OMRON

Vision Sensor

FH/FZ5 Series

Vision System

Hardware Setup Manual

FH-1□□□
FH-1□□□-□□
FH-3□□□
FH-3□□□-□□
FH-L□□□
FH-L□□□-□□

FZ5-6□□
FZ5-6□□-□□
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FZ5-8□□-□□
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FZ5-12□□
FZ5-12□□-□□
FZ5-L35□
FZ5-L35□-□□

SYSMAC
always in control

Z366-E1-05

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Introduction

Thank you for purchasing an FH series/FZ5 series Sensor Controller.

This manual contains information that is necessary to use the FH series/FZ5 series Sensor Controller.

Please read this manual and make sure you understand the functionality and performance of the FH series/FZ5 series Sensor Controller before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

Applicable Products

This manual covers the following products.

- FH-1□□□
- FH-1□□□-□□
- FH-3□□□
- FH-3□□□-□□
- FH-L□□□
- FH-L□□□-□□

- FZ5-6□□
- FZ5-6□□-□□
- FZ5-8□□
- FZ5-8□□-□□
- FZ5-11□□
- FZ5-11□□-□□
- FZ5-12□□
- FZ5-12□□-□□
- FZ5-L35□
- FZ5-L35□-□□

Part of the specifications and restrictions for the FH/FZ5-series are given in other manuals.

Refer to *Relevant Manuals* on page 2 and *Related Manuals* on page 26.

Relevant Manuals

The following table provides the relevant manuals for the FH/FZ5-series.

Read all of the manuals that are relevant to your system configuration and application before you use the FH/FZ5-series.

Information Reference Matrix	Manual					
	Basic information					
	Vision System FH/FZ5 Series User's Manual	Vision System FH/FZ5 series Hardware Setup Manual	FH/FZ5 Processing Item Function Reference Manual	Vision System FH/FZ5 series Macro Customize Functions Programming Manual	Vision System FH/FZ5 Series User's Manual for Communications Settings	Vision System FH series Operation Manual for Sysmac Studio
Overview of FZ/FZ5 series	●	●				
Setup and Wiring						
EtherCAT						
EtherNet/IP		●				
Ethernet						
RS-232C						
Parallel interface						
Setup the communication setting of Sensor Controller						
EtherCAT						●
EtherNet/IP	●	●			●	
Ethernet						
RS-232C						
Parallel interface						
Setup the Sensor Controller						
EtherCAT						●
EtherNet/IP	●				●	
Ethernet						
RS-232C						
Parallel interface						
Create and Set the Scene						
EtherCAT						●
EtherNet/IP	●		●			
Ethernet						
RS-232C						
Parallel interface						
Optimize the Scene Flow						
EtherCAT						
EtherNet/IP			●	●		
Ethernet						
RS-232C						
Parallel interface						

Information Reference Matrix	Manual					
	Basic information					
	Vision System FH/FZ5 Series User's Manual	Vision System FH/FZ5 series Hardware Setup Manual	FH/FZ5 Processing Item Function Reference Manual	Vision System FH/FZ5 series Macro Customize Functions Programming Manual	Vision System FH/FZ5 Series User's Manual for Communications Settings	Vision System FH series Operation Manual for Sysmac Studio
Connecting the Controller						
EtherCAT						●
EtherNet/IP	●	●			●	
Ethernet						
RS-232C						
Parallel interface						
Helpful Functions						
EtherCAT						●
EtherNet/IP	●					
Ethernet						
RS-232C						
Parallel interface						
Troubleshooting and Problem Solving	●					

Manual Structure

Page Structure

The following page structure is used in this manual.

This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use
Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use
Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information
Additional information to read as required.
This information is provided to increase understanding or make operation easier.

Reference
Information on differences in specifications and functionality for Sensor Controller with different unit versions and for different versions of the Sysmac Studio is given.

Sections in this Manual

1 Confirm the Package

2 Overview of FH/FZ5 series

3 Configuration

4 Handling and Installation Environment

5 Setup and Wiring

6 I/O Interface

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Terms and Conditions Agreement

Warranty, Limitations of Liability

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NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Safety Precautions

Symbols and the meanings for safety precautions described in this manual.

The following notation is used in this manual to provide precautions required to ensure safe usage of a Sensor Controller. The safety precautions that are provided are extremely important to safety.

Always read and heed the information provided in all safety precautions.

The following notation is used.

WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Meanings of Alert Symbols

	General Prohibition Indicates general prohibitions, including warnings, for which there is no specific symbol
	General Caution Indicates general cautions, including warnings, for which there is no specific symbol.
	Electrical Hazard Indicates the possible danger of electric shock under specific conditions.
	Explosion Hazard Indicates the possible danger of explosion under specific conditions.
	Laser Radiation Hazard Indicates the possible danger of laser radiation or light.
	High Temperature Caution Indicates the possible danger of injury by high temperature under specific conditions.

Alert statements in this Manual

⚠ WARNING

This product must be used according to this manual and Instruction Sheet. Failure to observe this may result in impairment of functions and performance of the product.	
This product is not designed or rated for ensuring safety of persons. Do not use it for such purposes.	
Never connect the AC power supply with this product. When the AC power supply is connected, it causes the electric shock and a fire.	
A lithium battery is built into the Sensor Controller and may occasionally combusted, explode, or burn if not treated properly. Dispose of the Sensor Controller as industrial waste, and never disassemble, apply pressure that would deform, heat to 100°C or higher, or incinerate the Sensor Controller.	
Since camera that can be connected with this product emits a visible light that may have an adverse effect on the eyes, do not stare directly into the light emitted from the LED. If a specular object is used, take care not to allow reflected light enter your eyes.	
Do not touch the terminals while the power supply is ON. Doing so may result in electrical shock.	
Please take external safety measures so that the system as a whole should be on the safe side even if a failure of a sensor controller or an error due to an external factor occurred. An abnormal operation may result in serious accident.	
Please take fail-safe measures on your side in preparation for an abnormal signal due to signal conductor disconnection and/or momentary power interruption. An abnormal operation may result in a serious accident.	

⚠ CAUTION

Danger of burns. Do not touch the case while the LED is ON or just after power is turned OFF, since it remains extremely hot.	

Precautions for Safe Use

Condition of the fitness of OMRON products

- Please do not use this product to directly or indirectly use to detect the human body for the purpose of ensuring the safety. In the same application, please use the safety sensor that is published on our sensor catalog.
- Omron products are designed and manufactured as general-purpose products for use in general industrial applications. They are not intended to be used in the following critical applications. If you are using Omron products in the following applications, Omron shall not provide any warranty for such Omron products, unless otherwise specifically agreed or unless the specific applications are intended by Omron.

(a) Applications with stringent safety requirements, including but not limited to nuclear power control equipment, combustion equipment, aerospace equipment, railway equipment, elevator/lift equipment, amusement park equipment, medical equipment, safety devices and other applications that could cause danger/harm to people's body and life.

(b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property.

(c) Applications under severe condition or in severe environment, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks

(d) Applications under conditions and environment not described in specifications

*1. In addition to the applications listed from (a) to (d) above, Omron products (see definition) are not intended for use in vehicles designed human transport (including two wheel vehicles). Please do NOT use Omron products for vehicles designed human transport. Please contact the Omron sales staff for information on our automotive line of products.

*2. The above is part of the Terms and Conditions Agreement. Please use carefully read the contents of the guarantee and disclaimers described in our latest version of the catalog, data sheets and manuals.

Installation Environment

- Do not use the product in areas where flammable or explosive gases are present.
- Install the product so that air can flow freely through its cooling vents.
- Clean the vent hole and discharge opening to prevent dust or particles from blocking them. Blocked cooling vents or discharge opening of the fan increasing heat inside, causing malfunction of the product.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.
- Make sure to tighten all installation screws securely.
- When mounting the Sensor Controller using the DIN rail mounting bracket, make sure the screw is tightened.
- Make sure to mount the DIN rail.

