

Customizable Vision System XG-X2000 Series

Setup Manual (Line Scan Camera Edition)

Read this manual before use.

Keep this manual in a safe place for future reference.



Introduction

This manual describes the setup procedures required for connections and initial installation of the XG-X2000 Series (hereafter referred to in this manual as "the controller"), as well as related information and product specifications. Read this manual thoroughly in order to understand how the controller works and to maximize the performance of the controller.

This manual applies to XG-X2000 Series. However, unless otherwise specified, the description in this manual basically refers to XG-X2800/X2802. For differences in specifications depending on the model, refer to the "XG-X2000 Series User's Manual".

Always keep this manual in a safe place for future reference.

Please ensure that the manual is passed to the end user of the software.

Symbols

The following warning symbols are used to ensure safety and to prevent human injury and/or damage to property when using the system.

 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.

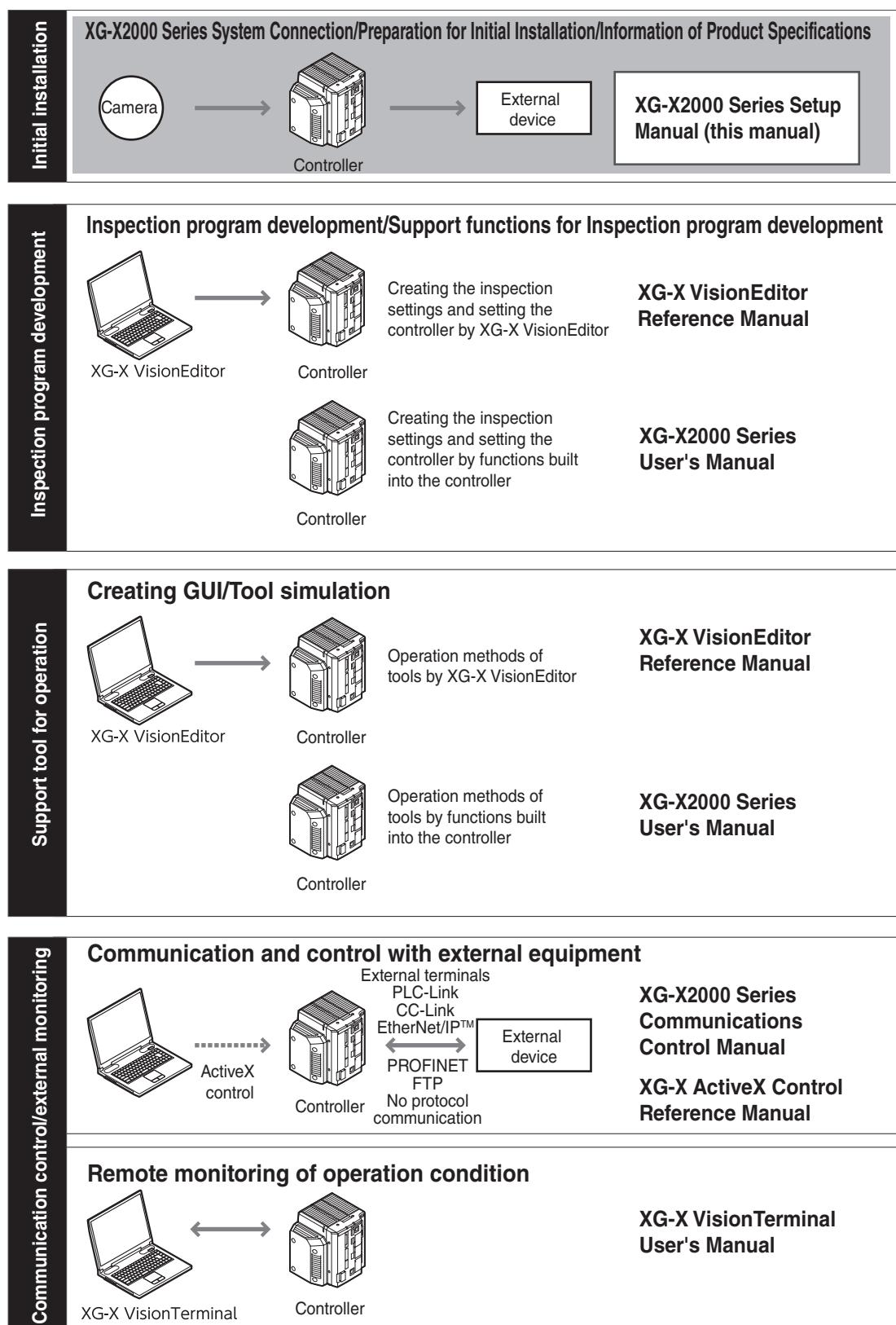
Trademarks

- Windows 7 is a registered trademark of Microsoft Corporation (US).
- "SD Memory Card" is a registered trademark of the SD Association.
- Other company names and product names noted in this document are registered trademarks or trademarks of their respective companies. The ™ mark and ® mark have been omitted in this manual.

This manual and related manuals

This manual describes the setup procedures required for connections and initial installation of the XG-X2000 Series (hereafter referred to in this manual as "the controller"), as well as related information and product specifications. Read this manual thoroughly in order to understand how the controller works and to maximize the performance of the controller. Always keep this manual in a safe place for future reference.

Please ensure that the manual is passed to the end user of the software.



Safety information for XG-X Series

Safety Precautions

DANGER	<ul style="list-style-type: none"> Do not use this product for the purpose of protecting the human body or any part thereof. Because this product was not designed for use in an explosion-proof area, it must never be used in an explosion-proof area.
CAUTION	<ul style="list-style-type: none"> Before starting or operating the system, check to make sure all system functions are working properly. If any Keyence product fails, take all safety precautions to prevent damage before using the system again.
NOTICE	<ul style="list-style-type: none"> If the system is operated beyond its published specifications or if the system is modified, its functions and performance cannot be guaranteed. Please note that when the system is used in combination with other instruments, its functions and performance may be degraded. Do not subject the controller or connected devices to a sudden change in temperature. There is the risk of condensation occurring.

General cautions for the controller

CAUTION	<ul style="list-style-type: none"> Do not use with any power voltage other than 24 VDC. Doing so may cause fire, electric shock, or product malfunction. Do not disassemble or modify the unit. Doing so may cause fire or electric shock.
----------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Operating environment and conditions

CAUTION	<p>To use the system properly and safely, avoid installing this unit in the following locations. Doing so may cause fire, electric shock, or product malfunction.</p> <ul style="list-style-type: none"> Locations that contain moisture or dust, or that are poorly ventilated. Locations where the system is exposed to direct sunlight or temperature increases. 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. Locations where static electricity is present or electric discharge may occur.
NOTICE	<ul style="list-style-type: none"> Keep this unit and cables away from high-tension cables and power lines. Otherwise, noise may cause malfunction or accidents. Bundle cables with spiral tubing material. Direct bundling will concentrate the cable load on the bindings, which can result in cable damage or short circuit. The controller and optional devices are precision components. To maintain performance, do not subject them to vibration or shock.

Measures to be taken when an abnormality occurs

CAUTION	<p>In the following cases, turn the power OFF immediately. Using the unit in an abnormal condition may cause fire, electric shock, or product malfunction. Contact your local Keyence office for repair.</p> <ul style="list-style-type: none"> If water or debris enters the system If the system is dropped or the case is damaged If smoke or a burning smell emits from the controller
----------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Usage

NOTICE	<ul style="list-style-type: none"> • Before making any connections/disconnections, be sure to turn off the power of this unit and connected devices. Failure to do so may result in a malfunction of the controller or connected devices. • Do not turn the power off while you are programming. Otherwise, all or part of the program settings may be lost. • Do not block the ventilation holes. Otherwise, the inside temperature may rise and a malfunction may occur. • Do not allow an excessive amount of sunlight or bright indoor light to enter the camera for a long period of time. Doing so may cause damage to the CCD inside the camera.
---------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Maintenance

NOTICE	<ul style="list-style-type: none"> • Do not clean with benzene, thinner, or alcohol. Doing so may cause discoloration or deformation of the unit. • If the unit has any dirt on it, wipe it off with a cloth moistened with a mild detergent, then wipe with a dry cloth.
---------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Precautions on Regulations and Standards

CE Marking

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

EMC Directive

- Applicable standard EN61326-1, Class A
- This product is intended to be used in an industrial environment.
- Use cables shorter than 30 m to connect this product and its external devices.
- Be sure to connect the ground terminal to a grounding.
- When connecting the CC-Link unit CA-NCL20E, attach a ferrite core (OP-84364, optional) within 300 mm on the CA-NCL20E side of the CC-Link dedicated cable.

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

KC mark (Republic of Korea)

Class A device

This product is an industrial electromagnetic wave generating device (Class A) and is intended for use in establishments other than domestic.

A 급 기기 (업무용 방송통신기자재)

이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Table of Contents

Introduction	2
This manual and related manuals	3
Safety information for XG-X Series	4
Safety Precautions	4
Precautions on Regulations and Standards	5
Table of Contents	6

Chapter1 Before Setting Up

Standard System Configuration	1-2
Identifying Controls and Connectors	1-4

Chapter2 Installing and Connecting the Device

Installing the Controller	2-2
Caution on Direction of Controller Mounting	2-2
Be careful in regard to cooling the unit in the installation site	2-2
Installing the Expansion Unit	2-3
Fixing the Controller	2-5
Installing the Camera	2-6
Selecting the Lens	2-7
Confirm the Working Distance from the FOV Chart.	2-7
Using the Close-up Rings	2-9
Connecting Cables	2-10
Selection and Installation of LED Lighting	2-13
Selecting the Correct Lighting System	2-13
Using the Illumination Expansion Unit	2-14

Chapter3 I/O Wiring

Overview	3-2
Trigger 1 Input	3-3
Permission Output for Trigger 1 Input	3-4
Error Output and Run Mode Output	3-5
Total Status Output and Strobe Output	3-6
Timing Chart	3-7
Setting the Status Change Time and Output Time ..	3-8
Wiring an Encoder	3-9
RS-422 Line Driver Output (Including Keyence Encoder Relay Units) ..	3-9
Open Collector Output	3-11

Chapter4 Checking the Wiring and Adjusting the Camera

Starting Up the Controller	4-2
Check that a Screen is Displayed on the Monitor ..	4-2
Switching between Run Mode and Setup Mode ...	4-3
Checking the Wiring	4-4
Checking the Input Signal	4-4
Checking the Output Signal	4-5
Adjusting the Camera	4-6
Enabling Light	4-6
Adjusting the Sharpness, Brightness and Image ..	4-7
In the Case that an Error Message is Displayed ...	4-9
Reference: Using an Encoder	4-11
Enabling the Encoder	4-11
Checking the Encoder Signal Input	4-12
Reference: Adjusting Capture Settings	4-13
Displaying the Graph Viewer	4-13
Changing the camera LED threshold setting	4-14
Changing the shading correction	4-14

Chapter5 I/O Interface

Overview of the I/O Interface	5-1
RS-232C Interface	5-2
RS-232C Port Specifications	5-2
Connecting to a PC	5-2
Ethernet Interface	5-3
Ethernet Port Specifications	5-3
USB Interface	5-4
USB Port Specifications	5-4
Connecting to a PC	5-4
CC-Link Interface	5-6
CA-NCL20E CC-Link Specifications	5-6
Connecting to the CC-Link	5-7
CC-Link Unit (option)	5-8
Parallel I/O Interface	5-9
Connector Specifications	5-9
Pin Layout	5-9
Terminal Block Interface	5-11
Standard Specifications	5-11
Pin Layout	5-12

Expansion Unit	5-13
Line Scan Camera Input Unit	
(CA-E100L : Option)	5-13
Illumination Expansion Unit	
(CA-DC40E : Option)	5-14
Illumination Expansion Unit	
(CA-DC50E : Option)	5-16
Input/Output Circuit	5-18
Input Connections (XG-X2800/X2802)	5-18
Input Connections (CA-E100L)	5-19
Output Connections (XG-X2800/X2802)	5-21

Chapter6 Specifications and Optional Devices

Main Specifications	6-2
Controller Unit (XG-X2800/X2802)	6-2
Line Camera Input Unit (CA-E100L)	6-4
Illumination Expansion Unit (CA-DC40E)	6-4
Illumination Expansion Unit (CA-DC50E)	6-5
CC-Link Unit (CA-NCL20E)	6-5
Line scan camera (XG-HL02M/HL04M/HL08M)	6-6
Using the Camera Cable Extension Repeater	
(CA-CHX10U)	6-6
Dimensions	6-7
Controller Unit (XG-X2800/X2802)	6-7
USB Handheld Controller (OP-87983)	6-9
Dedicated Mouse (OP-87506)	6-9
Line scan camera	
(XG-HL02M/HL04M/HL08M)	6-10
Camera cable	
(for line scan camera XG-HL***, high-speed camera XG-H****/CA-H****)	6-12
Repeater for Camera Cable Extension	
(CA-CHX10U)	6-14
Cameras and Connectable Camera Input Unit	6-15
Options	6-16
List of Options	6-16
4/3"-compatible High-resolution C Mount Lens ...	6-19
Line scan camera lenses	6-21
Line scan camera macro lens	6-24
F-mount adapter (OP-87319)	6-25
LED light for line scan camera	6-26
LED Light Cable	6-27
Ultracompact switching power supply	
(CA-U4/U5)	6-28
Touch Panel LCD Monitor (CA-MP120T)/	
LCD Monitor (CA-MP120)	6-31

Chapter7 Appendix

Controlling the Handheld Controller (Optional)	7-2
The Function for Each Button	7-2
Multiple Key Combinations	7-3
Loading and Removing an SD Card	7-4
Inserting an SD Card	7-4
Removing an SD Card	7-5
Connecting and Disconnecting the USB HDD	7-6
Connecting a USB HDD	7-6
Removing a USB HDD	7-7
Exporting and Importing Settings	7-8
Exporting Settings	7-8
Importing Settings	7-9
Saving Camera Images for Simulation	7-10
INDEX	I-1

Table of Contents

Chapter 1

Before Setting Up

Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

Standard System Configuration

By combining various optional (sold separately) products, such as a camera, with the controller, this unit can support many applications. Typical basic system configurations that use a line scan camera are introduced below.

Reference

Refer to "Chapter 6 Specifications and Optional Devices" (Page 6-1) for more details about the options which can be used with this controller.

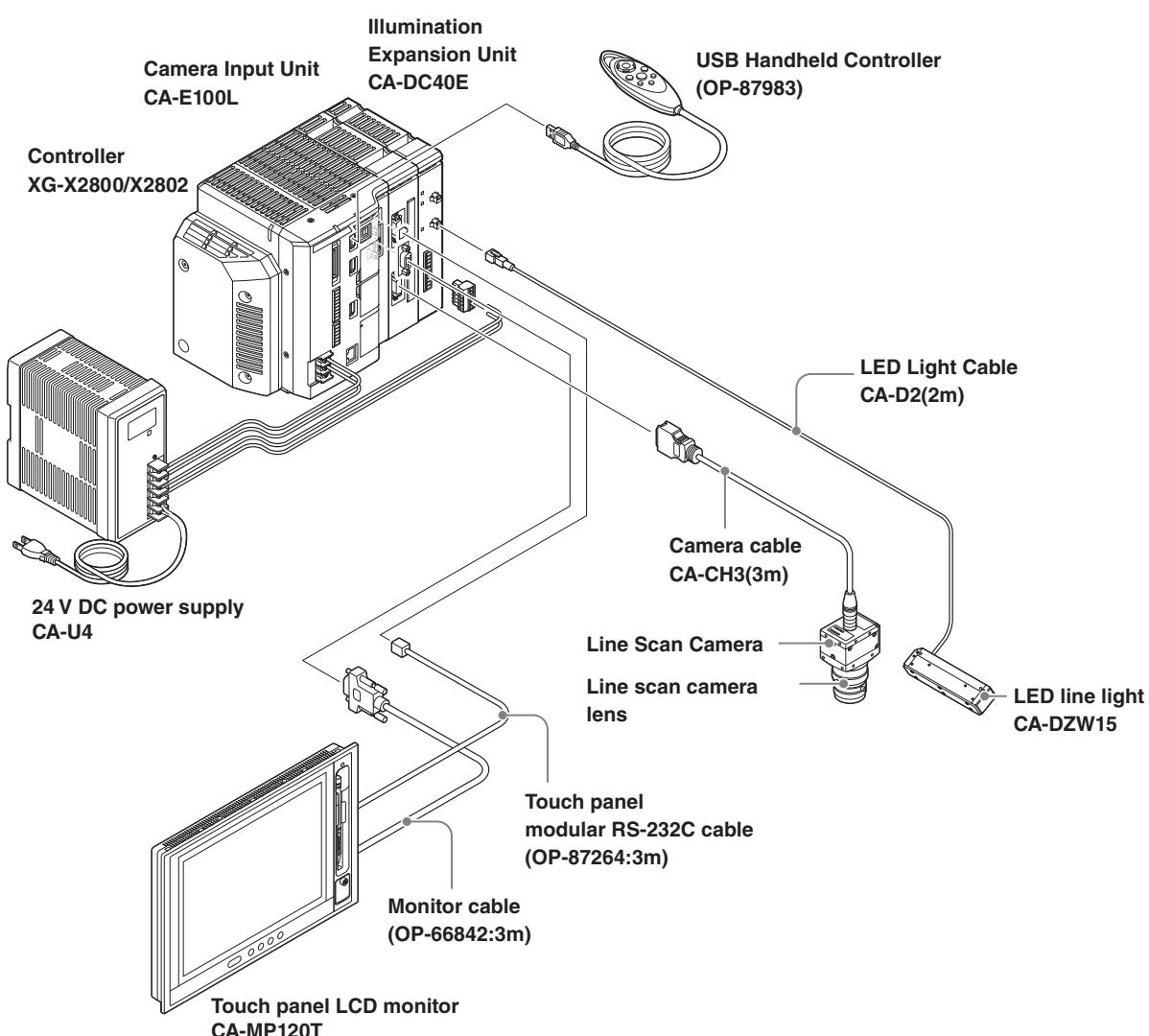
Example of a standard system setup with one Line Scan Camera

Point

In order to connect a camera to the controller, you need a camera input unit (for a Line scan camera: CA-E100L; for an area camera: CA-E100) that supports the camera you are going to use.

Reference

Devices other than the controller are optional (sold separately).



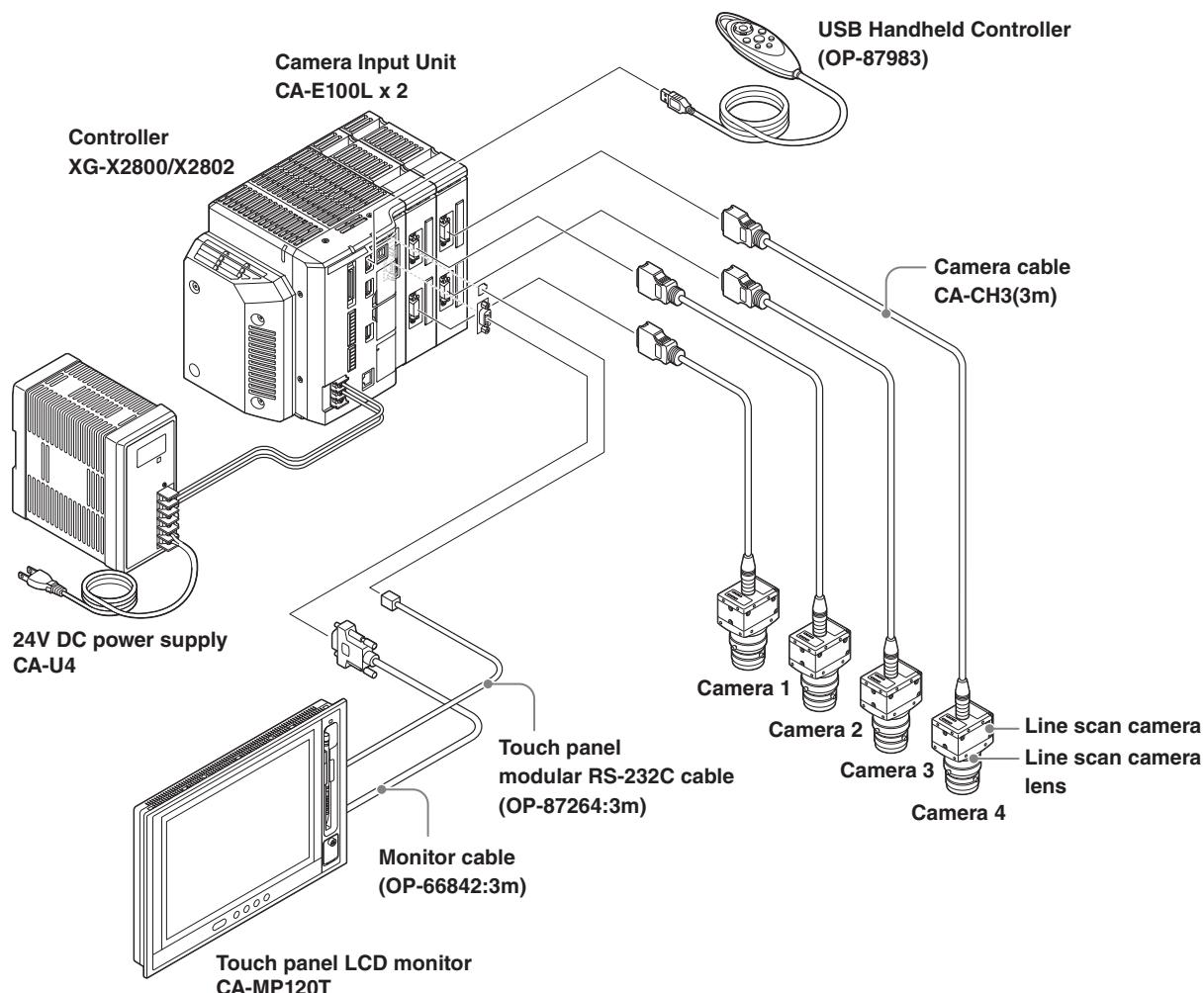
Example of a standard system setup with four Line Scan Cameras



Point In order to connect a camera to the controller, you need a camera input unit (for a Line scan camera: CA-E100L; for an area camera: CA-E100) that supports the camera you are going to use.



Reference Devices other than the controller are optional (sold separately).

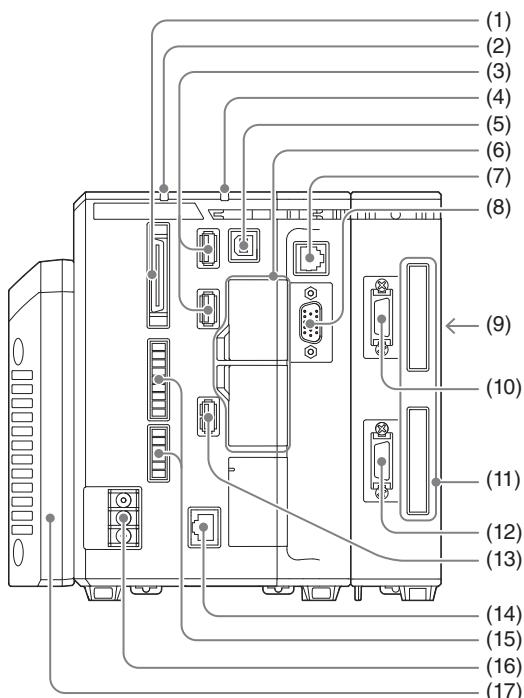


Identifying Controls and Connectors

Controller (With Camera input unit CA-E100L (sold separately) installed)



In order to connect a camera to the controller, you need a camera input unit (for a Line scan camera: CA-E100L; for an area camera: CA-E100) that supports the camera you are going to use.



(1) I/O (parallel I/O) connector

Used for signal input and output (Page 5-9).

(2) Power supply LED

Lights up when the power is being fed to the unit.

(3) CONSOLE/MOUSE (USB) connector

Connects the USB handheld controller (OP-87983, sold separately), or the proprietary mouse (OP-87506, sold separately).

(4) Error LED

Lights up in conjunction with the error output (%Error0) ON which is being used.

(5) USB connector

Used to connect a USB cable (Page 5-4).

(6) SD2 slot (upper), SD1 slot (lower)

Insert an SD card (Page 7-4).

The included SD card (CA-SD1G: 1 GB, or OP-87133: 512 MB) is inserted as SD card 1 in the lower slot (SD1).



SD Card 1 must be inserted while the device is operating.

(7) RS-232C port

Used to connect an optional RS-232C communication cable (OP-26487: 2.5 m) or an optional RS-232C modular cable for touch panels (OP-87264: 3 m/OP-87265: 10 m) (Page 5-2).



By default, the RS-232C port is used for data output and command control. For details about how to change the setting, see the XG-X2000 Series User's Manual.

(8) MONITOR (RGB output) terminal

Used to connect to an external monitor (Page 2-10).

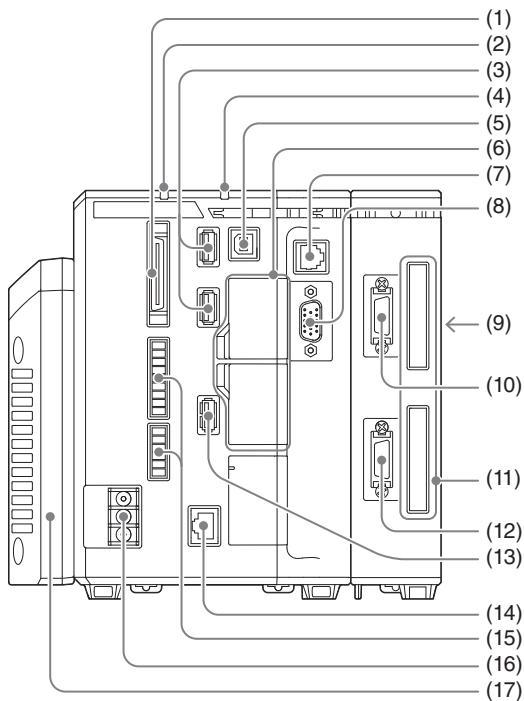


The unit's power GND (0V) is shared in common with the connector shield and signal GND.

If there is a potential difference with the connection for the external monitor, this may result in breakdowns or malfunctions of the unit and the connected external monitor. (Recommended monitors: CA-MP120/CA-MP120T)



The unit's monitor output is XGA (1024 × 768 pixels). If commercial analog RGB monitors other than XGA monitors are used, the display quality may worsen depending on the monitor's specifications, and images may not properly be displayed.

**(9) Expansion unit connector (right side)**

Used when connecting various kinds of expansion units (camera input unit, illumination expansion unit, or CC-Link unit).

(10) CAMERA 2 connector

Used to connect camera 2 (Page 2-10).

(11) Encoder connector

This connector is used for input of the encoder signal (RS-422 or open collector) for the Line scan camera (Page 5-13).

(12) CAMERA 1 connector

Used to connect camera 1.

(13) USB HDD connector

Connect USB 3.0 or USB 2.0 compatible hard discs.

NOTICE

The unit's power GND (0V) is shared in common with the connector shield and signal GND.

If there is a potential difference with the connection for the USB HDD, this may result in breakdowns or malfunctions of the unit and the USB HDD.

Reference

- If there are concerns about the potential difference with the connections, then use a USB HDD which supports bus powered drives.

The unit's bus power feed capacity is 900 mA (USB 3.0 compatible).

Check with the USB HDD manufacturer concerning the compatibility with bus powered drive of the USB HDD that you are using.

In addition, do not use USB hubs since they may cause the feed capacities and the data transmission speeds to decrease.

- For information about connecting and disconnecting the USB HDD, see "Connecting and Disconnecting the USB HDD" (Page 7-6)).

(14) ETHERNET connector

Used to connect an Ethernet cable (Page 5-3).

(15) OUT/IN connector (Terminal block)

Used for signal input and output (OUT/IN) (Page 5-11).

(16) Power and ground terminals

Used to connect power (24 V DC) and the ground wire (Page 2-12).

(17) Fan unit

Equipped with controller cooling fan unit (CA-F100).

NOTICE

Although the equipped fan unit can be detached and replaced for maintenance, the controller cannot be operated with the fan unit detached.

Chapter

2

Installing and Connecting the Device

Installing and Connecting the Device

Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

Installing the Controller

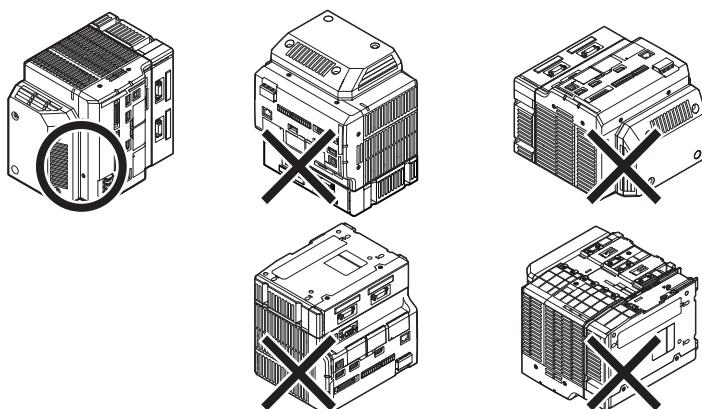
Install the controller to the DIN rail, or use the holes on the bottom of the controller to secure it with screws.

NOTICE

- Do not install the controller in a location with lots of dust or water vapor. The controller does not have a mechanism to protect it from dust or water. Dust or water entering the controller can cause damage to the controller.
- Turn off the controller when connecting or disconnecting an expansion unit, cable, or terminal block. Connecting or disconnecting a camera expansion unit, cable, or terminal block while connected to a power source may damage the controller or peripheral devices.
- When an expansion unit is not connected, keep the connector protection cover on the controller. Using the controller with the connector exposed may cause damage to the controller.

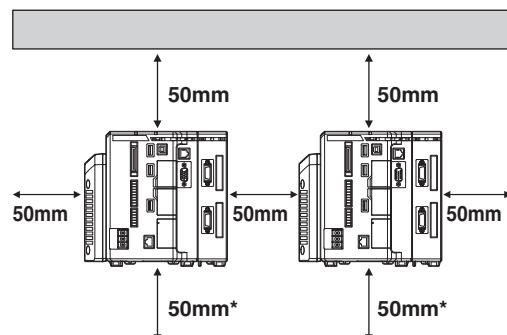
Caution on Direction of Controller Mounting

- Install the controller in the direction indicated by the circle shown below. Do not install the controller in any other direction.



Be careful in regard to cooling the unit in the installation site

- For ventilation, keep the space free of objects for 50 mm or more above the controller and 50 mm or more for both sides. Keep the space free of objects for 90 mm or more in the front of the connector panel in order to connect the cables safely.
 - If the controller units are to be installed in rows, make sure that there are spaces of 50 mm or more between the controllers, and spaces of 50 mm or more above them.
- * If spaces of 50 mm or more are ensured of even on the underside orientations by DIN rail mounting etc., then the units can be used at higher than rated temperatures.


NOTICE

- Do not block the ventilation openings on the top and bottom of the controller. If the vents are blocked, heat will accumulate inside the controller and can cause a system failure.
- If the temperature inside the control panel (temperature at the bottom of the controller) exceeds the rating, use forced air-cooling or increase the free space around the system to improve ventilation until the operating ambient temperature decreases below the rating.
- When the temperature gets high inside the controller unit, the unit may display abnormal heat generation alerts such as the following. (1) Warning: you are being notified that it is likely that operations may be terminated due to high temperatures, (2) Operations terminated: as the possibility of thermal runaway and unit damage occurring due to high temperature is high, operations are terminated as error state. If these alerts are displayed, quickly implement countermeasures, such as lowering the usage ambient temperature below the rated temperature, cooling the controller, and so on.

- The controller is equipped with a fan unit (CA-F100) on its left side when it is shipped from the factory. Although the fan unit can be detached and replaced for maintenance, the controller cannot be operated with the fan unit detached.

Installing the Expansion Unit

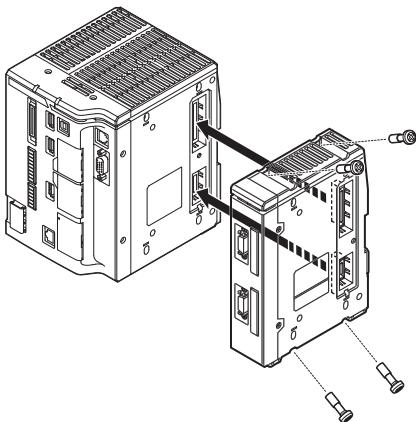
NOTICE

- Turn off the controller when connecting or disconnecting an expansion unit. Connecting or disconnecting an expansion unit while connected to a power source may damage the controller or peripheral devices.
- When an expansion unit is not connected, keep the connector protection cover attached. Using the controller with the connector exposed may cause damage to the controller.

Installing the Camera Input Unit

In order to connect the camera that you want to use, you can attach a camera input unit (sold separately) to the controller.

Remove the protective cover of the expansion unit connector from the right side of the controller, and then install the camera input unit as shown below.

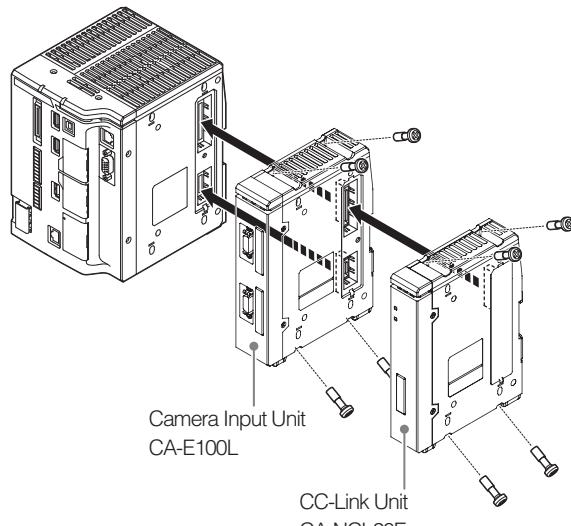

Point

- Illumination expansion units and CC-Link units cannot be installed between camera input units and controllers.
- Up to two compatible camera input units can be attached to the controller (XG-X2800/X2802). However, the CA-E100L input unit for line scan cameras and the CA-E100LJ/E110LJ LJ-V Series head input unit cannot be combined and attached to the CA-E100T input unit for a 3D camera.

Installing the Communication Expansion Unit

If you communicate via CC-Link (Page 5-6), one CC-Link unit CA-NCL20E (sold separately) can be attached.

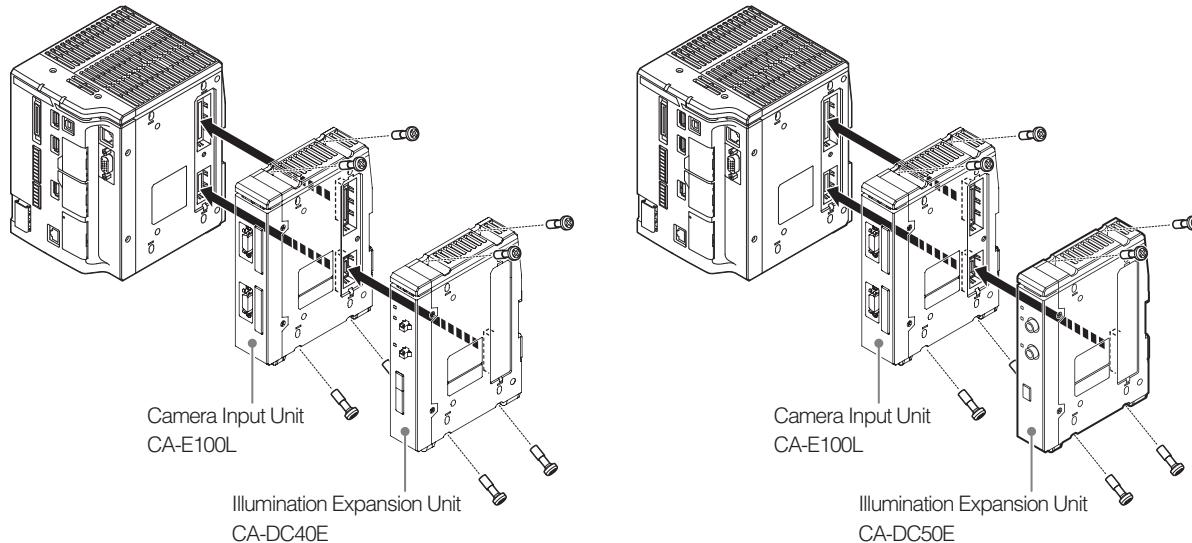
Remove the protective cover from the expansion unit connector on the right side of the camera input unit attached to the controller and install the CC-Link unit as shown below.



Installing the Illumination Expansion Unit

If the illumination is to be controlled from the controller, up to a maximum of eight (a maximum of two of the eight units can be CA-DC50E) separately sold CA-DC40E/DC50E illumination expansion units can be attached.

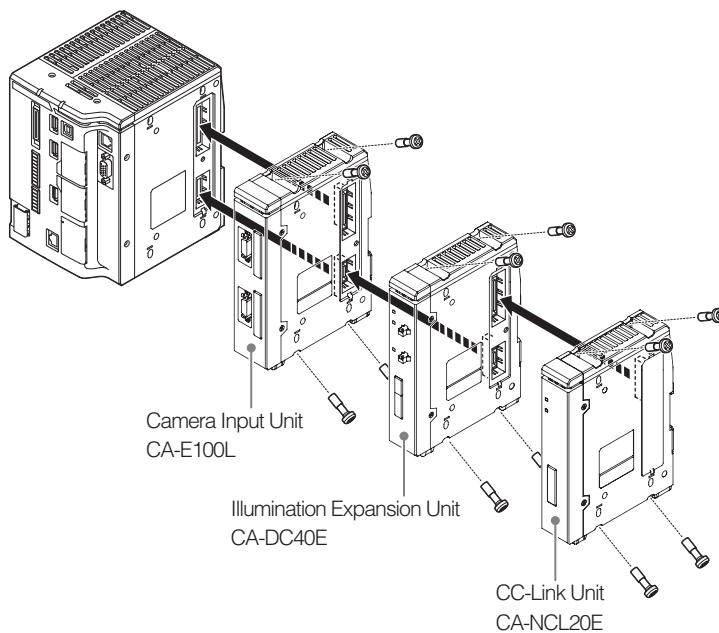
Remove the protective cover from the expansion unit connector on the right side of the camera input unit attached to the controller and install the illumination expansion unit as shown below.

**NOTICE**

Turn off the controller when connecting or removing an illumination expansion unit. Connecting or removing the illumination expansion unit while connected to a power source may damage the controller or peripheral devices.

When Using the Camera Input Unit, Illumination Expansion Unit and CC-Link Unit Together

Mount the camera input unit directly to the controller, then mount the illumination expansion unit and CC-Link unit to the right side of the camera input unit.



Illumination expansion units and CC-Link units cannot be installed between camera input units and controllers.

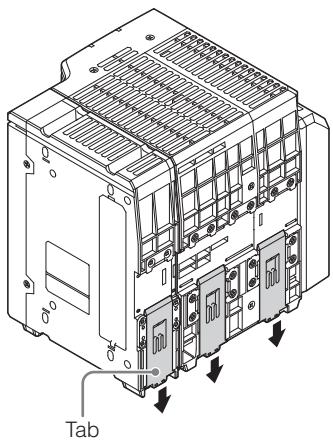
Fixing the Controller

NOTICE

Mount the controller in a stable location that is free from vibration.

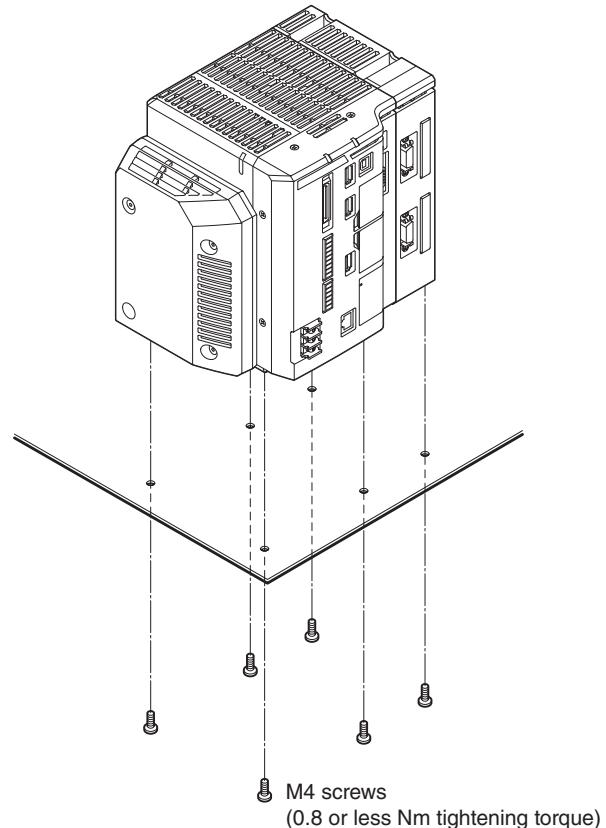
Installing the Controller on a DIN Rail

The controller and the expansion unit are designed to be mounted on a DIN rail.



