs during running.



"NG HOLD" is displayed as the total status result and the screen is held.

To release the image held, press [HOLD CLR].

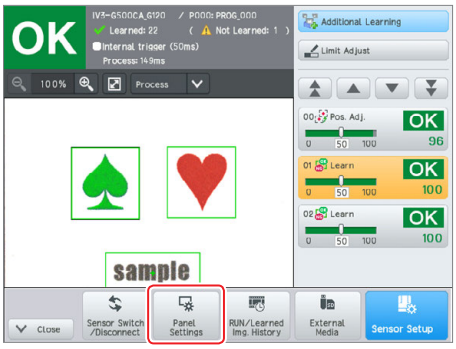


Point

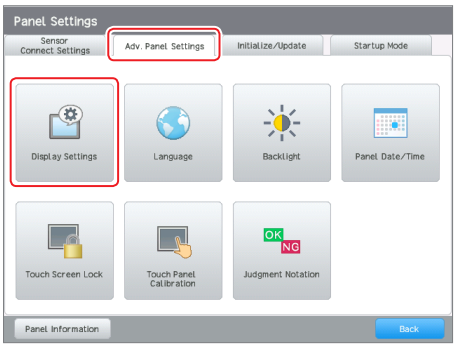
- **If another NG occurs during holding of an NG image, the NG image will be updated.**
- **The NG hold status will be released with one of the operations below.**
  - **When the run screen is changed to the [Sensor Setup Menu] screen.**
  - **When external master image registration is performed.**
  - **When the status output is reset with an error clear external input.**
  - **When [HOLD Clear] is pressed.**
- **The operation Information will be updated during NG hold.**

Setting the NG Hold function

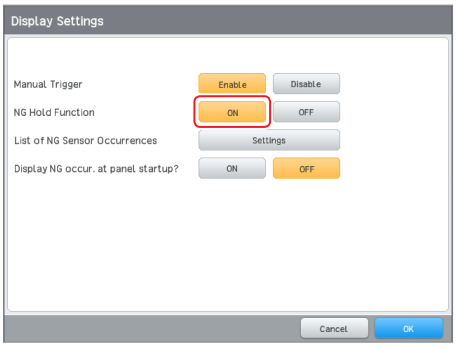
1 Display the control panel menu, and press [Panel Settings].



2 Press [Adv. Panel Settings], and then [Display Settings].



3 Set [NG Hold Function] to [ON].



4 Press [OK].

Returns to the [Panel Settings] screen.

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
- The 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 control panel 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, batch back up the images into USB memory.

Displaying the [Running Image Hist.] Screen

This section explains how to display the [Running Image Hist.] screen.

Point **There are 2 methods for displaying the [Running Image Hist.] screen.**
The [Logging Settings] can only be set and adjusted from the [Sensor Setup Menu] screen.

Displaying from the RUN screen

1 Display the menu of the control panel.

“Display Method” (page 5-9)

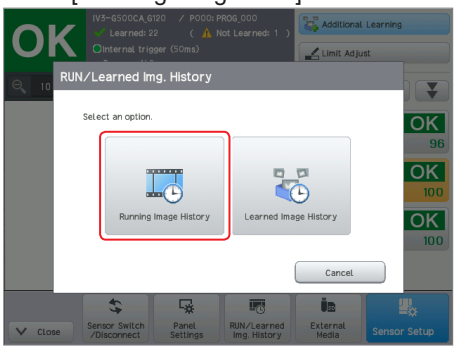
2 Perform the following.

● **When using the learning tool**

Press [RUN/Learned Img. History].

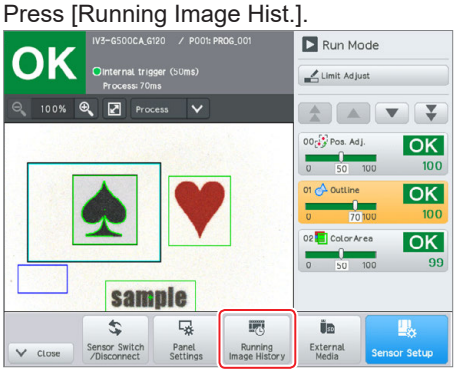


Press [Running Image Hist.].

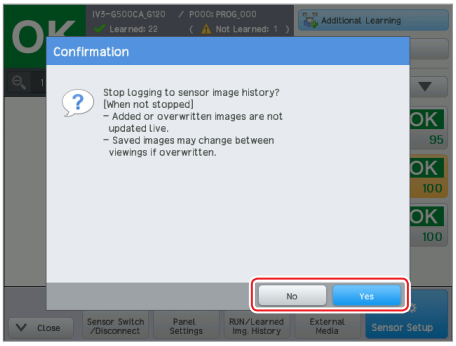


● **When not using the learning tool**

Press [Running Image Hist.].



3 Select whether or not to stop logging while running (image-updating of the image history).

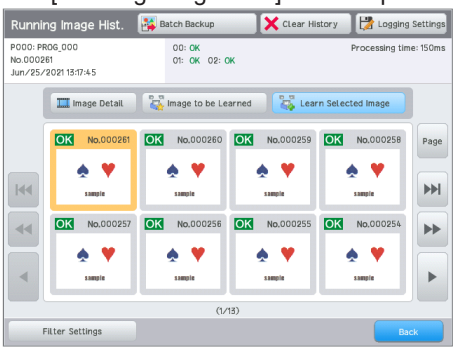


Point

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 control panel, the image may not be displayed again on the control panel.**

The [Running Image Hist.] screen opens.

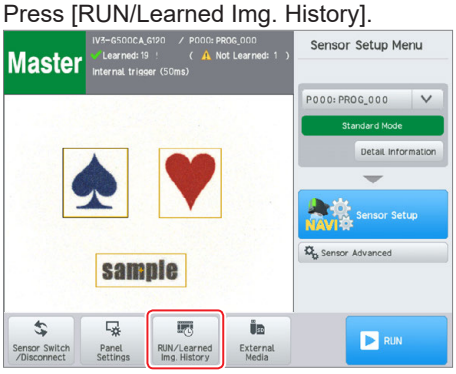


Displaying from the [Sensor Setup Menu] screen

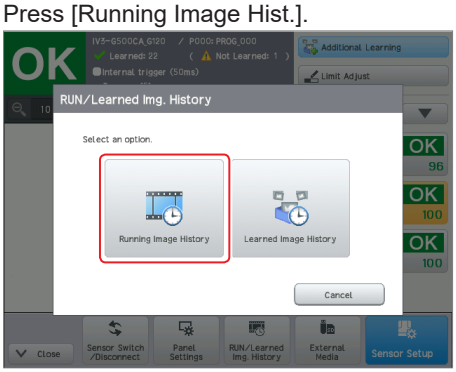
1 Perform the following.

● When using the learning tool

Press [RUN/Learned Img. History].

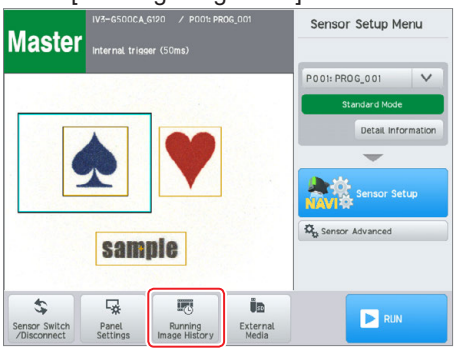


Press [Running Image Hist.].

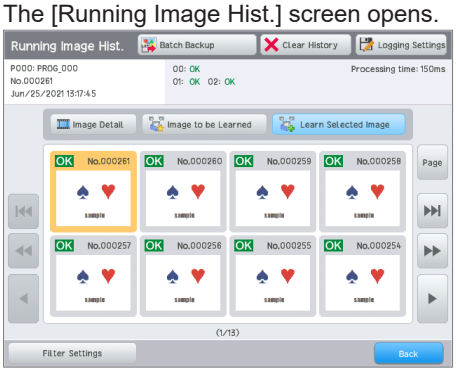


● When not using the learning tool

Press [Running Image Hist.].



The [Running Image Hist.] screen opens.

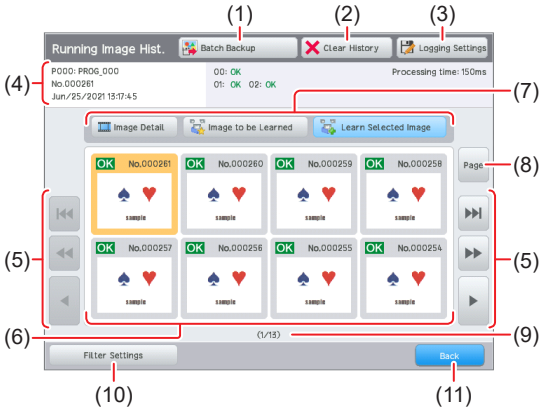


Loading and confirming saved images

Displays the running image history in the sensor.

1 Display the [Running Image Hist.] screen.

“Displaying the [Running Image Hist.] Screen” (page 5-19)



(1) [Batch Backup] button

Backs up the images in a batch.

“Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

Point **To back up the images in a batch from the View screen, the save target will be [Settings/ Running Image History].**

(2) [Clear History] button

“Clearing the Saved Images” (page 5-22)

(3) [Logging Settings] button

“Changing the logging conditions of the image history” (page 5-23)

(4) Detail Information

Displays the detailed information for the selected thumbnail image.
Displays the program number, program name, number of triggers, save time, status results for the position adjustment, the status results for each tool (standard mode), the part type numbers judged by each tool (sorting mode), and the processing time.

(5) Operation buttons

Selects a thumbnail image.

- Moves to the first page of the image history.
- Moves to the previous page.
- Moves to the previous history image.
- Moves to the last page of the image history.
- Moves to the next page.
- Moves to the next history image.

(6) Thumbnail images

Displays the total status result (standard mode), the part type number (sorting mode), the trigger number, and thumbnail images.
When an image is pressed twice, the sensor zooms in on the image.

“[Image Detail] button” (page 5-21)

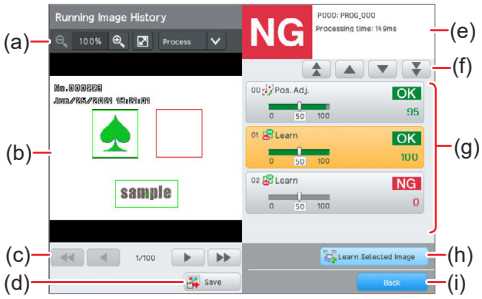
Reference For details of the number of triggers, refer to “Displaying the Operation Information” (page 5-6).

(7) Image operation button

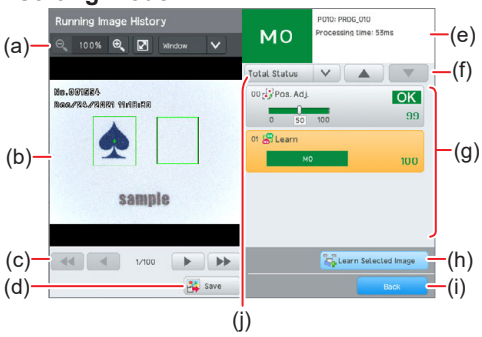
● [Image Detail] button

Zooms in on the selected image history.

In standard mode



In sorting mode



(a) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(b) History image

Displays the image saved in the sensor history.
The trigger number and save date is displayed on the image.

(c) Operation buttons

- Moves to the previous page.
- Moves to the previous history image.
- Moves to the next history image.
- Moves to the next page.

(d) [Save] button

The displayed history image is saved.

(e) Detail information

Displays the total status result, program number, program name and processing time.

Reference An image displayed with red characters requires processing with a setting different than the current program.

(f) Selection button

Selects a tool window set in the program.

(g) Tool list

Displays the tools set in the program.

(h) [Learn Selected Image] button (learning tool only)

Performs the additional learning with the selected history image.

Reference Additional learning cannot be performed while running. Stop the running and perform operation again.

“Additional Learning from the Running Image History” (page 6-6)

(i) [Back] button

Returns to the [Running Image Hist.] screen.

(j) Part type selection button

Displays the matching rate and status result for images registered in the selected part type judged as masters for each tool.

● **[Image to be Learned] button (learning tool only)**

Displays the images recommended to be learned.
“Additional Learning from the Running Image History” (page 6-6)

● **[Learn Selected Image] button (learning tool only)**

Performs the additional learning with the selected history image.

Reference Additional learning cannot be performed while running. Stop the running and perform operation again.

“Additional Learning from the Running Image History” (page 6-6)

(8) [Page] button

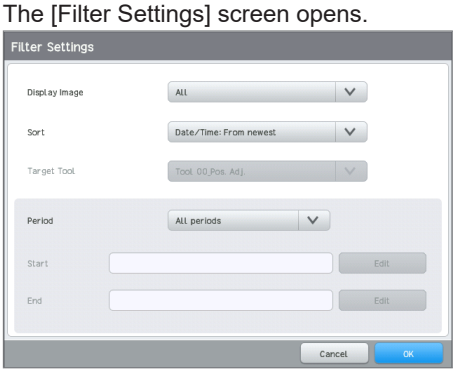
Allows the user to select the page of the image history displayed.

(9) Page number

Indicates the currently displayed page number of the image history.

(10) [Filter Settings] button

The [Filter Settings] screen opens.



● **Display Image**

Selects the type of images to be displayed on the [Running Image Hist.] 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 Hist.] screen from the following.
- Match: From highest
- Match: From lowest
- Date/Time: From newest
- Date/Time: From oldest

● **Target Tool**

Displays only the images containing the selected tools on the [Running Image Hist.] screen.

● **Period**

Specifies the images to be displayed on the [Running Image Hist.] screen by time period.
- **All periods**
  Displays all images.
- **Page**
  Specifies the time period for [Start] and [End], and displays images. Press [Edit], and specify the period for [Start] and [End].
  “Editing Numbers” (page 3-19)

(11) [Back] button

The system returns to the run screen or the [Sensor Setup Menu] screen.

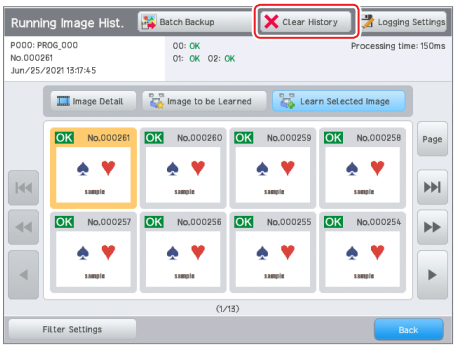
Clearing the Saved Images

Clears the history images saved in the sensor.

1 Display the [Running Image Hist.] screen.

“Displaying the [Running Image Hist.] Screen” (page 5-19)

2 Press [Clear History].



3 Press [OK].

The image history will be cleared and the system returns to the run screen or the [Sensor Setup Menu] screen.

Changing the logging conditions of the image history

Sets the logging condition (storage condition) for the image history.

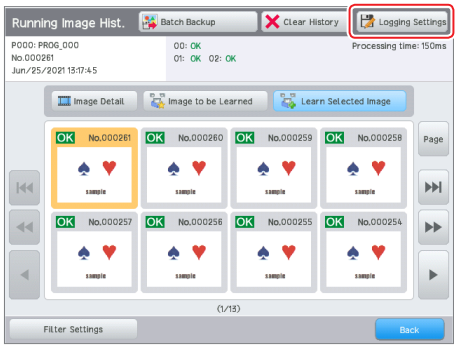
1 Display the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)

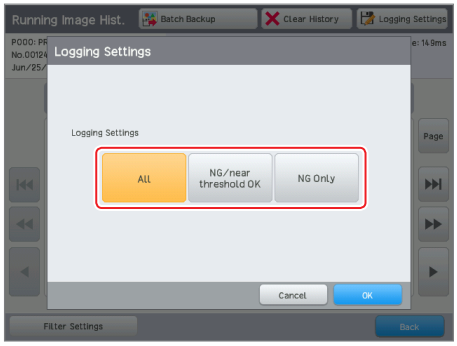
2 Display the [Running Image Hist.] screen.

“Displaying the [Running Image Hist.] Screen” (page 5-19)

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
- The 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 Hist.] screen.

MEMO

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.....6-17
Stabilizing the Judgment.....6-18
Shortening the Processing Time 6-28

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 4-25) and [3. Part Registration] (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 judgment image (OK/NG 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 6-11)

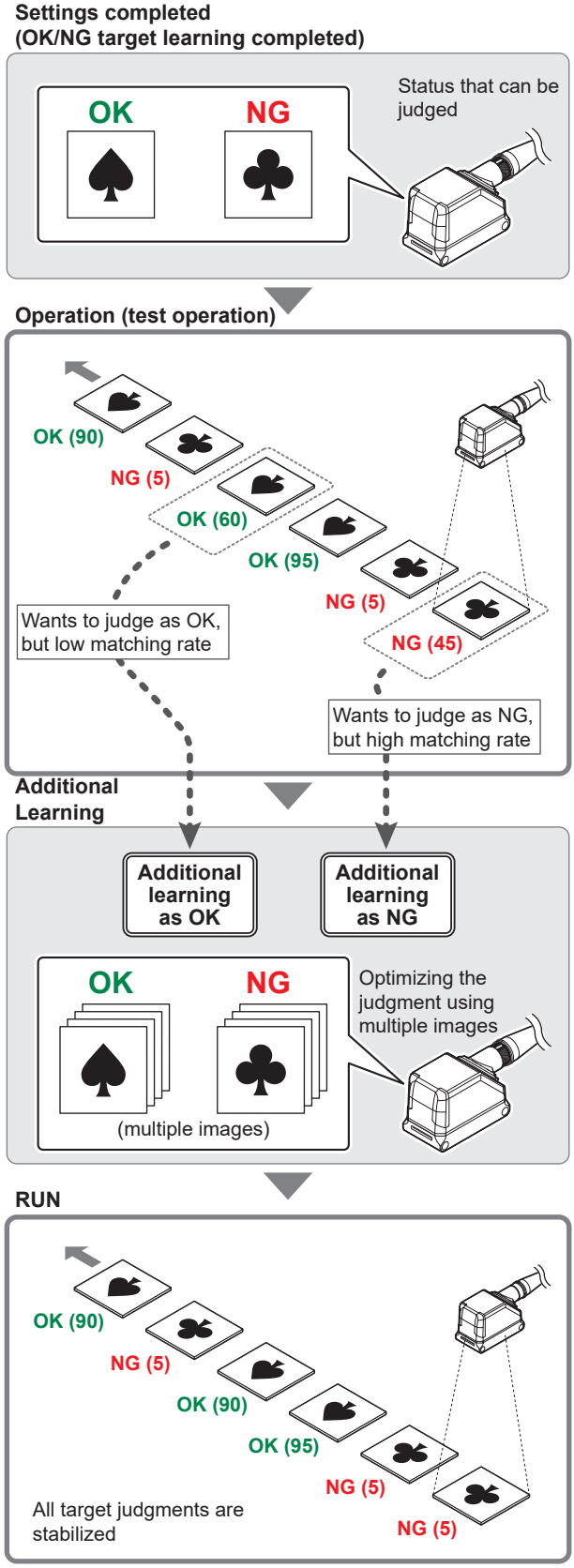
● Using images saved external media

Use a batch backup file (*.iv3a), individual program backup file (*.iv3a), or image capture file (*.iv3p) stored in the USB memory to adjust automatically the judgment of the learning tool.
“Additional Learning from USB Memory” (page 6-14)

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

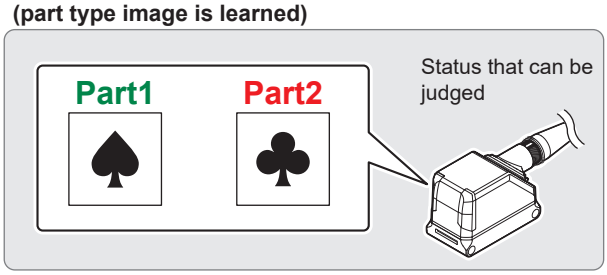
Flow of Additional Learning Operation

● In standard mode

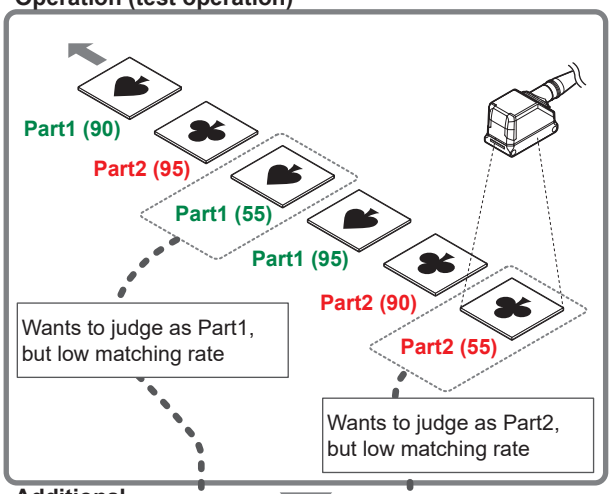


● In sorting mode

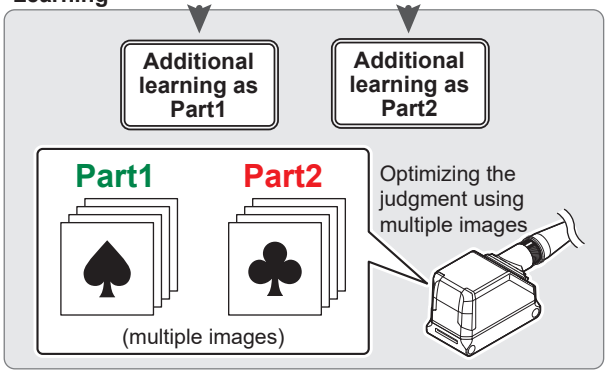
Settings completed
(part type image is learned)



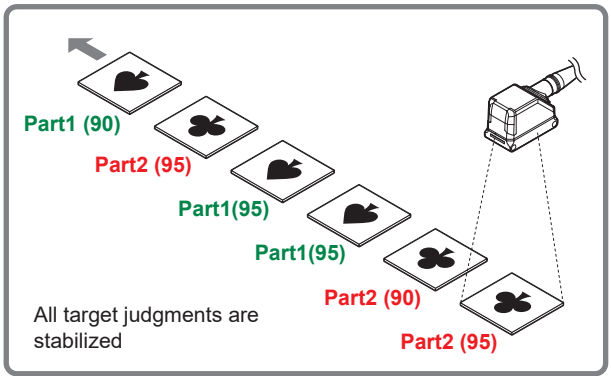
Operation (test operation)



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.	6-11
When you want to confirm the learned image.	Confirm the image in the [Learned Hist.] screen.	6-8
When you want to delete the learned image.	Delete the image in the [Learned Hist.] screen.	6-8
When you want to look automatically for an image whose detection is not stable.	Perform additional learning of the “Image to be Learned” in the [Running Image Hist.] 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 they are regarded as different varieties.	Delete the unneeded image in the [Learned Hist.] screen.	6-8
When an inspection is not stable even though additional learning has been repeatedly performed.	• 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.	6-18 6-23
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.	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).	6-11
When you want to perform additional learning by using an image acquired by another sensor.	Use additional learning from an outside media source.	6-14
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 6-14
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).	

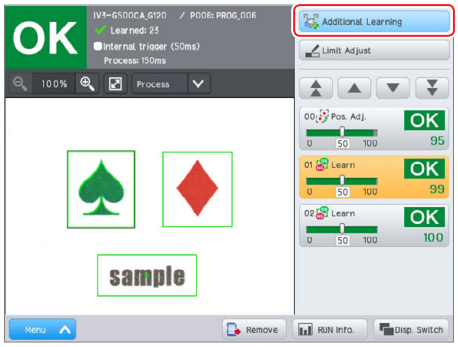
Additional Learning by Taken Image

1 **Display the operation screen.**

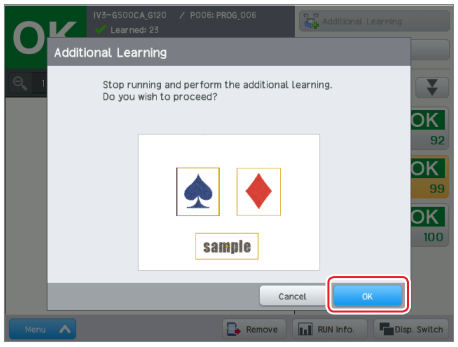
“Starting an Operation” (page 5-2)

2 **Capture an image where the target is the object desired for additional learning.**

3 **Press the [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 [Register From Running History] screen appears after operation stops.

“Operation When the Registered Number Reaches the Upper Limit” (page 6-16)

5 **Confirm the selection state of the status result. Change the status result as needed, then press [Start Learning].**

● **In standard mode**

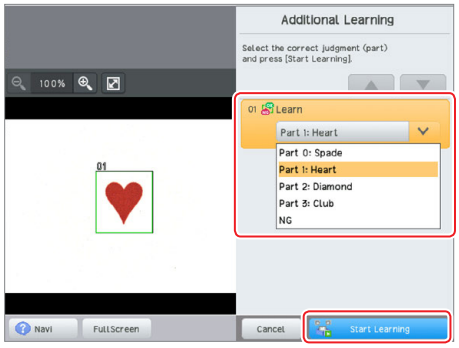


Point

When multiple tool windows are set, confirm/change all status results for the tool windows.

The confirmation screen opens.

● **In sorting mode**



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 [Register From Running History] screen opens.**

“Confirming the Similar Images and Additional Learning” (page 6-16)

- **You can edit/delete images where additional learning of the wrong status result is performed in the [Learned Hist.] screen.**

“Additional Learning from the Learned Image History” (page 6-11)

Returns to the Test Operation.

Additional Learning from the Running Image History

1 Display the [Running Image Hist.] screen.

"Displaying the [Running Image Hist.] Screen" (page 5-19)

2 Select an image for the additional learning.

"Loading and confirming saved images" (page 5-21)

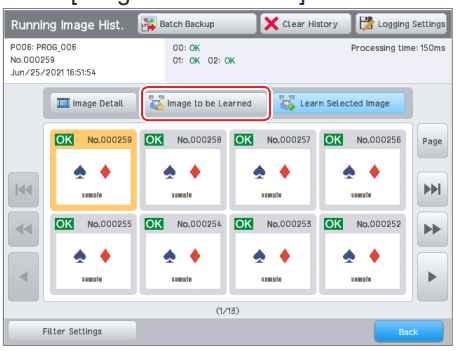
Point

When the number of images used for additional learning has exceeded the upper limit, the [Register From Running History] screen appears after operation stops.

"Operation When the Registered Number Reaches the Upper Limit" (page 6-16)

● When using the recommended image to be learned

Press [Image to be Learned].

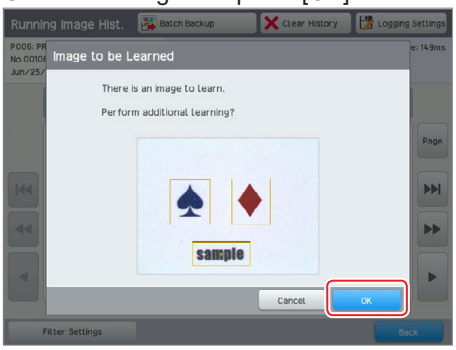


Images which have high impact on the learning effects are displayed automatically.

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].

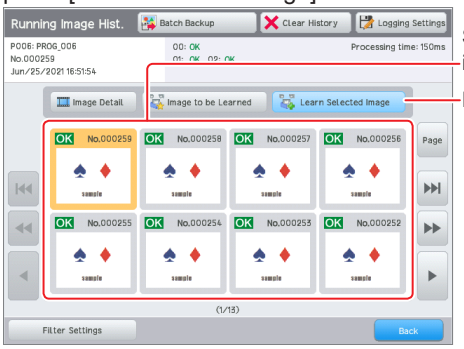


Reference The confirmation screen for stopping operation during Run mode will be displayed. Press [OK], and stop operation.

The [Additional Learning] screen opens.

● When specifying an image for additional learning

Select the image to perform additional learning, and press [Learn Selected Image].



Select the image

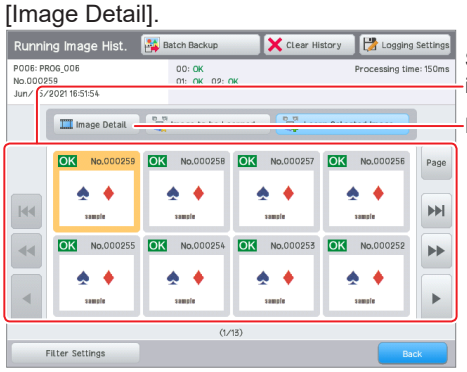
Press

Reference The confirmation screen for stopping operation during Run mode will be displayed. Press [OK], and stop operation.

The [Additional Learning] screen opens.

● When selecting from [Image Detail] screen

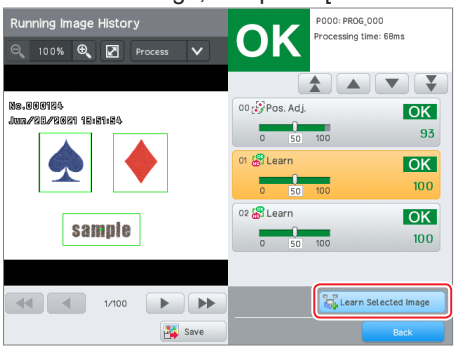
Select the screen to confirm the details, and press [Image Detail].



Select the image

Press

The [Running Image History] screen opens. Confirm the image, and press [Learn Selected Image].



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].

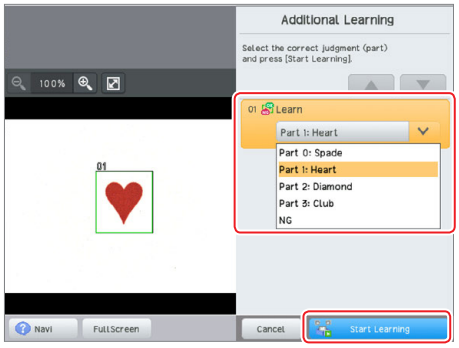
● **In standard mode**



Point **When multiple tool windows are set, confirm/change all status results for the tool windows.**

The confirmation screen opens.

● **In sorting mode**



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 [Register From Running History] screen opens.**
  “Confirming the Similar Images and Additional Learning” (page 6-16)
- **You can edit/delete images where additional learning of the wrong status result is performed in the [Learned Hist.] screen.**
  “Additional Learning from the Learned Image History” (page 6-11)

The system returns to the run screen or the [Sensor Setup Menu] screen.

Displaying the [Learned Hist.] screen

The [Learned Hist.] 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 4-40)
“Procedure to Register Part Image” (page 4-145)
“Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

This section explains how to display the [Learned Hist.] screen.

Point

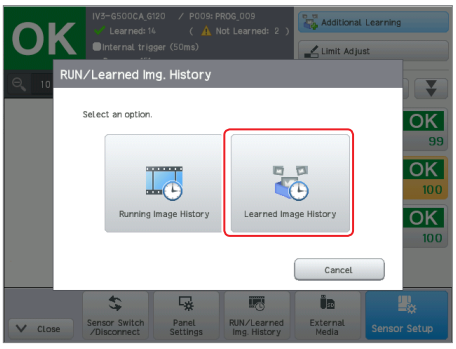
- **The [Learned Hist.] screen can be displayed when using a program including the learning tool.**
- **There are two methods for displaying the [Learned Hist.] screen.**

Displaying from the RUN screen

1 Display the control panel menu, and press [RUN/Learned Img. History].



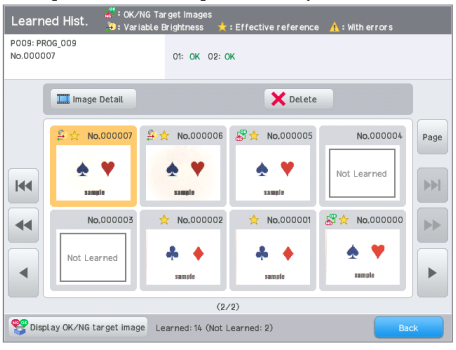
2 Press [Learned Image History].



The confirmation dialog for the operation stop appears.

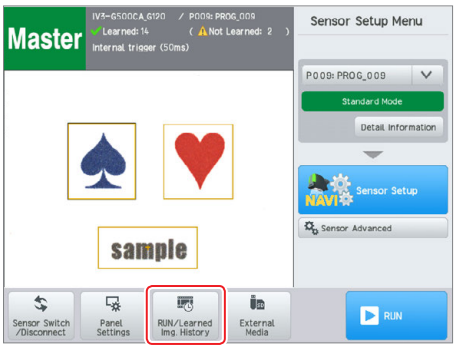
3 Press [OK] in the confirmation screen.

The [Learned Hist.] screen opens.

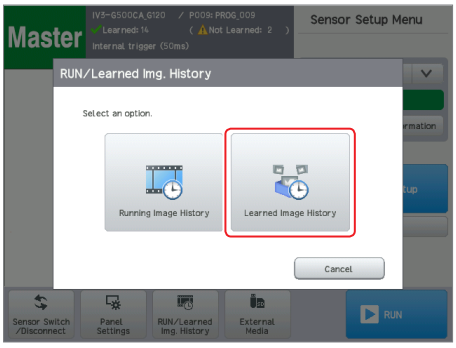


Displaying from the [Sensor Setup Menu] screen

1 Press [RUN/Learned Img. History] on the [Sensor Setup Menu] screen.



2 Press [Learned Image History].



The [Learned Hist.] screen opens.



Point

When an image where an error occurs is included in the learned image history, a confirmation dialog opens.

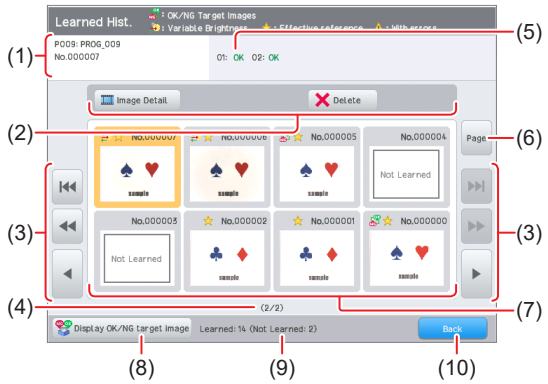
“(7) Thumbnail images” (page 6-9)

Confirming Learned Image History

Confirm the learned image history in the program.

1 Display the [Learned Hist.] screen.

“Displaying the [Learned Hist.] screen” (page 6-8)



(1) Detail Information

Displays the detailed information for the selected thumbnail image.
Displays the program number, program name and image number.

(2) Image operation button

● [Image Detail] button

Zooms in on the selected image.

“Image Detail Screen of the Learned Image History” (page 6-10)

● [Delete] button

Deletes the selected image.

“Deleting the Learned Images” (page 6-13)

(3) Operation buttons

Selects a thumbnail image.

- Moves to the top page.
- Moves to the previous page.
- Selects the previous image.
- Moves to the last page.
- Moves to the next page.
- Moves to the next image.

(4) Page number

Displays the page number of the learned image history.

(5) Registered status result

Displays the registered status result (OK/NG) of the learning tool list of the selected thumbnail image.

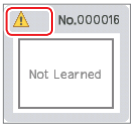
(6) [Page] button

Specifies the learned image history page to which to move.

(7) 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. 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 [Not Learned]. No error occurred. Delete or perform additional learning as needed.
	An image on which an error has occurred. • **Error in which the judgment is not selected** Images where the learning tool was added after registration by additional learning. There is no judgment information (OK/NG) for the added learning tool. Select the status result for additional learning. • **Pos. Adj. Error** There is a learning tool protruded out of the view range as the result of the position adjustment. Additional learning cannot be performed for this image.

(8) [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 4-40)

(9) No. of learned images

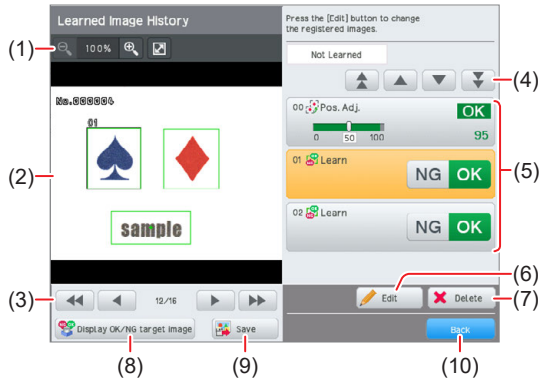
Display the number of learned images and number of not reflected images.

Reference The total number of registered images is up to 100 (including the brightness change function images).

(10) [Back] button

The system returns to the run screen or the [Sensor Setup Menu] screen.

Image Detail Screen of the Learned Image History



(1) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(2) History image

Displays the image saved in the sensor.
The image number is displayed.

(3) Operation buttons

- Moves to the previous page.
- Moves to the previous history image.
- Moves to the next history image.
- Moves to the next page.

(4) Selection button

- Moves to the previous page.
- Selects the previous tool.
- Selects the next tool.
- Moves to the next page.

(5) Tool list

Displays the list of the tools.

(6) [Edit] button

Selects this when editing the status result (OK/NG, or Part Type) of the learning tool.

“Editing the Status Result to be Learned” (page 6-11)

(7) [Delete] button

Deletes the learned image history.

“Deleting the Learned Images” (page 6-13)

(8) [Display OK/NG target image] button (standard mode only)

Displays [OK/NG Target Images] registered in the program.

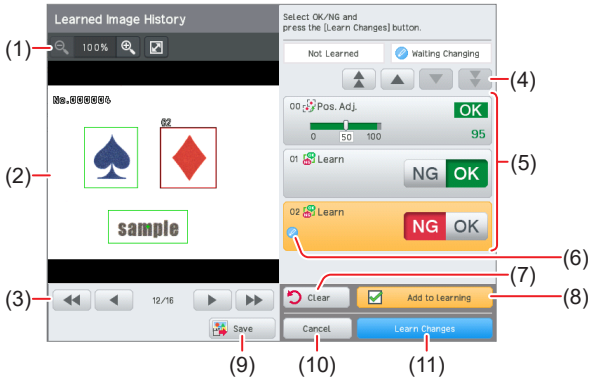
(9) [Save] button

Saves the displayed image to USB memory.

(10) [Back] button

Returns to the [Learned Hist.] screen.

Edit Screen of the Learned Image History



(1) Image tool bar

“Operation of the Image Tool Bar” (page 3-17)

(2) History image

Displays the image and tool windows.
The selected tool window is highlighted.

(3) Operation buttons

- Moves to the previous page.
- Moves to the previous history image.
- Moves to the next history image.
- Moves to the next page.

(4) Selection button

- Moves to the previous page.
- Selects the previous tool.
- Selects the next tool.
- Moves to the next page.

(5) Tool list

Displays the list of the tools. The status result (OK/NG, or Part Type) can be edited.

(6) Change Waiting Display

The status result of the learning tool has been changed. The detection window is waiting for the changed contents to be reflected.

(7) [Clear] button

Returns status result (OK/NG, or Part Type) edited in the tool window list to the state before editing.

(8) [Add to 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.

(9) [Save] button

Saves the displayed image to USB memory.

(10) [Cancel] button

Cancels the edit, and returns to the previous screen.

(11) [Learn Changes] button

Performs additional learning based on the changed contents.

Additional Learning from the Learned Image History

Editing the Status Result to be Learned

Point **The status result of the images registered as the OK/NG target learning or part image registration cannot be edited.**

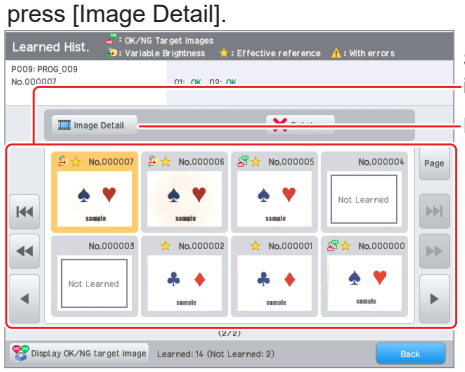
1 Display the [Learned Hist.] screen.

"Displaying the [Learned Hist.] screen" (page 6-8)

2 Select an image on which to edit the status result.

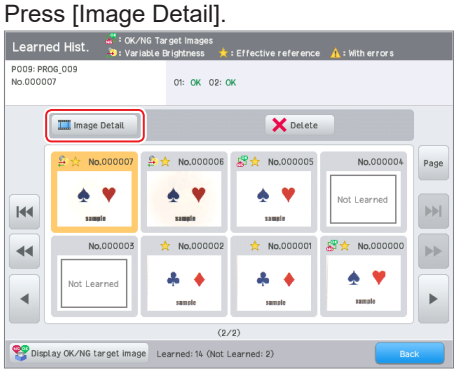
● **When selecting in the [Learned Hist.] screen**

Select an image on which to edit the status result and press [Image Detail].

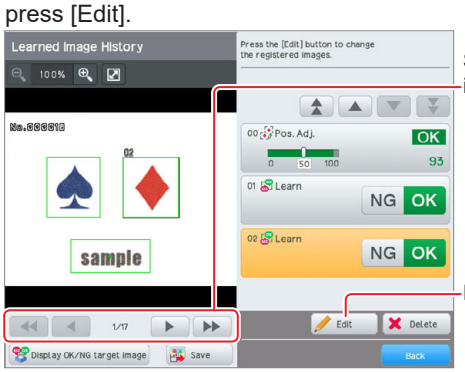


● **When selecting in the details screen**

Press [Image Detail].



Select an image on which to edit the status result and press [Edit].



Reference The image can be selected with the operation buttons as well.

3 Confirm the selection state of the status result of the learning 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 standard mode**

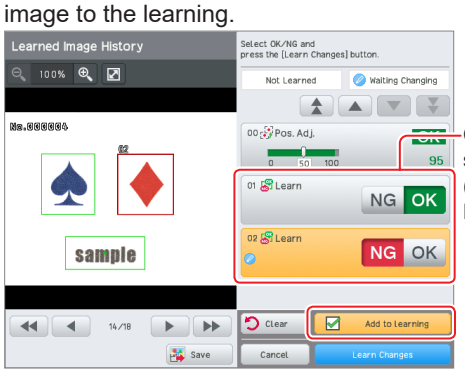


Point **The part type discrimination results are shown in sorting mode.**

● **Image not reflected to the learning (no error)**



The setting of the learning tool etc. 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 to 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.

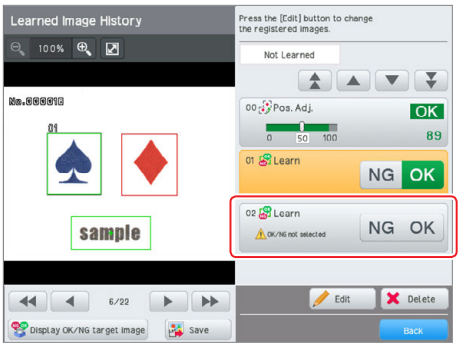


Point **The part type discrimination results are shown in sorting mode.**

● Image not reflected to the learning (with errors)



❍ Error in which the judgment is not selected



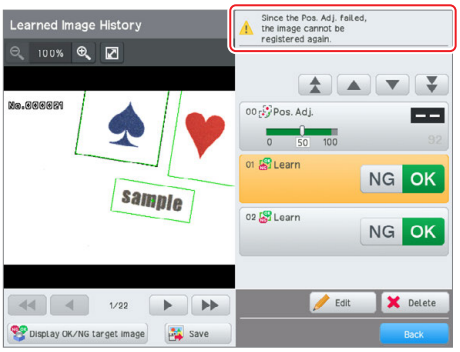
There is a learning tool whose status result is not selected.
When the target judgment can be performed normally using the image, select the desired status result and press [Add to Learning]. If there is a possibility for the image to judge the target mistakenly, do not add to learning.



Select status result (OK/NG, or Part Type)

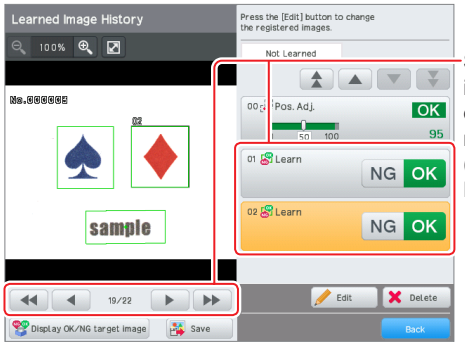
Reference For a changed learning tool, the change waiting display (Page 6-10) opens.

❍ Pos. Adj. Error



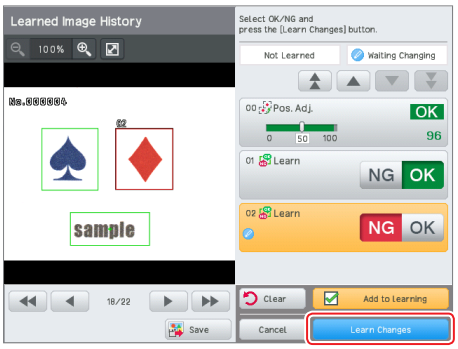
There is a tool window protruded out of the view range as the result of the position adjustment. Additional learning cannot be performed for this image. Check the position adjustment, or delete the image in the [Learned Hist.] screen.

4 When learning multiple images in a batch, change the selected image with the operation buttons, and repeat step 3.



Select the image to change status result (OK/NG, or Part Type)

5 Press [Learn Changes].



The confirmation screen opens.

6 Press [OK].

Learning will be performed.

7 After learning has been completed, press [OK].

The system returns to the run screen or the [Sensor Setup Menu] 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 Hist.] screen.**
  “Additional Learning from the Learned Image History” (page 6-11)

Deleting the Learned Images

Point **When deleting images from the learned image history, learning will be executed automatically to adjust the judgment process.**

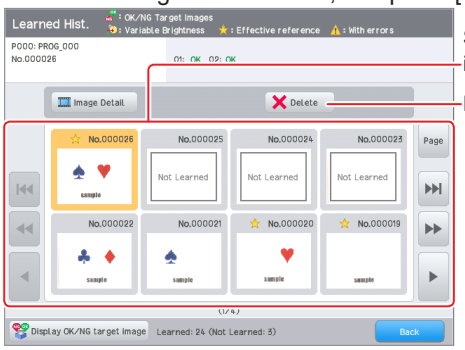
1 Display the [Learned Hist.] screen.

“Displaying the [Learned Hist.] screen” (page 6-8)

2 Select an image to be deleted.

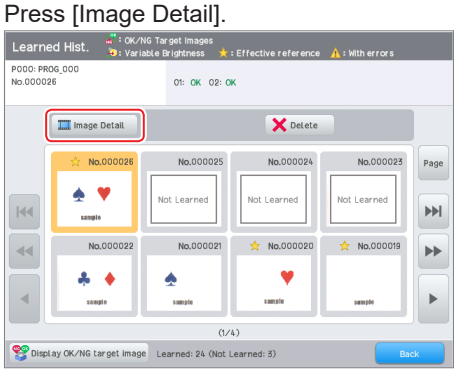
● When selecting in the [Learned Hist.] screen

Select the image to be deleted, and press [Delete].

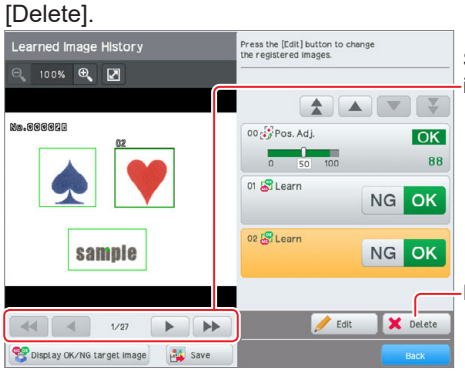


● When selecting in the details screen

Press [Image Detail].



Select the image with the operation buttons, and press [Delete].



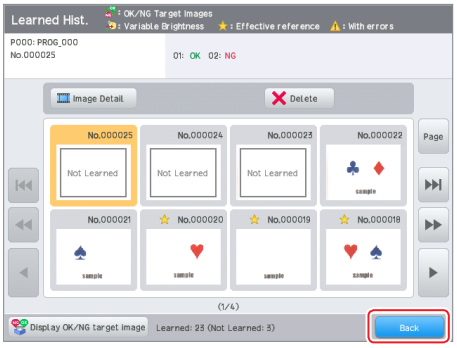
The confirmation screen opens.

3 Press [OK].

The image will be deleted.

Point **Deleting images cannot be undone.**

4 Press [Back].



Learning is automatically using the remaining images.

5 After learning has been completed, press [OK].

The system returns to the run screen or the [Sensor Setup Menu] screen.

Additional Learning from USB Memory

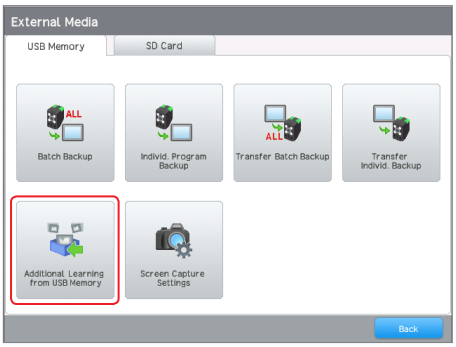
1 Insert the USB memory on which the batch backup files (*.iv3a), individual program backup files (*.iv3a), or image capture files (*.iv3p) are saved into the control panel.

“Saving the Sensor Settings and Images to a USB Memory” (page 8-3)

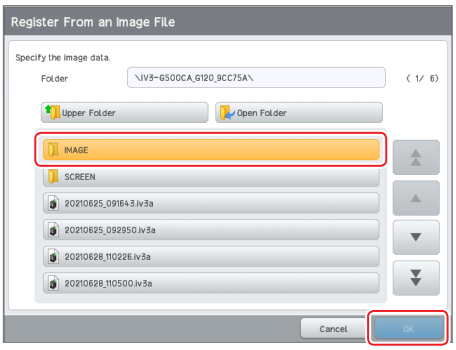
2 Display the [External Media] screen.

“Displaying the USB Memory screen” (page 8-3)

3 Press [Additional Learning from USB Memory].



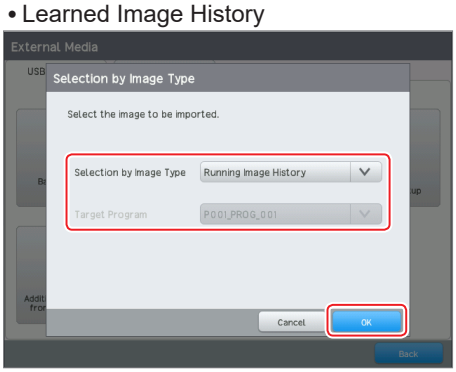
4 Select the batch backup file (*.iv3a), individual program backup file (*.iv3a) or image capture file (*.iv3p), and press [OK].



“Selecting the File/Folder in the USB Memory” (page 3-21)

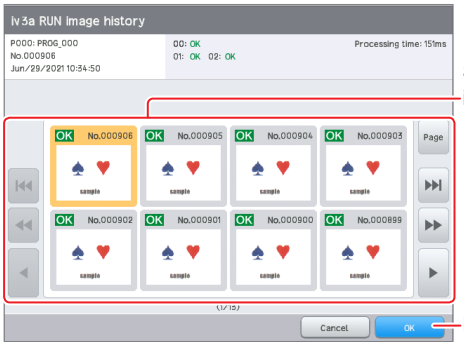
5 If a batch backup file (*.iv3a) or individual program backup file (*.iv3a) is selected, select the image type to be imported from the following.

- Running Image History
- Master Image
- Learned Image History



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

6 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 [Register From Running History] screen appears after operation stops.

“Operation When the Registered Number Reaches the Upper Limit” (page 6-16)

The [Additional Learning] screen opens.

7 **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.

8 **Press [OK].**

Learning will be performed.