Power Supply and Wiring

- Make sure to use the product with the power supply voltage specified by catalogue, this manual, or Instruction sheet.
- Do not connect AC power supply.
  If AC power source is connected, possible to cause of failure.
- Use the appropriate wire size.
- Keep the power supply wires as short as possible.
- Use a DC power supply with safety measures against high-voltage spikes (safety extra low-voltage circuits on the secondary side).
- Check the following confirmations again before turning on the power supply.
  - Is the voltage and polarity of the power supply correct? (24VDC)
  - Is the load of the output signal not short-circuited?
  - Is the load current of the output signal appropriate?
  - There is no the mistake found in wiring?
  - Is the voltage and polarity of the Encoder power(ENC0_VDD/GND ENC1_VDD/GND) supply? (5VDC)

Ground

- Confirm the internal circuit is written in this manual or Instruction Sheet.
- When the connected camera to the Sensor Control comes packaged with a base, make sure to mount with the base. Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.
- Perform Class D grounding (with a grounding resistance of 100 Ω or less).
  Keep the ground line as short as possible by setting the grounding point as close as possible.
  Ground the FH Sensor Controller independently. If sharing the ground line with other devices or connecting it with a building beam, the controller might be adversely affected.
- Check wiring again before turning on the FH Sensor Controller.
- Do not ground the plus (+) terminal of the 24VDC power source when the following Sensor Controllers are connected to the FH-SC12/FH-SM12 (12 megapixels). Doing so may cause a short circuit of the internal circuit, resulting in a malfunction.
  - FH-1000 series
  - FH-3000 series
  - FH-L series
- Do not ground the plus (+) terminal of the 24VDC power source when the following Sensor Controllers are connected to the FH-MT12 with a USB cable. Doing so may cause a short circuit of the internal circuit, resulting in a malfunction.
  - FH-1000 series
  - FH-3000 series
  - FH-L series

Other

- Use only the camera and cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the power of the Sensor Controller and peripheral devices before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.
- Do not apply stress to the connector by pulling or bending the cable. It may damage the connector.
- Do not attempt to dismantle, repair, or modify the product.
- Should you notice any abnormalities, immediately stop use, turn OFF the power supply, and contact your OMRON representative.
- While the power is ON or immediately after the power is turned OFF, the Sensor Controller and camera case are still hot. Do not touch the case.
- When disposing of the product, treat it as an industrial waste.
- Do not drop the product nor apply excessive vibration or shock to the product. Doing so may cause malfunction or burning.
- This product is heavy. Be careful not to drop it while handling.
- A lithium battery is incorporated, so a severe injury may rarely occur due to ignition or explosion.
- Be sure to take fail-safe measures externally when controlling stages and robots by using the measurement results of the Sensor Controller (axis movement output by calibration and alignment measurement).

Precautions for Correct Use

Installation and Storage Sites for FH-1000, FH-3000, FZ5-1200, FZ5-1100, FZ5-800, FZ5-600, FZ5-L Series

Install and store the product in a location that meets the following conditions:

- Surrounding temperature of 0 to +50°C
- No rapid changes in temperature (place where dew does not form)
- Relative humidity of between 35 to 85%RH
- No presence of corrosive or flammable gases
- Place free of dust, salts and iron particles
- Place free of vibration and shock
- Place out of direct sunlight
- Place where it will not come into contact with water, oils or chemicals
- Place not affected by strong electro-magnetic waves
- Place not near to high-voltage, or high-power equipment

Installation and Storage Sites: FH-L series

Install and store the product in a location that meets the following conditions:

- Surrounding temperature of the following environment:
  - Installation: 0 to 55°C in
  - Storage: -25 to 70°C
- No rapid changes in temperature and place where dew does not form
- Relative humidity of between 10 to 90% RH
- No presence of corrosive or flammable gases
- Place free of dust, salts and iron particles
- Place free of vibration and shock
- Place out of direct sunlight
- Place where it will not come into contact with water, oils or chemicals
- Place not affected by strong electro-magnetic waves
- Place not near to high-voltage, or high-power equipment

Orientation of Product

- For good heat dissipation, install the product only in the position written this manual or Instruction Sheet so as not to block the ventilation holes.

Ambient Temperature

- For good heat dissipation, keep the distance written this manual or Instruction sheet.
- Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient temperature exceed an operating temperature range.
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near the upper range of operating temperature range so that the ambient temperature never exceeds the upper range of operating temperature range.

Noise Resistance

- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the Sensor Controller within 200 mm of power cables.

Component Installation and Handling

- Touching Signal Lines
  When touching a terminal part or a signal wire in a connector, take anti-static measures using a wrist strap or another device to prevent damage from static electricity.
- Handling a USB Memory/SD memory card
  For more details, refer to *Using External Memory Device* in the *Vision System FH/FZ5 Series User's Manual* (Cat. No. Z365).
- Do not insert an SD memory card in the reverse orientation, at an angle, or in a twisting manner.
- Before removing a USB memory device or SD memory card, make sure that data is not being read or written to them.
  For a USB memory device, the memory device's LED flashes or lights while data is being read or written, so make sure that it is turned OFF before removing the memory.
  For SD memory card, the SD BUSY LED flashes or lights while data is being read or written, so make sure that it is turned OFF before removing the memory.
- Turning OFF the Power Source
  When a message is displayed indicating that a task is in progress, do not turn OFF the power.
  Doing so causes the data in the memory to be corrupted, resulting in the product not operating properly upon the next start-up.
- When turns OFF, conform the followings proceedings have completed. and then operate again.
  - When saves using Sensor Controller:
    Confirm the save processing is completed and next operation is possible.
  - When saves using communication command:
    Intended command is completed. BUSY signal is turned OFF.
- Setting of Power Source
  The power source need to be supplied from DC power source apparatus which is taken a save ultra-low voltage circuit: to protect high voltage.

Maintenance

- Turn OFF the power and ensure the safety before maintenance.
- Clean the lens with a lens-cleaning cloth or air brush.
- Lightly wipe off dirt with a soft cloth.
- Dirt on the image element must be removed using an air brush.
- Do not use thinners or benzene.
- To ensure safe access for operation and maintenance, separate the Sensor Controller as much as possible from high-voltage equipment and power machinery.

Communication with High-order Device

- After confirming that this product is started up, communicate with the high-order device.
  When this product has started up, an indefinite signal may be output from the high-order interface.
  To avoid this problem, clear the receiving buffer of your device at initial operations.

Fail-Safe Measures

- When controlling stages and robots using the measurement results from the Sensor Controller (axis movement output based on calibration and alignment measurement), always take fail-safe measures within the stage and robot systems, such as checking whether the data obtained from the measurement results is within the range of movement of the stages and robots.
- On a FH Sensor Controller side, supplementary use operations and branches of the FH Sensor Controller to configure a check flow such as “data should not be externally provide if the data is in a range from-XXXXX to XXXXX” based on the stage/robots range of movement.

Connecting the Sensor Controller and Monitor with a Switcher and Splitter

- Do not use devices that may require re-recognition of the monitor by the sensor controller.
  Re-recognizing the monitor during switch may slow.

Regulations and Standards

All Series

Using Product Outside Japan

This regulation applies to FH/FZ5 sensor controller and peripheral devices.

If you export (or provide a non-resident with) this product or a part of this product that falls under the category of goods (or technologies) specified by the Foreign Exchange and Foreign Trade Control Law as those which require permission or approval for export, you must obtain permission or approval or service transaction permission) pursuant to the law.