Pull the tab on the bottom in the direction of the arrow to mount or dismount the controller.

Base Installation of the Controller



Installing the Camera

NOTICE
Notes on Electrical Insulation

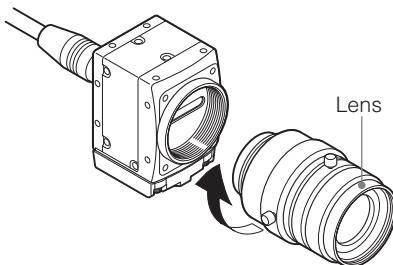
- The camera case acts as the ground for the camera circuit. If the installation location has any electrical potential or noise, it may cause internal damage and malfunction. For secure insulation, be sure to use the plastic mounting bracket and screws that are supplied when installing the camera.
- If the supplied plastic mounting parts are not used in the installation, take care to insulate adequately.

1 Install the lens on the camera.

Select an appropriate lens according to the size of the object and distance between the object and the camera (Page 2-7).

Reference

For more details about how to attach a close-up ring between the camera and the lens, see "Using the Close-up Rings" (Page 2-9).


► Important

- Do not touch the inside of the camera when installing the lens.
- Take care to ensure dust and/or foreign material does not enter into the camera.

2 Install the camera using the screw holes provided on the plastic mount.

► Important

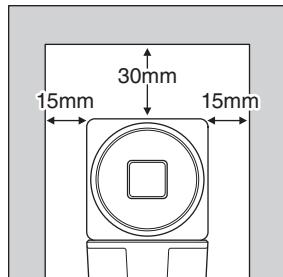
- When installing the camera, use a tightening torque of 0.5 Nm and a maximum tension of 30 N.
- Leave enough space around the lens to ensure easy adjustment of the focus and aperture (Page 4-7).
- If the camera is mounted where there is vibration, the lens mount or the lock screw for the lens may loosen. Use of a locking bond adhesive is recommended in such a case.
- Mounting the provided plastic mount on a side other than the bottom of the camera can cause gaps between the mount and the camera. If the installation needs to be very precise, try to fix the mount to the bottom of the camera.

Reference

To allow for future adjustment of the camera, use an XY stage. Opening elongate holes on the mounting stage of the camera will allow for similar adjustments to be made.

Warning on Installation Space for the Camera

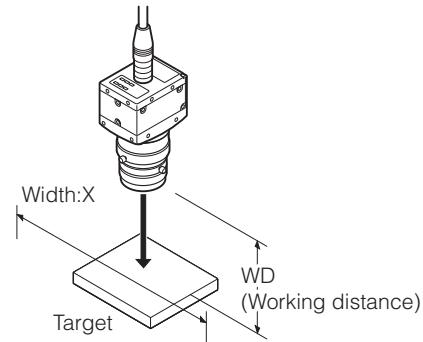
When installing the camera, maintain 30 mm or more of space above the camera and 15 mm or more on both sides.



Selecting the Lens

Select a lens according to the width of the target (field of view (FOV): X) and the distance (working distance (WD)) from the tip of the lens attached to the camera to the target.

Select a suitable lens referencing the FOV chart.



Confirm the Working Distance from the FOV Chart.

- The numbers in the FOV chart represent the thickness required for the close-up ring. Install the close-up ring between the lens and the camera when required.
- The asterisk (*) symbol in the FOV chart indicates the type of lens.

Point

- For more details about the close-up ring, see "Using the Close-up Rings" (Page 2-9).
- The numerical numbers shown in the FOV chart are typical values. Fine adjustment is needed during installation.

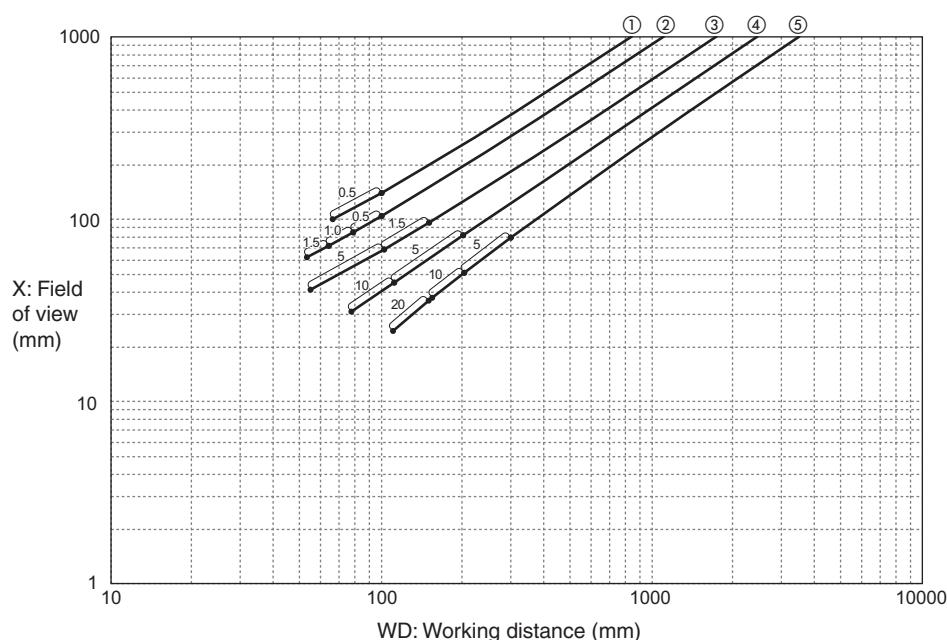
Reference

For information about the area camera FOV Chart, refer to the XG-X2000 Series Setup Manual (Area Camera Edition).

When a 2048-pixel Line Scan Camera (XG-HL02M) or 4096-pixel Line Scan Camera (XG-HL04M) is Used

When using the CA-LHE35 with a required X field of view of 40 mm, the chart shows that the working distance should be set to 100 mm and the 10 mm close-up ring should be used.

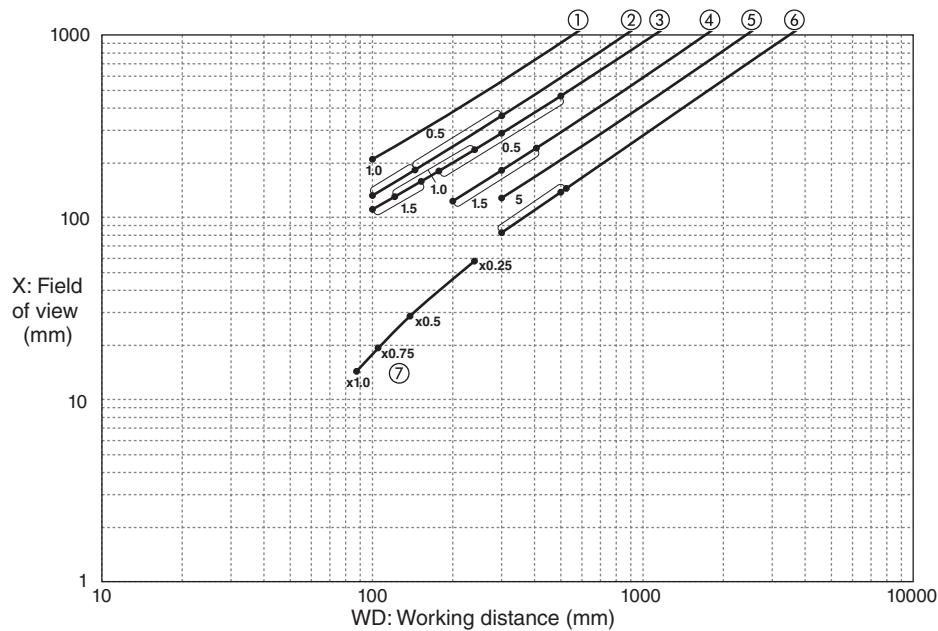
When a 4/3"-compatible, ultra high-resolution lens (CA-LHE) is used



①CA-LHE12 ②CA-LHE16 ③CA-LHE25 ④CA-LHE35 ⑤CA-LHE50

Point

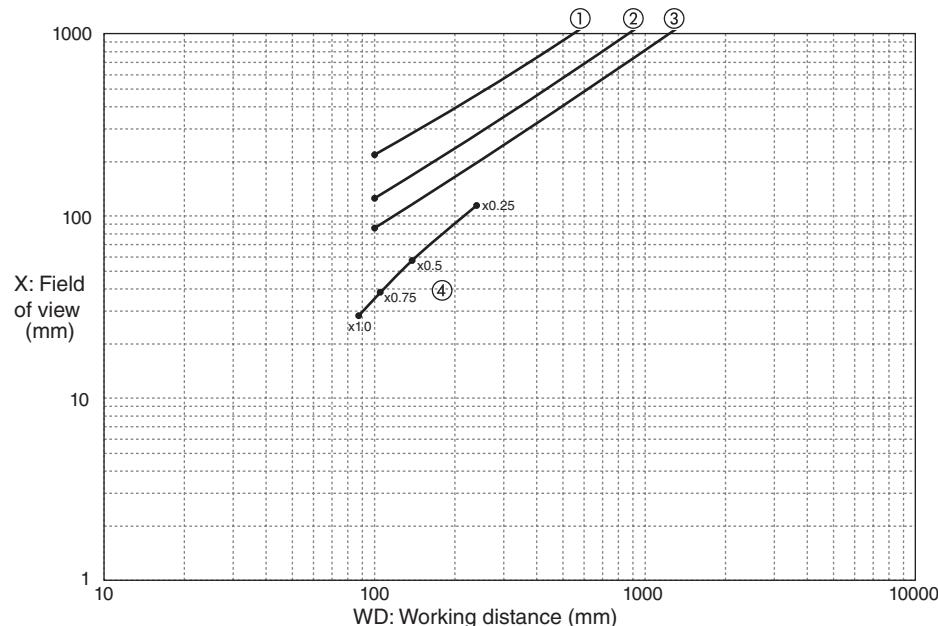
If a close-up ring is used with an ultra high-resolution lens (CA-LHE Series), the inherent peripheral resolution performance of the lens may not be satisfied.

When a line scan camera high resolution lens (CA-LHW*) is used

①CA-LHW8 ②CA-LHW12 ③CA-LHW16 ④CA-LHW25 ⑤CA-LHW35 ⑥CA-LHW50 ⑦CA-LM0210

Point

- C-mount lenses other than CA-LHE/CA-LHW cannot be used with a line scan camera.
- If a close-up ring is used with a line scan camera high-resolution lens (CA-LHW Series), the inherent peripheral resolution performance of the lens may not be satisfied.

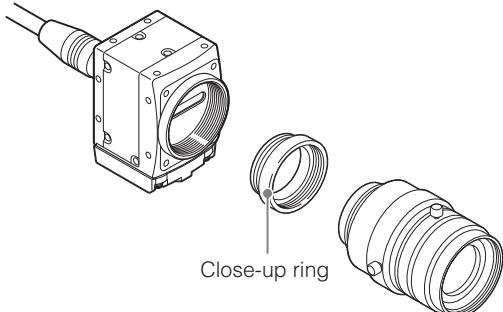
When an 8192-pixel Line Scan Camera (XG-HL08M) is Used**When a line scan camera high resolution lens (CA-LHL*) is used**

①CA-LHL16 ②CA-LHL25 ③CA-LHL35 ④CA-LML0210

Using the Close-up Rings

The close-up ring is installed between the camera and the lens.

Close-up rings are available in a set of five different sizes of 0.5 mm, 1.0 mm, 5 mm, 10 mm, and 22 mm (OP-51612, optional).



If a single ring does not provide the required thickness, combine multiple rings.

Point

- If you use the 0.5 mm or 1.0 mm close-up rings with other close-up rings, the lens may become loose through vibrations due to insufficient tightening with the camera. Use of a locking bond adhesive is recommended in such a case.
- When using a close-up ring on a lens for line scan cameras, the inherent peripheral resolution performance of the lens may not be able to be used to its full potential.
- A close-up ring cannot be used on the 8192-pixel line scan camera XG-HL08M.

Connecting Cables

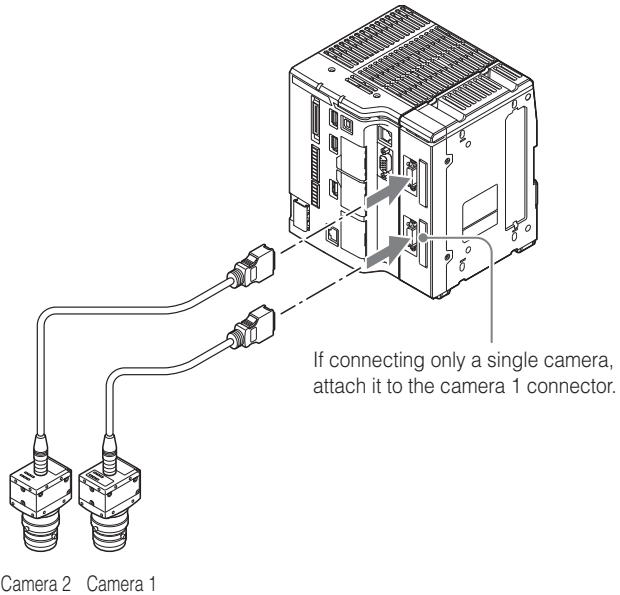
Point

Notes when connecting cables

- Make sure that there is no power to the controller before connecting cables. Connecting cables while the power is turned on may cause damage to the camera or peripherals.
- Bundle cables with a spiral tubing like protective material. Direct bundling will concentrate the cable load on the bindings, which can result in cable damage or short circuit.
- In the absence of other specifications, the minimum bending radius (R) should be 3 times the external diameter of the cable (5 times or more is recommended). Additionally, repeated flexing and twisting should be avoided. The minimum bending radius is the same, even when using high-flex cable. Unless otherwise stated, use the R100 or greater when using a cable bearer.

- 1 Connect the camera to the camera connector of the camera input unit attached to the controller using one of the optional camera cables.

If connecting only a single camera, attach it to the camera 1 connector.



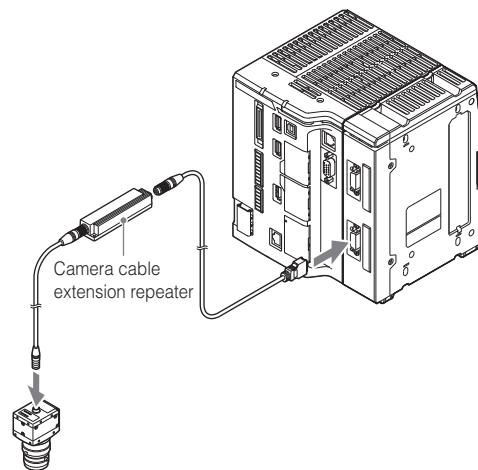
NOTICE

Do not connect cameras, LJ-V series heads, or cables, etc. which the controller does not support. This may cause failures, or breakdowns of the unit and connected devices.

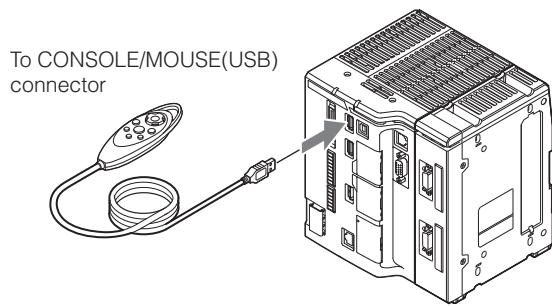
Using the camera cable extension repeater

Camera cables can be extended by using the camera cable extension repeater (Page 6-14).

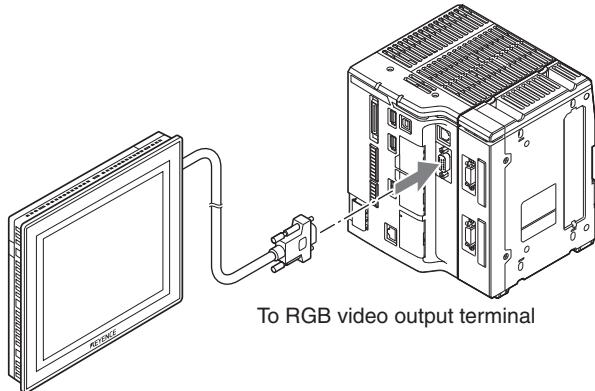
For more information on connection, read the instructions provided with the camera cable extension repeater.



- 2** Connect the USB handheld controller (OP-87983, sold separately) or the dedicated mouse (OP-87506, sold separately) to the CONSOLE/MOUSE(USB) connection port on the controller.



- 3** Connect the monitor to the video output terminal of the controller.


NOTICE

The unit's power GND (0V) is shared in common with the connector shield and signal GND. If there is a potential difference with the connection for the external monitor, this may result in breakdowns or malfunctions of the unit and the connected external monitor.
(Recommended monitors: CA-MP120/CA-MP120T)


Point

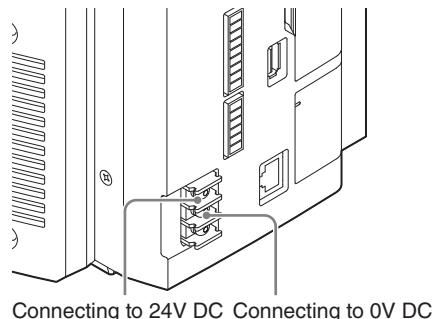
- The controller's monitor output is XGA (1024 × 768 pixels). If a commercial RGB analog monitor other than an XGA monitor is used, the display quality may worsen depending on the monitor's specifications, and images may not be displayed properly.
- When connecting the controller via Keyence touch panel VT3 and VT3-VD4, use the special RGB cable (3 m) OP-66842 or RGB cable (10 m) OP-87055. If a commercial RGB cable is used, the screen may not be displayed correctly.

Connecting Cables

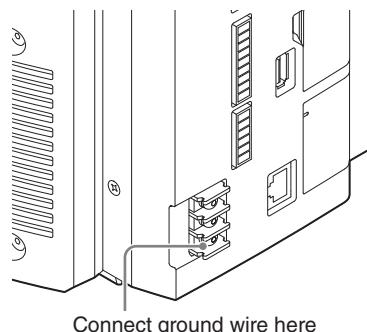
4 Connect the DC 24 V power.

NOTICE	<ul style="list-style-type: none"> • Use electrical wiring AWG14 to AWG22. • Make sure to connect the frame ground terminal for the DC 24 V power source to a Class D ground. • The solderless terminal sizes are noted in the figure on the right. Use a size that fits M3 screws. • Tighten the screws to a torque of 0.5 to 0.75 [Nm]. 	
--------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

- (1) Connect 24 V DC and 0 V to the power terminals.



- (2) Connect the ground wire to the grounding terminal.



NOTICE	<ul style="list-style-type: none"> • Ground each device separately. • Use a Class D ground. • Keep ground resistance to 100Ω or less. • Keep the ground wire as short as possible. • If it is not possible to ground each device separately, ground them together. However, make sure that the electrical cables are the same length. 	<p>A = B Ground per Class D Ground resistance 100Ω</p>	<p>A > B A < B</p>
--------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------	------------------------------

Selection and Installation of LED Lighting

Reference

Up to 16 LED lights can be controlled from the controller using the optional illumination expansion unit CA-DC40E/DC50E. See "Using the Illumination Expansion Unit" (Page 2-14) for more details.

Selecting the Correct Lighting System

Use the correct lighting system to ensure stable inspection

Inspecting in one of the following locations may lead to unstable detection. Relocate the inspection or use a dedicated lighting system.

- Locations where the inspection is exposed to direct sunlight
- Locations where the outside light varies greatly depending on the time of day
- Locations where the amount of light changes due to the movement of machines and people

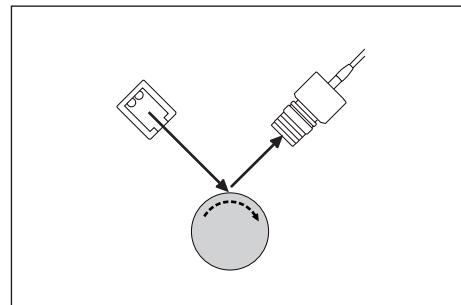
Ask your KEYENCE sales representative for details.

Reference

Refer to "LED light for line scan camera" (Page 6-26) for a list of the LED light (CA-DZ) products which can be used with the line scan camera.

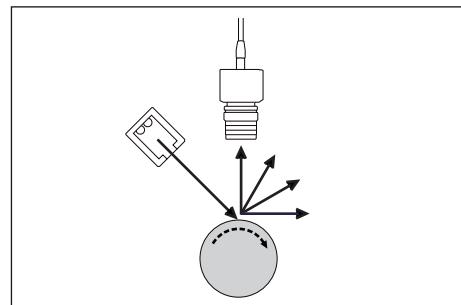
Specular Reflection

If a stain or indentation exists, the light is not reflected back to the camera and the corresponding area appears dark.



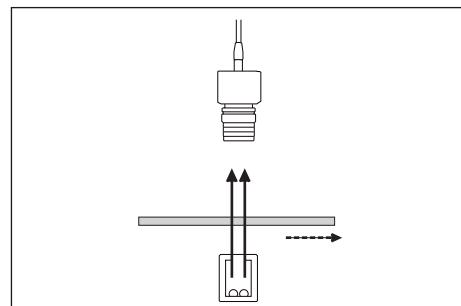
Diffuse Reflection

If a burr or protrusion is present, the light is reflected back to the camera and the corresponding area appears bright.



Transmittance

This method is frequently used for dimensions measurement and for detecting foreign substances on the sheet. With transmitted lighting, the outline edges are highlighted. When detecting foreign substances, because foreign substances block the light, the foreign substances appear dark.



Using the Illumination Expansion Unit

Precautions and wiring when using the optional illumination expansion unit CA-DC40E/DC50E are explained here.

Usage Precautions

 WARNING	<ul style="list-style-type: none"> For more details on general precautions for the illumination expansion unit, see "Safety information for XG-X2000 Series" (Page 4). For more details on cautions and warnings in the installation and handling of the unit, see the operation manuals of the illumination expansion unit and LED light that are being used.
--------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

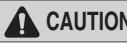
Power supply

 CAUTION	<p>Do not use with any power voltage other than DC 24 V. Doing so may cause fire, electric shock, or damage to the unit.</p>
--------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------



Always connect the frame ground terminal or ground terminal when a switching regulator is used.

Handling

 CAUTION	<ul style="list-style-type: none"> Illumination units may reach very high temperatures while in operation and immediately after use. Avoid direct contact. Doing so may cause burns. Do not disassemble or modify the unit. Doing so may cause fire, electric shock, or damage to the unit. Do not stare into the LED light source for prolonged periods of time. This may cause damage to the eyes. Correctly set the voltage for the illumination unit on the CA-DC40E illumination expansion unit. If a 12 V illumination unit is mistakenly connected to the connector terminal block for which the set voltage has been changed to 24 V, this may cause a fire, electric shock, or product malfunction.
--------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Connecting Cables

After attaching the illumination expansion unit to the controller (Page 2-4), follow the procedure below to connect the LED illumination unit and the 24 V DC power supply.

- An LED illumination unit that has a different output connector shape, such as a 24 V type, can also be wired directly to the terminal block of the CA-DC40E.
- Reference**
- For more details about the specifications for the CA-DC40E and CA-DC50E terminal blocks, see "Expansion Unit" (Page 5-13).
 - All of the illustrations in this section are of the CA-DC40E.

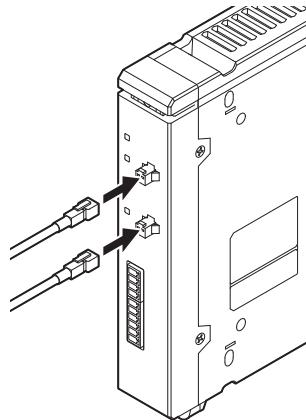
- 1** Connect the LED light to the output connector of the illumination expansion unit.

 WARNING	<p>Correctly set the voltage for the illumination unit on the CA-DC40E illumination expansion unit. If a 12 V illumination unit is mistakenly connected to the connector terminal block for which the set voltage has been changed to 24 V, this may cause a fire, electric shock, or product malfunction.</p>
--------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

 NOTICE	<p>If the light connector is to be removed or attached, shut off the power supply to the illumination expansion unit. If the light connector is removed or attached while power is being supplied, this may cause the illumination expansion unit and the light emitter to malfunction or become damaged.</p>
-------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



The light numbers are 1 for the bottom connector, and 2 for the top connector. If several illumination expansion units are connected, the light numbers are assigned in ascending order from the unit close to the controller.

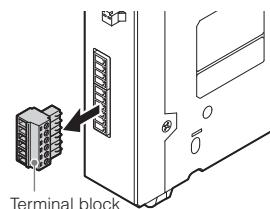


- 2** Supply a 24 V DC power source to the power input terminal of the IN connector terminal block.

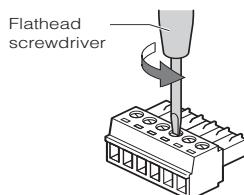


- Use a flat head screwdriver to connect the power supply to the input terminals.
- Use a torque of 0.25 Nm or less to tighten the screws.
- Use electrical wiring AWG14 to AWG22.
- Make sure to connect the frame ground terminal for the DC 24 V power source to a Class D ground.
- Do not supply power until the installation is completed.
- Do not apply soldering (preliminary soldering or pre-soldering) to the tip of electrical wire to be processed.

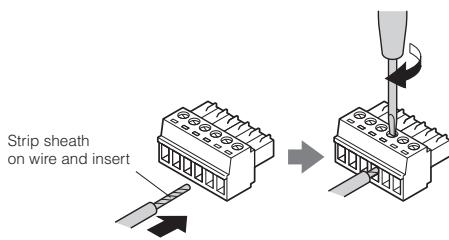
- (1) Remove the IN connector terminal block from the illumination expansion unit.



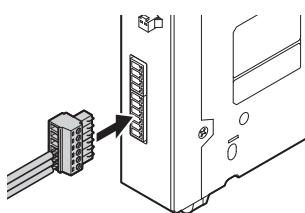
- (2) Loosen the screw of the IN connector terminal block using a flat head screwdriver.



- (3) After stripping the insulating sheath by about 7 mm, insert the wires to terminal 24 V DC and 0 V and ground wire (FG), and then tighten the screws.



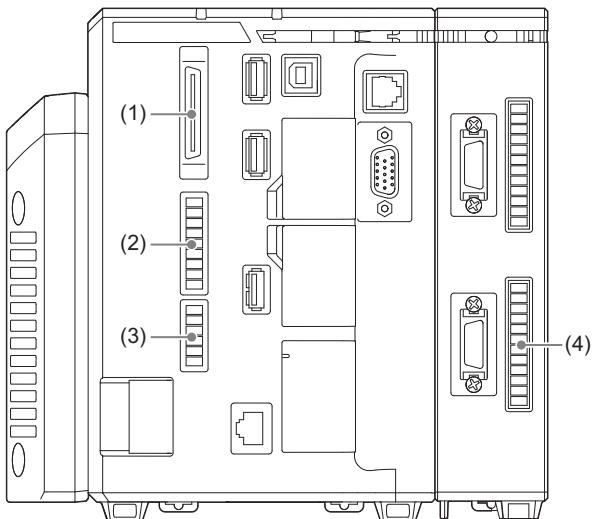
- (4) After connecting all the necessary wires, securely insert the IN connector terminal block into the I/O connector as far as it will go.



Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

Overview



This chapter describes the wiring methods that are necessary for basic input and output control that uses the I/O interfaces below.

I/O interfaces used in this chapter

(1) Parallel I/O interface (40-pin) (Page 5-9)

Use the specialized OP-51657 parallel connection cable (3 m) (sold separately).

(2) Terminal block interface (OUT 9-pin) (Page 5-11)

Standard on this controller as an attachable/detachable terminal block.

(3) Terminal block interface (IN 8-pin) (Page 5-11)

Standard on this controller as an attachable/detachable terminal block.

Reference If you are going to use an encoder, you will also use (4) ENCODER connector.

Capturing images of workpieces subject to inspection, output of the inspection result, and monitoring the status of the controller are performed on the below terminals that are on these I/O interfaces.

I/O terminals used in this chapter

- **Trigger 1 input (Page 3-3)**

A signal for capturing images. Inputs a signal from an external device to the controller when an image is to be captured.

- **Permission output for trigger 1 input (Page 3-4)**

A signal that indicates whether the controller can receive trigger 1 input. If a signal can be received, it is output from the controller to an external device.

- **Error output and run mode output (Page 3-5)**

Error output is a signal that indicates the operation state of the controller. If an error occurs on the controller, it is output from the controller to an external device.

Run mode output is a signal that indicates the operation state of the controller. If this controller is running, a signal is output from the controller to an external device.

- **Total status output and strobe output (Page 3-6)**

Total status output is a signal that indicates whether the inspection result is OK or NG. If the result is NG, a signal is output from the controller to an external device.

Strobe output is a signal that indicates the finalization of Total status output. A signal is output from the controller to an external device when Total status output is finalized.

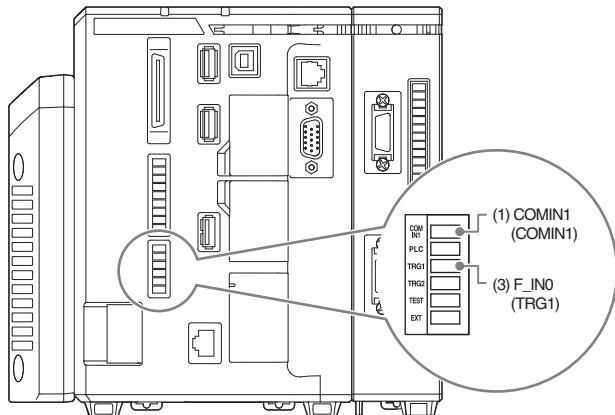
Reference

- For more details about the behavior of the above signals while this controller is running, see the timing chart (Page 3-7).
- I/O interfaces can control commands and data input and output in addition to those listed above. For more details, see the "XG-X2000 Series Communications Control Manual".

Trigger 1 Input

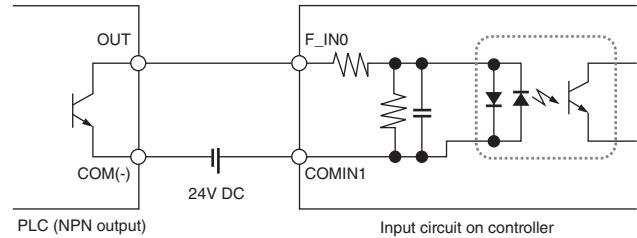
This is an example of terminal wiring for inputting a trigger signal from a PLC or a synchronization sensor to the controller. When you want to capture an image with the camera that trigger 1 is assigned to, turn on F_IN0 (TRG1) externally.

The external terminal that is to be actually wired is terminal No. 1 COMIN1 (COMIN1) and terminal No. 3 F_IN0 (TRG1) of the terminal block interface (IN connector).

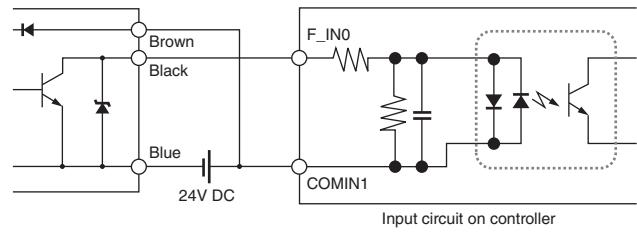


If the output device is compatible with the NPN open collector input

When connecting an NPN PLC output to the system input

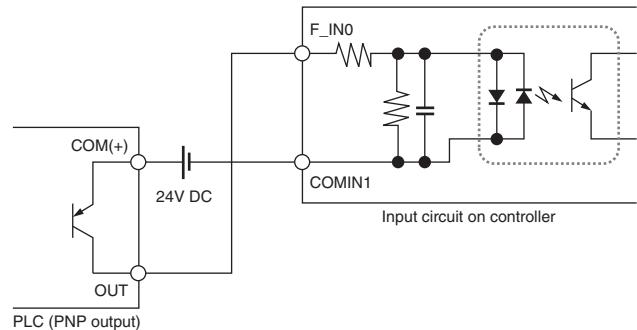


When connecting an NPN synchronization sensor output to the system input

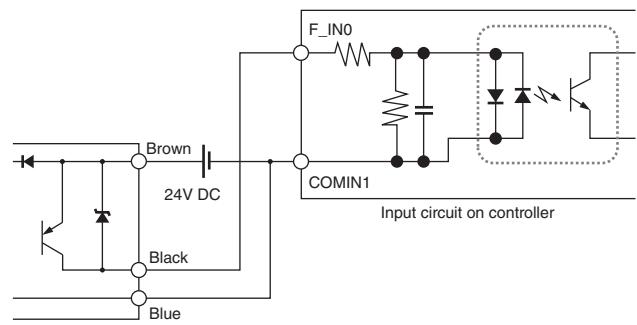


If the output device is compatible with the PNP open collector input

When connecting a PNP PLC output to the system input

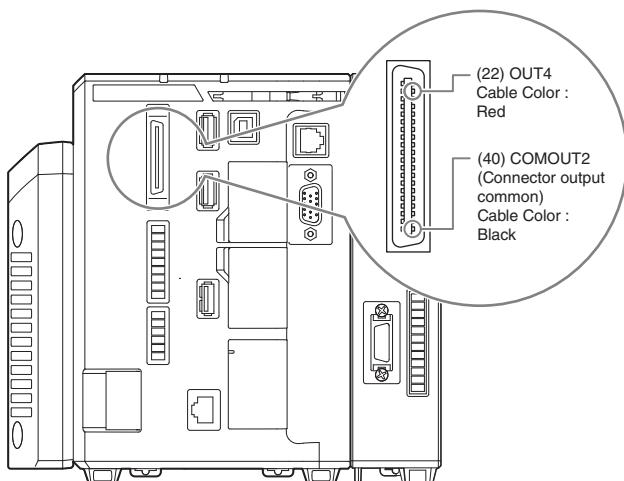


When connecting a PNP synchronization sensor output to the system input



This is an example of terminal wiring for checking whether trigger 1 can be input. If input to trigger 1 is possible, the controller turns on terminal No. 22 OUT4 (Trg1Ready) of the parallel I/O interface.

The terminal that is to be actually wired is terminal No. 22 OUT4 (Trg1Ready) and terminal No. 40 COMOUT2 (common for the connector output) of the parallel I/O interface.



Reference

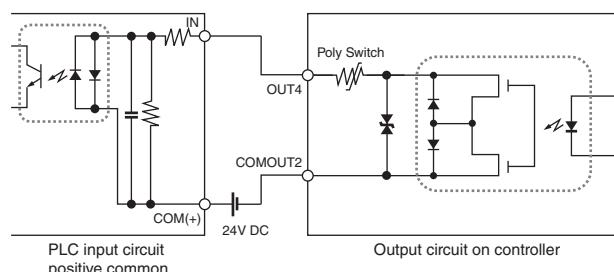
The color of the cable in the above figure is the color of the specialized OP-51657 parallel connection cable (3 m) (sold separately).

Point

Since the controller utilizes a photo MOSFET in the output elements, any one of the NPN inputs, or PNP inputs can be connected by simply wiring the respective compatible inputs. For more details about wiring, see the connection example.

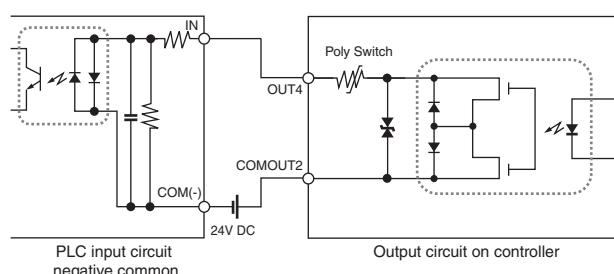
If the input device is compatible with the NPN open collector output

When connecting the output from the controller to a PLC with a positive common



If the input device is compatible with the PNP open collector output

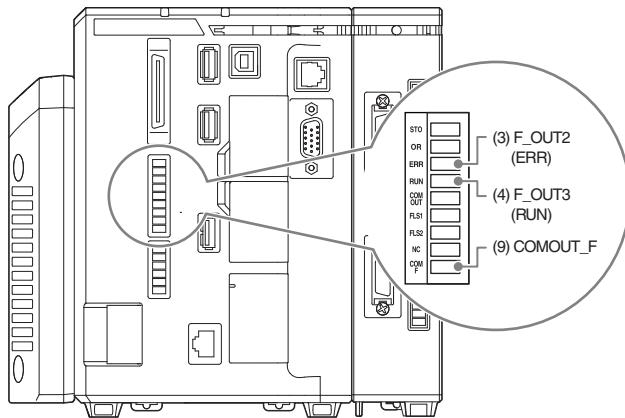
When connecting the output from the controller to a PLC with a negative common



Error Output and Run Mode Output

This is an example of terminal wiring for checking the controller's error and run statuses. If an error occurs, the controller turns on terminal No. 3 F_OUT2 (ERR) of the terminal block interface (OUT connector). If the controller is operating, the controller turns on terminal No. 4 F_OUT3 (RUN) of the terminal block interface (OUT connector).

The actual wiring is for terminal No. 3 F_OUT2 (ERR), terminal No. 4 F_OUT3 (RUN), and terminal No. 9 COMOUT_F (COMF) of the terminal block interface (OUT connector).

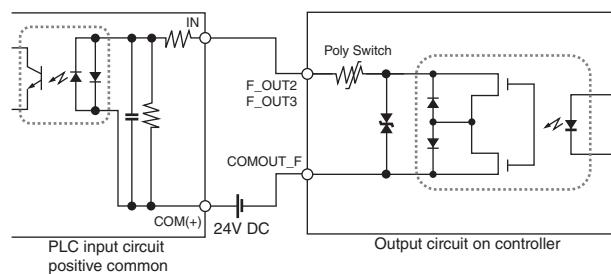


Point

Since the controller utilizes a photo MOSFET in the output elements, any one of the NPN inputs, or PNP inputs can be connected by simply wiring the respective compatible inputs. For more details about wiring, see the connection example.

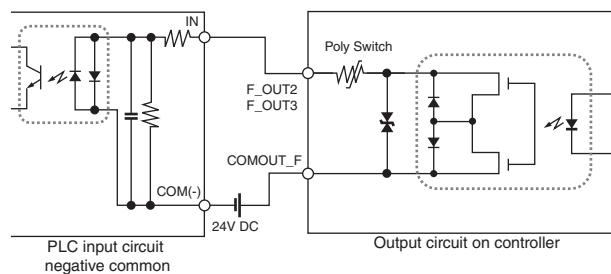
If the input device is compatible with the NPN open collector output

When connecting the output from the controller to a PLC with a positive common



If the input device is compatible with the PNP open collector output

When connecting the output from the controller to a PLC with a negative common



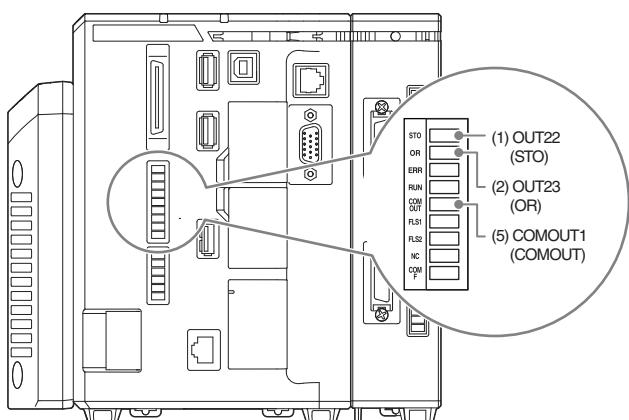
Total Status Output and Strobe Output

This is an example of terminal wiring for checking whether the total status of inspection is OK or NG. If the total status is NG, the controller turns on terminal No. 2 OUT23 (OR) of the terminal block interface (OUT connector). As this total status is output for STO (strobe) synchronization, terminal No. 1 OUT22 (STO) of the terminal block interface (OUT connector) is also necessary for checking the total status.