9 **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 [Register From Running History] screen opens.**
  “Confirming the Similar Images and Additional Learning” (page 6-16)
- **You can edit/delete images where additional learning of the wrong status result is performed in the [Learned Hist.] screen.**
  “Additional Learning from the Learned Image History” (page 6-11)

10 **Press [Back].**



The system returns to the run screen or the [Sensor Setup Menu] screen.

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.

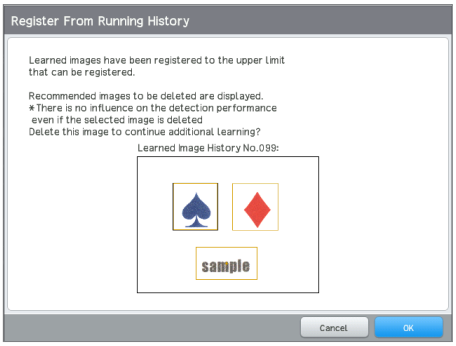
- Standard Mode
  Total number of registration images of OK/NG target learning (including variable brightness image) + registered images of the additional learning
- Sorting Mode
  Total number of registration images of part image registration (including variable brightness image) + registered images 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 [Register From Running History] 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 learning images, etc.

1 The [Check Registered Images] screen opens.



2 When deleting the displayed images, press [OK]. When not deleting them, press [Cancel].

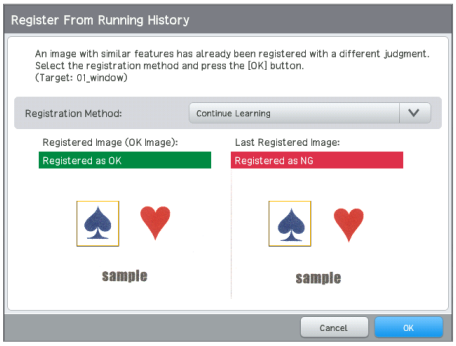
- When pressing [OK], the images will be deleted, and additional learning can be performed.
- When pressing [Cancel], additional learning will finish.

Point **When not deleting the images recommended to be deleted, select images from the learned image history to delete.**
"Deleting the Learned Images" (page 6-13)

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 [Register from a Running History] screen opens.
Confirm the status result for each image.

1 The [Register From Running History] 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 (OK Image)] and [Last Registered Image] as OK.
- **Continue Learning with Both NG**
  Performs the additional learning regarding both status results of [Registered Image (OK Image)] and [Last Registered Image] as NG.
- **Continue Learning**
  Performs the additional learning without changing the status results of [Registered Image (OK 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 (OK Image)] and [Last Registered Image] as a specified part number.
- **Continue Learning**
  Performs the additional learning without changing the status results of [Registered Image (OK 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 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)

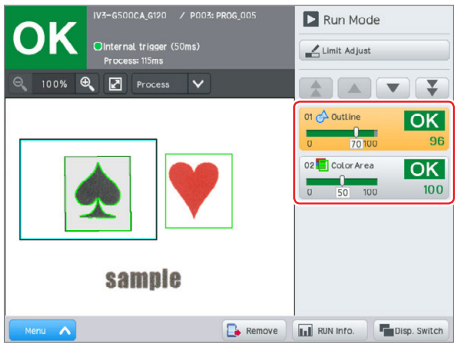
Reference

Threshold adjustment can be started using [Limit Adjustment] in [Tool Settings] of the Settings Navigator as well.

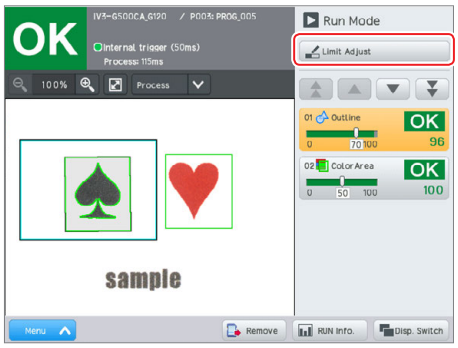
1 Display the operation screen.

“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 Adjust].



The confirmation screen opens.

4 Press [Yes].

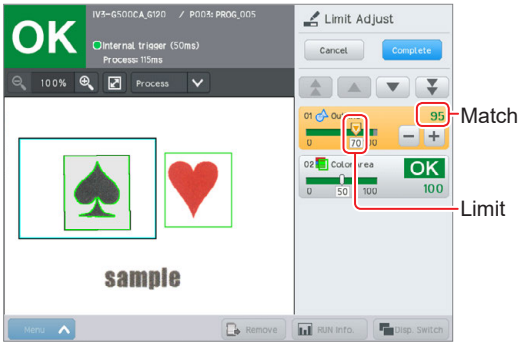
Point

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 5-11)
- The threshold can be changed by using the slider.
  “Editing Numbers” (page 3-19)

7 After adjustment is completed, press [Complete].

Returns to the operation screen.

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 6-18)
  - 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 6-21)
- "Stabilizing by Correcting for Misaligned Target Position" (page 6-23)
- "Stabilizing the Position Adjustment" (page 6-23)
- "Stabilizing the High-Speed Position Adjustment" (page 6-24)
- "Stabilizing the Outline Tool" (page 6-24)
- "Stabilizing the Color Area/Area/Color Average/Brightness Average/Color Prohibition/Brightness Prohibition Tool" (page 6-25)
- "Stabilizing the Width/Edge/Pitch tool" (page 6-25)
- "Stabilizing the Diameter Tool" (page 6-26)
- "Stabilizing the OCR Tool" (page 6-26)
- "Stabilizing the EdgePixels tool" (page 6-27)
- "Stabilizing the Blob Count tool" (page 6-27)

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.

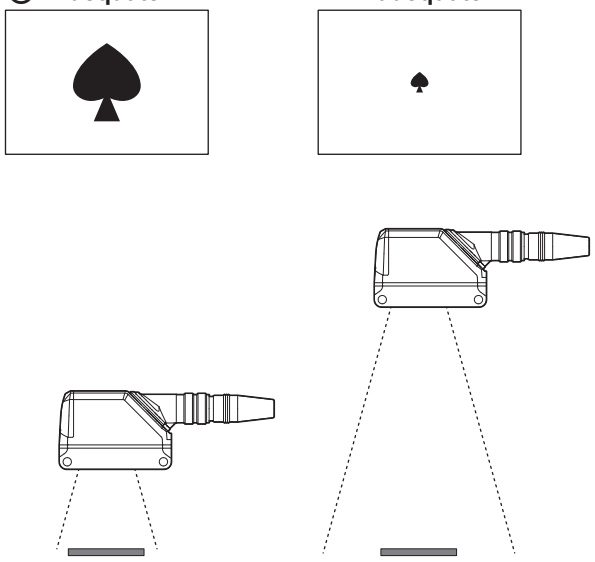
Make the target large in the field of view

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.
"Digital Zoom" (page 4-15)

Achieving Adequate Image Brightness

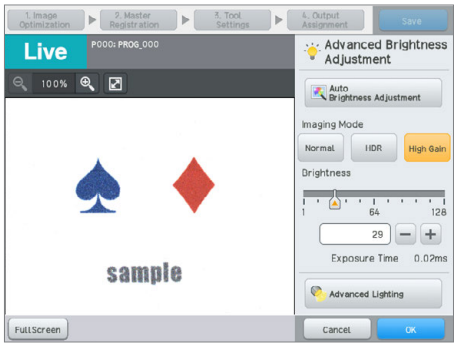
If the image is too dark, the judgment process becomes unstable due to poor contrast. Also, if the image is too bright, the judgment process may become unstable. Perform Smart Image Optimization and select the best optimized image. When the best image cannot be acquired for Smart Image Optimization adjust it using brightness adjustment.

“Setting items for Smart Image Optimization” (page 4-9)
“Adjusting Brightness” (page 4-12)

When Performing Fine Brightness Adjustment

Adjustment Finer adjustment of the brightness can be made in Advanced Brightness Adjustment.

“Adjusting Brightness” (page 4-12)



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 [Auto Brightness Adjustment] are too bright or dark due to the influence of the image 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 6-20).

Achieving Good Focus

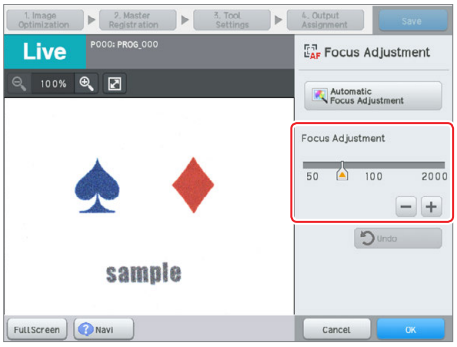
Adjusting the focus is required to clearly image the target. Since focus can be adjusted automatically using Smart Image Optimization individual adjustments are not needed. However, when performing fine adjustment etc., the finer adjustment can be made using "Focus Adjustment".

“Focus Adjustment” (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 4-12) and then perform auto focus adjustment.
If the focus still cannot be properly adjusted, adjust the focus manually.

“Adjusting the focusing position manually” (page 4-14)



Adjust the focus position by pressing [+] or [-].

Reducing the Image Blur

If the image is blurred while imaging a moving target, the image blurring can be corrected by using the AI Lighting unit, or by shortening the exposure time (shutter time).

■ Using the AI Lighting Unit

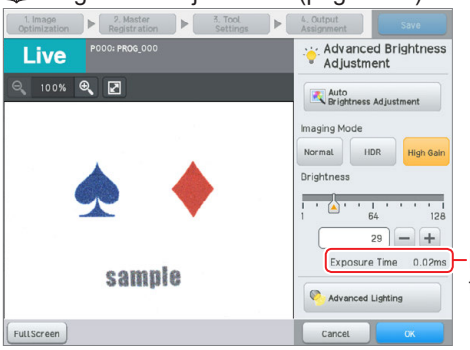
Using the AI Lighting unit increases the light intensity so that the exposure time can be shortened and the image blurring can be reduced.

“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.

“Brightness Adjustment” (page 4-12)



● 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

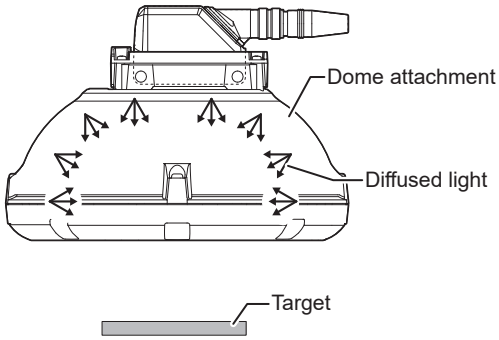
By performing multiple imaging for a target and combining the images of shine-free areas, a clean image with less shine can be created.
The multiple imaging can be performed with only the built-in light of the sensor. However, by using the AI Lighting unit, light can be emitted at a certain angle to the target, resulting in a cleaner image with less shine.
Perform Smart Image Optimization and select the optimized image for the multiple imaging. The settings can be done manually from the lighting advanced settings.

“Advanced Lighting” (page 4-13)
“Brightness Adjustment” (page 4-12)
“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 AI Lighting unit” (page 2-6)



■ 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

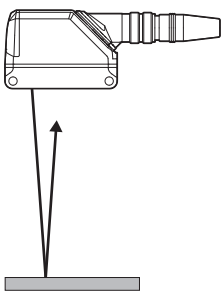
Selecting HDR in the imaging mode can reduce the shininess.
The HDR (High Dynamic Range) function prevents light saturation in the area with glare by imaging the target with a wider dynamic range.

“Adjusting brightness automatically” (page 4-12)
“Brightness Adjustment” (page 4-12)

■ Installing the sensor at an angle

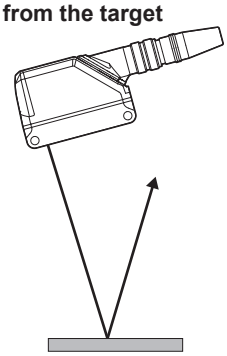
The built-in lighting will not reflected back into the camera, so the glare on the target's surface can be reduced.
This is effective for flat-surface targets.

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 7-25)

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 4-22)

If detection cannot be stabilized with the methods above, use shielding around the sensor to prevent influence from the ambient light.
“Brightness Correction” (page 4-22)

Stabilizing the Learning Tool

Optimizing the Size of the Tool Window

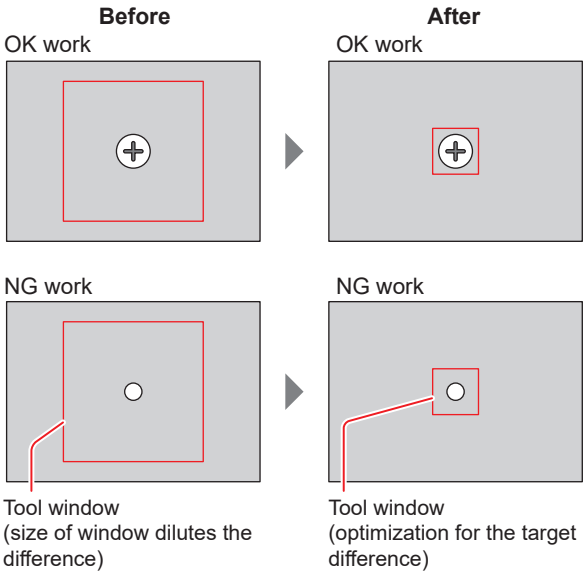
To enhance the learning effect, the tool window should be set according to the size of the image where the difference in an "OK" and "NG" or part image is clear. When the difference between an “OK” and “NG” target in the tool window is small, judgment may not be stable since the differences cannot be 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

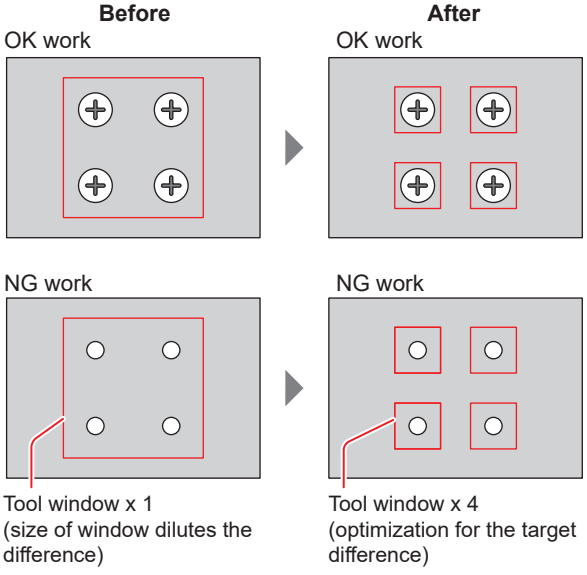
- Before .... Setting a tool window that is much larger than the target.
- After ..... Setting a tool window that fits to the size of the target.



■ Setting by dividing into multiple tool windows

Usage example: Detection of the presence of four targets (less than 3 is NG).

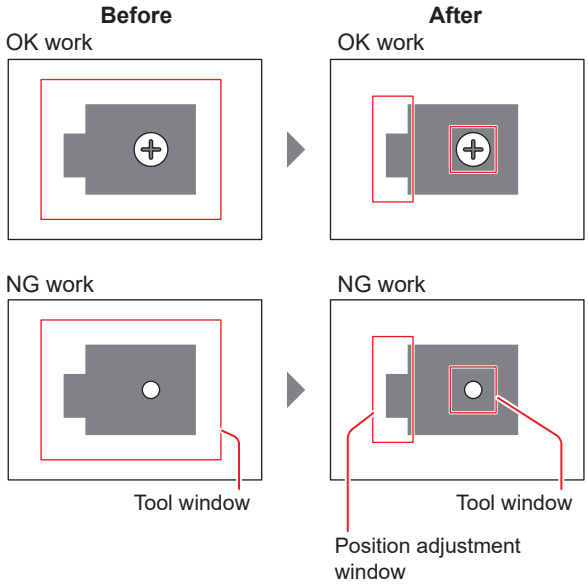
- Before .... Setting one tool window for the four targets in a batch.
- After ..... Setting four tool windows, one for each target.



■ Setting the position adjustment window

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 6-23)
“Stabilizing the Position Adjustment” (page 6-23)

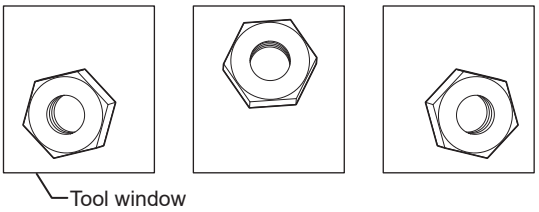
Learning Multiple Images for Stability

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 “Learning OK/NG Targets” or "Part Image Registration", and “Additional Learning”.
“OK/NG Target Learning for the Learning Tool” (page 4-40)
“Procedure to Register Part Image” (page 4-145)
“Auto Adjustment by the Additional Learning (Learning Tool Only)” (page 6-2)

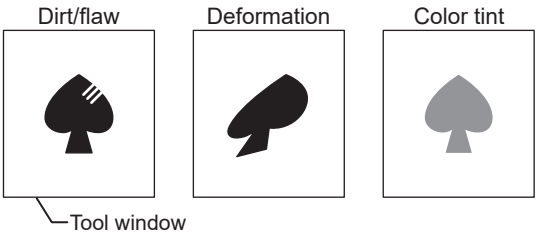
The following indicates examples of images that are different in capture status. Perform learning to register multiple images as OK or NG.

● Example 1: Registering multiple images with position misalignment

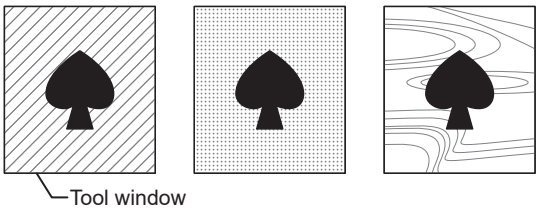
The capture status (what is seen) changes due to target misalignment. If it is the case, multiple images with different capture statuses are registered.



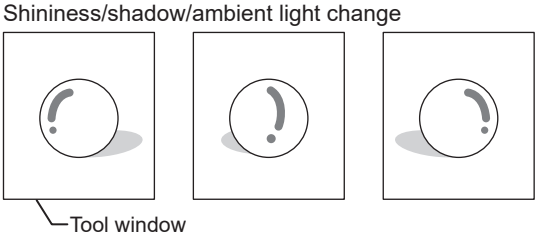
● Example 2: Registering multiple images for changes of the target



● Example 3: Registering multiple images for changes of the background



● Example 4: Registering multiple images for changes of the ambient light

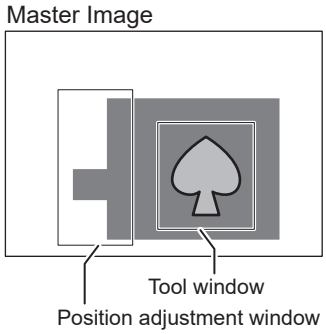


Reference By turning ON [Variable Brightness] to perform the OK/NG target learning, the influence from the ambient light becomes small.
“Registration of Taken Image” (page 4-42)

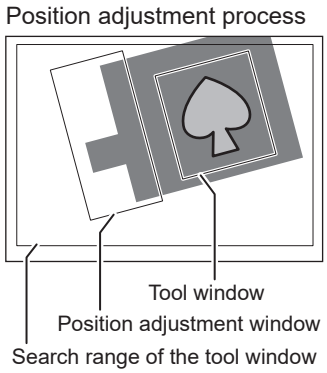
Stabilizing by Correcting for Misaligned Target Position

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 4-27)
“Position Adjustment Tool” (page 4-63)

● Tool settings



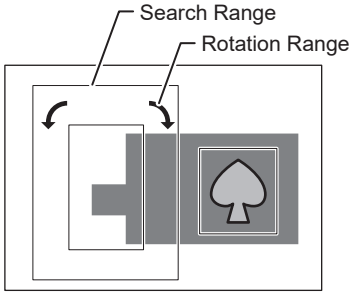
● Processing during an operation



Stabilizing the Position Adjustment

This section explains how to adjust when the position adjustment is not stable.
“Position Adjustment tool” (page 4-27)
“Position Adjustment Tool” (page 4-63)

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: ± 20°).
  “Rotation Range” (page 4-66)
- To stabilize the position adjustment, the tool window will search with the range ± a few degrees wider than the set value of the rotation range. (The tool window will search ± 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 4-65)

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 4-65)
- Set the extraction sensitivity to [Low].
  “Setting a Sensitivity” (page 4-66)

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].
  “Setting a Sensitivity” (page 4-66)
  If the process remains unstable even after setting the extraction sensitivity to [High], 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 6-18)
- For the color type, the outline extraction may become stable by using the color filter.
  “Distortion correction (wide field of view sensor model only)/color filters (color type only)” (page 4-16)

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 4-67)

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 (Hi-Sp.Adj) Tool” (page 4-90)

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 Manual Adjustment” (page 4-94)
- 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 Manual Adjustment” (page 4-94)

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 4-44)

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.
“Setting the Outline tool” (page 4-45)

If the detection becomes unstable due to the effect of unwanted outlines other than the target

- The outline disabling function can disable unwanted outlines.
  “Remove Outline” (page 4-46)
- Set the extraction sensitivity to [Low].
  “Sensitivity” (page 4-46)
- Set the search area so that non-target areas containing unwanted outlines are not searched.
  “Setting the Outline tool” (page 4-45)
- Set the search algorithm to [High Accuracy].
  “Search Algorithm” (page 4-47)
- 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: ± 20°).
“Rotation Range” (page 4-47)

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 [Normal] or [High Accuracy]. [High Accuracy] improves judgment accuracy more than [Normal]. However, the processing time becomes longer.
“Search Algorithm” (page 4-47)

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].
  “Setting a Sensitivity” (page 4-66)
  If the process remains unstable even after setting the extraction sensitivity to [High], 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 6-18)
- For the color type, the outline extraction may become stable by using the color filter.
  “Distortion correction (wide field of view sensor model only)/color filters (color type only)” (page 4-16)

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 4-48)
“Color/Brightness Average Tool” (page 4-56)
“Color Prohibition/Brightness Prohibition tool” (page 4-108)

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 ([+]/[-]). 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 [Exclude], and then press the unnecessary color extracted to exclude it.
  “Setting the Color Area/Area tool” (page 4-49)
  “Setting the Color/Brightness Average tool” (page 4-57)
  “Setting the Color Prohibition/Brightness Prohibition tool” (page 4-109)
- Set the [Fixed Reference Area] to [Enable: Large/Small].
  “Advanced settings of the Color Area/Area Tool” (page 4-54)
- If color difference detection does not stabilize when using the color average tool, adjust [Color ID Sens.] and [Threshold]. Use the Live image (capture the target) for adjustment. The sensitivity 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 4-58)

If the area search becomes unstable due to unwanted colors being extracted

- For the Color Area/Color Average/Color Prohibition tool, select [Exclude], and then press the color that was unnecessarily extracted to exclude it.
  “Setting the Color Area/Area tool” (page 4-49)
  “Setting the Color/Brightness Average tool” (page 4-57)
  “Setting the Color Prohibition/Brightness Prohibition tool” (page 4-109)
- Adjust with the mask function. The region in which unwanted colors are extracted can be disabled.
  “Mask settings” (page 4-35)
- 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 4-57)

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 4-68)
“Edge Tool” (page 4-79)
“Pitch tool” (page 4-84)

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 4-35)
- Raise the threshold for edge sensitivity so that unwanted edges are not extracted.
  “Edge Sensitivity Manual Adjustment” (page 4-71)
  “Edge Sensitivity Manual Adjustment” (page 4-82)
  “Edge Sensitivity Manual Adjustment” (page 4-87)
- 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 Manual Adjustment” (page 4-71)
  “Edge Sensitivity Manual Adjustment” (page 4-82)
  “Edge Sensitivity Manual Adjustment” (page 4-87)

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 4-74)

If the detection becomes unstable due to the effect of unwanted circles other than the target

- Adjust with the mask function.
  “Mask settings” (page 4-35)
- Set the edge sensitivity to low so that the unwanted circles will not be detected.
  “Diameter Extraction Settings” (page 4-76)
- 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.
  “Advanced Diameter Extraction” (page 4-77)
- 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 4-76)

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 4-96)

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 6-18)
- 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 4-35)

When reading dot characters from an IJP (ink jet printer) is not stable

● Read Dot Printing

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 4-103)

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 4-104)

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 [Hi Sens].
  If the process remains unstable even after setting the edge extraction sensitivity to [Hi Sens], it may be necessary to adjust the exposure for the target.
  “Edge Sensitivity Adjustment” (page 4-106)
- 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 4-35)

Stabilizing the Blob Count tool

This section explains how to adjust the Blob Count tool when the count is not stable.
“Blob Count Tool” (page 4-113)

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 Settings” (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.

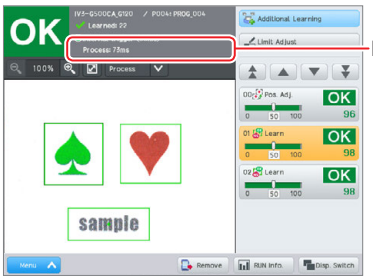
- Shortening the Imaging Processing Time(page 6-29)
- Selecting the tool(page 6-29)
- Shortening the processing time of each tool(page 6-29)
- Shortening the processing time of the Color Area/Area/Width/Diameter/Edge/Pitch/Edge Pixel/Color Prohibition/Brightness Prohibition/Blob Count tool(page 6-30)
- Shortening the Processing Time of the OCR Tool(page 6-30)
- Shortening the Processing Time of the Position Adjustment(page 6-30)

Point

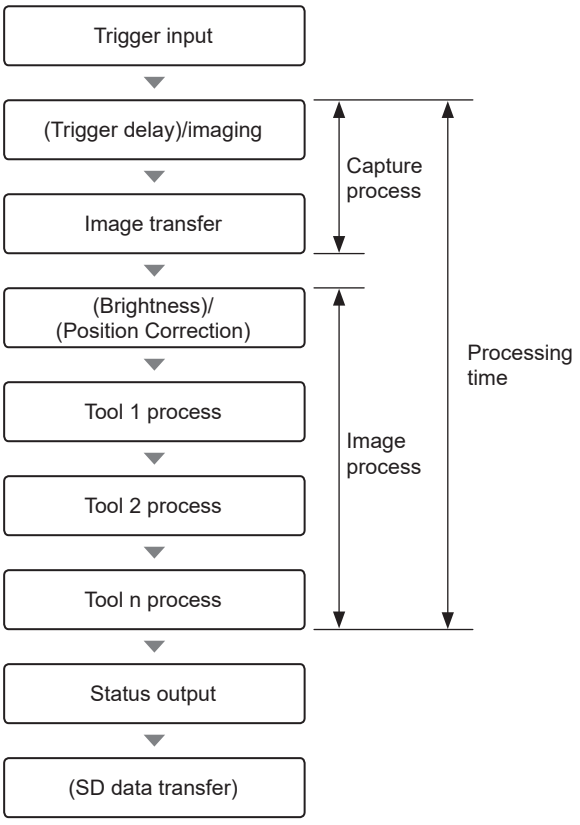
If the processing time is shortened, the stability of judgment may decrease. The processing time should therefore be adjusted while maintaining balance with the stability of the judgment process.

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 4-12). 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.**

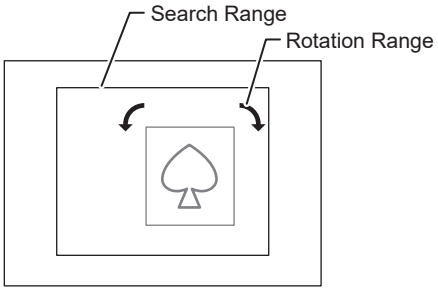
Selecting the tool

- 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.
“Setting the Outline tool” (page 4-45)

● 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: ± 20°)
Make sure that the range of installation angles for the target does not exceed the rotation range.
“Rotation Range” (page 4-47)

● Search Algorithm

Select [High Speed]. This will decrease judgment accuracy, but the processing time will be shorter.
“Search Algorithm” (page 4-47)

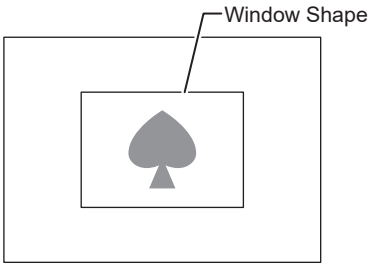
● Producing an image with less unwanted outlines

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.

“Setting the Outline tool” (page 4-45)

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.

“Setting the Color Area/Area tool” (page 4-49)
“Setting the EdgePixels tool” (page 4-105)
“Setting the Width tool” (page 4-69)
“Setting the Diameter tool” (page 4-75)
“Setting the Edge tool” (page 4-80)
“Setting the Pitch tool” (page 4-85)
“Setting the Color Prohibition/Brightness Prohibition tool” (page 4-109)
“Setting the Blob Count tool” (page 4-114)

● Window orientation

For the Width/Edge/Pitch tool, do not rotate the tool window (secure the orientation horizontally or vertically) to reduce processing time.

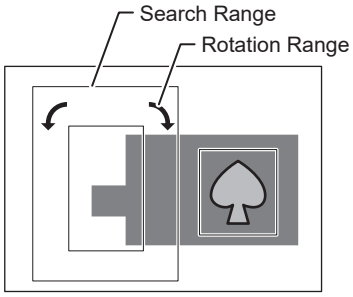
Shortening the Processing Time of the OCR Tool

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 4-65)

● 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: ± 20°)
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 4-66)

● Search Algorithm

Select [High Speed]. This will decrease the positioning accuracy, but the processing time will be shorter.
“Search Algorithm” (page 4-67)

● 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 4-65)

● Using High-Speed Position Adjustment tool

Compared with the normal position adjustment tool, the High-Speed Position Adjustment tool has a faster processing time.

7

Various Functions

In this section the [Sensor Setup Menu] screen, the [Sensor Advanced] screen, and the [Panel Settings] screen are explained.

Displaying the Sensor Setup Menu Screen 7-2
Changeover for a Target (Program Functions).....7-3
Using Program Auto-Switching 7-11
Setting the Extended Functions of the Sensor.....7-13
Setting Advanced Control Panel Information 7-27

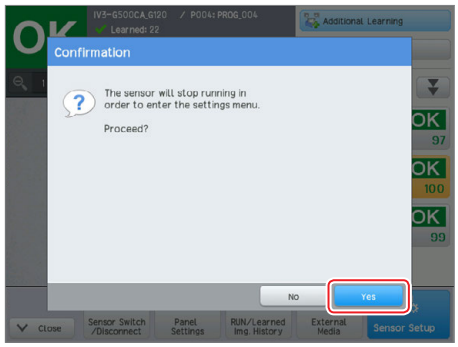
Displaying the Sensor Setup Menu Screen

This section explains the [Sensor Setup Menu] screen, which is displayed by pressing [Sensor Setup] when the menu display of the control panel is ON.

1 Display the control panel menu, and press [Sensor Setup].



2 Press [Yes].



The [Sensor Setup Menu] screen opens.
The displayed items are as follows.



(1) Image Type

For standard mode, displays "Master". For sorting mode, displays "Master00" when the master name is not registered in the master image 00, or displays the registered master name when registered.

(2) Sensor device name

Displays the sensor device name.
“Device Name” (page 7-20)

(3) Program number and name

Displays the program number (Page 7-4) and program name (Page 7-8) of the selected program.

(4) Number of learned images (learning tool only)

Displays the number of learned images and images not applied if a program including the learning mode is selected.
“Confirming Learned Image History” (page 6-9)

(5) Trigger type (trigger interval)

Displays the trigger type and interval for the currently selected program.

(6) Master image

Displays the master image registered to the currently selected program. For sorting mode, displays the master image 00. If no master image is registered, displays the [No Master Image].

(7) Program

Displays the program number of the selected program. The program can be switched from the drop-down menu.
“Changeover for a Target (Program Functions)” (page 7-3)

(8) Mode

Displays the currently selected program mode (Not Set/ Standard Mode/Sorting Mode).

(9) [Detail Information] button

By pressing the button, the [Program Details] screen opens. The master image can be confirmed and the program name can be edited.
“Displaying the [Program Details] screen” (page 7-8)

(10) [Sensor Setup] button

Start the Settings Navigator.
“4 Settings Navigator” (page 4-1)

(11) [Sensor Advanced] button

Configures the advanced settings for the sensor.
“Setting the Extended Functions of the Sensor” (page 7-13)

(12) [Sensor Switch/Disconnect] button

Changes the sensor displayed on the control panel.
“Switching and Terminating the Sensor to be Connected” (page 3-12)

(13) [Panel Settings] button

Configures the control panel settings.
“Setting Advanced Control Panel Information” (page 7-27)

(14) [RUN/Learned Img. History] button

Displays the running image history and learned image history (learning tool only).
“Confirming the Images Whose Judgment are NG (Running Image History)” (page 5-19)
“Displaying the [Learned Hist.] screen” (page 6-8)

(15) [External Media] button

Displays the settings menu for the USB memory and SD card.
“8 External Media” (page 8-1)

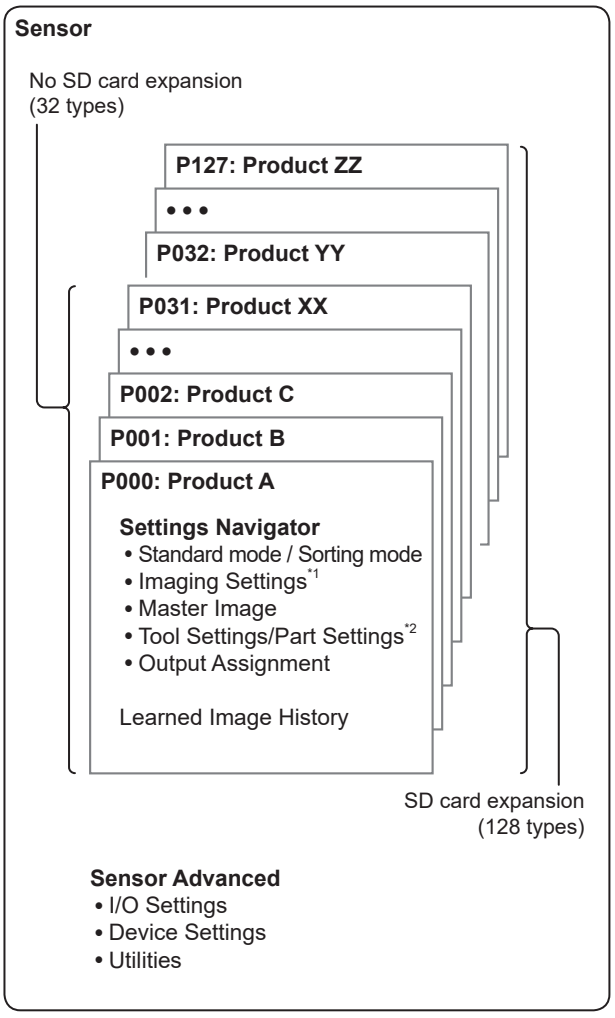
(16) [RUN] button

Starts the sensor in RUN mode.
“Exiting the sensor settings and starting operation” (page 5-2)

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 SD Card Access (Page 8-14) 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).
  “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 7-16)
- A program can be imported from a batch backup file (*.iv3a) or an individual program backup file (*.iv3a).
  “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 7-8)
- Copies and uses the judgment conditions (programs) for another program number.
  “Copying a Program” (page 7-10)
- 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] to [Enable].
“Transferring Program Settings” (page 8-14)
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 the 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
- Switch from a control panel
- 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.
- A program can be imported from a batch backup file (*.iv3a) or an individual program backup file (*.iv3a).
  “Importing a Program” (page 7-9)
- The product name can be registered to the program.
  “Editing a Program Name” (page 7-8)
- To register a similar product, the program can be copied, and then the settings can be edited.
  “Copying a Program” (page 7-10)
- 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] 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 8-11)

2 Set [SD Card Access] to [Enable].

“Transferring Program Settings” (page 8-14)

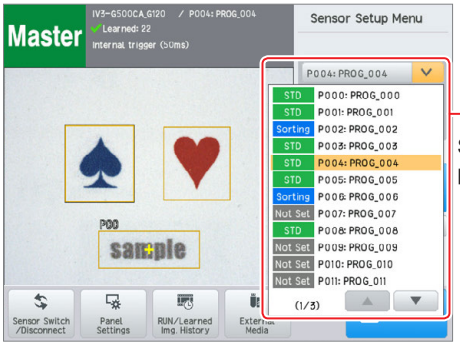
Transfer program settings information is created on the SD card.

Preparation procedures

1 Display the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)

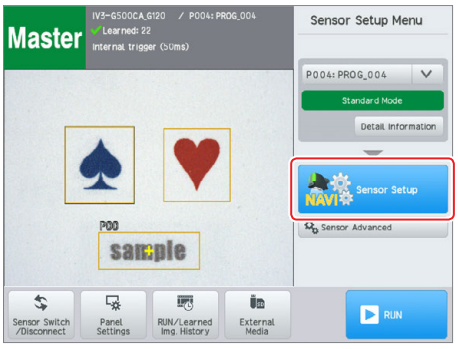
2 Select a program number to register the judgment conditions for a product.



Reference

The program can also be selected from the [Detail Information] button (Page 7-2).

3 Set the judgment conditions in the Settings Navigator.

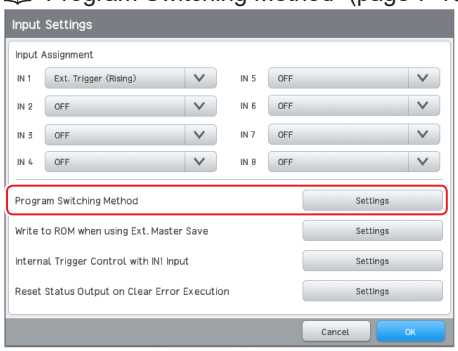


“4 Settings Navigator” (page 4-1)

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 7-16)



● External Input

Use this setting to switch programs by inputting signals from the PLC to the input line of the sensor

● Panel/PC/Network/Auto-Switching

Use this settings to switch programs from the control panel 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 7-16)

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

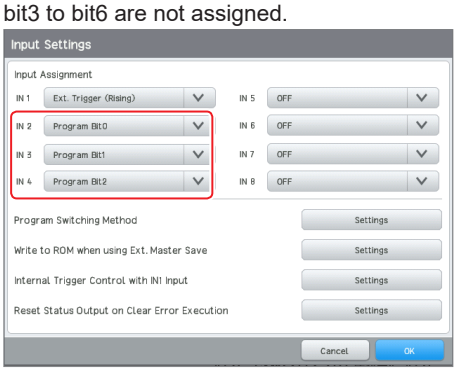
Point

- **Setting “SD Card Access” (Page 8-14) to [Enable] allows 33 or more programs (maximum of 128) to be set.**
- **To switch programs for 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] 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 8-12).**
- **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 8-4). 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 [SD card Access], re-read the SD card that the correct advanced program is saved on.
- When not using [SD card Access], set the [SD card Access] to [Disable].

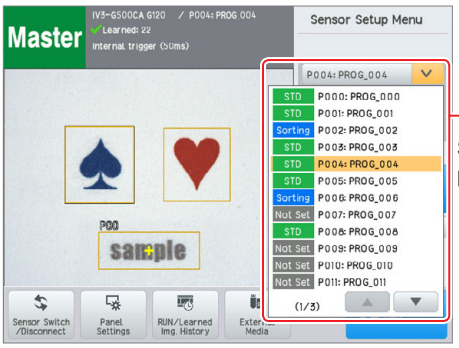
When [Program Switching Method] is set to [Panel/PC/Network/Auto-Switching]

● To switch programs with the control panel

1 Display the [Sensor Setup Menu] screen.

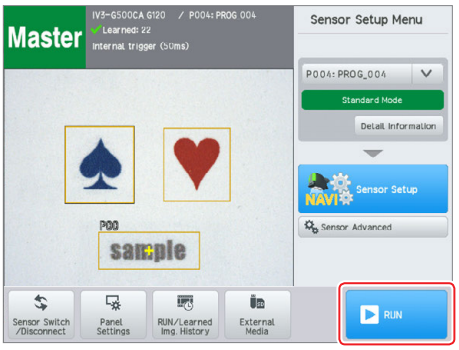
“Displaying the Sensor Setup Menu Screen” (page 7-2)

2 Select the program number to which the product to be judged is registered.



Reference The program number can also be selected while confirming the master image by pressing [Detail Information] (Page 7-8).

3 Press [RUN] and the new program will start in RUN mode.



● To switch a program from a field network

For details of how to switch programs using a field network PLC, 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 on which bit0 to bit6 are assigned to in the input assignment (Page 7-16) to change the program number (for the ultra-compact model: IN2 to IN8, for the built-in amplifier type: IN2 to IN3 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 10-9).

● 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 the 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	OFF	ON
P082	ON	OFF	ON	OFF	OFF	ON	OFF
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

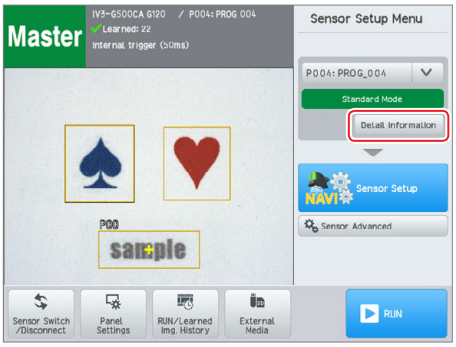
Displaying the [Program Details] screen

Press [Detail Information] on the [Sensor Setup Menu] screen to display the [Program Details] screen.

1 Display the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)

2 Press [Detail Information].



The [Program Details] screen opens.



- Moves to the previous page.
- Selects the previous program.
- Selects the next program.
- Moves to the next page.

3 Configure the program settings.

“Editing a Program Name” (page 7-8)
“Importing a Program” (page 7-9)
“Copying a Program” (page 7-10)
“Initializing a Program” (page 7-10)

4 Press [Back].

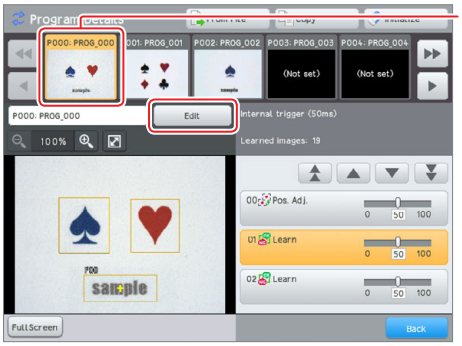
Editing a Program Name

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 name and press the [Edit] button.



Select the program

The screen to edit the program name opens.

3 Enter the user-defined program name and press [OK].

You can enter up to 16 alphanumeric characters.
“Inputting characters” (page 3-20)

Point

If the display language (Page 7-31) is changed, the device name might be replaced and displayed as hyphens (-).

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 8-4)
“Saving the program individually” (page 8-5)

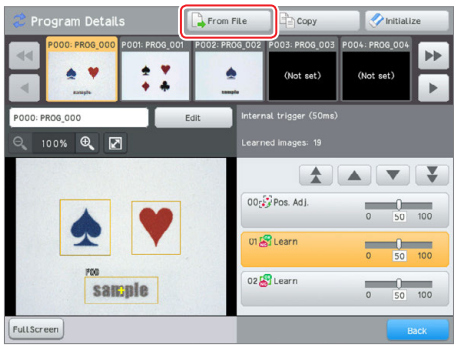
1 Connect the USB memory on which the batch backup file (*.iv3a) or individual program backup file (*.iv3a) is saved to the control panel.

Point **Programs cannot be imported from the SD card.**

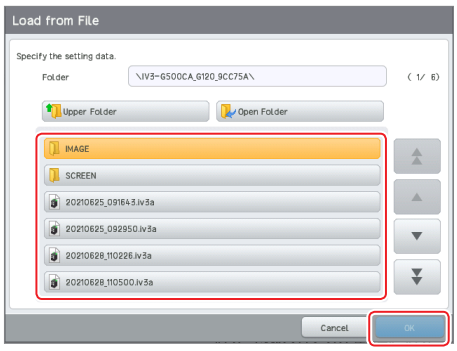
2 Display the [Program Details] screen.

“Displaying the [Program Details] screen” (page 7-8)

3 Press [From File].

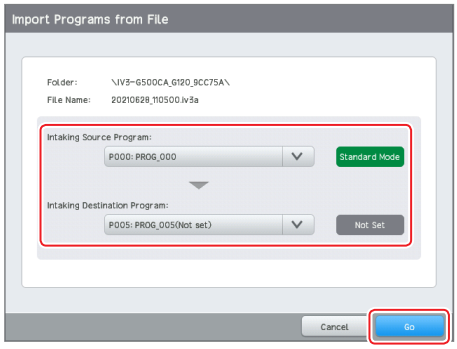


4 Select a batch backup file (*.iv3a) or an individual backup file (*.iv3a) and press [OK].

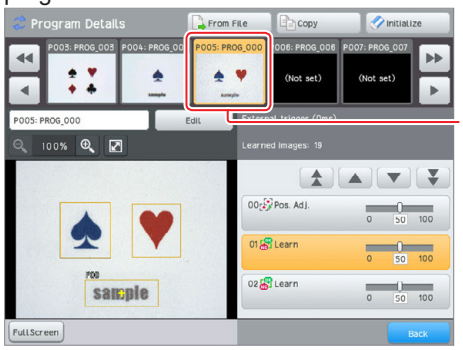


“Selecting the File/Folder in the USB Memory” (page 3-21)

5 Select the number of the source program and the number of the destination program, and press [Go].



The source program is copied to the destination program number.



Imported programs

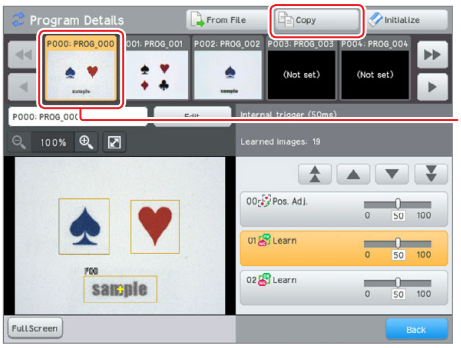
Copying a Program

Copies a set program to another program number. Re-uses the set items and creates a new program.

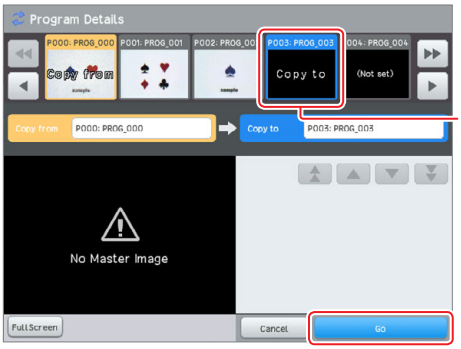
1 Display the [Program Details] screen.

“Displaying the [Program Details] screen” (page 7-8)

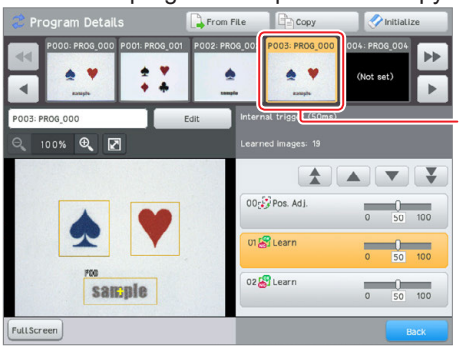
2 Select the program to be copied and press [Copy].



3 Select the program number to be the copy destination and press [Go].



The source program is copied to the copy destination.



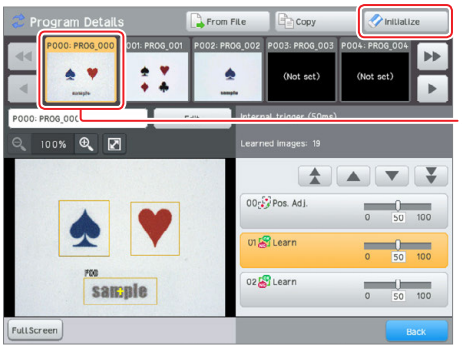
Initializing a Program

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)

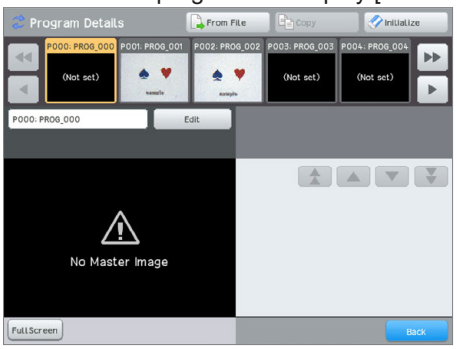
2 Select the program to be initialized and press [Initialize].



The confirmation screen opens.

3 Press [OK].

The system returns to the [Program Details] screen.
The initialized program will display [No Master Image].



Using Program Auto-Switching

● Program Auto-Switching

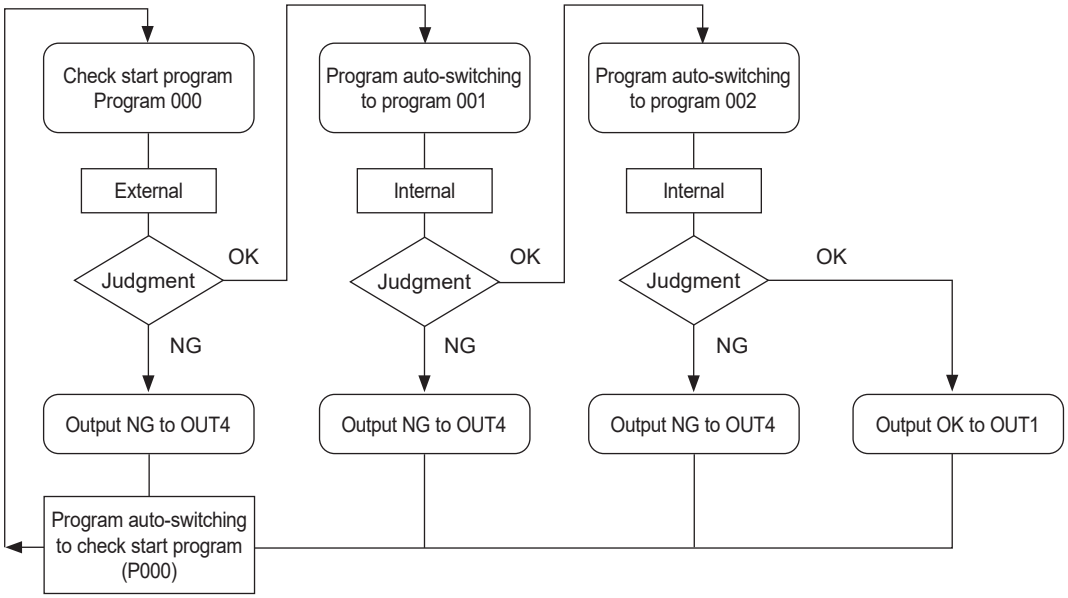
If multiple programs are used to perform a single examination, examinations can be performed continuously without controlling the program switching with a PLC etc.
“Program Auto-Switching” (page 4-156)
“Importing the Status Output (When Program Auto-Switching is "Enable")” (page 10-7)

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
Destination Program	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.

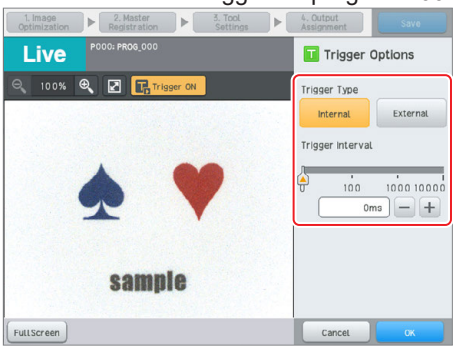
Point **By assigning the total status OK to OUT1 for P002 only, you can prevent the total status OK from being output for the program in the middle of the process.**

● Setting procedures

This section explains the settings using program 000 as an example.