U.S. California Notice

This product contains a lithium battery for which the following notice applies: Perchlorate Material - special handling may apply.

See www.dtsc.ca.gov/hazardouswaste/perchlorate

Conformance to KC Standards

This regulation applies to FH/FZ5 sensor controller and peripheral devices.

Observe the following precaution if you use this product in Korea.

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

- Class A Device (Broadcasting Communications Device for Office Use)

  This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes. Sellers and/or users need to take note of this.

FH-1000 and FH-3000 Series

Conformance to EC/EU Directives

This regulation applies to FH-1000/FH-5000 series Sensor Controller and peripheral devices.

The FH-1000/FH-5000 series Sensor Controller is compliant with the standards below:

- EC Directive 2004/108/EC (Until April 19 2016) / EU Directive 2014/30/EU (After April 20 2016)

  EN61326-1

  Electromagnetic environment: Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
- Also, the following condition is applied to the immunity test of this product.
  - If the level of disturbance of the video is such that characters on the monitor are readable, the test is a pass.
- This product complies with EC/EU Directives. EMC-related performance of the OMRON devices that comply with EC/EU Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed.
- The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.
- If there is a need to respond to the EC / EU directive, please use by an analog RGB output.

Conformance to UL Standards

This regulation applies to FH-1000 and FH-3000 series Sensor Controller and peripheral devices.

This product complies with UL Standards.

- UL508

FH-L series

Conformance to EC/EU Directives

This regulation applies to FH-L series Sensor Controller and peripheral devices.

The FH-L series Sensor Controller is compliant with the standards below:

- EC Directive 2004/108/EC (Until April 19 2016) / EU Directive 2014/30/EU (After April 20 2016)
  EN61326-1
  Electromagnetic environment: Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
- Also, the following condition is applied to the immunity test of this product.
  - If the level of disturbance of the video is such that characters on the monitor are readable, the test is a pass.
- This product complies with EC/EU Directives. EMC-related performance of the OMRON devices that comply with EC/EU Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed.
- The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.
- If there is a need to respond to the EC / EU directive, please use by an analog RGB output.

Conformance to UL Standards

This regulation applies to FH-L series Sensor Controller and peripheral devices.

This product complies with UL Standards.

- UL 61010-2-201

FZ5 and FZ-L Series

Conformance to EC/EU Directives

This regulation applies to FZ5/FZ5-L series Sensor Controller and peripheral devices.

The FZ5/FZ5-L series Sensor Controller is compliant with the standards below:

- EC Directive 2004/108/EC (Until April 19 2016) / EU Directive 2014/30/EU (After April 20 2016)

  EN61326-1

  Electromagnetic environment: Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
- Also, the following condition is applied to the immunity test of this product.
  - If the level of disturbance of the video is such that characters on the monitor are readable, the test is a pass.
- This product complies with EC/EU Directives. EMC-related performance of the OMRON devices that comply with EC/EU Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed.
- The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

Conformance to CSA Standards

This regulation applies to FZ5/FZ5-L Sensor Controller and peripheral devices.

This product complies with CSA Standards.

- CSA C22.2 No.61010-1

Related Manuals

The followings are the manuals related to this manual. Use these manuals for reference.

Name of Manual	Man.No.	Model	Purpose	Contents
Vision System FH Instruction Sheet	9607479-9	FH-1□□□ FH-1□□□-□□ FH-3□□□ FH-3□□□-□□	To confirm the safety and usage precautions of the Vision System FH series Sensor Controller.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FH series in the manual.
Vision System FH-L Instruction Sheet	9606631-1	FH-L□□□ FH-L□□□-□□	To confirm the safety and usage precautions of the Vision System FH-Lite series Sensor Controller.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FH-L series in the manual.
Vision System FZ5 Instruction Sheet	9524422-4	FZ5-6□□ FZ5-6□□-□□ FZ5-11□□ FZ5-11□□-□□	To confirm the setup procedures, safety and usage precautions of the Vision System FZ5-600, FZ5-1100 series Sensor Controller, including I/O setup and wiring.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FZ5-600, FZ5-1100 series in the manual.
Vision System FZ5 Instruction Sheet	9308317-7	FZ5-8□□ FZ5-8□□-□□ FZ5-12□□ FZ5-12□□-□□	To confirm the setup procedures, safety and usage precautions of the Vision System FZ5-800,FZ5-1200 series Sensor Controller, including I/O setup and wiring.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FZ5-800, FZ5-1200 series in the manual.
Vision System FZ5-L Instruction Sheet	9910002-2	FZ5-L35□ FZ5-L35□-□□	To confirm the setup procedures, safety and usage precautions of the Vision System FZ5-L Series Sensor Controller, including I/O setup and wiring.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FZ5-L series in the manual.
Vision System FH/FZ5 Series User's Manual	Z365	FH-1□□□ FH-1□□□-□□ FH-3□□□ FH-3□□□-□□ FH-L□□□ FH-L□□□-□□ FZ5-L35□ FZ5-L35□-□□ FZ5-6□□ FZ5-6□□-□□ FZ5-8□□ FZ5-8□□-□□ FZ5-11□□ FZ5-11□□-□□ FZ5-12□□ FZ5-12□□-□□	When User want to know how to setup the Sensor Controller of the Vision System FH/FZ5 series.	Describes the soft functions, setup, and operations to use Sensor Controller of the Vision System FH/FZ5 series.
Vision System FH/FZ5 series Hardware Setup Manual	Z366		When User want to know about the Hard-ware specifications or to setup the Sensor Controller of the Vision System FH/FZ5 series.	Describes FH/FZ5 series specifications, dimensions, part names, I/O information, installation information, and wiring information.
Vision System FH/FZ5 series Macro Customize Functions Programming Manual	Z367		When User operate or programming using Macro Customization functions.	Describes the functions, settings, and operations for using Macro Customize function of the FH/FH5-series.
Vision System FH/FZ5 series Processing Item Function Reference Manual	Z341		When User confirm the details of each processing items at the create the measurement flow or operate it.	Describes the software functions, settings, and operations for using FH/FH5-series.
Vision System FH/FZ5 Series User's Manual for Communications Settings	Z342		When User confirm the setting of communication functions.	Describes the functions, settings, and communications methods for communicating between FH/FH5 series. The following communication protocol are described. Parallel, PLC Link, EtherNet/IP, EtherCAT, and Non-procedure
Vision System FH Series Operation Manual for Sysmac Studio	Z343	FH-1□□□ FH-1□□□-□□ FH-3□□□ FH-3□□□-□□	When User connect to NJ series via EtherCAT communication.	Describes the operating procedures for setting up and operating FH series Vision Sensors from the Sysmac Studio FH Tools.