The actual wiring is for terminal No. 1 OUT22 (STO), terminal No. 2 OUT23 (OR), and terminal No. 5 COMOUT1 (COMOUT) of the terminal block interface (OUT connector).

Point

- For an example of the behavior of total status OR and STO signals, refer to the timing chart (Page 3-7).
- To output total status OR, a terminal output unit needs to be added. For details, see the XG-X2000 Series User's Manual.

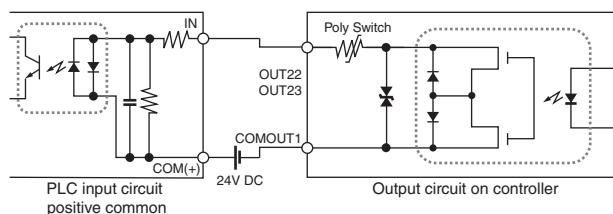


Point

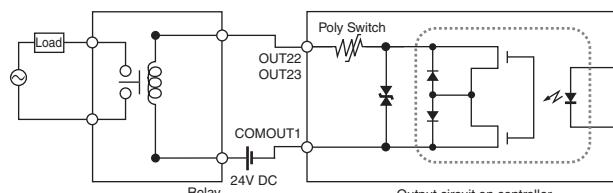
Since the controller utilizes a photo MOSFET in the output elements, any one of the NPN inputs, or PNP inputs can be connected by simply wiring the respective compatible inputs. For more details about wiring, see the connection example.

If the input device is compatible with the NPN open collector output

When connecting the output from the controller to a PLC with a positive common

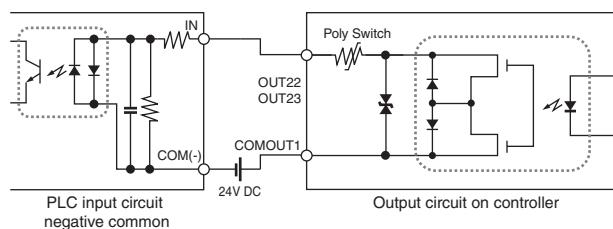


When connecting the output from the controller to a Relay with a positive common

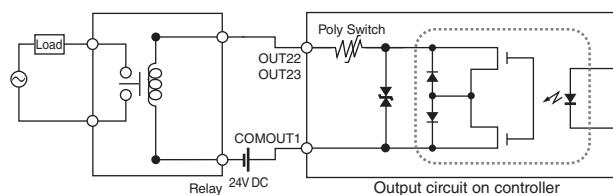


If the input device is compatible with the PNP open collector output

When connecting the output from the controller to a PLC with a negative common

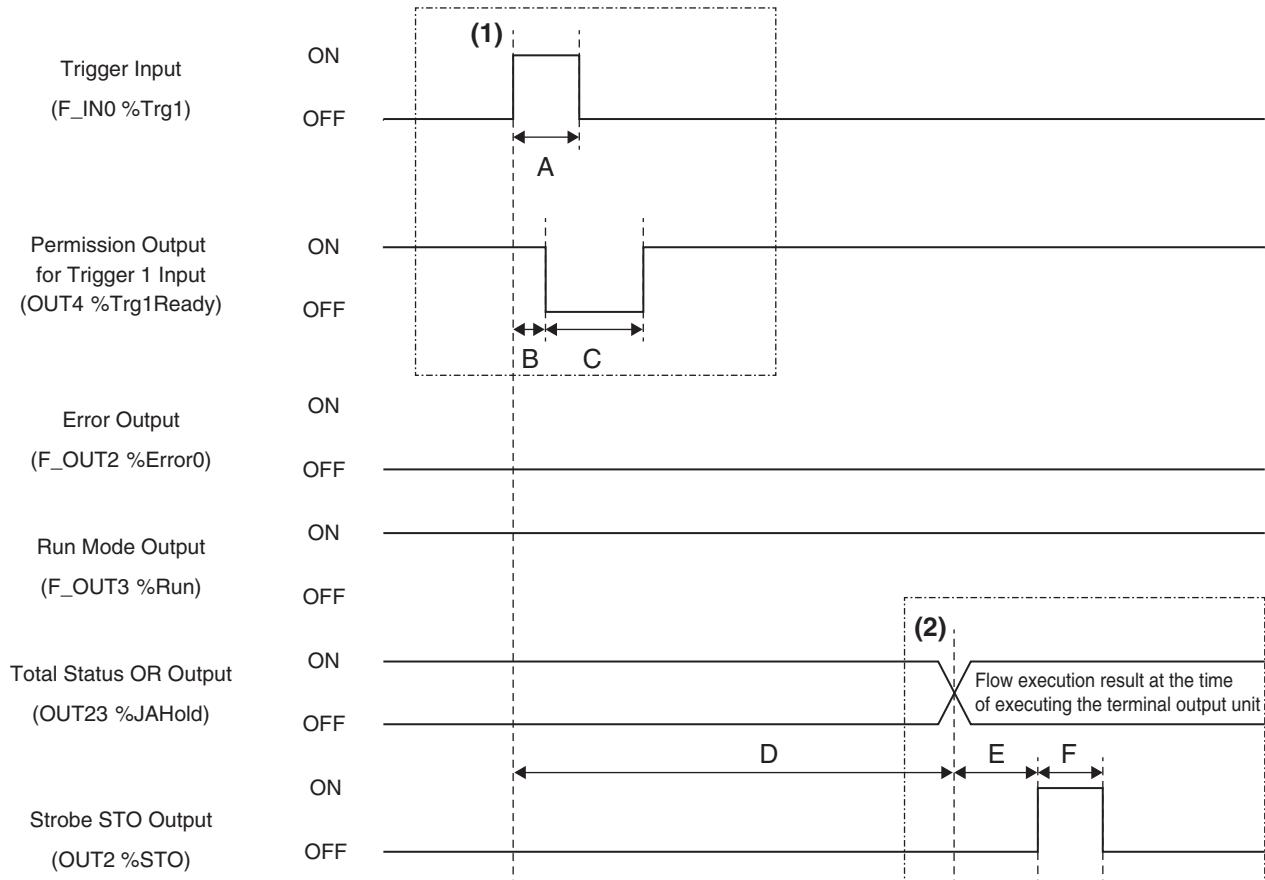


When connecting the output from the controller to a Relay with a negative common



Timing Chart

An example of behavior from trigger input to total status output



A: Smallest trigger input time

1 ms or higher

B: %Trg1Ready fall response delay

1 ms or less

C: %Trg1Ready fall time

Depends on the settings

D: Output start time

Depends on the settings

E: Status change time

Depends on the settings (1 to 999 ms; default setting: 5 ms)

F: Output time

Depends on the settings (1 to 999 ms; default setting: 10 ms)

- (1) A trigger can be input when the permission output for trigger input is ON. When a trigger is input, the camera starts capturing images.



Behavior when Image Capture Buffer is enabled (default setting).

For details, refer to the "XG-X2000 Series Communications Control Manual".

- (2) Each time the total status OR switches, the strobe STO output turns on and after the output time has passed turns off. Total status OR turns off for a pass (OK) and on for a fail (NG) (default setting). A pass/fail can be determined by getting the AND of the rise of strobe STO output and the total status OR output.



- To output total status OR, a terminal output unit needs to be added (refer to the setting example).
For details, see the XG-X2000 Series User's Manual.
- Behavior when there is no handshake.
For details about behavior when there is a handshake, refer to the XG-X2000 Series User's Manual.
- You can change E: Status change time and F: Output time via the settings.
For information about how to change the times, refer to "Setting the Status Change Time and Output Time" (Page 3-8).

Setting example)



Setting the Status Change Time and Output Time

You can change E: Status change time and F: Output time on the timing chart (Page 3-7) via the settings.

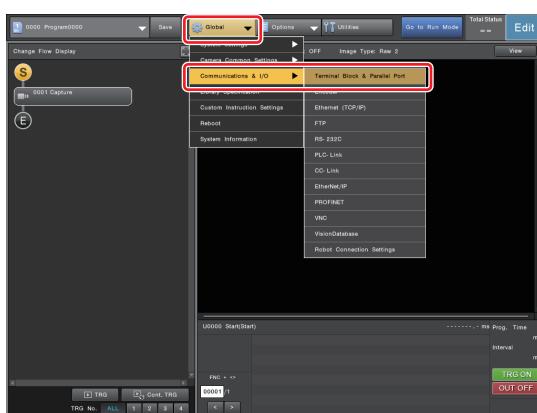
Reference

Depending on the PLC scan time, the output from the controller may not be able to be detected with the default settings. In that case, set the output time (ms) and status change time (ms) to a value higher than the scan time.

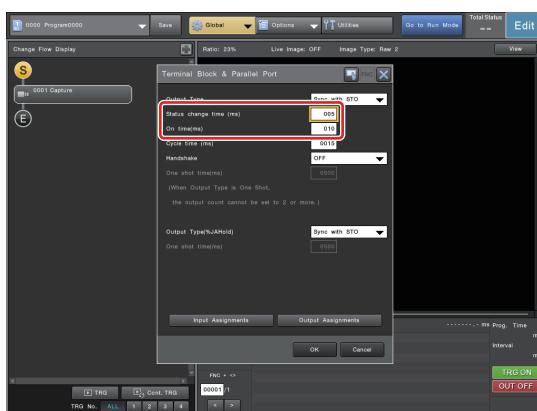
1 Switch to Setup mode.

For information about how to switch modes, refer to "Switching between Run Mode and Setup Mode" (Page 4-3). If the unit is already in Setup mode, you do not need to follow this step.

2 On the [Global] menu, select [Communications & I/O] - [Terminal Block & Parallel Port].



3 Adjust [Status change time (ms)] and [On time(ms)].



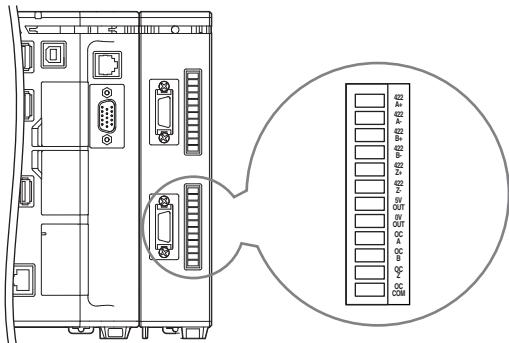
4 Once you have completed the settings, select [OK]. The Settings screen closes.



If you changed the input and output terminal assignments, you need to restart the controller.

Wiring an Encoder

XG-X2800 + CA-E100L



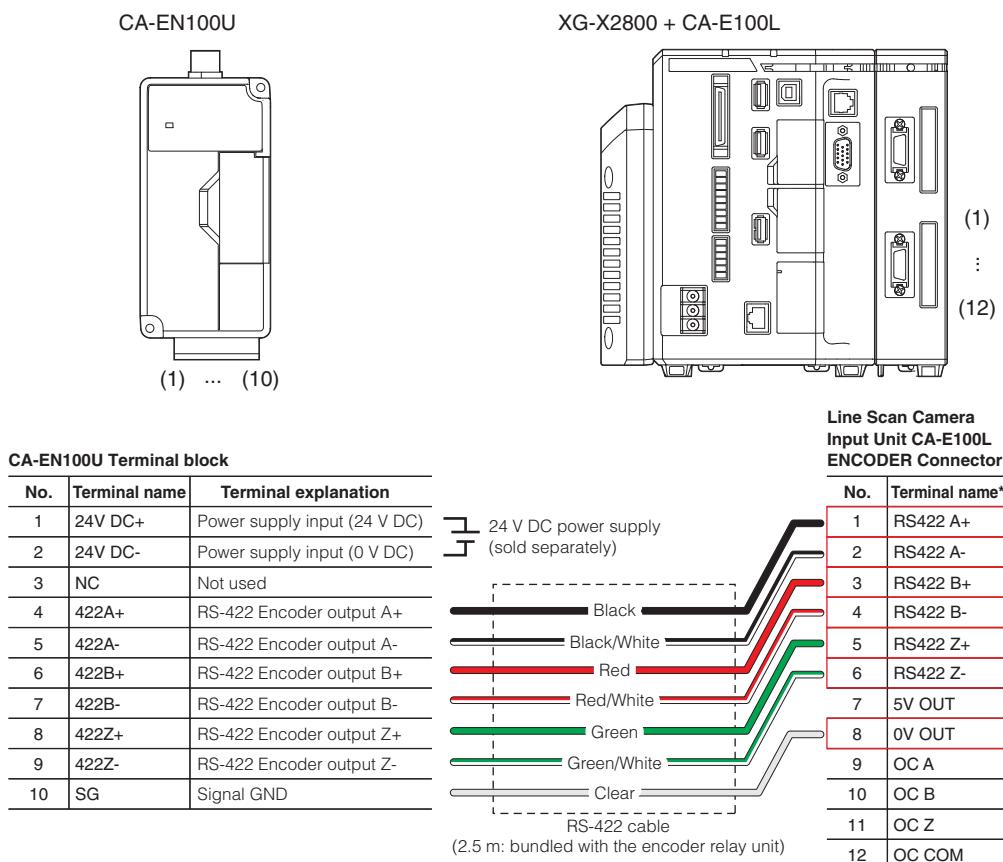
If you use an encoder, you need to wire the encoder to the ENCODER connector on the line camera input unit (CA-E100L) connected to the controller.

There are two ways to connect the controller and the encoder: the RS-422 line driver and the open collector. The terminal to be wired differs depending on the signal of the encoder to be connected.

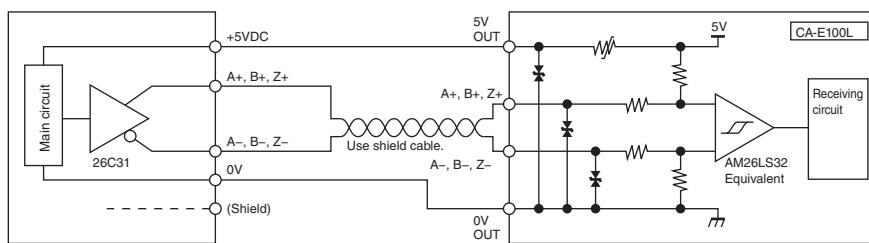
See below for the specific wiring. For more details about connector specifications, see "Expansion Unit" (Page 5-13).

RS-422 Line Driver Output (Including Keyence Encoder Relay Units)

An example of wiring to a Keyence encoder relay unit (CA-EN100U)

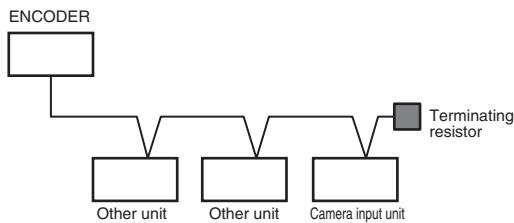


* This is the inscription on the bundled terminal block when shipped. For more details about the terminal name and description, see "Expansion Unit" (Page 5-13).

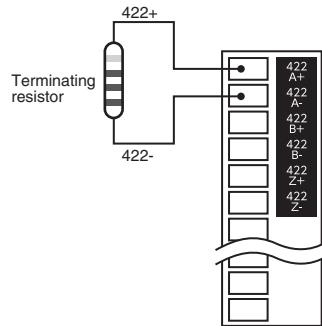
An example of wiring with other encoders**CA-E100L
ENCODER Connector**

No.	Terminal name
1	RS422 A+
2	RS422 A-
3	RS422 B+
4	RS422 B-
5	RS422 Z+
6	RS422 Z-
7	5V OUT
8	0V OUT
9	OC A
10	OC B
11	OC Z
12	OC COM

- Point**
- Use a shield cable that supports an RS-422 signal for the RS-422 cable, and always connect the Cable shield to the FG.
 - When connecting via RS-422, install a terminating resistor (110Ω 1/2 W: supplied with CA-E100L) on the camera input unit farthest away from the encoder.

Example of connections**Installation**

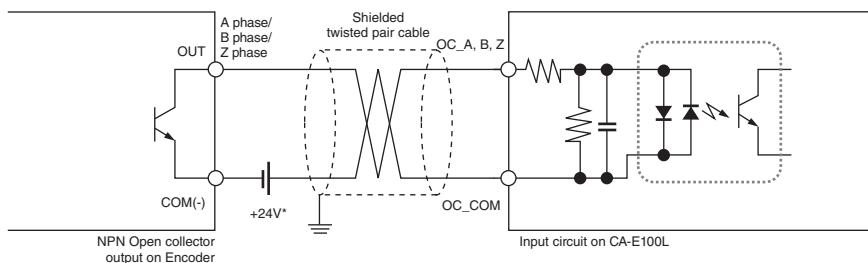
Install the terminating resistor between the 422+ and 422- which are to be used as shown per the following diagram.

**Reference**

5 V OUT and 0 V OUT are the encoder service power supply (the rated output is 150 mA). When you are going to use encoders that exceed the rating, prepare an external 5 V power supply.

Open Collector Output

Connection example: when connecting an NPN open collector output encoder

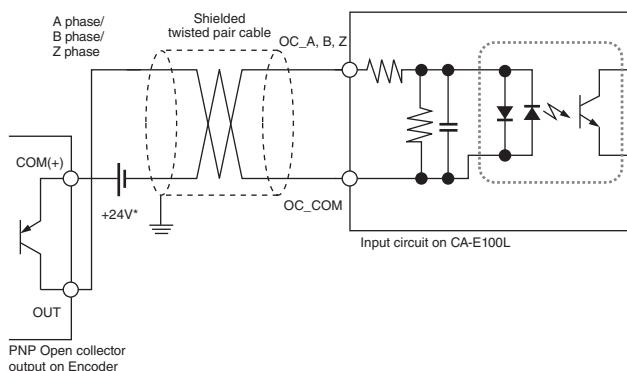


- * This instrument's (CA-E100L) open collector encoder inputs are only compatible with 24 V type encoders.

**CA-E100L
ENCODER Connector**

No.	Terminal name
1	RS422 A+
2	RS422 A-
3	RS422 B+
4	RS422 B-
5	RS422 Z+
6	RS422 Z-
7	5V OUT
8	0V OUT
9	OC A
10	OC B
11	OC Z
12	OC COM

Connection example: when connecting a PNP open collector output encoder



- * This instrument's (CA-E100L) open collector encoder inputs are only compatible with 24 V type encoders.



- Use a shield cable, and always connect the Cable shield to the FG.
- There is continuity between each input circuit. Pay attention so that potential differences are not generated between the signals.

Chapter

4

Checking the Wiring and Adjusting the Camera

Checking the Wiring and Adjusting the Camera

Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

Starting Up the Controller

This section explains how to adjust the controller from its purchased condition to capture images properly.



To adjust the controller, you need an optional USB handheld controller (OP-87983) or a special mouse (OP-87506).

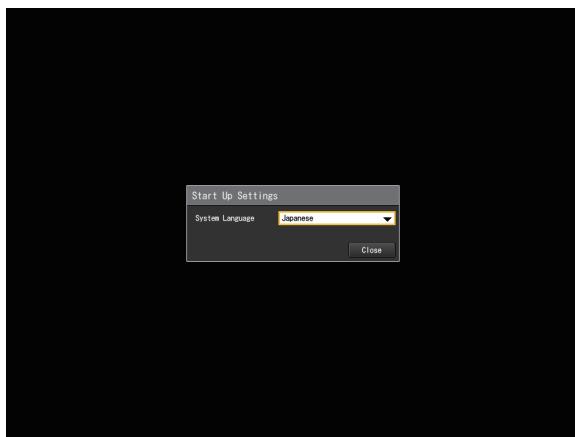


The software may not operate as described below if program settings have already been uploaded.

Check that a Screen is Displayed on the Monitor

- 1 Confirm that the cables are connected correctly, and then turn on the power.

After the opening screen is displayed, the initial startup screen appears.



If nothing appears on the monitor

Check the following:

- Are the power input terminals connected correctly?
- Are you using a 24 V DC power supply that satisfies the controller's rated consumption current?
- Have the power input terminals (+24 V) and (0 V) been connected in reverse polarity by mistake?
- Is the monitor cable connected correctly?
- Is the monitor turned on?
- Does the monitor support XGA (1024 x 768 pixel) resolution, and 60 Hz vertical frequency?

- 2 In the [System Language] box, select the language to use.

- Japanese
- English
- Traditional Chinese
- Simplified Chinese
- German

- 3 Click [Close].

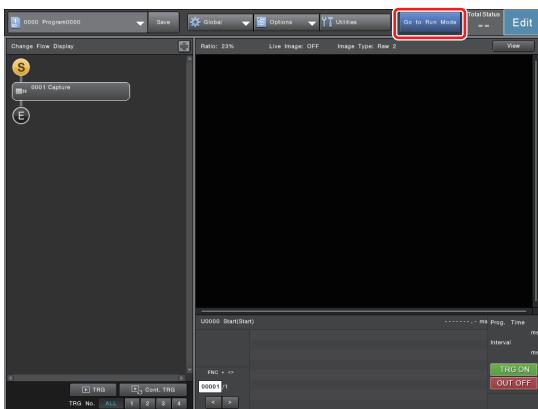


If you want to change [System Language] after starting the unit for the first time, in Setup mode select [Global] - [System Settings] - [Language] and change to your desired language.

Switching between Run Mode and Setup Mode

Switching from Setup mode to Run mode

- 1** Select [Go to Run Mode].



- 2** If a confirmation screen appears, select [OK].

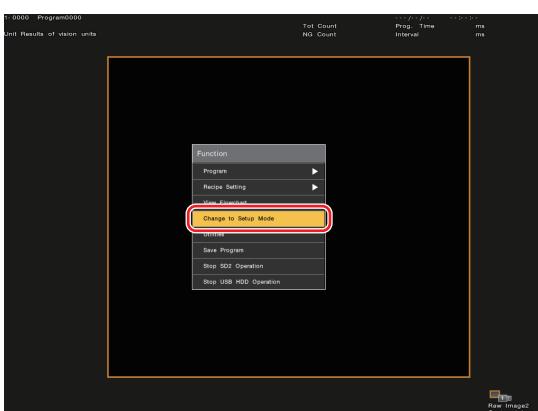
The mode switches to Run mode

Switching from Run mode to Setup mode

- 1** On the handheld controller, press the No. 1 (FUNCTION) button.

The Function menu appears.

- 2** Select [Change to Setup Mode].



A confirmation screen appears.

- 3** Select [OK].

The mode switches to Setup mode.



You can also switch between Run mode and Setup mode by flipping the No. 8 switch (RUN/STOP) on the handheld controller.

The unit starts in Setup mode as the default setting. You can change the mode the unit starts in to Run mode from [Global] - [System Settings] - [Startup Settings] in Setup mode.

Checking the Wiring

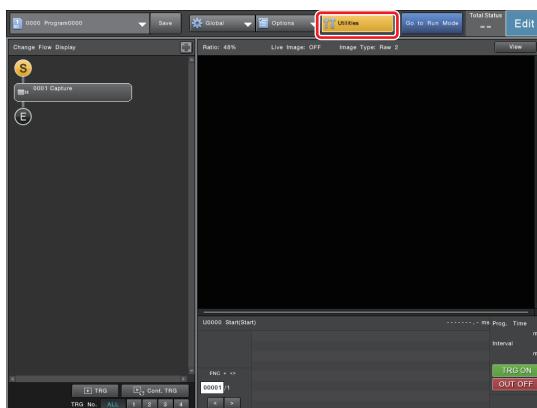
Checking the Input Signal

Input a trigger signal from the PLC or synchronization sensor into the controller and check that the trigger is correctly input. You can check whether the trigger signal is correctly input into the controller on the I/O monitor.

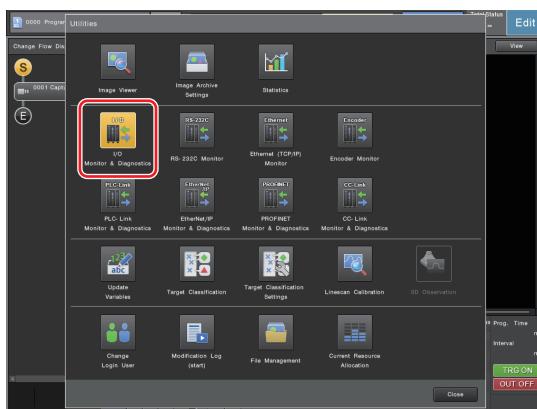
1 Switch to Setup mode.

For information about how to switch modes, refer to "Switching between Run Mode and Setup Mode" (Page 4-3).

2 Select [Utilities].



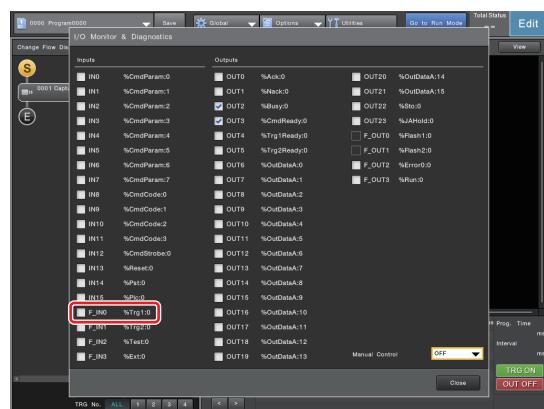
3 Select [I/O Monitor & Diagnostics].



- 4** Input a trigger signal from the PLC to the controller and check that the [F_IN0 (%Trg1:0)] check box is selected. If the signal is correctly input from the PLC to the controller, the check box will be selected.



If the signal input time is short, the screen refresh rate cannot keep up and the check box may not be selected even if the signal was correctly input. Input the signal for a sufficiently long amount of time.



Checking the Output Signal

Check whether the signal is output correctly from the controller to the PLC.

On the I/O monitor, forcibly output a signal output by the controller and check that you can check that signal on the PLC.

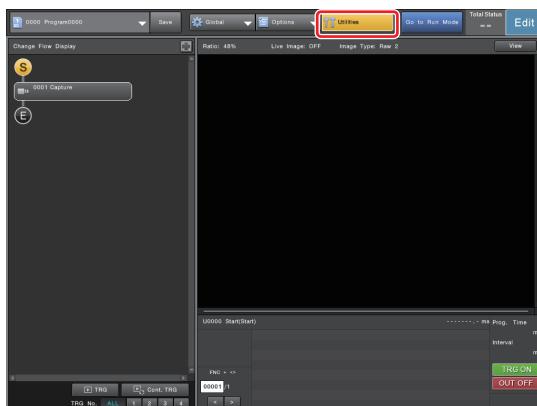


If you selected [Utilities] - [I/O Monitor & Diagnostics] from the Function menu in Run mode, you cannot forcibly output a signal. To perform forcible output, switch to Setup mode.

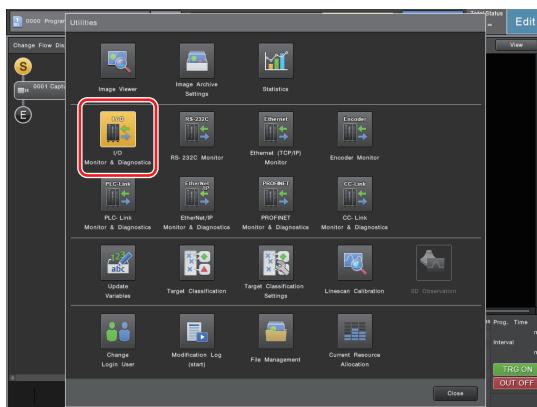
1 Switch to Setup mode.

For information about how to switch modes, refer to "Switching between Run Mode and Setup Mode" (Page 4-3).

2 Select [Utilities].

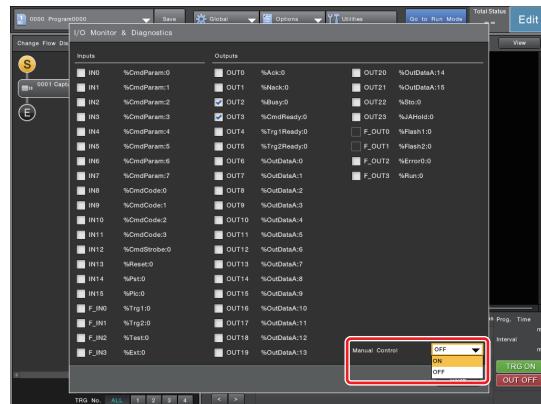


3 Select [I/O Monitor & Diagnostics].



4 For [Manual Control], select [ON].

If you select the check box for a terminal in this state, that terminal will turn on.



5 Select the check box for a wired terminal and check that it can be recognized on the PLC.

Adjusting the Camera

In this section, the camera will be adjusted and an image will be shown.

Reference

If you will use existing program setting data, see "Importing Settings" (Page 7-9) of "Chapter 7 Appendix".

Enabling Light

Enable the light connected to the illumination expansion unit. If you are not using an illumination expansion unit, this setting is unnecessary.

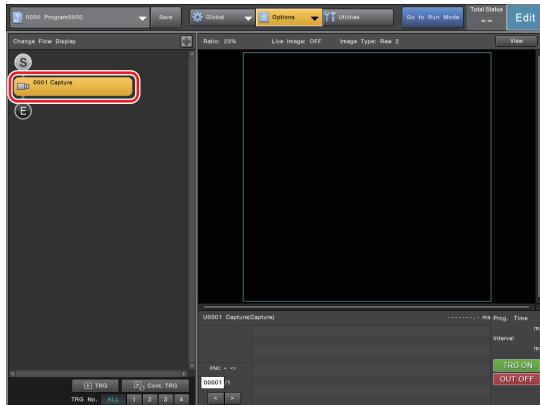
1 Switch to Setup mode.

For information about how to switch modes, refer to "Switching between Run Mode and Setup Mode" (Page 4-3).

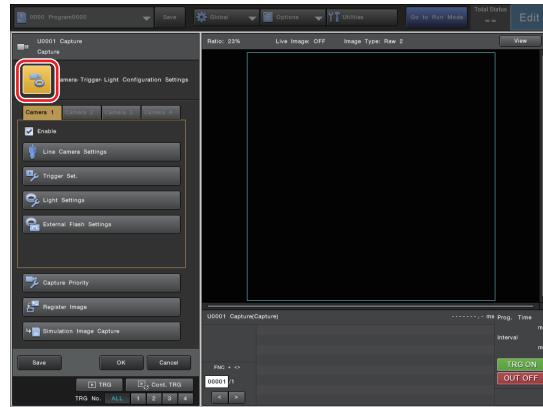
2 Select the capture unit.

Reference

- The Capture unit is the unit (processing unit) for capturing workpiece images that are subject to inspection and measurement with a camera.
- For typical handheld controller operations and functions, refer to "Controlling the Handheld Controller (Optional)" (Page 7-2).

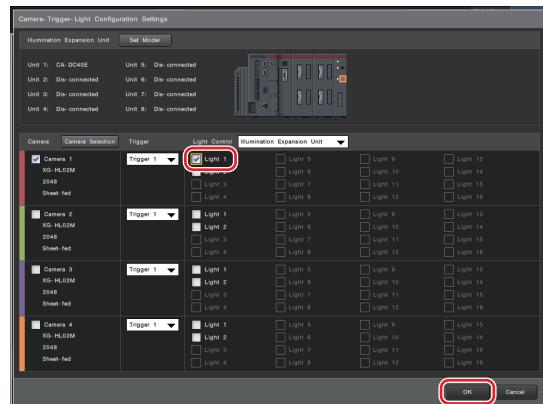


3 Select [Camera-Trigger-Light Configuration Settings].



4 Select the check box for the light that you want to use.

5 Select [OK] to apply changes and close the screen.



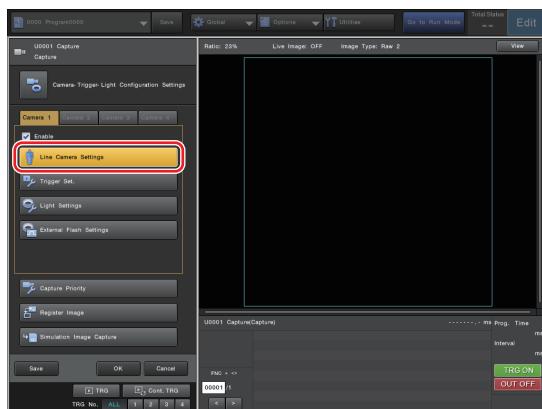
Adjusting the Sharpness, Brightness and Image

The operation below differs depending on the capture conditions and environment. This section describes operations when using fixed capture with a specified time.

Reference

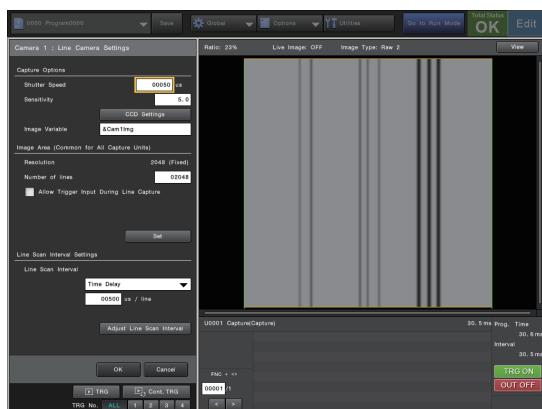
- For more details about the following operation cases, see the XG-X2000 Series User's Manual.
- Continuous capture with time delay
 - Fixed length capture with encoder input
 - Continuous capture with encoder input

1 In the capture unit, select [Line Camera Settings].



2 On the handheld controller, push the No.3 (TRIGGER) button. A trigger is input.

Image capture is performed once.



Reference

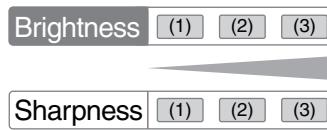
- Because brightness has not yet been adjusted, a black screen may be displayed. This is not a problem.
- Pressing and holding the No. 3 button (TRIGGER) on the handheld controller will continuously update the screen. In this case, the lights that are connected to the illumination expansion unit and will remain continuously on.

Point

By temporarily reducing the number of lines, image updating when the image is updated live by holding down the No. 3 (TRIGGER) button on the handheld controller will speed up, so subsequently the sharpness and brightness will be easier to adjust.

- 3** Display a location where there is an intensity difference, and adjust the lens aperture and focus while watching the indicators on the rear of the camera.

When brightness increases the upper "Brightness" lamps illuminate white, and when the intensity difference increases, the lower "Sharpness" lamps illuminate blue.



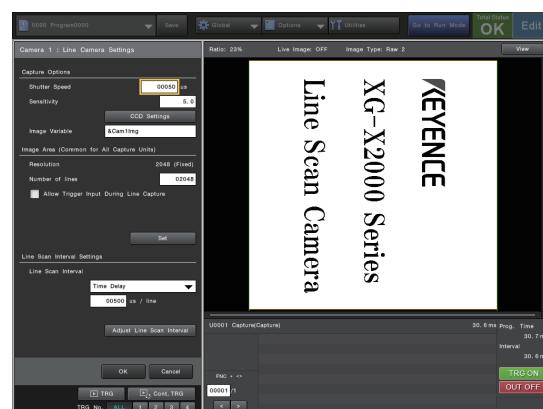
There are three lamps for each. With the default settings, the lamps indicate the values shown below (0 - 255, unit: tone)

	(1)	(2)	(3)
Brightness (Maximum brightness value)	64	128	192
Sharpness (Maximum intensity difference value)	10	20	30

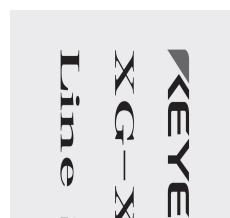
Reference

The threshold values for the "Brightness" and "Sharpness" camera LEDs can be changed in "Linescan Intensity Calibration" (Page 4-13).

- 4** After inputting the trigger, move the target, and show the developed image.



If the image is displayed stretched or compressed vertically, the camera settings need to be adjusted.



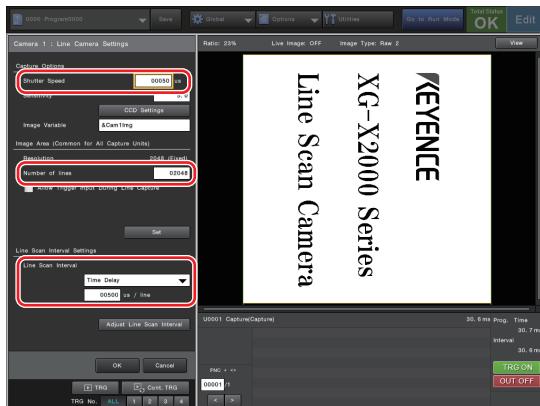
Example of a stretched image



Example of a compressed image

Adjusting the Camera

- 5** Adjust the [Shutter Speed], [Number of Lines], and [Line Scan Interval] values. When the values are correctly adjusted, the correct image will be displayed at each update without displacement.



Shutter speed

Specify the shutter speed for the capture of 1 line (unit:μs)

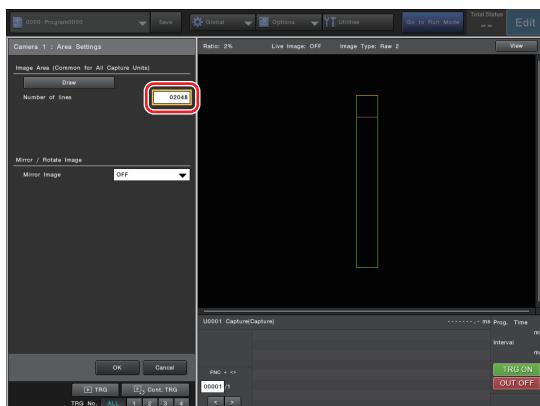


It must be set at least 3 μs faster than the line scan interval.

Number of lines

Select [Set] in [Image Area (Common for All Capture Units)]. If [OK] is selected on the confirmation screen, the [Image Area] screen will display.

Calculate the required number of lines for the size in the vertical direction based on the field of view in the horizontal direction, and specify the number of lines to use for development in the vertical direction.



Example: When capturing a 100 square mm target. If an XG-HL02M camera (2048 pixels) is used, and the field of view needs to be 150 mm in the horizontal direction (X direction), and 130 mm in the vertical direction (line expansion direction). In this case, since the pixel resolution is 0.0732 mm/pix (150 mm ÷ 2048 pix), the required number of lines is 1780 (130 mm ÷ 0.073 mm/pix).

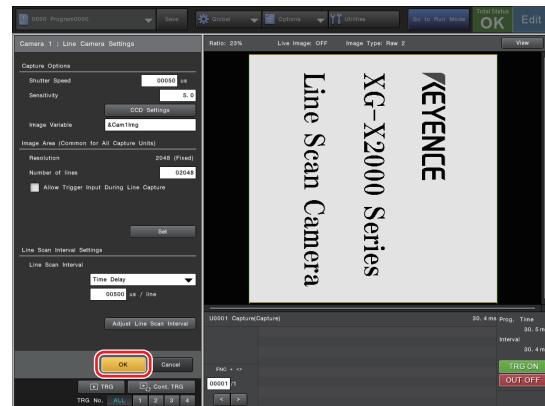
Line Scan Interval

Calculate this from the number of lines and the movement time for one target size in the vertical direction, and specify the cycle for the capture of 1 line (Line Scan Interval) between 24 to 30000 (45 to 30000 in the case of XG-HL08M) (unit:μs/line).

Example: When the vertical direction field of view is 100mm (number of lines is 1370 lines) and the speed is 200mm/s

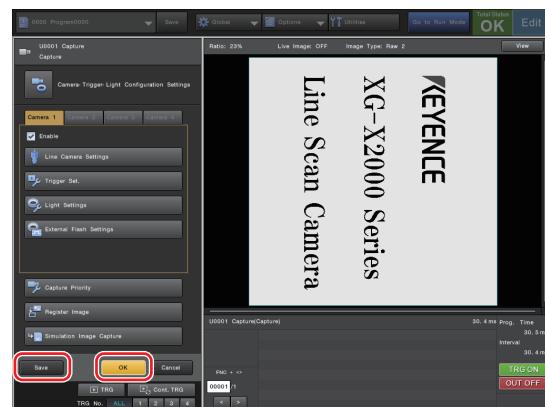
Because the movement time corresponding to the size of the target in the vertical direction is 0.5 s ((100mm/200mm) / second), a suitable line scan interval is 365 μs/line (0.5 s / 1370 lines).

- 6** Select [OK]. The setting screen closes.



- 7** Select [Save] and on the confirmation screen, select [OK]. The settings will be saved.

- 8** Select [OK] and the capture unit setting screen closes.



Saving camera images

In [Simulation Image Capture] of the capture unit, you can save camera images to an SD card.