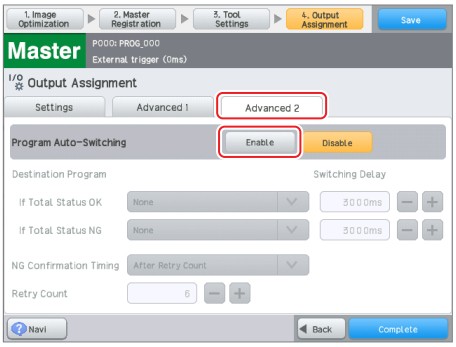
1 Set the trigger options.

Select the external trigger for program 000.
Select the internal trigger for programs 001 and 002.



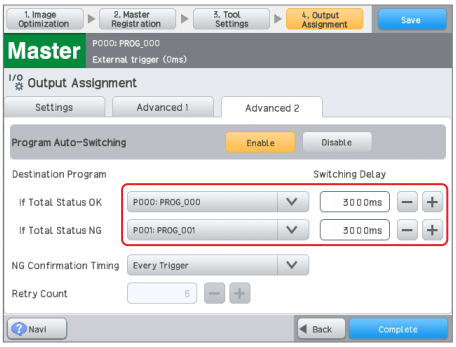
“Setting the Trigger Options” (page 4-10)

2 Enable the program auto-switching by selecting the [4. Output Assignment] → [Advanced 2] tab.

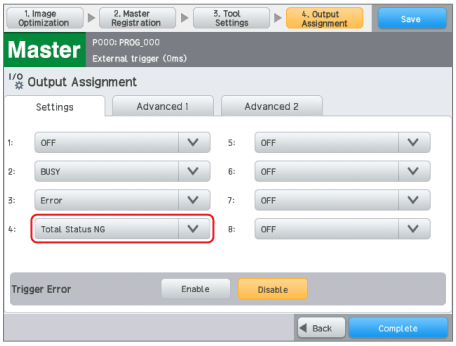


“Program Auto-Switching” (page 4-156)

3 Select the program switching destination at the total status OK and program switching destination at the total status NG.



4 Select the [Settings] tab, and select "Total Status NG" for OUT4.



“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

5 Set P001 and P002 with the same procedures according to each program setting.

Point

- **To use program auto-switching, select "Panel/PC/Network/Auto-Switching" as the program switching method.**
  “Program Switching Method” (page 7-16)
- **The statistical information will be reset because the program is switched.**
- **To use program auto-switching, change 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 7-25)

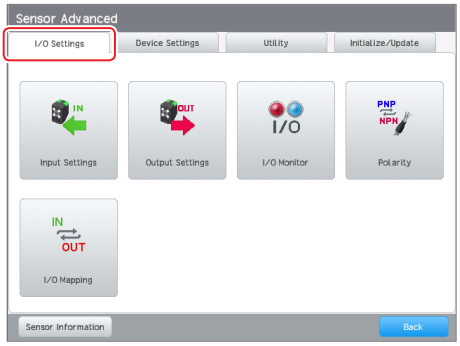
Setting the Extended Functions of the Sensor

Sensor Advanced Settings

The section explains the [Sensor Advanced] screen displayed by pressing [Sensor Advanced] on the [Sensor Setup Menu] screen.



[I/O Settings] tab



● Input Settings

Sets the sensor I/O assignment, program switching method, and input options.
“Input Settings” (page 7-16)

● Output Settings

Sets the timing for the sensor output and the output type.
“Output Settings” (page 7-18)

● I/O Monitor

Used for confirming the proper operation and wiring of the I/O lines.
“I/O Monitor” (page 7-19)

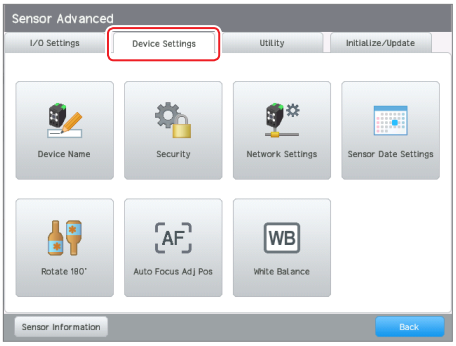
● Polarity

Sets the sensor polarity.
“Polarity” (page 7-19)

● I/O Mapping (Built-In Amplifier Type)

Changes settings of the I/O port available for the I/O mapping.
“I/O Mapping (Built-In Amplifier Type)” (page 7-20)

[Device Settings] tab



● Device Name

Sets the sensor name.
“Device Name” (page 7-20)

● Security

Sets the sensor security settings.
“Security” (page 7-21)

● Network Settings

Sets the network settings of the sensor.
“Network Settings (Sensor)” (page 7-22)

● Sensor Date Settings

Confirms or changes the time set in the sensor.
“Sensor Date Settings” (page 7-23)

● Rotate 180°

Rotates the control panel display image by 180°.
“Rotate image 180°” (page 7-24)

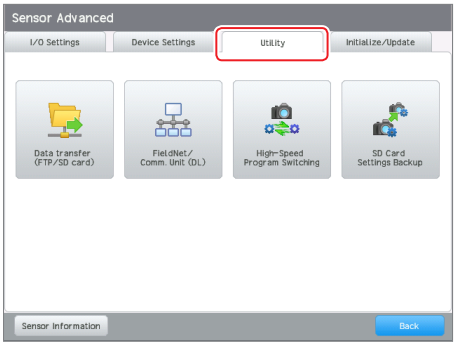
● Auto Focus Adj Pos

Sets whether or not to make the adjustment position for the auto focus common to all programs.
“Auto Focus Adj Pos” (page 7-25)

● White Balance (for color type only)

Adjusts the white balance for the image displayed on the control panel.
“White Balance (for Color Type Only)” (page 7-25)

[Utility] tab



● Data Transfer (FTP/SD card)

Sets the FTP client function settings for the sensor.
“Saving Judgment Results and Judged Images to an FTP/SFTP server” (page 9-2)

● 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)

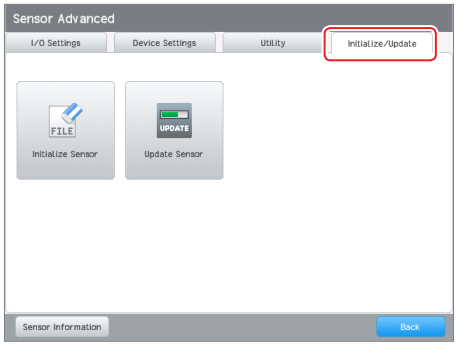
● High-Speed Program Switching

Selects the programs to be used for high-speed program switching.
“High-Speed Program Switching” (page 7-26)

● 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 8-23)

[Initialize/Update] tab



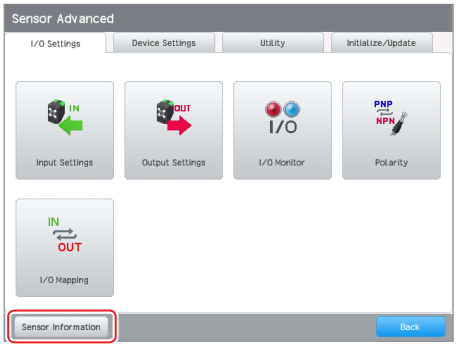
● Initialize Sensor

Initializes the information set in the sensor.
“Initializing the Sensor” (page 3-15)

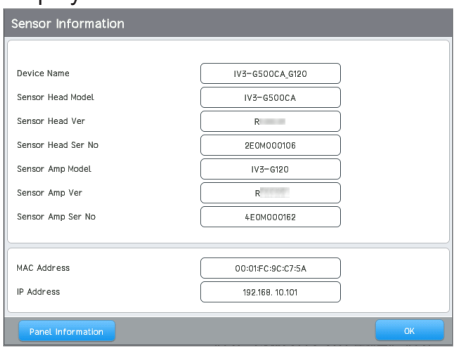
● Update Sensor

Updates the operation software of the sensor.
For details, refer to KEYENCE homepage.
URL: www.keyence.com/glb

[Sensor Information] button



Displays the information set in the sensor.



Reference The control panel information (Page 7-28) can be confirmed by pressing [Panel Information] at the lower left of the screen.

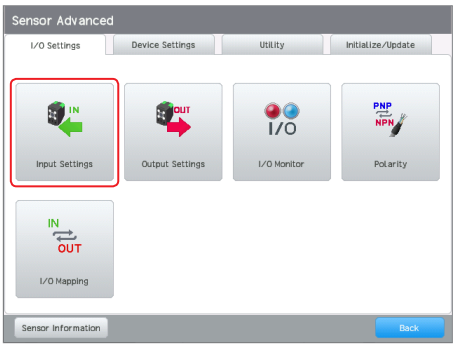
Input Settings

Set the input settings for the sensor.

1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

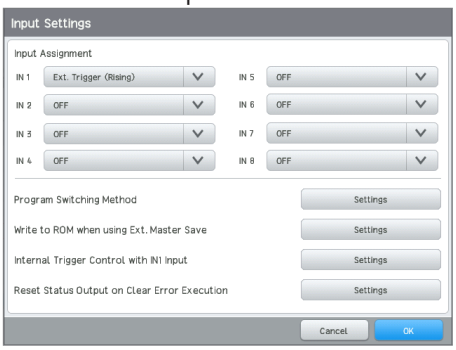
“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [Input Settings] on the [I/O Settings] tab.

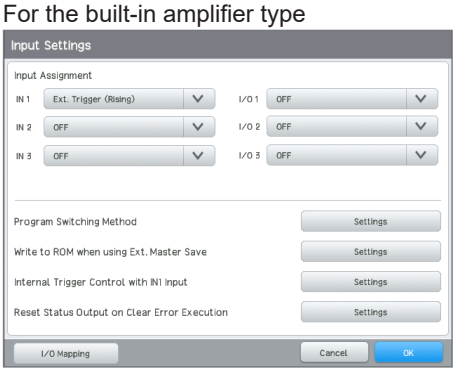


3 Set the input settings for the sensor.

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.
  “Changeover for a Target (Program Functions)” (page 7-3)

❍ 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.
- **Clear Error**
  Used to clear error outputs.
  “Clearing Errors” (page 10-12)
- **Ext. Master Save**
  Registers a new master image using the external input.
  “Registering the Master Image” (page 10-10)
- **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 10-13)

❍ 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.

● Program Switching Method

Sets the method for switching the program number.
“Changeover for a Target (Program Functions)” (page 7-3)

- **Panel/PC/Network/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 bits bit0 to bit6 must be assigned to one of IN2 to IN8, or I/O1 to I/O3 in [Input Assignment].**
“Input Assignment” (page 7-16)

● 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 10-10)
- **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.**
- **If [Trigger Options] is set to [External], 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.

● [I/O Mapping] Button (Built-In Amplifier Type)

Changes settings of the I/O port available for the I/O mapping.
“I/O Mapping (Built-In Amplifier Type)” (page 7-20)

4 Press [OK].

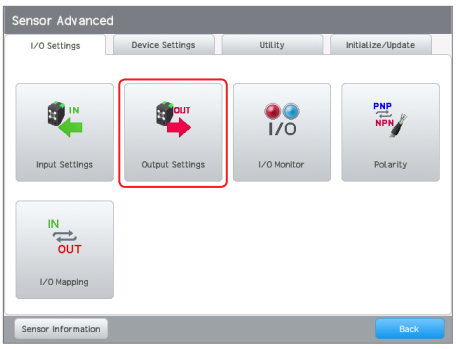
Output Settings

Set the Output Settings of the sensor.

1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

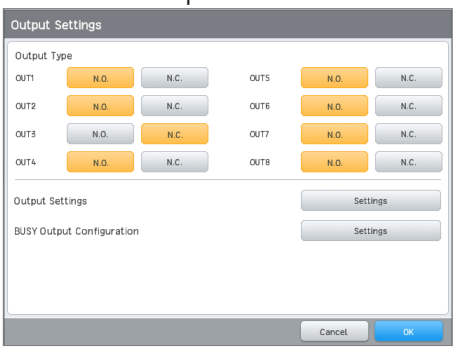
“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [Output Settings] on the [I/O Settings] tab.

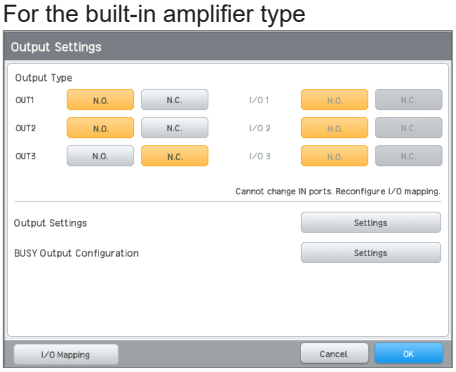


3 Set the Output Settings of the sensor.

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

The screen to select the output type opens by pressing [Settings].

“Changing the timing of status outputs” (page 10-6)

❍ [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.

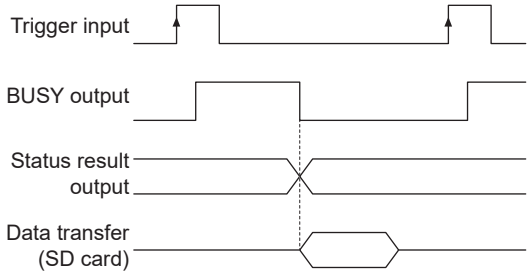
“Editing Numbers” (page 3-19)

- **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

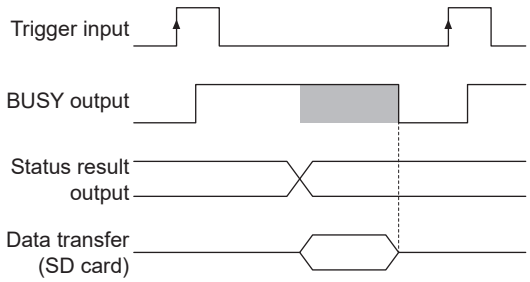
❍ Until Judgment is Complete (default)

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.



Point

- **This setting is not valid for data transfer (FTP). BUSY output does not turn on during FTP/SFTP data transfer.**
- **Processing time” (Page 5-8) is not included in the data transfer time.**

● [I/O Mapping] Button (Built-In Amplifier Type)

Changes settings of the I/O port available for the I/O mapping.

“I/O Mapping (Built-In Amplifier Type)” (page 7-20)

4 Press [OK].

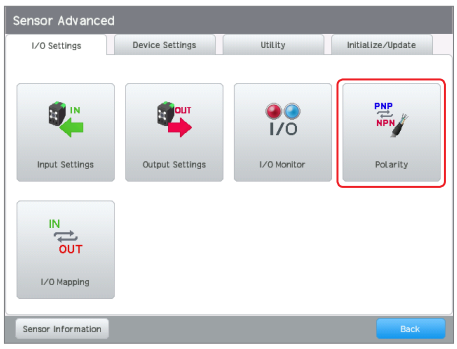
Polarity

Sets the sensor polarity.

1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [Polarity] on the [I/O Settings] tab.



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 2-18)

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 2-18)

5 Press [OK] and the system returns to the [Sensor Advanced] screen.

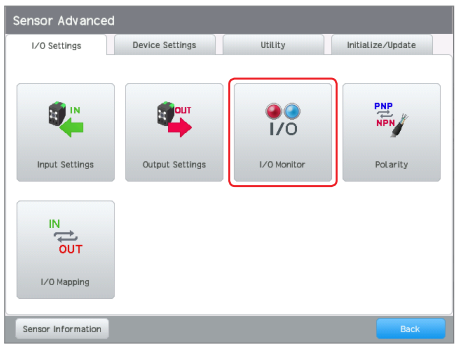
I/O Monitor

Use the I/O monitor to confirm the correct function and wiring for the I/O lines.

1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

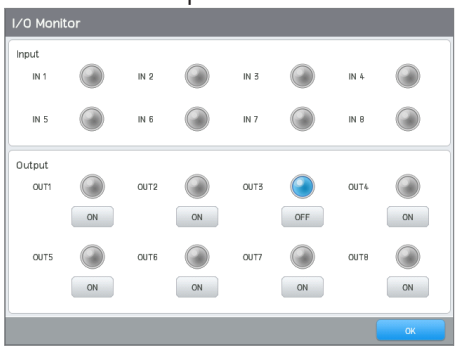
“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [I/O Monitor] on the [I/O Settings] tab.

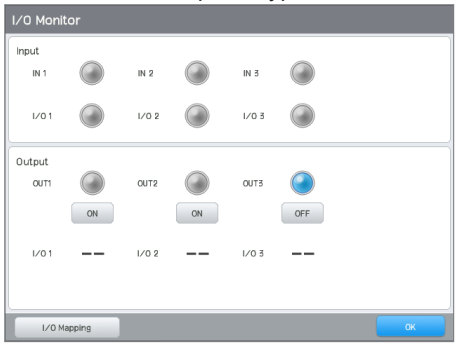


3 Configure the I/O control panel settings.

For the ultra-compact model



For the built-in amplifier type



● Input

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.

4 Press [OK].

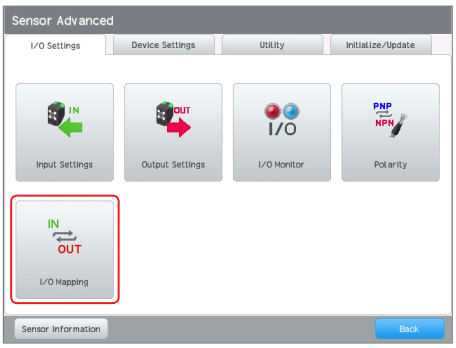
I/O Mapping (Built-In Amplifier Type)

Sets whether to use IN or OUT for ports where input and output can be switched (I/O ports).

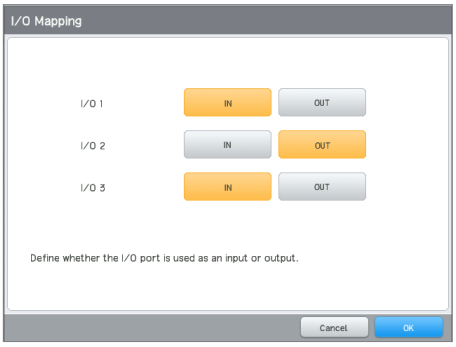
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [I/O Mapping] on the [I/O Settings] tab.



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 affected. Check each setting again after it is changed.**

4 Press [OK].

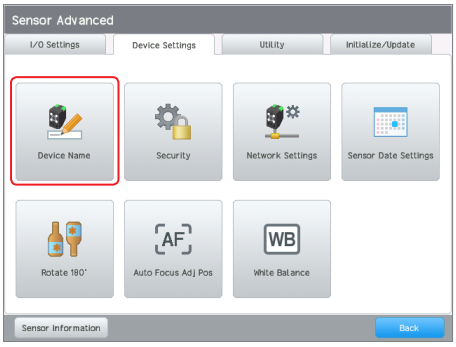
Device Name

The sensor can be arbitrarily named and controlled.

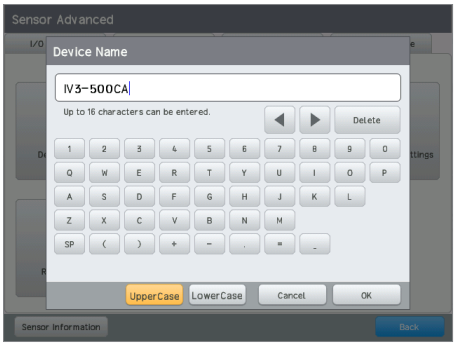
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [Device Name] on the [Device Settings] tab.



3 Enter the user-defined program name and press [OK].



Up to 16 alphanumeric characters can be set.
“Inputting characters” (page 3-20)

4 Press [OK].

Security

Sets a password on the sensor to prevent incorrect operation.
Two levels of security authorizations (supervisor password and operator password) can be set.

Point **Correctly use the security of the sensor and the touch screen lock on the control panel (Page 7-33).**

● Enable the security

After setting a password and displaying the run screen, the security becomes enabled.
While the security is enabled, 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

To disable, input the password when the input dialog for the password opens.

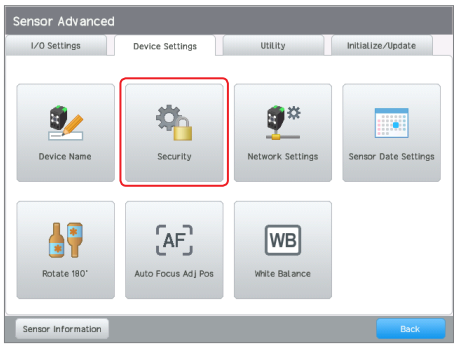
If the security is temporarily canceled in the control panel menu (Page 5-3), the lock is canceled until the system displays the hide menu screen (Page 5-3).

Setting the Password

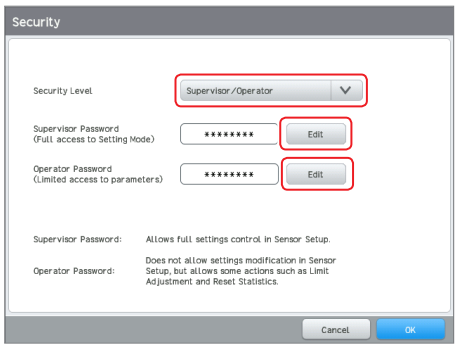
1 **Press [Sensor Advanced] on the [Sensor Setup Menu] screen.**

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 **Press [Security] on the [Device Settings] tab.**

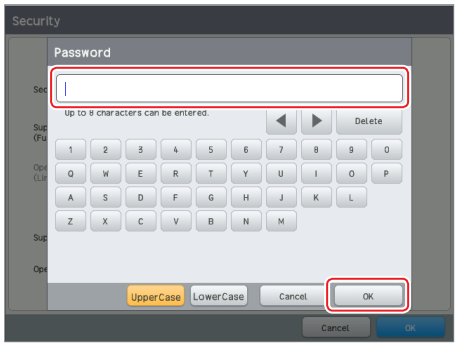


3 **Select a target for enabling a password, and then press [Edit] of each password.**



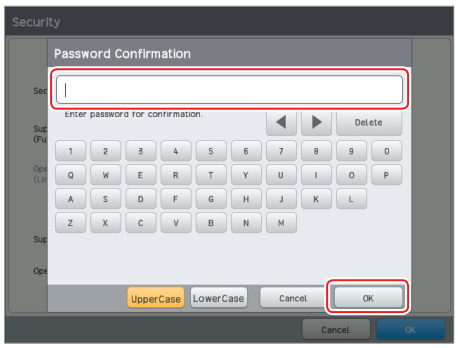
- **OFF**
  Disables all passwords.
- **Supervisor**
  Enables a supervisor password. The settings can be changed in the settings mode using the supervisor password.
- **Supervisor/Operator**
  Enables both the supervisor password and operator password. Although the threshold changing and statistics reset and others in operation are available when the operator password is used, the settings cannot be changed in the settings mode.

4 **Set an user-defined password and press [OK].**



Up to 8 characters can be set.
Default: None (blank)
“Inputting characters” (page 3-20)

5 **Confirm the password that was set in step 4 and press [OK].**



6 **Press [OK].**

The password will be changed and the system returns to the [Sensor Advanced] screen.

Network Settings (Sensor)

Sets the network settings of the sensor.

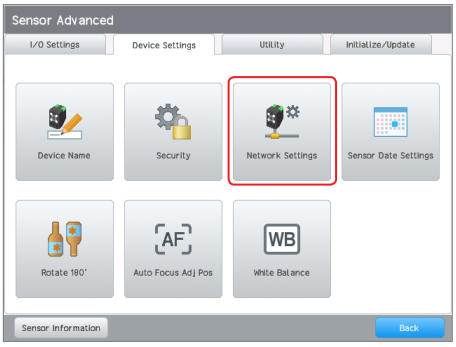
Point

- **For details about the network settings for the control panel, refer to "Panel Network Settings" (page 7-30).**
- **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-26) of the sensor.

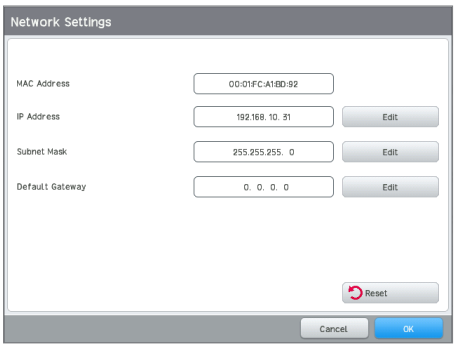
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

"Displaying the Sensor Setup Menu Screen" (page 7-2)
"Sensor Advanced Settings" (page 7-13)

2 Press [Network Settings] on the [Device Settings] tab.



3 Set the network address of the sensor.



● MAC Address

Displays the MAC address of the sensor. The MAC address cannot be changed.

● IP Address/Subnet Mask/ Default Gateway

Displays the address for each network.
Pressing [Edit] opens the screen to edit the address.
Set the desired address and press [OK].

Reference — Change the port number from the [IP Address] editing screen.

● [Reset] button

By pressing [Reset], resets the IP Address / Subnet Mask / Default Gateway.
"Not Set" will be displayed after the reset.

4 Press [OK].

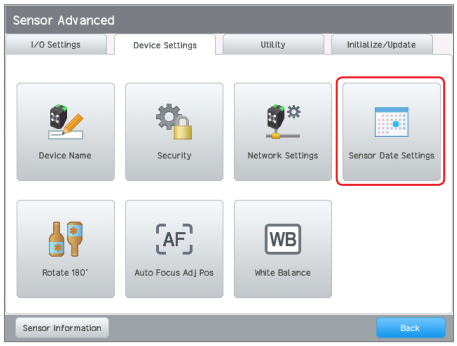
The connection to the sensor will be disconnected and reconnected. If reconnection is successful, the [Sensor Setup Menu] screen will be displayed. If reconnection fails, the [Panel Settings] screen opens.

Sensor Date Settings

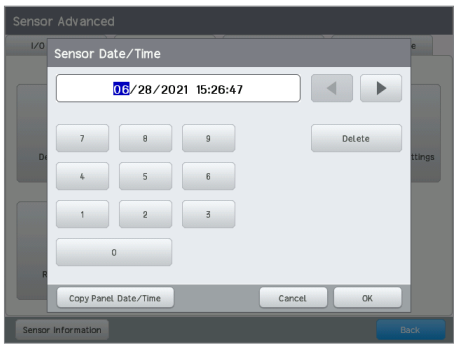
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [Sensor Date Settings] on the [Device Settings] tab.



3 Set the sensor date settings.

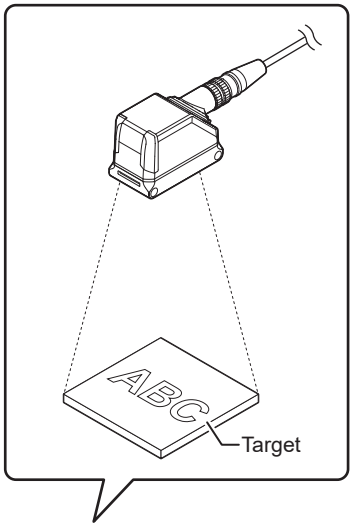


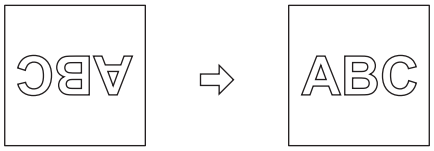
- Move to the item to be set with the ◀/▶ buttons and enter the numbers.
- Press [Delete] to reset the display of the selected item.
- Press [Copy Panel Date/Time] to set the date and time of the sensor by acquiring those in the panel.

4 Press [OK].

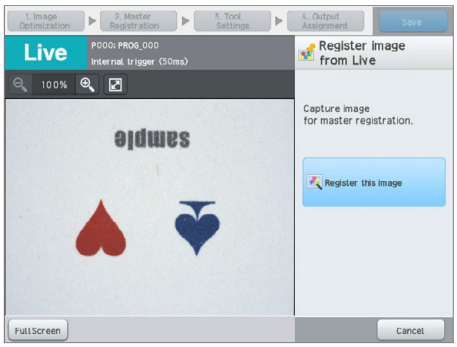
Rotate image 180°

Due to the installation restrictions of the sensor or the target, the image may be rotated.
Using [Rotate 180°] enables the image to be rotated 180°.





Before 180° rotation After 180° rotation

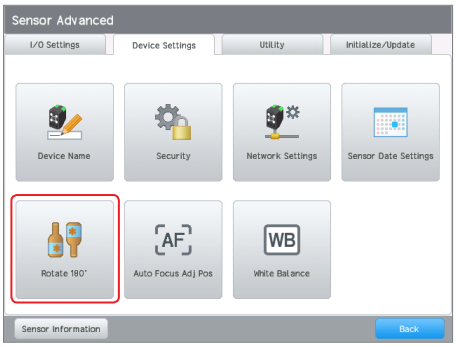


Point **If the quality of the taken image displayed on the control panel is poor, adjust the captured image in the sensor menu.**
“4 Settings Navigator” (page 4-1)

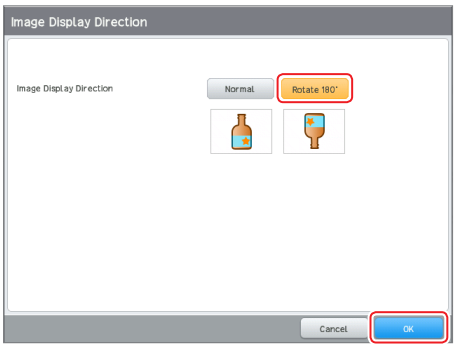
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

2 Press [Rotate 180°] on the [Device Settings] tab.



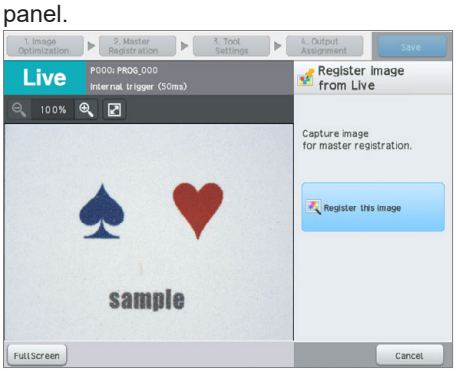
3 Press [Rotate 180°] and press [OK].



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 4-18)

4 Press [Back].

Rotates the image 180° to display it on the control panel.



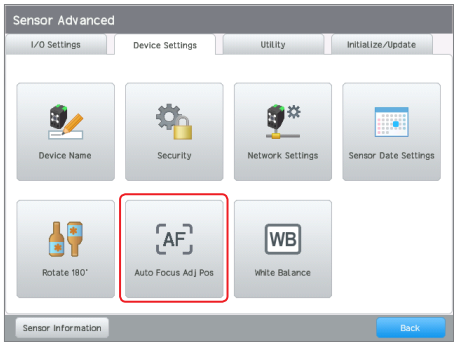
Auto Focus Adj Pos

Sets whether or not to make the adjustment position for the auto focus common to all programs.

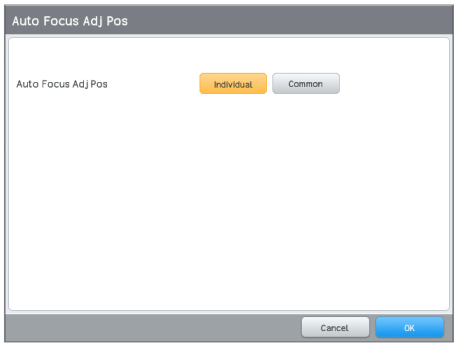
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

"Displaying the Sensor Setup Menu Screen" (page 7-2)
"Sensor Advanced Settings" (page 7-13)

2 Press [Auto Focus Adj Pos] on the [Device Settings] tab.



3 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	**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.**

4 Press [OK].

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 4-18)

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.

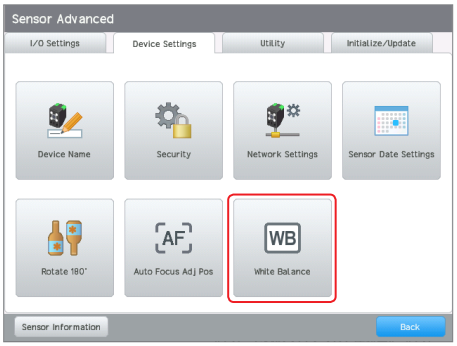
Point

When using the AI Lighting unit or polarizing filter, perform the white balance with the attachment mounted.

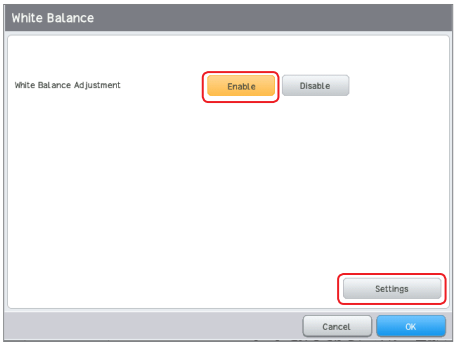
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

"Displaying the Sensor Setup Menu Screen" (page 7-2)
"Sensor Advanced Settings" (page 7-13)

2 Press [White Balance] on the [Device Settings] tab.



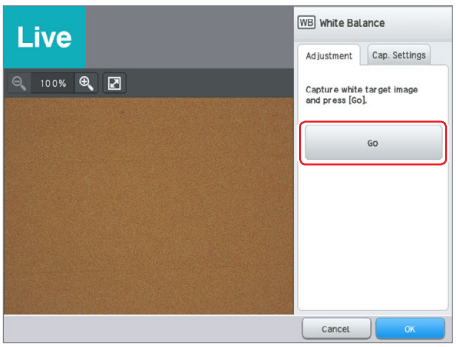
3 Set white balance adjustment to [Enable] and press [Settings].



4 Image a white-colored target and press [Go].

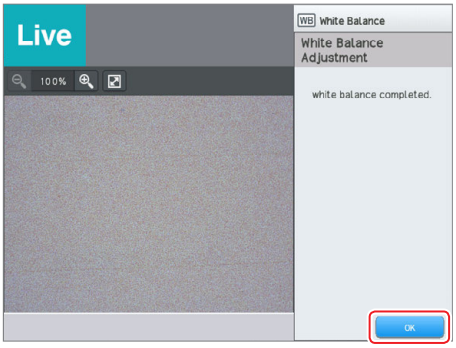
Point

If the captured image displayed on the control panel is not suitable for adjusting the white balance, press the [Cap. Settings] tab to adjust the captured 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 Adjustment” (page 4-12)**
- **“Focus Adjustment” (page 4-14)**
- **“Advanced Lighting” (page 4-13)**
- **“Digital Zoom” (page 4-15)**



When adjustment is completed, the message, “White balance completed.” opens.

5 Press [OK].



The system returns to the White Balance screen.

6 Press [OK].

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 4-18)

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.

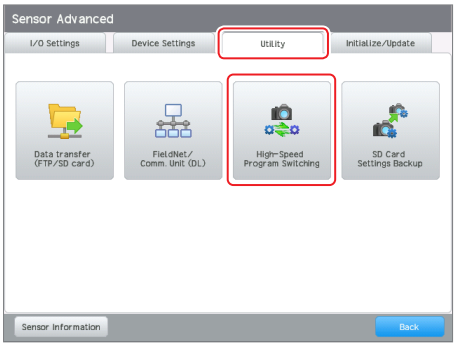
Reference

- 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).

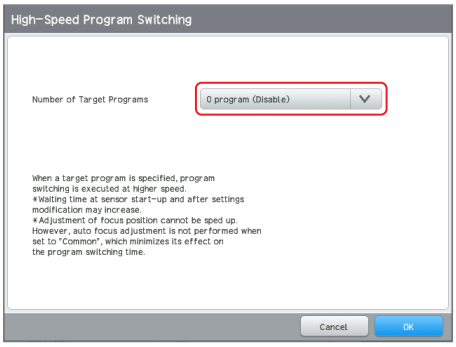
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Setting the Extended Functions of the Sensor” (page 7-13)

2 Select the [Utility] tab and press [High-Speed Program Switching].



3 Select the number of target programs from [Number of Target Programs], and then press [OK].



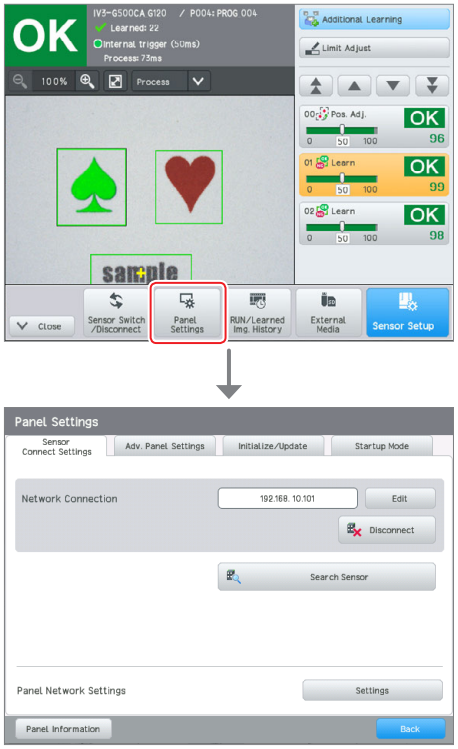
0 Program (Disable)	High-speed program switching disabled
2. Program (P000 to P001)	High-speed switching enabled, only for two programs of P000 to P001
4. Program (P000 to P003)	High-speed switching enabled, only for four programs of P000 to P003
8. Program (P000 to P007)	High-speed switching enabled, only for eight programs of P000 to P007

A progress bar will be displayed while preparing high-speed program switching.

Setting Advanced Control Panel Information

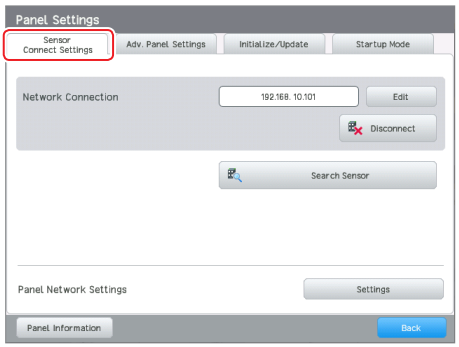
Control panel settings

This section explains the [Panel Settings] screen that is displayed by pressing [Panel Settings] when the control panel menu is displayed.



Reference The [Panel Settings] screen can also be displayed by pressing [Panel Settings] on the [Sensor Setup Menu] screen.

[Sensor Connect Settings] tab



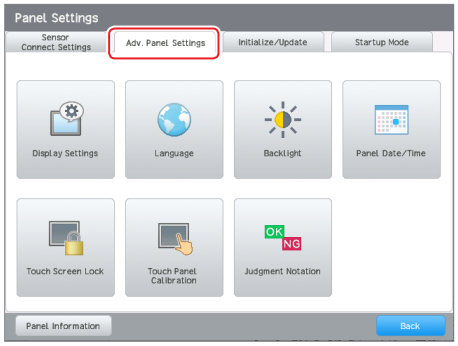
● Setting the sensor connection destination

Sets the method for connecting with the sensor.
“Connection method” (page 7-29)

● Panel Network Settings

Configures the control panel network settings.
“Panel Network Settings” (page 7-30)

[Adv. Panel Settings] tab



● Display Settings

Configures the settings for the screens and buttons displayed on the control panel.
“Display Settings” (page 7-31)

● Language

Select the language to be displayed on the control panel.
“Language” (page 7-31)

● Backlight

Configures the control panel backlight settings.
“Backlight” (page 7-32)

● Panel Date/Time

Confirms or changes the time set on the control panel.
“Panel Date/Time” (page 7-32)

● Touch Screen Lock

Configures settings to prevent the control panel being incorrectly operated.
“Touch Screen Lock” (page 7-33)

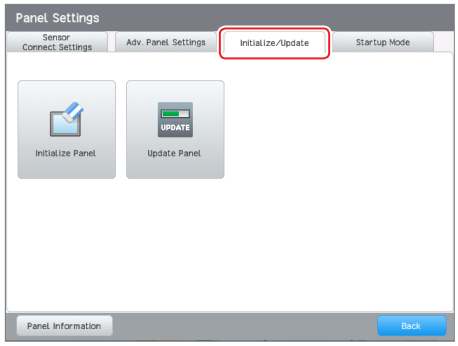
● Touch Panel Calibration

Adjusts the control panel touch position.
“Touch Panel Calibration” (page 7-34)

● Judgment Notation

Sets the notation (OK/NG) of the status results to a user-defined notation.
“Judgment Notation Settings” (page 7-34)

[Initialize/Update] tab



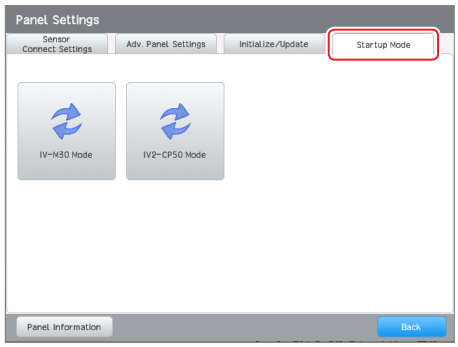
● Initialize Panel

Initializes the information set on the control panel.
“Initialization of the Control Panel” (page 3-16)

● Update Panel

Update the operation software for the control panel.
For details, refer to KEYENCE homepage.
URL: www.keyence.com/glb

[Startup Mode] tab



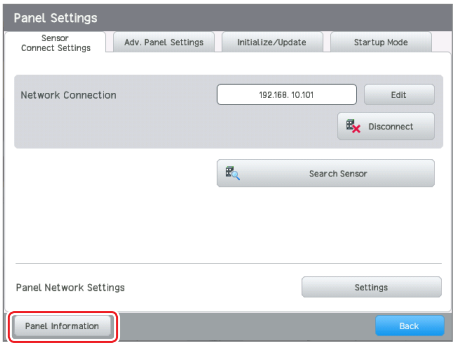
● IV-M30 Mode

Switch the control panel to IV-M30 mode. In IV-M30 mode, the control panel can be connected with the IV-series sensors.

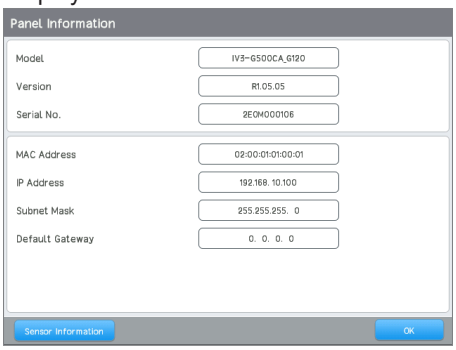
● IV2-CP50 Mode

Switch the control panel to IV2-CP50 mode. The IV2-CP50 mode can be connected to the IV2 Series sensor.

[Panel Information] button



Displays the information set on the control panel.



Reference — The sensor information (Page 7-15) can be confirmed by pressing the [Sensor Information] button at the lower left of the screen.

Connection method

Sets the sensor connection destination.

Point

Operation when connecting to an IV2 Series sensor

- **The [Startup Mode] tab appears on the panel settings screen. Press [IV2-CP50 Mode].**
- **The control panel restarts in IV2-CP50 mode.**
- **For details on connecting with the sensor of the IV2 Series, refer to "IV2 Series User's Manual (Control Panel)".**

Operation when connecting to an IV Series sensor

- **The [Startup Mode] tab appears on the panel settings screen. Press [IV-M30 Mode].**
- **The control panel restarts in IV-M30 mode.**
- **For details when connecting an IV-HG/IV-H Series sensor, refer to "IV-HG/IV-H Series User's Manual (Monitor)".**
- **For details when connecting an IV-G/IV Series sensor, refer to "IV- G/IV Series User's Manual (Monitor)."**

Performing the sensor connection

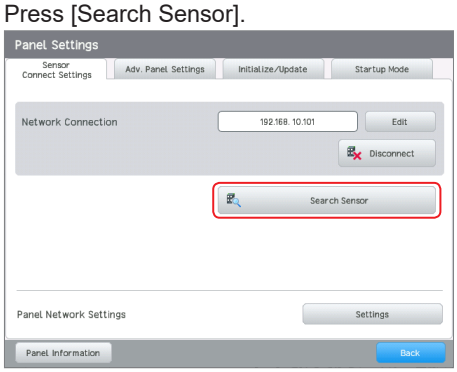
1 Display the control panel menu and press [Panel Settings].

"Control panel settings" (page 7-27)

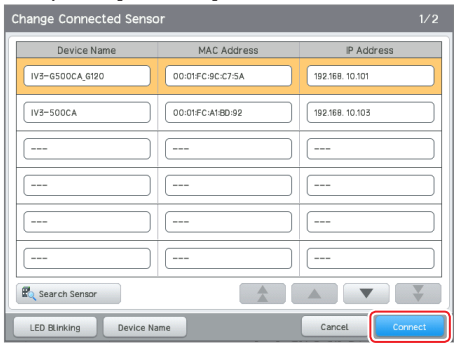
2 On the [Sensor Connect Settings] tab, specify the sensor to connect to.

● **Searching for and connecting to sensors on the network**

Press [Search Sensor].



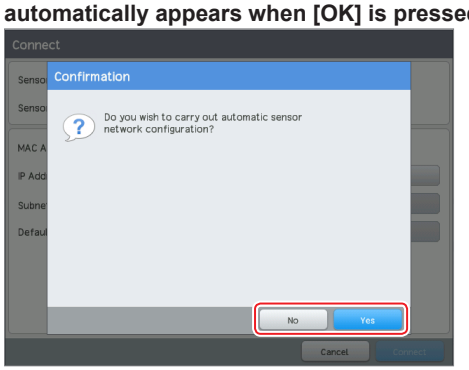
The search results will be displayed.
Select the sensor to be connected using ▲ or ▼ and press [Connect].



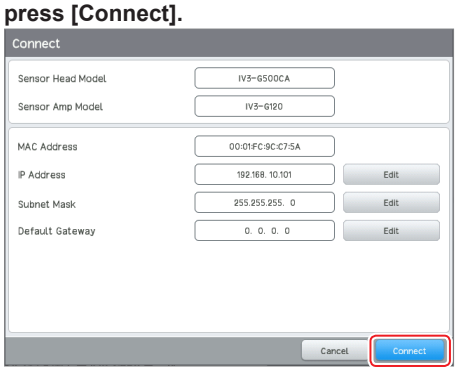
After connecting, the run screen or the [Sensor Setup Menu] screen opens.

Point

When a sensor without a set IP address is selected and [Connect] is pressed, the confirmation dialog opens.
The screen to confirm to set the default value automatically appears when [OK] is pressed.



The screen to set the sensor network settings opens when [Yes] or [No] is pressed. Press [Edit], set the IP address, the subnet mask, and the default gateway, and then press [Connect].

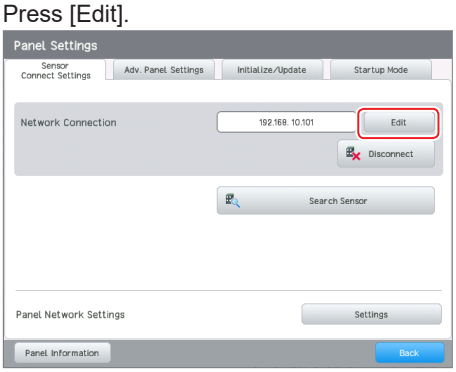


Reference

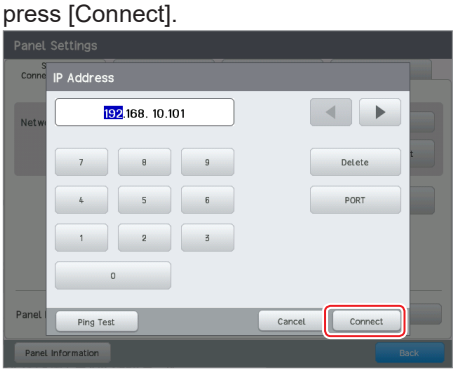
- The UDP command is used for assigning the IP address to the sensor.
- The search time is about 10 to 15 seconds.
- Up to 64 sensors can be searched.

● Specifying the IP address of and connecting to the sensor

Press [Edit].



Enter the IP address of the sensor to be connected and press [Connect].



Reference
- When [Ping Test] is pressed after the IP address is input, you can confirm whether or not a sensor with the specified IP address exists on the network.
- Set a port number using [PORT].

After connecting, the run screen or the [Sensor Setup Menu] screen opens.

Point **If the connection cannot be established, refer to “Remedy when the Software cannot be Connected with the Sensor” (page A-16).**

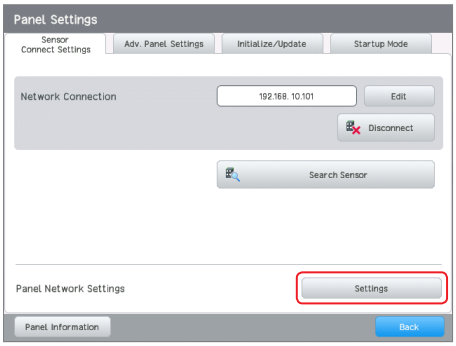
Panel Network Settings

Configures the network address settings for the control panel.

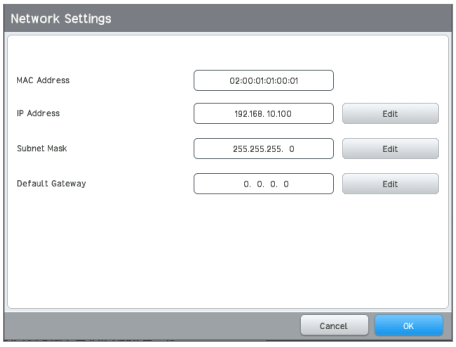
1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Settings] on the [Sensor Connect Settings] tab.



3 Configure the network address settings for the control panel.



● MAC Address

Display the MAC address for the control panel. The MAC address cannot be changed.

● IP Address/Subnet Mask/ Default Gateway

Pressing [Edit] opens the screen to edit the address. Set the desired address and press [OK].

4 Press [OK].

The message, “Panel will be restarted to apply the setting.” adjustment has been completed.” opens.

5 Press [OK].

The control panel will re-start.
After the restart, the run screen opens.

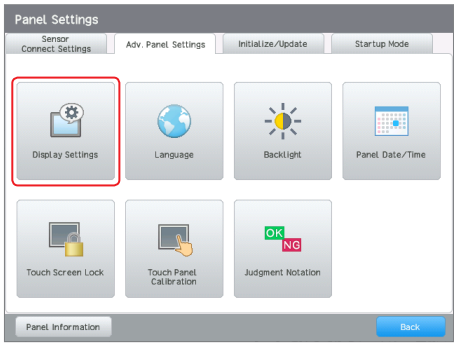
Display Settings

Sets the display method of the screens or messages to be displayed on the control panel.

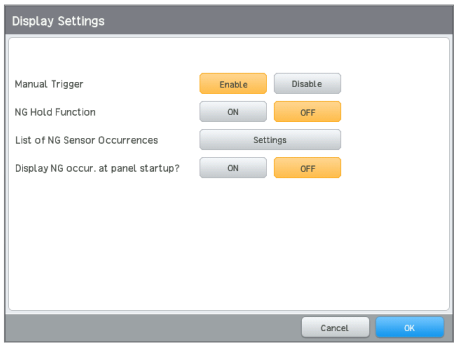
1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Display Settings] of the [Adv. Panel Settings] tab.



3 Set the individual display item.



● Manual Trigger

When the trigger option is set to the external trigger, or [Internal Trigger Control with IN1 Input] is enabled, set showing/hiding the [Trigger] button.

“Names and Functions of the Operation Screen” (page 5-4)

Reference The [Trigger] button displayed in the settings screen cannot be set to hidden.

● NG Hold Function

Set to enable/disable the NG hold function.