Terminology

Term	Definition
FH series	All FH series model names as follows: FH-1□□□, FH-1□□□-□□, FH-3□□□, FH-3□□□-□□, FH-L□□□, FH-L□□□-□□
FH-1000 series	All FH-1□□□ series model names as follows: FH-1□□□, FH-1□□□-□□
FH-3000 series	All FH-3□□□ series model names as follows: FH-3□□□, FH-3□□□-□□
FH-L series	All FH-L□□□ series model names as follows: FH-L□□□, FH-L□□□-□□
FZ5 series	All FZ5 series name shows the following: FZ5-6□□, FZ5-6□□-□□, FZ5-11□□, FZ5-11□□-□□, FZ5-L35□, FZ5-L35□-□□
FZ5-600 series	All FZ5-6□□ series name the following: FZ5-6□□, FZ5-6□□-□□
FZ5-800 series	All FZ5-8□□ series name the following: FZ5-8□□, FZ5-8□□-□□
FZ5-1100 series	All FZ5-11□□ series name the following: FZ5-11□□, FZ5-11□□-□□
FZ5-1200 series	All FZ5-12□□ series name the following: FZ5-12□□, FZ5-12□□-□□
FZ5-L series	All FZ5-L35□series name the following: FZ5-L35□, FZ5-L3□-□□
measurement flow (abbreviated as “flow”)	A continuous flow of measurement processing. A measurement flow consists of a scene created from a combination of processing items.
measurement processing	Executing processing items for inspections and measurements.
Measurement ID	measurement time YYYY-MM-DD_HH-MM-SS-XXXX (YYYY: Calendar, MM: Month, DD: Day, HH: Hour, MM: Minute, SS: Second, XXXX: Millisecond and Line number) Example Measurement time: 11:10:25.500 AM, December 24, 2007 and Line 0, the measurement ID is "2007-12-24_11-10-25-5000". Since the file name of the logging image also includes the same measurement ID, confirmation of the measurement data and image data can be performed with the measurement ID.
processing item	Any of the individual items for vision inspections that are partitioned and packaged so that they can be flexibly combined. These include the Search, Position Compensation, and Fine Matching items. Processing items can be classified for image input ([Input image]), inspection/measurement ([Measurement]), image correction ([Compensate image]), inspection/measurement support ([Support measurement]), process branching ([Branch]), results external output ([Output result]), resulting image display ([Display result]), etc. You can freely classify processing items to handle a wide range of applications. A scene (i.e., a unit for changing the measurement flow) is created by registering the processing items as units.

Term		Definition
Scene		A unit for changing the measurement flow that consists of a combination of processing items. “Scene” is used because of the correspondence to the scene (i.e., type of measurement object and inspection contents) where measurements are performed. A scene is created for each measurement or measurement contents. You can easily achieve a changeover simply by changing the scene when the measurement object or inspection content changes. Normally you can set up to 128 scenes. If you need more than 128 scenes, you can separate them into different groups or use the Conversion Scene Group Data Tool to create a scene group that contains over 128 scenes.
processing unit (abbreviated as “unit”)		A processing item that is registered in a scene. Numbers are assigned to processing units in order from the top and they are executed in that order. Processing items are registered for the processing units to create a scene (i.e., a unit for changing the measurement flow).
measurement trigger		A trigger for executing measurements. With a parallel interface, the STEP signal or command 00 (Continuous Measurement) is used. With a serial interface, an Execute One Measurement or a Start Continuous Measurement command is used.
test measurement		A measurement that is performed to manually test (check) measurements under the conditions that are set in the currently displayed scene. Test measurements can be executed on an Adjustment Window. Processing is completed inside the Controller and the measurement results are not normally output on an external interface. However, you can select [Output] in [Test measurement] to output the measurement results after executing measurements.
single measurement		A measurement that is executed only once in synchronization with the trigger input.
continuous measurement		Measurements are executed repeatedly and automatically without a trigger input.
Operation mode	Double Speed Multi-input	A mode that processes the measurement flow for the first trigger and then processes the measurement flow in parallel for the second trigger to achieve a high-speed trigger input interval. It is used together with the multi-input function.
	Multi-line random-trigger mode	A trigger mode that allows you to independently processing multiple measurement flows. With traditional image processing, two or more triggers cannot be acknowledged at the same time. In Multi-line Random-trigger Mode, you can randomly input multiple triggers into one Controller to independently process multiple scenes in parallel.
	Non-stop adjustment mode	A mode that allows you to adjust the flow and set parameters while performing measurements. The enables adjustments without stopping the line or stopping inspections.
	Standard	A logging mode that allows complete parallel processing of measurements and logging. Traditionally, logging was not possible while processing measurements. Either measurements or logging had to be given priority and the other one had to wait. With this mode, you can save the measurement images in external memory without affecting the transaction time.
parallel processing (an option for any of the above operation modes)		Parallel processing splits part of the measurement flow into two or more tasks, and processes each task in parallel to shorten the transaction time. Processing items for parallel processing are used so that the user can specify the required parallel processing.

Term	Definition
multi-input function	A function that is used to consecutively and quickly input images. It allows the next STEP signal to be acknowledged as soon as the image input processing is completed. There is no need to wait for measurement processing to be completed. You can check whether image input processing has been completed with the status of the READY signal. Even if the READY signal is ON when measurement processing is being executed, the next STEP signal can be acknowledged.
Position compensation	When the location and direction of measured objects are not fixed, the positional deviation between reference position and current position is calculated and measurement is performed after correcting. Please select processing items that are appropriate to the measurement object from processing items that are related to position compensation.
Reference position	The point that is always the reference. If the location of the registered model is different from the reference position, the setting should be changed in [Ref. setting].
Model	The image pattern that serves as the inspection target. Characteristics portions are extracted from images of the object and registered as model registration.

Term	Definition
2's complement	Binary numbers are generally used to represent negative numbers. Negative numbers are expressed by "Inverting all bits of a positive number and adding 1 to the result". (Example) "−1" is expressed as 2's complement "−1" can be calculated by "0-1". (In the case of 1, minus 1) 00000000 (= 0) -) 00000001 (= 1) 11111111 (=-1) ⇐ −“1” is expresses with 2’s Complement (for 8 bits) There are methods for simple calculation without performing this kind of computation. For instance, "Negative number = inverting all bits of a positive number and then adding 1 to the result". 00000001 (= 1) ↓ Invert all bits 11111110 ↓ Plus 1 11111111 (=-1) The first digit is used to judge whether the number is positive or negative. • When 0: Positive number (or 0) • When 1: Negative number The advantage of two's complement numbers is that positive and negative numbers can be used as is in calculations. (Example) When −1+10=9 11111111 (= -1) +)00001010 (= 10) 00001001 (= 9)

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.

Revision code	Date	Revised content
01	April 2016	Original production
02	August 2016	Corrected mistakes.
03	April 2017	Corrected mistakes and revisions for the support of NY series
04	April 2017	Corrected mistakes.
05	June 2017	Revisions for the support of FZ5-800 Series, FZ5-1200 Series, and FZ-S□5M3.

1

Confirm the Package

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1-1 Sensor Controller

First, please check to see if the package has all the necessary Sensor Controller parts.

1-1-1 FH-1□□□ / FH-3□□□ Series

- Sensor Controller: 1
  FH-1□□□ or FH-3□□□: 1
- Instruction Sheet (Japanese and English): 1
- Instruction Installation Manual for FH series: 1
- General Compliance Information and Instructions for EU: 1
- Power source: 1 (male)
  FH-XCN: 1
- Ferrite core for camera cable: 2

1-1-2 FH-1□□□-10 / FH-3□□□-10 Series

- Sensor Controller: 1
  FH-1□□□-10 or FH-3□□□-10: 1
- Instruction Sheet (Japanese and English): 1
- Instruction Installation Manual for FH series: 1
- General Compliance Information and Instructions for EU: 1
- Power source: 1 (male)
  FH-XCN: 1
- Ferrite core for camera cable: 4

1-1-3 FH-1□□□-20 / FH-3□□□-20 Series

- Sensor Controller: 1
  FH-1□□□-20 or FH-3□□□-20: 1
- Instruction Sheet (Japanese and English): 1
- Instruction Installation Manual for FH series: 1
- General Compliance Information and Instructions for EU: 1
- Power source: 1(male)
  FH-XCN: 1
- Ferrite core for camera cable: 8

1-1-4 FH-L□□□ Series

- Sensor Controller: 1
  FH-L□□□: 1
- Instruction Sheet (Japanese and English): 1
- Instruction Installation Manual for FH-L series: 1
- General Compliance Information and Instructions for EU: 1
- Power source: 1 (male)
  FH-XCN-L: 1