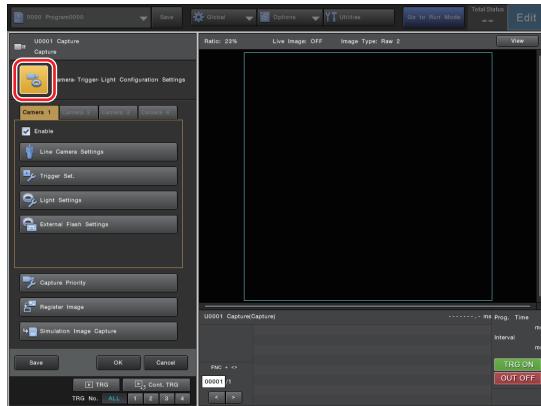
For details, see "Saving Camera Images for Simulation" (Page 7-10).

In the Case that an Error Message is Displayed

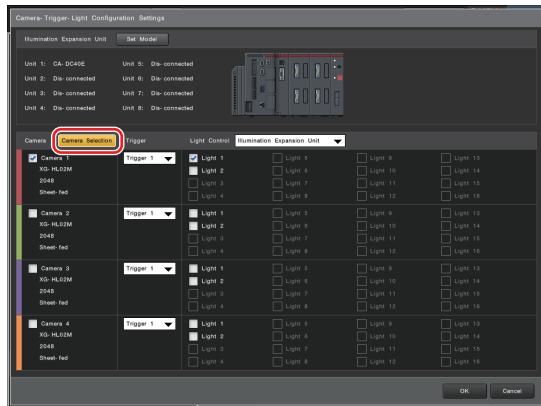
If the error message "Program settings are referring to an unconnected camera." is displayed

You need to set the camera model.

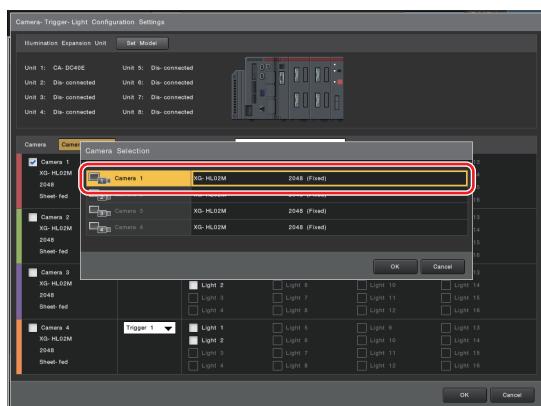
- 1 In the capture unit, select [Camera-Trigger-Light Configuration Settings].



- 2 Select [Camera Selection].

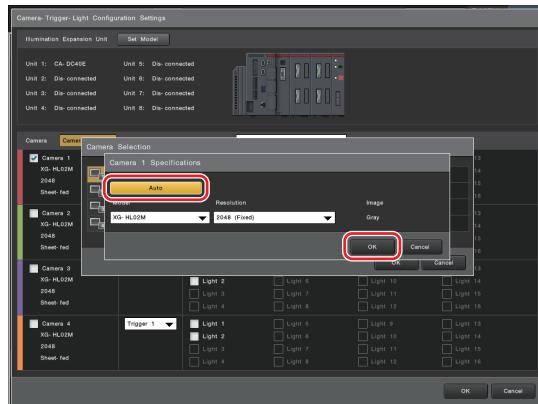


- 3 Select the applicable camera.

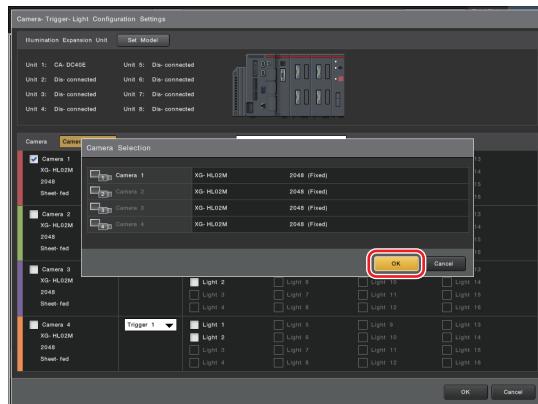


- 4 Select [Auto].

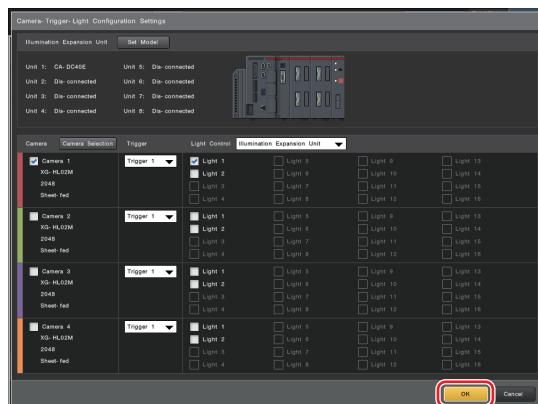
- 5 Select [OK] to set the model for the selected camera.



- 6 Select [OK]. The [Camera Selection] screen closes.



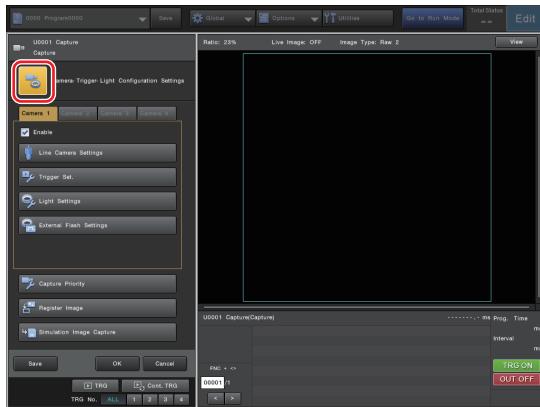
- 7 Select [OK]. The [Camera-Trigger-Light Configuration Settings] screen closes.



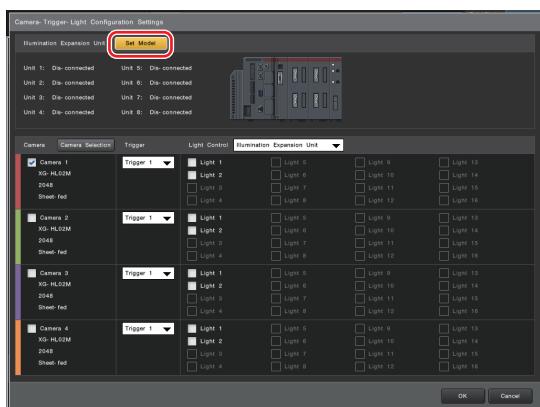
If the error message "The illumination expansion unit set in Illumination Expansion Unit Model Settings is not connected." is displayed

You need to set the illumination expansion unit model.

- In the capture unit, select [Camera-Trigger-Light Configuration Settings].

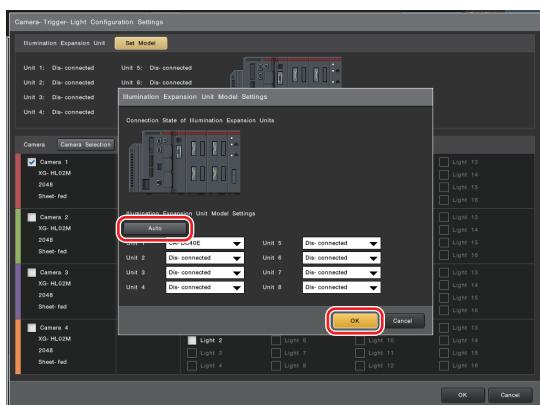


- Select [Set Model].

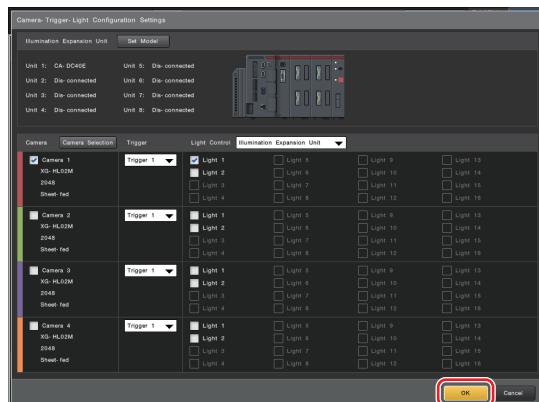


- Select [Auto].

- Select [OK]. The model for the illumination expansion unit will be set.



- Select [OK]. The [Camera-Trigger-Light Configuration Settings] screen closes.



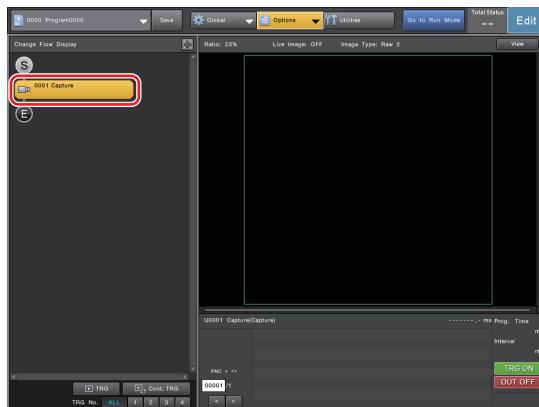
Reference: Using an Encoder

Enabling the Encoder

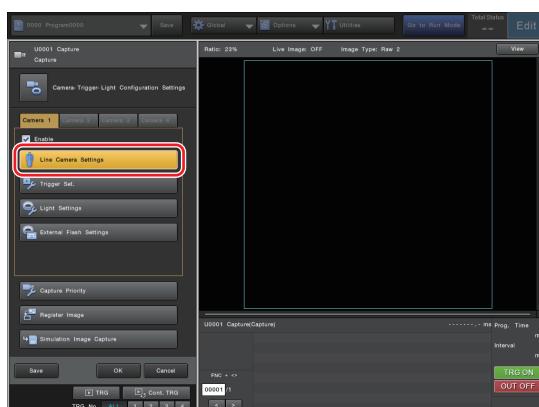
1 Switch to Setup mode.

For more details about how to switch modes, see "Switching between Run Mode and Setup Mode" (Page 4-3).

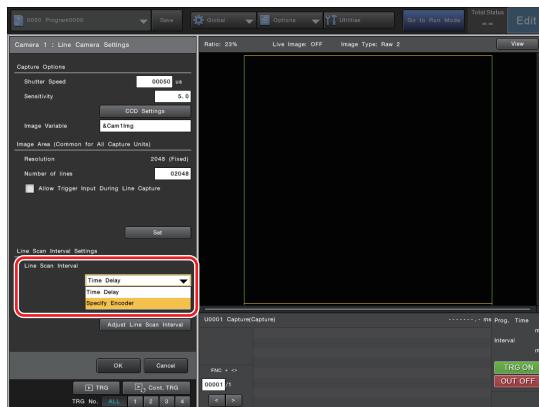
2 Select the capture unit.



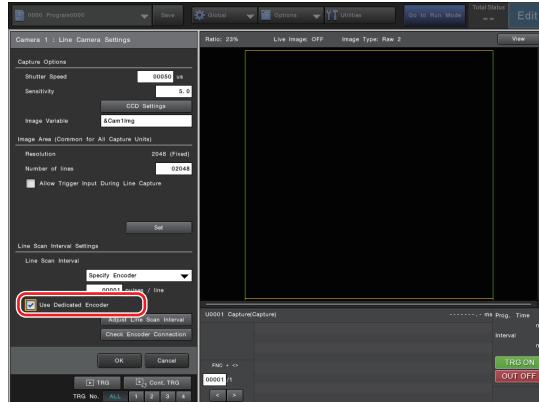
3 Select [Line Camera Settings].



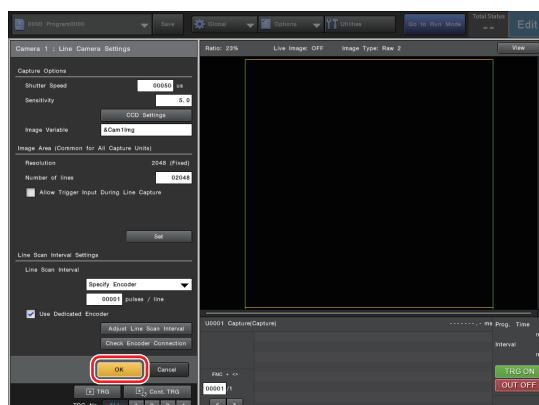
4 Select [Specify Encoder] for [Line Scan Interval], and respectively select [OK] and [Close] on the two confirmation screens that are displayed.



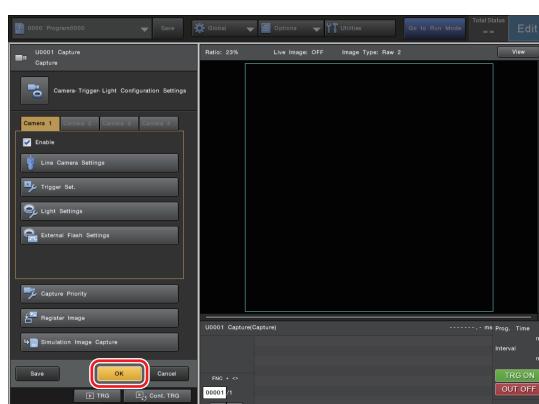
5 If you use a Keyence encoder, select the [Use Dedicated Encoder] check box, then select [OK] on the confirmation screen.



6 Select [OK] to close the [Line Camera Settings] screen.



7 Select [OK] to close the capture unit settings screen.



For more details about encoder settings, see the XG-X2000 Series User's Manual.

Checking the Encoder Signal Input

You can check whether the encoder signal is being input into the controller on the encoder monitor.

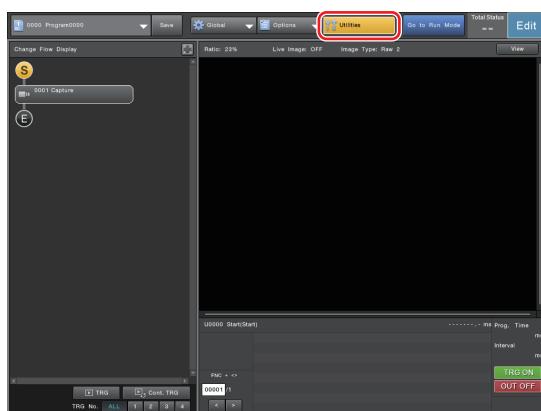
Reference

To enable the encoder monitor, you have to select [Specify Encoder] on the capture unit. For more details, see "Enabling the Encoder" (Page 4-11).

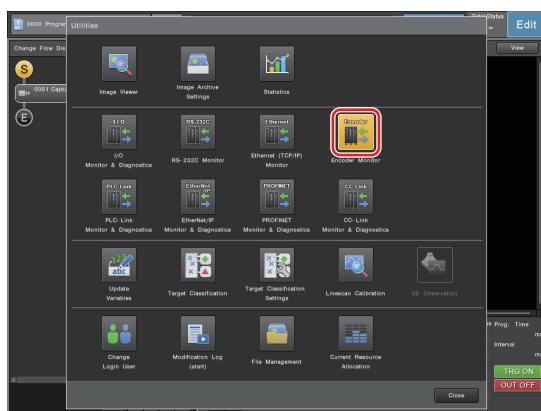
1 Switch to Setup mode.

For more details about how to switch modes, see "Switching between Run Mode and Setup Mode" (Page 4-3).

2 Select [Utilities].

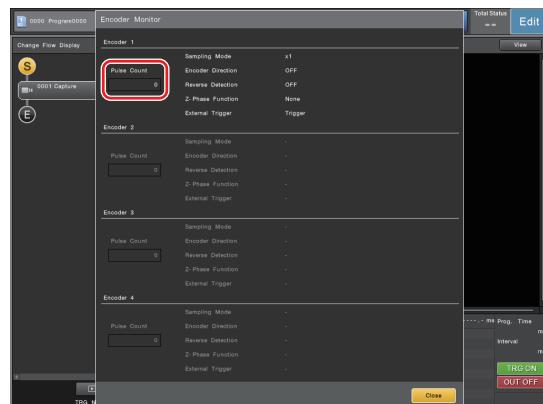


3 Select [Encoder Monitor].



4 Input an encoder signal into the controller and check whether the [Pulse Count] goes up.

The [Pulse Count] counts up if the signal is correctly input into the controller.



Reference: Adjusting Capture Settings

The Linescan Calibration can be used to display a graph of the intensity data for the selected 1 line in the image. Check the graph and adjust the lens focus, adjust the camera LED indicators, or correct shading. This can be used to check the intensity graph, differential graph, and other information for the captured image, or to change the settings for the selected line or magnification region.



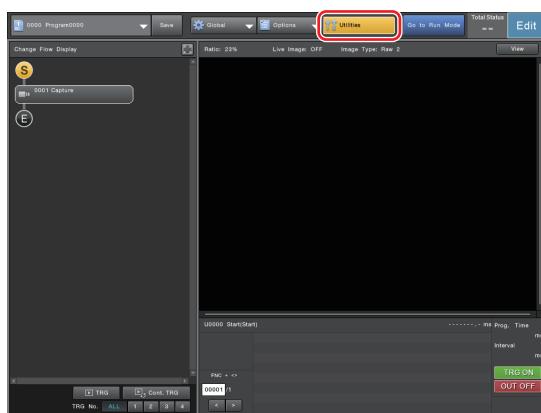
The Graph Viewer uses the global settings information even in Run mode.

Displaying the Graph Viewer

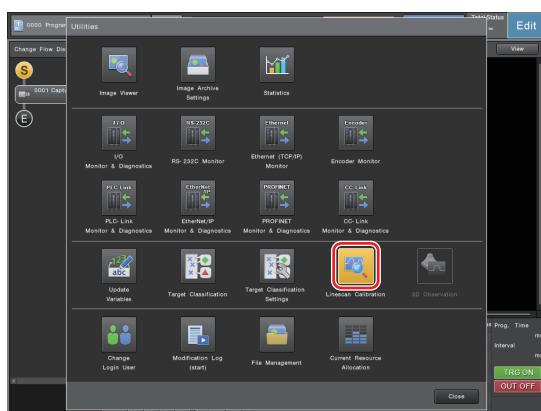
1 Switch to Setup mode.

For more details about how to switch modes, see "Switching between Run Mode and Setup Mode" (Page 4-3).

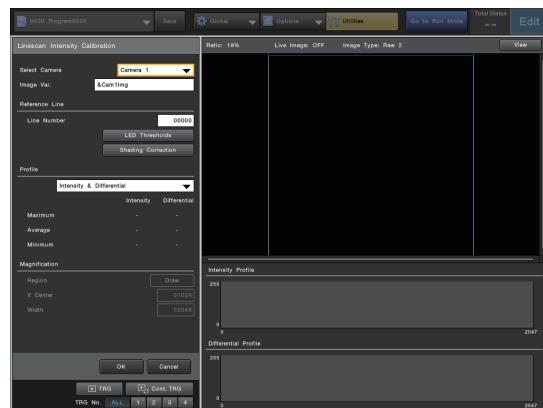
2 Select [Utilities].



3 Select [Linescan Calibration].



The Linescan Intensity Calibration screen appears, and the input image that was most recently captured is displayed.



Reference Line (global settings information)

Specify the line (0 - 16383) to display the graph for.

Profile

The displayed contents change as follows according to the Profile setting. (Vertical axis indicates the pixel value 0 - 255.)

- **Intensity & Differential:** The intensity graph for the entire selected line is shown on top, and the differential graph for the entire selected line is shown at the bottom.
- **Intensity:** The intensity graph for the entire selected line is shown on top, and the intensity graph for the zoom area of the selected line is shown at the bottom.
- **Differential:** The differential graph for the entire selected line is shown on top, and the differential graph for the zoom area of the selected line is shown at the bottom.



When either [Intensity] or [Differential] is selected, a zoom area can be selected to enlarge and check the necessary position.

Magnification Region

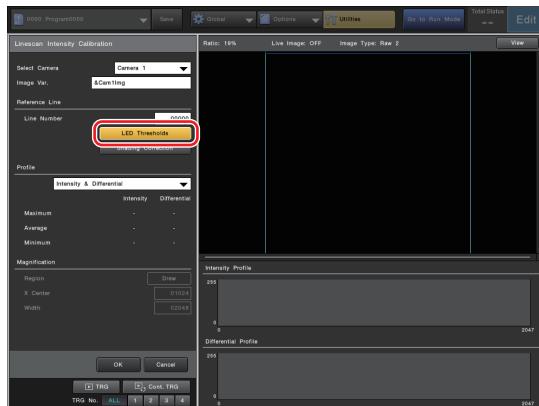
Select the area to be displayed in the zoom graph.

- **X Center:** Specify the center position in the X direction.
- **Width:** Specify the width in the X direction.

Changing the camera LED threshold setting

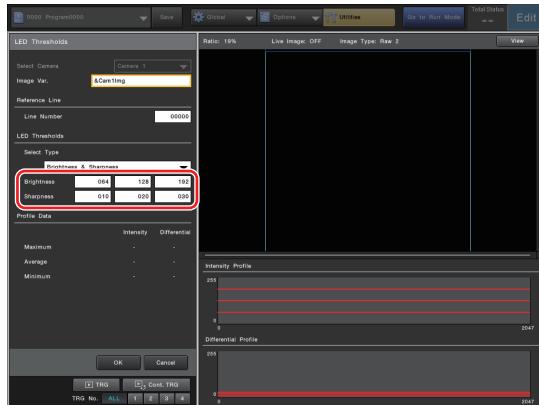
The light level of the LED indicators on the rear of the camera can be adjusted as necessary.

- Click [LED Thresholds] on the Linescan Intensity Calibration screen.



The LED Thresholds screen appears.

- Capture the standard target, and specify each of the 3 LED thresholds under [LED Thresholds] while checking the graph.



The thresholds are linked with the LEDs on the rear of the camera, and the LEDs illuminate when the entered threshold is exceeded.

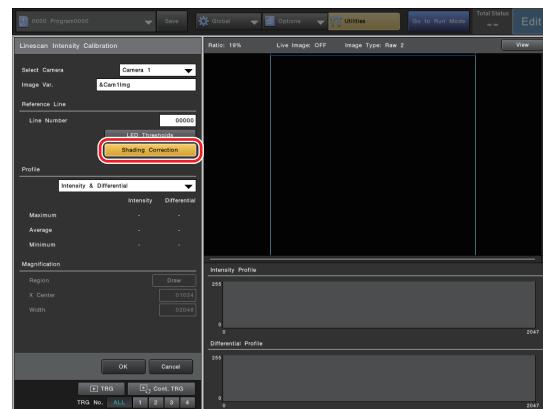
- Brightness:** Specify the intensity within the range of 0 - 255.
- Sharpness:** Specify the differential within the range of 0 - 255.

- When setting is finished, click [OK].

Changing the shading correction

If the light brightness is uneven, it is possible to correct the X direction brightness.

- In the Linescan Intensity Calibration screen, click [Shading Correction].

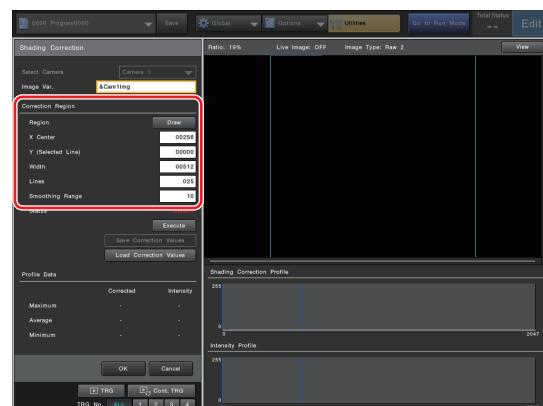


The Shading Correction screen appears.

The graph which is displayed here shows the intensity graph after filtering on top, and before filtering at the bottom.

The top graph (intensity graph after filtering) is the graph after Y direction averaging and X direction smoothing have been performed on the intensity graph.

- Specify the area to be the standard for correction.

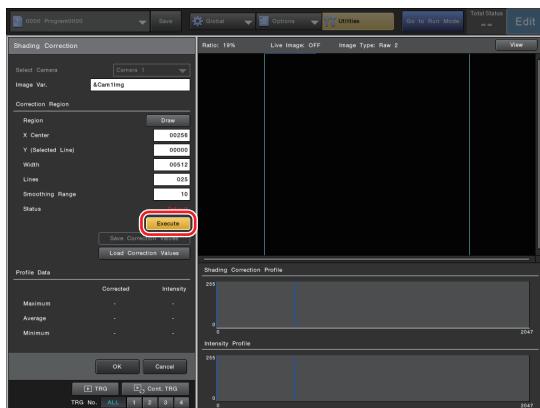


2 blue lines appear and indicate the width on the displayed graph according to the specified width.

- Region:** Specify X Center, Y (Selected Line), Width, or Lines.
- X Center:** Specify the center position in the X direction.
- Y (Selected Line):** Specify the position (selected line) in the Y direction.
- Width:** Specify the width in the X direction.
- Lines:** Specify the Y direction range (Find the average value of multiple lines.)
- Smoothing Range:** Specify the degree of correction as a percentage (%) of the image pixels in the X direction. When correction is to be performed for a narrow range, make the value small. When performing correction for a broader range, make the value large.

Reference

- The smoothing range is linked to the graph display.
- With a larger value, the graph after filtering becomes smoother.
- With a smaller value, the graph after filtering shows sharper changes.

3 Click [Execute].

Shading correction is executed. The corrected images can then be checked when the next and later triggers are input.

The correction value for shading correction is saved inside the camera and is retained until [Clear] is executed.

Reference

- When an encoder is used, the image will be displayed after the encoder reaches the designated count.
- After correction has been executed, the correction value can be written to an SD card.
- The correction value can also be read from an SD card. Save the file that contains the correction value in the following folder.
SD1(2): /xg/linecam/
- The maximum shading correction value is 5x.
- In Profile Data at the lower left of the screen, the intensity maximum value, average value, and minimum value after correction (Corrected) and before correction (Intensity) are displayed.
- The SD card slot can be specified in System Settings of the XG-X VisionEditor (default setting: SD2).

Overview of the I/O Interface

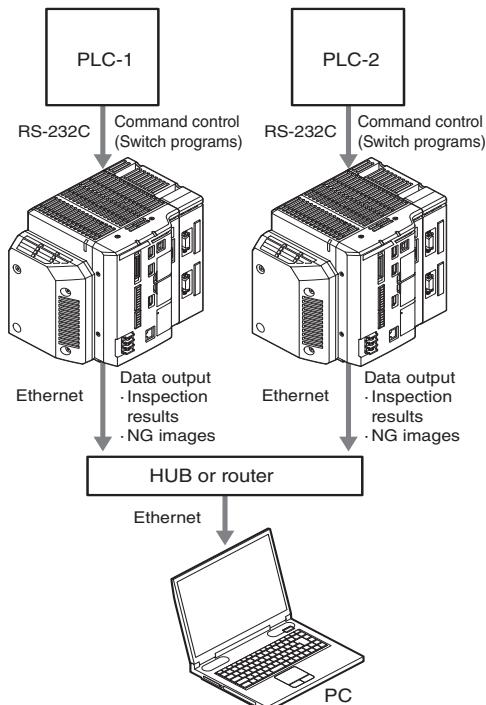
This controller has the following communication and I/O ports.

- RS-232C Interface (Page 5-2)
- Ethernet Interface (Page 5-3)
- USB Interface (Page 5-4)
- CC-Link Interface (Page 5-6)
- Parallel I/O Interface (Page 5-9)
- Terminal Block Interface (Page 5-11)

In addition to controlling the controller through the I/O ports, measurement results can be output, the controller can be controlled, and files can be input and output by using the communication ports. Additionally, the expansion unit connected to the controller is also equipped with I/O ports. For information about the I/O and communication ports, refer to the "XG-X2000 Series Communications Control Manual".

Example of communication port usage

Data such as measurement results and NG images are output to the PC via Ethernet while the inspection settings are controlled from the PLC via RS-232C.



Communication software is required to receive data on the computer.

Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

RS-232C Interface

The RS-232C port on the system can be used to communicate with external equipment. The system can communicate with external equipment using two communication modes: non-procedural mode or the PLCLink mode.

The transmitted data will differ depending on the communication mode. Switch modes depending on the environment. Refer to "XG-X2000 Series Communications Control Manual" for more details on the non-procedural mode and switching the communication mode.

RS-232C Port Specifications

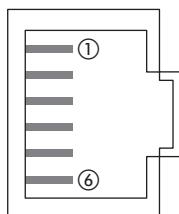
RS-232C basic specifications

- Connector: RJ-11
- Standards: The connected device must comply with EIA (Electronic Industries Association) RS-232C standards.

Item	Compatibility
Communication System	Full-duplex
Synchronous system	Asynchronous
Transmission Code	ASCII (Part binary code)
Data Length	8-bit
Stop-bit	1-bit/2-bit
Parity-bit	None/odd/even
Communication speed	9600/19200/38400/57600/115200/230400 bps
Start Delimiter	STX/ENQ/ASCII Code/None
End Delimiter	CR/CR+LF/LF/EXT/ASCII Code
Flow Control	None, CTS/RTS
Maximum cable length	15m

Connector specifications

The specifications of the RS-232C port on the controller are as follows:



No.	Signal	Signal Description	Signal direction
1	CS (CTS)	Data Transmission Permission	Output
2	Not used	—	—
3	SD (TXD)	Data Transmission	Inputs
4	SG (GND)	GND	—
5	RD (RXD)	Data Reception	Output
6	RS (RTS)	Data Transmission Request	Inputs

Since the controller uses the RS-232C modem definition, SD is assigned to input and RD is assigned to output.

NOTICE

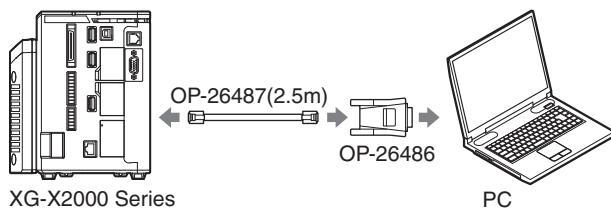
The signal GND is isolated from the power GND.

Connecting to a PC

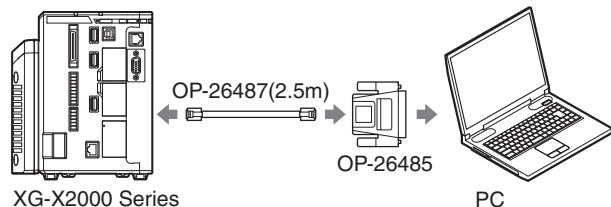
Example when RS-232C port is used

The controller can be connected to your computer using a dedicated serial cable (optional).

When the PC has a D-sub 9-pin connector



When the PC has a D-sub 25-pin connector



- In the connection examples above, flow control is not possible.
- The controller uses the communication settings selected in the communication mode specified in the System Settings in XG-X VisionEditor. For more details, refer to "XG-X2000 Series Communications Control Manual".

Ethernet Interface

The Ethernet port on this controller can be used to communicate with external devices in addition to connecting to Keyence computer application software. The controller can communicate with external equipment using four communication modes: no protocol mode based on the RS-232C command set, the PLC link mode, EtherNet/IP, or PROFINET. The system has functionality to act as an FTP client and an external FTP server can be specified as the output destination for sending stored images and archived data. It also has functionality to act as an FTP server to access the SD card on the controller from an external FTP client, and functionality to act as a VCN server to remotely control the controller from an external PC client.

Reference

For more details about various types of communications control using the Ethernet port, refer to the XG-X2000 Series Communications Control Manual.

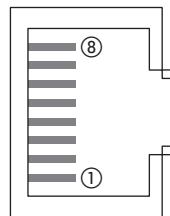
Ethernet Port Specifications

Standard specifications

- Connector: RJ-45
- Medium: 10 BASE-T/100 BASE-TX/1000 BASE-T

Connector Specifications

The specifications of the Ethernet port are as follows:



No.	10BASE-T/ 100BASE-TX		1000BASE-T	
	Signal	Signal direction	Signal	Signal direction
1	TX +	Output	TRX+	Input/Output
2	TX -	Output	TRX-	Input/Output
3	RX +	Inputs	TRX+	Input/Output
4	Not used	—	TRX-	Input/Output
5	Not used	—	TRX-	Input/Output
6	RX -	Inputs	TRX-	Input/Output
7	Not used	—	TRX+	Input/Output
8	Not used	—	TRX-	Input/Output

Point

Use a category 5e LAN cable or above when connecting via 1000 Base-T. An STP type is recommended for the cable structure.

USB Interface

The USB port (type 'B' female connector) on the controller is used exclusively for connecting to Keyence computer application software. The USB port cannot be used with any other software.

NOTICE

The power GND (0V) is shared in common with the connector shield and signal GND. If there is a potential difference with the connected device, this may result in breakdowns or malfunctions of the controller and the connected device.

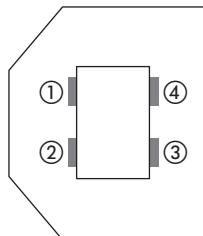
USB Port Specifications

Standard specifications

- Connector: Female B connector
- Standard: USB Version 2.0.

Connector Specifications

Specifications of the USB port on the controller are as follows:



No.	Signal	Signal Description	Signal direction
1	VBUS	VBUS	-
2	D-	Differential signal-	Input/Output
3	D+	Differential signal+	Input/Output
4	GND	GND	-

Connecting to a PC

You can connect the controller to the PC via the USB port. To connect the controller to the PC, use the optional USB cable (2 m) OP-66844.


Point

- Only 1 controller can be connected to a single PC.
- If a cable other than OP-66844 or an extension cable is used, the controller may not operate correctly.
- The USB port is used exclusively for connecting to a computer. Other USB devices cannot be connected to this port.
- Communication may be interrupted due to high voltage or electrical noise near the system. If communication is interrupted, disconnect and re-connect the USB cable, and restart the software.
- If communication interruption occurs frequently, check the surrounding area for noise sources (inverter, solenoid valve, etc.).

System requirements

To connect the controller to a PC via the USB port, a PC with the following requirements is needed.

- OS: Microsoft Windows 7 Home Premium/Professional/Enterprise/Ultimate (32 bit/64 bit version)
(Other Windows operating systems are not supported.)
- USB terminal that supports USB 2.0
- DVD-ROM drive

Installing the USB driver

To use the controller's USB interface, you must first install Keyence application software and the USB driver for the XG-X Series before connecting the controller to a computer.

Normally the USB driver is installed when the Keyence application software is installed. However, if the driver was not installed, follow the procedure below to install the USB driver.

 Point

USB driver installation must be performed by a user with Administrator privileges.

This section describes how to install the driver, using Windows 7 as an example.

- 1** Turn on the controller and the PC.
- 2** Connect the USB port of the controller and that of the PC using the OP-66844 cable (optional).
- 3** On the computer, open Device Manager, and under [Other devices] in Properties, click [Update driver]. Next, click [Browse my computer for driver software] and specify the folder that contains the USB driver.

The USB driver will be installed.

 Reference

- If Keyence application software is installed, the USB driver will also reside in C:\drivers\XG-H1X. You can also download the driver from the Keyence user support page (<http://www.keyence.com/xgxxus>).
- When installing USB drivers in PC, a warning message may appear confirming the installation. When such a warning message appears, click [Continue] to continue installation.

The controller is now ready to communicate with PC via the USB port.

CC-Link Interface

The controller can be used as a remote device station on a network connection with a CC-Link master station by connecting the optional CA-NCL20E unit. The CC-Link interface supports command execution, input / output of system variables for control and output of measurement result data.

The settings in the Global Settings are used to set the station type, communication speed, and number of exclusive stations on the CC-Link. For more details, see the XG-X2000 Series Communication Control Manual.

NOTICE

- The controller must be turned off before connecting or disconnecting the CA-NCL20E unit.**
- Restart the controller and master station after changing the CC-Link settings.**

Reference

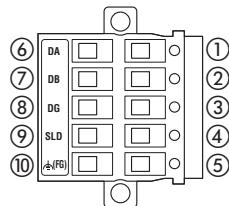
See "Installing the Communication Expansion Unit" (Page 2-3) for more details on connecting the CA-NCL20E unit.

CA-NCL20E CC-Link Specifications

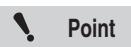
Standard specifications

Item	
CC-Link station type	Ver.1.10 remote device station Ver.2.00 remote device station
Communication speed	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
Connection cable	Ver.1.10 compatible CC-Link cable FANC-110SBH, FA-CBL200PSBH, CS110 OP-79426, OP-79427
Max. total cable length	156 kbps 1200 m 625 kbps 900 m 2.5 Mbps 400 m 5 Mbps 160 m 10 Mbps 100 m
Count	Select 1 station, 2 stations, 3 stations, or 4 stations.
Cyclic settings (Ver.2.00 only)	Select 1x, 2x, 4x, or 8x.

Wiring Diagram



No.	Wire color	Signal name	Function
1, 6	Blue	DA	Communication wire "DA" for CC-Link. Connects to the master station or other slave stations (1 and 6 are shorted).
2, 7	White	DB	Communication wire "DB" for CC-Link. Connects to the master station or other slave stations (2 and 7 are shorted).
3, 8	Yellow	DG	Communication wire "DG" for CC-Link. Connects to the master station or other slave stations (3 and 8 are shorted).
4, 9	Bare wire	SLD	Shield. Connect the shielded wire of the CC-Link Ver. 1.10 compatible cable (OP-79426, OP-79427, etc.) (4 and 9 are shorted.).
5, 10	—	FG	Frame ground "FG" for CC-Link. Ground using Class D ground* (100 Ω or less) (5 and 10 are shorted).



* Use a cable with a nominal cross-section area of at least 2 mm² as the grounding cable.

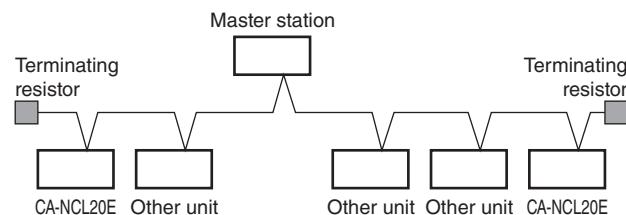
Connecting to the CC-Link

Precautions when wiring

- Take note of the following when wiring the CA-NCL20E unit.
- When connecting the CA-NCL20E to a CC-Link network/device, always use a CC-Link Ver.1.10 compatible cable or a cable approved by the CC-Link Partner Association. Correct operation cannot be assured when using another type of cable.
 - When a CC-Link cable is used near a high voltage/current source or cable, electrical noise may cause operational errors. When using both a CC-Link cable and high voltage/current devices, maintain at least 100 mm of separation between them.

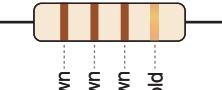
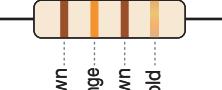
Terminating resistor

When connecting a CA-NCL20E unit to both ends of the CC-Link network, install a terminating resistor between CA-NCL20E terminals DA and DB. Make sure to install the terminating resistors, as they reduce signal noise and stabilize communications.

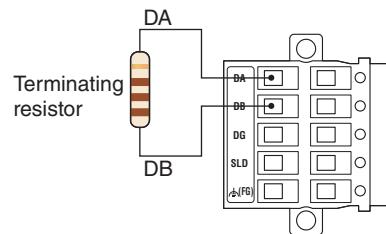


The terminating resistor will differ depending on the cable type

Two of each are shipped, one for terminating each end of the network with CA-NCL20E. Use the correct terminating resistor for the type of CC-Link cable being used.

Cable type	Terminating resistor
Ver. 1.10 compatible CC-Link cable FANC-110SBH, FA-CBL200PSBH, CS110 OP-79426, OP-79427	110Ω 1/2W  Brown, Brown, Brown, Gold
CC-Link cable	
CC-Link high-performance cable	130Ω 1/2W  Brown, Orange, Brown, Gold

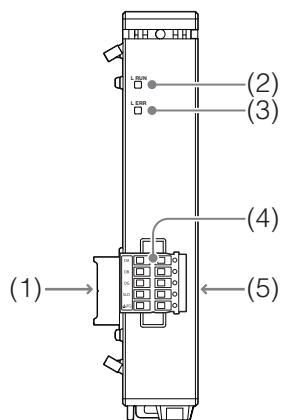
CA-NCL20E terminating resistor installation



Reference

Because terminals 1 and 6, and terminals 2 and 7, are shorted, the terminating resistor can be installed either onto terminals 1 and 2, or onto terminals 6 and 7.

CC-Link Unit (option)



(1) Connector on controller side

Connect the unit to the controller, camera input unit, or illumination expansion unit (Page 2-3).



Only one CC-Link unit can be connected to the controller.

(2) Operation status indicator light (L RUN)

- **ON:** Master station and self station are updating the data correctly (green light lit).
- **OFF:** Data communication timed out (light will turn on again when data is being received correctly).