“Holding the Image of the Sensor on which NG Occurred (NG Hold Function)” (page 5-18)

● List of NG Sensor Occurrences

Adjust settings for the List of NG Sensor Occurrences.

“Confirming the NG Occurrence Status of the Sensor Connected (List of NG Sensor Occurrences Function)” (page 5-14)

● Display NG occur. at panel startup?

Adjust the settings of whether to display the “List of NG Sensor Occurrences” ON/OFF when starting up the control panel.

“Setting [List of NG Sensor Occurrences]” (page 5-15)

4 Press [OK].

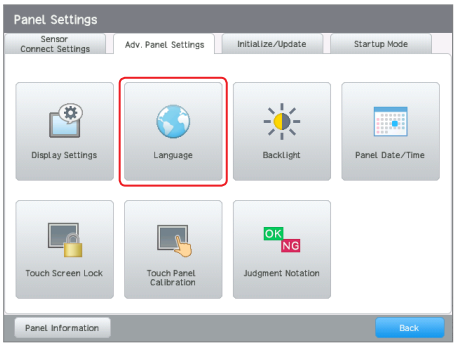
Language

Select the language to be displayed on the control panel.

1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Language] on the [Adv. Panel Settings] tab.



3 Select the button for the language to be displayed on the control panel and press [OK].



4 Press [OK].

The control panel will re-start.
After the restart, the display language will be switched to the selected language and the RUN screen opens.

Point **About the display of the characters in device names (Page 7-20) and program names (Page 7-8) when changing the display language**

- **Characters which cannot be displayed with the language after the change are replaced and displayed as hyphens (-).**
- **If the device or program name has not been changed after you changed a language, those names can be displayed as they were in the previous language once you change back to the previous language.**
- **If the device or program name has been changed after the language change, the name will remain replaced by hyphens (-) and the former information will be erased when the language is changed back to the previous language.**

Backlight

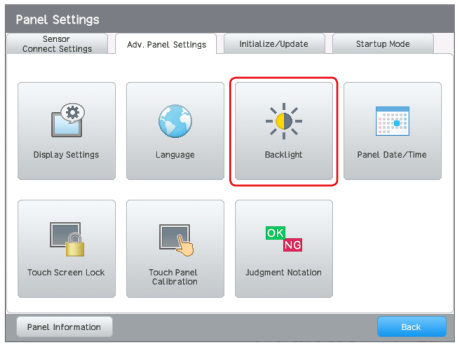
Configures the control panel backlight.

Reference The monitor exists from dim mode when the touch panel is operated or when an error occurs

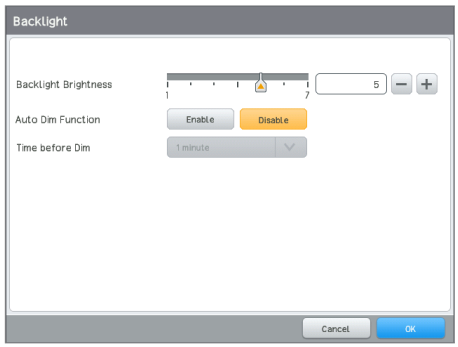
1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Backlight] on the [Adv. Panel Settings] tab.



3 Configures the control panel backlight settings.



● Backlight Brightness

Adjusts the brightness of the backlight.
The brightness can be adjusted between level 1 to 7 (default :

● Auto Dim Function

Selects the [Enable]/[Disable] for the Auto Off function.

● Time before Dim

This is available when the [Enable] is selected for the Auto Off function. Sets the time until the control panel is dimmed. After 30 minutes of the monitor being dimmed, the monitor screen will turn off.
Options: 30 seconds/ 1 minute (default value)/ 5 minutes/ 10 minutes/ 30 minutes

4 Press [OK].

Panel Date/Time

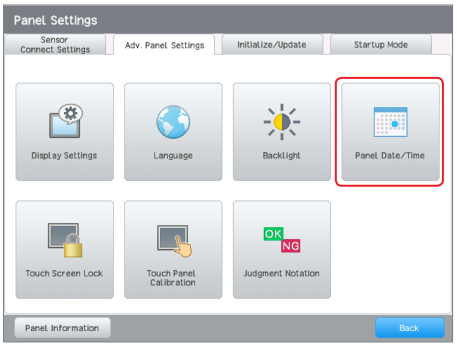
Sets the time and date on the control panel.

Reference
- This setting is adjusted by default.
- The date and time information are used for saving files into the USB memory.

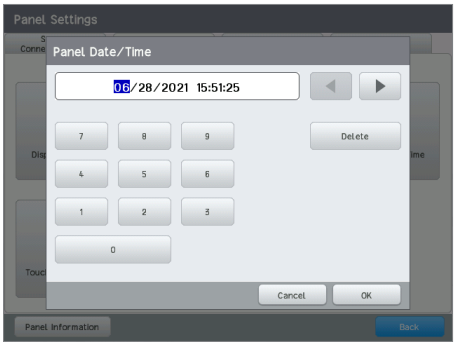
1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Panel Date/Time] on the [Adv. Panel Settings] tab.



3 Sets the time and date on the control panel.



- Move to the item to be set with the ◀/▶ buttons and enter the numbers.
- Press [Delete] to reset the display of the selected item.

4 Press [OK].

Touch Screen Lock

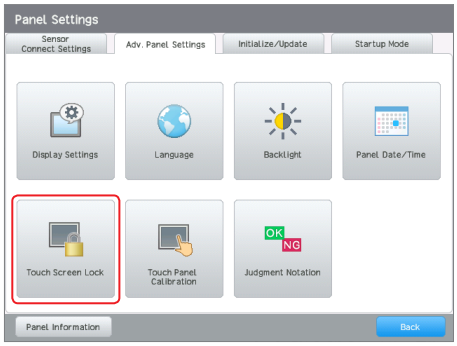
Sets the password on the control panel to prevent misoperation of the touch screen.

- Closing the menu on the RUN screen (Page 5-3) will enable the touch screen lock.
- To disable the touch screen lock, press the [Menu] button and input the password.
- When the touch screen is locked, operations other than tool selection and image capture will be locked.

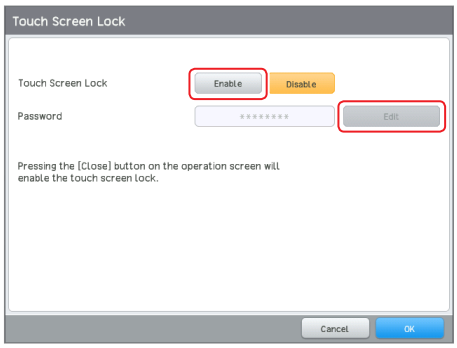
1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Touch Screen Lock] of the [Adv. Panel Settings] tab.



3 Select [Enable] and press [Edit].



4 Set a user-defined password in the password settings screen.

Up to 8 characters can be set.
Default: None (blank)

“Inputting characters” (page 3-20)

5 Press [OK].

The password confirmation dialog opens.

6 Enter the password set in step 4 and press [OK].

The system returns to the Touch Screen Lock screen.

7 Press [OK].

Point

To efficiently use [Touch Screen Lock] and [Security] (Page 7-21)

- **[Touch Screen Lock] locks the touch screen operation of the control panel to prevent misoperations of the control panel and the sensor connected to control panel.**
- **[Security] locks the sensor settings. It does not lock the operations of the control panel.**
- **To lock editing of the sensor settings when using multiple control panels or the IV3-Navigator (IV3-H1), use [Security]. This function cannot protect from misoperations by a control panel or IV3-Navigator (IV3-H1) for which [Touch Screen Lock] is not set.**

“Security” (page 7-21)

Touch Panel Calibration

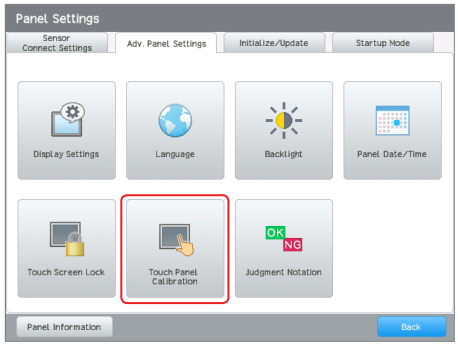
Adjusts the position of the screen operated when touched on the touch screen.

Reference This setting is adjusted by default.

1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

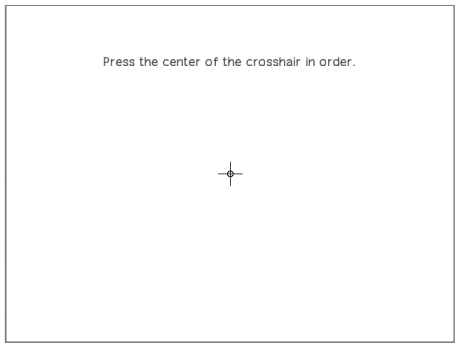
2 Press [Touch Panel Calibration] on the [Adv. Panel Settings] tab.



The confirmation screen opens.

3 Press [OK].

4 Follow the instructions displayed on the control panel and press the centers of the cross mark (⌖) in order.



After the adjustment for the positions to be tapped is completed, the message “Touch panel calibration complete. Press the screen.” opens. adjustment has been completed.” opens.

5 Tap the control panel.

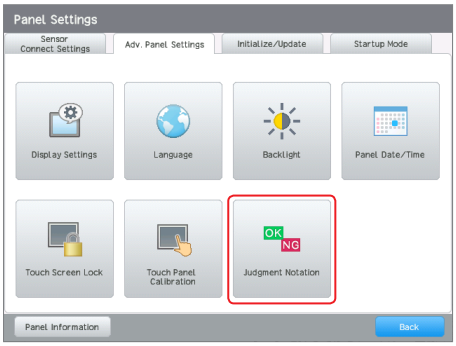
Judgment Notation Settings

Sets the notation (OK/NG) of the total status results on the run screen to a user-defined notation.

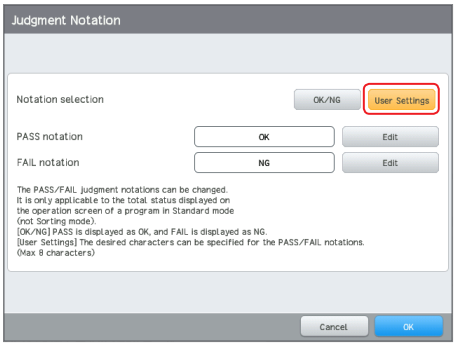
1 Display the control panel menu and press [Panel Settings].

“Control panel settings” (page 7-27)

2 Press [Judgment Notation] on the [Adv. Panel Settings] tab.



3 Select the [User Settings] button. Press [Edit] for [PASS notation] and [FAIL notation] to set the desired 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 was selected, input character strings for both good and bad products.

“Inputting characters” (page 3-20)

4 Press [OK].

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.**

8

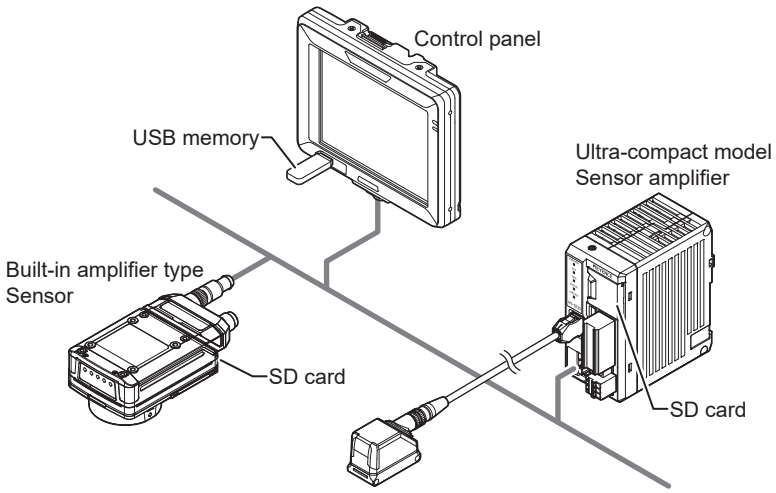
External Media

This chapter explains how to use and set up external media (USB memory and SD cards).

Overview of External Media.....8-2
Saving the Sensor Settings and Images to a USB Memory.....8-3
Setting up the SD Card 8-11
Transferring Judgment Results or Judged Images to the SD Card.....8-16
Automatically Back Up/Restore the Settings on the SD Card 8-23

Overview of External Media

This device can use external media (USB memory and SD cards).
- USB memory can be used by inserting it into the control panel.
- 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.



Functions that can use external media

USB memory

What can be performed		Function	Ref.
Saving device settings on USB memory	All	Batch Backup	8-4
	Individual programs	Individual Program Backup	8-5
Saving “Running Image History” on USB memory	All	Batch Backup	8-4
	Individual programs	Individual Program Backup	8-5
Importing settings backed up on USB memory (all programs in a batch) to the device		Batch Program Settings Transfer	8-7
Importing individual programs from setting files backed up on USB memory to the device		Individual Program Settings Transfer	8-8
Capturing an image of the control panel screen and saving it to external media		Screen Capture Function	8-9
Capturing images shot by the sensor and saving them to external media		Screen Capture Function	8-9
Using images saved on external media to set up the device	Additional Learning (learning tool)	Additional Learning	6-14
	Master Registration	Master Registration	4-20
	Color Extraction	Color Area tool Blob count tool	4-51 4-116
Updating operating software	Sensor	Update Sensor	7-15
	Control panel	Update Panel	7-28

SD card

What can be performed	Function	Ref.
Transferring image data and status results to external media	Data Transfer (SD card)	8-16
Increasing the number of programs to be changed over (Expanding the number of programs to 128)	SD Card Access Function	8-14
Automatically back up the settings for this device	Automatically back up/restore the settings on the SD card	8-23
Use the settings automatically backed up for restoration		

Saving the Sensor Settings and Images to a USB Memory

Connect the USB memory to the control panel so that the data backup, settings data transfer, and screen capture can be performed.

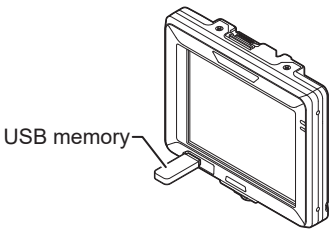
Inserting/Removing the USB memory

Inserting the USB memory

1 Open the cover of the USB connector on the control panel.

“Control panel” (page 1-18)

2 Connect the USB memory to the USB connector.



Supported formats: FAT (FAT16) / FAT32

Removing the USB memory

Point

The USB memory can be removed at any time, except while a progress bar or a dialog indicating that a saving process is in progress is being displayed.

1 Remove the USB memory from the USB connecting connector.

Displaying the USB Memory screen

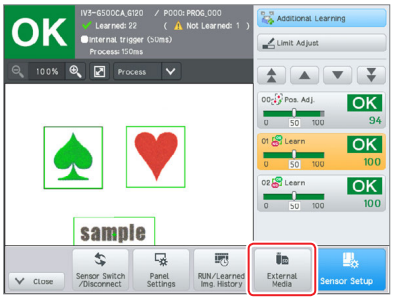
This section explains how to display the USB Memory screen.

Reference

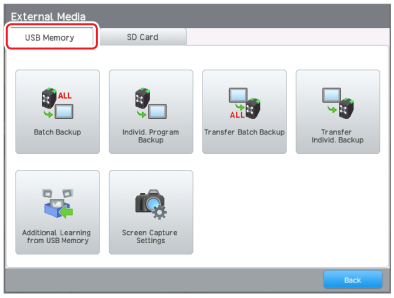
There are two methods for displaying the USB Memory screen.
The items that can be set are the same for the two methods.

Displaying from the RUN screen

1 Display the control panel menu and press [External Media].



2 Select the [USB Memory] tab.



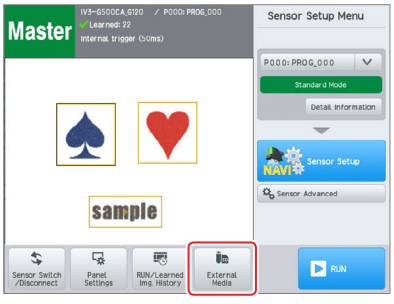
Reference

The following buttons and function are enabled when USB memory is inserted into the control panel:

- Batch Backup
- Individual Program Backup
- Batch Program Settings Transfer
- Individual Program Settings Transfer
- Additional Learning from USB Memory

Displaying from the [Sensor Setup Menu] screen

1 Press [External Media] on the [Sensor Setup Menu] screen.



The [External Media] screen opens.

Saving the Sensor Settings or the Image History

Backing up in a Batch

Backs up the data saved in the sensor into the USB memory in a batch.
When multiple sensors are to be used, the settings can be copied based on the batch backup data.
The image history of the batch backup data can be confirmed by the simulation function of IV3-Navigator.

Point

- **It is recommended to perform a batch backup of the data saved in the sensor in case of malfunction of the product.**
- **For files where the head type or power supply type is different, the settings cannot be transfered.**
- **Saving time increases when this is performed from the RUN screen. It is recommended to perform batch backup from the [Sensor Setup Menu] screen.**
- **If [SD Card Access] is set to [Enable], the program data saved on the SD card is also backed up.**

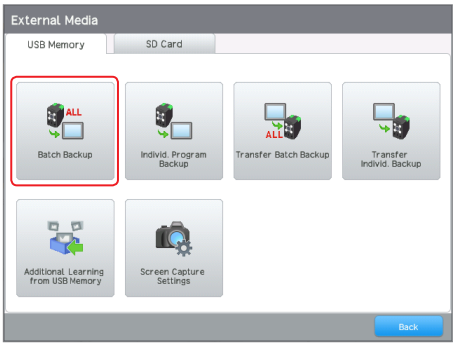
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

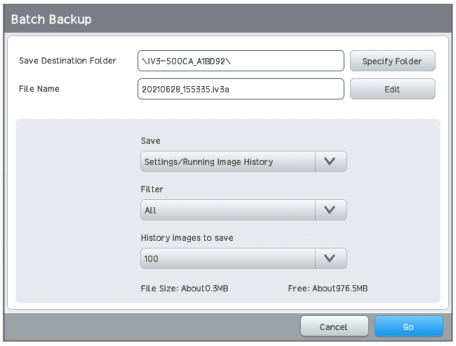
2 Display the USB memory screen.

“Displaying the USB Memory screen” (page 8-3)

3 Press [Batch Backup].



4 Configure the Batch Backup settings.



● Save Destination Folder

Displays the name of the folder to be created on USB memory. “Device name_Last 24bit of the MAC address” is the default name of the folder.
Press [Specify Folder] also enables the save folder to be changed.
“Selecting the File/Folder in the USB Memory” (page 3-21)

● File name

Displays the name of the backup file. Press [Edit] and the name can be edited to a user-defined name.
“Inputting characters” (page 3-20)

● Save

Selects the backup target.

- **Program Only**
  Backs up the sensor settings (the Sensor Setup (Settings Navigator) and Sensor Advanced settings of all programs).
- **Settings/Running Image History**
  Backs up all the images in the image history as well as the sensor settings.

Point

When the 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.

● Filter

This setting can be set when [Settings/Running Image History] is selected.
[All] or [NG Only] can be selected for the image history to be saved.

● History images to save

This setting can be set when [Settings/Running Image History] is selected.
[20], [50], or [100] can be selected for the image history to be saved.

● File Size

Displays the expected of the backup file and the free space on the USB memory.

Point

**If the file size exceeds 1 GB, you cannot back up to USB memory.
Use IV3-Navigator to save the backup file on the PC.**

5 When setting is completed, press [Go].

6 Confirm the backup result and press [OK].

The system returns to the USB memory screen.

Saving the program individually

Backs up the setting data saved in the sensor into the USB memory for each individual program.

Point **Saving time increases when this is performed from the RUN screen. It is recommended to perform batch backup from the [Sensor Setup Menu] screen.**

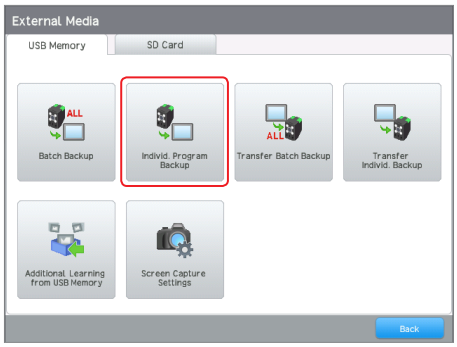
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

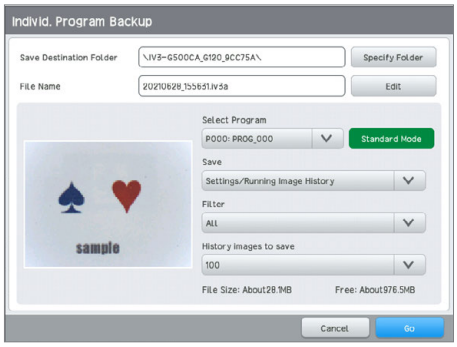
2 Display the USB memory screen.

“Displaying the USB Memory screen” (page 8-3)

3 Press [Individ. Program Backup] button.



4 Set the individual program backup settings.



● Save Destination Folder

Displays the name of the folder to be created on USB memory. “Device name_Last 24bit of the MAC address” is the default name of the folder.
Press [Specify Folder] also enables the save folder to be changed.
“Selecting the File/Folder in the USB Memory” (page 3-21)

● File name

Displays the name of the backup file. Press [Edit] and the name can be edited to a user-defined name.
“Inputting characters” (page 3-20)

● Select Program

Specifies the program number which is to be individually backed up.

● Save

Selects the backup target.

- **Program Only**
  Backs up the sensor settings (the Sensor Setup (Settings Navigator) and Sensor Advanced settings of the selected programs).
- **Settings/Running Image History**
  Backs up the image history for the selected program in addition to the sensor settings.

Point **When the image history has been saved while in [RUN], the images saved object may be updated and deleted during the individual program backup. A deleted image is not saved. Because of this, saving while in [Program] is recommended.**

● Filter

This setting can be set when [Settings/Running Image History] is selected.
[All] or [NG Only] can be selected for the image history to be saved.

● History images to save

This setting can be set when [Settings/Running Image History] is selected.
[20], [50], or [100] can be selected for the image history to be saved.

● File Size

Displays the expected of the backup file and the free space on the USB memory.

Point **If the file size exceeds 1GB, saving to the USB memory is not possible.
Use IV3-Navigator to save the backup file on the PC.**

5 When setting is completed, press [Go].

6 Confirm the backup result and press [OK].

The system returns to the USB memory screen.

Saving images from the running image history individually

Saves the image detail screen of the running image history screen as a screen capture and saves it to USB memory.

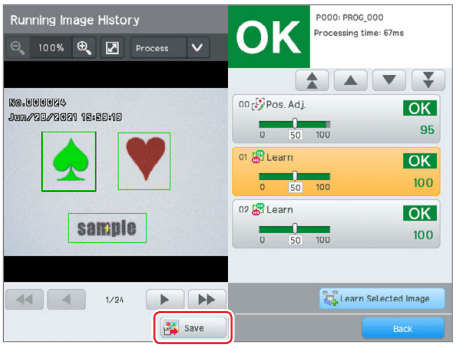
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

2 Display the image detail screen of the running image history.

“Loading and confirming saved images” (page 5-21)

3 Press [Save].



Saving images from the learned image history individually

Saves the image detail screen of the learned image history as a screen capture and saves it to USB memory.

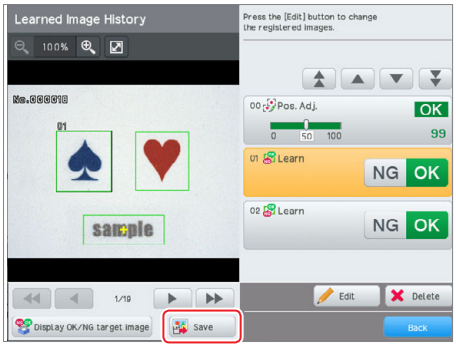
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

2 Display the image detail screen of the learned image history.

“Image Detail Screen of the Learned Image History” (page 6-10)

3 Press [Save].



Transferring the settings backed up in the USB memory 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 8-4)
- **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 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 USB memory to the sensor.
“Backing up in a Batch” (page 8-4)
“Saving the program individually” (page 8-5)

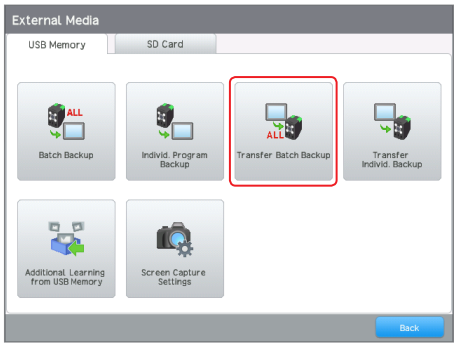
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

2 Display the USB memory screen.

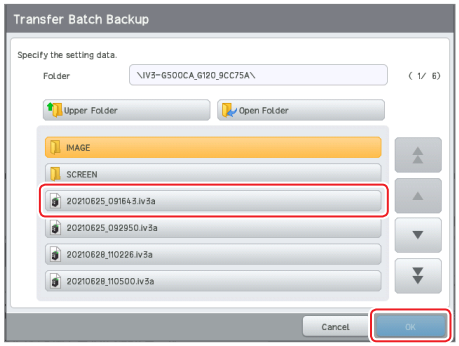
“Displaying the USB Memory screen” (page 8-3)

3 Press [Transfer Batch Backup]



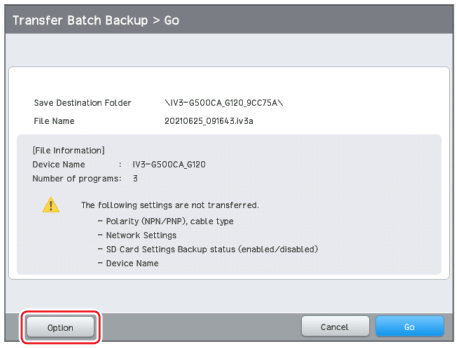
4 Press [OK] in the confirmation screen.

5 Select a batch backup file to be transferred (*.iv3a), and press [OK].

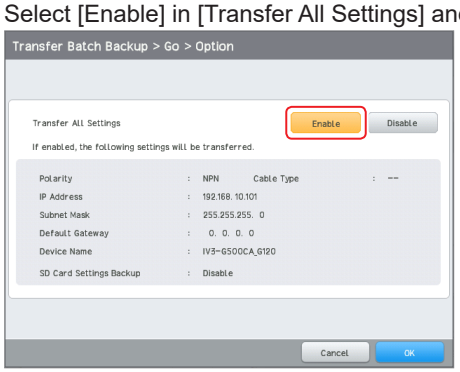


“Selecting the File/Folder in the USB Memory” (page 3-21)

6 If it is necessary to transfer the I/O polarity (NPN/PNP) and the network settings, press [Option].



Select [Enable] in [Transfer All Settings] and press [OK].



Point

The setting for [Transfer All Settings] is reset to [Disable] after the setting data is transferred or when the setting is canceled.

7 Confirm the information of the settings file to be transferred and press [Go].

After the settings data is transferred, the transmission result will be displayed on the control panel.

Point

When the protocol setting has been changed, connection is terminated and the sensor restarts.

8 Confirm the transmission result and press [OK].

The system returns to the USB memory screen.

Reference

When [Transfer All Settings] has been set to [Enable], the system returns to the [Panel Settings] screen.

Transferring the program individually

Transfers the program (individual backup file) saved in the USB memory to the sensor.
“Backing up in a Batch” (page 8-4)
“Saving the program individually” (page 8-5)

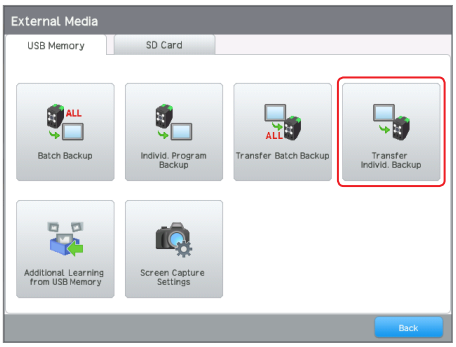
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

2 Display the USB memory screen.

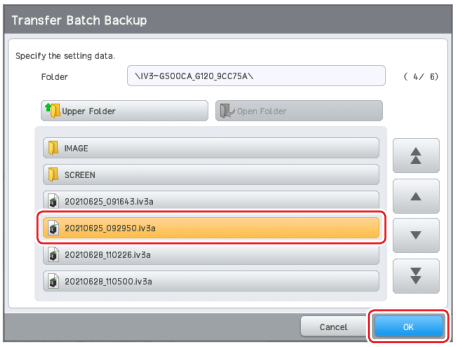
“Displaying the USB Memory screen” (page 8-3)

3 Press [Transfer Individ. Backup].



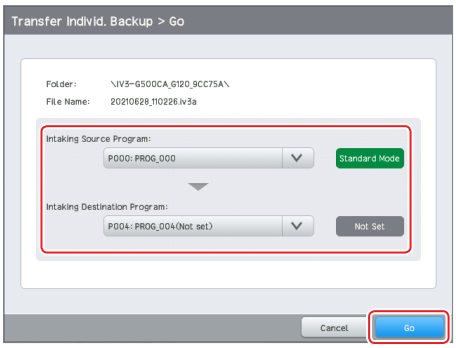
4 Press [OK] in the confirmation screen.

5 Select a batch backup file (*.iv3a) or an individual program backup file (*.iv3a) including the individual program to transfer, and press [OK].



“Selecting the File/Folder in the USB Memory” (page 3-21)

6 Select the number of the source program and the number of the destination program, and press [Go].

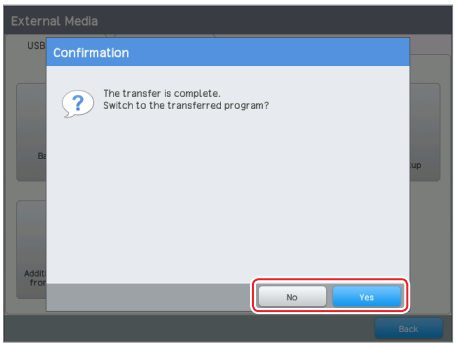


Point **When the destination program is already set, the confirmation screen appears. Press [OK].**

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.

7 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 USB memory screen.

Capturing the control panel screen and saving it to USB memory

Save the run screen or settings screen of the control panel in the USB memory as an image file (BMP).
The saved image files can be imported into the PC and used images for creating reports.

Enabling the screen capture function

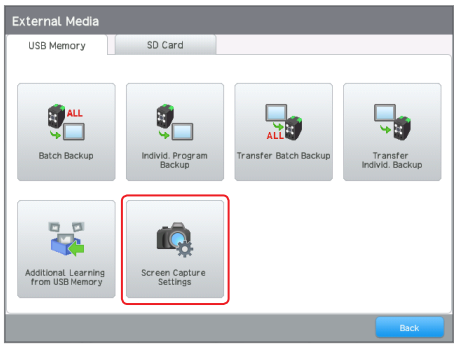
1 Connect the USB memory to the USB connector on the control panel.

“Inserting the USB memory” (page 8-3)

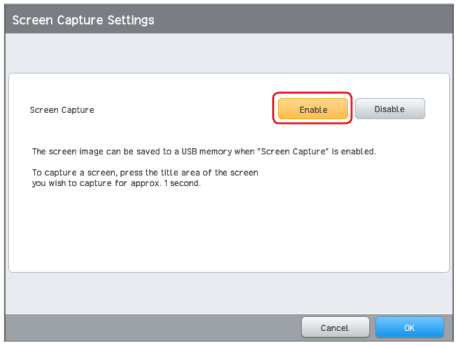
2 Display the USB memory screen.

“Displaying the USB Memory screen” (page 8-3)

3 Press [Screen Capture Settings].



4 Select [Enable] and press [OK].



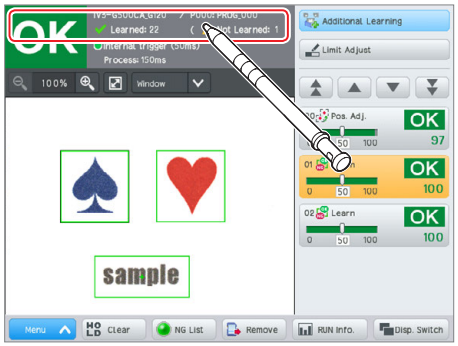
The system returns to the USB memory screen.

Capturing the screen

1 Enable the screen capture function.

“Enabling the screen capture function” (page 8-9)

2 Display the screen to be captured and press the title area at the upper part of the screen (any part other than a button) for about one second.



Capture will be executed and the completion message appears for a few seconds.

Reference

- Any setup screen can be captured by pressing the title area.
- When the screen that displays the taken image is captured, three types of files (screen capture (.bmp), raw image (.jpg), and image capture (.iv3p) files) are saved at the same time.
- For details of the saved folder or file name, refer to “USB memory folder composition and file naming rules” (page 8-10).
- In some cases, such as when choice items of a pulldown menu are being displayed or during file processing, screens cannot be captured.

USB memory folder composition and file naming rules

Data type	Storage Rule		Description	Ref.
Batch Backup	Storage folder	\(Device name of the sensor) _(Last 24 bit of the MAC address)	Batch saves all the settings in the sensor. [Program Only] or [Settings/Running Image History] can be selected.	8-4
	File name	YYYYMMDD_hhmmss *1		
	Extension	iv3a		
Individual Program Backup	Storage folder	\(Device name of the sensor) _(Last 24 bit of the MAC address)	Save the settings inside the sensor by individual program. [Program Only] or [Settings/Running Image History] can be selected.	8-5
	File name	YYYYMMDD_hhmmss *1		
	Extension	iv3a		
Screen capture (with taken images)	Storage folder	\(Device name of the sensor) _(Last 24 bit of the MAC address)\IMAGE	Captured .jpg image files and files designated for the IV3 Series are simultaneously saved.	8-9
	File name	YYYYMMDD_hhmmss *1		
	Extension	jpg		
		iv3p		
Screen capture	Storage folder	• **When the sensor is connected** \(Device name of the sensor)_(Last 24 bit of the MAC address)/SCREEN • **When the sensor is not connected** \IV2-CP50	Saves an image, including the title area and the buttons, of the currently displayed screen.	8-9
	File name	YYYYMMDD_hhmmss *1		
	Extension	bmp		

*1 YYYY: Year, MM: Month, DD: Day, hh: Hour, mm: Minute, ss: Second
When saving the batch backup and individual program backup, the file name can be changed to any name and saved.

▶ Important

- **The numbers of files to be saved in each folder must be 100 files or less.**
  If there are more than 100 files in a folder, files may not be saved correctly.
  For a folder with a number of files over 100 files, delete unnecessary files or change the folder used.
- **The total numbers of sub folders and files in each folder (iv3a files or iv3p files) that can be displayed on the screen to select a file (Page 3-21) is 128.**
- **If characters which cannot be displayed correctly with the current display language (Page 7-31) are included in the folder or file names, the folders or files will be saved with those characters replaced by hyphens (-).**

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

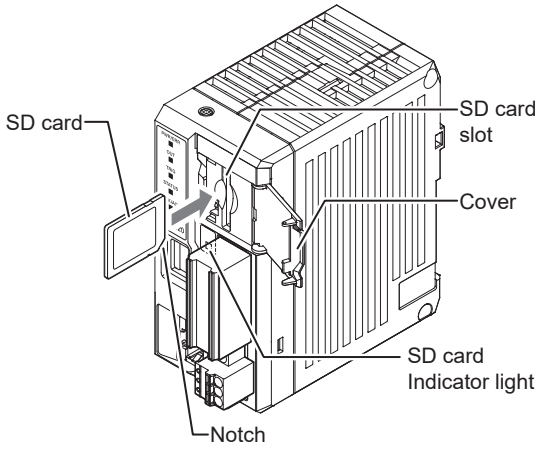
Inserting the SD Card

■ 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).

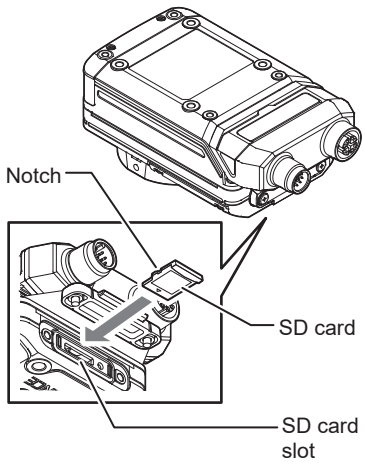
Point **After inserting the SD card, make sure to close the cover. If the cover is left open, the sensor amplifier cannot recognize the SD card.**

■ 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 left 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).**

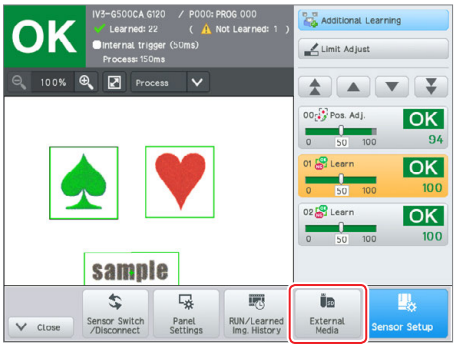
3 **Close the cover, and fix the sensor with two fall prevention screws.**

- Tightening torque: 0.15 to 0.20 N·m

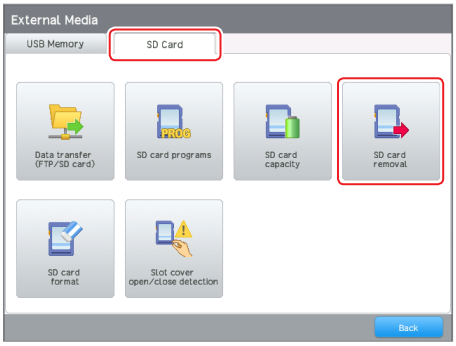
Removing the SD card

Point
- **Always perform the [SD card removal] procedure before removing the SD card.**
- **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. Also, the control panel may restart.**

1 **Display the control panel menu and press [External Media].**



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.**

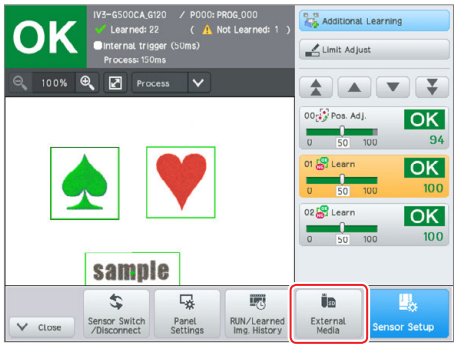
- Built-in amplifier type: tightening torque: 0.15 to 0.20 N·m

Displaying the SD Card Screen

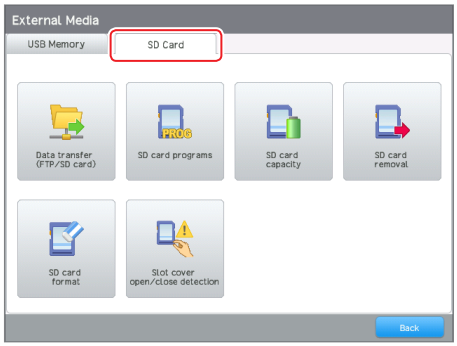
This section explains how to display the SD card screen.

Reference The [SD Card] screen can also be displayed by pressing [External Media] on the [Sensor Setup Menu] screen.

1 Display the control panel menu and press [External Media].



2 Select the [SD Card] tab.



Reference The following buttons are enabled when the SD card is inserted:

- [SD card programs] button
- [SD card capacity] button
- [SD card removal] button
- [SD card format] button

● Data Transfer (FTP/SD card)

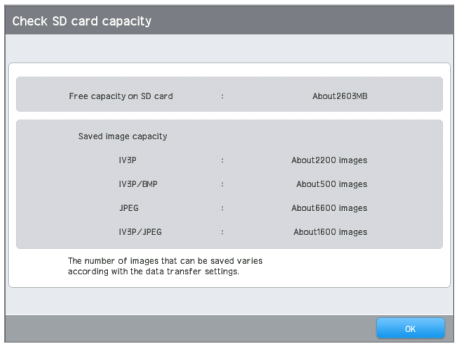
Automatically transfers the image data and status result information saved in the sensor memory to an SD card.
“Transferring Judgment Results or Judged Images to the SD Card” (page 8-16)

● SD card programs

Expands the number of available programs on the sensor to a maximum of 128.
“Transferring Program Settings” (page 8-14)

● SD card capacity

Displays the amount of memory available on the SD card.



● SD card removal

Allows the SD card to be properly remove.
“Removing the SD card” (page 8-12)

● SD card format

Formats the SD card.
“Formatting the SD card” (page 8-15)

● Slot cover open/close detection

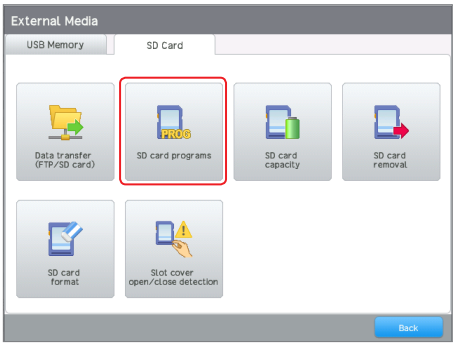
Use this button if the SD card slot cover breaks.
“Slot cover open/close detection (ultra-compact model only)” (page 8-15)

Transferring Program Settings

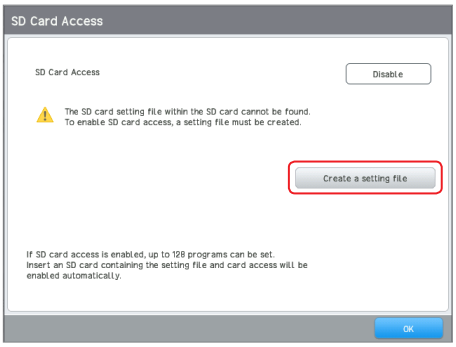
1 Display the [SD Card] screen.

“Displaying the SD Card Screen” (page 8-13)

2 Press [SD card programs].

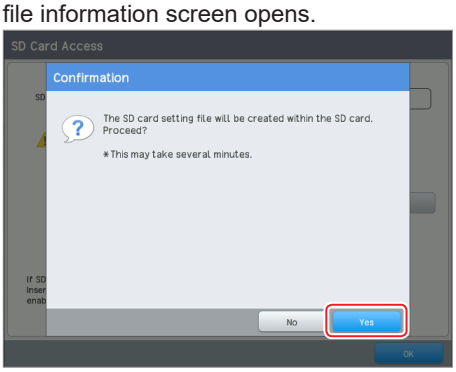


3 Press [Create a setting file].

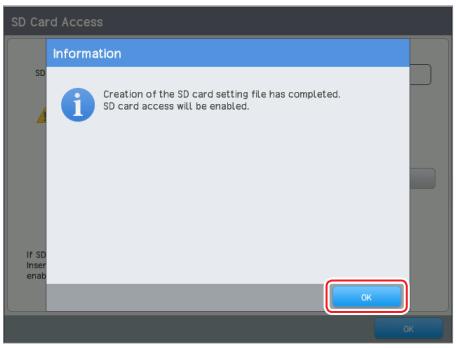


4 Press [Yes] in the confirmation screen.

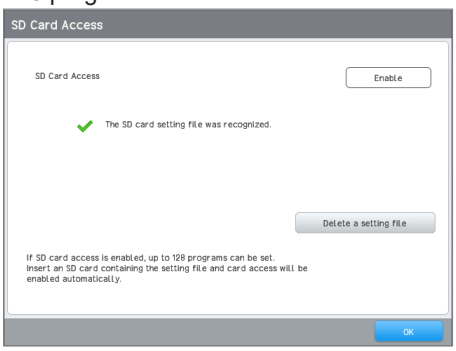
Once the transfer program settings file is created, the file information screen opens.



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 a setting file].**
- **Expansion files created on a different sensor head model cannot be recognized.**

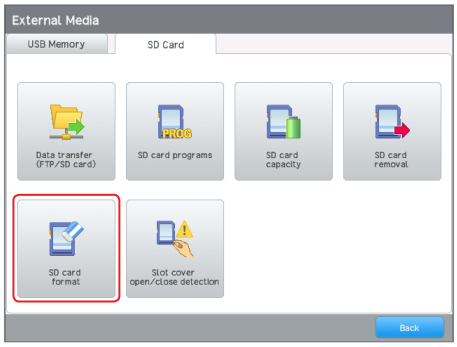
Formatting the SD card

Point **If [SD Card Access] (Page 8-14) is set to [Enable] and the [SD card format] procedure is performed, the transfer program settings will be disabled.**

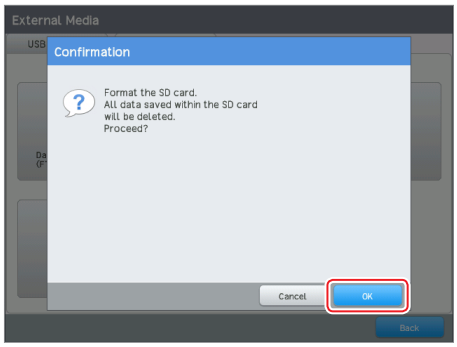
1 Display the [SD Card] screen.

“Displaying the SD Card Screen” (page 8-13)

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

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.

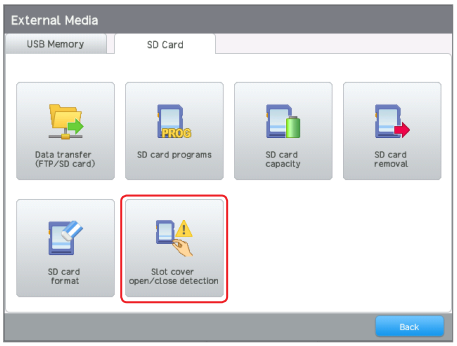
Point **In most situations, use the device with this function set to [Enable] (default).**
Re-enable the function once the device has been repaired.

Reference The built-in amplifier type will not be displayed.

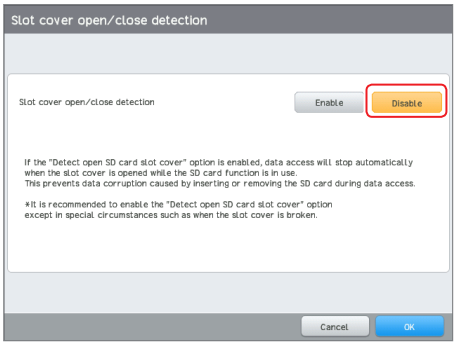
1 Display the [SD Card] screen.

“Displaying the SD Card Screen” (page 8-13)

2 Press [Slot cover open/close detection].



3 To disable the function that detects that the SD card slot cover is open or closed, 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.

4 When setting is completed, press [OK].

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 8-11)

Setting up the SD Card Data Transfer Function

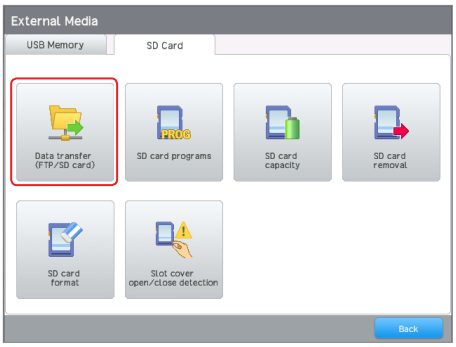
1 **Insert the SD card into the sensor amplifier.**

“Inserting the SD Card” (page 8-11)

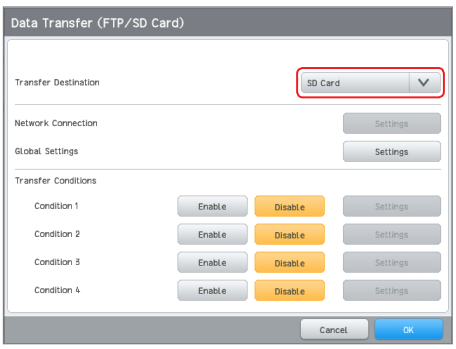
2 **Display the [SD Card] screen.**

“Displaying the SD Card Screen” (page 8-13)

3 **Press [Data transfer (FTP/SD Card)].**



4 **Press [SD Card] for [Transfer Destination].**



Point

- **You can select any of [FTP], [SFTP], or [SD Card] as the transfer destination. You cannot transfer data to all destinations at the same time.**
- **When you change the transfer destination from [SD Card], the [Index Upper Limit] and [Create Subfolder] settings are initialized.**

5 **Configure the SD card data transfer settings.**

“Global Settings” (page 8-17)
“Setting the Transfer Conditions” (page 8-18)
“Setting the Transfer Destination Folder and File Names” (page 8-20)

6 **Press [OK].**

7 **Start the run mode.**

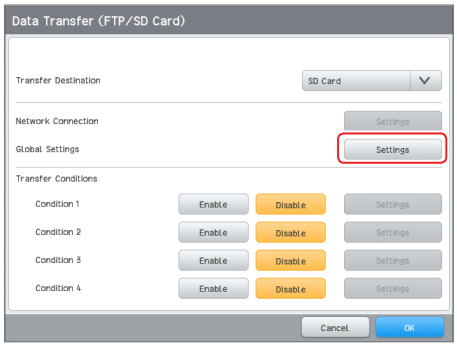
Once the target is judged, the specified data file is automatically transferred to the SD card.

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 7-18) 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 8-17).**
- **When the transfer condition is set to [All], confirm that there is sufficient storage on the SD card.**

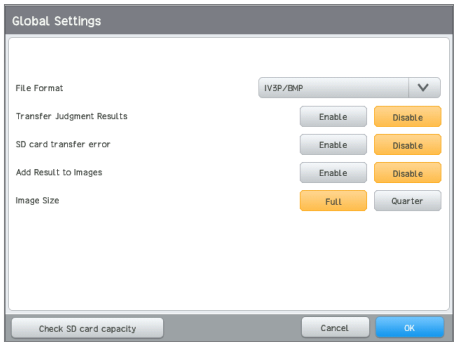
Global Settings

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	2021/1/12	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, select [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.**

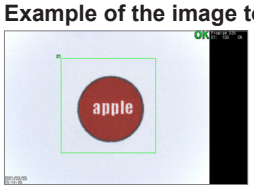
“Clearing Errors” (page 10-12)

● Add Result to Images

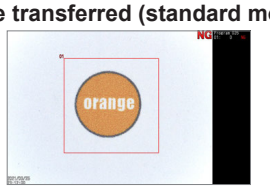
Press [Enable] to add the tool window (frame), total status results (standard mode: OK/NG, sorting mode: master number), program number, matching rate for each tool and status result, and capture date information to the image data to be transferred to the SD card.
The setting can be made only when BMP or JPEG are included in the file format.

❍ Example of the image to be transferred

Example of the image to be transferred (standard mode)

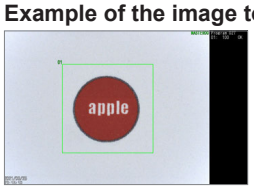


Total Status OK

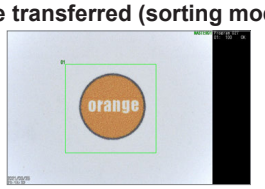


Total Status NG

Example of the image to be transferred (sorting mode)



Part Type Discrimination MASTER00



Part Type Discrimination MASTER01

Reference The judgment notation settings (Page 7-34) 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 8-22)

● Check SD card capacity

Displays the amount of memory available on the SD card.

3 Press [OK].

The system returns to the main screen of Data transfer (FTP/SD Card).