1-1-5 FH-L□□□-10 Series

- Sensor Controller: 1
  FH-L□□□-10: 1
- Instruction Sheet (Japanese and English): 1
- Instruction Installation Manual for FH-L series: 1
- General Compliance Information and Instructions for EU: 1
- Power source: 1 (male)
  FH-XCN-L: 1

1-1-6 FZ5-12□□ / FZ5-11□□ / FZ5-60□ / FZ5-8□□ Series

- Sensor Controller: 1
  FZ5-12□□, FZ5-12□□-10, FZ5-11□□, FZ5-11□□-10, FZ5-8□□, FZ5-8□□-10, FZ5-6□□, or FZ5-6□□-10
- Installation Instruction Manual for FZ5 series x 1 (FZ5-12□□, FZ5-8□□ Series only)
- General Compliance Information and Instructions for EU: 1
- Touch pen
- DIN rail mounting bracket: 6

1-1-7 FZ5-L35□ Series

- Sensor Controller: 1
  FZ5-L35□: 1
- Instruction Sheet (Japanese and English): 1
- General Compliance Information and Instructions for EU: 1

1-1-8 FZ5-L35□-10 Series

- Sensor Controller: 1
  FZ5-L35□-10: 1
- Instruction Sheet (Japanese and English): 1
- General Compliance Information and Instructions for EU: 1

1-2 Sold Separately

1-2-1 Cameras and Related

Camera

Appearance	Type	Description	Color / Mono-chrome	Image Acquisition Time	Model	Reference
	High-speed Digital CMOS Cameras (Lens required)	12 megapixels (Up to four cameras can be connected to one Controller. Up to eight cameras other than 12 megapixels cameras can be connected to a FH-3050-20 or a FH-1050-20.)	Color	25.7 ms*1	FH-SC12	
			Mono-chrome		FH-SM12	
	High-speed Digital CMOS Cameras (Lens required)	4 megapixels	Color	8.5 ms*1	FH-SC04	
			Mono-chrome		FH-SM04	
		2 megapixels	Color	4.6 ms*1	FH-SC02	
			Mono-chrome		FH-SM02	
		0.3 megapixels	Color	3.3 ms	FH-SC	
			Mono-chrome		FH-SM	
	Digital CCD Cameras (Lens required)	5 megapixels	Color	71.7 ms	FH-SC05R	
			Mono-chrome		FH-SM05R	
	Digital CCD/CMOS Cameras (Lens required)	5 megapixels (When connecting FZ5-L35□, up to two cameras can be connected.)	Color	62.5 ms	FZ-SC5M2	
			Mono-chrome		FZ-S5M2	
			Color	38.2 ms	FZ-SC5M3	
			Mono-chrome		FZ-S5M3	
		2 megapixels	Color	33.3 ms	FZ-SC2M	
			Mono-chrome		FZ-S2M	
		0.3 megapixels	Color	12.5 ms	FZ-SC	
			Mono-chrome		FZ-S	
	High-speed Digital CCD Cameras (Lens required)	0.3 megapixels	Color	4.9 ms	FZ-SHC	
			Mono-chrome		FZ-SH	
	Small Digital CCD Cameras (Lenses for small camera required)	0.3 megapixels flat type	Color	12.5 ms	FZ-SFC	
			Mono-chrome		FZ-SF	
		0.3 megapixels pen type	Color	12.5 ms	FZ-SPC	
			Mono-chrome		FZ-SP	
	Intelligent Compact Digital CMOS Cameras (Camera + Manual Focus Lens + High power Lighting)	Narrow view	Color	16.7 ms	FZ-SQ010F	
		Standard view	Color		FZ-SQ050F	
		Wide View (long-distance)	Color		FZ-SQ100F	
		Wide View (short-distance)	Color		FZ-SQ100N	

*1. Frame rate in high speed mode when the camera is connected using two camera cables. For other conditions, please refer to *3-2-1 High-speed digital CMOS Camera (FH-S camera series)* on page 3-27.

Camera Mounting Fitting

Appearance	Description		Model	Reference
	For Intelligent Compact Digital Camera	Mounting Bracket	FQ-XL	
		Precise Mounting Brackets	FQ-XL2	
		Polarizing Filter Attachment (Packaged item)	FQ-XF1	
---	Mounting Bracket for FZ-S□		FZ-S-XLC	
	Mounting Bracket for FZ-S□2M		FZ-S2M-XLC	
	Mounting Bracket for FZ-SH□		FZ-SH-XLC	
	Mounting Bracket for FH-S□, FZ-S□5M□		FH-SM-XLC	
	Mounting Bracket for FH-S□12		FH-SM12-XLC	

Camera Cable

Appearance	Description	Model[*1]	Reference
	Camera Cable Cable length: 2 m, 3 m, 5m, or 10 m[*2]	FZ-VS3 □M	
	Bend resistant Camera Cable Cable length: 2 m, 3 m, 5m, or 10 m[*2]	FZ-VSB3 □M	
	Right-angle Camera Cable[*3] Cable length: 2 m, 3 m, 5m, or 10 m[*2]	FZ-VSL3 □M	
	Bend resistant Right-angle Camera Cable[*3] Cable length: 2 m, 3 m, 5 m, or 10 m[*2]	FZ-VSLB3 □M	
	Long-distance Camera Cable Cable length: 15 m[*2]	FZ-VS4 15M	
	Long-distance Right-angle Camera Cable[*3] Cable length: 15 m[*2]	FZ-VSL4 15M	
	Cable Extension Unit Up to two Extension Units and three Cables can be connected. (Maximum cable length: 45 m[*2])	FZ-VSJ	

*1. Insert the cables length into □ in the model number as follows. 2 m = 2, 3 m = 3, 5 m = 5, 10 m = 10

*2. The maximum cable length depends on the Camera being connected, and the model and length of the Cable being used. For further information, please refer to *3-3-4 Cable Connection Table* on page 3-46 and *3-3-5 Cable Extension Units* on page 3-48.

When a high-speed digital CMOS camera FH-S□□02/-S□□04/-S□□12 is used in the high speed digital mode of transmission speed, two camera cables are required.

*3. This Cable has an L-shaped connector on the Camera end.

1-2-2 Monitor

Touch Panel Monitor and Cables

Appearance	Description	Model	Reference
	Touch Panel Monitor 12.1 inches For FH Sensor Controllers*1	FH-MT12	

*1. FH Series Sensor Controllers version 5.32 or higher is required.

Appearance	Description	Model	Reference
	DVI-Analog Conversion Cable for Touch Panel Monitor Cable length: 2 m, 5 m or 10 m	FH-VMDA □M*1	
	RS-232C Cable for Touch Panel Monitor Cable length: 2 m, 5 m or 10 m	XW2Z-□□□PP-1*2	
	USB Cable for Touch Panel Monitor Cable length: 2 m or 5 m	FH-VUAB □M*1	

*1. Insert the cables length into □ in the model number as follows. 2 m = 2, 5 m = 5, 10 m = 10

*2. Insert the cables length into □□□ in the model number as follows. 2 m = 200, 5 m = 500, 10 m = 010.

LCD Monitor and Cable

Appearance	Description		Model	Reference
	LCD Monitor 8.4 inches For Box-type Controllers*1		FZ-M08	
	LCD Monitor Cable When you connect a LCD Monitor FZ-M08 to FH sensor controller, please use it in combination with a DVI-I -RGB Conversion Connector FH-VMRGB.	2 m	FZ-VM 2M	
		5 m	FZ-VM 5M	
	DVI-I -RGB Conversion Connector		FH-VMRGB	

*1. It can be used in FH series.