(3) Error indicator lamp (L ERR)

- **ON:** Communication error (red light lit).
- **Flashing at constant intervals:** Station number or communication speed setting was changed during data transfer.
- **Flashing irregularly:** Terminator is not installed properly and or the unit or CC-Link cable is being affected by electrical noise.
- **OFF:** No communication errors

(4) Terminal block

See the wiring diagram (Page 5-6).

(5) Connector on expansion unit side

This is used when connecting an illumination expansion unit (Page 2-4).

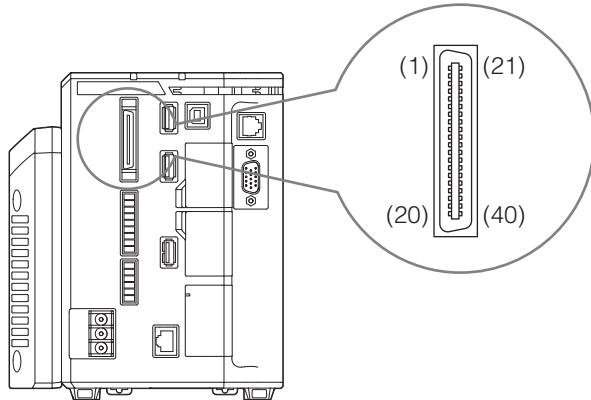


The camera input unit cannot be connected to the connector on the expansion unit.

Parallel I/O Interface

Connector Specifications

The following values show the parallel I/O connector specifications for the system.



Connector

FX2B-40SA-1.27R (Hirose Electric)

Color flat cable

UL20028-FRX-CF-40 (Fujikura, equivalent wire gauge AWG28)

Reference

In normal situations, use the specialized parallel connection cable (3 m) OP-51657 (optional).

Pin Layout: Cable colors when optional OP-51657 is used.

No.	Terminal name	Terminal explanation	Signal direction	Assigned default state*1				Circuit diagram (Page 5-18)	Cable color
				Assigned variable	Variable function*2	Bit	N.O/ N.C		
1	COMIN2	Connector input common	—	—	—	-	-	-	Brown
2	IN0	General purpose input 0	In	%CmdParam	Custom instruction parameter input	0	-	B	Red
3	IN1	General purpose input 1	In	%CmdParam		1	-	B	Orange
4	IN2	General purpose input 2	In	%CmdParam		2	-	B	Yellow
5	IN3	General purpose input 3	In	%CmdParam		3	-	B	Green
6	IN4	General purpose input 4	In	%CmdParam		4	-	B	Blue
7	IN5	General purpose input 5	In	%CmdParam		5	-	B	Purple
8	IN6	General purpose input 6	In	%CmdParam		6	-	B	Gray
9	IN7	General purpose input 7	In	%CmdParam		7	-	B	White
10	IN8	General purpose input 8	In	%CmdCode	Custom instruction No. input	0	-	B	Black
11	IN9	General purpose input 9	In	%CmdCode		1	-	B	Brown
12	IN10	General purpose input 10	In	%CmdCode		2	-	B	Red
13	IN11	General purpose input 11	In	%CmdCode		3	-	B	Orange
14	IN12	General purpose input 12	In	%CmdStrobe	Custom instruction assignment input (terminal)	0	-	B	Yellow
15	IN13	General purpose input 13	In	%Reset	Reset input	0	-	B	Green
16	IN14	General purpose input 14	In	%Pst	Output data input switch	0	-	B	Blue
17	COMOUT2	Connector output common	—	—	—	-	-	-	Purple
18	OUT0	General purpose output 0	Out	%Ack	Pin command success confirmation output	0	N.O	C	Gray
19	OUT1	General purpose output 1	Out	%Nack	Pin command failure confirmation output	0	N.O	C	White
20	OUT2	General purpose output 2	Out	%Busy	Busy output	0	N.O	C	Black
21	OUT3	General purpose output 3	Out	%CmdReady	Permission output for command input	0	N.O	C	Brown
22	OUT4	General purpose output 4	Out	%Trg1Ready	Permission output for trigger 1 input	0	N.O	C	Red

No.	Terminal name	Terminal explanation	Signal direction	Assigned default state*1				Circuit diagram (Page 5-18)	Cable color
				Assigned variable	Variable function*2	Bit	N.O/ N.C		
23	OUT5	General purpose output 5	Out	%Trg2Ready	Permission output for trigger 2 input	0	N.O	C	Orange
24	OUT6	General purpose output 6	Out	%OutDataA	Data output of system variable %OutDataA	0	N.O	C	Yellow
25	OUT7	General purpose output 7	Out	%OutDataA		1	N.O	C	Green
26	OUT8	General purpose output 8	Out	%OutDataA		2	N.O	C	Blue
27	OUT9	General purpose output 9	Out	%OutDataA		3	N.O	C	Purple
28	OUT10	General purpose output 10	Out	%OutDataA		4	N.O	C	Gray
29	OUT11	General purpose output 11	Out	%OutDataA		5	N.O	C	White
30	OUT12	General purpose output 12	Out	%OutDataA		6	N.O	C	Black
31	OUT13	General purpose output 13	Out	%OutDataA		7	N.O	C	Brown
32	OUT14	General purpose output 14	Out	%OutDataA		8	N.O	C	Red
33	OUT15	General purpose output 15	Out	%OutDataA		9	N.O	C	Orange
34	OUT16	General purpose output 16	Out	%OutDataA		10	N.O	C	Yellow
35	OUT17	General purpose output 17	Out	%OutDataA		11	N.O	C	Green
36	OUT18	General purpose output 18	Out	%OutDataA		12	N.O	C	Blue
37	OUT19	General purpose output 19	Out	%OutDataA		13	N.O	C	Purple
38	OUT20	General purpose output 20	Out	%OutDataA		14	N.O	C	Gray
39	OUT21	General purpose output 21	Out	%OutDataA		15	N.O	C	White
40	COMOUT2	Connector output common	—	—		-	-	-	Black

*1 The default assigned state refers to the default system variables assigned to each pin in the Global menu. These assignments may vary if the Global settings have been changed.

*2 For details about the functions of individual variables, refer to the XG-X2000 Series Communications Control Manual.

Point

- COMOUT2 for Pin 17 and Pin 40 are common.
- Power source 0 V, COMIN1, COMIN2, COMOUT1, COMOUT2 and COMOUT_F are all isolated.
- COMIN2 is a common terminal exclusively for input pins 2 to 16 on the parallel I/O connector.
- COMOUT2 is a common terminal exclusively for output pins 18 to 39 on the parallel I/O connector.

Terminal Block Interface

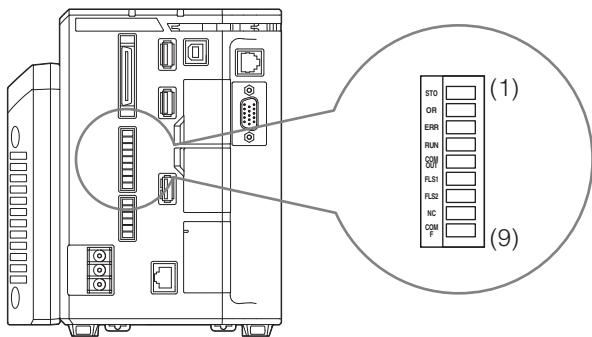
Standard Specifications

Terminal block specifications for the controller are as follows.



Point Tightening above the specified torque may cause damage to the terminal block.

OUTPUT connector



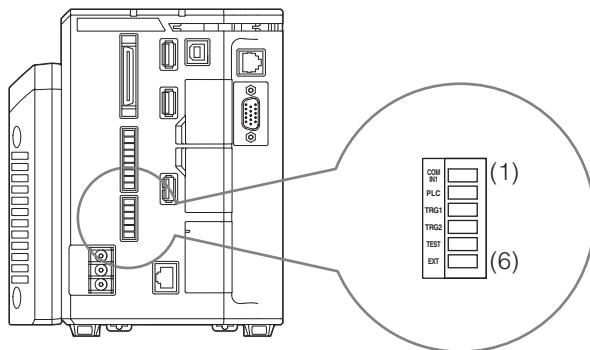
Suitable wiring

AWG 16 - 28

Terminal block screw torque

0.25 Nm or less

INPUT connector



Suitable wiring

AWG 16 - 28

Terminal block screw torque

0.25 Nm or less

Pin Layout

OUTPUT connector

No.	Terminal name	Terminal explanation	Signal direction	Assigned default state ^{*1}				Circuit diagram (Page 5-18)
				Assigned variable	Variable function ^{*2}	Bit	N.O/ N.C	
1	OUT22 (STO)	General purpose output 22	Out	%Sto	Strobe output for reading parallel terminal output unit data	0	N.O	C
2	OUT23 (OR)	General purpose output 23	Out	%JAHold	Hold output total status	0	N.O	C
3	F_OUT2 (ERR)	High-speed general purpose output 2	Out	%Error0	Error 0 output	0	N.O	C
4	F_OUT3 (RUN)	High-speed general purpose output 3	Out	%Run	Run mode output	0	N.O	C
5	COMOUT1 (COMOUT)	Common for terminal block outputs	—	—	—	-	-	-
6	F_OUT0 (FLS1)	High-speed general purpose output 0	Out	%Flash1	Strobe light output 1	0	N.O	C
7	F_OUT1 (FLS2)	High-speed general purpose output 1	Out	%Flash2	Strobe light output 2	0	N.O	C
8	N.C	-	-	-	-	-	-	-
9	COMOUT_F(COMF)	Common for high-speed general purpose output terminals	-	-	-	-	-	-

*1 The default assigned state refers to the default system variables assigned to each pin in the Global menu. These assignments may vary if the Global settings have been changed.

*2 For details about the functions of individual variables, refer to the XG-X2000 Series Communications Control Manual.

 Point

- Power source 0 V, COMIN1, COMIN2, COMOUT1, COMOUT2 and COMOUT_F are all isolated.
- COMOUT1 is the common terminal for output of OUT connectors 1 to 2.
- COMOUT_F is the common terminal for output of OUT connectors 3 to 4 and 6 to 7.

() indicates labels printed on terminal blocks at time of shipment

INPUT connector

No.	Terminal name	Terminal explanation	Signal direction	Assigned default state ^{*1}				Circuit diagram (Page 5-18)
				Assigned variable	Variable function ^{*2}	Bit	N.O/ N.C	
1	COMIN1 (COMIN1)	Common for terminal block inputs	—	—	—	-	-	-
2	IN15 (PLC)	General purpose input 15	In	%Plc	Custom instruction execution input (PLC)	0	-	B
3	F_IN0 (TRG1)	High-speed general purpose input 0	In	%Trg1	Trigger 1 input	0	-	A
4	F_IN1 (TRG2)	High-speed general purpose input 1	In	%Trg2	Trigger 2 input	0	-	A
5	F_IN2 (TEST)	High-speed general purpose input 2	In	%Test	Trial run input	0	-	A
6	F_IN3 (EXT)	High-speed general purpose input 3	In	%Ext	Disable trigger input	0	-	A

*1 The default assigned state refers to the default system variables assigned to each pin in the Global menu. These assignments may vary if the Global settings have been changed.

*2 For details about the functions of individual variables, refer to the XG-X2000 Series Communications Control Manual.

 Point

- Power source 0 V, COMIN1, COMIN2, COMOUT1, COMOUT2 and COMOUT_F are all isolated.
- COMIN1 is the common terminal for input of IN connectors 2 to 6.

() indicates labels printed on terminal blocks at time of shipment

Expansion Unit

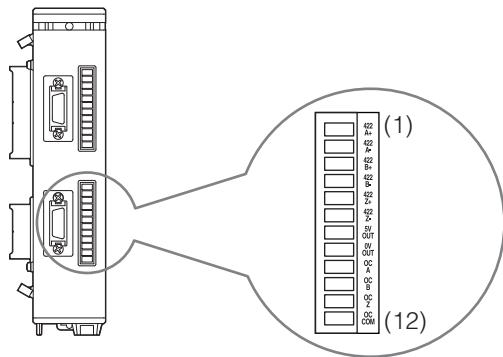
Line Scan Camera Input Unit (CA-E100L : Option)

The encoder connector specifications for the CA-E100L line scan camera input unit (sold separately) are as follows.



Tightening with a force above the standard torque may cause damage to the terminal block.

ENCODER1/ENCODER3 connector



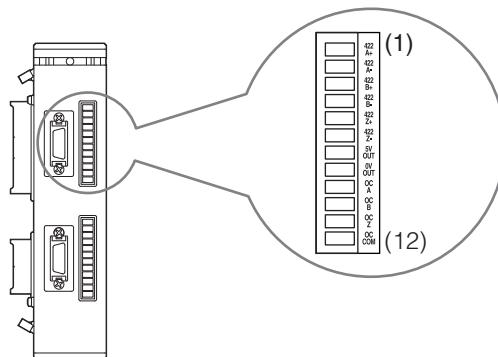
Suitable wiring

AWG 16 - 28

Terminal block screw torque

0.25 Nm or less

ENCODER2/ENCODER4 connector



Suitable wiring

AWG 16 - 28

Terminal block screw torque

0.25 Nm or less

Pin Layout

The ENCODER No. assignments (1 - 4) are determined by the installation positions of the CA-E100L to the controller. Reference
ENCODER1/ENCODER2 are assigned to the unit that is directly attached to the controller, while ENCODER3/ENCODER4 are assigned to the unit attached to the controller with the 1st CA-E100L or some other camera input unit sandwiched in between.

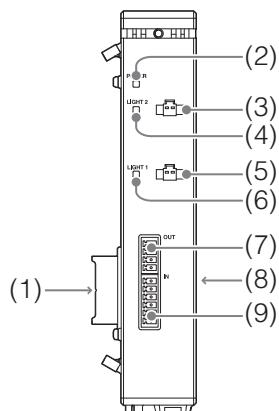
ENCODER1/ENCODER3 connector, ENCODER2/ENCODER4 connector

No.	Terminal name	Terminal explanation	Signal direction	Assigned default state*1				Circuit diagram (Page 5-18)
				Assigned variable	Variable function*2	Bit	N.O/ N.C	
1	422A+	RS-422 Encoder input A+	In	-	Cannot be assigned.	-	-	D
2	422A-	RS-422 Encoder input A-	In	-	Cannot be assigned.	-	-	D
3	422B+	RS-422 Encoder input B+	In	-	Cannot be assigned.	-	-	D
4	422B-	RS-422 Encoder input B-	In	-	Cannot be assigned.	-	-	D
5	422Z+	RS-422 Encoder input Z+	In	-	Cannot be assigned.	-	-	D
6	422Z-	RS-422 Encoder input Z-	In	-	Cannot be assigned.	-	-	D
7	5VOUT	5V OUT	-	-	-	-	-	-
8	0VOUT	0V OUT	-	-	-	-	-	-
9	OC A	Open collector Encoder input A (24V)	In	-	Cannot be assigned.	-	-	E
10	OC B	Open collector Encoder input B (24V)	In	-	Cannot be assigned.	-	-	E
11	OC Z	Open collector Encoder input Z (24V)	In	-	Cannot be assigned.	-	-	E
12	OC COM	Open collector Encoder input common	-	-	-	-	-	-



- Use a shield cable that supports an RS-422 signal for the RS-422 cable, and always connect the Cable shield to the FG.
- The rated output for the 5 V OUT is 150 mA. When using encoders which are going to exceed that, prepare an external 5 V power supply.
- Open collector encoder inputs are only compatible with 24 V type encoders.
- The OV OUT, OC COM, and the controller and other expansion unit commons are all isolated.

Illumination Expansion Unit (CA-DC40E : Option)



(1) Connector on controller side

Connect the unit to the controller, or to a camera input unit or expansion unit already connected to the controller (Page 2-4).

(2) Power supply LED

Lit when the power is supplied to the illumination expansion unit.

(3) Light 2 output connector

Connect the LED illumination unit of Light 2.

(4) Light 2 Status LED

Indicates the state* of Light 2.

(5) Light 1 output connector

Connect the LED illumination unit of Light 1.

(6) Light 1 Status LED

Indicates the state* of Light 1.

(7) OUT Connector Terminal Block

This is used when wiring a non-Keyence LED illumination unit directly to the terminal block.

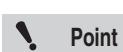
CAUTION	<p>Correctly set the voltage for the illumination unit on the CA-DC40E illumination expansion unit. If a 12 V illumination unit is mistakenly connected to the connector terminal block for which the set voltage has been changed to 24 V, this may cause a fire, electric shock, or product malfunction.</p>
----------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



Do not use if the Keyence LED light emitter is connected.

(8) Connector on expansion unit side

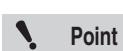
This is used when connecting more than one illumination expansion unit or a CC-Link unit (Page 2-4).



The camera input unit cannot be connected to the connector on the expansion unit.

(9) IN Connector Terminal Block

Use this to supply power to the illumination expansion unit, and to control the forced light off input.



- What the status LED indicates
 - Green: The light is enabled in the controller settings and functioning normally.
 - Off: No power is supplied to the controller or the illumination expansion unit, or the light is disabled in the controller settings.
 - Red: Overcurrent has been detected due to the connected illumination unit exceeding the specification rating or a short in the cable, or voltage is not being correctly output due to a malfunction in the illumination expansion unit.

Terminal Block Interface (CA-DC40E)

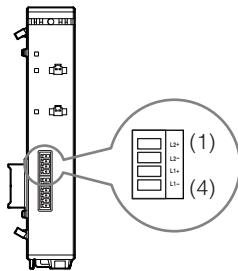
The following section details the terminal block specifications for the illumination expansion unit (CA-DC40E).



Tightening above the specified torque may cause damage to the terminal block.

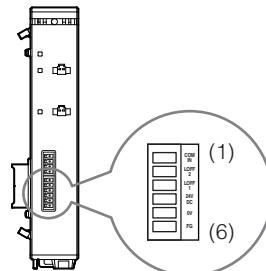
OUTPUT connector

- Compatible wires: AWG14 to 22
- Terminal block screw torque: 0.25 Nm or less



INPUT connector

- Compatible wires: AWG14 to 22
- Terminal block screw torque: 0.25 Nm or less



Connector Specifications

- OUT Connector Terminal Block

No.	Signal (terminal block display)	Signal Description	Description
1	LIGHT2+(L2+)	+ ve terminal for Light 2	Connect the + ve side of light 2.
2	LIGHT2-(L2-)	- ve terminal for Light 2	Connect the - ve side of light 2.
3	LIGHT1+(L1+)	+ ve terminal for Light 1	Connect the + ve side of light 1.
4	LIGHT1-(L1-)	- ve terminal for Light 1	Connect the - ve side of light 1.



If a 12 V illumination unit is connected to a terminal block for which the voltage has been set to 24 V, this may cause a fire, electric shock, or product malfunction. Normally use the standard voltage for Keyence illumination units, 12 V, which is also the default setting.



If the voltage has been set to 24 V, nothing will be output from the Light 1 Output Connector or the Light 2 Output Connector.

- IN Connector Terminal Block

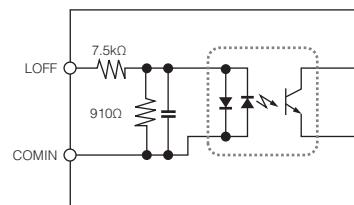
No.	Signal (terminal block display)	Signal Description	Description
1	COMIN(COMIN)	Common for terminal block inputs	Dedicated input common for the IN connector terminal block.
2	LIGHT2_OFF(LOFF2)	Forcibly stop lighting input for Light 2	Used to force the emission of LED illumination unit to off by level synchronized input.
3	LIGHT1_OFF(LOFF1)	Forcibly stop lighting input for Light 1	Used to force the emission of LED illumination unit to off by level synchronized input.
4	24VDC(24VDC)	+ ve power supply input (24 V DC)	Supplies a 24 V power source for the illumination expansion unit.
5	0V(0V)	- power supply (0 V) input	Connects the 0 V of the 24 V power source for the illumination expansion unit.
6	FG(FG)	frame ground terminal	Connect to a Class D ground.



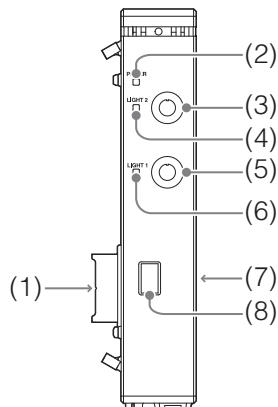
The 0 V power supply, COMIN, controller, and other expansion unit commons are all insulated.

Input Circuit Diagram

- Max. applied voltage: 26.4 V
- ON voltage: 10.8 V or greater
- ON current: 3 mA or greater
- OFF voltage: 5 V or less
- OFF current: 1 mA or less



Illumination Expansion Unit (CA-DC50E : Option)



(1) Connector on controller side

Connect the unit to the controller, or to a camera input unit or expansion unit already connected to the controller (Page 2-4).

(2) Power supply LED

Lit when the power is supplied to the illumination expansion unit.

(3) Light 2 output connector

Connect the LED illumination unit of Light 2.

NOTICE

If the light connector is to be removed or attached, shut off the power supply to the illumination expansion unit. If the light connector is removed or attached while power is being supplied, this may cause the illumination expansion unit and the light emitter to malfunction or become damaged.

(4) Light 2 Status LED

Indicates the state* of Light 2.

(5) Light 1 output connector

Connect the LED illumination unit of Light 1.

NOTICE

If the light connector is to be removed or attached, shut off the power supply to the illumination expansion unit. If the light connector is removed or attached while power is being supplied, this may cause the illumination expansion unit and the light emitter to malfunction or become damaged.

(6) Light 1 Status LED

Indicates the state* of Light 1.

(7) Connector on expansion unit side

This is used when connecting more than one illumination expansion unit or a CC-Link unit (Page 2-4).



The camera input unit cannot be connected to the connector on the expansion unit.

(8) Power connector

This is used when connecting a power supply to the illumination expansion unit.



• What the status LED indicates

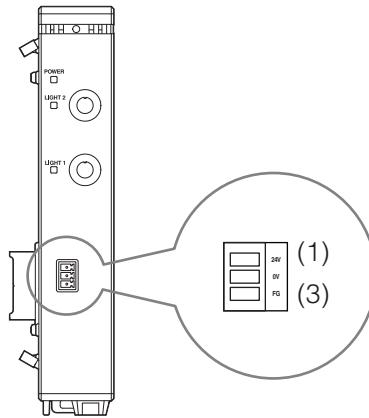
- Green: The light is enabled in the controller settings and functioning normally.
- Off: No power is supplied to the controller or the illumination expansion unit, or the light is disabled in the controller settings.
- Red: Breakdown of the illumination unit or cable disconnection has been detected, or voltage is not being correctly output due to a malfunction in the illumination expansion unit.

Terminal Block Interface (CA-DC50E)

The following section details the terminal block specifications for the illumination expansion unit (CA-DC50E).

INPUT connector

- Compatible wires: AWG14 to 22
- Terminal block screw torque: 0.25 Nm or less



Connector Specifications

- Power supply Connector Terminal Block

No.	Signal (terminal block display)	Signal Description	Description
1	24VDC(24V)	+ ve power supply input (24 V DC)	Supplies a 24 V power source for the illumination expansion unit.
2	0V(0V)	- power supply (0 V) input	Connects the 0 V of the 24 V power source for the illumination expansion unit.
3	FG(FG)	frame ground terminal	Connect to a Class D ground.



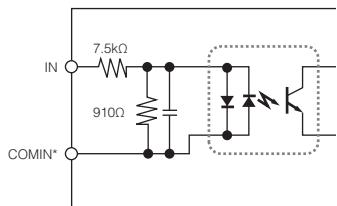
The 0 V power supply, controller, and other expansion unit commons are all insulated.

Input/Output Circuit

Input Connections (XG-X2800/X2802)

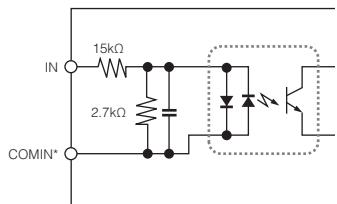
Input circuit diagram

Circuit A (For F_IN0 to 3 only, EV compatible)



- Max. applied voltage: 26.4 V
- ON voltage: 19 V or greater
- ON current: 3 mA or greater
- OFF voltage: 5 V or less
- OFF current: 1 mA or less

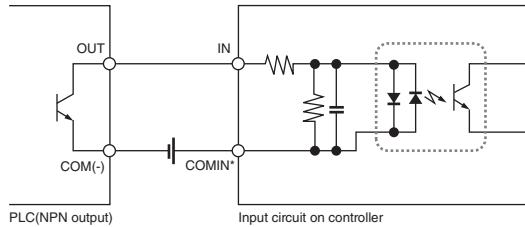
Circuit B (other inputs)



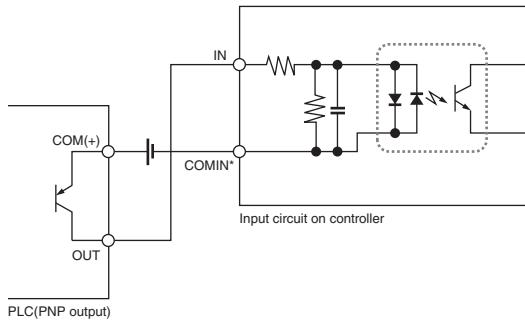
- Max. applied voltage: 26.4 V
- ON voltage: 19 V or greater
- ON current: 2 mA or greater
- OFF voltage: 3 V or less
- OFF current: 0.3 mA or less

Example of connections

When connecting an NPN PLC output to the system input



When connecting a PNP PLC output to the system input

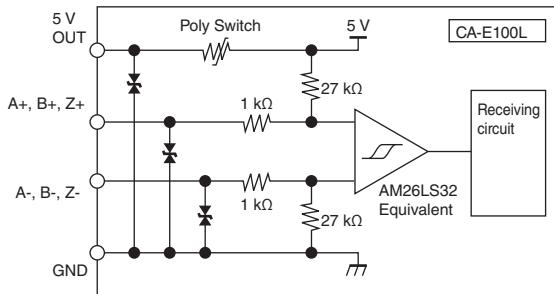


* The commons which are connected differ according to the IN terminals. The common terminal for IN connectors 2 - 6 is COMIN1, and the common terminal for parallel I/O connectors 2 - 16 is COMIN2.

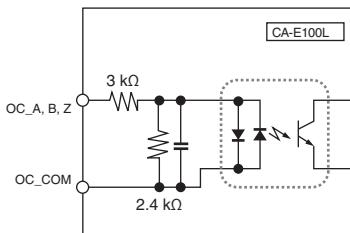
Input Connections (CA-E100L)

Input circuit diagram

Circuit D (RS-422 ENCODER Input)



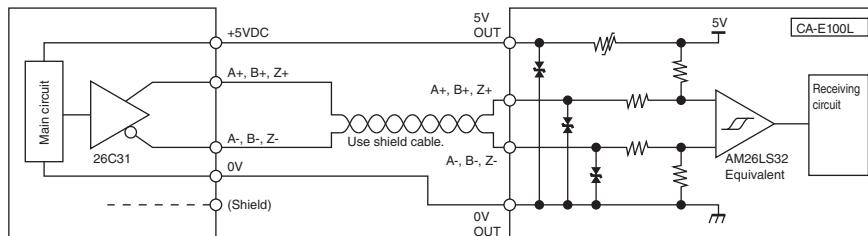
Circuit E (Open Collector ENCODER Input)



- Max. applied voltage: 26.4 V
- ON voltage: 19 V or greater
- ON current: 3 mA or greater
- OFF voltage: 3.6 V or less
- OFF current: 1 mA or less

Example of connections

When connecting an RS-422 output encoder

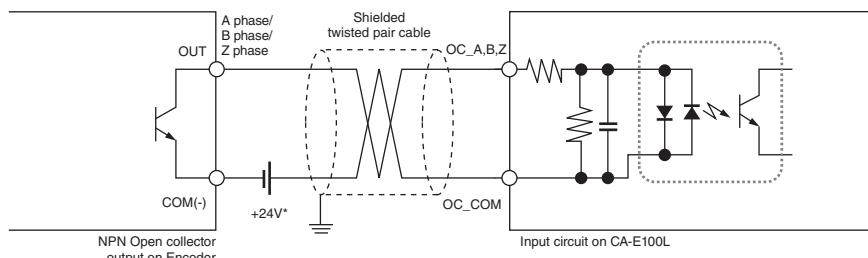


Point Use a shielded cable that supports the RS-422 signal for the connection.



Reference This instrument supports multi-drop connection. When connecting an RS-422 output encoder to this instrument, install a terminating resistor (110Ω 1/2W: supplied with the CA-E100L) on the camera input unit farthest from the encoder.

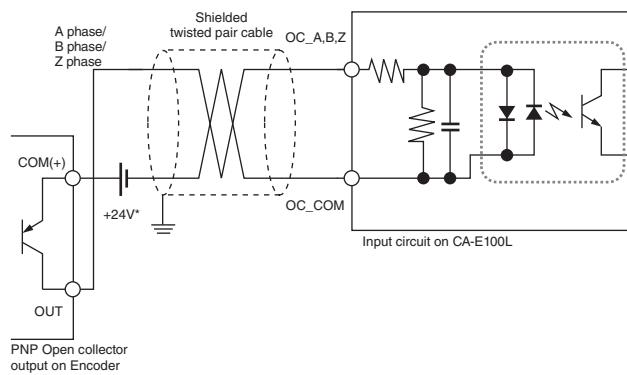
When connecting an NPN open collector output encoder



* This instrument's (CA-E100L) open collector encoder inputs are only compatible with 24 V type encoders.



Point Use a shielded cable for the connection.

When connecting a PNP open collector output encoder

- * This instrument's (CA-E100L) open collector encoder inputs are only compatible with 24 V type encoders.

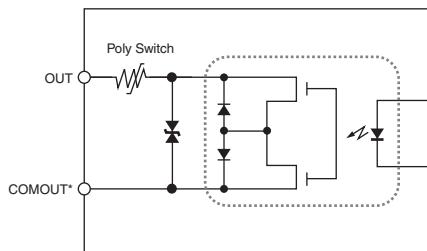


Point Use a shielded cable for the connection.

Output Connections (XG-X2800/X2802)

Output circuit diagram

Circuit C (common for all output terminals)



- Max. applied voltage: 30 V
- Max. sink current: 50 mA
- Leakage current: 0.1 mA or less
- Residual voltage:
1.4 V or less (50 mA)
1.0 V or less (20 mA)

Point

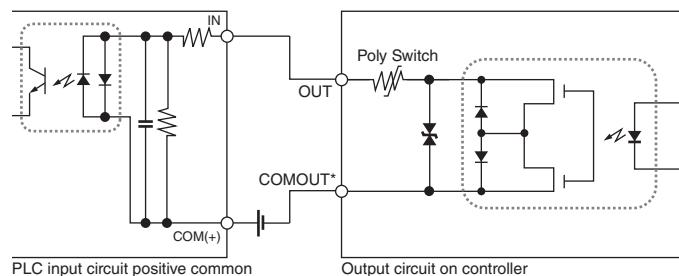
Since this unit utilizes a photo MOSFET in the output elements, any one of the NPN inputs, or PNP inputs is connectable.

Example of connections: When connecting the output from the controller with a positive common

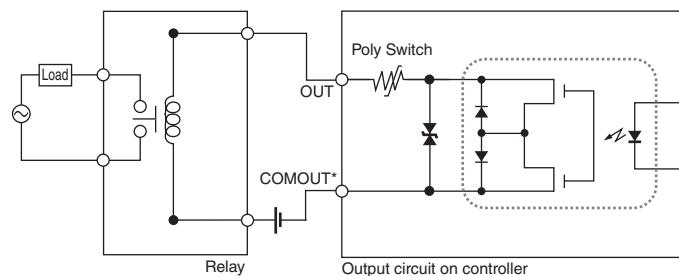
Point

If the input instrument is compatible with the NPN open collector outputs, then refer to this connection example.

When connecting the output from the controller to a PLC with a positive common



When connecting the output from the controller to a relay

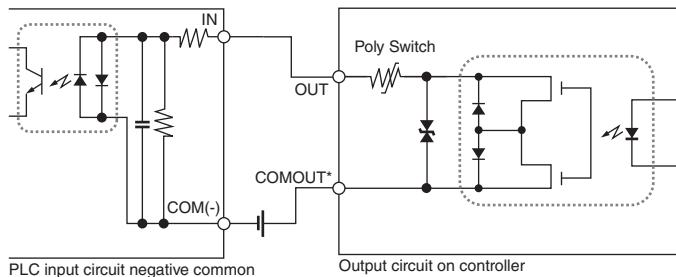
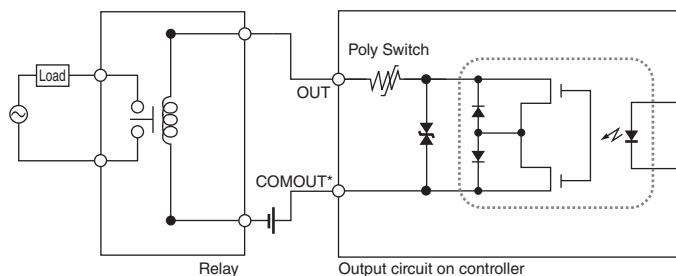


Point

* The commons which are connected differ according to the OUT terminals. The common terminal for OUT connectors 1 - 2 is COMOUT1, and the common terminal for OUT connectors 3 - 4/6 - 7 is COMOUT_F, and the common terminal for parallel I/O connectors 18 - 39 is COMOUT2.

Example of connections: When connecting the output from the controller with a negative common

If the input instrument is compatible with the PNP open collector outputs, then refer to this connection example.

When connecting the PNP output from the controller to a PLC with a negative common**When connecting the PNP output from the controller to a relay**

* The commons which are connected differ according to the OUT terminals. The common terminal for OUT connectors 1 - 2 is COMOUT1, and the common terminal for OUT connectors 3 - 4/6 - 7 is COMOUT_F, and the common terminal for parallel I/O connectors 18 - 39 is COMOUT2.

Chapter

6

Specifications and Optional Devices

Specifications and Optional Devices

Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

Main Specifications

Point

The actual number of settings available for all items listed depends on the total amount of available memory in the system.

Controller Unit (XG-X2800/X2802)

Model type		XG-X2800/X2802
Camera input ^{*1}		<ul style="list-style-type: none"> With area camera input unit CA-E100 connected 2 color/monochrome cameras per one CA-E100, up to 4 cameras via a maximum of 2 units can be connected With line scan camera input unit CA-E100L connected 2 line scan cameras per one CA-E100L, or 2 color/monochrome cameras, up to 4 cameras via a maximum of 2 units can be connected With 3D camera input unit CA-E100T connected 1 3D camera per one CA-E100T, up to 2 cameras via a maximum of 2 units can be connected With LJ-V input unit CA-E100LJ/E110LJ connected 2 identical models of the LJ-V series heads per one CA-E100LJ/E110LJ, up to 4 heads via a maximum of 2 units can be connected
Trigger input		Simultaneous capture by up to 4 cameras/individual capture can be selected. (when 1 input unit is connected, simultaneous capture is by up to 2 cameras)
Supported cameras/ Number of pixels	Area camera	<ul style="list-style-type: none"> With XG-035C/S035C/H035C/035M/S035M/H035M connected 310 k pixel mode: 640(H) x 480(V), approx. 310,000 pixels 240 k pixel mode: 512(H) x 480(V), approx. 240,000 pixels With CA-HX048C/HX048M connected 470 k pixel mode: 784(H) x 596(V), approx. 470,000 pixels 310 k pixel mode: 640(H) x 480(V), approx. 310,000 pixels 240 k pixel mode: 512(H) x 480(V), approx. 240,000 pixels With XG-200C/S200C/H200C/200M/S200M/H200M connected 2 mega-pixel mode: 1600(H) x 1200(V), approx. 1.92 mega-pixels 1 mega-pixel mode: 1024(H) x 960(V), approx. 980,000 pixels With CA-HX200C/HX200M connected 2 mega-pixel mode: 1600(H) x 1200(V), approx. 1.92 mega-pixels With XG-H500C/H500M connected 5 mega-pixel mode: 2432(H) x 2050(V), approx. 4.99 mega-pixels With CA-HX500C/HX500M connected 5 mega-pixel mode: 2432(H) x 2040(V), approx. 4.96 mega-pixels 2 mega-pixel mode: 1600(H) x 1200(V), approx. 1.92 mega-pixels With CA-H2100C/H2100M connected 21 mega-pixel mode: 5104(H)x4092(V), approx. 20.89 mega-pixels 5 mega-pixel mode: 2432(H)x2050(V), approx. 4.99 mega-pixels
Line scan camera		<ul style="list-style-type: none"> With XG-HL08M connected 8192(H) x 8192(L), approx. 67.11 mega-pixels With XG-HL04M connected 4096(H) x 16384(L), approx. 67.11 mega-pixels With XG-HL02M connected 2048(H) x 16384(L), approx. 33.55 mega-pixels
3D Camera		<ul style="list-style-type: none"> With XR-HT40M connected 2048(H) x 2048(V), approx. 4.19 mega-pixels With XR-HT15M connected 1408(H) x 1408(V), approx. 1.98 mega-pixels
LJ-V Sensor Head		<ul style="list-style-type: none"> With LJ-V7020/7020K/7060/7060K/7080/7200/7300 connected 512(H) x 16384(L), approx. 8.39 mega-pixels 1024(H) x 8192(L), approx. 8.39 mega-pixels 2048(H) x 4096(L), approx. 8.39 mega-pixels
Main image processor		DSP (High-speed)
Registered number of program settings		SD cards 1 and 2 can each hold 1000 programs (depending on the size of the SD card and the size of the programs) External switching is possible
Number of registered screens		Maximum of 1000 screens per camera for each program (depending on SD card size), Image compression function, position adjusted image registration and partial image registration supported, external switching via variable referencing possible.
SD card		<ul style="list-style-type: none"> SD card slot x 2 Compatible with OP-87133 (512MB), CA-SD1G (1GB: installed standard to SD1 slot), CA-SD4G (4GB), and CA-SD16G (16GB)
Interface	Controlled input (compatible with arbitrary assignment)	<ul style="list-style-type: none"> 20 inputs (including four high speed inputs designed for trigger input) Input rating 26.4 V or lower, 2 mA or greater (3 mA or greater for high speed input terminal)
	Controlled output (compatible with arbitrary assignment)	<ul style="list-style-type: none"> 28 outputs (including four high speed outputs designed for FLASH outputting linked to external trigger) Photo MOSFET^{*2} Maximum 50 mA (30 V or less)
Encoder input		<ul style="list-style-type: none"> When connecting CA-E100L, 2 systems per 1 unit, up to 4 systems via a maximum of 2 units When connecting CA-E100LJ/E110LJ, 1 system per 1 unit, up to 2 systems via a maximum of 2 units (up to 1 system via a maximum of 1 unit for XG-X2800LJ) RS-422 line driver output (5 V output supplied: maximum 150 mA, the CA-E100L is multi-drop compatible), combined open collector output (CA-E100L is for 24 V compatible components)

Model type		XG-X2800/X2802
Interface (continued)	Monitor output	Analog RGB Output, XGA (1024 x 768, 24 bit color)
	Operation indicators	LED display for Power ON and ERROR
	RS-232C	<ul style="list-style-type: none"> Can be switched to be used for performing numerical value output and control input/output, or be used for the CA series touch panel interface function (Cannot be used with PLC-Links using the RS-232C port) Supports a max. baud rate of up to 230400 bps
	PLC link	<ul style="list-style-type: none"> Can output numerical values and perform control input/output using the Ethernet or RS-232C port (Cannot be used in conjunction with CC-Link, EtherNet/IP and PROFINET.) The following PLCs are supported via link unit:^{*3} KEYENCE: KV-700 Series, KV-1000 Series, KV-3000 Series, KV-5000 Series, KV-5500 Series, KV-7000 Series, KV Nano Series Mitsubishi Electric: MELSEC A Series (RS-232C only), Q Series, L Series, FX Series (RS-232C only) OMRON: SYSMAC C Series (RS-232C only), CP1/CST1/CJ1/CJ2 Series YASKAWA Electric Corporation: MP900 Series (RS-232C only)/MP2000 Series
	Ethernet	<ul style="list-style-type: none"> Numerical value output, and control input/output possible. By the connection of KEYENCE PC application software, in addition to the function described above, uploading and downloading of program settings, simulations, sending/receiving of various data, including image data, and remote desktop are possible. Supports FTP client/server function, the VNC server function (for clients other than for PC it will be only for the screen display), and BOOTP function. 1000BASE-T/100BASE-TX/10BASE-T
	USB	<ul style="list-style-type: none"> By the connection of KEYENCE PC application software, in addition to numerical value output and control input/output, uploading and downloading of program settings, simulations, sending/receiving of various data, including image data, and remote desktop are possible. USB2.0
	CC-Link	<ul style="list-style-type: none"> By connecting the optional CC-Link unit CA-NCL20E, numerical value output and control input/output are possible. (Cannot be used in conjunction with PLC Link, EtherNet/IP and PROFINET.) Compatible to the Ver.1.10 remote device station, Ver.2.00 remote device station
	EtherNet/IP	<ul style="list-style-type: none"> Numerical value output, and control input/output by using the Ethernet port are possible. (Cannot be used in conjunction with PLC Link, CC-Link and PROFINET.) Compatible to the cyclic communication (max.1436 byte), and message communication Maximum number of connections 32 Compliant with the conformance test Version.CT12
	PROFINET	<ul style="list-style-type: none"> Numerical value output, and control input/output by using the Ethernet port possible. (Cannot be used in conjunction with PLC Link, CC-Link and EtherNet/IP) Compatible to the cyclic communication (max. 1408 byte) Compatible to the aperiodic (recorded data) communication Compliant with the Conformance Class A
	USB Console	<ul style="list-style-type: none"> By the optional USB handheld controller (OP-87983), various menu can be operated Supports operation assignment settings to the handheld controller buttons
	Mouse	Possible to control various menus via an optional dedicated mouse (OP-87506)
	Touch Panel	<ul style="list-style-type: none"> Setting operation from the CA Series touch panel used by the RS-232C port is possible (When RS-232C is used, the nonprocedural communication and PLC-Links that use the RS-232C port cannot be used.) Supports the dedicated touch menu and the operation buttons
	USB HDD	By connecting a HDD (maximum 2 TB) to the dedicated USB port (USB 3.0 compliant and bus powered compatible: rated output 900 mA), various kinds of data including image data can be output
Display language		Japanese/English/Simplified Chinese/Traditional Chinese/German selectable (Choose the default language to be used when the controller is started up for the very first time)
Illumination control		By connecting the optional illumination expansion unit CA-DC40E/DC50E, the lighting and light intensity of the LED illumination can be controlled. ^{*4}
Cooling fan		Cooling fan unit CA-F100 is standard equipment
Rating	Power source voltage	DC24V±10%
	Consumption current	5.0 A
Environment al resistance	Ambient operating temperature	0 to 45°C (DIN rail mounted)/0 to 40°C (Bottom mounted)
	Ambient operating humidity	35 to 85% RH (no condensation)
Weight		Approx. 1750 g

*1 Since the controller unit itself does not support camera inputs, at least 1 camera input unit is required.