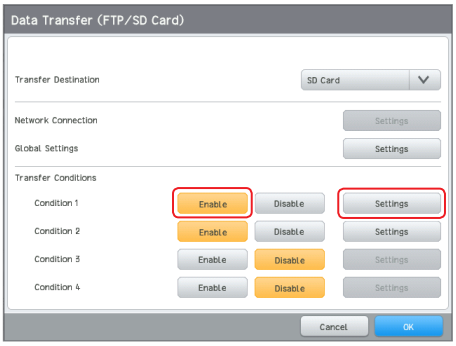
Setting the Transfer Conditions

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 conditions 1 to 4 to be enabled.

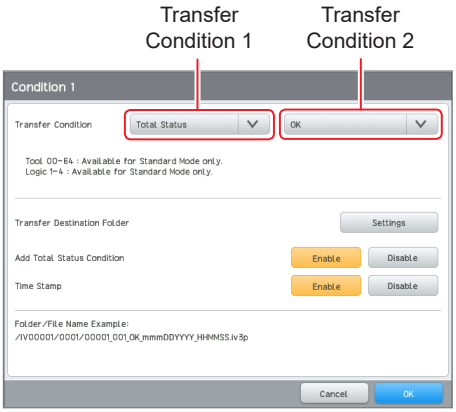
2 Press [Settings] of the enabled condition.



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 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 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 SD card.

“Setting the Transfer Destination Folder and File Names” (page 8-20)

● 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 standard mode: filename_001_OK.iv3p
filename_001_NG.iv3p
In 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)

Example: filename_20210106_141510.iv3p

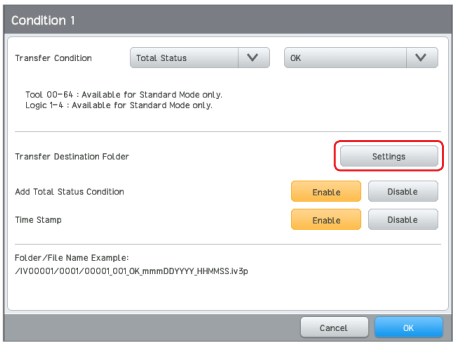
4 Press [OK].

The system returns to the main screen of Data transfer (FTP/SD Card).

Setting the Transfer Destination Folder and File Names

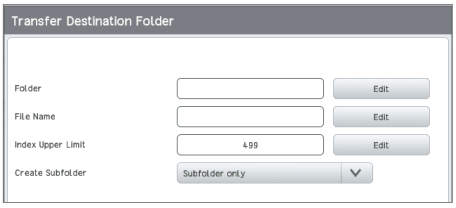
Reference For detailed specifications of the transfer destination folder and file name, refer to the following:
- “Details of the transfer destination folder” (page 8-21)
- “Details of the file name” (page 8-22)

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.
“Inputting characters” (page 3-20)

- 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.

When [Edit] is pressed, the “Folder” screen opens.
Set a user-defined folder name and press [OK].

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))
Press [Edit] to change the file name to a name up to 16 characters in length.
“Inputting characters” (page 3-20)

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 [Create Subfolder] is set to any setting other than [No Sorting with Folders], a 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

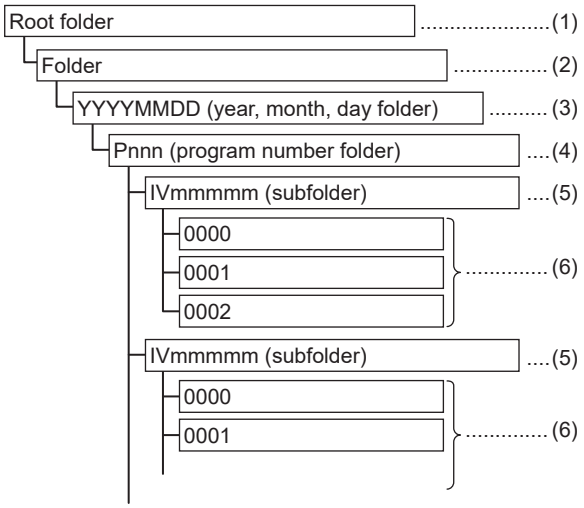
A YYMMDD folder/program number folder/subfolder will be created.

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 the [OK] button.

The system returns to the main screen of Data transfer (FTP/SD Card).

● 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 8-20) 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) YYMMDD folder
If [Create Subfolder] is set to [Date], [Program/Date], or [Date/Program], a YYMMDD 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 8-20), a new folder with the next sequential number will be created.

Reference
- You can create any YYMMDD 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	_bbbbb	_ccc	_ddd	_YYYYMMDD_hhmmss	.eee

❍ Explanation of file names

- aaaa .....Set file name (Page 8-20). If this setting is blank, a name will not be appended.
- bbbbb .....The 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 8-20) 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.
- ddd .....In 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 8-19)
- YYYYMMDD ....The date (year, month, and day) the file is transferred.“Time Stamp” (page 8-19)
- hhmmss .....The time (hour, minutes, and seconds) the file is transferred.
- eee .....The 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 8-17)

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

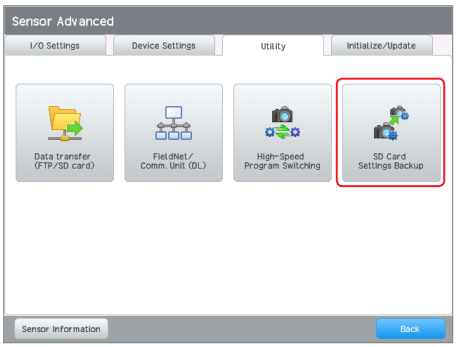
- **Backup when settings are updated and restoration when a sensor is replaced is performed automatically. Operation from IV3-CP50 is not necessary.**
- **A USB memory stick can also be used for backing up and restoring settings.**
- **To copy settings for sensors that have expansion programs enabled 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 8-4)
“Transferring the settings backed up in the USB memory to the sensor” (page 8-7)

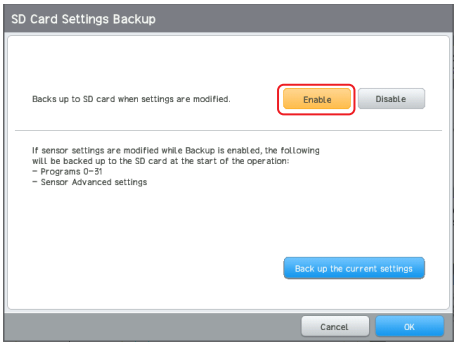
Setting Up SD Card Settings Backup

1 Insert the SD card into the sensor.

2 Press [SD Card Settings Backup] on the Sensor Advanced screen.

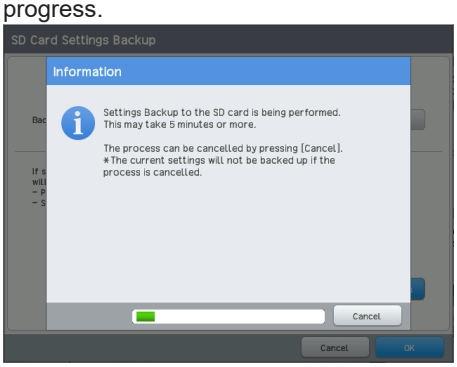


3 Set [Backs up to SD card when settings are modified.] to [Enable].



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.



The dialog box will close once backup completes.

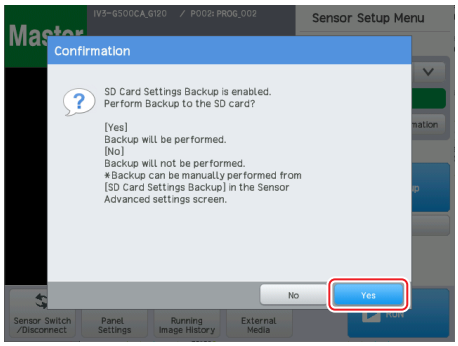
5 Press [OK].

Checking Backups When Changing Sensor Settings

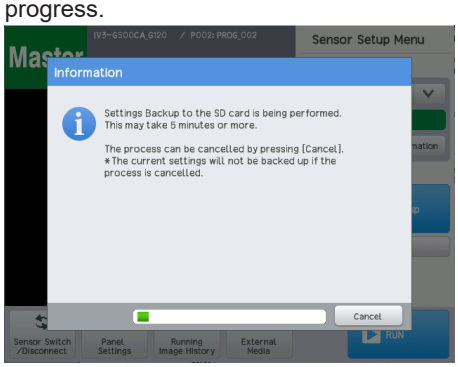
1 After changing sensor settings, go to the run screen.

A dialog box appears confirming backup.

2 Press [Yes].



A dialog box appears indicating that backup is in progress.



The dialog box will close once backup completes.

Point

- **If the SD card settings backup is set to [Enable], initializing the sensor (Page 3-15) 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 6-17)

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.

9

Connecting to a Network

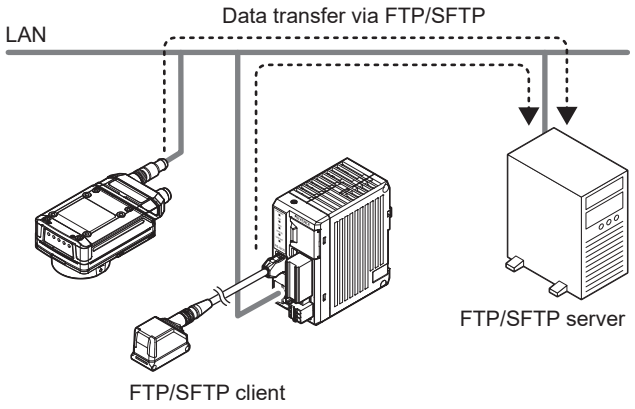
This chapter explains the procedures to connect this device to a network.

Saving Judgment Results and Judged Images to an FTP/SFTP server.....9-2
Connecting to a Field Network.....9-10

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

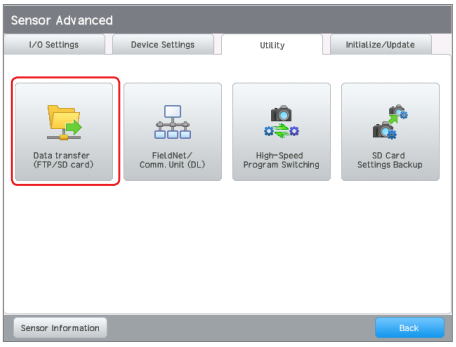
1 Configure the network settings for the sensor.

Set the IP address, subnet mask, and default gateway for the sensor.
“Network Settings (Sensor)” (page 7-22)

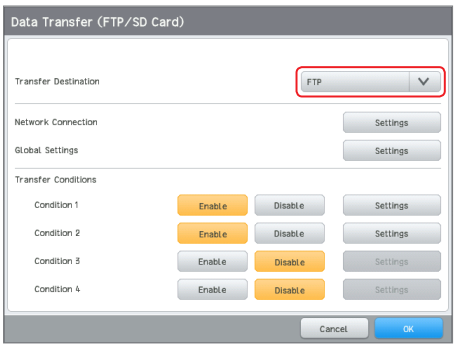
2 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

“Displaying the Sensor Setup Menu Screen” (page 7-2)
“Sensor Advanced Settings” (page 7-13)

3 Press [Data transfer (FTP/SD Card)] on the [Utility] tab.



4 Select [FTP] or [SFTP] as [Transfer 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.**

5 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)

6 Press [OK].

The system returns to the [Sensor Advanced] screen.

7 Start the run mode.

Once the target is judged, the specified data file is automatically transferred to the FTP/SFTP server.

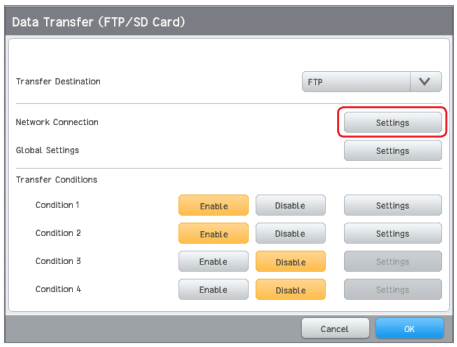
Point

- **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.**

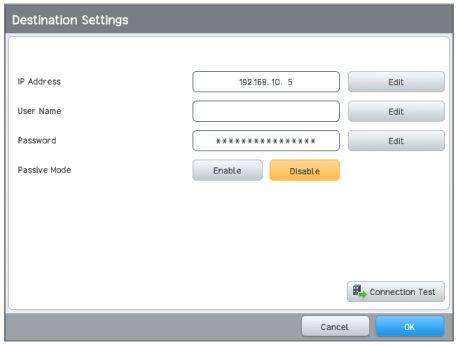
Setting the Connection Destination

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.
Press [Edit] to set the desired address.

Reference
- The port number settings will be set in the edit screen of the IP address.
- The default values of the port numbers are 21 for FTP and 22 for SFTP.

● User Name

Input the user name (max.: 48 characters) to log in to the FTP/SFTP server.
(Default: Not set (blank))
Press [Edit] to set the desired user name.
“Inputting characters” (page 3-20)

● Password

Input the password (max.: 16 characters) to log in to the FTP/SFTP server.
(Default: Not set (blank))
Press [Edit] to set the desired password.
“Inputting characters” (page 3-20)

● Passive Mode

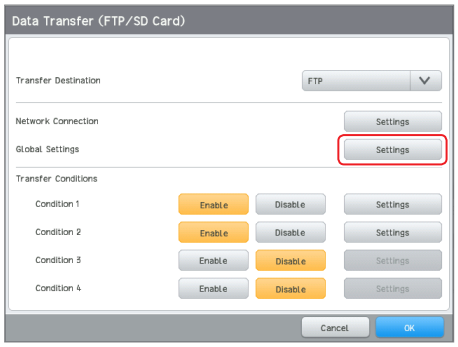
To use the passive mode for FTP, select [Enable]. The passive mode cannot be used for SFTP.

3 Press [OK].

The system returns to the main screen of Data transfer (FTP/SFTP/SD Card).

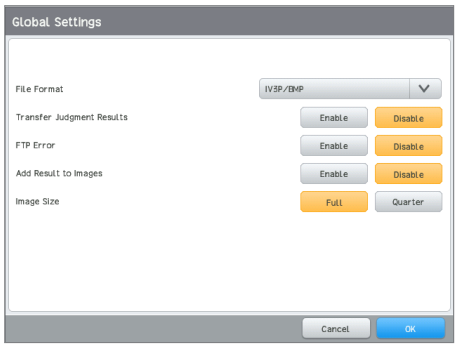
Global Settings

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	2021/1/12	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)**

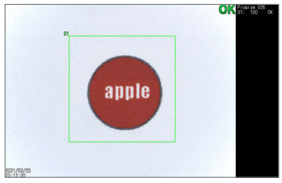
  “Remedy when data transfer via FTP/SFTP is unavailable” (page A-24)
- **The error output function turns ON.**
- **The indicator light of the sensor blinks in red.**
- **If “FTP Transfer Error” has occurred while the sensor is running, the error condition will continue until the error is cleared.**

  “Clearing Errors” (page 10-12)

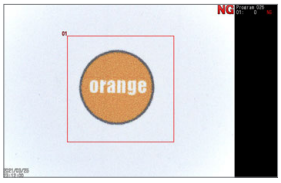
● Add Result to Images

Press [ON] 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 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)

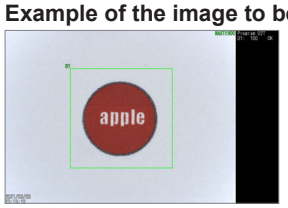


Total Status OK

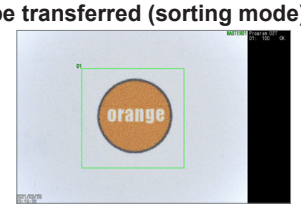


Total Status NG

Example of the image to be transferred (sorting mode)



Part Type Discrimination MASTER00



Sort Status MASTER01

Reference The judgment notation settings (Page 7-34) 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 main screen of Data transfer (FTP/SD Card).

Setting the Transfer Conditions

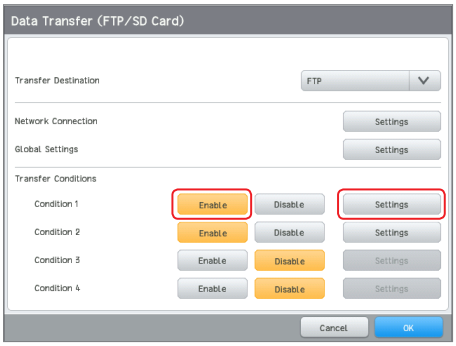
Up to 4 transfer conditions can be set. The setting contents of each transfer condition are the same.

Point

Each transfer condition operates independently. Therefore, if judgment is duplicated, the file may be overwritten.

1 Press [Enable] of the conditions 1 to 4 to be enabled.

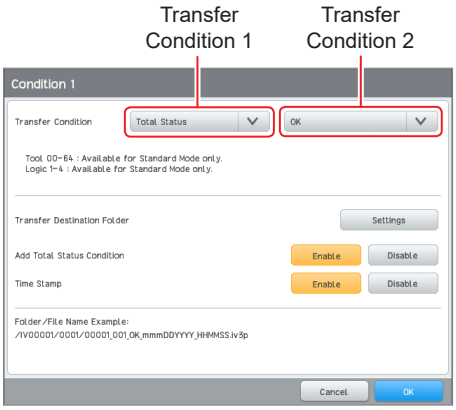
2 Press [Settings] of the enabled condition.



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 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.

Reference 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. The status info on the image will be "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

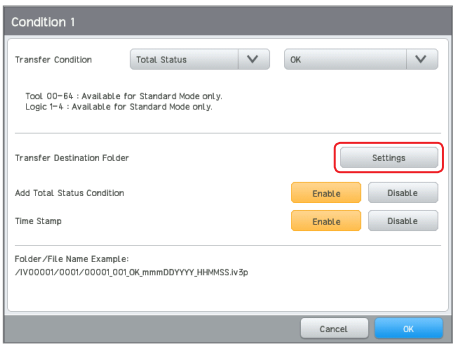
4 Press [OK].

The system returns to the main screen of Data transfer (FTP/SD Card).

Setting the Transfer Destination Folder and File Names

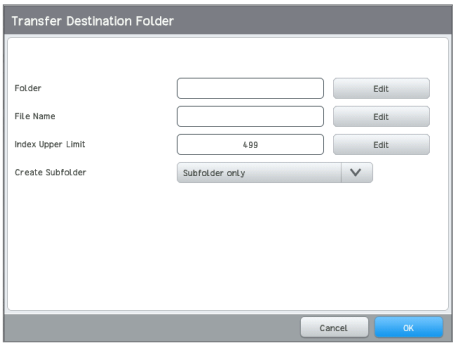
Reference For detailed specifications of the transfer destination folder and file name, refer to the following:
- “Details of the transfer destination folder” (page 9-7)
- “Details of the file name” (page 9-8)

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.
“Inputting characters” (page 3-20)

- 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.

When [Edit] is pressed, the “Folder” screen opens.
Set a user-defined folder name and press [OK].

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))
Press [Edit] to change the file name to any desired name up to 64 characters in length.
“Inputting characters” (page 3-20)

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 [Create Subfolder] is set to any setting other than [No Sorting with Folders], a 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

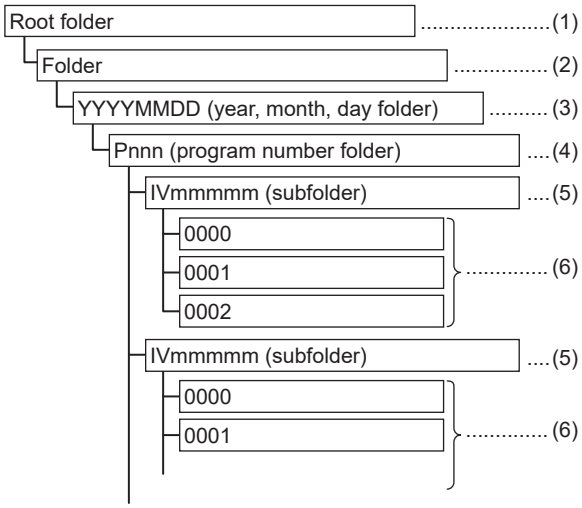
A YYMMDD folder/program number folder/subfolder will be created.

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 main screen of the FTP Settings.

● 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 [Folder] (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) YYMMDD folder
If [Create Subfolder] is set to [Date], [Program/Date], or [Date/Program], a YYMMDD 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.
Select this setting to create a program number folder and sort files.
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 FTP 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.

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.**

Reference
- You can create any YYMMDD 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	_bbbbb	_ccc	_ddd	_YYYYMMDD_hhmmss	.eee

❍ Explanation of file names

- aaaa .....Set file name (Page 9-6). If this setting is blank, a name will not be appended.
- bbbbb .....The 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.
- ddd .....In 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)
- YYYYMMDD ....The date (year, month, and day) the file is transferred.“Time Stamp” (page 9-5)
- hhmmss .....The time (hour, minutes, and seconds) the file is transferred.
- eee .....The 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

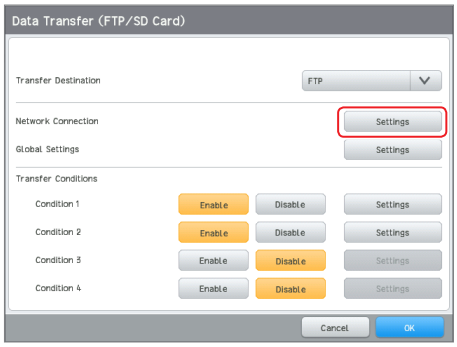
● Approximate image size to save

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

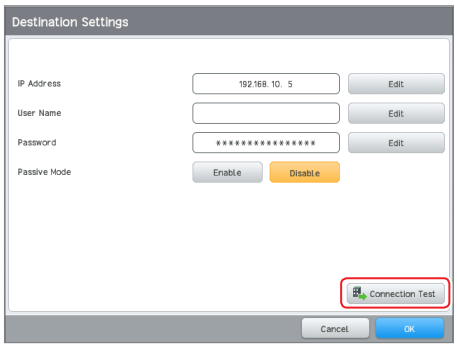
“Image Size” (page 9-4)

Testing data Transfer via FTP/SFTP

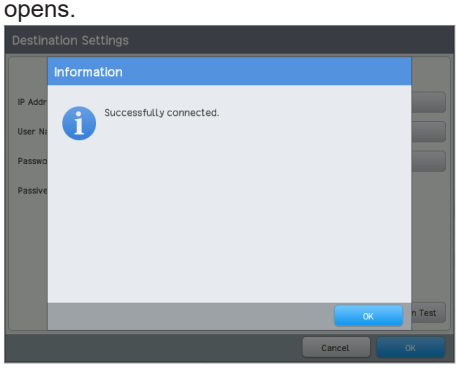
1 Press [Settings] of the Network Connection.



2 Press [Connection 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

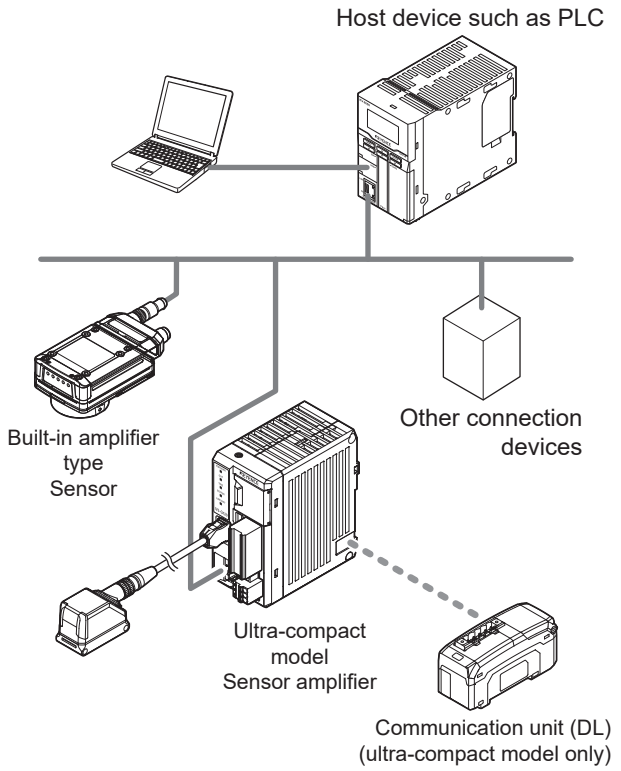
If data is not transferred properly with the FTP/SFTP client, refer to “Remedy when data transfer via FTP/SFTP is unavailable” (page A-24).

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) (supported for the ultra-compact model only)



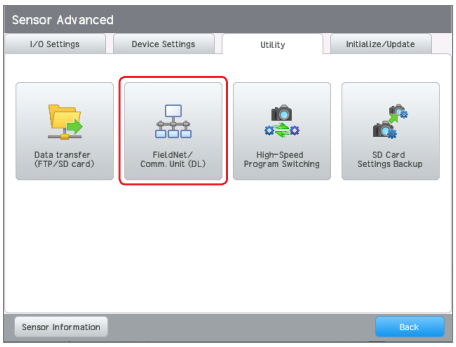
Point

- **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.**

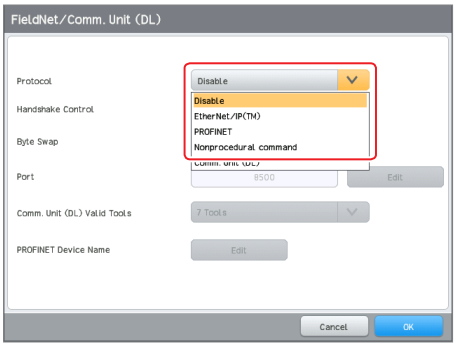
1 Press [Sensor Advanced] on the [Sensor Setup Menu] screen.

📖 "Displaying the Sensor Setup Menu Screen" (page 7-2)
📖 "Sensor Advanced Settings" (page 7-13)

2 Press [FieldNet/Comm. Unit (DL)] on the [Utility] tab.

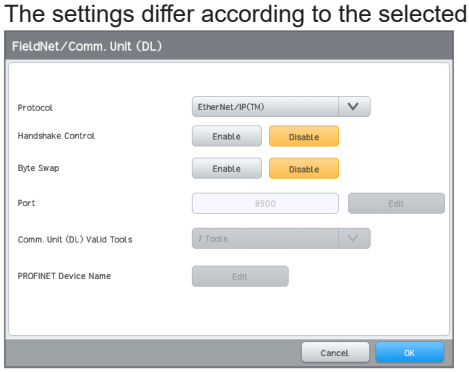


3 Select the protocol.



4 Configure the communications settings.

The settings differ according to the selected protocol.



● 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 128 alphanumeric characters).
“Inputting characters” (page 3-20)

Reference Up to 240 characters can be set if using IV3-Navigator 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 sensor restarts and the run screen opens.

MEMO

10

Controlling with the Input/Output Line

This chapter explains how the input / output terminal controls each operation.

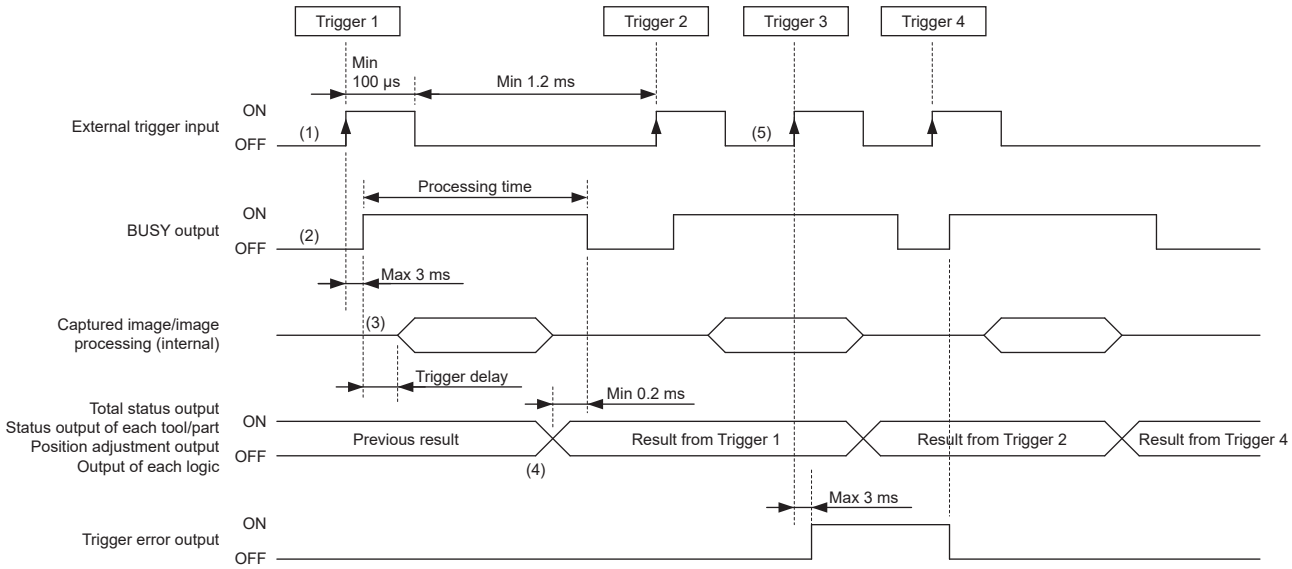
Controlling Timing of Judgment with Triggers.....10-2
Importing the Status Output (When Program Auto-Switching is "Disable").....10-4
Importing the Status Output (When Program Auto-Switching is "Enable").....10-7
Changing Over.....10-9
Registering the Master Image 10-10
Clearing Errors 10-12
Behavior When the Sensor Power is Turned On or Off.....10-13
Input Response Time 10-15

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], 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 us. 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 Settings” “BUSY Output Configuration” (page 7-18), 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.

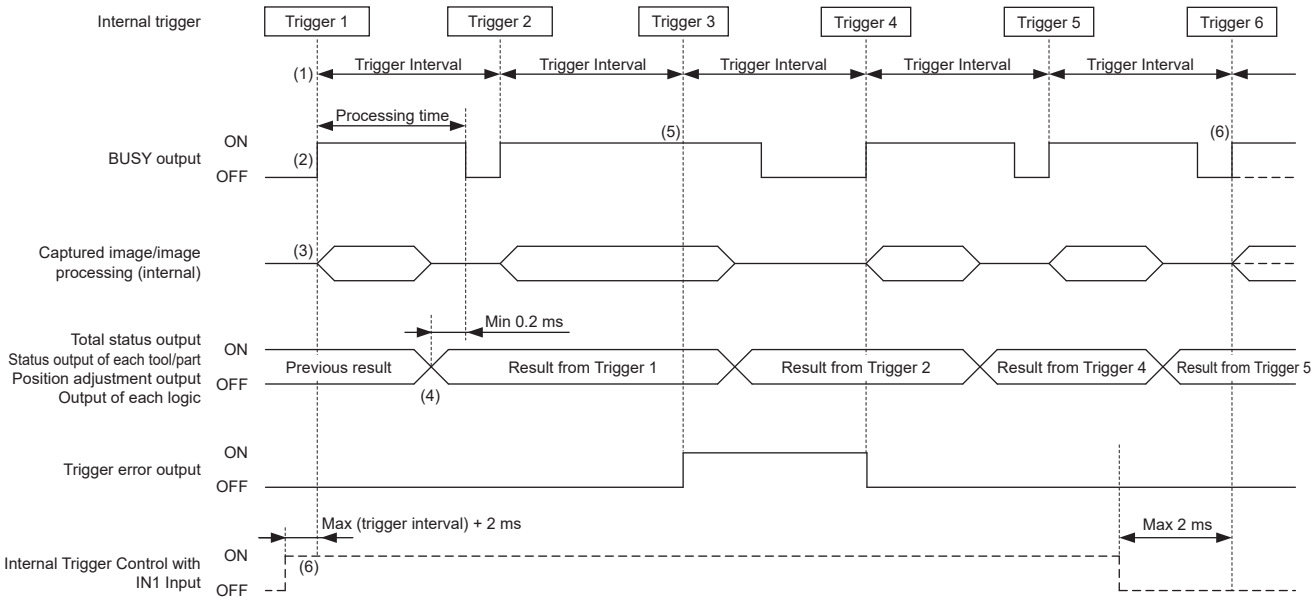
(5) If the external trigger is input while BUSY is being output, the input is ignored and a trigger error occurs. Trigger 3 is not judged. To output the trigger error, set trigger error in the Output Assignment (Page 4-151) under the Settings Navigator to [ON].

- Use external trigger input and BUSY output to control the timing.
- The ON status of each output is as follows.
  When Output Settings (Page 7-18) are [N.O.]: Status with output ON.
  When Output Settings (Page 7-18) are [N.C.]: Status with output OFF.
- The ON status of each input indicates the input line is shorted when the Polarity (Page 7-19) 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 7-16)
- 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 status output (Page 7-18) is set to [Latching]. For [One-Shot], refer to “Changing the timing of status outputs” (page 10-6).

Internal Trigger

When the [Trigger Options] is set to [Internal], 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 7-18) 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 4-151) under the Settings Navigator to [ON].

(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 7-18) are [N.O.]: Status with output ON.
  When Output Settings (Page 7-18) are [N.C.]: Status with output OFF.
- 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 status output (Page 7-18) is set to [Latching]. For [One-Shot], refer to “Changing the timing of status outputs” (page 10-6).
- When [Internal Trigger Control with IN1 Input Input] is set to [Yes], 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”.

Point **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

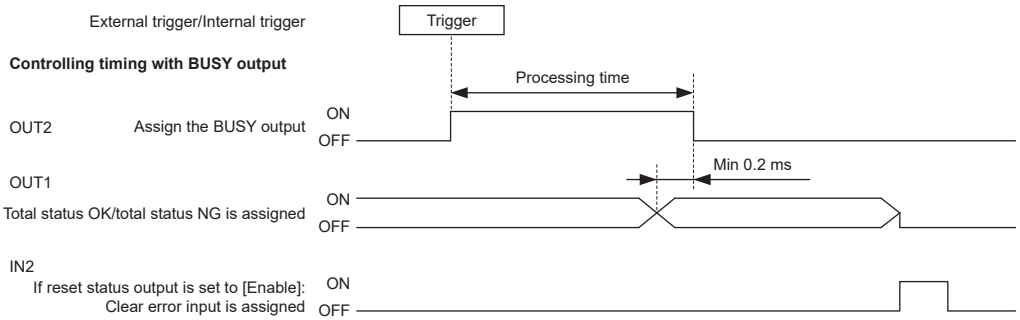
To input the internal trigger in the shortest cycle and perform the judgment process, set the trigger interval to 1 ms.
Set the trigger error in the Output Assignment (Page 4-151) in Settings Navigator to [OFF] and disregard the trigger error.

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 4-151).
To use program auto-switching, refer to “Importing the Status Output (When Program Auto-Switching is "Enable")” (page 10-7).

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 status output (Page 7-18) is set to [Latching]. For [One-Shot], refer to “Changing the timing of status outputs” (page 10-6).
- 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

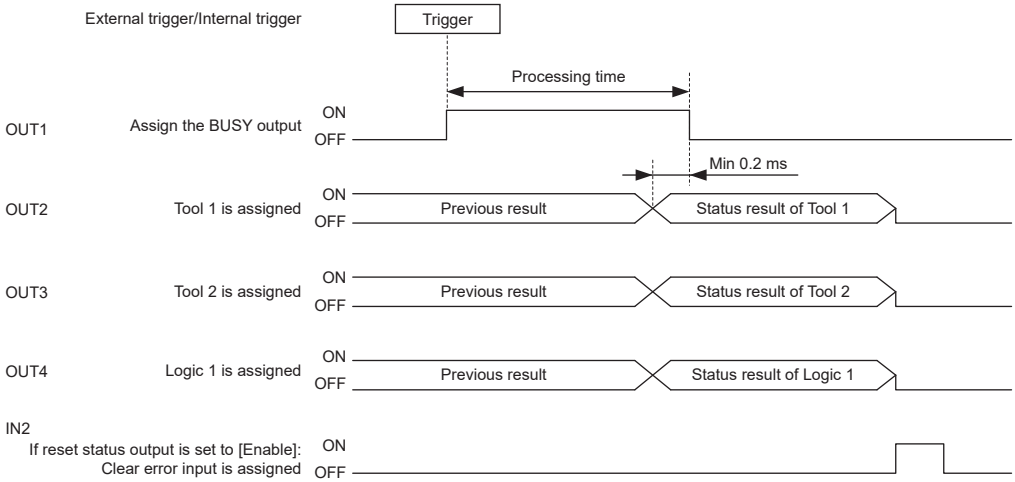
The total status conditions can be selected from [All Tools OK], [Any Tool OK] and [Logic 1] to [Logic 4].

- **[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 7-18) are [N.O.]: Status with output ON.
  When Output Settings (Page 7-18) are [N.C.]: Status with output OFF.
- When [Reset Status Output on Clear Error Execution] is set to [Yes], the status output can be reset with the clear error input.

Importing the individual status output of each detection tool/part type/logic

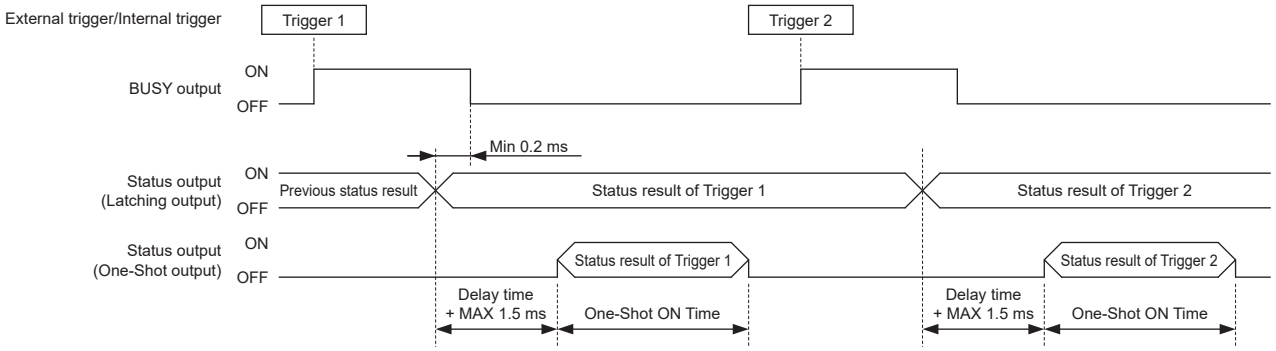
The individual status result of the detection tool, part type, and position adjustment for the examined target can be checked.
The operation is as follows.



- This is an example operation when the output mode of status output (Page 7-18) is set to [Latching]. For [One-Shot], refer to "Changing the timing of status outputs" (page 10-6).
- 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 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 was OK. Turns OFF when the result was NG or --.
- The ON status of each output is as follows.
  When Output Settings (Page 7-18) are [N.O.]: Status with output ON.
  When Output Settings (Page 7-18) 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 [Yes], 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 7-18).



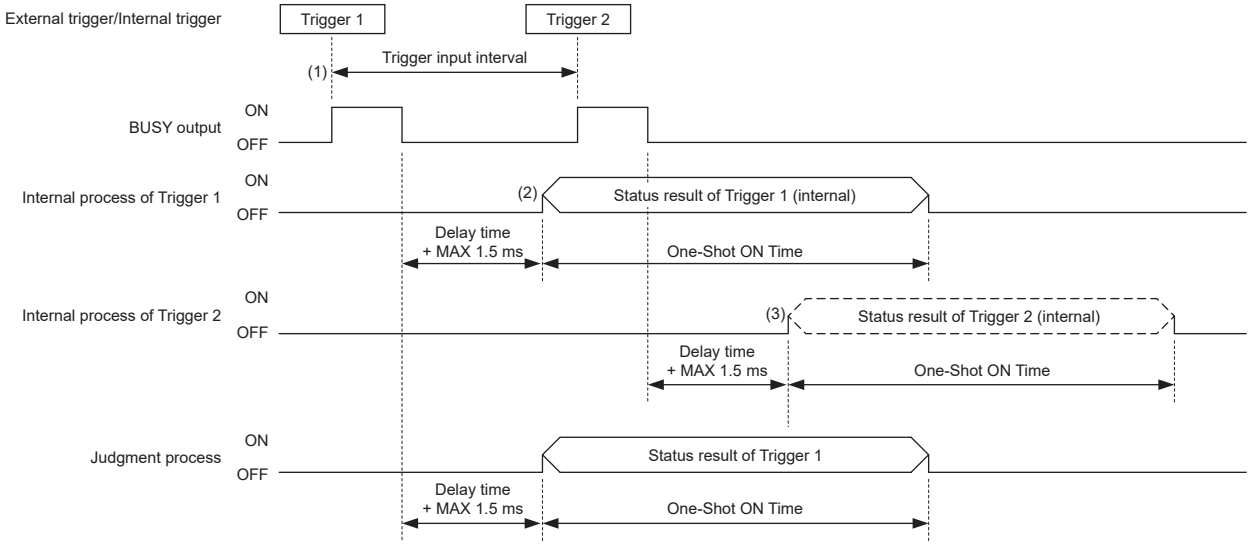
- In case of [Latching], updates the output by linking with judgment.
- In case of [One-Shot], outputs for a set amount of time after the set delay time is passed.
- When the program number is switched or the external master image is registered, the status output turns OFF.

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 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.

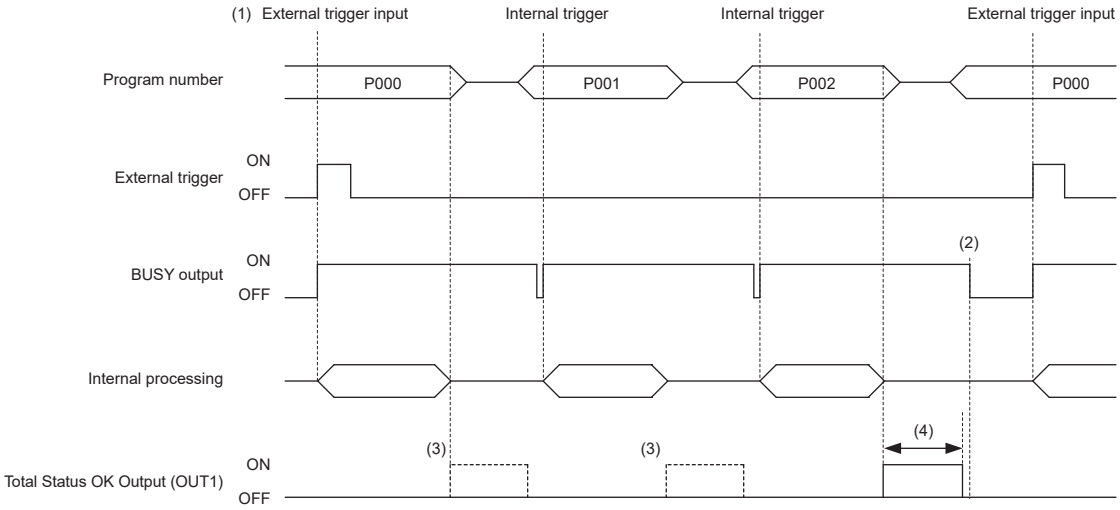
(3) Since the previous One-Shot output has not been completed, the status result of Trigger 2 cannot be output as a One-Shot and will be canceled.

Importing the Status Output (When Program Auto-Switching is "Enable")

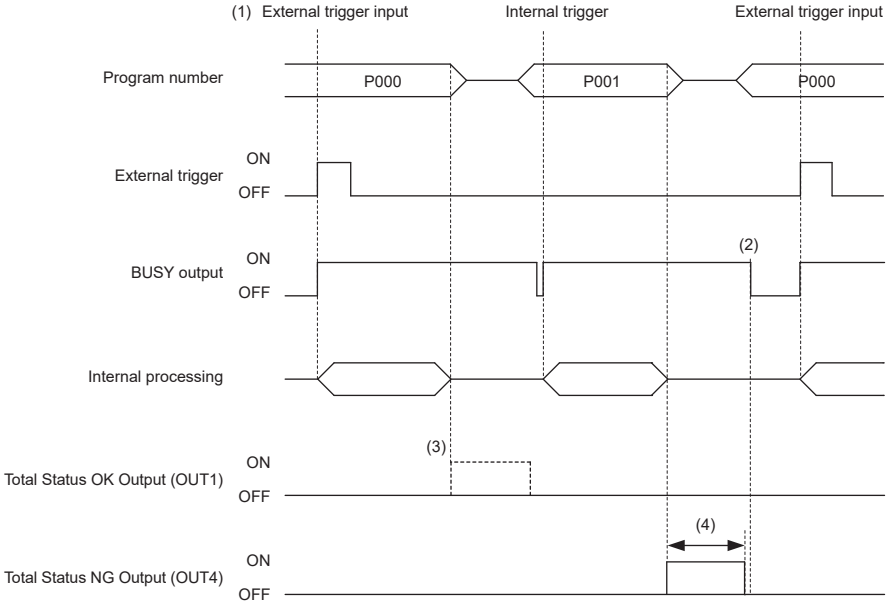
Program auto-switching is a function to change automatically to a pre-set program number according to the status result. If multiple programs are used to perform a single examination, examinations can be performed continuously without controlling the program switching with a PLC etc. For details, refer 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



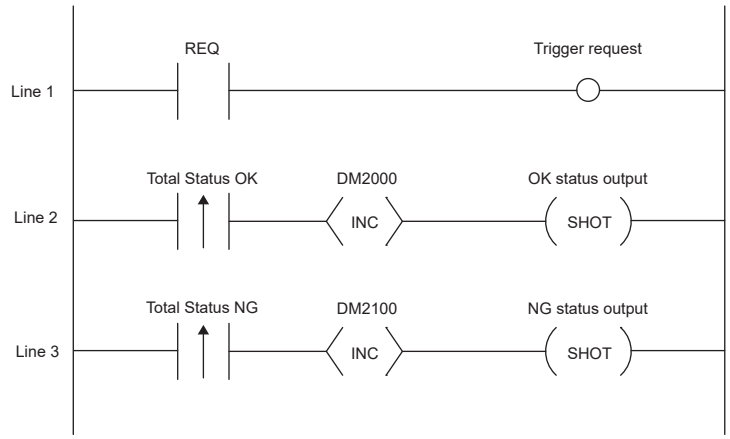
When the judgment in the program 001 is NG



(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 "OFF" 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 4-156)

<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.

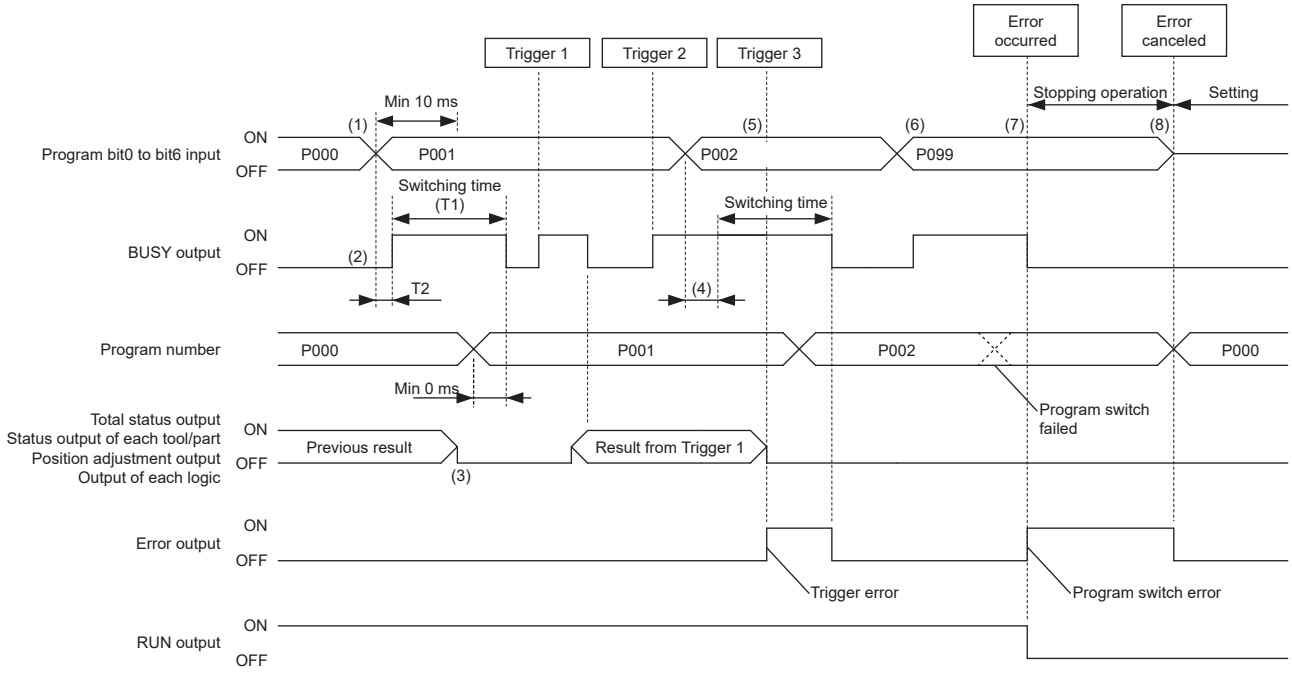
Additionally, the reference ladder above uses an increment instruction to count the number of OKs and NGs. Use it as needed.
In the reference ladder program above, the number of times OK and NG are recorded in DM2000 and DM2100.

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 by 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 7-3).



(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 4-151) under the Settings Navigator to [ON]. 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 10-15).
- 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], 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 control panel might be delayed until after switching programs (BUSY output OFF).

Program switch error

If using the program expansion function for the SD card (Page 8-14), 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.

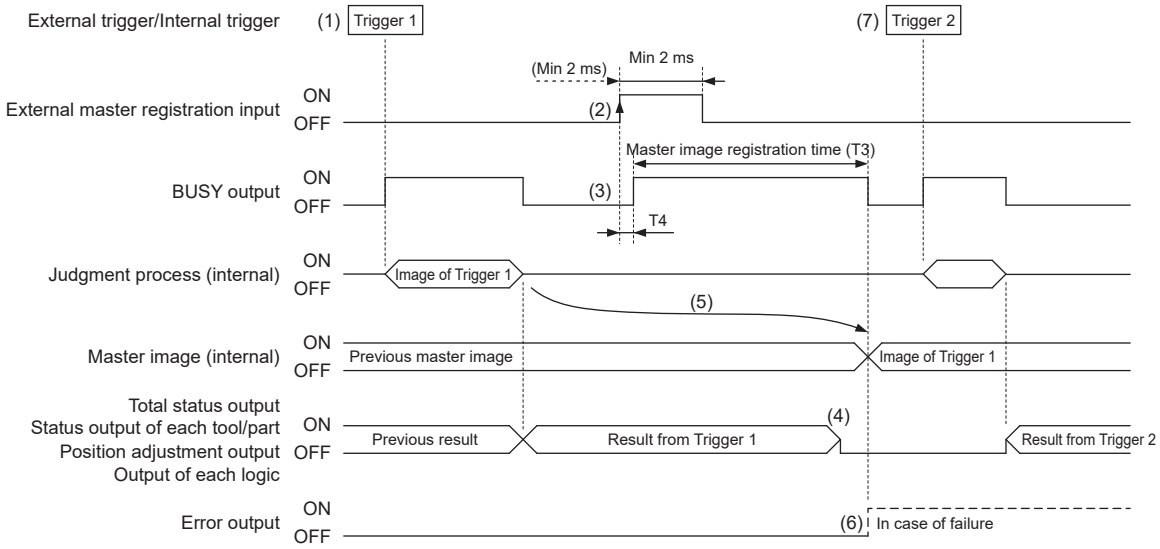
(7) A program switch error occurs. BUSY output turns OFF and error output turns ON.
Run output turns OFF and operation stops. The previous program number will be retained but the device cannot run. Clear error input is disabled. The PWR/ERR indicator light on the sensor amplifier turns ON (red). The sensor head operation indicator light blinks (red).