1-2-3 Lighting and Lighting Controller

Appearance	Description			Model	Reference
---	External Lighting		---	FLV Series	For the method of setting the lighting controller, please refer to the respective instruction manual.
				FL Series	
	Lighting Controller (Required to control external lighting from a Controller)	For FLV-Series	Camera Mount Lighting Controller	FLV-TCC Series	
			Analog Lighting Controller	FLV-ATC Series	
		For FL-Series	Camera Mount Lighting Controller	FL-TCC Series	

1-2-4 Accessories

Appearance	Description				Model	Reference
	USB Memory	2 GB			FZ-MEM2G	
		8 GB			FZ-MEM8G	
	SD memory card	2 GB			HMC-SD291	
		4 GB			HMC-SD491	
	USB/Monitor Switcher				FZ-DU	
---	Mouse Driverless wired mouse (A mouse that requires the mouse driver to be installed is not supported.)				---	
	EtherCAT junction slaves	3 port	Power supply voltage: DC20.4V to DC28.8V (DC24V-15% to +20%)	Current consumption: 0.22 A	GX-JC03	
		6 port		Current consumption: 0.22 A	GX-JC06	
	Industrial Switching Hubs for EtherNet/IP and Ethernet	3 port	Failure detection: None	Current consumption: 0.22 A	W4S1-03B	
		5 port	Failure detection: None	Current consumption: 0.22 A	W4S1-05B	
			Failure detection: Supported		W4S1-05C	
---	Calibration Plate				FZD-CAL	
	Common items related to DIN rail (for FH-L550/-L550-10)	DIN rail mounting bracket			FH-XDM-L	
		DIN 35mm rail	PHOENIX CONTACT	• Length: 75.5/95.5/115.5/200 cm • Height: 7.5mm • Material: Iron • Surface: Conductive	NS 35/7,5 PERF	
				• Length:75.5/95.5/115.5/200 cm • Height: 15mm • Material: Iron • Surface Conductive	NS 35/15 PERF	
		End plate		Need 2 pieces each Sensor Controller	CLIPFIX 35	

1-2-5 Cable

Parallel I/O Cables/Encoder Cable

Item	Descriptions	Model
	Parallel I/O Cable *1 Cable length: 2 m, 5 m or 15 m	XW2Z-S013-□*2
	Parallel I/O Cable for Connector-terminal Conversion Unit *1 Cable length: 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 5 m Connector-Terminal Block Conversion Units can be connected (Recommended Connector-Terminal Block Conversion Unit: OMRON XW2R-□34GD-T)	XW2Z-□□□EE*3
	Connector-Terminal Block Conversion Units, General-purpose devices	XW2R-□34GD-T*4
	Encoder Cable for line-driver Cable length: 1.5 m	FH-VR 1.5M

*1. 2 Cables are required for all I/O signals.

*2. Insert the cables length into □ in the model number as follows.
2 m = 2, 5 m = 5, 15 m = 15

*3. Insert the cables length into □□□ in the model number as follows.
0.5 m = 050, 1 m = 100, 1.5 m = 150, 2 m = 200, 3 m = 300, 5 m = 500

*4. Insert the wiring method into □ in the model number as follows.
Phillips screw = J, Slotted screw (rise up) = E, Push-in spring = P
Refer to the XW2R Series catalog (Cat. No. G077) for details.

Recommended EtherCAT and EtherNet/IP Communications Cables

Use Straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT.

Use Straight or cross STP (shielded twisted-pair) cable of category 5 or higher for EtherNet/IP.

Item	Description				Model
	For EtherCAT	Standard type Cable with Connectors on Both Ends (RJ45/RJ45) • Wire Gauge and Number of Pairs: AWG27, 4-pair Cable, Cable Sheath material: LSZH*1 • Cable color: Blue, Yellow, or Green • Cables length: 0.2m, 0.3m, 0.5m, 1m, 1.5m, 2m, 3m, 5m, 7.5m, 10m, 15m, 20m			XS6W-6LSZH8SS□CM-Y
		Rugged type Cable with Connectors on Both Ends (RJ45/RJ45) • Wire Gauge and Number of Pairs: AWG22, 2-pair Cable • Cables length: 0.3m, 0.5m, 1m, 2m, 3m, 5m, 10m, 15m			XS5W-T421-□MD-K
		Rugged type Cable with Connectors on Both Ends (M12/RJ45) • Wire Gauge and Number of Pairs: AWG22, 2-pair Cable • Cables length: 0.3m, 0.5m, 1m, 2m, 3m, 5m, 10m, 15m			XS5W-T421-□MC-K
		Rugged type Cable with Connectors on Both Ends (M12 L/RJ45) • Wire Gauge and Number of Pairs: AWG22, 2-pair Cable • Cables length: 0.3m, 0.5m, 1m, 2m, 3m, 5m, 10m, 15m			XS5W-T422-□MC-K
--	For EtherCAT and EtherNet/IP	Wire Gauge and Number of Pairs: AWG24, 4-pair Cable	Cables	Hitachi Metals, Ltd.	NETSTAR-C5E SAB 0.5 × 4P*2
--				Kuramo Electric Co.	KETH-SB*2
--				SWCC Showa Cable Systems Co.	FAE-5004*2
--			RJ45 Connectors	Panduit Corporation	MPS588-C*2
--		Wire Gauge and Number of Pairs: AWG22, 2-pair Cable	Cables	Kuramo Electric Co.	KETH-PSB-OMR*3
--				Nihon Electric Wire&Cable Co.,Ltd.	PNET/B*3
			RJ45 Assembly Connector	OMRON	XS6G-T421-1*3
--	For EtherNet/IP	Wire Gauge and Number of Pairs: 0.5 mm, 4-pair Cable	Cables	Fujikura Ltd.	F-LINK-E 0.5mm × 4P*4
--			RJ45 Connectors	Panduit Corporation	MPS588*4

*1. The lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.
*2. We recommend you to use above cable for EtherCAT and EtherNet/IP, and RJ45 Connector together.
*3. We recommend you to use above cable for EtherCAT and EtherNet/IP, and RJ45 Assembly Connector together.
*4. We recommend you to use above cable for EtherNet/IP and RJ45 Connectors together.

Note Please be careful while cable processing, for EtherCAT, connectors on both ends should be shield connected and for EtherNet/IP, connectors on only one end should be shield connected.

1-2-6 Software

Product	Specifications	Number of licenses	Media	Model
Sysmac Studio Standard Edition Ver.1.□□	The Sysmac Studio is the software that provides an integrated environment for setting, programming, debugging and maintenance of machine automation controllers including the NJ/NX Series, EtherCat Slave, and the HMI. Sysmac Studio runs on the following OS. • OS: Windows XP (Service Pack 3 or higher, 32-bit version) / Windows Vista (32-bit version) / Windows 7 (32-bit/64-bit version) / Windows 8 (32-bit/64-bit version) / Windows 8.1 (32-bit/64-bit version)	--- (Media only)	DVD*1	SYSMAC-SE200D
		1 license	---	SYSMAC-SE201L
		3 license	---	SYSMAC-SE203L
		10 license	---	SYSMAC-SE210L
		30 license	---	SYSMAC-SE230L
		50 license	---	SYSMAC-SE250L
Sysmac Studio Vision Edition Ver.1.□□*2*3	Sysmac Studio Vision Edition is a limited license that provides selected functions required for FH-series/ FQ-M-series Vision Sensor settings.	1 license	---	SYSMAC-VE001L

Note 1. Site licenses are available for users who will run Sysmac Studio on multiple computers. Ask your OMRON sales representative for details.

2. Sysmac Studio version 1.07 or higher supports the FH Series. Sysmac Studio does not support the FZ5 Series.

*1. The same media is used for both the Standard Edition and the Vision Edition.

*2. With the Vision Edition, you can use only the setup functions for FH-series/FQ-M-series Vision Sensors.

*3. This product is a license only. You need the Sysmac Studio Standard Edition DVD media to install it.