*2 Either positive common connecting which is compatible with NPN input instruments, or negative common connecting which is compatible with PNP input instruments is feasible.

*3 Models equipped with the Ethernet port in the CPU unit also support Ethernet port direct connection.

*4 Connect up to 8 illumination expansion units (a maximum of two of the eight units can be CA-DC50E).

Line Camera Input Unit (CA-E100L)

		CA-E100L
Camera input		2 (Line camera and Area camera support)
Supported cameras		CA-HL02M/HL04M/HL08M, CA-H2100C/H2100M, CA-HX500C/HX200C/HX048C/HX500M/HX200M/HX048M, XG-H500C/200C/S200C/H200C/035C/S035C/H035C/H500M/200M/S200M/H200M/035M/S035M/H035M
Encoder input		2 systems: RS-422 line driver output (multi-drop compatible, 5 V output supplied: maximum 150 mA), combined open collector output (dedicated for 24V compatible products, input rating 26.4V or less, 3mA or greater)
Response frequency	RS-422	Single phase/Z-phase 1.6 MHz 2-phase 1 time 1.6MHz 2-phase 2 times 3.2MHz 2-phase 4 times 6.4MHz
	Open collector (OC)	Single phase/Z-phase 100kHz 2-phase 1 time 100kHz 2-phase 2 times 200kHz 2-phase 4 times 400kHz
Supplied item		RS-422 dedicated terminating resistor (110Ω 1/2W: quantity of 6)
Power supply		Supplied from the controller
Environmental resistance	Ambient operating temperature	0 to 45°C (DIN rail mounted)/0 to 40°C (Bottom mounted)
	Ambient operating humidity	35 to 85% RH (no condensation)
Weight		Approx. 650 g

Illumination Expansion Unit (CA-DC40E)

		CA-DC40E
Output	Illumination control	(1) Rated voltage (DC) (2) Pulse width modulation (light emission frequency 100 kHz) (Controller selectable.)
	Intensity level	1024 digital levels (controller selectable)
	Lighting connections	2 channels (LED Connector or terminal block connection)*1
	Voltage*1	DC12V/DC 24V (controller selectable)
	Capacity	Max. 30W (2channels total: 40W or less)*2
	Synchronization	FLASH output synchronization/continuous illumination (controller selectable)
	Response speed	(1) Rated voltage control: 3 ms or less (2) Pulse width modulation control: 1 ms or less
Inputs	Force illumination OFF	2 channels Individual control (Rated voltage: 26.4 V or less, 2 mA or more)
Display	LED display	Power display Light status display (separate for the 2 channels)
Rating	Power supply voltage	24V DC±10%
	Current consumption	3 A
Environmental resistance*3	Ambient operating temperature	0 to 45°C (DIN rail mounted)/0 to 40°C (Bottom mounted)
	Ambient operating humidity	35 to 85% RH (no condensation)
Weight		Approx. 500 g

*1 Output only from the terminal block when switched to 24 V

*2 The total for all units for simultaneous lighting when multiple illumination expansion units are connected is 80 W or less.

*3 The environmental resistance of just the LED lights is ambient temperature 0 to 40°C and ambient humidity 35 to 65% RH (no condensation).

Illumination Expansion Unit (CA-DC50E)

CA-DC50E		
Output	Illumination control	Constant current control
	Intensity level	1024 digital levels (controller selectable)
	No. of connections	2 channels (dedicated Six-pole circular connector)
	Synchronization	Synchronized with trigger applied to camera and with shutter (continuous lighting not supported)* ¹
	Response speed	Within 1 ms
Display	LED display	Power display Light status display (separate for the 2 channels)
Rating	Power supply voltage	24 VDC ±10%
	Current consumption	5 A
Environmental resistance* ¹	Ambient operating temperature	0 to 45°C (DIN rail mounted)/0 to 40°C (Bottom mounted)
	Ambient operating humidity	35 to 85% RH (no condensation)
Weight	Approx. 500 g	

*1 If the light-on time of the connected illumination unit is too long compared with the light-off time, an error may occur due to overload. In such a case, adjust the trigger intervals or shutter speed on the controller so that the light-off time of the unit is three times or more longer than the light-on time.

*2 The environmental resistance of just the LED lights is ambient temperature 0 to 40°C and ambient humidity 35 to 65% RH (no condensation).

CC-Link Unit (CA-NCL20E)

CA-NCL20E		
Communication	CC-Link station type	Ver.1.10 remote device station/Ver.2.00 remote device station
	Communication speed	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
	Connection cable	Ver.1.10 compatible CC-Link cable FANC-110SBH, FA-CBL200PSBH, CS110, OP-79426, OP-79427
	Max. total cable length (Max. communication distance)	156 kbps:1200 m / 625 kbps:900 m / 2.5 Mbps:400 m / 5 Mbps:160 m / 10 Mbps:100 m
Power supply	Supplied from the controller	
Environmental resistance	Ambient operating temperature	0 to 45°C (DIN rail mounted)/0 to 40°C (Bottom mounted)
	Ambient operating humidity	35 to 85% RH (no condensation)
Weight	500 g	

Line scan camera (XG-HL02M/HL04M/HL08M)

	XG-HL02M	XG-HL04M	XG-HL08M
CCD	14.3 mm monochrome CMOS image receiving element, 8x high-speed reading using square-grid (2 outputs)	14.3 mm monochrome CMOS image receiving element, 16x high-speed reading using square-grid (4 outputs)	28.7 mm monochrome CMOS image receiving element, 16x high-speed reading using square-grid (8 outputs)
Unit cell size	7 µm x 7 µm	3.5 µm x 3.5 µm	3.5 µm x 3.5 µm
Effective pixels	2048 pixels Processing Area (individual) Processing Area (continuous)	4096 pixels 4096 (H) x 16384 (L) 4096 (H) x 8192 (V)	8192 pixels 8192 (H) x 8192 (L) 8192 (H) x 8192 (V)
Minimum Scan Time	24 µs (41.7kHz)	24 µs (41.7kHz)	45 µs (22.2kHz)
Image transfer frequency	100 MHz (50 MHz x 2ch) 8x high-speed	200MHz (50MHz x 4ch) 16x high-speed	200MHz (25MHz x 8ch) 16x high-speed
Transfer system	Digital serial transfer		
Electronic shutter	User-defined setting (2 µs to 20,000 µs, The maximum shutter speed is limited to by up to 3 µs less than the line scan interval (shutter speed ≤ line scan interval - 3 µs).)		
Functions	Shading correction (1 save pattern unit)		
Lens mount	C mount	C mount	Special mount (M40 P0.75)
Environmental resistance	Ambient operating temperature Ambient operating humidity	0 to +40 °C 35 to 85%RH (No condensation)	
Weight	Approx.340g (not including the lens)	Approx.350g (not including the lens)	Approx.310g (not including the lens)

Using the Camera Cable Extension Repeater (CA-CHX10U)

Product name	Camera cable extension repeater (for high speed cameras)	
Model name	CA-CHX10U	
Supported cameras	<ul style="list-style-type: none"> • XG-HL02M • XG-HL04M • XG-HL08M 	
Transfer system	Digital serial transfer	
Environmental resistance	Ambient operating temperature 0 to +40°C Ambient operating humidity 35 to 85% RH (no condensation)	
Outside dimensions	112.6 (W) x 26 (D) x 21 (H)	
Weight	Approx. 60 g	

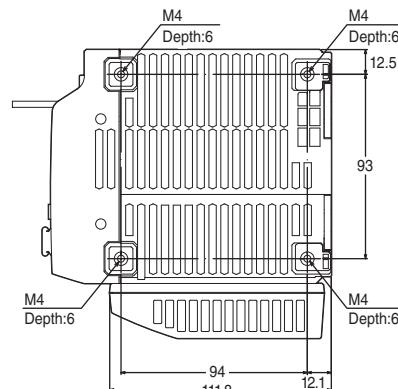
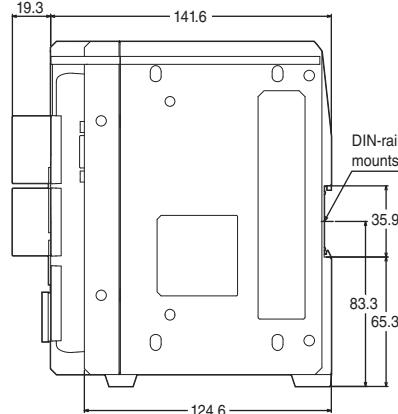
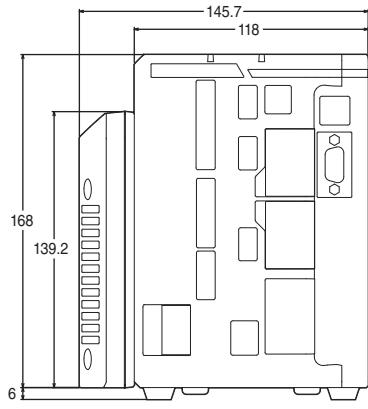
Controller power consumption ratings when using a repeater

Connecting a repeater changes the rated power consumption of the controller.

Controller type	Cameras connected	Power consumption (A)	
		With repeater	Without repeater
XG-X2000/X2002	2	2.4	2.3
	4	3.1	2.9
XG-X2200/X2202	2	2.7	2.5
	4	3.8	3.4
XG-X2500/X2502	2	2.8	2.6
	4	3.8	3.4
XG-X2700/X2702	2	2.8	2.6
	4	3.8	3.5
XG-X2800/X2802	2	3.7	3.4
	4	5.3	4.8
XG-X2800LJ	2	3.2	2.9

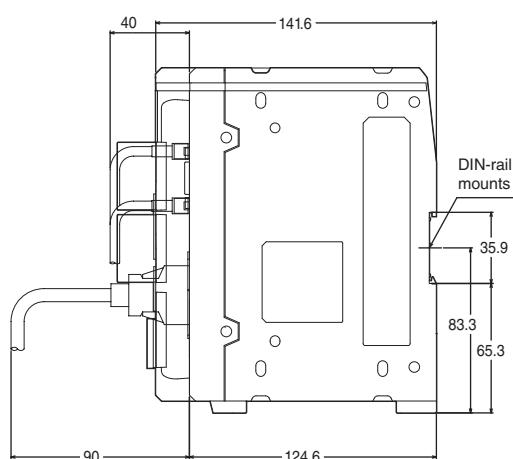
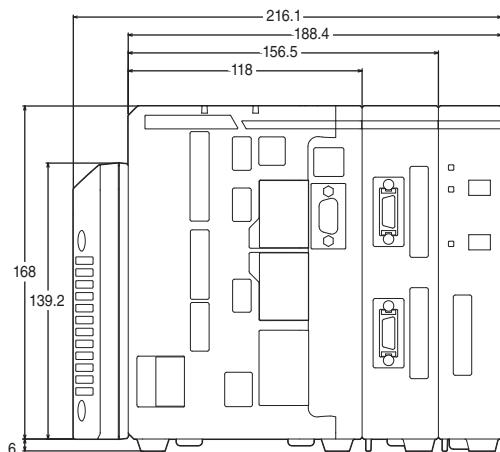
Dimensions

Controller Unit (XG-X2800/X2802)



Unit: mm

With camera input unit CA-E100L and illumination expansion unit CA-DC40E installed

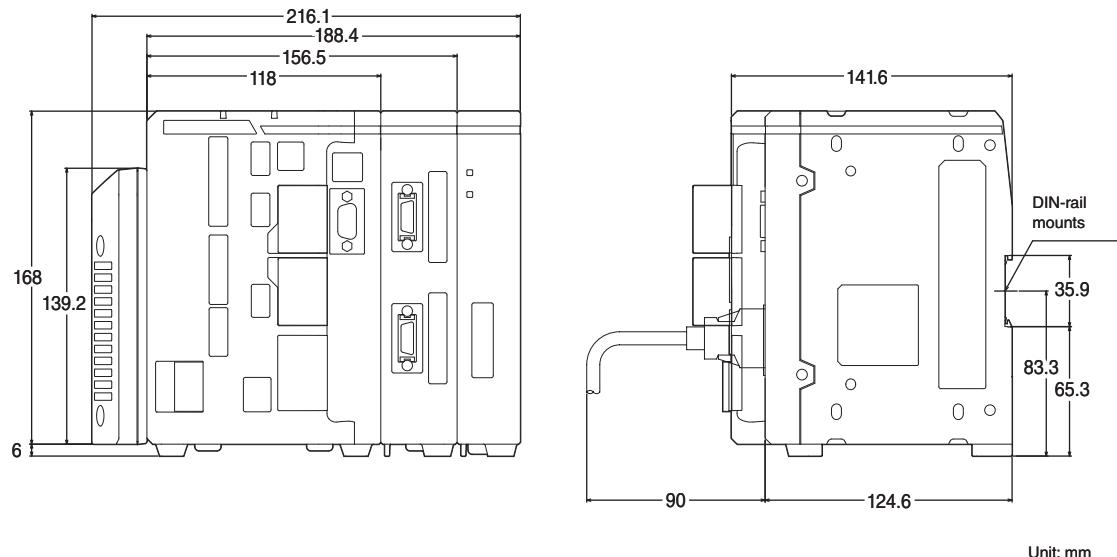


Unit: mm

(Total weight: approx. 2900 g)

Dimensions

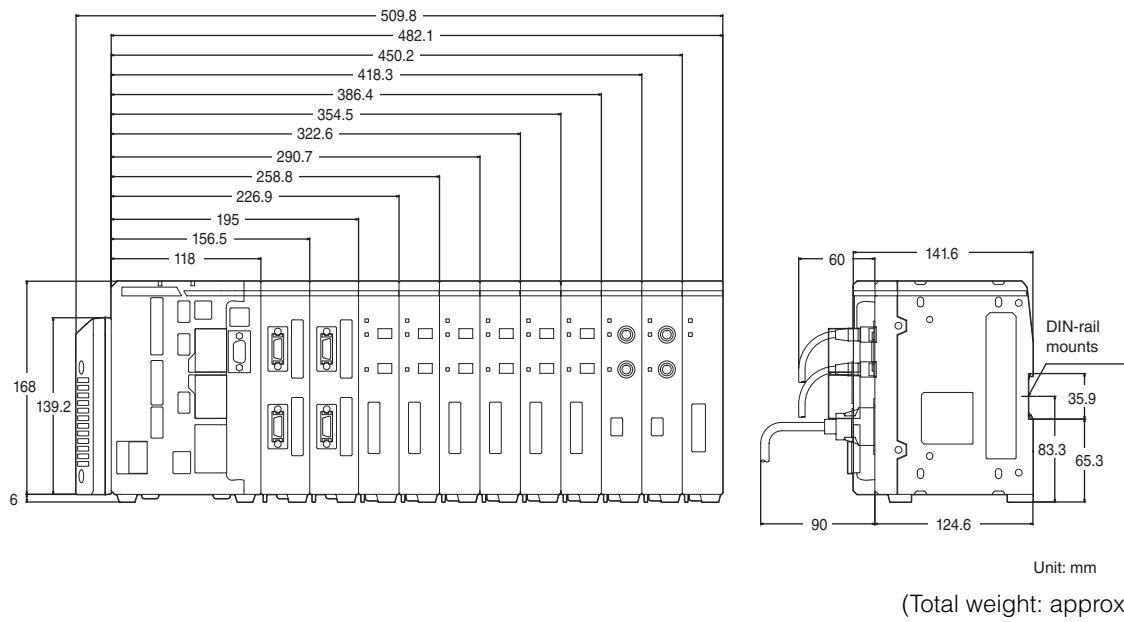
With camera input unit CA-E100L and CC-Link Unit CA-NCL20E installed



Unit: mm

(Total weight: approx. 2900 g)

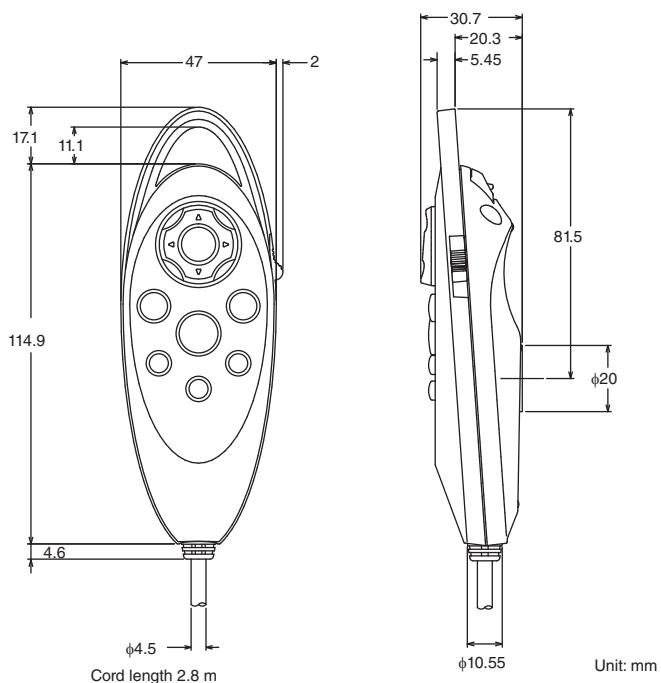
With camera input unit CA-E100L/CC-Link Unit CA-NCL20E/illumination expansion unit CA-DC40E/CA-DC50E installed



Unit: mm

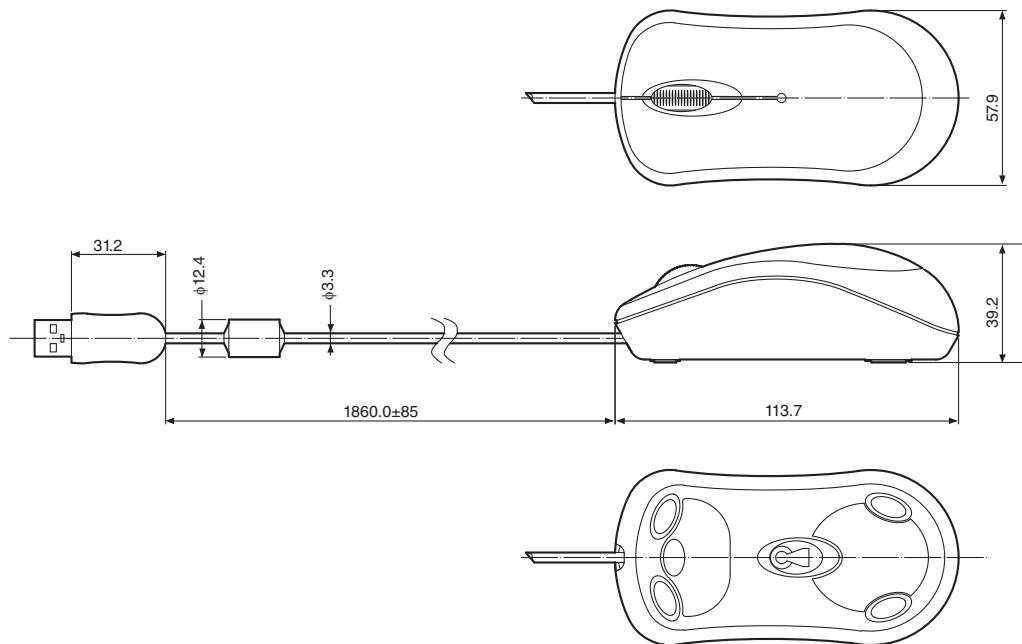
(Total weight: approx. 7550 g)

USB Handheld Controller (OP-87983)



(Weight: approx. 160 g)

Dedicated Mouse (OP-87506)

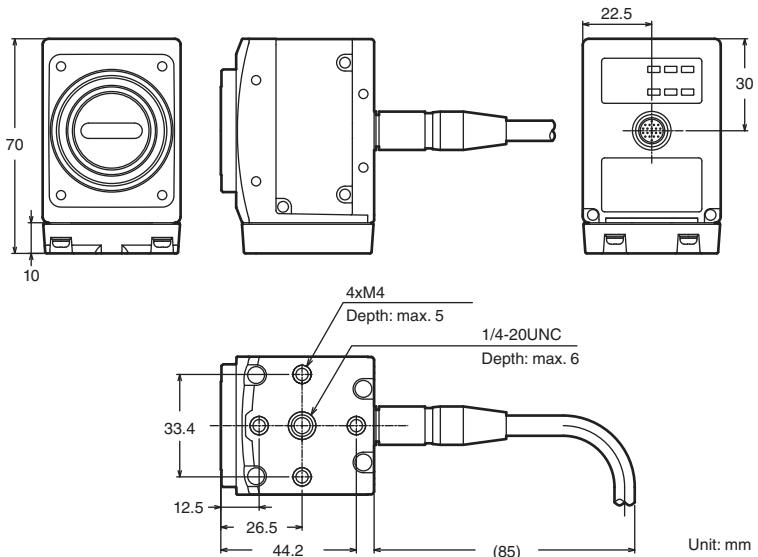


Unit: mm
(Weight: approx. 100 g)

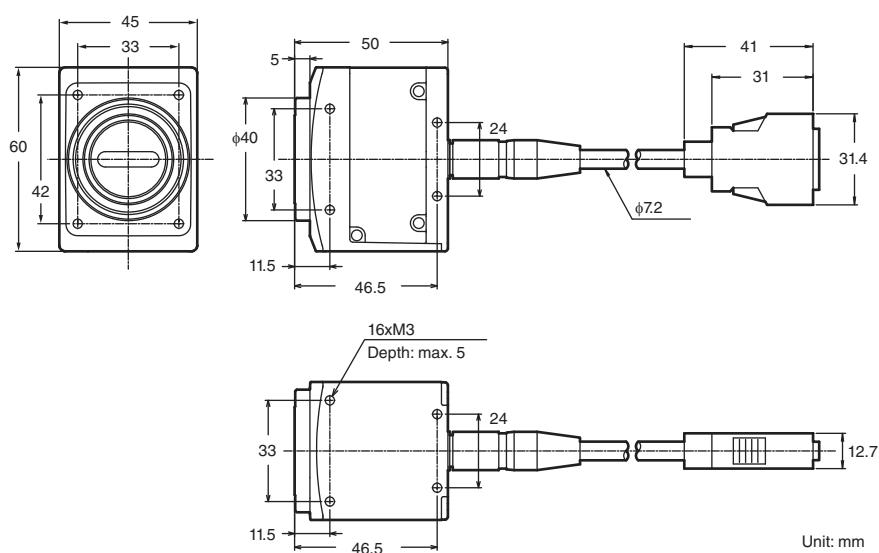
Line scan camera (XG-HL02M/HL04M/HL08M)

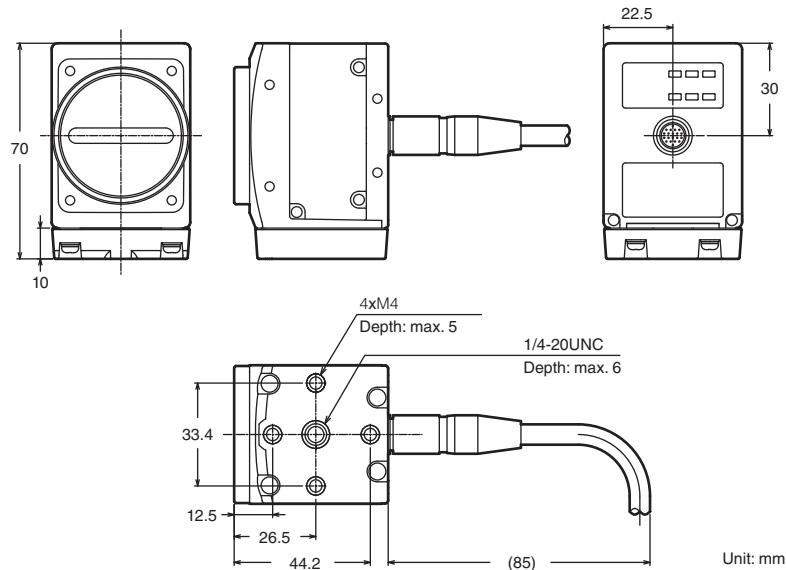
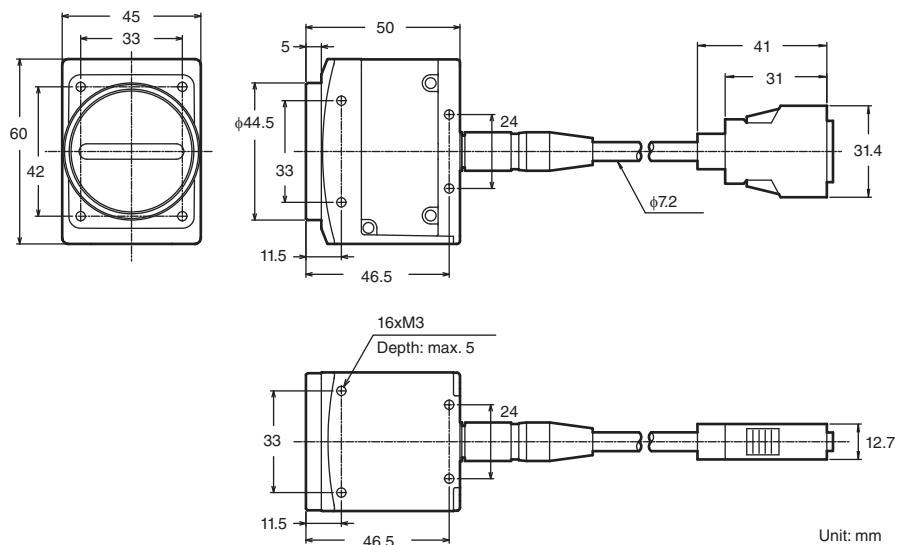
Line scan camera XG-HL02M/HL04M

With plastic mount attached (factory shipped condition)



Without plastic mount

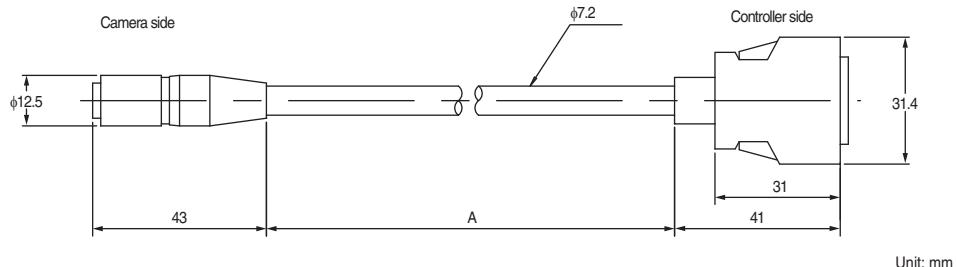


Line scan camera XG-HL08M**With plastic mount attached (factory shipped condition)****Without plastic mount**

Camera cable (for line scan camera XG-HL***, high-speed camera XG-H****/CA-H****)

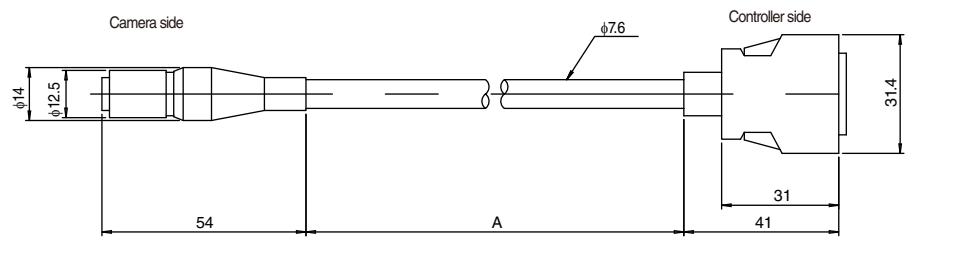
NOTICE

Use these cables only with line scan cameras XG-HL*** and high-speed cameras (XG-H****/CA-H****). Using them with other cameras may cause damage to the connector pins.

Standard cable

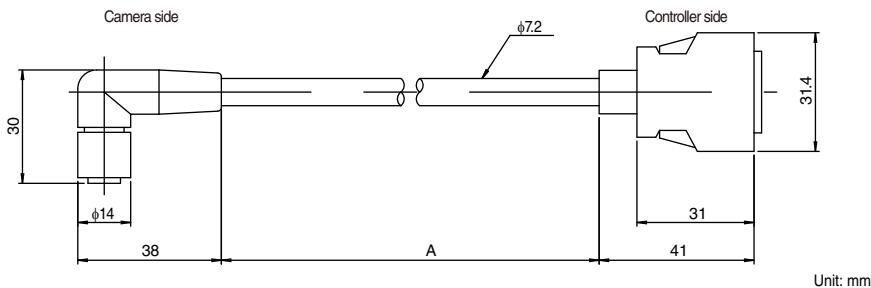
Model	Cable length (A)	Weight	XG-HL02M/ HL04M/ HL08M	XG-H035C/ H035M	XG-H200C/ H200M	XG-H500C/ H500M	CA-HX048C/ HX048M	CA-HX200C/ HX200M	CA-HX500C/ HX500M	CA-H200C/ H2100M
CA-CH3	3 m	290 g	○	○	○	○	○	○	○	○
CA-CH5	5 m	440 g	○	○	○	○	○	○	○	○
CA-CH10	10 m	880 g	○	○	○	○	○	○	○	○

○: Connection possible, x: Connection not possible

High flex robotic cable

Model	Cable length (A)	Weight	XG-HL02M/ HL04M/ HL08M	XG-H035C/ H035M	XG-H200C/ H200M	XG-H500C/ H500M	CA-HX048C/ HX048M	CA-HX200C/ HX200M	CA-HX500C/ HX500M	CA-H200C/ H2100M
CA-CH3R	3 m	250 g	○	○	○	○	○	○	○	○
CA-CH5R	5 m	410 g	○	○	○	○	○	○	○	○
CA-CH10R	10 m	740 g	○	○	○	○	○	○	○	○

○: Connection possible, x: Connection not possible

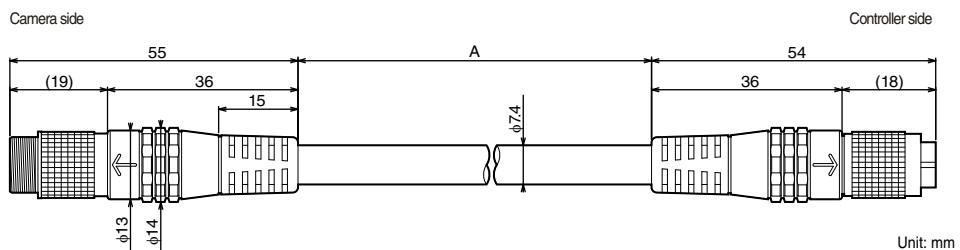
L-shape cable

Model	Cable length (A)	Weight	XG-HL02M/ HL04M/ HL08M	XG-H035C/ H035M	XG-H200C/ H200M	XG-H500C/ H500M	CA-HX048C/ HX048M	CA-HX200C/ HX200M	CA-HX500C/ HX500M	CA-H2100C/ H2100M
CA-CH3L	3 m	270 g	○	○	○	○	○	○	○	○
CA-CH5L	5 m	450 g	○	○	○	○	○	○	○	○
CA-CH10L	10 m	810 g	○	○	○	○	○	○	○	○

O: Connection possible, x: Connection not possible

High flex robotic extension type**NOTICE**

- CA-CH3BE cannot be used on its own because it is an extension cable. This is used by connecting CA-CH3/ CH3R/CH3L/CH3X to the connector on the controller side.
- CA-CH3BE is comparable to a 7m cable, not a 3m cable due to the electric characteristics. Use this within the range of the maximum extension of the camera that is used by converting it by calculation to a 7m cable.



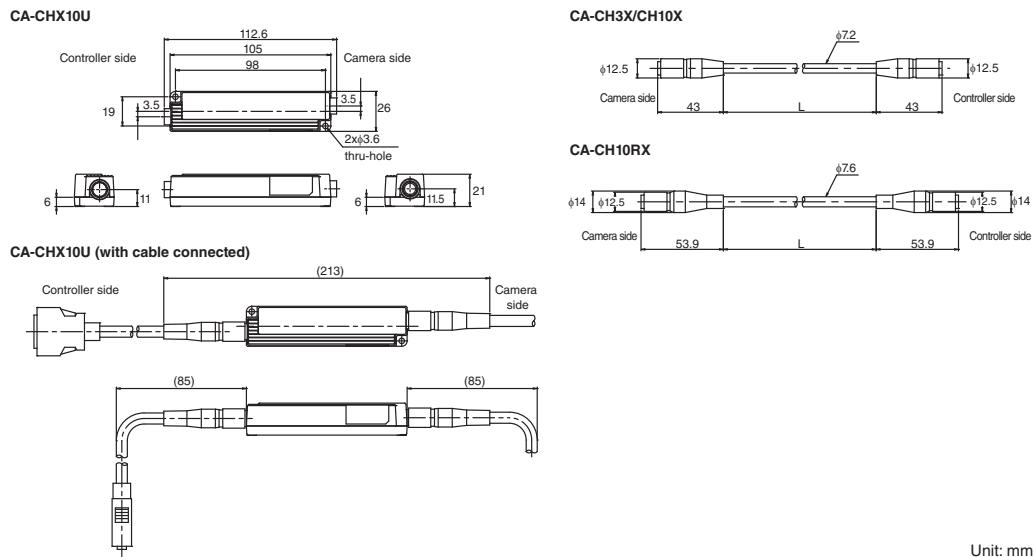
Model	Cable length (A)	Weight	XG-HL02M/ HL04M/ HL08M	XG-H035C/ H035M	XG-H200C/ H200M	XG-H500C/ H500M	CA-HX048C/ HX048M	CA-HX200C/ HX200M	CA-HX500C/ HX500M	CA-H2100C/ H2100M
CA-CH3BE	3 m	280 g	○(6m)	○(6m)	○(6m)	○(6m)	○(6m)	○(6m)	○(6m)	○(6m)

O: Connection possible, x: Connection not possible * Figures in () indicate maximum total extension length.

Repeater for Camera Cable Extension (CA-CHX10U)

A maximum of 2 repeaters can be connected in series to a line scan camera. In such a case, the maximum cable length is 30 m.

Outside dimensions



Unit: mm

Camera cable (dedicated for the repeater CA-C*X10U)



For the camera side connector on the repeater unit, connect the compatible repeater proprietary camera cable (CA-C**X) to the camera being used. No other camera cables can be directly connected to the camera side connector on the repeater.

Model	Cable length (L)	Weight
CA-CH3X	3 m	270 g
CA-CH10X	10 m	820 g
CA-CH10RX	10 m	740 g

Cameras and Connectable Camera Input Unit

List of Cameras and Number of Units Supported by Controller

The figures in the chart are the maximum number of cameras that can be connected to the camera port on the controller, and the figures in the brackets are the maximum number of cameras that can be connected by using the maximum number of camera input units.

		Camera connection	XG-X2000/ XG-X2002	XG-X2200/ XG-X2202	XG-X2500/ XG-X2502	XG-X2700/ XG-X2702	XG-X2800/ XG-X2802	XG-X2800LJ
Area camera	XG-035C/035M, XG-S035C/S035M, XG-H035C/H035M	Camera port on the controller or CA-E100, CA-E100L ^{*4}	2 (4)	2 (4)	2 (4)	2 (4)	(4)	x
	CA-HX048C/HX048M		2 (4) ^{*1}	2 (4) ^{*1}	2 (4) ^{*1}	2 (4) ^{*1}	(4) ^{*1}	x
	XG-200C/200M, XG-S200C/S200M, XG-H200C/H200M		x	2 (4)	2 (4)	2 (4)	(4)	x
	CA-HX200C/HX200M		x	2 (4) ^{*1}	2 (4) ^{*1}	2 (4) ^{*1}	(4) ^{*1}	x
	XG-H500C/H500M		x	x	2 (4)	2 (4)	(4)	x
	CA-HX500C/HX500M		x	x	2 (4) ^{*1}	2 (4) ^{*1}	(4) ^{*1}	x
	CA-H2100C/H2100M		x	x	x	2 (4)	(4)	x
Line scan camera	XG-HL02M	CA-E100L	x	x	x	x	(4) ^{*2}	x
	XG-HL04M		x	x	x	x	(4) ^{*2}	x
	XG-HL08M		x	x	x	x	(4) ^{*2}	x
3D Camera	XR-HT40M/HT15M	CA-E100T	x	x	x	x	(2) ^{*2}	x
LJ-V Series head	LJ-V7020/7020K/7060/ 7060K/7080/7200/7300	CA-E100LJ	x	x	x	x	(4) ^{*2 *3}	(2) ^{*3}
		CA-E110LJ ^{*5}	x	x	x	x	(4) ^{*2 *3}	x

*1 Compatible with LumiTrax light. For more details about LumiTrax light, see the XG-X2000 Series User's Manual.

*2 The line scan camera and LJ-V Series head cannot be connected at the same time as the 3D camera. Additionally, the line scan camera and LJ-V Series head cannot be used at the same time as an area camera for which LumiTrax light is enabled.

*3 For one camera input unit, up to two LJ-V Series heads (limited to the same model) can be connected. However, the capture timing and number of capture lines of the LJ-V Series heads connected to the same camera input unit will be the same.

*4 In addition to the line scan camera, the area camera can also be connected to the CA-E100L. In that case, the encoder input can also be used as a trigger signal.

*5 By combining the Keyence designated LJ-V Series head model, the CA-E110LJ is a camera input unit that also supports the capture of luminance images in addition to height images. For more details, contact a Keyence sales representative.