(7) 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”.

Reference 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 using the input line (standard mode only).
For details, refer to “2. Master Image Registration (Registering an Image as a Reference)” (page 4-18).



(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 10-15).
- 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 4-151) under the Settings Navigator to [ON].
- 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

• 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 7-16).

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

• 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.

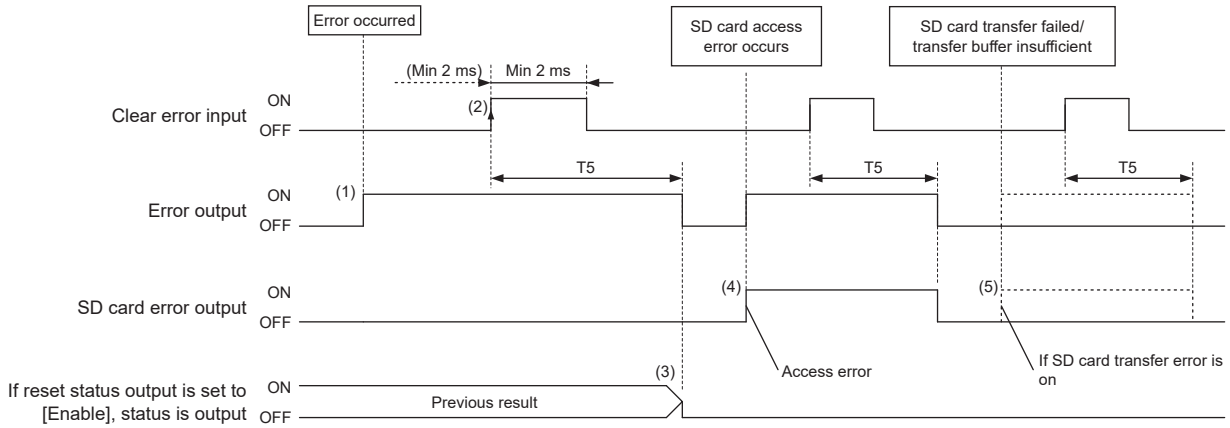
● Saving a program (P032 to P127) on an SD card

NOTICE

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].

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 [Yes], 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.

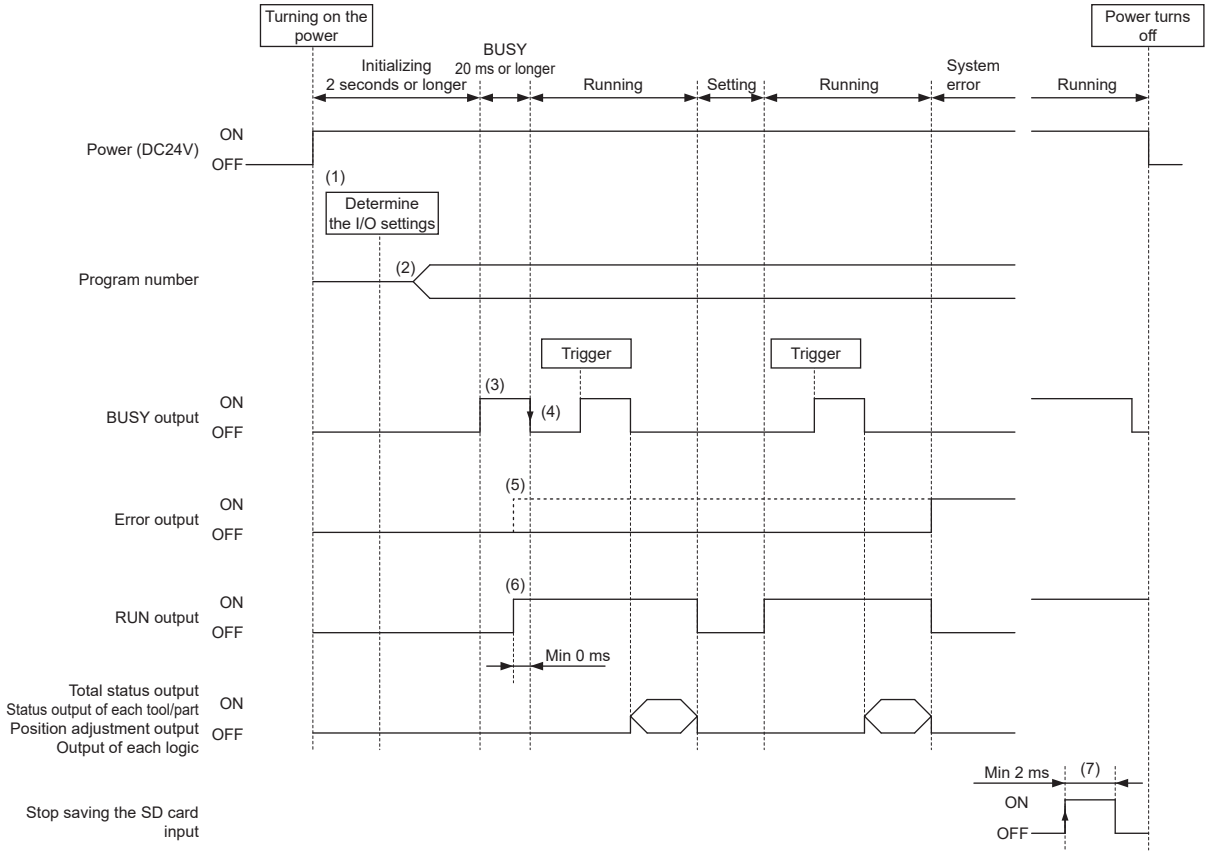
• For details about T5, refer to “Input Response Time” (page 10-15).

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 7-3) “Changing Over” (page 10-9) “Transferring Program Settings” (page 8-14)
Program switch error at startup	Disable	-	
External master registration error	Enable	Can be cleared	“Registering the Master Image” (page 10-10)
SD card access error			
Trigger error	OFF (default)/ON	Can be cleared	“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151) “Controlling Timing of Judgment with Triggers” (page 10-2)
FTP error			“FTP Error” (page 9-4)
SD card transfer error			“SD card transfer error” (page 8-17)

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 3-10)
“Polarity” (page 7-19)
“Output Settings” (page 7-18)

(2) The program number will be determined. If [Program Switching Method] (Page 7-6) 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.

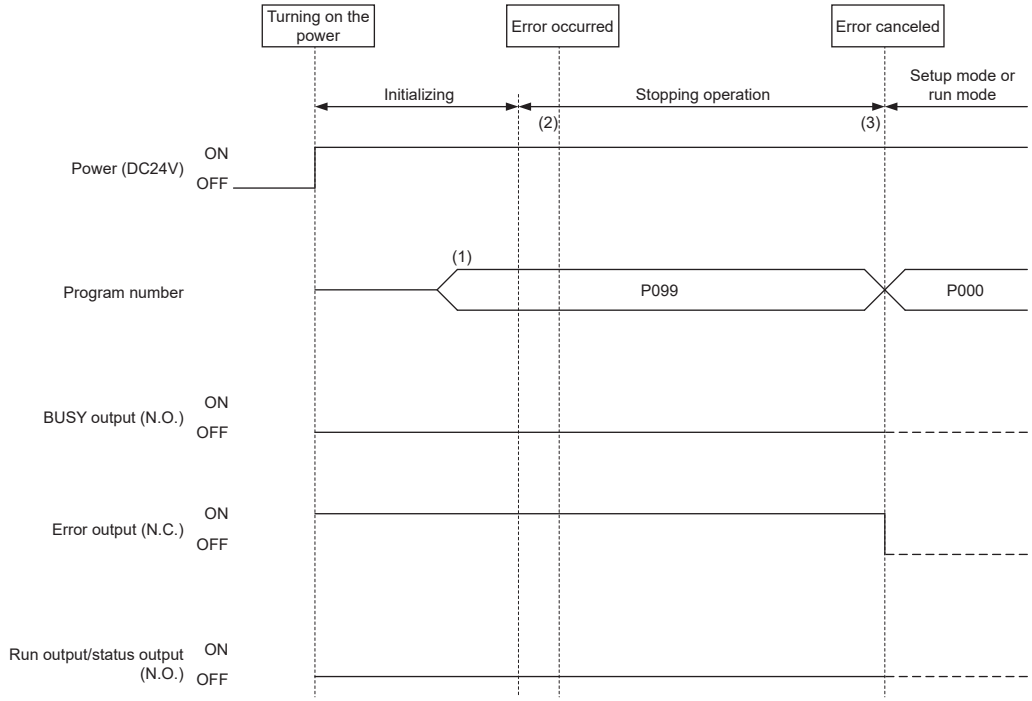
(7) To turn the power off when using data transfer to SD card.
- Set [BUSY Output Settings] to [Until Data Transfer is Complete].
- In the case of an external trigger, check that BUSY output from input of [Stop saving the SD card] has turned off and then turn the power off.
- In the case of an internal 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.
- The “SD card save stop” input is valid only during operation.

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 7-18) are [N.O.]: Status with output ON.
  When Output Settings (Page 7-18) 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 4-151) 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 8-14), 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 [NO] and [NC].

(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/Communications], 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 7-18) are [N.O.]: Status with output ON.
  When Output Settings (Page 7-18) are [N.C.]: Status with output OFF.

Input Response Time

Point **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] (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 • Learning*1/OCR*2 :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 Adjustment Position] is set to [Individual]. (Page 7-25).
D	The [Auto Focus Adj Pos] (Page 7-24) is set to [Individual].	5000 [ms] (typ.) *3 • [Write to ROM when using Ext. Master Save] (Page 7-16) is set to [Yes]. • 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 • 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.).

MEMO

11

Specifications

This chapter explains the specifications and dimensions of the sensor and control panel.

Specifications **11-2**
Dimensions **11-7**

Specifications

Ultra-compact model sensor head

Model		IV3-G500CA	IV3-G500MA	IV3-G600CA	IV3-G600MA
Type		Standard type		Wide view type	
Installed distance		50 to 2000mm		50 to 2000mm	
Field of view (typical example)		Installed distance 50 mm: 22 (H) × 16 (V) mm Installed distance 2000 mm: 789 (H) × 592 (V) mm		Installed distance 50 mm: 51 (H) × 38 (V) mm Installed distance 2000 mm: 1822 (H) × 1364 (V) mm	
Image sensor		1/2.9inch color CMOS	1/2.9inch monochrome CMOS	1/2.9inch color CMOS	1/2.9inch monochrome CMOS
	Pixel	1280 (H) x 960 (V)			
Focus adjustment		Auto[*1]			
Exposure time		12 µs to 9 ms	12 µs to 9 ms[*2]	12 µs to 9 ms	12 µs to 9 ms[*2]
Lighting	Light source	White LED	Infrared LED	White LED	Infrared LED
	Lighting method	Pulse/continuous lighting switchable	Pulse lighting	Pulse/continuous lighting switchable	Pulse lighting
Indicator light		2 (indicate the same status)			
Environmental resistance	Ambient temperature	0 to +40°C (No freezing)			
	Relative humidity	35 to 85 % RH (No condensation)			
	Vibration[*3]	10 to 55 Hz, 1.5 mm double amplitude, 2 hours each for X, Y, and Z axes			
	Shock resistance[*3]	500 m/s^2 6 different directions in 3 times			
	Enclosure rating[*4]	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 The focus position can be automatically adjusted at the time of installation. Disabled during the operation. The focus position can be registered by program.
*2 When the AI Lighting unit is mounted, the maximum exposure time is 6.25 ms.
*3 Except for mounting the dome attachment for (IV2-GD05/IV2-GD10).
*4 Except when the polarizing filter (OP-88642/OP-88643/OP-88646/OP-88647) is mounted.

Ultra-compact model sensor amplifier

Model		IV3-G120
Tool	Available mode	Standard mode / Sorting Mode
	Tool with standard mode	Learning, Outline, Color area[*1], Area[*2], Edge pixel, Color average[*1], Brightness average[*2], Width, Diameter, Edge presence, Pitch, OCR, Color prohibit, 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/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

Model		IV3-G120
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, 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 (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
	Utility	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, Stop saving for SD card
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
Supported interface	Built-in Ethernet	EtherNet/IP™ PROFINET[*9], TCP/IP non-procedure communication
	Communication unit[*10]	EtherCAT, CC-Link, DeviceNet, RS-232C
Expanded memory		SD card (SD/SDHC)[*11]
Rating	Power voltage	DC 24 V ±10% (including ripple)
	Current consumption	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 +40°C (No freezing)
	Relative humidity	35 to 85% RH (No condensation)
Material		Main unit case: PC Power connector: PA, POM I/O terminal block: PA Sensor head connection connector: Zinc + Ni plating, PA Ethernet connector: Copper alloy + Ni plating Radiator plate on rear of the main unit: Aluminum DIN rail tab on rear of the main unit: POM Nameplate: PC
Weight		Approx. 300 g

*1 Color type only.
*2 Monochrome type only.
*3 Tools can be installed by programs. 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 160mA or less.
*9 Conformance Class B, applicable protocol: LLDP and SNMP
*10 When a communication unit (DL Series) is connected.
*11 Use the KEYENCE recommended product.

Built-in amplifier type sensor

Model		IV3-500CA	IV3-500MA	IV3-600CA	IV3-600MA
Type		Standard type		Wide view type	
Reference distance		50 to 2000mm		50 to 1000mm	
Field of view (typical example)		Installed distance 50 mm: 22 (H) × 16 (V) mm Installed distance 2000 mm: 789 (H) × 592 (V) mm		Installed distance 50 mm: 51 (H) × 38 (V) mm Installed distance 2000 mm: 1822 (H) × 1364 (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) x 960 (V)			
Focus adjustment		Auto[*1]			
Exposure time		12 µs to 10 ms			
Lighting	Light source	White LED	Infrared LED	White LED	Infrared LED
	Lighting method	Pulse/continuous lighting switchable	Pulse lighting	Pulse/continuous lighting switchable	Pulse lighting
Tool	Available mode	Standard mode / Sorting Mode			
	Tool with standard mode	Learning, Outline, Color area[*2], Area[*3], Edge pixel, Color average[*2], Brightness average[*3], Width, Diameter, Edge presence, Pitch, OCR, Color prohibit, Brightness prohibit, Position adjustment, High-speed position adjustment (1-axis edge/2-axis edge), Blob count			
	Number of tools [*4]	Total: 65 tools			
Switch settings (programs)		128 programs (with SD card) /32 programs (without SD card)			
Image history[*5]	Numbers	100 images			
	Condition	Selectable between NG only, NG and OK near threshold[*6]/and All			
Image data transfer	Transfer Destination	SD card/FTP server/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[*6], and All			
Analysis information[*7]	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 (2×, 4×), HDR, High gain, Color filter[*2], White balance[*2], Brightness correction, AI capture			
	Tool functions	Additional Learning, Remove Outline, Mask function, Color extraction/Color exclusion[*2], Color histogram function[*2], Monochrome histogram function[*3], Scaling function			
	Utility	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		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 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		IV3-500CA	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[*9]			
	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 12 pin A code Male connector			
	PoE	PoE power Class 3/4/6 [*10]			
Ethernet	Standard	1000BASE-T/100BASE-TX			
	Connector	M12 8 pin X code Female connector			
Network function		FTP client/SFTP client			
Supported interface	Built-in Ethernet	EtherNet/IP™, PROFINET[*11], TCP/IP non-procedure communication			
Expanded memory		micro SD card (microSD/microSDHC)[*12]			
Rating	Power voltage	DC 24 V ±10% (including ripple)[*13]			
	Current consumption	3.3 A or less (without the AI Lighting unit, and including the output load) 1.8 A or less (with the AI Lighting unit, and including the output load) [*14]			
Environmental resistance	Ambient temperature	0 to +40°C (No freezing)			
	Relative humidity	35 to 85% RH (No condensation)			
	Vibration resistance[*15]	10 to 55 Hz, 1.5 mm double amplitude, 2 hours each for X, Y, and Z axes			
	Shock resistance[*15]	500 m/s^2 6 different directions in 3 times			
	Enclosure rating[*16]	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 The focus position can be automatically adjusted at the time of installation. Disabled during the operation. The focus position can be registered by program.
*2 Color type only.
*3 Monochrome type only.
*4 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 the sorting mode is 8 tools (learning tool).
*5 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).
*6 Learning tool only.
*7 Can also be displayed on the control panel (IV3-CP50) or the software for the IV3 Series (IV3-H1).
*8 Usable on the software for the IV3 Series (IV3-H1).
*9 Make sure to keep a total of each output with 120 mA or less.
*10 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 is recommended when not using the AI Lighting unit.
When using the PoE, operation may be restricted due to power limitation.
*11 Conformance Class B, applicable protocol: LLDP and SNMP
*12 Use the KEYENCE recommended product.
*13 To use OP-88656 (10 m), 24 V DC +25%/-10% (including ripple).
*14 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
*15 Except for mounting the dome attachment for (IV2-GD05/IV2-GD10).
*16 Except when the polarizing filter (OP-88640/OP-88641/OP-88644/OP-88645) is mounted.

Control panel

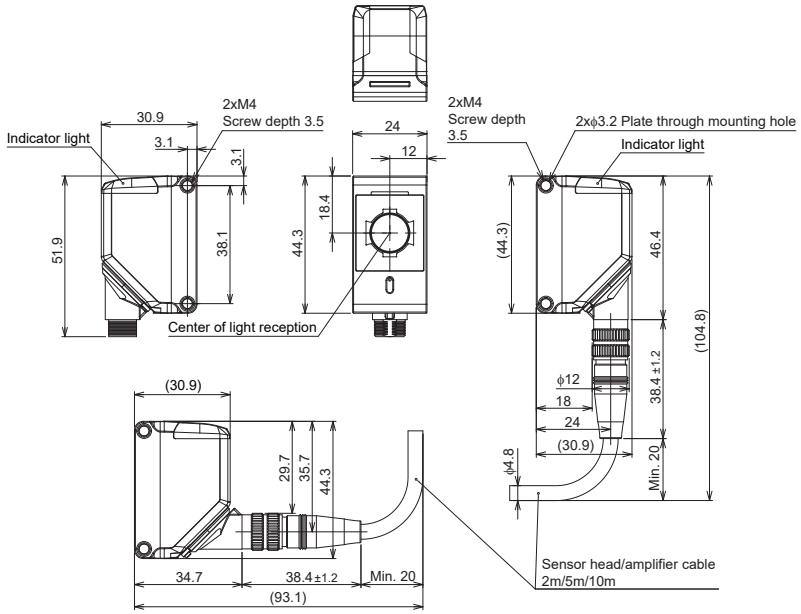
Model		IV3-CP50
Compatible sensor		IV3 series, IV2 series, IV series
Display		5.7" TFT color LCD 640 x 480 (VGA)
Backlight	Method	White LED
	Duration	Approx. 50,000 hours (25 ˚C)
Touch panel	Method	Analog resistive
	Actuating force	0.8 N or lower
Indicator light		PWR, SENSOR
Ethernet*1	Standard	100BASE-TX
	Connector	M12 4pin connector
Supported languages*2		Japanese/English/Chinese (Simplified)/Chinese(Traditional)/Korean/German/Italian/ French/Spanish/Portuguese/Czech/Hungarian/Polish/Thai
Expanded memory		USB flash memory*3
Rating	Power voltage	DC 24 ± 10% (including ripple)
	Current consumption	0.3A or less
Environmental resistance	Ambient temperature	0 to +50°C (No freezing)
	Operating ambient humidity *4	35 to 85% RH (No condensation)
	Vibration resistance	10 to 55 Hz, 0.7 mm double amplitude, 2 hours each for X, Y, and Z axes
	Drop impact resistance	1.3 m over the concrete (2 times each in the arbitrary direction)
	Enclosure rating	IP40
Material		Main unit case: PC Power connector: brass + Ni coat Ethernet connector: Zinc + Ni coat, PA USB connector cover: EPDM Pen holder: PC Hook for adapter: POM LED lamp cover: PC Mounting adapter: PC Stylus: POM
Weight		Control panel: Approx. 450 g A mounted with the wall mounting adapter and the stylus: Approx. 485 g

*1 This is dedicated for connection with the IV3 Series, IV2 Series and IV Series.
*2 When connected to the IV3 series. When the IV2 Series is connected, the language supported by the IV2-CP50 is used. When the IV Series is connected, the language supported by the IV-M30 is used.
*3 Use only products recommended by KEYENCE.
*4 If the ambient temperature is over 40˚C, use it in an absolute humidity of 40˚C 85% RH or lower.

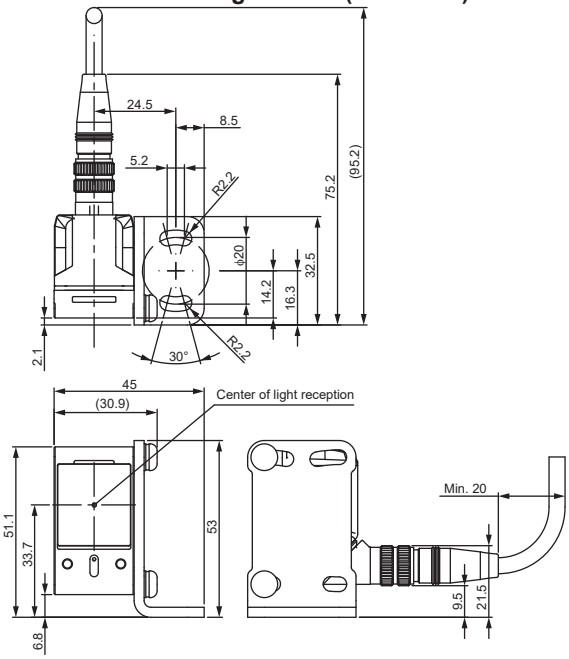
Dimensions

Ultra-compact model sensor head

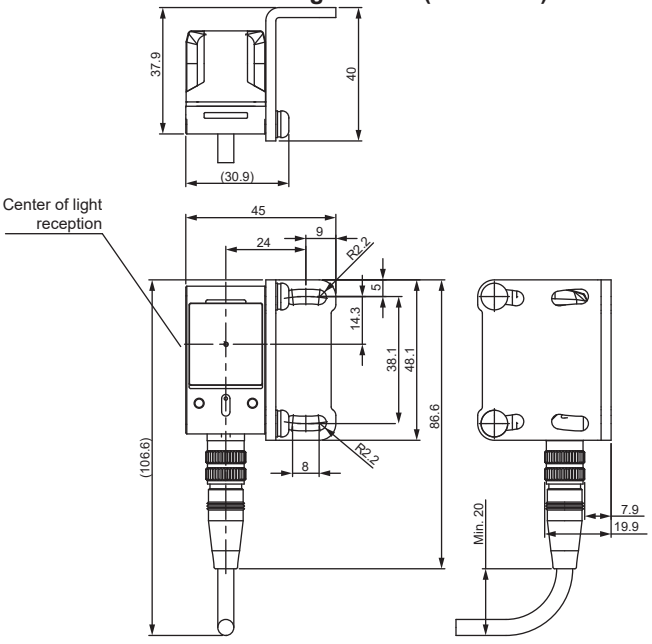
• IV3-G500MA • IV3-G500CA • IV3-G600MA • IV3-G600CA



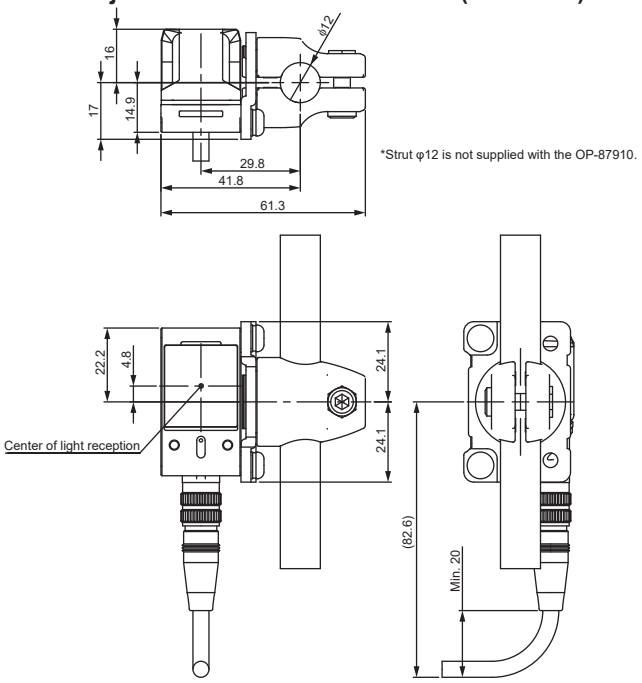
• With vertical mounting bracket (OP-87908)



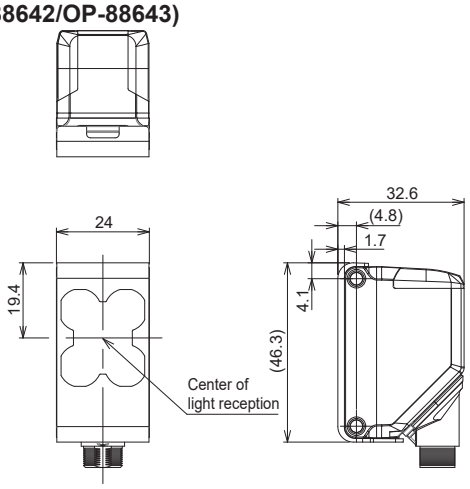
• With transverse mounting bracket (OP-87909)



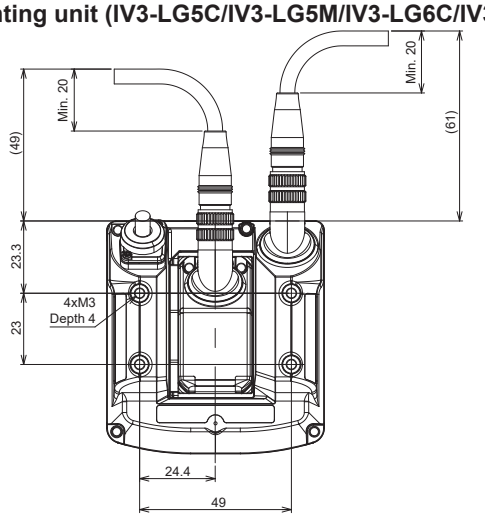
• With adjustable bracket for IV3 Series (OP-87910)

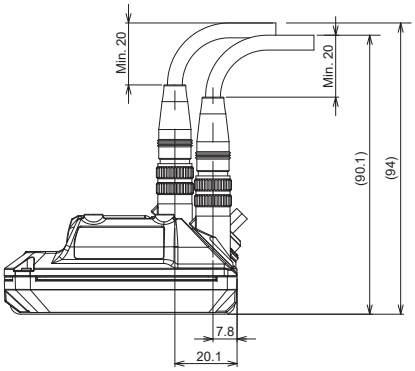


• With the polarizing filter for the ultra-compact model (OP-88642/OP-88643)

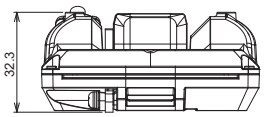


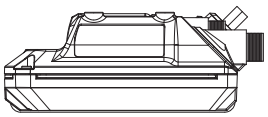
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M)

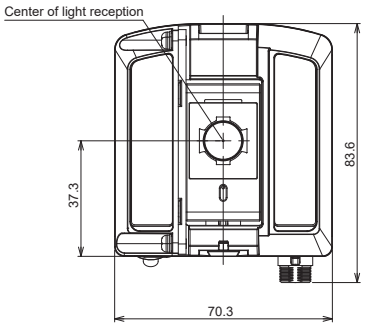




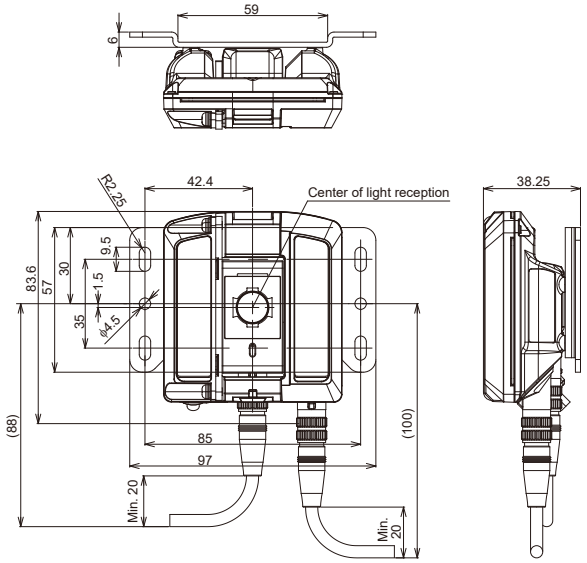
Rotating connector (at 90 degrees rotation)



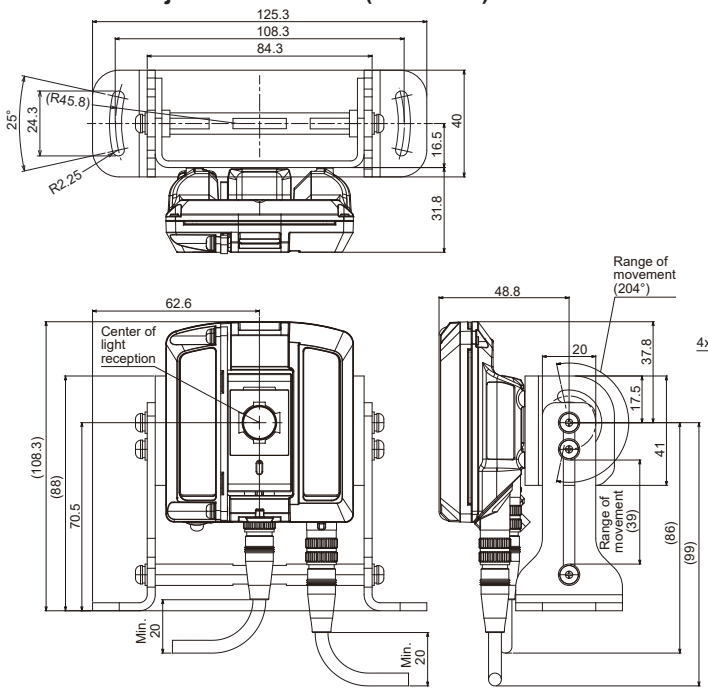




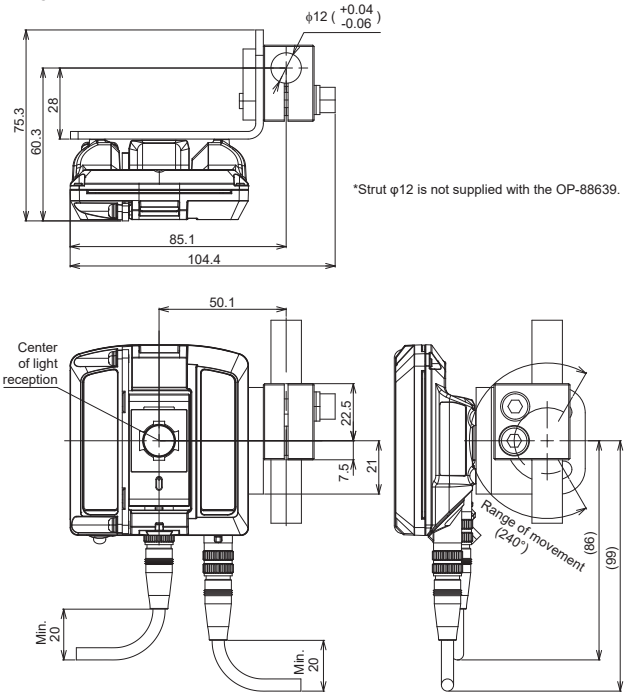
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), common mounting bracket (OP-88634)



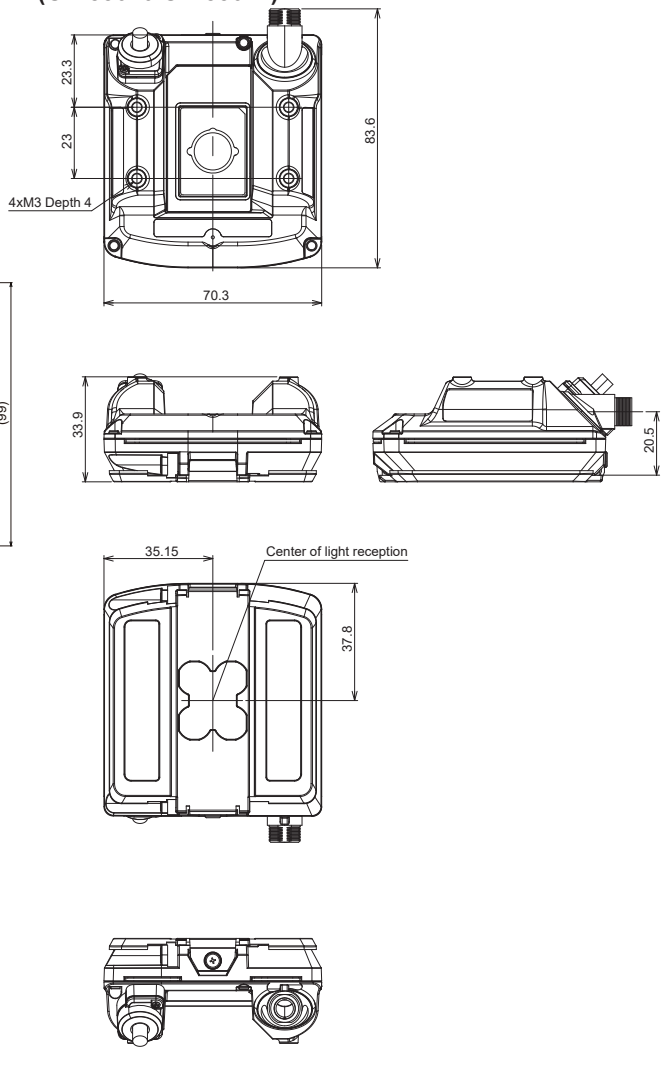
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), biaxial adjustment bracket (OP-88638)



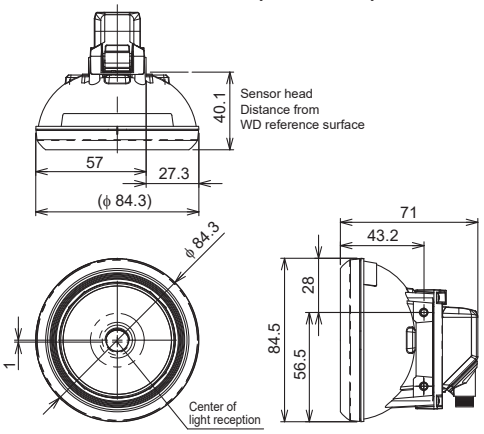
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), adjustable bracket (OP-88639)



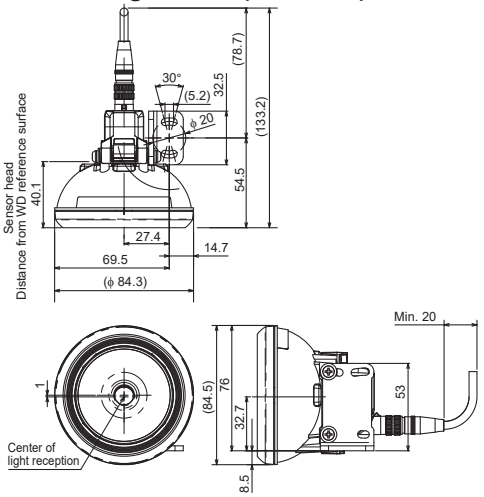
• With the AI Lighting unit (IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M), polarizing filter for the AI Lighting unit (OP-88646/OP-88647)



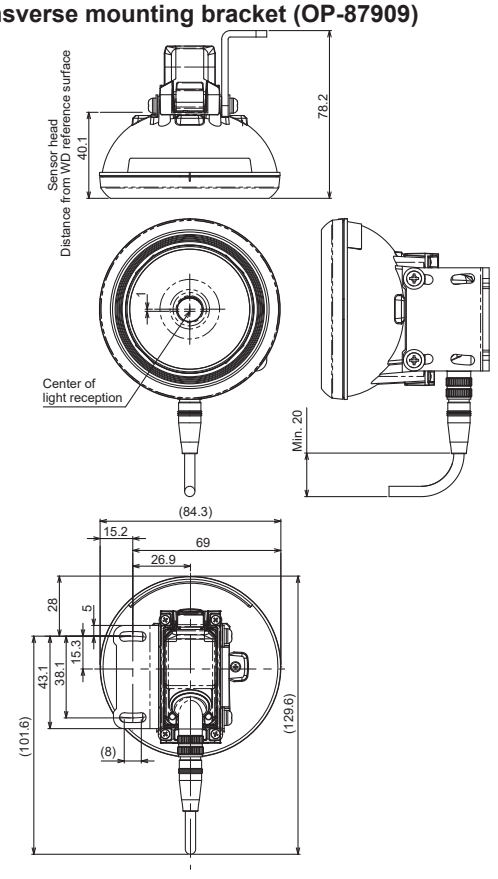
• With the Dome Attachment (IV2-GD05)



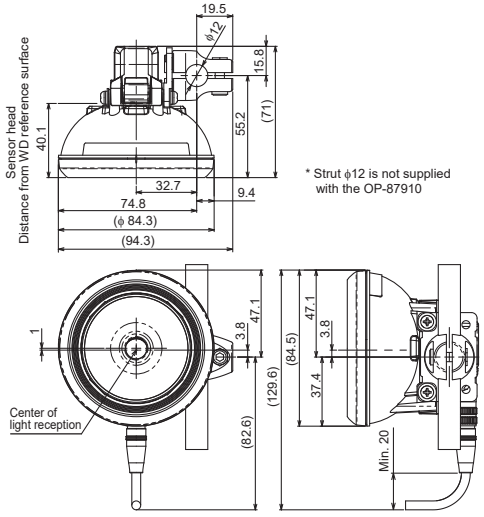
• With the Dome Attachment (IV2-GD05), vertical mounting bracket (OP-87908)



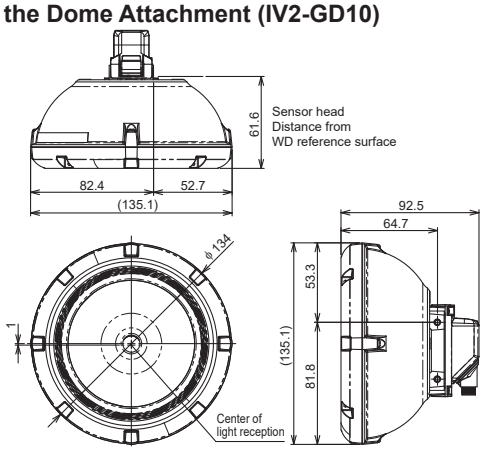
• With the Dome Attachment (IV2-GD05), transverse mounting bracket (OP-87909)



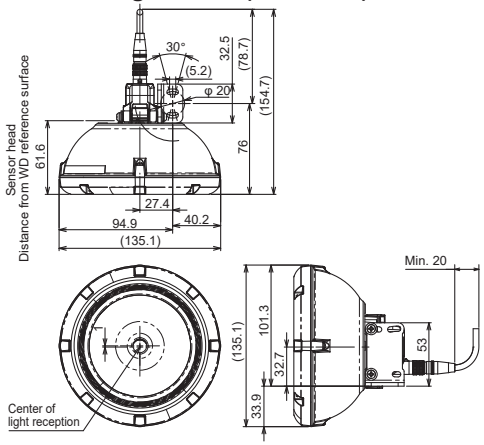
• With the Dome Attachment (IV2-GD05), adjustable bracket (OP-87910)



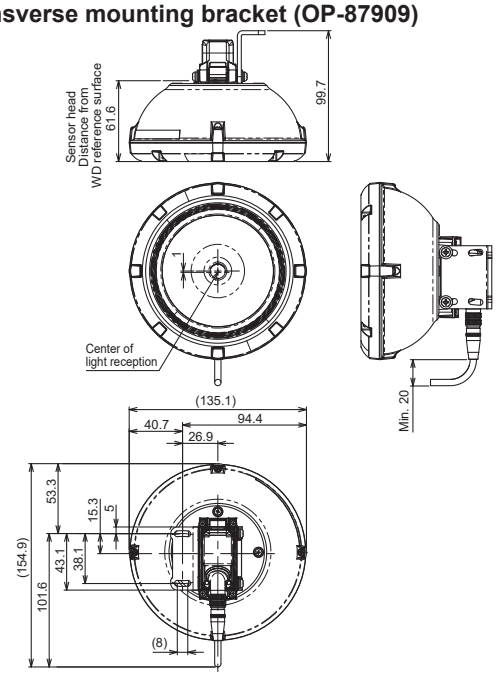
• With the Dome Attachment (IV2-GD10)



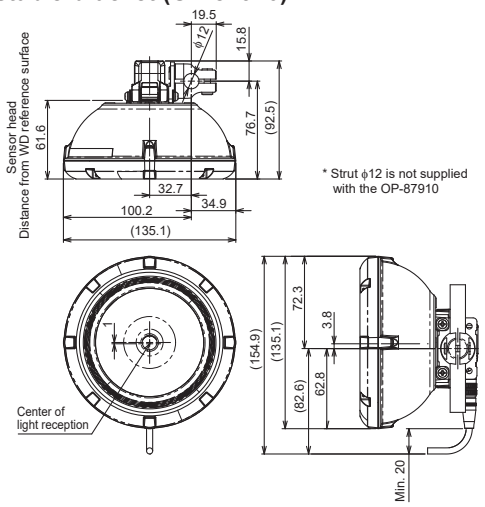
• With the Dome Attachment (IV2-GD10), vertical mounting bracket (OP-87908)



• **With the Dome Attachment (IV2-GD10), transverse mounting bracket (OP-87909)**

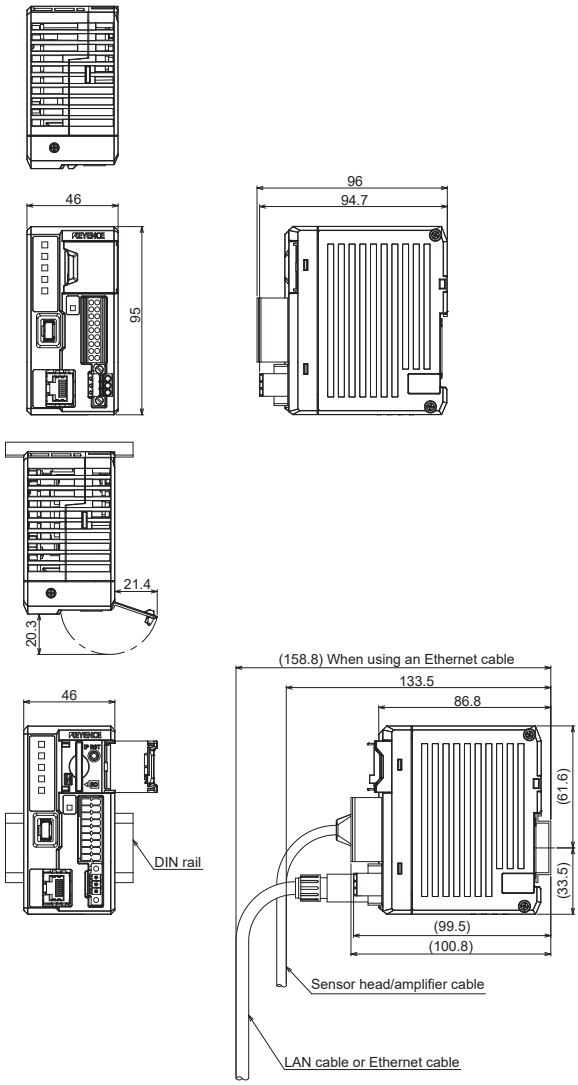


• **With the Dome Attachment (IV2-GD10), adjustable bracket (OP-87910)**



Ultra-compact model sensor amplifier

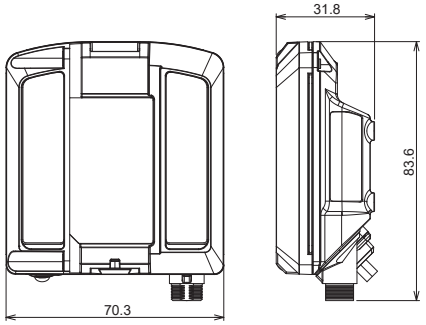
• **IV3-G120**



Options for the ultra-compact model

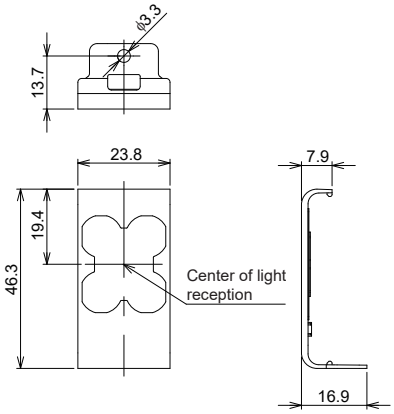
AI Lighting unit

• IV3-LG5C/IV3-LG5M/IV3-LG6C/IV3-LG6M

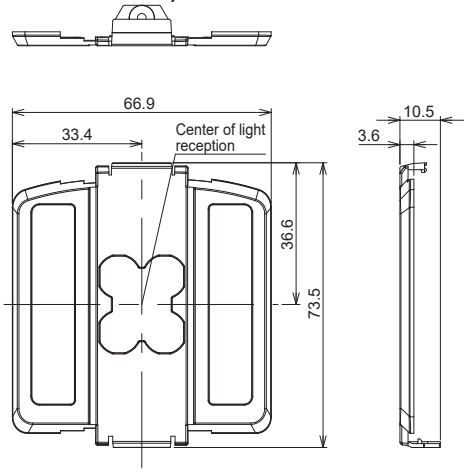


Polarizing filter

• Polarizing filter for the ultra-compact model (OP-88642/OP-88643)

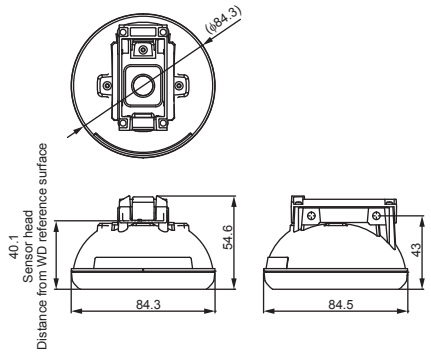


• Polarizing filter for the AI Lighting unit (OP-88646/OP-88647)

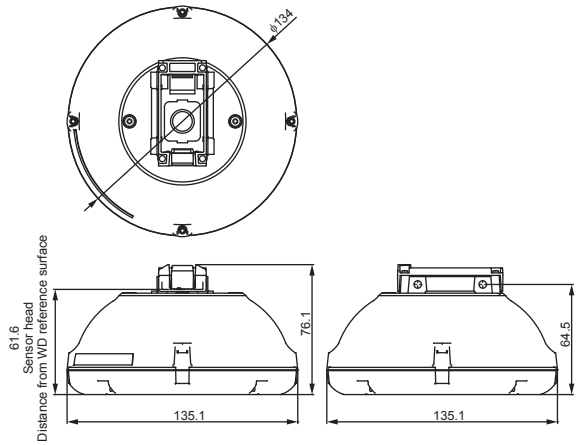


Dome Attachment

IV2-GD05



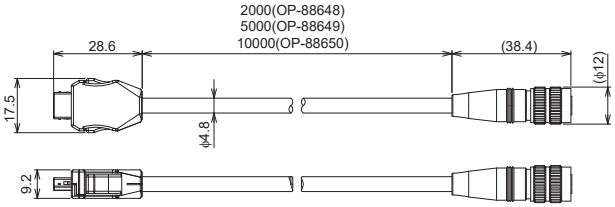
IV2-GD10



Cable (option)

IV3 sensor head/amplifier cable

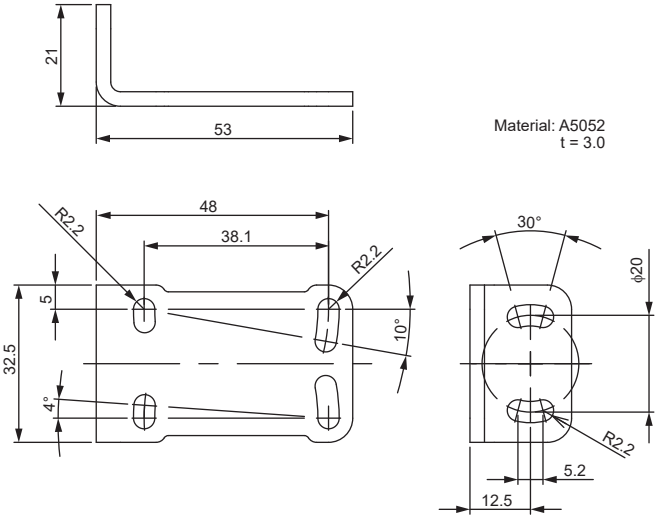
- **OP-88648 (2m)**
- **OP-88649 (5m)**
- **OP-88650 (10m)**



Mounting bracket (option)

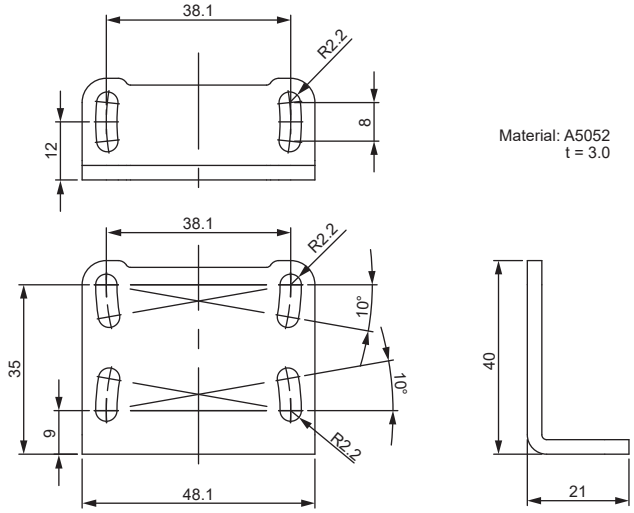
Vertical mounting bracket

- **OP-87908**



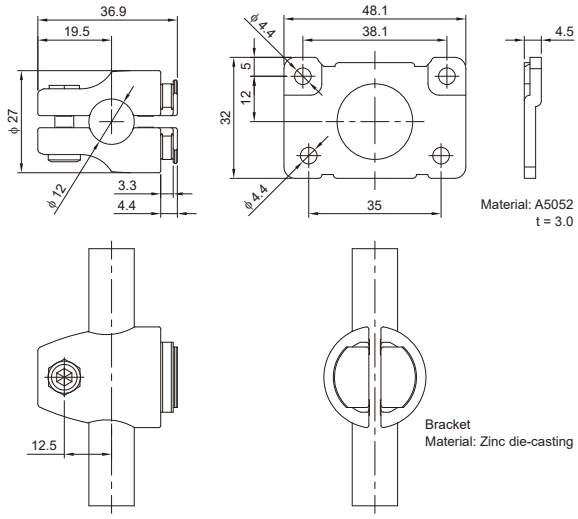
Transverse mounting bracket

- **OP-87909**



Adjustable bracket

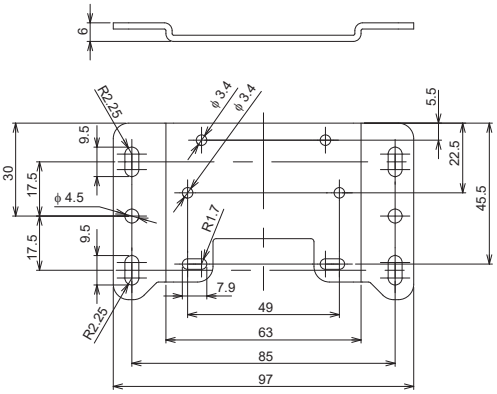
- **OP-87910**



*Strut φ12 is not supplied with the OP-87910.