Product	Specifications	Number of Model Standards licenses	Media	Model
Application Producer	Software components that provide a development environment to further customize the standard controller features of the FH Series. System requirements: • CPU: Intel Pentium Processor (SSE2 or higher) • OS: Windows 7 Professional (32/64bit) or Enterprise(32/64bit) or Ultimate (32/64bit), Windows 8 Pro(32/64bit) or Enterprise(32/64bit), Windows 8.1 Pro(32/64bit) or Enterprise(32/64bit) • .NET Framework: .NET Framework 3.5 or higher • Memory: At least 2 GB RAM Available disk space: At least 2 GB • Browser: Microsoft®Internet Explorer 6.0 or later • Display: XGA (1024 × 768), True Color (32-bit) or higher • Optical drive: CD/DVD drive • The following software is required to customize the software: Microsoft®Visual Studio®2010 Professional or Microsoft®Visual Studio®2008 Professional or Microsoft®Visual Studio®2012 Professional	--- (Media only)	CD-ROM	FH-AP1
		1 license	---	FH-AP1L

2

Overview of FH/FZ5 series

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2-1 Overview of System

2-1-1 Basic System of Measurement

An FH/FZ5 series Sensor Controller uses pre-built packages that contain all the processing tasks (for image input, measurement processing, displays, outputs, etc.) that are required for vision inspections.

You arrange these packaged processes in order of execution of the vision inspection.

An FH/FZ5 series Sensor Controller executes vision inspections according to user-created flows.

Additional Information

In the FH/FZ5 series Sensor Controller, a flow that contains packaged processes that are arranged in order of execution of processing items and image processing is called a measurement flow.

Processing items and measurement flows can have more than one setting. You can switch the setting based on the scene to inspect. (Refer to the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).)

Concept of Measurement Processing

When the FH/FZ5 receives a measurement trigger from the PLC or other external device, the image input from a Camera, measurement processing, and output of measurement results (e.g., OK/NG judgement results) are executed in the order that those processing items are registered in the measurement flow.

- In the measurement flow, you can change the processing to execute based on the inspection results or input conditions of the vision inspection.
- You can use macro processing to execute pre-packaged processing items and functions in the FH/FZ5 to create original programs. This allows you to create original measurement processes, display processing, input and output processing, and settings dialog boxes that are custom-tailored to your application.

2-1-2 FH-1000/FH-3000 Series

Vision System FH-1000 and FH-3000 series is the BOX type Sensor Controller having functions, high-speed, and safety, reliability, and maintainability of a machine embedded controller.

This series includes the previously supported image processing functions and with the addition of new EtherCAT support, this series now also has the high-speed connectivity needed for connection with programmable logic controllers and other devices with similar I/O requirements for EtherCAT communication.

With a maximum of 8 camera connections possible, high-speed image transfer, faster than previously available, is now possible than herebefore.

OMRON provides Sysmac device which unified communication specification or deigned User Interface specification. Vision System FH-1000 and FH-3000 series can be easily connected Sysmac device, i.e. NJ/NX/NY-series Controller or EtherCAT slave. Therefore the optimum functions or operations can be realized.

The following is an example system configuration.

EtherCAT Connection for FH Series

Example of the FH Sensor Controllers (4-camera type)

*1. To use STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT and RJ45 connector.

*2. To use STP (shielded twisted-pair) cable of category 5 or higher for Ethernet and RJ45 connector.

2-1-3 FH-L Series

Vision System FH-L series is the small, low-cost, and BOX type Sensor Controller. This series includes the necessary function for assembling machine and safety, reliability, and maintainability of a machine embedded controller.

This series supports a maximum of 4 camera connections, making high-speed image transfer, faster than previously available, possible.

*1. To use STP (shielded twisted-pair) cable of category 5 or higher for Ethernet and RJ45 connector.

2-1-4 FZ5 Series

Vision System FZ5 series is an LED integrated Sensor Controller with added positioning and inspection functionality not available in the FZ4 series.

- EtherNet/IP, No-protocol Ethernet and PLC Link Connections

  Example of the FZ5 Sensor Controllers (4-camera type)

*1. To use Straight or cross STP (shielded twisted-pair) cable of category 5 or higher for Ethernet and RJ45 connector.

2-1-5 FZ5-L Series

Vision System FZ5-L series is a low-cost, BOX type Sensor Controller with added positioning and inspection functionality not available in the FZ4 series.

2-2 System Configuration

2-2-1 FH-1000/FH-3000 Series

* Items indicated with an asterisk are dedicated items, and cannot be substituted.

* Sensor controller

The Controller performs the image processing specified by the user settings and outputs the measurement results.

Camera 2ch type	Camera 4ch type	Camera 8ch type
FH-3050	FH-3050-10	FH-3050-20
FH-1050	FH-1050-10	FH-1050-20

* Camera cable

Camera cable
FZ-VS3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant camera cable
FZ-VSB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Right-angle camera cable
FZ-VSL3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant Right-angle camera cable
FZ-VSLB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Long-distance camera cable
FZ-VS4 (15 m, min. bending radius: 78 mm)
Long-distance Right-angle camera cable
FZ-VSL4 (15 m, min. bending radius: 78 mm)

* Camera

Detects workpieces as images.

Standalone camera
FZ-SC/FZ-S/
FZ-SC2M/FZ-S2M/
FZ-SFC/FZ-SF/
FZ-SPC/FZ-SP/
FZ-SHC/FZ-SH
FH-SC/FH-SM
FH-SC02/FH-SM02
FH-SC04/FH-SM04
FZ-SC5M□/FZ-S5M□
FH-SC12/FH-SM12
FH-SC05R/FH-SM05R

Intelligent Compact Digital Camera
FZ-SQ010F/FZ-SQ050F/
FZ-SQ100F/FZ-SQ100N

* Camera with Lighting

FLV-TCC1/FLV-TCC4/
FLV-TCC1EP/FLV-TCC3HB

* LCD monitor

Use the monitor to check images and display the condition-setting menus.

FZ-M08 (8.4 inch)

* Monitor cable

FH-VMDA
(2 m, 5 m, 10 m, min. bending radius 36 mm)

* Touch panel monitor

Use the monitor to check images and display the condition-setting menus.

FH-MT12 (12.1 inch)

* Monitor cable

FH-VMDA
(2 m, 5 m, 10 m, min. bending radius 36 mm)

* Touch panel cable

FH-VUAB
(USB type, 2 m, 5 m, min. bending radius: 25 mm)
XW2Z-□□□PP-1
(RS-232C type, 2 m, 5 m, 10 m, min. bending radius: 59 mm)

Peripheral Device

* USB memory	* SD Memory Card
FZ-MEM2G	HMC-SD291
FZ-MEM8G	HMC-SD491

* Switcher
In case of switching multiple of sensor controllers with a single monitor or touch panel monitor, please make sure to use an appropriate product.
Recommended model by OMRON: FZ-DU

Power Supply

The power supply connected to FH Sensor Controller varies depending on the number of connected cameras and types for various consumption current types. Use is accordingly.
Recommended Model by OMRON:
S8VK-G series/S8VS series

Input Device

Mouse, track ball
(Commercially available USB devices)

2-2-2 FH-L Series

* Items indicated with an asterisk are dedicated items, and cannot be substituted.

* Sensor controller

The Controller performs the image processing specified by the user settings and outputs the measurement results.

Camera 2ch type
FH-L550

Camera 4ch type
FH-L550-10

* Camera cable

Camera cable
FZ-VS3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant camera cable
FZ-VSB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Right-angle camera cable
FZ-VSL3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant Right-angle camera cable
FZ-VSLB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Long-distance camera cable
FZ-VS4 (15 m, min. bending radius: 78 mm)
Long-distance Right-angle camera cable
FZ-VSL4 (15 m, min. bending radius: 78 mm)

* Camera

Detects workpieces as images.