Options

List of Options

Line scan camera lenses

Model	Description	Reference page
CA-LHE12	4/3"-compatible high-resolution C mount lens (Focal distance 12 mm)	Page 6-19
CA-LHE16	4/3"-compatible high-resolution C mount lens (Focal distance 16mm)	Page 6-19
CA-LHE25	4/3"-compatible high-resolution C mount lens (Focal distance 25mm)	Page 6-19
CA-LHE35	4/3"-compatible high-resolution C mount lens (Focal distance 35mm)	Page 6-19
CA-LHE50	4/3"-compatible high-resolution C mount lens (Focal distance 50mm)	Page 6-20
CA-LHW8	1-inch lens (C-mount) (focal length 8 mm)	Page 6-21
CA-LHW12	1-inch lens (C-mount) (focal length 12 mm)	Page 6-21
CA-LHW16	1-inch lens (C-mount) (focal length 16 mm)	Page 6-21
CA-LHW25	1-inch lens (C-mount) (focal length 25 mm)	Page 6-21
CA-LHW35	1-inch lens (C-mount) (focal length 35 mm)	Page 6-21
CA-LHW50	1-inch lens (C-mount) (focal length 50 mm)	Page 6-22
CA-LHL16	2-inch lens (M40P0.75) (focal length 16 mm)	Page 6-22
CA-LHL25	2-inch lens (M40P0.75) (focal length 25 mm)	Page 6-22
CA-LHL35	2-inch lens (M40P0.75) (focal length 35 mm)	Page 6-22
CA-LM0210	1-inch lens (C-mount) Macro zoom lens 0.2x to 1.0x optical magnification (standard magnification) (straight)	Page 6-24
CA-LML0210	2-inch lens (M40P0.75) Macro zoom lens 0.2x to 1.0x optical magnification (standard magnification) (straight)	Page 6-24
OP-87337	Macro zoom lens stand	Page 6-24
OP-87319	F-mount adapter	Page 6-25

LED light for line scan camera

Model	Description	Reference page
CA-DZW5	50 mm (line-type, white)	Page 6-26
CA-DZW15	150 mm (line-type, white)	
CA-DZW30	300 mm (line-type, white)	
CA-DZW45	450 mm (line-type, white)	
CA-DC40E	Illumination Expansion Unit	Page 6-4
CA-DC50E	Illumination Expansion Unit	Page 6-5

Cables

Model	Description	Reference page
CA-CH3	High-speed camera cable (3 m)	Page 6-12
CA-CH5	High-speed camera cable (5 m)	
CA-CH10	High-speed camera cable (10 m)	
CA-CH3R	High-speed camera high flex robotic cable (3 m)	Page 6-12
CA-CH5R	High-speed camera high flex robotic cable (5 m)	
CA-CH10R	High-speed camera high flex robotic cable (10 m)	
CA-CH3L	High-speed camera L-shape connector cable (3 m)	Page 6-13
CA-CH5L	High-speed camera L-shape connector cable (5 m)	
CA-CH10L	High-speed camera L-shape connector cable (10 m)	
CA-CH3BE	High-speed camera high flex robotic extension cable (3 m)	Page 6-13
CA-CHX10U	Camera cable extension repeater (for line scan cameras, high-speed cameras)	Page 2-10, 6-6, 6-14
CA-CH3X	Repeater high speed camera cable (3 m)	Page 6-14
CA-CH10X	Repeater high speed camera cable (10 m)	
CA-CH10RX	Repeater high flex high speed camera cable (10 m)	
CA-D2	LED light cable (2 m)	Page 6-27
CA-D5	LED light cable (5 m)	
CA-D3R	High flex robotic LED light cable (3 m)	Page 6-27
CA-D5R	High flex robotic LED light cable (5 m)	
CA-D10R	High flex robotic LED light cable (10 m)	
CA-D17R	High flex robotic LED light cable (17 m)	
CA-D1W	Y-split LED light cable (0.5 m)	Page 6-27
OP-84457	Bare wire LED light cable (1 m)	Page 6-27
OP-26487	Serial connection cable (2.5 m, straight)	Page 5-2
OP-26486	D-sub 9-pin connector (female)	
OP-26485	D-sub 25-pin connector (female)	
OP-84384	D-sub 9-pin connector (male, for SYSMAC)	
OP-86930	D-sub 9-pin connector (male, for MELSEC)	
OP-66843	Ethernet cable (3 m, cross cable)	
OP-51657	Parallel port ribbon cable (3 m)	Page 5-9
OP-66844	USB 2.0 cable (2 m)	
OP-66842	Monitor cable (3 m)	Page 2-11
OP-87055	Monitor cable (10m)	
OP-79426	Ver.1.10 compatible CC-Link cable (20 m)	Page 5-7
OP-79427	Ver.1.10 compatible CC-Link cable (100 m)	
OP-87264	Touch panel modular RS-232C cable (3 m)	Page 6-31
OP-87265	Touch panel modular RS-232C cable (10 m)	

Softwares

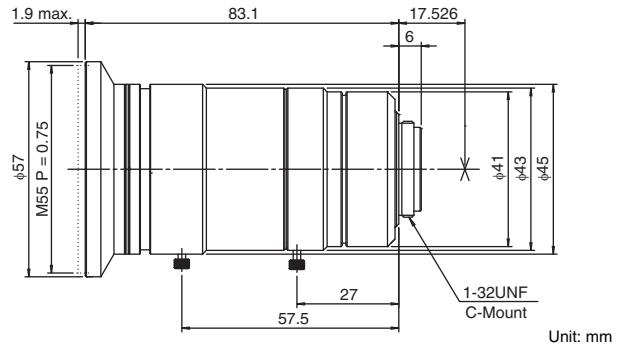
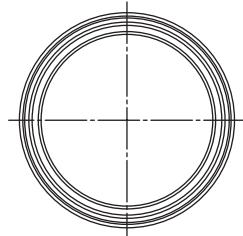
Model	Description	Reference page
XG-H1X	XG-X2000 Series Integrated Vision Editing Software	
CA-H1DB	Database Software for the Image Processing System	
CA-AD1	Function Addition Add-on SD Card	

Others

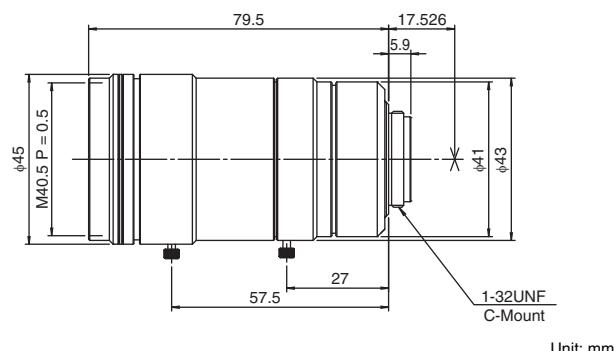
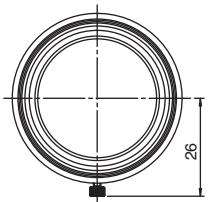
Model	Description	Reference page
CA-U4	Ultracompact switching power supply (6.5 A)	Page 6-28
CA-U5	Ultracompact switching power supply (12.5 A)	Page 6-29
OP-87133	SD card (512 MB)	Page 7-4
CA-SD1G	SD card (1 GB)	
CA-SD4G	SD card (4 GB)	
CA-SD16G	SD card (16 GB)	
OP-87983	USB Handheld Controller	Page 6-9, 7-2
OP-87506	Dedicated Mouse	Page 6-9
OP-84364	Ferrite core for the CA-NCL10E/20E	Page 5
CA-MP120	LCD monitor	Page 6-31
CA-MP120T	Touch panel LCD monitor	
OP-87262	Monitor stand for CA Series LCD monitor	Page 6-31
OP-87263	Touch panel scratch-prevention sticker	
CA-F100	Fan unit	
CA-EN100U	Encoder relay unit	Page 3-9
CA-EN100H	Encoder head	
CA-EN5	Encoder head cable (5m)	
CA-EN10	Encoder head cable (10m)	

4/3"-compatible High-resolution C Mount Lens

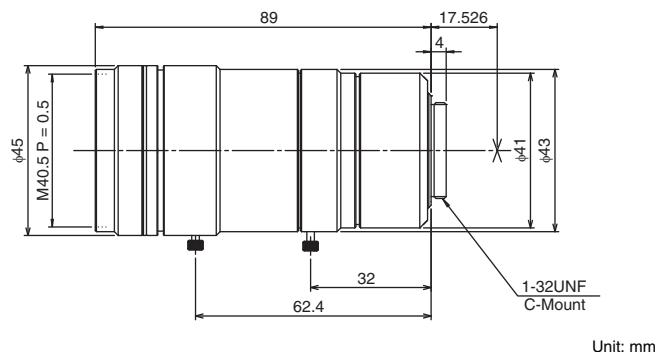
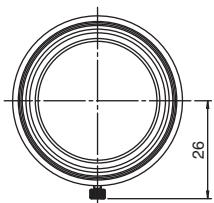
12-mm lens (CA-LHE12)



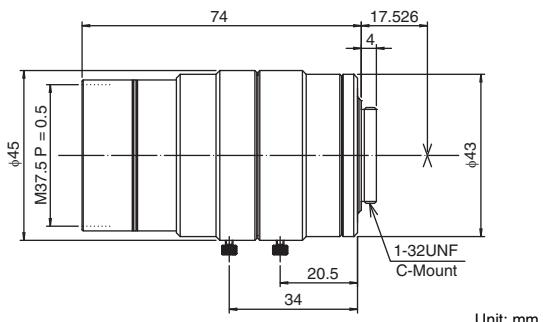
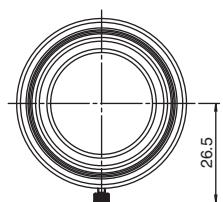
16-mm lens (CA-LHE16)



25-mm lens (CA-LHE25)

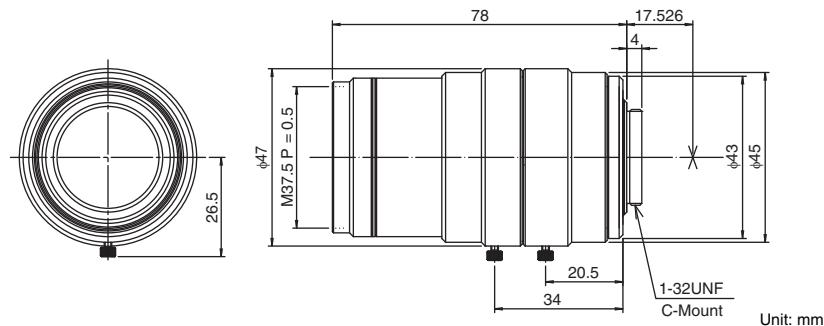


35-mm lens (CA-LHE35)



Options

50-mm lens (CA-LHE50)



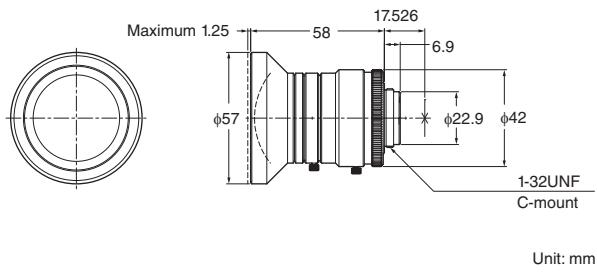
Specifications

Specifications and Optional Devices

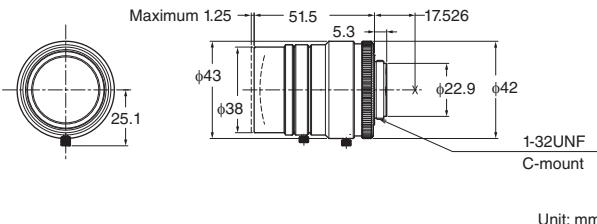
	CA-LHE12	CA-LHE16	CA-LHE25	CA-LHE35	CA-LHE50
Focal Distance	12mm	16mm	25mm	35mm	50mm
Aperture	F2.0 to F22	F2.0 to F22	F2.0 to F16	F2.0 to F16	F2.0 to F22
Minimum working distance	0.1m	0.1m	0.15m	0.2m	0.3m
Mount	C-mount				
Filter thread diameter	55mm P0.75	40.5mm P0.5	40.5mm P0.5	37.5mm P0.5	37.5mm P0.5
Maximum CCD size	φ23 (C mount full-size)				
TV distortion	0.59%	0.02%	-0.57%	-0.17%	0.80%
Resolving power	Center 160 lines/mm, periphery 80 lines/mm				
Lens coating	WIDE BAND MULTI COATING				
Operating temperature/humidity range	0 to +50°C, 35 to 80% RH (no condensation)				
Weight	Approx. 270 g	Approx. 250 g	Approx. 260 g	Approx. 210 g	Approx. 220 g

Line scan camera lenses

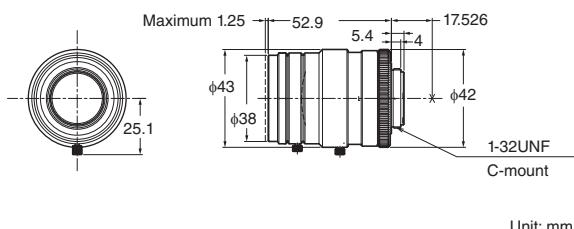
8 mm Lens (CA-LHW8)



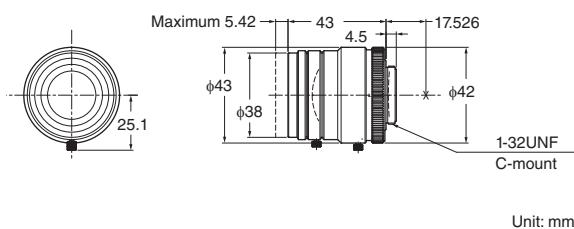
12 mm Lens (CA-LHW12)



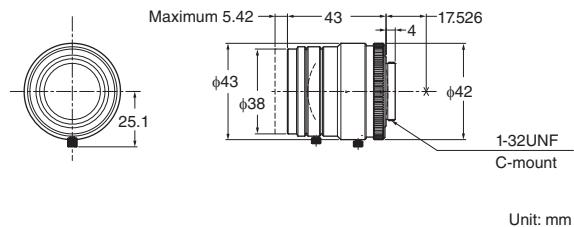
16 mm Lens (CA-LHW16)

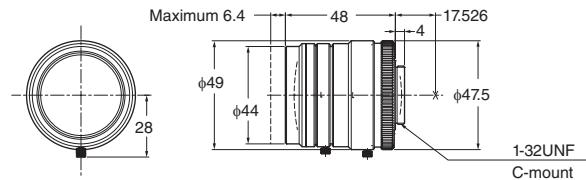


25 mm Lens (CA-LHW25)

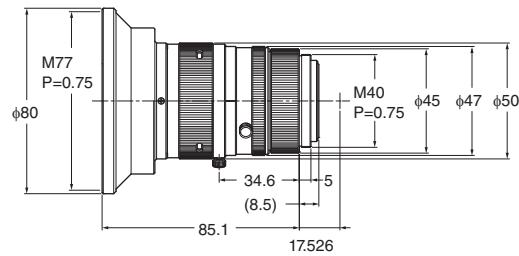


35 mm Lens (CA-LHW35)

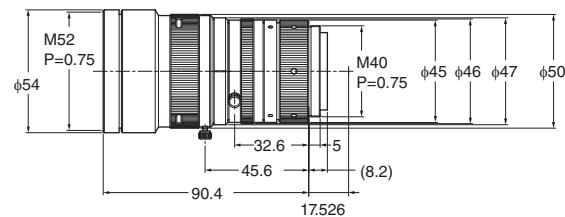


50 mm Lens (CA-LHW50)

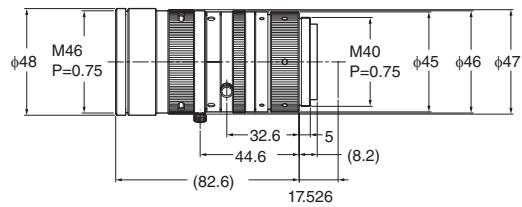
Unit: mm

16 mm Lens (for 8K Line Scan Camera) (CA-LHL16)

Unit: mm

25 mm Lens (for 8K Line Scan Camera) (CA-LHL25)

Unit: mm

35 mm Lens (for 8K Line Scan Camera) (CA-LHL35)

Unit: mm

Specifications

	CA-LHW8	CA-LHW12	CA-LHW16	CA-LHW25	CA-LHW35	CA-LHW50	CA-LHL16	CA-LHL25	CA-LHL35
Focal Distance	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	16 mm	25 mm	35 mm
Aperture ¹⁾	F1.4 - F16	F1.4 - F16	F1.4 - F16	F1.4 - F16	F1.4 - F16	F1.4 - F16	F2.8 - F32	F2.8 - F32	F2.8 - F32
Minimum working distance	0.1 m	0.3 m	0.3 m	0.3 m	0.3 m	0.5 m	0.1 m	0.1 m	0.1 m
Mount	C-mount						Special mount (M40P0.75)		
Filter thread diameter	55.0 mm P0.75	35.5 mm P0.5	35.5 mm P0.5	35.5 mm P0.5	35.5 mm P0.5	40.5 mm P0.5	77 mm P0.75	52 mm P0.75	46 mm P0.75
Maximum image size	1 inch						2 inch		
TV distortion ²⁾	-1.2% (-1.6%-1%)	-1.58% (-1%-0.6%)	-1.0% (-0.7%-0.4%)	-1.0% (-0.5%-0.3%)	-0.5% (-0.3%-0.1%)	-0.05% (-0.05%-0.02%)	-0.20%	-0.06%	-0.05%
Resolving power	Center 120 lines/mm, periphery 63 lines/mm						Center 100 lines/mm, periphery 80 lines/mm		
Operating temperature/humidity range	0 to +50°C, 35 to 80% RH (no condensation)						0 to +50°C, 35 to 80% RH (no condensation)		
Weight	Approx. 210 g	Approx. 160 g	Approx. 150 g	Approx. 130 g	Approx. 140 g	Approx. 210 g	Approx. 420 g	Approx. 420 g	Approx. 330 g

*1 When a line scan camera is used, an aperture of approximately F2.8 is recommended. This will improve the periphery resolution.

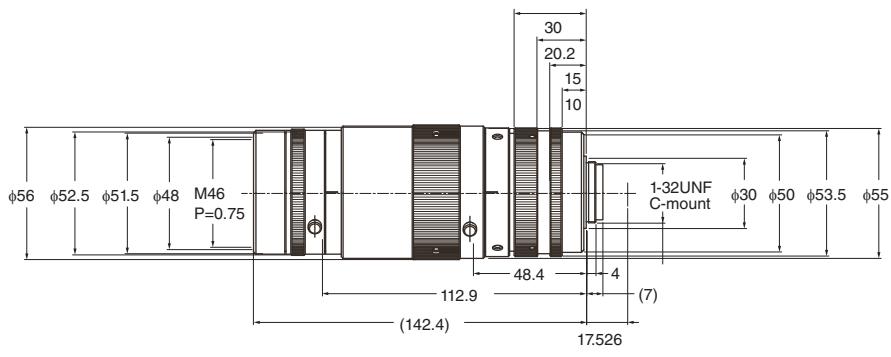
*2 The indicated values are for the applicable size CCD. The values for the case of 2/3 inch and 1/2 inch are indicated in parenthesis ().

Line scan camera macro lens

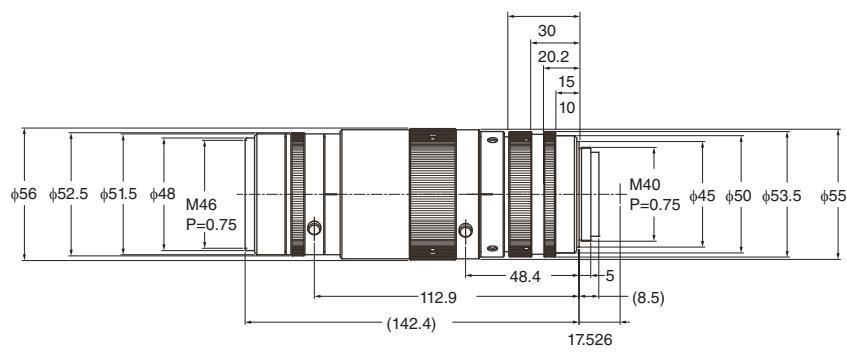
Point

When a macro zoom lens is used, be sure to fasten the macro zoom lens directly to the equipment using the optional macro zoom lens fixing stand (OP-87337) or a mechanism with an equivalent structure. If it is not fastened in this way, excessive load near the camera mount may damage the device or cause it to fall off.

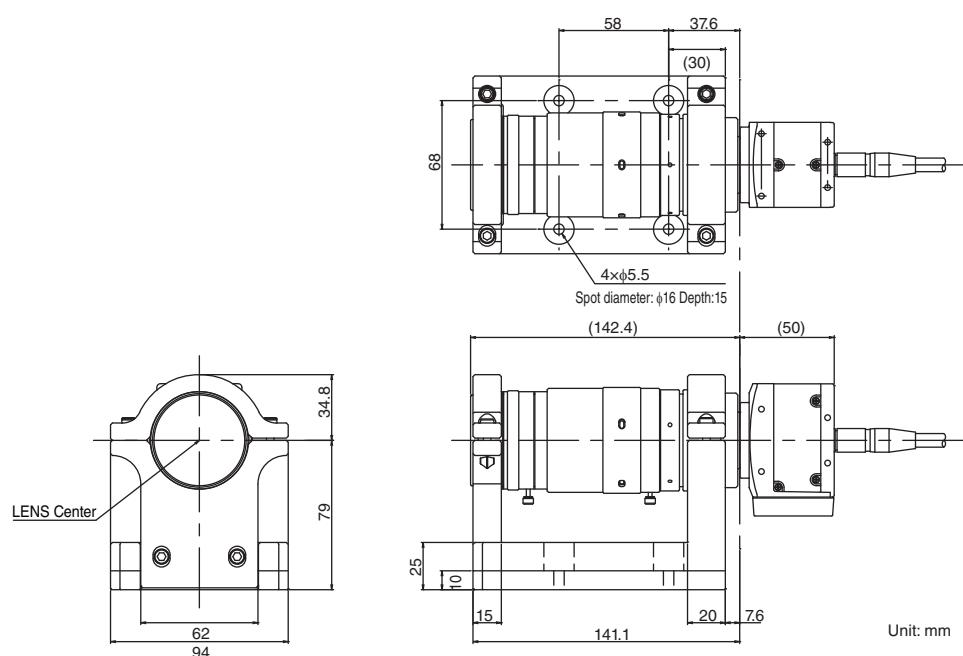
CA-LM0210



CA-LML0210 (for 8K Line Scan Camera)



When the Macro Zoom Lens Fixing Stand OP-87337 is installed



Weight of single stand: approx.980 g

Specifications



All the values in the specifications below are based on the optical design value. Individual differences can occur depending on the assembling accuracy.

		CA-LM0210	CA-LML0210
Optical magnification (standard magnification)		x 0.25 to x 1.0	x 0.25 to x 1.0
Telecentricity		-	-
WD ^{*1} (mm, at standard magnification)	x 0.25 x 0.50 x 0.75 x 1.0	238 mm 137 mm 105 mm 88 mm	238 mm 137 mm 105 mm 88 mm
Maximum CCD size		1 inch	2 inch
Field of view ^{*2} (mm, at standard magnification)	2/3 inch 14.3 mm line scan camera 1 inch	6.6 x 8.8 mm - 26.4 x 35.2 mm 14.3 mm - 57.3 mm 9.6 x 12.8 mm - 38.4 x 51.2 mm	9.6 x 12.8 mm - 38.4 x 51.2 mm 28.7 mm - 114.7 mm 19.2 x 25.6 mm - 76.8 x 102.4 mm
Effective F value		F6 - F64 (F value: F2.8 - F32)	F6 - F64 (F value: F2.8 - F32)
Depth of field ^{*3 *4} (μm)	x 0.25 x 0.50 x 1.0	20480 μm 5120 μm 1280 μm	20480 μm 5120 μm 1280 μm
TV distortion (Max)	x 0.25 x 0.50 x 1.0	-0.11% 0.03% 0.01%	-0.10% 0.10% -0.10%
Resolution ^{*5} (μm)	x 0.25 x 0.50 x 1.0	16.8 μm 8.4 μm 4.2 μm	16.8 μm 8.4 μm 4.2 μm
Mount		C-mount	Special mount (M40P0.75)
Filter thread diameter		46.0 mm P0.75	46.0 mm P0.75
Operating temperature and humidity range		0 to +50°C, 80% RH (no condensation)	0 to +50°C, 80% RH (no condensation)
Weight		Approx. 640 g	Approx. 650 g

*1 WD indicates the working distance when each lens is used at standard magnification. Working distance will vary depending on the magnification adjustment.

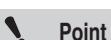
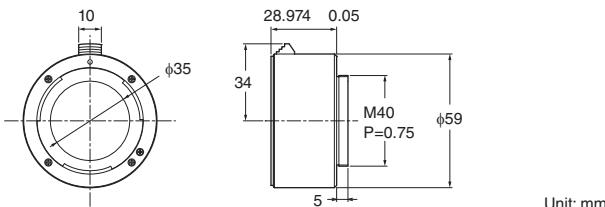
*2 Field of view indicates the standard field of view for each CCD size. The field of view can be changed by adjusting the magnification.

*3 The indicated depth of field is a simulation value that assumes 1/2" image / CCD size and a horizontal resolution of 320 TV lines. (Circle of least confusion is 40 μm in the image)

*4 The depth of field is for an effective F value of 32. Depth of field varies depending on the F value.

*5 The resolution indicates a simulation value calculated at 550 nm.

F-mount adapter (OP-87319)

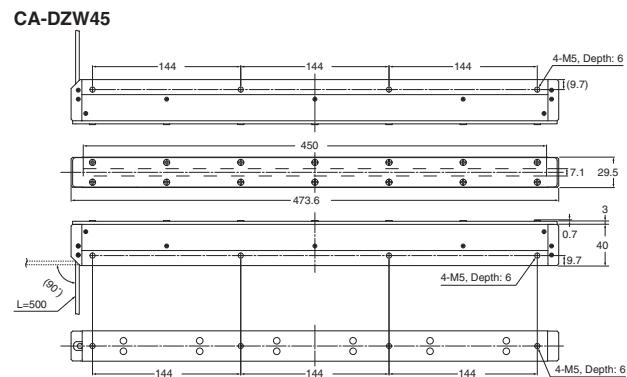
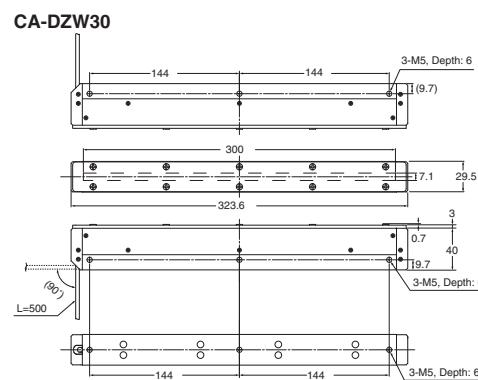
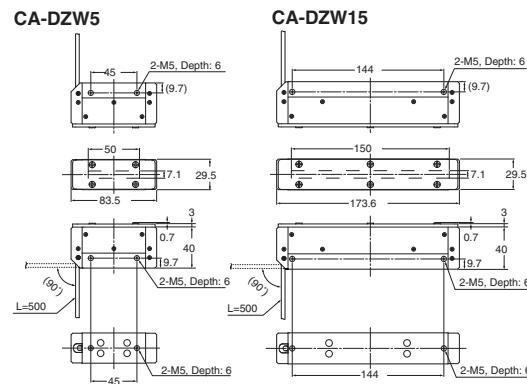


Due to the mount structure, there may be a gap between the mount and the lens where they fit together. Because they are susceptible to vibration, install in such a way that surrounding vibration is not transmitted to the lens and camera.

LED light for line scan camera

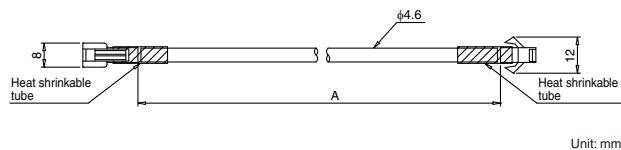
Line type (CA-DZ)

Model	LED colour	Weight	Current consumption
CA-DZW5	White	Approx. 240 g	2.5 W
CA-DZW15	White	Approx. 480 g	7.6 W
CA-DZW30	White	Approx. 880 g	15.1 W
CA-DZW45	White	Approx. 1280 g	22.7 W



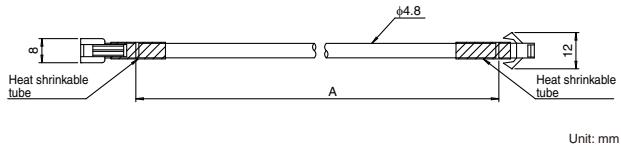
LED Light Cable

Standard cable



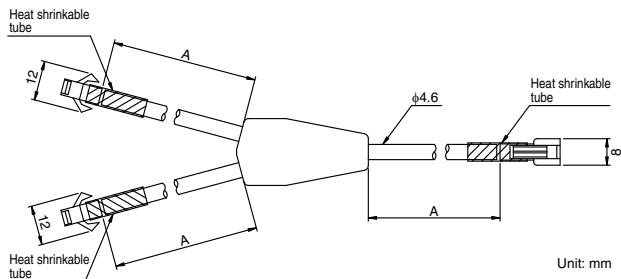
Model	Cable length (A)	Weight
CA-D2	2 m	60 g
CA-D5	5 m	130 g

High flex robotic cable



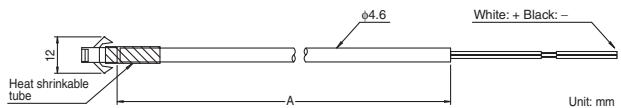
Model	Cable length (A)	Weight
CA-D3R	3 m	80 g
CA-D5R	5 m	140 g
CA-D10R	10 m	270 g
CA-D17R	17 m	450 g

Y-split type



Model	Cable length (A)	Weight
CA-D1W	0.5 m	50 g

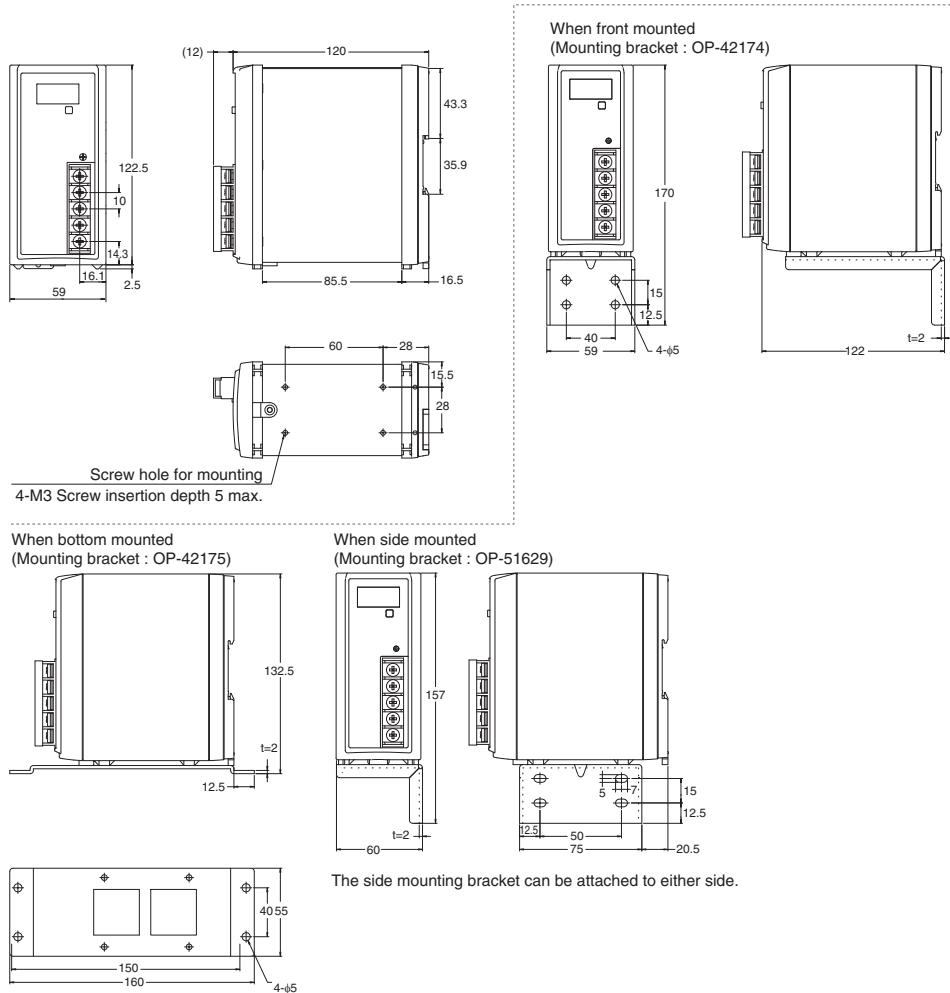
Bare wire to connector cable



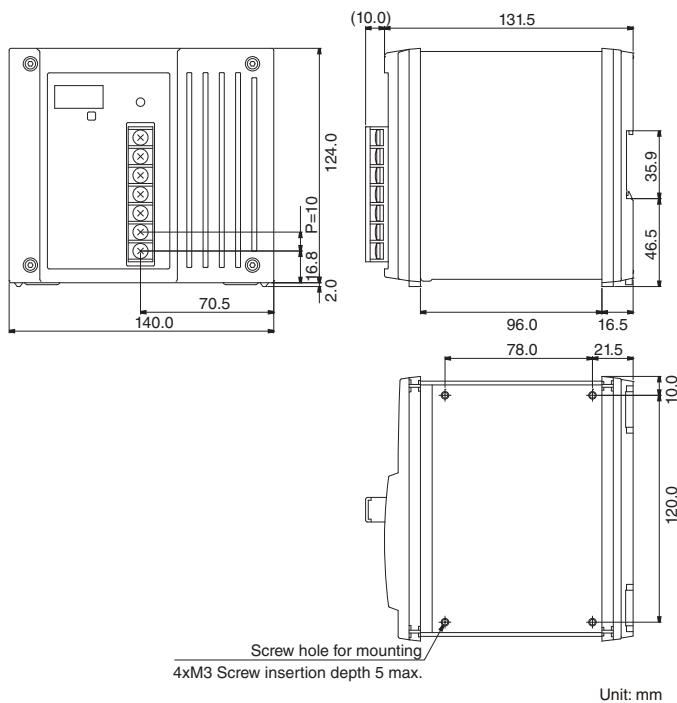
Model	Cable length (A)	Weight
OP-84457	1 m	30 g

Ultracompact switching power supply (CA-U4/U5)

Ultracompact switching power supply CA-U4



Unit: mm

Ultracompact switching power supply CA-U5

Specifications

Model		CA-U4	CA-U5
Input conditions	Rated Input voltage*1	85 to 264 VAC, 110 to 370 VDC	
	Rated Frequency*1	47 to 63 Hz, DC	
	Input current (100/200 VAC)	2.2 A/1.1 A max.	3.9 A/1.8 A max.
	Efficiency (100/200 VAC)	82%/85% typ. (with 100% load)	
	Leakage current (100/200 VAC)	0.4 mA/0.75 mA max. (with 100% load)	
	Rush current (100/200 VAC)	25 A/50 A max. (with 100% load, at 25 °C cold start)	
Output characteristics	Rated output voltage	24V DC	
	Adjustable voltage range	±5% (with V.ADJ)	
	Rated output current	6.5 A	12.5 A
	Ripple/noise voltage	180mVp-p max.	
	Input fluctuation	0.4 % max.	
	Load fluctuation	1.5 % max.	
	Temperature fluctuation	0.02 %/°C max.	
	Starting time	500 ms max. (at Surrounding Air Temperature of 0 to 55°C under rated I/O conditions)	
Protection	Overcurrent protection	Constant current reduction. Automatic reset	
		6.5 A	15.6 A
	Oversupply protection*2	Activates when the voltage reaches 26.4 V or more. Voltage turn-off. Operation resumes when the input power is turned on again.	
Display	Display method	3-digit, 7-segment LED (Character height: 10 mm)	
	Memory backup time	Approx. 10 years (at 20°C)	
	Display resolution	0.1 A/0.1 V/1%	
Environmental resistance	Surrounding Air Temperature (for operation)	−10 to 55°C, No freezing (See "Output Derating Characteristics".)	
	Ambient operating humidity	25 to 85%RH, No condensation	
	Surrounding Air Temperature (for storage)	−20 to 70°C, No freezing	
	Withstand voltage	3.0 kVAC 50/60 Hz 1 min (across input and output terminals) 2.0 kVAC 50/60 Hz 1min (across input terminal and FG terminal) 500 VAC 50/60 Hz 1 min (across output terminal and FG terminal)	
	Shock resistance	Peak acceleration: 300 m/s ² , in X, Y, and Z directions, 2 times respectively	
	Vibration resistance	In X, Y, and Z directions, 2 hours respectively under the following conditions 10 to 57 Hz: 0.3 mm double-amplitude, 57 to 500 Hz: 19.6 m/s ² (2G), 5.5-minute cycle	
	Insulation resistance	100 MΩ min. (with 500 VDC megohmmeter) (across input and output terminals) (across input terminal and FG terminal) (across output terminal and FG terminal)	
	Applicable standard	UL : UL508, UL60950-1 C-UL : CSA C22.2 No.14-M95, CSA C22.2 No.60950-1-03 EN : EN60950-1, EN50178 IEC : IEC60950-1	
Others	EMC standard	FCC Part15B ClassA, EN55011 ClassA, EN61000-6-2	
	Harmonic current emissions regulation	EN61000-3-2	
Others	Parallel operation	Possible (OP-42207 is required.)*3	
	Serial operation	Possible (External diode is required.)*3	
	Cooling method	Natural air-cooling	
	Weight	Approx. 700 g	Approx. 1540 g

*1 During the application for safety standard, the rated input voltage is 100 to 240 VAC and the rated frequency is 50/60 Hz.

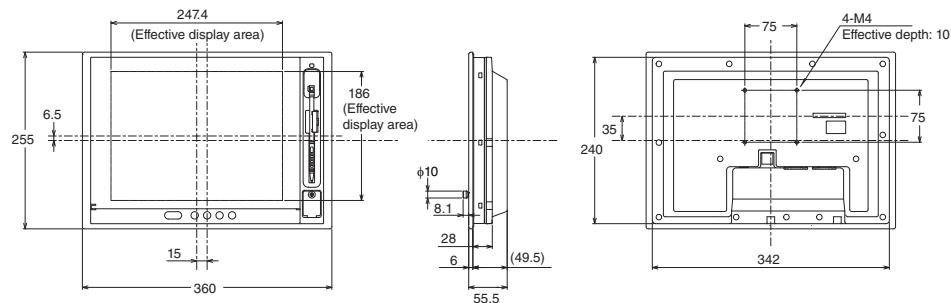
*2 To reset the unit, turn off the input power once, wait for 1 minute or more, and then turn on the input power again.

*3 The Applicable standards do not apply for parallel and serial operations.