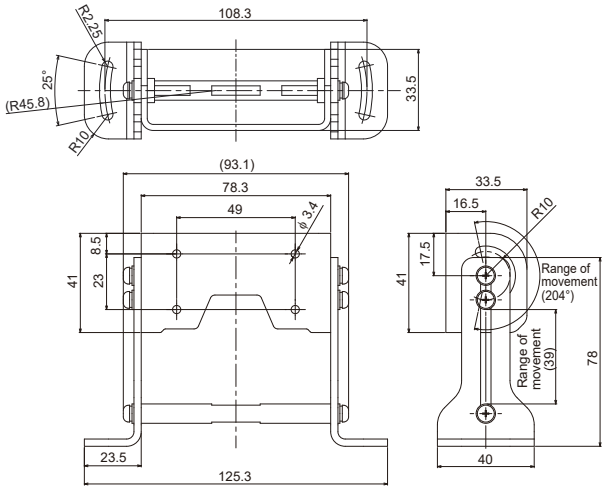
Common mounting bracket (also for the built-in amplifier type)

- **OP-88634**



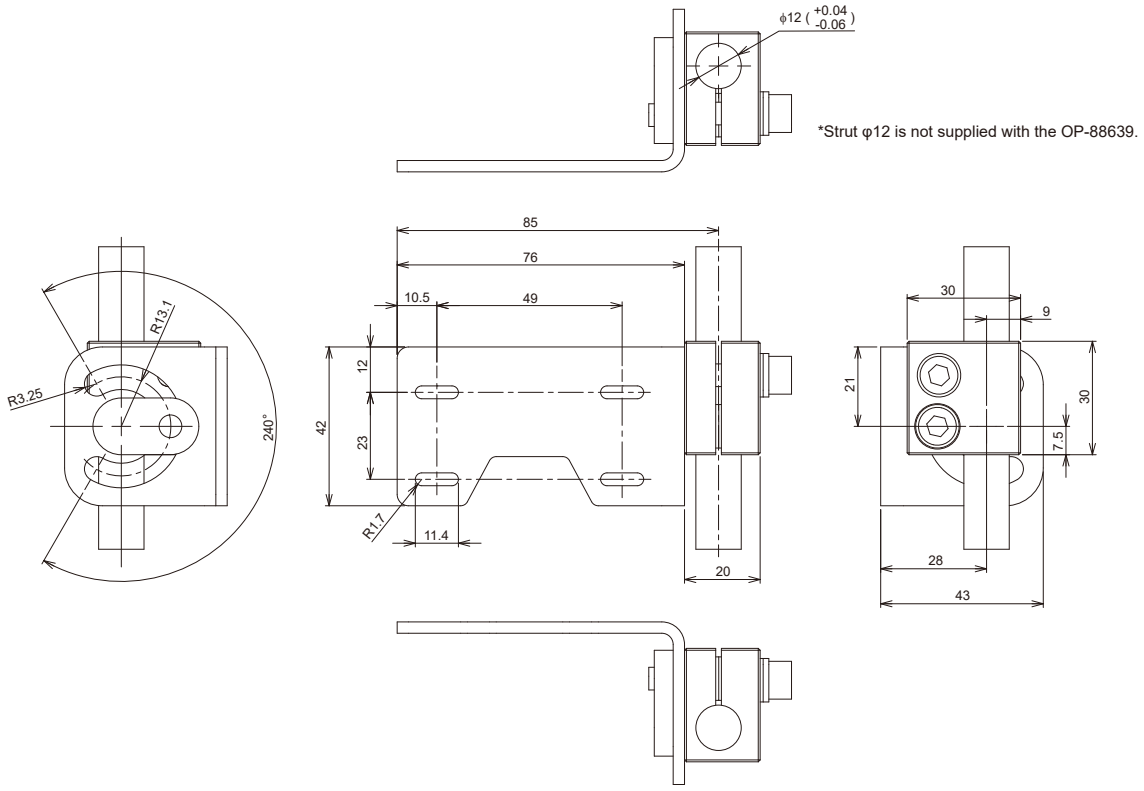
Biaxial adjustable bracket

- **OP-88638**



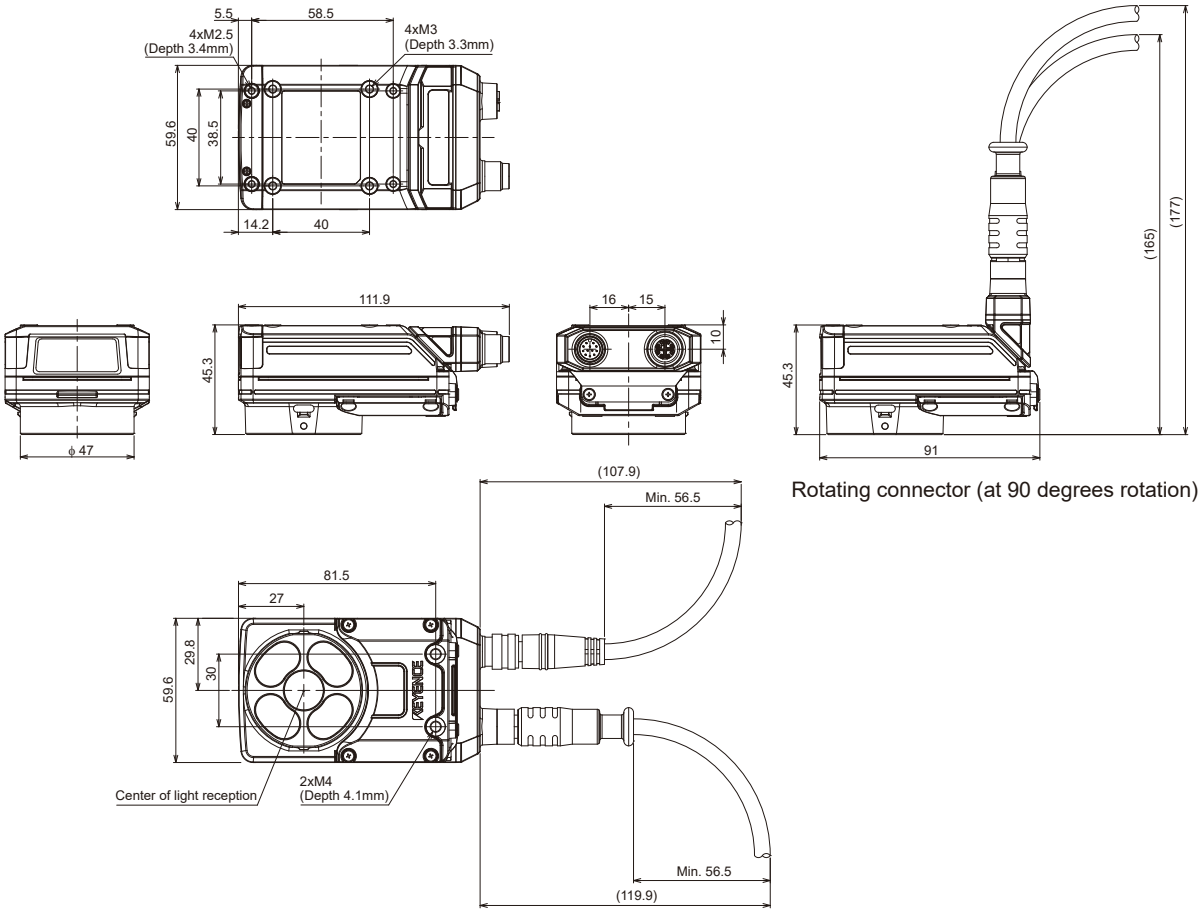
Adjustable bracket (for the AI Lighting unit)

• OP-88639



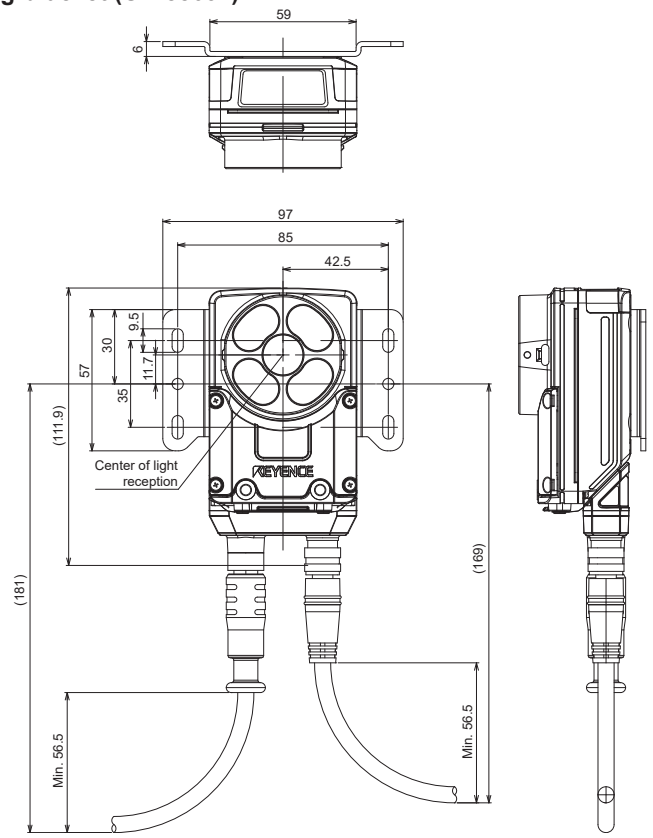
Built-in amplifier type sensor

• IV3-500MA **• IV3-500CA** **• IV3-600MA** **• IV3-600CA**

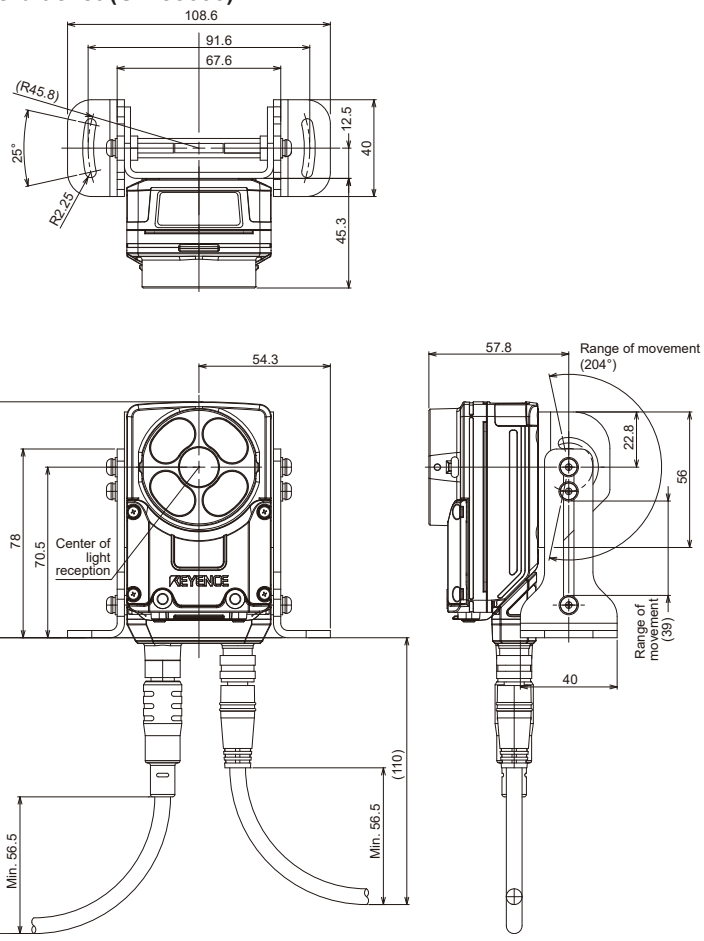


Rotating connector (at 90 degrees rotation)

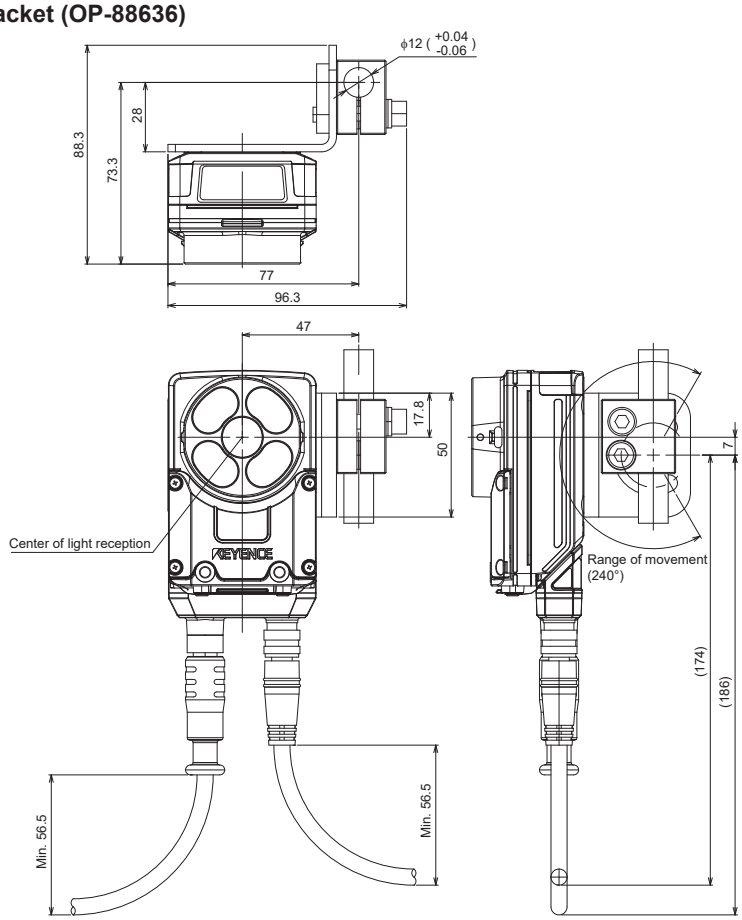
• With the common mounting bracket (OP-88634)



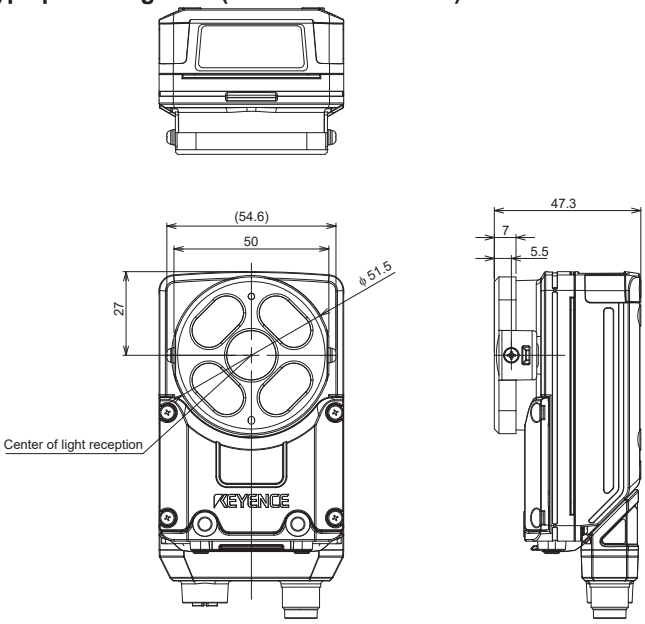
• With the biaxial adjustable bracket (OP-88635)



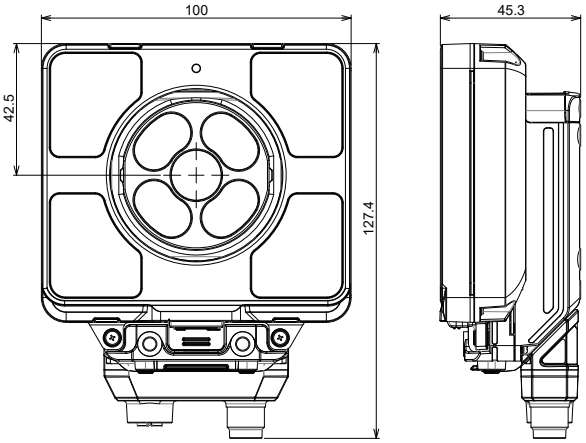
• **With the adjustable bracket (OP-88636)**



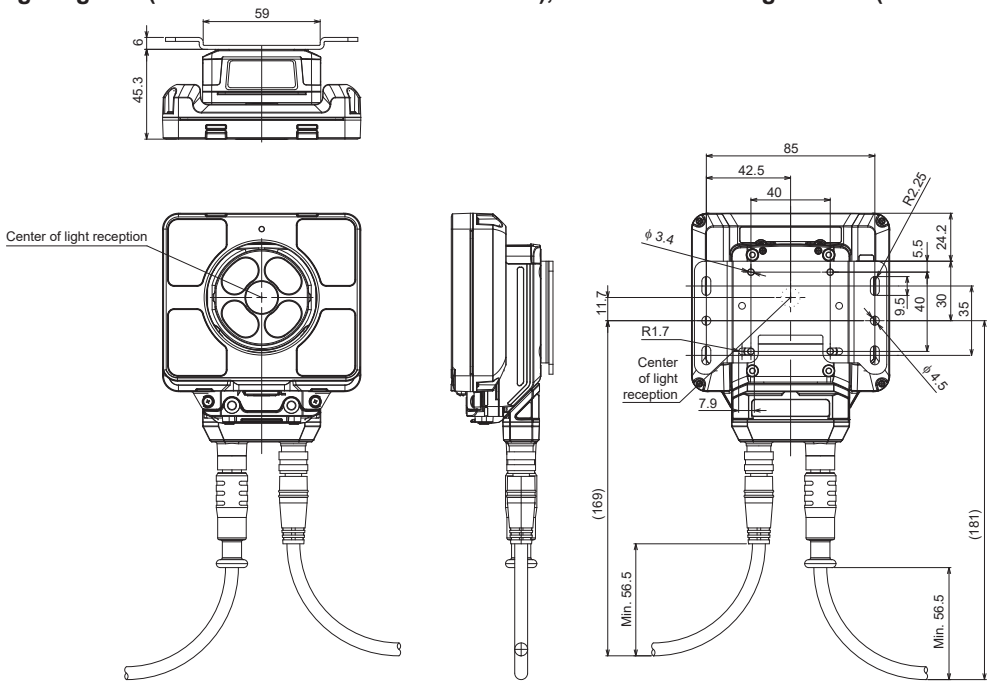
• **With the built-in amplifier type polarizing filter (OP-88640/OP-88641)**



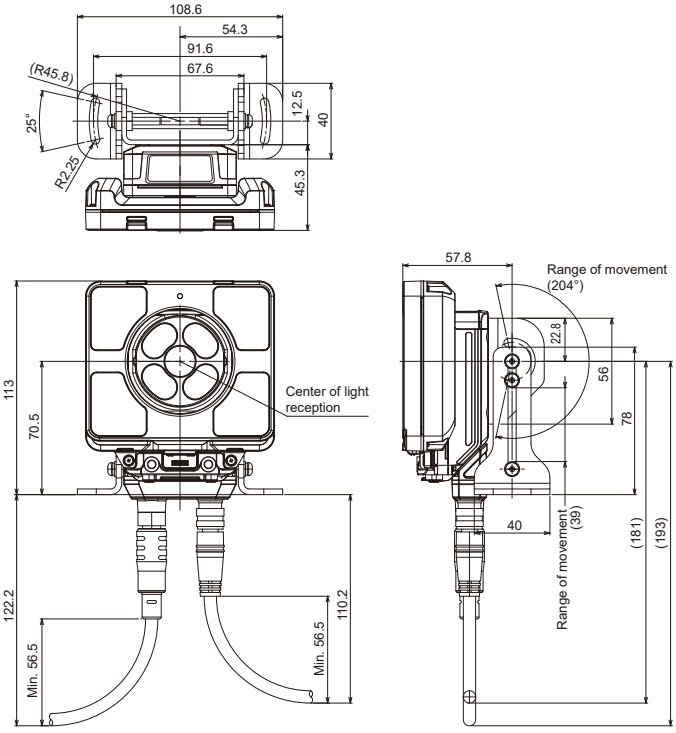
• With the AI Lighting unit (IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M)



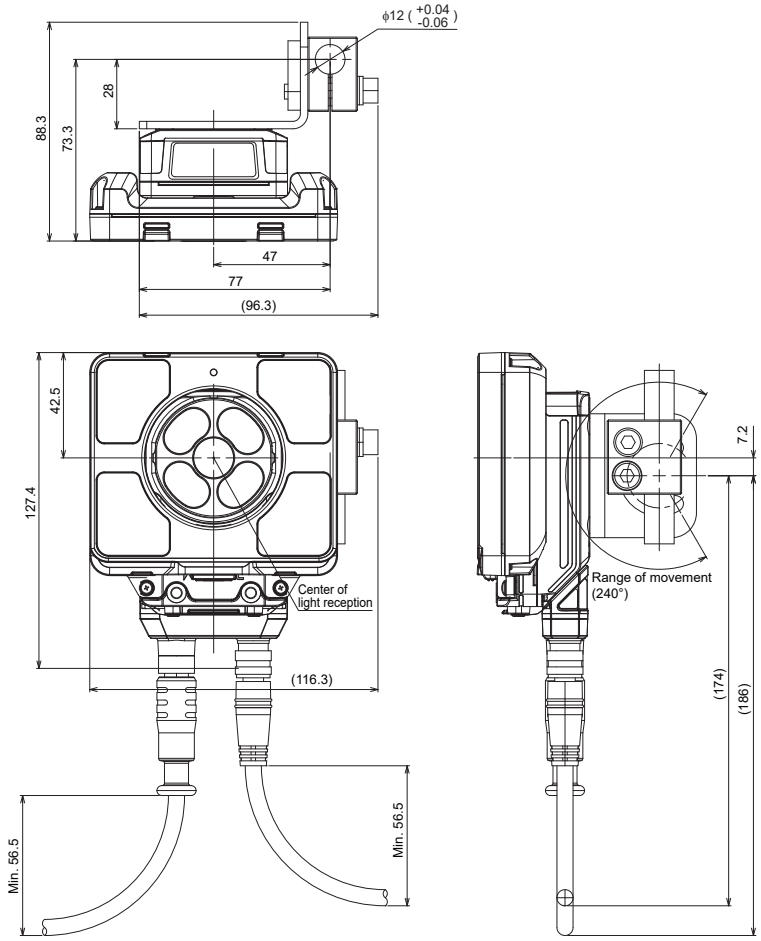
• With the AI Lighting unit (IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), common mounting bracket (OP-88634)



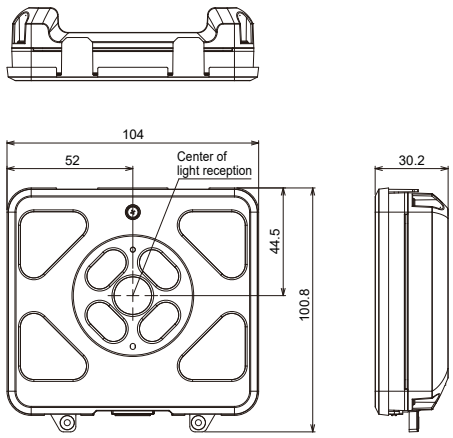
• With the AI Lighting unit (IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), biaxial adjustment mounting bracket (OP-88635)



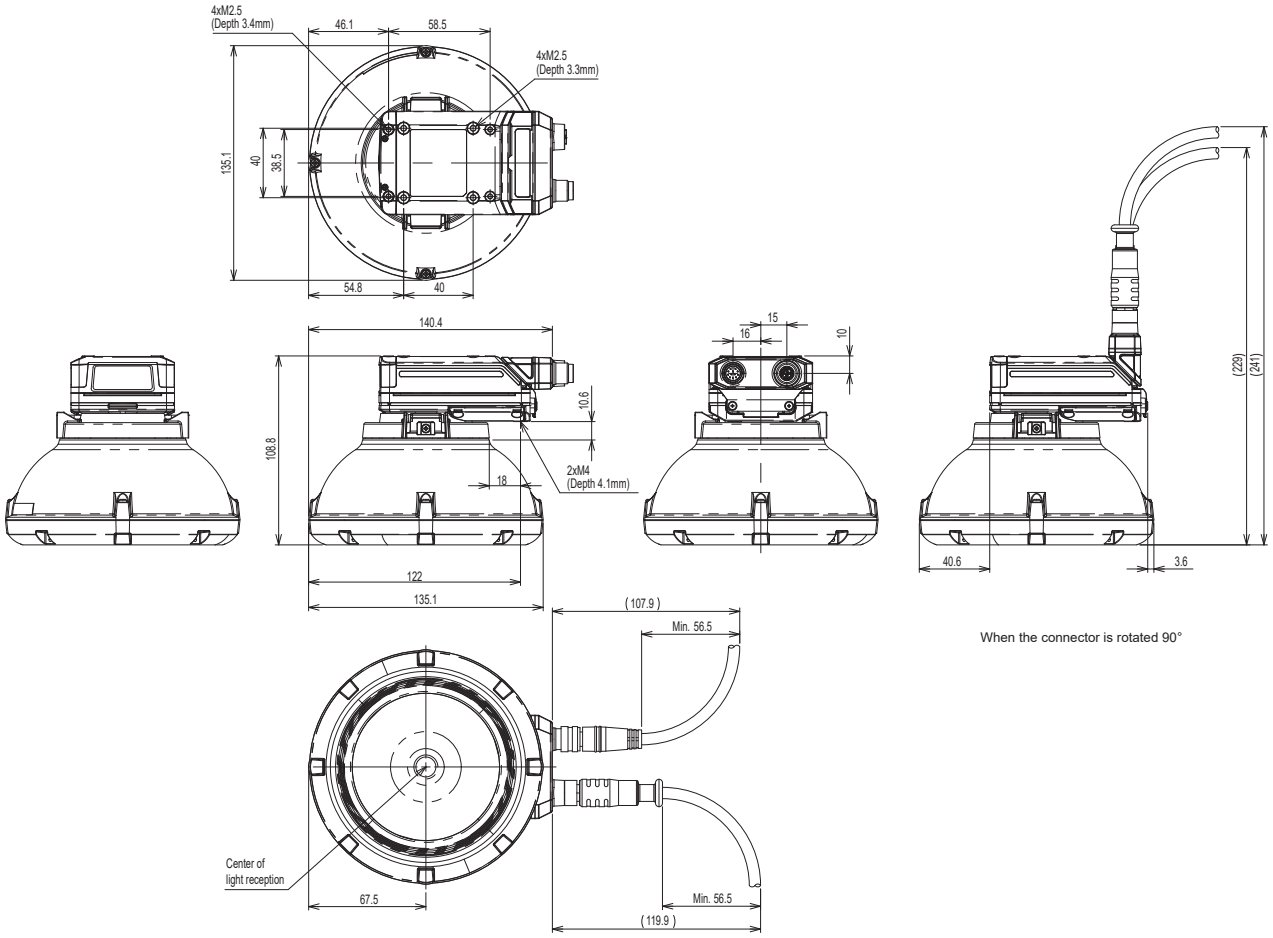
• With the AI Lighting unit (IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), adjustable bracket (OP-88636)



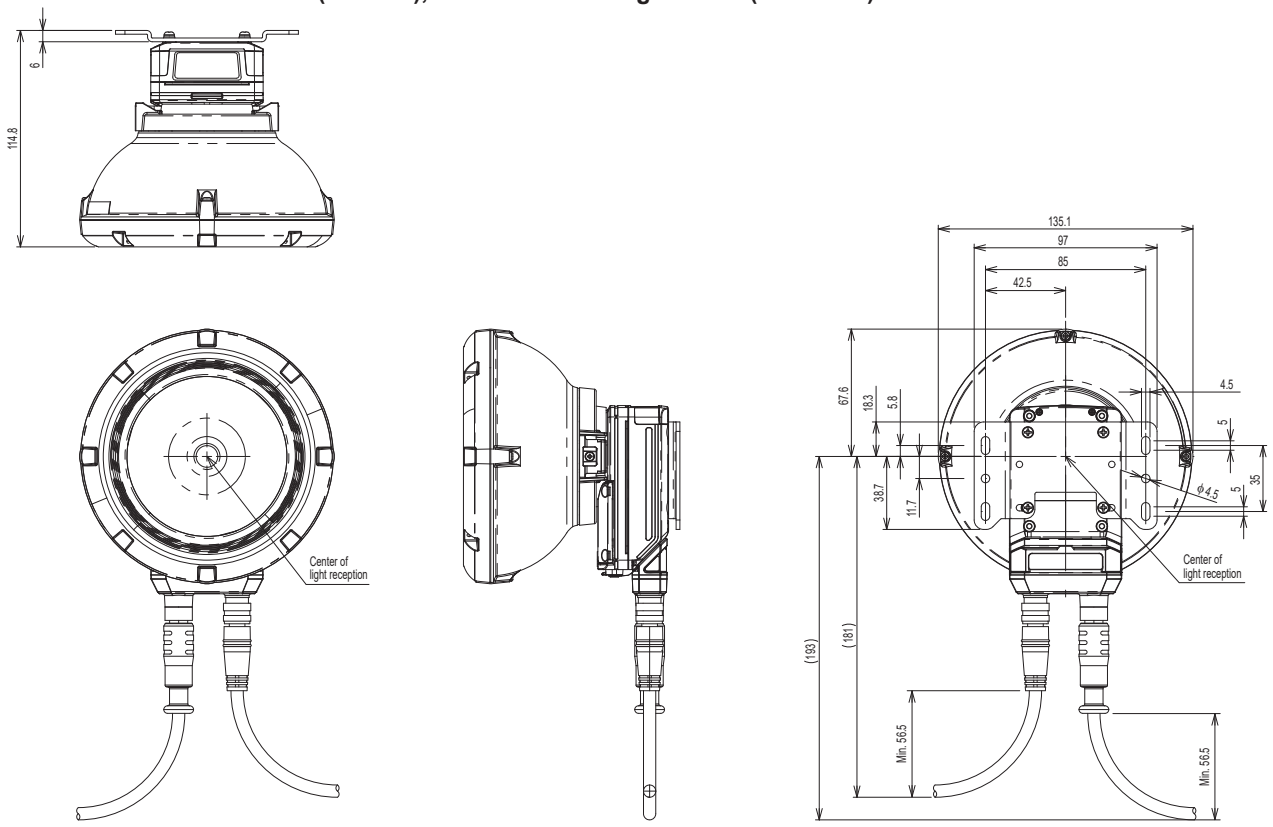
• With the AI Lighting unit (IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M), polarizing filter for the AI Lighting unit (OP-88644/ OP-88645)



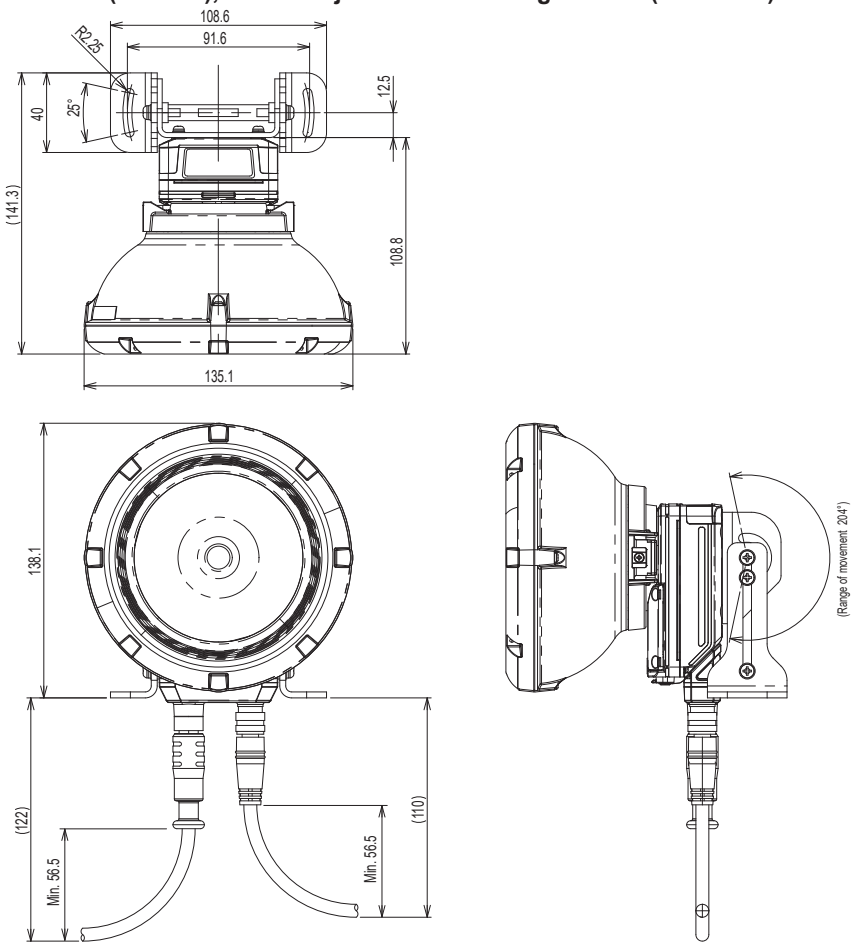
• With the Dome Attachment (IV3-D10)



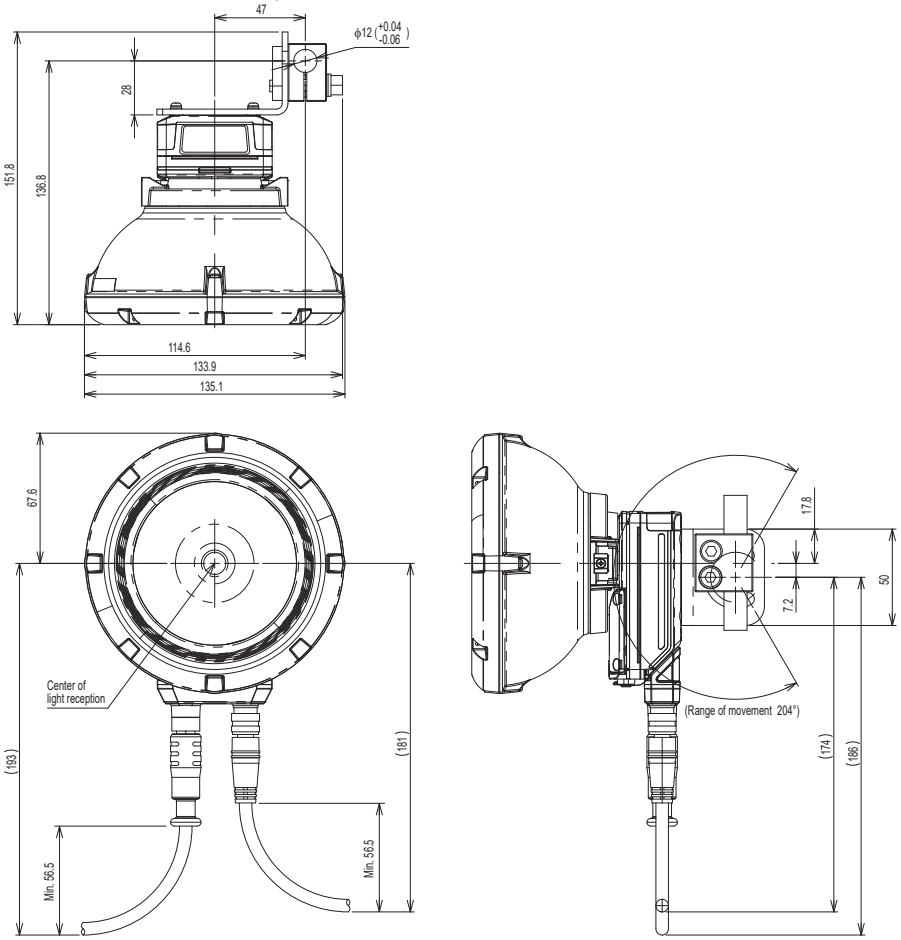
• With the Dome Attachment (IV3-D10), common mounting bracket (OP-88634)



• **With the Dome Attachment (IV3-D10), biaxial adjustment mounting bracket (OP-88635)**



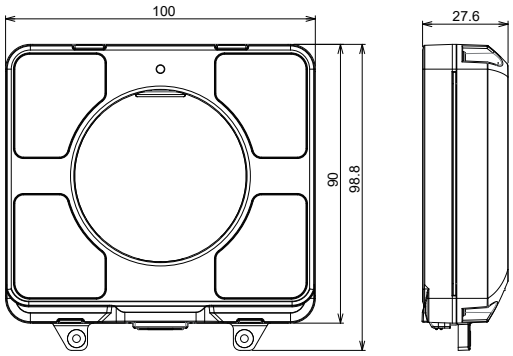
• **With the Dome Attachment (IV3-D10), adjustable bracket (OP-88636)**



Options for the built-in amplifier type

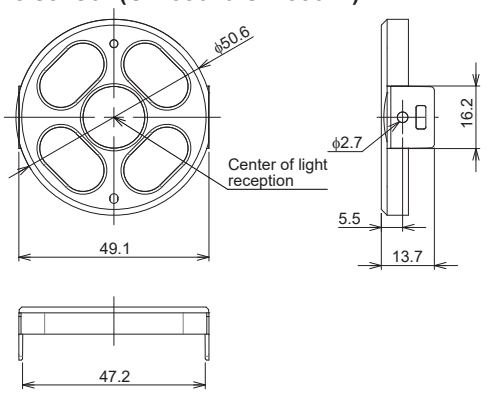
AI Lighting unit

• IV3-L5C/IV3-L5M/IV3-L6C/IV3-L6M

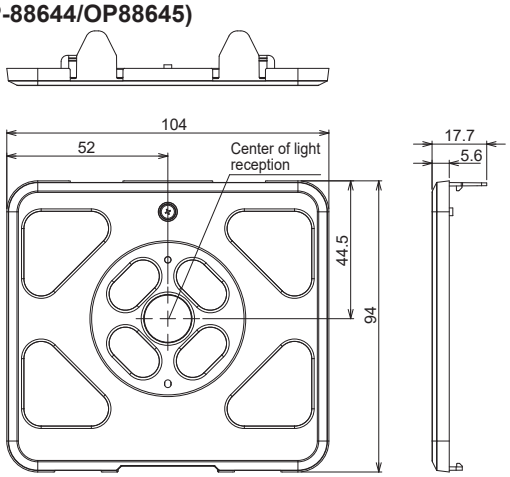


Polarizing filter

• For the sensor (OP-88640/OP-88641)

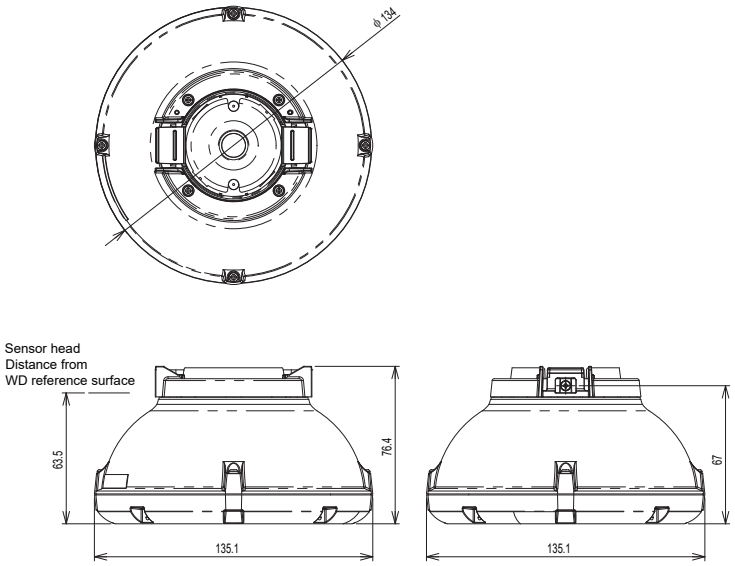


• Polarizing filter for the AI Lighting unit (OP-88644/OP88645)



Dome Attachment

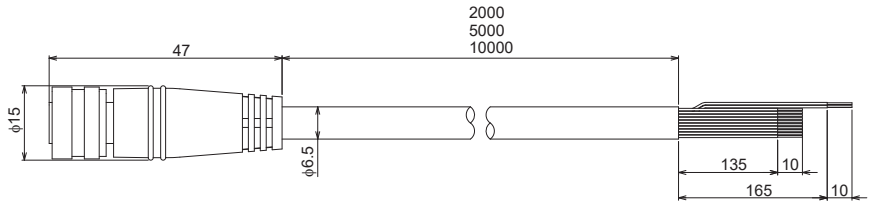
• IV3-D10



Cable

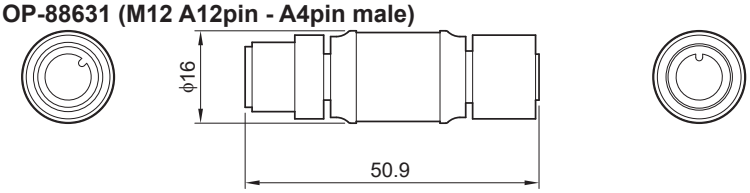
Power I/O cable

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

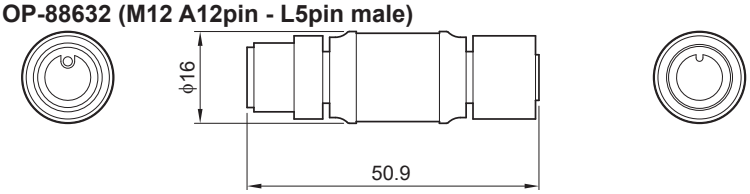


Conversion connector for power I/O cable

• OP-88631 (M12 A12pin - A4pin male)

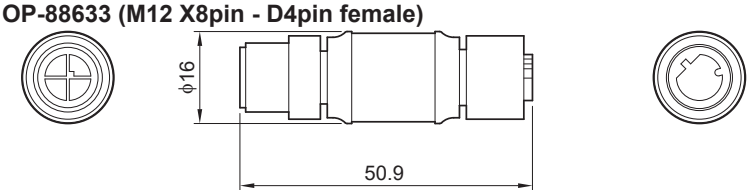


• OP-88632 (M12 A12pin - L5pin male)



Conversion connector for the Ethernet cable

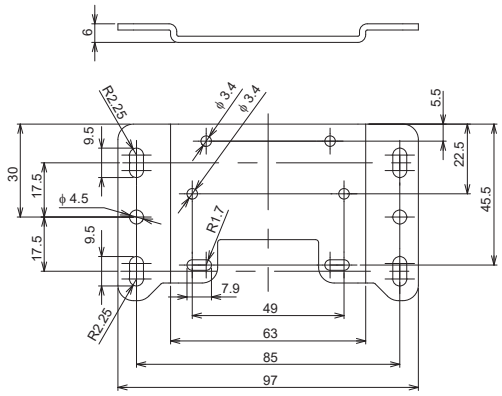
• OP-88633 (M12 X8pin - D4pin female)



Mounting bracket

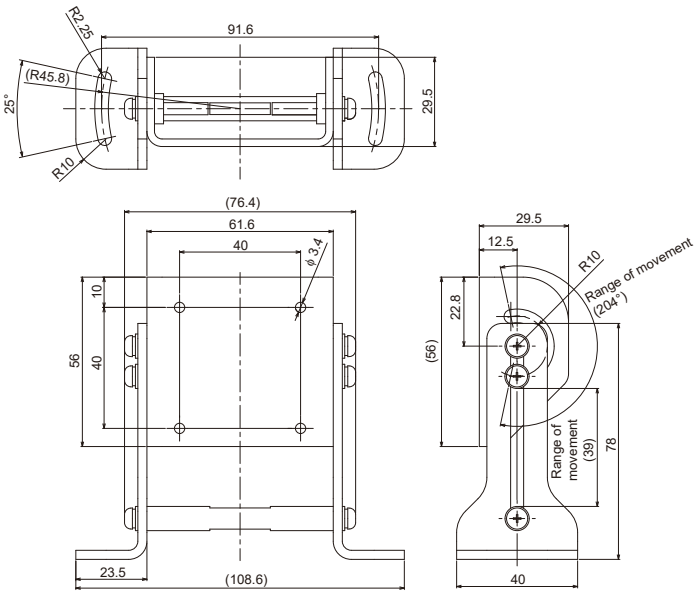
Common mounting bracket (also for the ultra-compact model)

• **OP-88634**



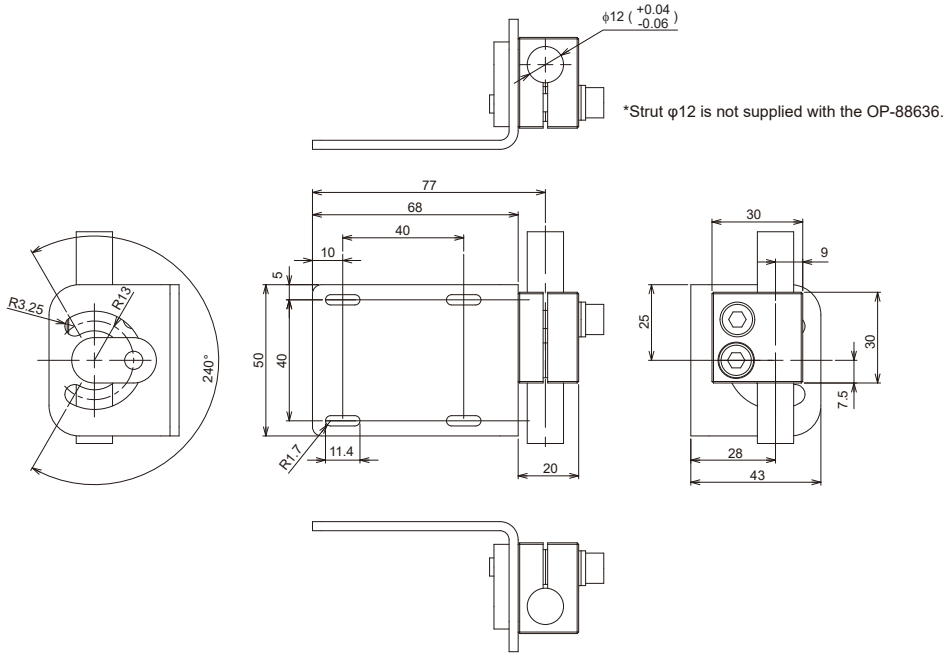
Biaxial adjustable bracket

• **OP-88635**



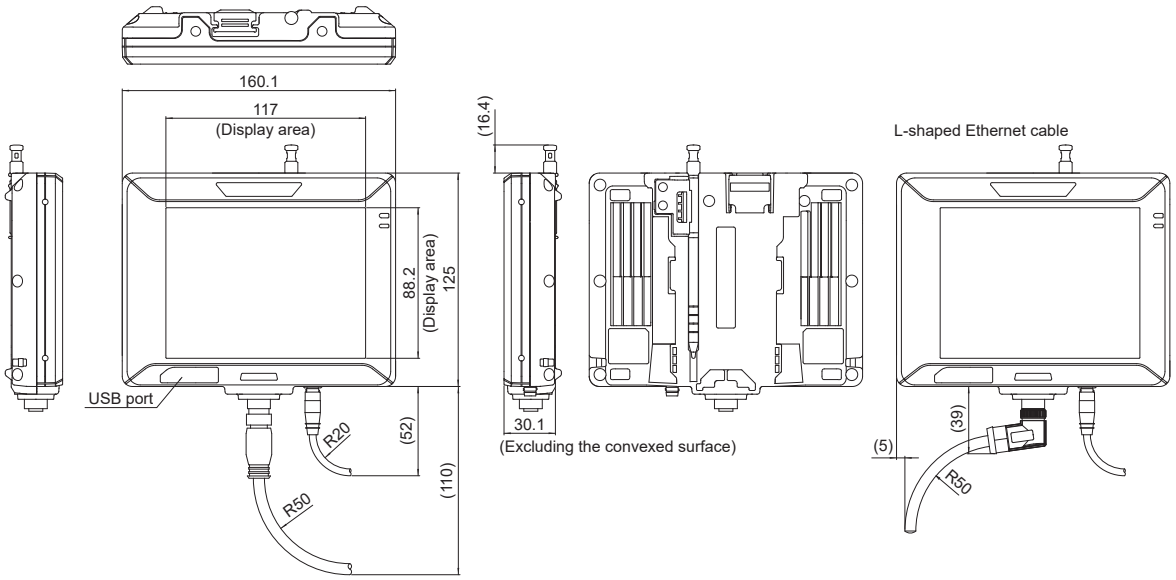
Adjustable bracket

• **OP-88636**

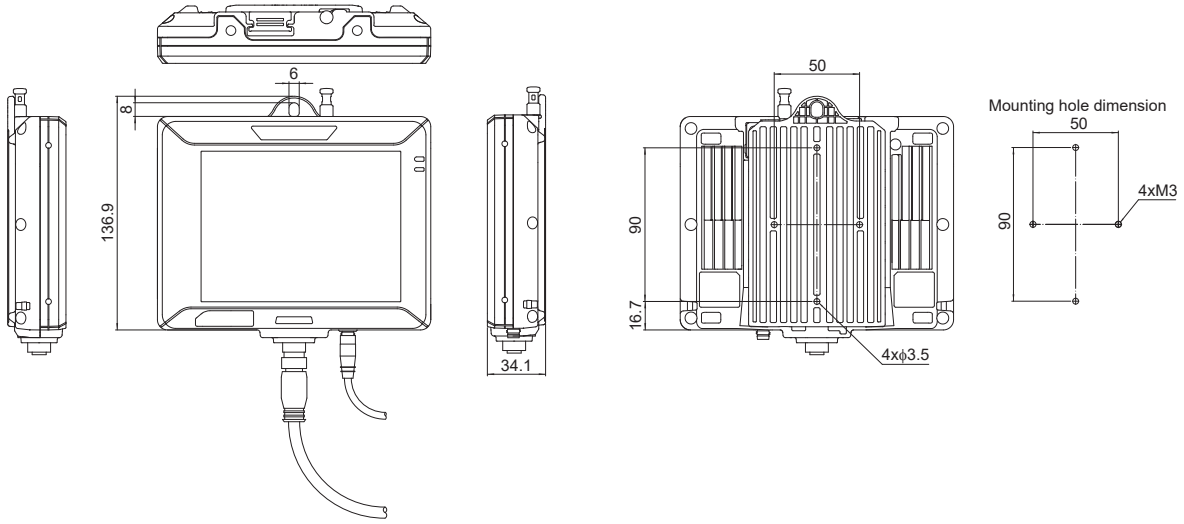


Control panel

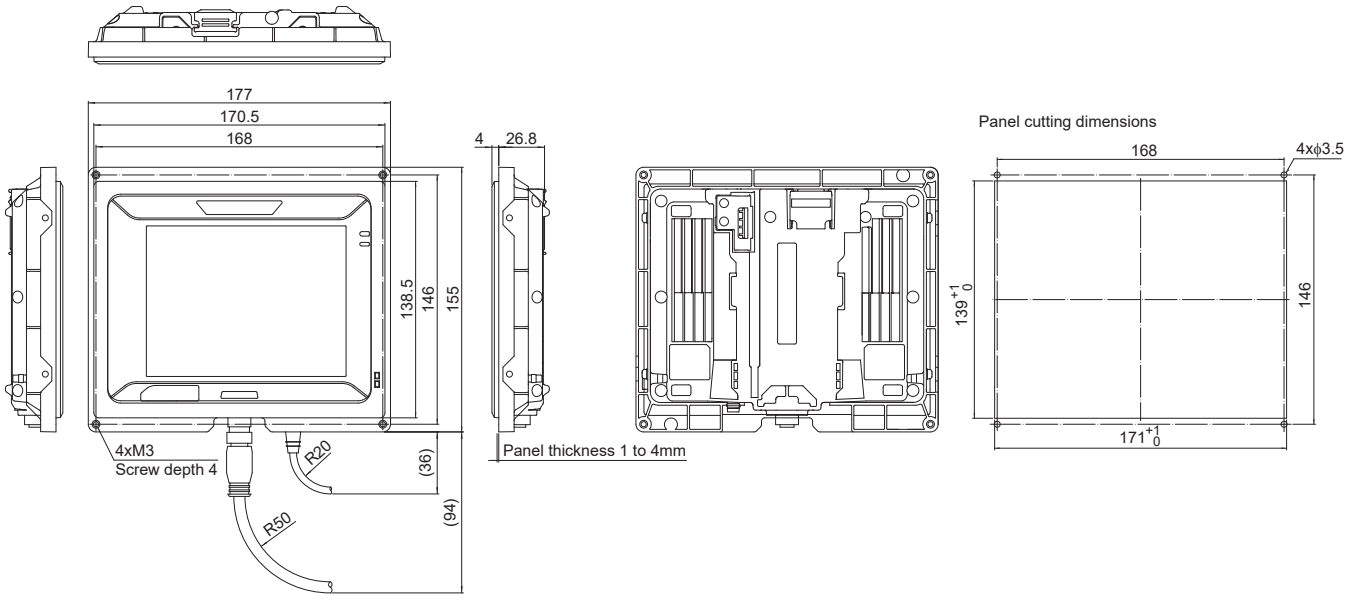
IV3-CP50



Using the wall mounting adapter (OP-88349)



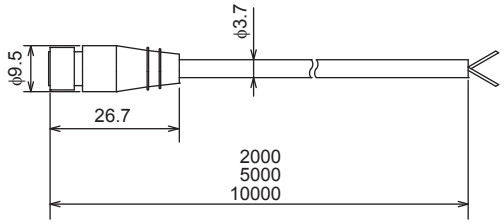
Using the control board mounting adapter (OP-88350)



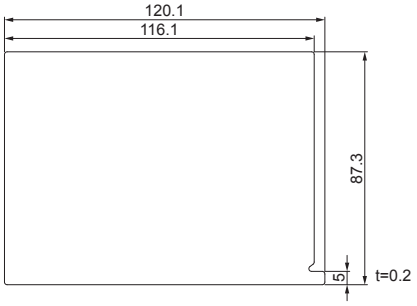
Control panel options

Panel/Monitor power cable (M8 4pin - strand wire)

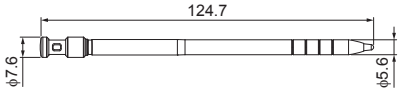
- OP-87443 (2 m)
- OP-87444 (5m)
- OP-87445 (10m)



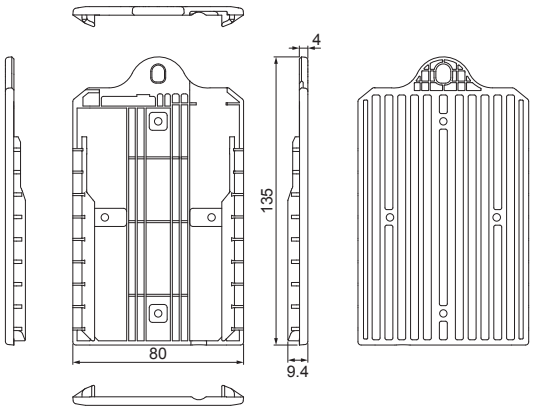
Touch panel protection sheet (OP-88351)



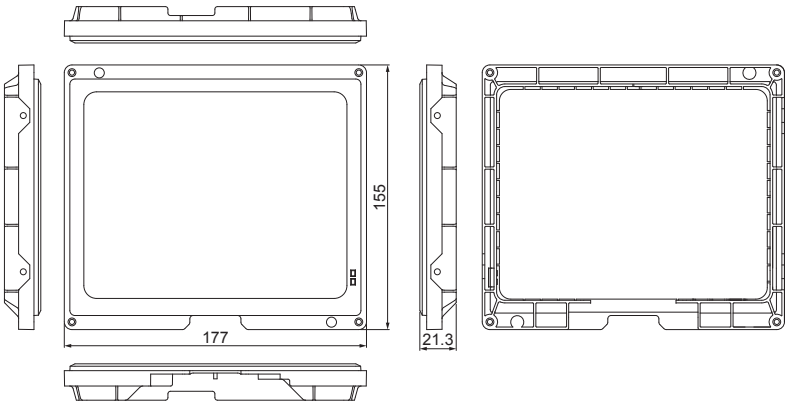
Stylus (OP-88352)



Wall mounting adapter (OP-88349)

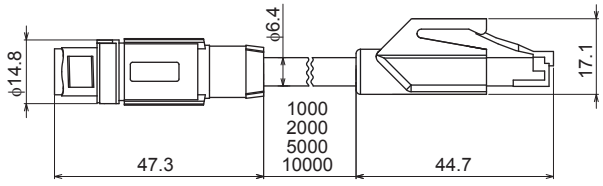


Control board mounting adapter (OP-88350)



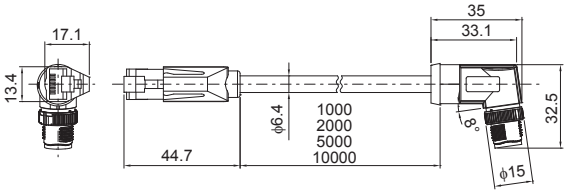
Ethernet cable

- OP-87907 (1 m)
- OP-87457 (2 m)
- OP-87458 (5 m)
- OP-87459 (10 m)



L type Ethernet cable

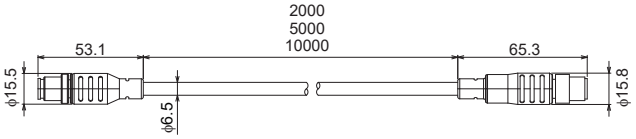
- OP-88042 (1 m)
- OP-88043 (2 m)
- OP-88044 (5 m)
- OP-88045 (10 m)



Communication cable (option)

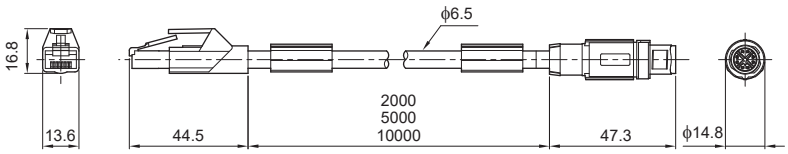
M12-M12 Ethernet cable (dedicated for the built-in amplifier type)

- **OP-88651 (2 m)**
- **OP-88652 (5 m)**
- **OP-88653 (10 m)**
- **OP-88045 (10 m)**



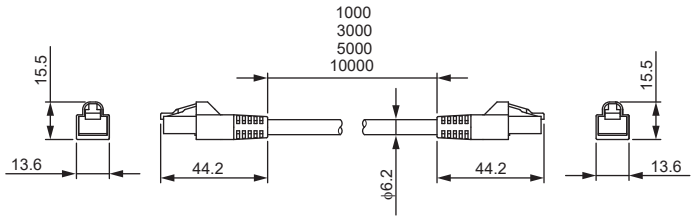
Ethernet cable (dedicated for the built-in amplifier type)

- **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)**



MEMO

Appendices

Status Table A-2
Matching Rate of the Outline Tool and Position Adjustment Tool A-6
Troubleshooting A-7
Error Messages A-9
Remedy when data transfer to the SD card is unavailable A-15
Remedy when the Software cannot be Connected with the Sensor A-16
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Maintenance A-27
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A

Status Table

Status Table

Status			Screen type	Sensor (built-in amplifier)/ Sensor amplifier (ultra-compact model) indicator light				
				PWR/ERR (Ultra-compact model)	Status indicator light (Built-in amplifier type) (Ultra-compact model head part)	OUT	TRIG	
Starting up			-	Lighting (green)	Blink (green)	Blink (green)	OFF	
Running*2	Waiting for a trigger		RUN	Lighting (green)	*3	*3	OFF	
	Judgment processing						*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					
	Capturing AI/Automatically adjusting the brightness						*13	
	Setup Adjustment						*14	
	I/O Monitor		-				OFF	
	Others							
Error	Trigger error	Running	RUN	Blink (red)	Blink (red)	Same as normal		
		Setting	LIVE					
	External master registration error		-					
	System error			Lighting (red)		OFF	OFF	
	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 4-154)
When the position adjustment is NG, the status of each tool becomes NG.
*2 The sensor continues running even during the operation of the [Monitor Settings]/[Run/Learned Img. History]/[External Media] 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.

	Input				Output			
	External trigger	Switching programs	External master image registration	Clear Error	BUSY	Total Status / Total Status NG / Each Tool / Each Logic / Part Type / Pos. Adj.*1	RUN	Error
	×	×	×	×	OFF	OFF	OFF	OFF
	✓	✓	✓	×	OFF	*4	ON	OFF
	*6	*7	*8		ON			
		*10	*11			*12		
		*11	*10					
	✓	×	×	×	Same as while running	OFF	OFF	OFF
	×				*13			
					OFF			
	*15	←	←	←	←	←		←
	×	×	×	×	OFF	OFF		OFF
	Same as normal			✓	Same as normal			ON
	×	×	×	×	OFF	OFF	OFF	
					*16	*16		*16

*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 “10 Controlling with the Input/Output Line” (page 10-1).

A

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 4-154)

*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 (master) number in sorting mode.

*6 Displays the part (master) name and part (master) number in sorting mode.

*7 In standard mode. 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			Total Status*2 (standard mode only)	Tot.StatusNG (standard mode only)
			Pos. Adj./ Hi-Sp.Adj	Outline	Learning Tool/ Color Area/Area/ EdgePixels/Width/ Diameter/Edge/ Pitch/OCR		
Succeeded	No	View judgment	OK	OK/NG	OK/NG*3	OK/NG	
		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	
		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 4-154)

*3 Displays the part (master) number, part (master) name, or NG in 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/EdgePixels/Width/Diameter/Pitch: 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

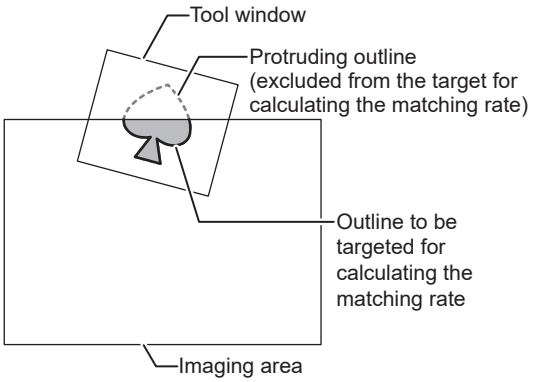
Matching Rate of the Outline Tool and Position Adjustment Tool

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.

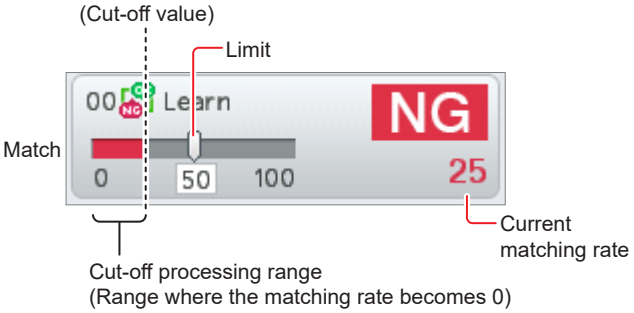
- With the [Search Range] of the Outline tool set to [Partial]
- With the [Search Range] of the Position Adjustment set to [Partial] and with the [Search Algorithm] set to [High Speed]
- With the [Search Range] of the Position Adjustment set to [High Accuracy]

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/Brightness Area/ ColorAverage/Brightness Average EdgePixels/ Width/Diameter/Edge/Pitch tool OCR/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 or the PWR indicator light of the control panel is lighting or blinking in red. The status indicator light is blinking in red. (Built-in amplifier type)	An error has occurred. Check the errors indicated by the lighting or blinking.	Refer to “Error Message”.	A-9
An error message is displayed on the control panel.	Check the details of the error message.	Refer to “Error Message”.	A-9
The power of the sensor or control panel does not turn on.	Is the power cable correctly connected?	Connect the power cable correctly.	2-18
	• Does the voltage or capacity of the power source meet the specification? • Has the voltage dropped due to the power cable conductor resistance?	• Use a power source of the correct rating. • Choose a power cable with consideration to a voltage drop.	11-2
An image is not displayed on the monitor. 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.	4-14
	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 on a moving target?	Set the image optimization again.	
	Does ambient light affect the image?	Mount the AI Lighting unit.	2-6
		Use brightness correction.	4-22
		Implement a shield to prevent the incident of ambient light.	-
	Is the front cover dirty or damaged?	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?	• 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 [OFF].	5-18
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.	-

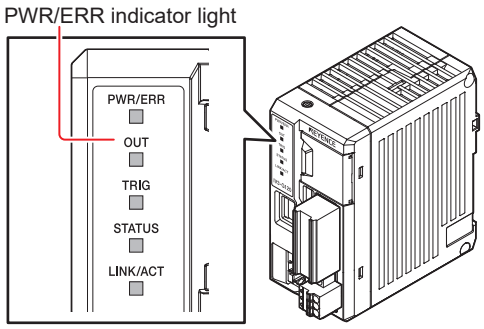
Symptom	Check point	Remedy	Ref.
The monitor cannot be operated using the touch panel.	Is the input screen for the unlock password displayed?	The touch screen lock of the control panel or the security of the sensor is enabled. Input the unlock password.	7-21 7-33
	The password is lost and cannot unlock.	Contact your nearest KEYENCE office.	-
	Is there any damage or cracks on the touch screen?		
The status result is not output.	Is the output line correctly connected?	Correctly connect to the external devices.	2-18
	Is the output setting correctly set?	Set the output line and output settings correctly in the Settings Navigator.	4-151
	Is the system in the setting mode?	Start run mode	5-2
	Is the threshold correctly set?	Set the threshold correctly.	6-17
	Is the tool correctly set?	• Set the judgment tool correctly. • Set the position adjustment tool correctly.	4-25 4-121
	Is the Polarity correctly set?	Set NPN or PNP according to the circuits of the external devices.	7-19
	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.	7-18
An external trigger cannot be input.	Is the trigger condition set to [External]?	Select [External] in Trigger Options.	4-10
	Is the input line correctly connected?	Correctly connect to the external devices.	2-18
	Has the input setting been made correctly?	Adjust the input line and input settings correctly in [Input Settings].	7-16
	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.	7-19
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].	7-16
	Is the input line correctly connected?	Correctly connect to the external devices.	2-18
	Has the input setting been made correctly?	Adjust the input line and input settings correctly in [Input Settings].	7-16
	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.	7-19
	When using P032 to P127, is the SD card correctly inserted?	Insert the SD card correctly and close the cover.	8-11
	Is the program expansion function correctly set?	Set the [Transfer Program Settings] to [Enable].	8-14
The control panel and the sensor cannot be connected.	Check the cables and settings.	Refer to “Remedy when the Monitor cannot be Connected with the Sensor” (Page A-16).	A-16
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-24
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-15

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.



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.	• Cycle the power of this device. • If the same error occurs, contact your nearest KEYENCE office.
		A startup memory read error occurred. • A data abnormality occurred due to noise or because the power switched OFF while writing was in progress.	• Initialize the settings. • If the same error occurs, contact your nearest KEYENCE office.
		An error occurred in switching the advanced program at the time of startup or during operation.	Refer to "Checking error message on the control panel" (page A-11).
	Blink	A trigger error occurred. The judgment process is not performed. • 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.	• A trigger error can be fixed using one of the following procedures. • 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 Settings] is set to [Until Judgment is Complete]). • An error will not occur if the trigger error is set to [OFF] described in output assignment for the Settings Navigator (Page 4-151).
		An error occurred in switching the advanced program during setup.	Refer to "Checking error message on the control panel" (page A-11).
		An external master image registration error (with no registered master image) occurred. The master image is not updated. • The image to be registered as a master image was not imaged. • The work memory is insufficient.	• An external master image registration error can be fixed using one of the following procedures. • 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.

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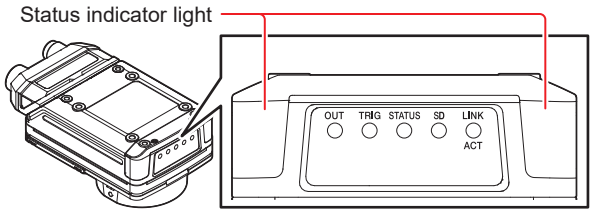
PWR/ERR indicator light status		Cause	Remedy
Red	Blink	An external master image registration error (with registered master image) occurred. The following errors occurred even though the image was updated and registered as a master image. • For the new master image, the outline cannot be extracted with 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.	• An external master image registration error can be fixed using one of the following procedures. • 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. • 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-15).
		An FTP error occurred. The following errors occurred. • Connection with the FTP/SFTP server failed. • Tranfer 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. • Press [OK] on the Error screen • Clear Error input • Resolve the causes of transfer failure.
OFF		Power is not supplied to this device.	• 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 2-18)
“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

■ 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.	• 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 on 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.	• 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 2-18)
“4. Output Assignment (Setting Details of Outputting to Output Line)” (page 4-151)

Checking error message on the control panel

Message	Cause	Remedy	Output/ Indicator
A system error occurred on the sensor. Turn on the power of the sensor again. If not turned on, contact local service center.	A system error occurred in the sensor. • It is possible that a fault occurred inside the sensor.	• Turn on the power of the sensor again. • If the same error occurs, contact your nearest KEYENCE office.	*1
Failed to read nonvolatile memory at sensor startup. Turn on the sensor power again or initialize the sensor. After this message is closed, the [Initialize] button will be displayed.	A memory read error occurred when the sensor started. • A data error occurred. • It is possible that the power was switched OFF during writing, or noise was picked up.	• 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
Initialization is necessary because sensor program xx is corrupt. After this message is closed, the [Initialize] button for program xx will be displayed.	A memory read error occurred when the sensor started. • 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.	• 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
Trigger error	A trigger error occurred. Judgment processing has not been executed. • 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.	• A trigger error can be fixed using one of the following procedures. • 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 [OFF] described in output assignment for the Settings Navigator (Page 4-151).	*2
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.	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. • 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 Edge Pixel/Width/Diameter/Edge/Pitch 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.	• An external master image registration error can be fixed using one of the following procedures. • 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
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.			
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.			
Brightness adjustment area is not adjustable as a result of “Ext. Master Save”. Check configuration of brightness adjustment.			
External master registration failed because the learning tool is set to the program.			

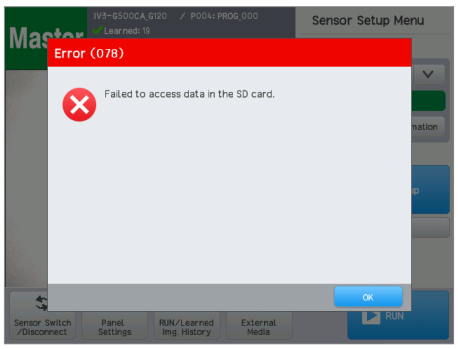
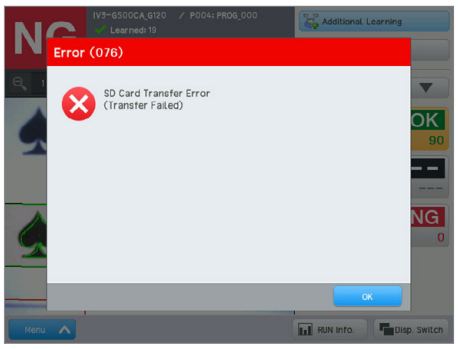
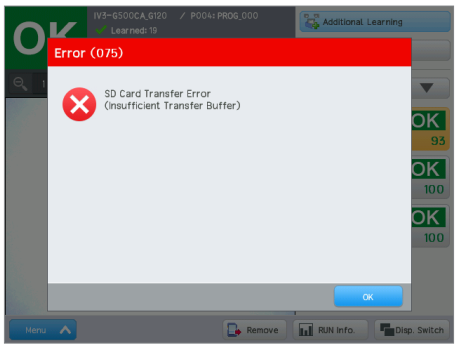
Message	Cause	Remedy	Output/ Indicator
External master registration failed because the image has not been captured. External master registration failed due to insufficient work memory.	An external master image registration error (with no registered master image) occurred. The master image is not updated. • The image to be registered as a master image was not imaged. • The work memory is insufficient.	• An external master image registration error can be fixed using one of the following procedures. • 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
Monitor fatal error (XXX) occurred. Contact your nearest KEYENCE office. Monitor system error happens. Turn on monitor. If not turned on, contact local service center.	A system error occurred in the control panel. • It is possible that a fault occurred inside the control panel.	• Turn on the power of the control panel again. • If the same error occurs, contact your nearest KEYENCE office.	*3
Connecting to sensor…	Connection is not possible because there is no response from the sensor.	Refer to “Remedy when the Software cannot be Connected with the Sensor” (page A-16).	*4
Connecting to sensor (XXX.XXX.XXX.XXX)…	Connection is not possible because there is no response from the sensor with the specified IP address.		
Communication timeout to sensor occurred.	Connection is not possible because there is no response from the sensor.		
Data transfer to sensor fails.	Connection is not possible because data transmission to the sensor has failed.		
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.	*4
Failed to write file.	File saving to the USB memory failed.	Replace USB memory.	
Failed to access the file or folder.	Access to the USB memory failed.	• Format USB memory. • Replace USB memory.	
Data saving has failed. If it happens repeatedly, check the following items. Replace USB memory. Format USB memory.	The USB memory is broken.		
Disk space is insufficient.	Saving is not possible because the amount of free space of the USB memory is insufficient.	Increase the amount of free space by deleting files in the USB memory or by formatting.	
There is not enough space to perform individual program backup.	Saving is not possible because the amount of free space of the USB memory is insufficient.	Increase the amount of free space by deleting files in the USB memory or by formatting.	
This file configuration data is for xxxx. This file is not readable.	The setting files for a different model of sensor cannot be read.	Read the setting files of a sensor of the same model.	

Message	Cause	Remedy	Output/ Indicator
FTP Connection Error	Connection with the FTP/SFTP server failed.	Refer to 📖 "Remedy when data transfer via FTP/SFTP is unavailable" (page A-24).	*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.		
It does not match the server settings. Review the server settings and others. (Key exchange algorithm)			
It does not match the server settings. Review the server settings and others. (Host key algorithm)			
It does not match the server settings. Review the server settings and others. (Cryptographic algorithm)			
It does not match the server settings. Review the server settings and others. (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. - The network settings of the panel.	Connection with the sensor failed.	Check the following items. • Specify the correct IP address of the sensor. • Power supply for the sensor. • Network connection. • Network settings of the control panel	
The system will return to the sensor settings 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.	*5
The system will return to the sensor settings menu because the program file selected previously cannot be found. The program number will be switched 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.	*5
The system will return to the sensor settings 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

Message	Cause	Remedy	Output/ Indicator
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-15).	*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: Lighting (red), Status indicator light: Blinking (red), PWR indicator light of the control panel: Lighting (red)
*2 Error output from the sensor: ON, PWR/ERR indicator light of the sensor: Blinking (red), Status indicator light: Blinking (red), PWR indicator light of the control panel: Blinking (red)
*3 PWR indicator light of the control panel: Lighting (red)
*4 SENSOR indicator light of the control panel: Off
*5 Error output from the sensor: does not work, PWR/ERR indicator light of the sensor: Lighting (red), Status indicator light: Blinking (red), PWR indicator light of the control panel: Lighting (red)

Remedy when data transfer to the SD card is unavailable

Status	Remedy
 Accessing the data in the SD card failed.	• 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.
 Data transfer to the transfer destination folder failed.	• 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.
 Data which is larger than the remaining storage of the transfer buffer has been created and the transfer failed.	• Increase the trigger cycle of the sensor. “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.” “BUSY Output Configuration” (page 7-18)

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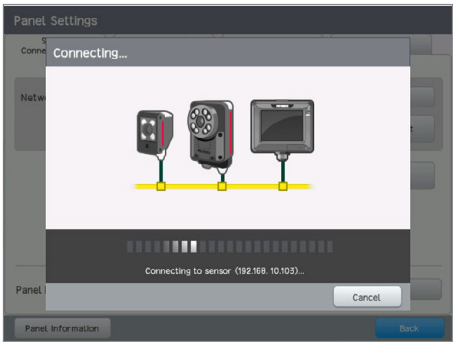
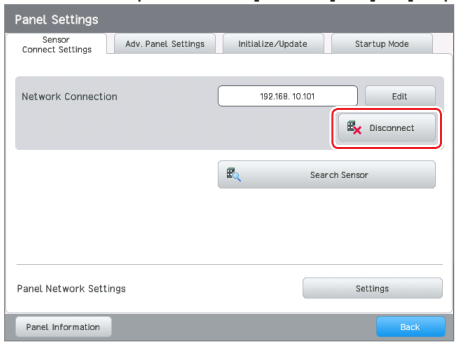
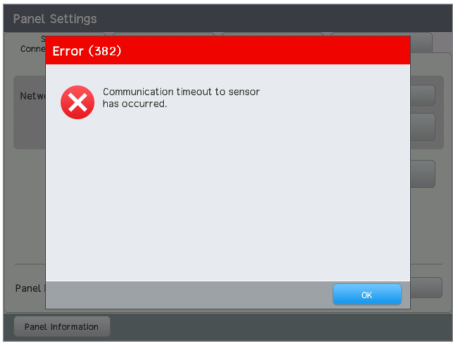
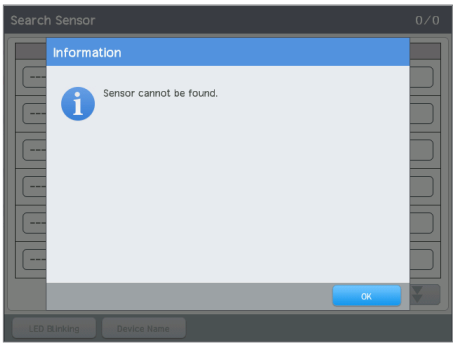
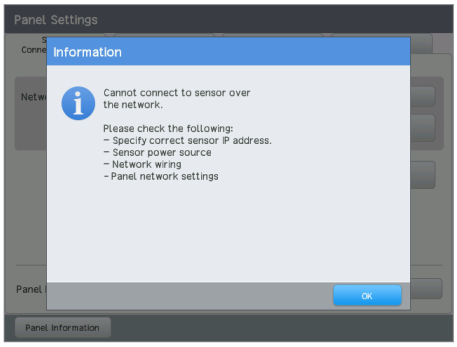
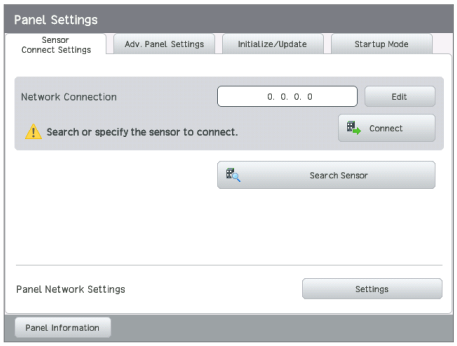
Remedy when the Software cannot be Connected with the Sensor

Remedy when connection via a network is unavailable

Status	Remedy
 Retries occur repeatedly because connection is not possible after the power is turned on.	• Supply power to the sensor and the network equipment. • Correctly connect with the sensor and the network equipment. • After a correct connection is established as a result of a retry, the run screen opens automatically. The Sensor Connect screen opens when [Cancel] or [OK] is pressed. 
 • An error (381) “Data transfer to sensor failed.” may also be displayed. • Connection became impossible after connection was established.	• Press [Start Connection] after a correct connection has established. • Press [Search Sensor] to search for the sensor. 📖 “Searching for and connecting to sensors on the network” (page 7-29) If the connection cannot be established, refer to 📖 “When the connection cannot be established by searching for the sensor” (page A-16). • Press [Specify Sensor] to connect the sensor. 📖 “Specifying the IP address of and connecting to the sensor” (page 7-30) If the connection cannot be established, refer to 📖 “When the connection cannot be established by specifying the sensor” (page A-17).


The sensor was not found using [Search Sensor] on the Sensor Connect screen.
	When the connection cannot be established by searching for the sensor
	• Supply power to the sensor and the network equipment.
	• Correctly connect with the sensor and the network equipment.
	📖 “Connecting the Sensor with the Control Panel” (page 2-25)
	• Confirm that the IP address of the control panel does not coincide with that of the sensor or another device. Also, correctly set the subnet mask and the default gateway.
	📖 “Confirming/Setting the IP address of the control panel” (page A-22)
	• Reset (initialize) the network setting for the sensor.
	📖 “Confirming/Setting the IP address of the sensor” (page A-23)
	📖 “Initializing the Network Settings (IP Reset Switch)” (page A-26)
	• The following conditions are required for a successful sensor search.
	  • The subnet masks of the sensor and control panel are matched.
	  • The sensor network setting is not set or the IP address is not duplicated.
	  • For the control panel start mode, select [IV3-CP50 Mode]. When in [IV2-CP50/IV-M30] mode, a sensor without an IP address cannot be found.
	  📖 “[Startup Mode] tab” (page 7-28)

A

Status	Remedy
 Connection is not possible using [Specify Sensor] or [Connect] on the Sensor Connect screen.	**When the connection cannot be established by specifying the sensor** • Supply power to the sensor and the network equipment. • Correctly connect with the sensor and the network equipment. 📖 “Connecting the Sensor with the Control Panel” (page 2-25) • Specify the correct IP address of the sensor. • If the sensor IP address has not been set, establish a connection using [Search Sensor]. 📖 “Searching for and connecting to sensors on the network” (page 7-29) • Confirm that the IP address of the control panel does not coincide with that of the sensor or another device. Also, correctly set the subnet mask and the default gateway. 📖 “Confirming/Setting the IP address of the control panel” (page A-22) Reset (initialize) the network setting for the sensor. 📖 “Confirming/Setting the IP address of the sensor” (page A-23) 📖 “Initializing the Network Settings (IP Reset Switch)” (page A-26)
 First connection after purchasing, or connection after the initialization of the control panel.	• Press [Search Sensor] to search for the sensor. 📖 “Searching for and connecting to sensors on the network” (page 7-29) If the connection cannot be established, refer to 📖 “When the connection cannot be established by searching for the sensor” (page A-16). • To make connection by specifying the IP address, press [Edit] and display the [IP Address] screen. Input the IP address of the sensor and press [Start Connection]. 📖 “Specifying the IP address of and connecting to the sensor” (page 7-30) If the connection cannot be established, refer to 📖 “When the connection cannot be established by specifying the sensor” (page A-17).

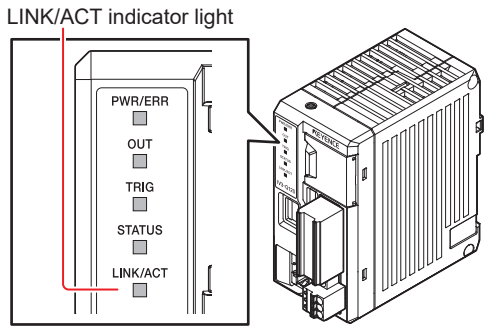
A

Confirming the status by observing the indicator light of the sensor

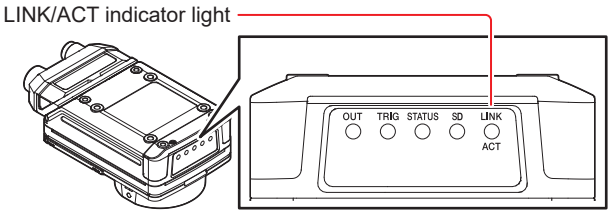
LINK/ACT (link/activity) indicator light

Displays the link status with the network.

Ultra-compact model amplifier



Built-in amplifier type



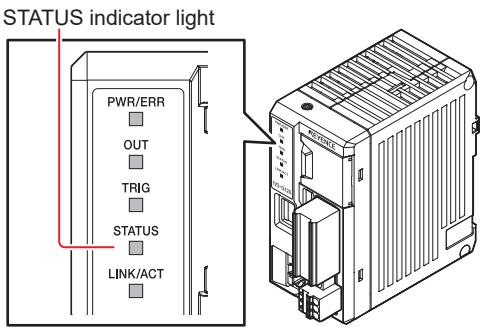
LINK/ACT indicator light status		Status	Remedy
Green	ON	Correct link with the control panel or the Ethernet switch.	Link is normal. When connection with the control panel is not possible, check the STATUS indicator light.
	Blink	Correct link with the control panel or the Ethernet switch. Data is being sent and received.	
OFF		Incorrect link with the control panel or the Ethernet switch. • Power is not supplied to this unit or the connection target. • The cable is not connected correctly.	• Supply power to the sensor. • Supply power to the control panel or the Ethernet switch of the connection target. • Connect the cable correctly.

A

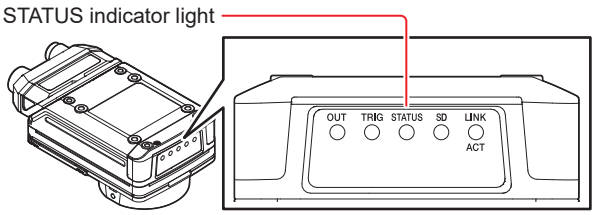
STATUS indicator light

Indicates the connection status with the control panel.
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 of the indicator light		Status	Remedy
Green	ON	Connected normally to the control panel. The connection with the control panel has been established by acquiring the IP address.	-
	Blink	No correct connection with the PC. The IP address of the sensor has been acquired, but connection with the control panel has not been established.	Check the connection state to take appropriate measures. “Remedy when connection via a network is unavailable” (page A-16)
OFF		Connected incorrectly to the control panel. The IP address of the sensor has not been acquired.	Check the connection state to take appropriate measures. “Remedy when connection via a network is unavailable” (page A-16)

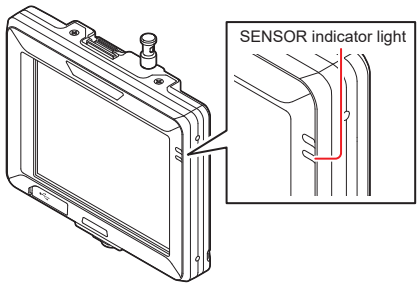
If the light is ON (red), the IP address coincides or a network loop is detected.

Reference

- The communication timeout time is 1 minute.
- During the timeout interval after an error has occurred, the screen of the control panel may fail to be updated while the STATUS indicator light is on, or the control panel may not accept an operation.
- During the timeout interval, devices other than the previously connected control panel cannot be connected.

Confirming the status by observing the SENSOR indicator light of the control panel

The causes of an unavailable connection and countermeasures can be confirmed by checking the SENSOR indicator light of the control panel.



SENSOR Status of the indicator light		Status	Remedy
Green	ON	Connected normally to the sensor.	-
	Blink	No correct connection with the sensor. The link with the sensor or the Ethernet switch has been established, but connection with the sensor has not been established.	Check the connection state to take appropriate measures. “Remedy when connection via a network is unavailable” (page A-16)
OFF		No correct connection with the sensor. The link with the sensor or the Ethernet switch has not been established.	• Supply power to the control panel. • Supply power to the sensor or the Ethernet switch of the connection target. • Connect the cable correctly.

Reference

- The communication timeout time is 1 minute.
- During the timeout interval after an error has occurred, the screen may fail to be updated while the SENSOR indicator light is on, or the control panel may not accept an operation.

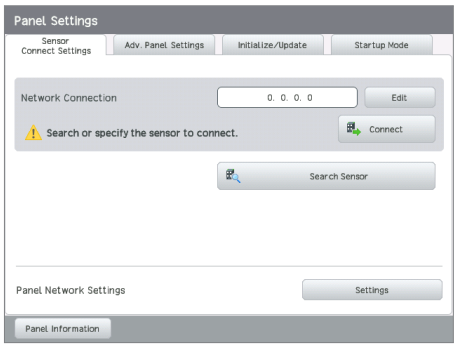
A

Other methods for confirmation

Confirming the existence of the sensor from the control panel

Whether or not the sensor is correctly connected can be confirmed by performing test communication from the control panel to the sensor to be connected.

1 Display the [Sensor Connect Settings] screen.



● When the control panel starts for the first time or after the initialization of the control panel

“Operation for initial startup of the control panel” (page 3-6)

● If not connected with the sensor via network connection.

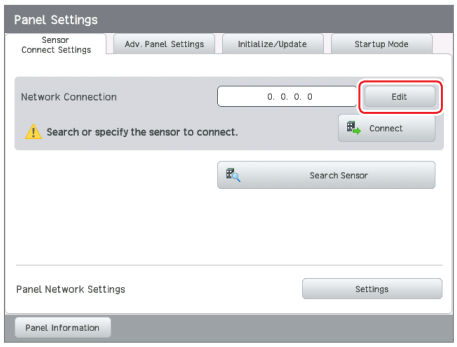
After the power turned on, the [Sensor Connect Settings] screen opens automatically.

● If connected with the sensor via network connection

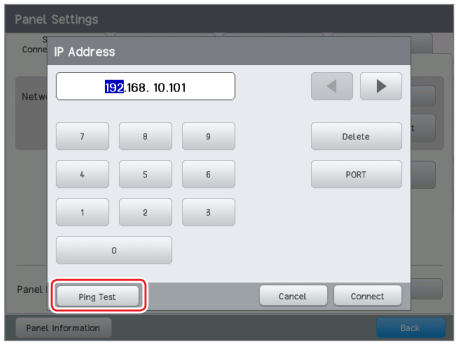
“Connection method” (page 7-29)

Reference When the control panel and the sensor are connected via network, [Network Connection] will be displayed and the IP address of the connected sensor will be displayed.

2 Press [Edit].



3 Input the IP address of the sensor whose existence is to be confirmed and press [Ping Test].



The confirmation result will be displayed on the control panel.

● When the confirmation result is “OK”



● When the confirmation result is “NG”



■ If the displayed confirmation result is “NG”

Confirm the following.

- Supply power to the sensor and the network equipment.
- Correctly connect with the sensor and the network equipment.
  “Connecting the Sensor with the Control Panel” (page 2-25)
- Correctly set the IP address, the subnet mask, and the default gateway of the control panel and sensor.
  “Searching for a Sensor to be Connected” (page 3-7)
  “Confirming/Setting the IP address of the control panel” (page A-22)
  “Confirming/Setting the IP address of the sensor” (page A-23)

Point **The existence confirmation function utilizes the ping command. Note that even when this is executed for devices other than a sensor, confirmation will succeed if there is a response to the ping command.**

A

Confirming/Setting the IP address of the control panel

1 Display the [Panel Settings] screen and press the [Sensor Connect Settings] tab.

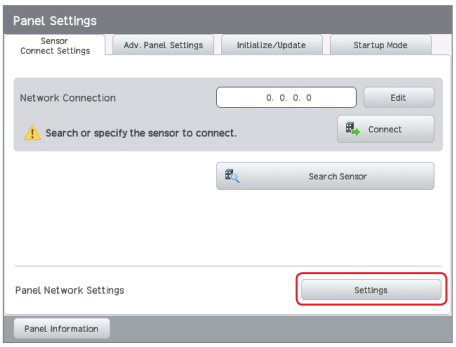
● **If not connected with the sensor**

After the power turned on, the [Sensor Connect Settings] screen opens automatically.

● **If connected with the sensor**

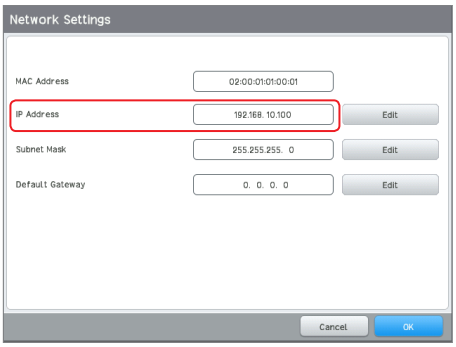
“Control panel settings” (page 7-27)

2 Press [Settings].



The network setup screen of the control panel opens.

3 Check the IP address of the control panel



To change the settings, press [Edit] to display the editing screen. Set the desired address and press [OK].

4 When confirmation/setting is completed, press [OK].

- If the setting has not been changed, system returns to the [Panel Settings] screen.
- If the setting has been changed, the message “Monitor will be restarted.” opens.

5 Press [OK] if the setting has been changed.

The control panel will re-start.

● **If connectable with the sensor**

The run screen opens.

● **If the IV-3 Navigator cannot be connected with the sensor**

The Sensor Connect screen opens. Set the connection method etc. and make connection with the sensor.
“Connection method” (page 7-29)

Reference

For detail on how to make connection after the control panel starts for the first time or after initialization (Page 3-16) of the control panel, refer to “Operation for initial startup of the control panel” (page 3-6).

A

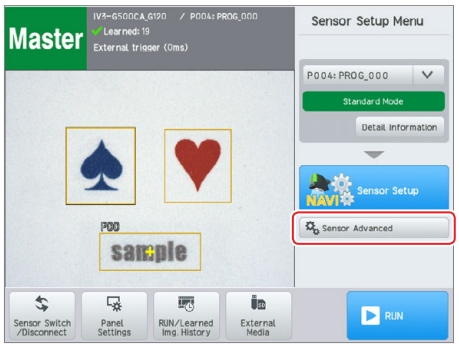
Confirming/Setting the IP address of the sensor

Confirms the IP address of the sensor connected to the control panel and the network.

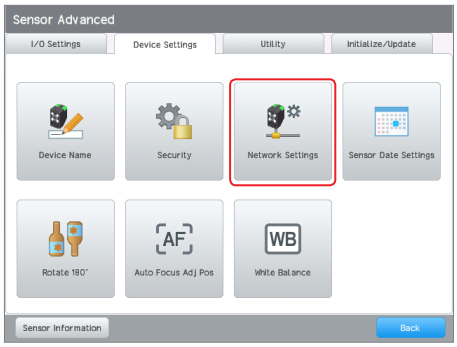
1 Display the Sensor Setup Menu screen.

"Displaying the Sensor Setup Menu Screen" (page 7-2)

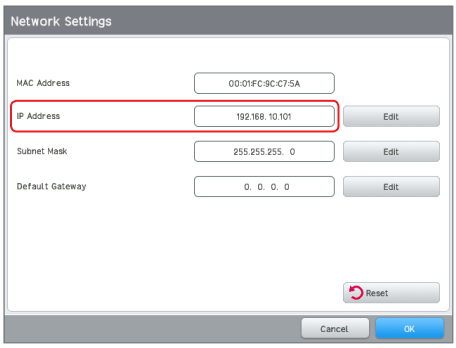
2 Press [Sensor Advanced].



3 Select the [Device Settings] tab and press [Network Settings].



4 Confirm the IP address of the sensor.



- Pressing [Edit] opens the screen to edit the address. Set the desired address and press [OK].
- When [Reset] is pressed, the setup values for the [IP Address], [Subnet Mask], and [Default Gateway] will be reset and nothing will be set. Again, set a user-defined address.

5 After confirmation/setting is completed, press [OK] and exit from the network settings.

6 Turn OFF the power and connect the sensor and control panel via network connection.

"Connecting the Sensor with the Control Panel" (page 2-25)

7 Turn on the power.

● If connectable 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-16)

Confirming the router settings

When a router is used, confirm that the following port is opened.

Sensor: 63000 (default value)

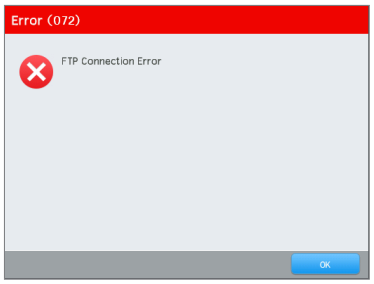
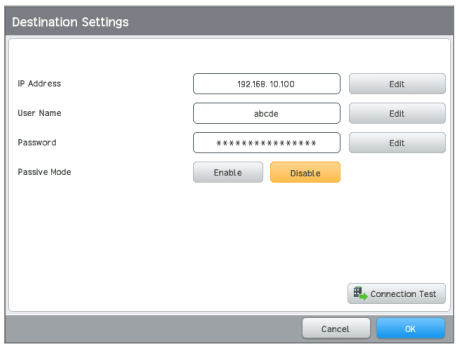
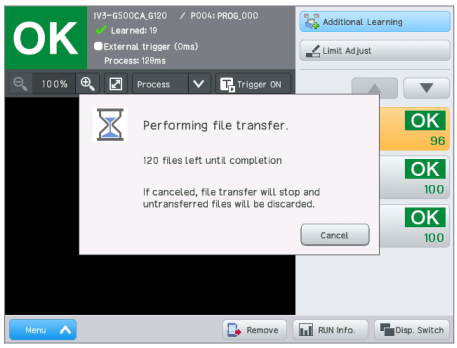
Reference For the setting methods of the sensor port number, refer to the following.

"Network Settings (Sensor)" (page 7-22)

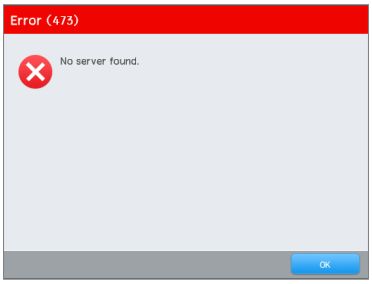
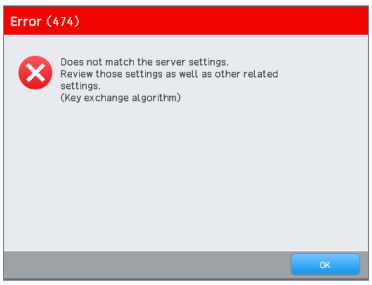
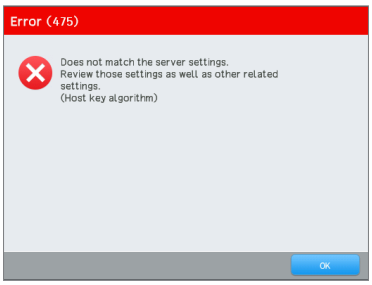
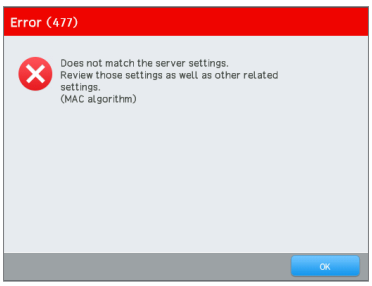
- The FTP/SFTP port number can be changed on the server. It is generally 20 and 21 for the FTP port, and 22 for the SFTP port.

A

Remedy when data transfer via FTP/SFTP is unavailable

Status	Remedy
 Connection with the FTP/SFTP server failed.	• 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.  “Setting the Connection Destination” (page 9-3)
 Data transfer to the transfer destination folder failed.	• 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. “Setting the Transfer Destination Folder and File Names” (page 9-6) • When the control panel 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.  Pressing [Cancel] during transfer will forcibly finish the transfer.
 Data which is larger than the remaining storage of the FTP/SFTP buffer has been created and the transfer failed.	• Change the trigger cycle of the sensor. “Setting the Trigger Options” (page 4-10) • Confirm the stress status of the network.

A

Status	Remedy
 Connection with the SFTP server failed.	• 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.
 Connection with the SFTP server failed.	• Review the SFTP server setting of the key exchange algorithm (KexAlgorithms).
 Connection with the SFTP server failed.	• Review the SFTP server setting of the host key algorithm (HostKeyAlgorithms).
 Connection with the SFTP server failed.	• Review the SFTP server setting of the cryptographic algorithm (Ciphers).
 Connection with the SFTP server failed.	• 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.

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
Subnet Mask	0.0.0.0
Default Gateway	0.0.0.0

* 1 In the Network Settings screen of the sensor, [Empty] is displayed.
"Network Settings (Sensor)" (page 7-22)

● Fixed IP address

Assigns the fixed IP address (192.168.10.10). This is used for having connection with the IV3-Navigator when the sensor amplifier cannot be searched because the factory default settings are blocked by firewalls, etc. This is not required to use to connect with the control panel.

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

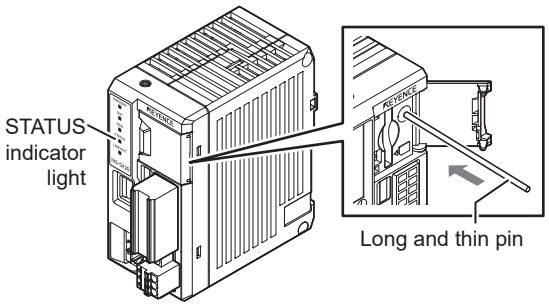
Connecting method after initialization

Search for the sensor to be connected. Search will be made for a sensor without IP address, set the IP address by following the instructions on the screen.
"Connection method" (page 7-29)

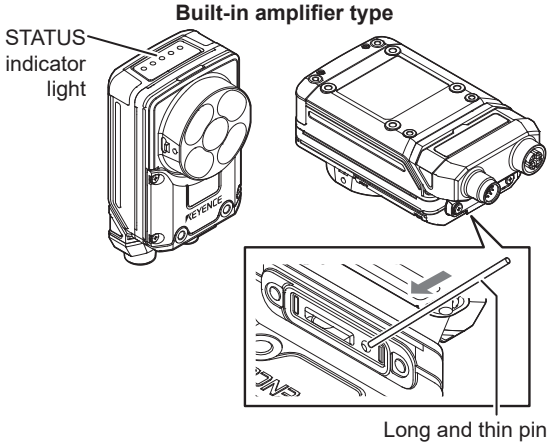
Initializing the network settings

1 Insert a long and thin pin (1 to 2 mm in diameter) and press and hold the IP reset switch with the power on.

Ultra-compact model amplifier



Built-in amplifier type



● 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.

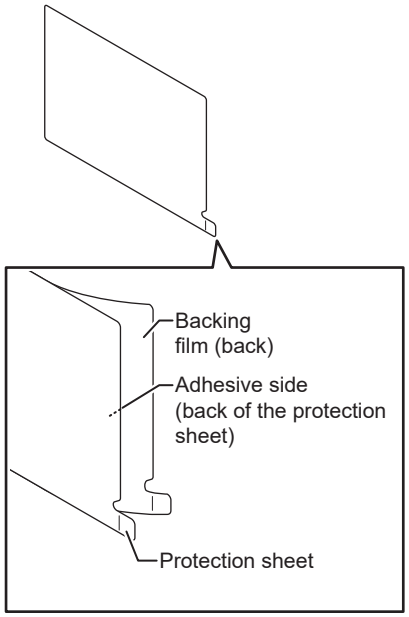
A

Maintenance

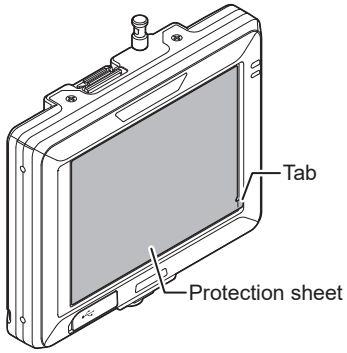
Attaching the protection sheet

A protection sheet (OP-88351) can be attached to protect the LCD panel.

1 Remove the backing film (transparent) from the back side of the protection sheet.



2 Apply the protection sheet on the control panel's display with the tab at the lower right.



Point **Apply the protection film while making sure that no debris is on the screen.**

A

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HAL module driver

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Revision history

Revision history	Edition number	Revision details
September, 2021	1st edition	
February 2022	2nd edition	Support for version R1.20
April 2022	3rd edition	

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