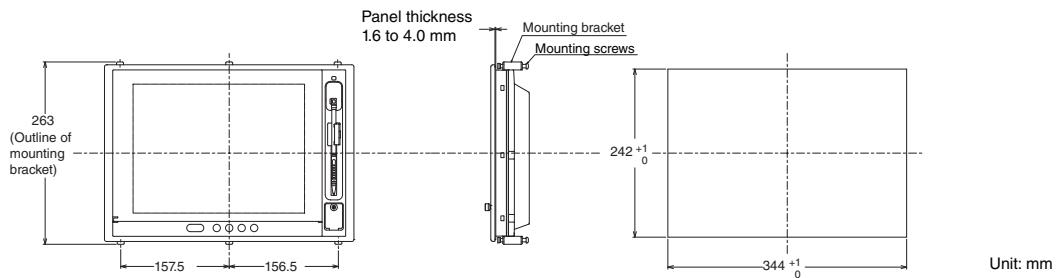
Touch Panel LCD Monitor (CA-MP120T)/LCD Monitor (CA-MP120)

CA-MP120T

Panel installation diagram

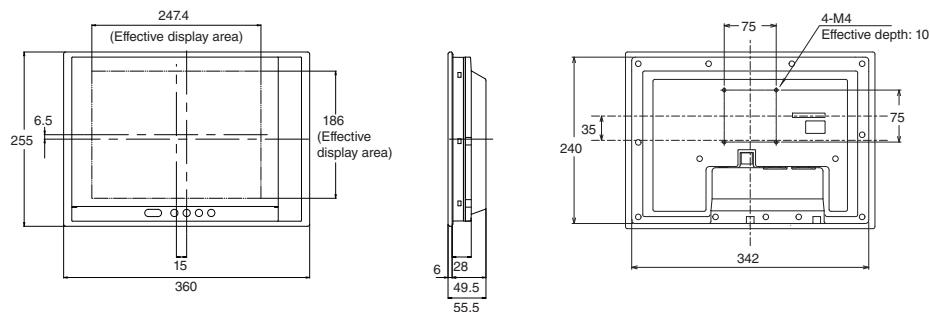


Panel cut dimensions

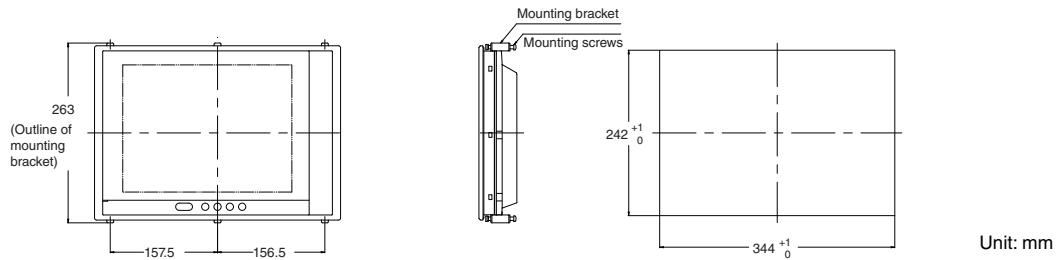


CA-MP120

Panel installation diagram



Panel cut dimensions



Specifications

Model		CA-MP120T	CA-MP120
Liquid crystal panel	Display element	a-Si TFT Active Matrix	
	Effective display area	245 (W) x 184 (H) mm	
	Number of display dots	1024 (W) x 768 (H) dots or 800 (W) x 600 (H) dots	
	Display color	16,777,216 colors	
Backlight	Life	Average life: approx. 100,000 hours (25°C vertical installation)	
Input/Output	Input signal	Analog RGB signal (0.7 Vp-p, 75Ω) horizontal, vertical period signal	
	Input signal mode	1024 (W) x 768 (H), vertical frequency 60 Hz, or 800 (W) x 600 (H), vertical frequency 60 Hz	
	Input signal connector	High-density mini D-sub 15-pin, female (3WAY, inch screw)	
	Touch panel connector	D-sub 9-pin, male (2WAY, inch screw)	-
	Handheld controller connector	RJ45 connector	-
Rating	Power supply voltage	24 V DC ±10%	
	Current consumption	1.5 A or less	
	Ambient temperature	0 to +40°C	
	Relative humidity	35 to 85% RH	
Structure		Panel embedded type, dust-proof, drop-proof structure equivalent to IP65f at front only	
Weight		Approx. 2.3 kg	

Chapter

7

Appendix

Appendix

Documentation for the installation and configuration methods of the controller, and CAD data can be downloaded from the following URL.

<http://www.keyence.com/xgxus>

Controlling the Handheld Controller (Optional)

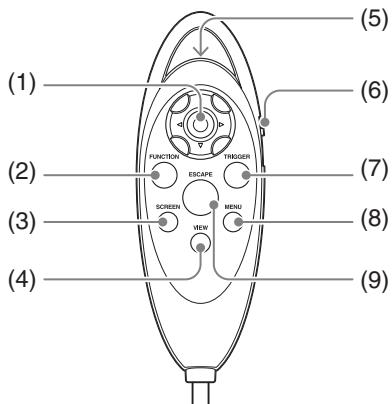
This section explains the common operations and functions of the USB handheld controller (OP-87983).

The Function for Each Button

Reference

Functions can be assigned to each button and to key combinations. The accessible operations on the handheld controller can be changed for different user accounts. The operations described here assume the handheld controller is being used with the default assignments by a user with administrator privileges. The actual operation may differ for your handheld controller. For more details about assigning functions to the handheld controller, see the XG-X VisionEditor Reference Manual.

Appendix



(1) No. 0 button/8-way thumbpad

Press the outer cursor button up, down, right or left to move the selected item on the screen.

Press the button in the center to confirm the setting on the screen.

(2) No. 1 button (FUNCTION)

Press the button to toggle the function menu on/off. It is also setup by default as a combination button.

(3) No. 4 button (SCREEN)

This button cycles the screen through different display types (raw image 1, filtered, etc.).

(4) No. 5 button (VIEW)

Press to display the View Toolbar for zooming in or out on the screen, or for switching between options of such as result display or display patterns.

(5) No. 7 Back button

In Setup mode, this button is used to toggle the display of the flowchart between normal and magnified.

In Run mode, this button is used to open the number 100 custom menu box. To open the number 100 custom menu box, you need to create the custom menu box in advance on the XG-X VisionEditor. For more details, see the XG-X VisionEditor Reference Manual.

It is also setup by default as a combination button.

(6) No. 8 selector switch (RUN/STOP)

This switch toggles between Run mode and Setup mode. Flick this switch to toggle between Run mode and Setup mode.

(7) No. 3 button (TRIGGER)

Press this button to issue a trigger for all cameras.

Press and hold the No. 3 button in the Setup mode to issue a continuous trigger (only when trigger input is enabled). Press the No. 3 button (TRIGGER) again to stop triggering.

(8) No. 6 button (MENU)

Push this button to display the Image Viewer to check archived images or run tests again.

(9) No. 2 button (ESCAPE)

Press this button to return to the previous screen or to resume the previous operation.

Multiple Key Combinations

Various functions can be performed on the handheld controller using key combinations (pressing two or more buttons simultaneously). Note, the functions available will differ depending on the controller operating state, and the functions assigned to the key combinations on the handheld controller.

Operation when the power is on (combination keys: default settings)

Operation	Buttons to use
Saving the current image on the screen to SD Card 2 (Screen capture)	No. 1 button (FUNCTION) + No. 5 button (VIEW) Or No. 7 Back button + No. 5 button (VIEW)
Send a reset signal to the controller	No. 1 button (FUNCTION) + No. 2 button (ESCAPE) Or No. 7 Back button + No. 2 button (ESCAPE)
Changing screens	No. 1 button (FUNCTION) + No. 4 button (SCREEN) Or No. 7 Back button + No. 4 button (SCREEN)
Change the level of intensity for the dialog menus	No. 1 button (FUNCTION) + No. 6 button (MENU) Or No. 7 Back button + No. 6 button (MENU)

Reference

In addition to the above, there are also key operations which can only be used from the Flow Editor and Screen Editor.
For more details, see the XG-X2000 Series User's Manual.

Loading and Removing an SD Card

Users can save the program settings or captured images on an SD card.

NOTICE

- The flash memory used as the storage element on the SD card has a read/write lifespan that, when reached, may result in an eventual loss of data. Data stored on an SD card should be backed up regularly to other media.
- SD Card 1 contains the global settings and other data necessary for the controller to operate. Make sure it is inserted at startup and while the power is ON.
- Data that must be loaded by swapping SD cards should be stored on SD card 2.

Supported SD Card Models

Use the optional Keyence OP-87133 (512 MB), optional CA-SD1G (1 GB), optional CA-SD4G (4 GB) or optional CA-SD16G (16 GB).

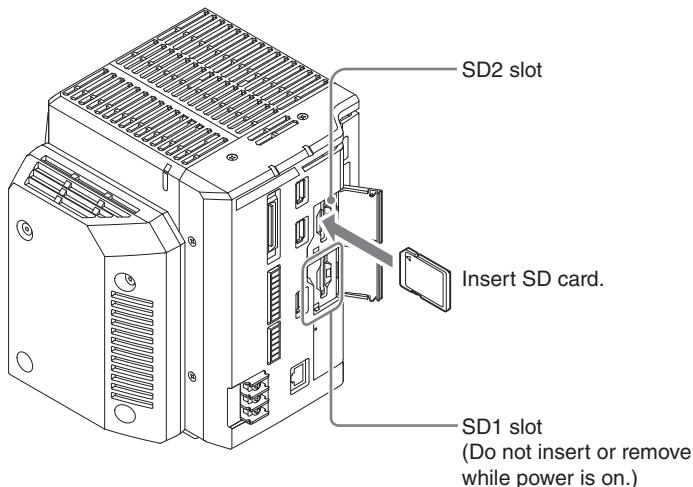
Note that the controller ships with OP-87133 (CA-SD1G for XG-X2500/X2502/X2700/X2702/X2800/X2802) inserted in the SD1 slot.

NOTICE

- Do not use any SD card other than the models mentioned above. Using those cards may cause data loss or setting data damage.
- For details about file management on SD cards and card formatting, refer to the XG-X2000 Series User's Manual.

Inserting an SD Card

Insert the SD card into the SD1 and SD2 slot such that the triangle inscription is on the top of the card.


NOTICE

- Be sure the card is oriented correctly when inserting it. Inserting the card in the wrong direction may damage the data and SD card.
- The access drive light illuminates while there is an SD card in the drive.
 - Green: An SD card is inserted and accessible.
 - Red: The SD card is being accessed.
 - Not lit: The SD card is not active. (The SD card can be removed from the slot.)
- When inserting the SD card into the SD1 slot, turn off the controller. Keep SD Card 1 inserted at startup and while the power is ON.

Removing an SD Card

Choose [Stop SD2 Operation], then press the SD card in the SD2 slot inward to release and remove the card.

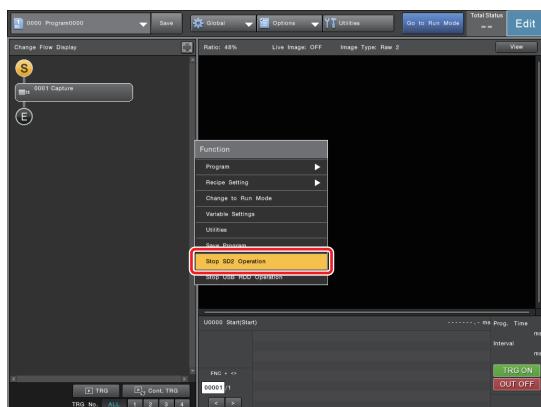
NOTICE

- Make sure to take the following steps to protect the SD card and the data it contains.
- If you remove the SD card using a procedure other than that specified, or if power is turned off when the card is being accessed, any writing task will stop resulting in a possible loss of data or damage to the SD card.
- SD Card 1 should not be removed while the controller is turned on. Turn off the controller before removing SD Card 1.

1 On the handheld controller, press the No. 1 (FUNCTION) button.

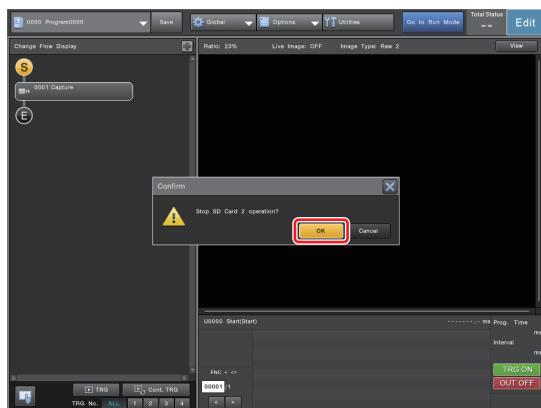
The Function menu appears.

2 Select [Stop SD2 Operation].



A confirmation screen appears.

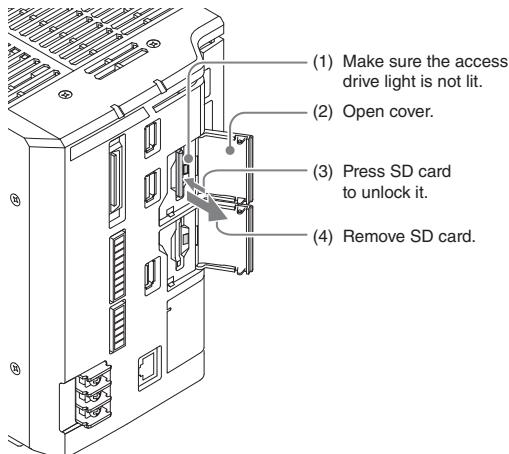
3 Select [OK].



4 When a confirmation screen appears stating that preparation to eject the card is complete, select [Close] to close the confirmation screen.

The LED indicator turns off, indicating that SD Card 2 can now be removed.

5 Remove the SD card from the SD2 slot on the controller.



Connecting and Disconnecting the USB HDD

Users can save the program settings or captured images on a USB HDD.

NOTICE

- The unit's power GND (0V) is shared in common with the connector shield and signal GND. If there is a potential difference with the connection for the USB HDD, this may result in breakdowns or malfunctions of the unit and the USB HDD.
- Depending on lifespan, malfunctions, and the like, the saved data on the USB HDD may be lost. Data stored on a USB HDD should be backed up regularly to other media.

Reference

If you think that there are potential difference with the connections, use a USB HDD which supports bus powered drives. The controller's bus power feed capacity is 900 mA (USB 3.0 compatible). Check with the USB HDD manufacturer concerning the bus power drive compatibility of the USB HDD that you are using. In addition, do not use USB hubs since they may cause the feed capacities and the data transmission speeds to decrease.

Supported USB HDD

NOTICE

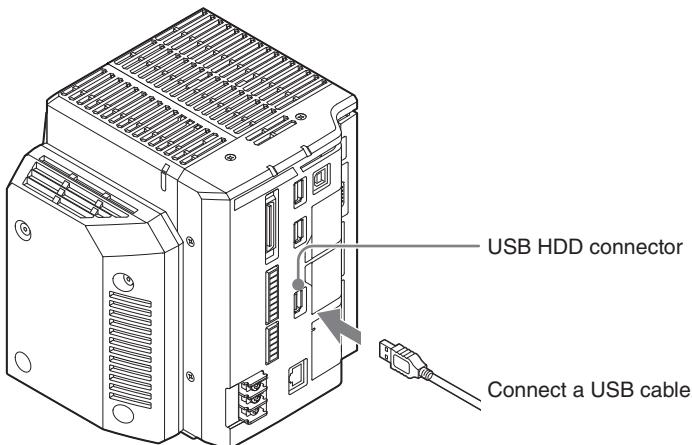
- External HDDs that support USB 2.0 and USB 3.0 can be connected to the controller's USB HDD connector. However, not every external HDD that is compatible with this specification is guaranteed to function on the controller.
- The maximum capacity that can be recognized as a disk on the controller is 2 TB. Additionally, if there are multiple partitions on the USB HDD, the controller will recognize only the first partition that it recognized as a disk.

Point

The power saving function on some USB HDDs may cause the read speed from the controller to decrease. Keyence recommends that you disable the power saving function in advance.

Connecting a USB HDD

Insert a USB cable that is compatible with the USB HDD that you are going to connect into the controller's USB HDD connector (blue terminal).

**NOTICE**

Use a USB cable that is compatible with the USB HDD that you are going to connect to the controller. Using a cable that is not compatible may cause the controller and the USB HDD to malfunction. Check with the USB HDD manufacturer concerning the compatible USB cable.

Important

Make sure to format the connected USB HDD with the controller before using it. The controller may not correctly recognize the USB HDD with its factory settings or if it has been formatted by a computer. For more details about formatting the USB HDD, see the XG-X2000 Series User's Manual.

Point

Only the blue USB HDD connector on the controller can be used to connect a USB HDD. If you connect a USB HDD to the black CONSOLE/MOUSE (USB) connector or the USB connector, it will not function.

Removing a USB HDD

After you perform the procedure to remove the USB HDD, remove the USB cable and the USB HDD.

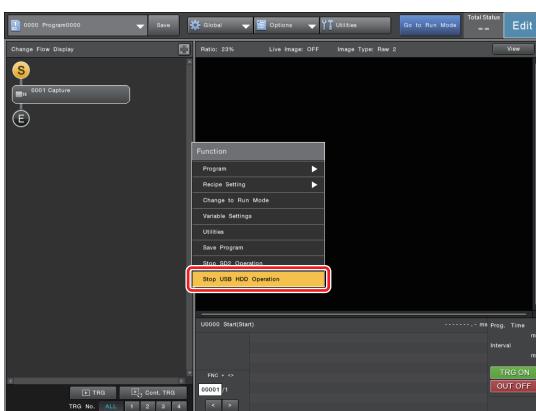
NOTICE

- To prevent the corruption of data or damaging the USB HDD, make sure to always perform the procedure below.
- If you perform a procedure other than the one specified and remove the USB HDD or turn off power to the USB HDD while it is being accessed, files will stop being saved, which may corrupt data or damage the USB HDD.

1 On the handheld controller, press the No. 1 (FUNCTION) button.

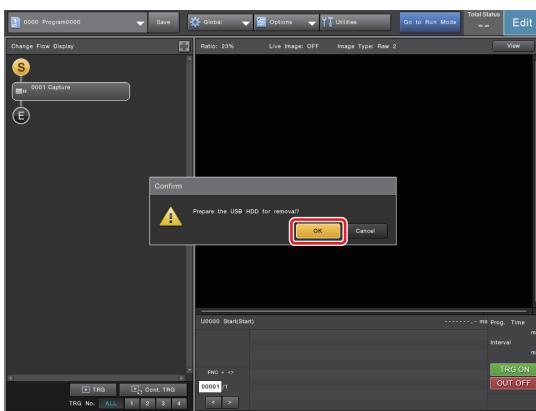
The Function menu appears.

2 Select [Stop USB HDD Operation].



A confirmation screen appears.

3 Select [OK].



4 When a confirmation screen appears stating that preparation to remove the USB HDD is complete, select [Close] to close the confirmation screen.

The USB HDD can now be removed.

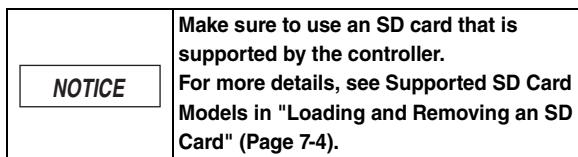
Exporting and Importing Settings

By exporting and importing settings data, you can copy settings data from another controller, or edit controller settings data on the XG-X VisionEditor and apply the edited settings data to the controller.

Exporting Settings

This section will describe how to export settings data to an SD card.

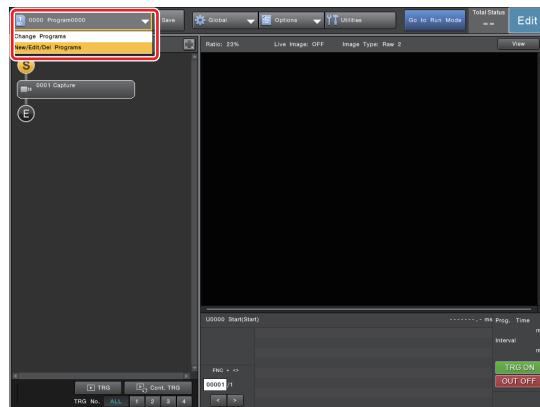
- 1 Insert an SD card into the SD2 slot.



- 2 Switch to Setup mode.

For more details about how to switch modes, see "Switching between Run Mode and Setup Mode" (Page 4-3).

- 3 Select the Setting No. Display field and then select [New/Edit/Del Programs].



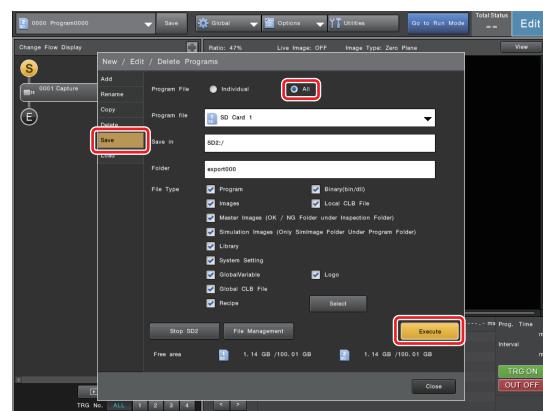
- 4 Select [Save].

- 5 For [Program File], select [All].

Reference

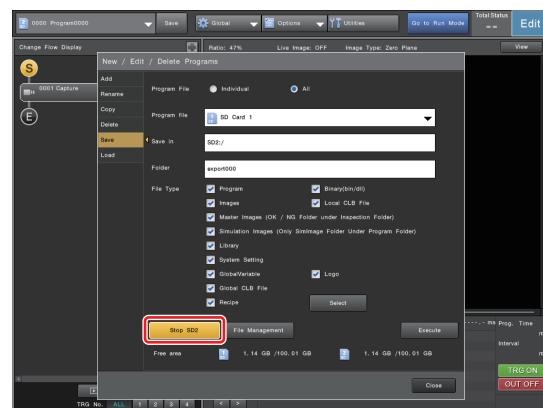
- By changing [Folder], you can change the name of the folder that you want to export the settings to.
- You can also export only a specific program number. For [Program File], select [Individual] and then select the program number that you want to export in [Program file].

- 6 Select [Execute] to start exporting the settings.



- 7 When a confirmation screen appears stating that exporting of settings is complete, select [Close] to close the confirmation screen.

- 8 Select [Stop SD2].



A confirmation screen appears.

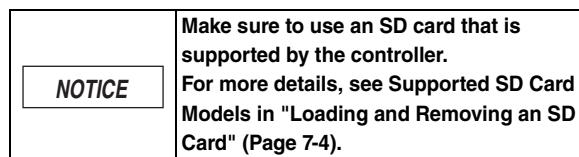
- 9 Select [OK].

When a confirmation screen appears stating that preparation to eject the card is complete, select [Close] to close the confirmation screen, and then remove the SD card.

Importing Settings

This section will describe how to import settings data from an SD card.

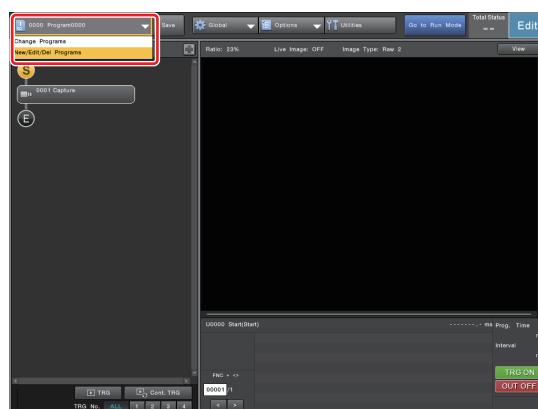
- 1 Insert an SD card into the SD2 slot.



- 2 Switch to Setup mode.

For more details about how to switch modes, see "Switching between Run Mode and Setup Mode" (Page 4-3).

- 3 Select the Setting No. Display field and then select [New/Edit/Del Programs].

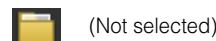


- 4 Select [Load].

- 5 For [Program File], select [All].

- 6 In [Load from], select the settings data that you want to import.

Folders that can be imported are displayed as one of the following icons:



(Not selected)

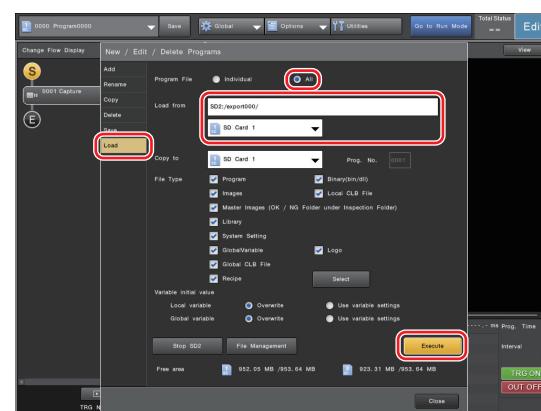


(Selected)



You can also import only a specific program number. For [Program File], select [Individual] and then select the program number that you want to import in [Load from].

- 7 Select [Execute] to start importing the settings.

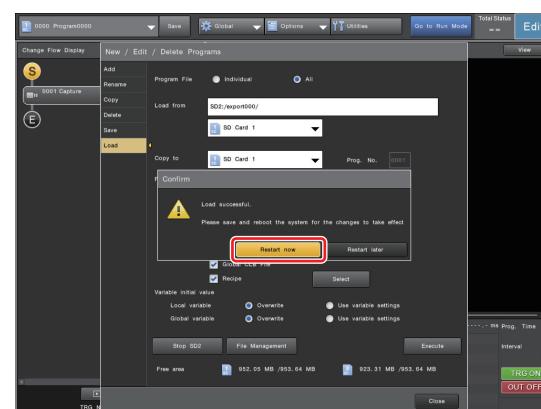


A confirmation screen appears stating that the settings have been imported.

- 8 Select [Restart now] to restart the controller.



If you have not selected the [System Setting] check box in [File Type], the controller does not need to be restarted. A confirmation screen prompting you to restart will not appear.



Saving Camera Images for Simulation

This section describes the procedure to save captured camera images to the SD1.

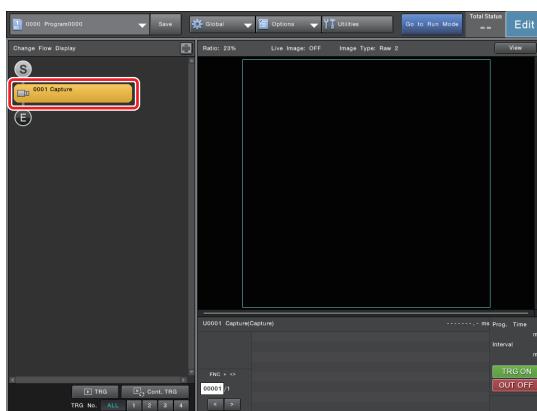


Camera images saved to the SD card can be used for simulations on a computer and the controller's retest function.

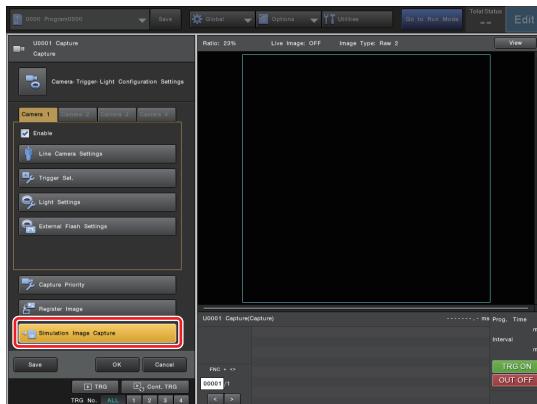
1 Switch to Setup mode.

For more details about how to switch modes, see "Switching between Run Mode and Setup Mode" (Page 4-3).

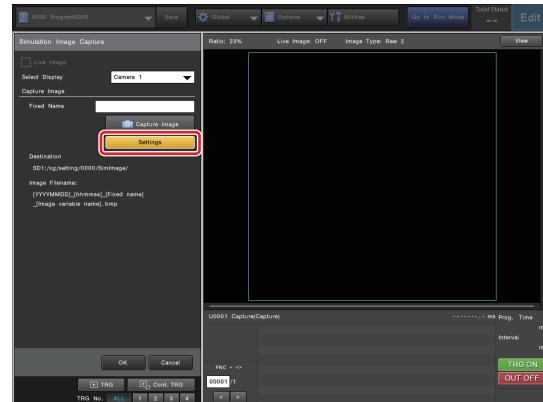
2 Select the capture unit.



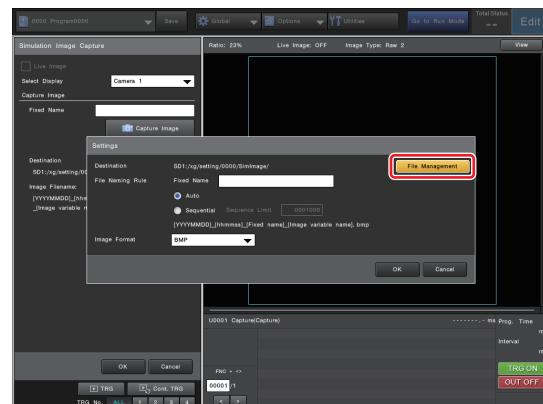
3 Select [Simulation Image Capture].



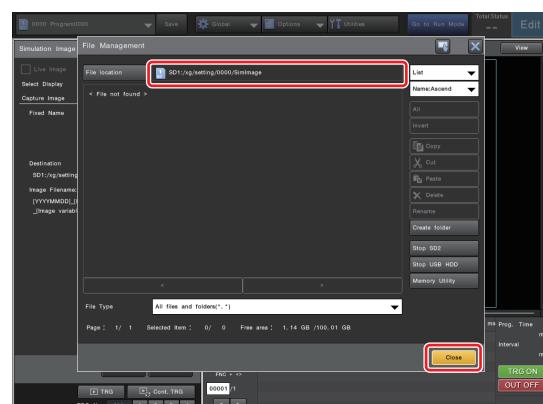
4 Select [Settings].



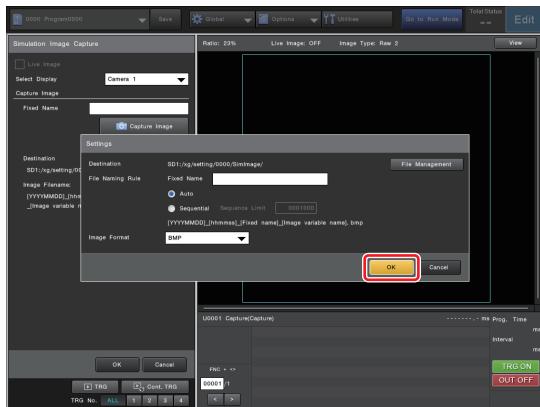
5 Select [File Management].



6 Select [Close] to close the [File Management] screen.



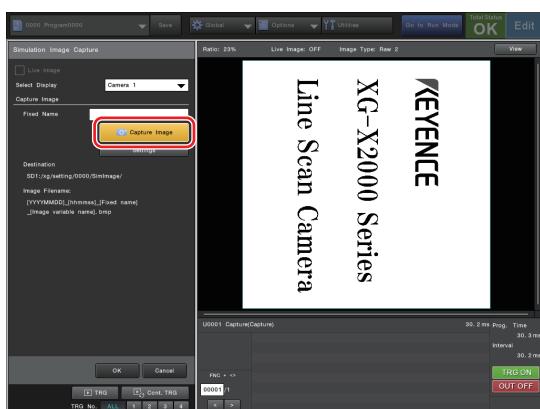
7 Select [OK] to close the [Settings] screen.



8 On the handheld controller, push the No.3 (TRIGGER) button. A trigger is input and an image is captured.

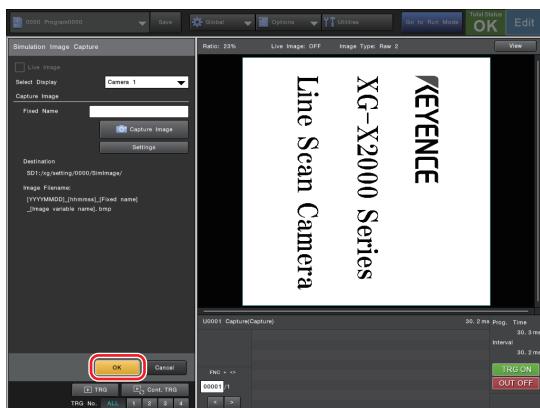
The camera image that you want to save will be displayed.

9 Select [Capture Image].



When a confirmation screen appears stating that saving of the image is complete, select [Close] to close the confirmation screen.

10 Select [OK] to close the operation screen.



11 Turn off the controller and remove the SD card from the SD1 slot.

INDEX

Numerics

8-way thumbpad 7-2

B

Bottom of the Controller 2-5
Brightness 4-7

C

CA-CHX10U 6-6, 6-14
CA-DC40E 5-14, 6-4, 6-7, 6-8
CA-DC50E 5-16, 6-5, 6-8
CA-E100L 5-13, 5-19, 6-4, 6-7, 6-8
CA-EN100U 3-9
Camera 4-6
CAMERA 1 connector 1-5
CAMERA 2 connector 1-5
Camera Cable 6-12
Camera Cable Extension Repeater 2-10, 6-6, 6-14
Camera Input Unit 2-3, 6-7, 6-8, 6-15
Camera LED threshold setting 4-14
CA-NCL20E 5-6, 6-5, 6-8
Capture Settings 4-13
CA-U4 6-28
CA-U5 6-29
CC-Link Interface 5-6
CC-Link Unit 2-4, 5-8, 6-8
Circuit 5-18
Close-up Ring 2-9
Communication Expansion Unit 2-3
Compatible Cameras by Controller 6-15
Connecting 2-10
Connecting a USB HDD 7-6
Connecting Cables 2-10, 2-15
CONSOLE/MOUSE (USB) connector 1-4
Controller 1-2, 1-3, 1-4, 2-2, 4-2, 6-2, 6-7
Cooling 2-2

D

DC 24 V power 2-12
Dedicated Mouse 6-9
Diffuse Reflection 2-13
Dimensions 6-7
DIN Rail 2-5

E

Encoder 4-11
Encoder connector 1-5
Encoder Relay Unit 3-9
Encoder Signal 4-12
ENCODER1 connector 5-13
ENCODER2 connector 5-13
ENCODER3 connector 5-13
ENCODER4 connector 5-13
Error LED 1-4
Error message 4-9, 4-10
Error Output 3-5
ESCAPE button 7-2
ETHERNET connector 1-5
Ethernet Interface 5-3
Example of connections 3-10, 5-18, 5-19, 5-21, 5-22
Expansion Unit 2-3, 5-13
Expansion unit connector 1-5
Exporting Settings 7-8

F

Fan unit 1-5
FOV Chart 2-7
FUNCTION button 7-2

G

Graph Viewer 4-13

H

Handheld Controller 7-2

INDEX

I	
I/O (parallel I/O) connector	1-4
I/O Interface	5-1
Illumination Expansion Unit	
.....2-4, 2-14, 2-15, 5-14, 5-16, 6-7, 6-8	
Importing Settings	7-9
Input Circuit Diagram	5-15, 5-18, 5-19
Input Signal	4-4
Input/Output Circuit	5-18
Inserting an SD Card	7-4
Install	2-6, 2-13
Installation	2-3, 2-5, 3-10

L	
Lens	2-7
Light	2-13, 4-6

M	
Main Specifications	6-2
MENU button	7-2
MONITOR (RGB output) terminal	1-4
Multiple Key Combinations	7-3

N	
No.0 button	7-2
No.1 button	7-2
No.2 button	7-2
No.3 button	7-2
No.4 button	7-2
No.5 button	7-2
No.6 button	7-2
No.7 Back button	7-2
No.8 selector switch	7-2

O	
OP-87506	2-11, 4-2, 6-9
OP-87983	2-11, 4-2, 6-9
Open Collector Output	3-11
Options	6-16
OUT/IN connector	1-5
Output circuit diagram	5-21
Output Signal	4-5
Output Time	3-8

P	
Parallel I/O Interface	5-9
Permission Output for Trigger 1 Input	3-4
Pin Layout	5-9, 5-12, 5-13
Port Specifications	5-3, 5-4, 5-6
Power and ground terminals	1-5
Power supply LED	1-4

R	
Removing a USB HDD	7-7
Removing an SD Card	7-5
Reset Signal	7-3
RS-232C Interface	5-2
RS-232C port	1-4
RS-422 Line Driver Output	3-9
Run Mode Output	3-5
RUN/STOP switch	7-2

S	
Saving Camera Images	4-8
SCREEN button	7-2
Screen capture	7-3
SD Card	7-4
Selector Switch	7-2
Setup Mode	4-3
Shading correction	4-14
Sharpness	4-7
Specular Reflection	2-13
Standard System Configuration	1-2
Status Change Time	3-8
Strobe Output	3-6
Supported SD Card Models	7-4
Supported USB HDD	7-6

T	
Terminal Block	1-5, 2-15
Terminal Block Interface	5-11, 5-15, 5-17
Timing Chart	3-7
Total Status Output	3-6
Transmittance	2-13
Trigger 1 Input	3-3
TRIGGER button	7-2

U

USB connector	1-4
USB driver	5-5
USB Handheld Controller	6-9
USB HDD	7-6
USB HDD connector	1-5
USB Interface	5-4

V

VIEW button	7-2
-------------------	-----

W

Wiring	3-1, 4-4
Wiring an Encoder	3-9
Wiring Diagram	5-6
Wiring Example	3-9, 3-10
Working Distance	2-7

X

XG-HL02M	2-7, 6-6, 6-10
XG-HL04M	2-7, 6-6, 6-10
XG-HL08M	2-8, 6-6, 6-11
XG-X2800/X2802	5-21, 6-2

Revision history

Date printed	Revision number	Revision contents
June 2016	Official release	

WARRANTIES AND DISCLAIMERS

- (1) KEYENCE warrants the Products to be free of defects in materials and workmanship for a period of one (1) year from the date of shipment. If any models or samples were shown to Buyer, such models or samples were used merely to illustrate the general type and quality of the Products and not to represent that the Products would necessarily conform to said models or samples. Any Products found to be defective must be shipped to KEYENCE with all shipping costs paid by Buyer or offered to KEYENCE for inspection and examination. Upon examination by KEYENCE, KEYENCE, at its sole option, will refund the purchase price of, or repair or replace at no charge any Products found to be defective. This warranty does not apply to any defects resulting from any action of Buyer, including but not limited to improper installation, improper interfacing, improper repair, unauthorized modification, misapplication and mishandling, such as exposure to excessive current, heat, coldness, moisture, vibration or outdoors air. Components which wear are not warranted.
- (2) KEYENCE is pleased to offer suggestions on the use of its various Products. They are only suggestions, and it is Buyer's responsibility to ascertain the fitness of the Products for Buyer's intended use. KEYENCE will not be responsible for any damages that may result from the use of the Products.
- (3) The Products and any samples ("Products/Samples") supplied to Buyer are not to be used internally in humans, for human transportation, as safety devices or fail-safe systems, unless their written specifications state otherwise. Should any Products/Samples be used in such a manner or misused in any way, KEYENCE assumes no responsibility, and additionally Buyer will indemnify KEYENCE and hold KEYENCE harmless from any liability or damage whatsoever arising out of any misuse of the Products/Samples.
- (4) **OTHER THAN AS STATED HEREIN, THE PRODUCTS/SAMPLES ARE PROVIDED WITH NO OTHER WARRANTIES WHATSOEVER. ALL EXPRESS, IMPLIED, AND STATUTORY WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF PROPRIETARY RIGHTS, ARE EXPRESSLY DISCLAIMED. IN NO EVENT SHALL KEYENCE AND ITS AFFILIATED ENTITIES BE LIABLE TO ANY PERSON OR ENTITY FOR ANY DIRECT, INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, ANY DAMAGES RESULTING FROM LOSS OF USE, BUSINESS INTERRUPTION, LOSS OF INFORMATION, LOSS OR INACCURACY OF DATA, LOSS OF PROFITS, LOSS OF SAVINGS, THE COST OF PROCUREMENT OF SUBSTITUTED GOODS, SERVICES OR TECHNOLOGIES, OR FOR ANY MATTER ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE PRODUCTS, EVEN IF KEYENCE OR ONE OF ITS AFFILIATED ENTITIES WAS ADVISED OF A POSSIBLE THIRD PARTY'S CLAIM FOR DAMAGES OR ANY OTHER CLAIM AGAINST BUYER.** In some jurisdictions, some of the foregoing warranty disclaimers or damage limitations may not apply.

BUYER'S TRANSFER OBLIGATIONS:

If the Products/Samples purchased by Buyer are to be resold or delivered to a third party, Buyer must provide such third party with a copy of this document, all specifications, manuals, catalogs, leaflets and written information provided to Buyer pertaining to the Products/Samples.

Specifications are subject to change without notice.

KEYENCE CORPORATION

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

www.keyence.com

AUSTRIA

Phone: +43 22 36-3782 66-0

FRANCE

Phone: +33 1 56 37 78 00

BELGIUM

Phone: +32 1 528 1222

GERMANY

Phone: +49 6102 36 89-0

BRAZIL

Phone: +55-11-3045-4011

HONG KONG

Phone: +852-3104-1010

CANADA

Phone: +1-905-366-7655

HUNGARY

Phone: +36 1 802 73 60

CHINA

Phone: +86-21-3357-1001

INDIA

Phone: +91-44-4963-0900

CZECH REPUBLIC

Phone: +420 222 191 483

ITALY

Phone: +39-02-6688220

KOREA

Phone: +82-31-789-4300

MALAYSIA

Phone: +60-3-7883-2211

MEXICO

Phone: +52-55-8850-0100

NETHERLANDS

Phone: +31 40 20 66 100

POLAND

Phone: +48 71 36861 60

ROMANIA

Phone: +40 269-232-808

SINGAPORE

Phone: +65-6392-1011

SLOVAKIA

Phone: +421 2 5939 6461

SLOVENIA

Phone: +386 1-4701-666

SWITZERLAND

Phone: +41 43-45577 30

TAIWAN

Phone: +886-2-2721-8080

THAILAND

Phone: +66-2-369-2777

UK & IRELAND

Phone: +44-1908-696900

USA

Phone: +1-201-930-0100

VIETNAM

Phone: +84-4-3772-5555