Standalone camera
FZ-SC/FZ-S/
FZ-SC2M/FZ-S2M/
FZ-SFC/FZ-SF/
FZ-SPC/FZ-SP/
FZ-SHC/FZ-SH
FH-SC/FH-SM
FH-SC02/FH-SM02
FH-SC04/FH-SM04
FZ-SC5M□/FZ-S5M□
FH-SC12/FH-SM12
FH-SC05R/FH-SM05R

Intelligent Compact Digital Camera
FZ-SQ010F/FZ-SQ050F/
FZ-SQ100F/FZ-SQ100N

* Camera with Lighting

FLV-TCC1/FLV-TCC4/
FLV-TCC1EP/FLV-TCC3HB

* LCD monitor

Use the monitor to check images and display the condition-setting menus.

FZ-M08 (8.4 inch)

* Monitor cable

FH-VMDA
(2 m, 5 m, 10 m, min. bending radius 36 mm)

* Touch panel monitor

Use the monitor to check images and display the condition-setting menus.

FH-MT12 (12.1 inch)

* Monitor cable

FH-VMDA
(2 m, 5 m, 10 m, min. bending radius 36 mm)

* Touch panel cable

FH-VUAB
(USB type, 2 m, 5 m, min. bending radius: 25 mm)
XW2Z-□□□PP-1
(RS-232C type, 2 m, 5 m, 10 m, min. bending radius: 59 mm)

Peripheral Device

* USB memory
FZ-MEM2G
FZ-MEM8G

* SD Memory Card
HMC-SD291
HMC-SD491

* Switcher
In case of switching multiple of sensor controllers with a single monitor or touch panel monitor, please make sure to use an appropriate product.
Recommended model by OMRON: FZ-DU

Input Device

Mouse, track ball
(Commercially available USB devices)

Power Supply

The power supply connected to FH Sensor Controller varies depending on the number of connected cameras and types for various consumption current types. Use is accordingly.
Recommended Model by OMRON:
S8VK-G series/S8VS series

2-2-3 FZ5-600/FZ5-800/FZ5-1100/FZ5-1200 Series

* Items indicated with an asterisk are dedicated items, and cannot be substituted.

*

Sensor controller

The Controller performs the image processing specified by the user settings and outputs the measurement results.

Camera 2ch type	Camera 4ch type
FZ5-120□	FZ5-120□-10
FZ5-110□	FZ5-110□-10
FZ5-80□	FZ5-80□-10
FZ5-60□	FZ5-60□-10

Front view　　Right-side view

Touch pen (standard accessory)

*

Camera cable

Camera cable
FZ-VS3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant camera cable
FZ-VSB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Right-angle camera cable
FZ-VSL3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant Right-angle camera cable
FZ-VSLB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Long-distance camera cable
FZ-VS4 (15 m, min. bending radius: 78 mm)
Long-distance Right-angle camera cable
FZ-VSL4 (15 m, min. bending radius: 78 mm)

*

Camera

Detects workpieces as images.

Standalone camera
FZ-SC/FZ-S/
FZ-SC2M/FZ-S2M/
FZ-SFC/FZ-SF/
FZ-SPC/FZ-SP/
FZ-SHC/FZ-SH
FZ-SC5M□/FZ-S5M□

Intelligent Compact Digital Camera
FZ-SQ010F/FZ-SQ050F/
FZ-SQ100F/FZ-SQ100N

*

Camera with Lighting

Lighting controller
FLV-TCC1/FLV-TCC4
FL-TCC1

Peripheral Device

* USB memory
FZ-MEM2G
FZ-MEM8G

Power Supply

The power supply connected to FZ5 Sensor Controller differs depending on the number of connected cameras and types for various consumption current types. Select accordingly.
FZ5-600/FZ5-1100 Series
Recommended Model by OMRON:
S8VS series
FZ5-800/FZ5-1200 Series
Recommended Model by OMRON:
S8VK-G/S8VS series

Input Device

Mouse, track ball
(Commercially available USB devices)

2-2-4 FZ5-L Series

* Items indicated with an asterisk are dedicated items, and cannot be substituted.

*

Sensor controller

The Controller performs the image processing specified by the user settings and outputs the measurement results.

Camera 2ch type	Camera 4ch type
FZ5-L350	FZ5-L350-10
FZ5-L355	FZ5-L355-10

*

Camera cable

Camera cable
FZ-VS3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant camera cable
FZ-VSB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Right-angle camera cable
FZ-VSL3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Bend resistant Right-angle camera cable
FZ-VSLB3 (2 m, 3 m, 5 m, 10 m, min. bending radius: 69 mm)
Long-distance camera cable
FZ-VS4 (15 m, min. bending radius: 78 mm)
Long-distance Right-angle camera cable
FZ-VSL4 (15 m, min. bending radius: 78 mm)

*

Camera

Detects workpieces as images.

Standalone camera
FZ-SC/FZ-S/
FZ-SC2M/FZ-S2M/
FZ-SC5M□/FZ-S5M□/
FZ-SFC/FZ-SF/
FZ-SPC/FZ-SP/
FZ-SHC/FZ-SH

Intelligent Compact Digital Camera
FZ-SQ010F/FZ-SQ050F/
FZ-SQ100F/FZ-SQ100N

*

Camera with Lighting

FLV-TCC1/FLV-TCC4/
FLV-TCC1EP/FLV-TCC3HB

*

LCD monitor

Use the monitor to check images and display the condition-setting menus.

FZ-M08 (8.4 inch)

*

Monitor cable

FZ-VM (2m, 5m, bending radius: 75m)

Peripheral Device

* USB memory
  FZ-MEM2G
  FZ-MEM8G

Power Supply

The power supply connected to FZ5 Sensor Controller differs depending on the number of connected cameras and types for various consumption current types. Select accordingly.
Recommended Model by OMRON: S8VS series

Input Device

Mouse, Keyboard
(Commercially available USB devices)

2-3 Flow of Use Procedure

The following table shows the flow for using the FH/FZ5.

Procedure	Description	Reference
Preparations	Installation and Wiring	*Section 4 Handling and Installation Environment* *Section 5 Setup and Wiring*
	↓	
	Turning ON Power	*5-1 When turning ON and OFF* on page 5-3
	↓	
	Language Selection in Dialog Box (only when the Sensor Controller is started for the first time)	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Main Window (Layout 0) Display	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Camera Adjustments (Display the settings dialog box for a Camera Image Input processing item.)	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Select [Tool] − [System settings], and then under [Startup setting], set the settings for [Basic], [Communication], and [Operation mode].	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Click the [Data save] button, and then select [Function] − [System restart].	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Select [Tool] − [System settings], and then set the settings for [Camera], [Communication] and [Other].	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Click the [Data save] button, and then select [Function] − [System restart].	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
↓		
Scene Editing	In the Main Window (layout 0), edit the measurement flow. • Register processing items. • Set the properties for each processing item.	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Click the [Data save] button.	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
↓↑		

Procedure	Description	Reference
Testing	Execute test measurements. (In the Main Window (layout 0), click the [Measure] button.)	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	Adjust the parameters for each processing item.	*Vision System FH/FZ5 series Processing Item Function Reference Manual* (Cat. No. Z341)
	↓	
	Click the [Data save] button.	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
↓		
Measuring (Operation)	In the Main Window (layout 0), click the [Switch layout] button, and then select [Main Window (Layout 1)].	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)
	↓	
	In the Main Window (layout 1), check the communications with the PLC.	*Vision System FH/FZ5 series User's Manual for Communications Settings* (Cat. No. Z342)
	↓	
	In the Main Window (layout 1), execute commands from the PLC, such as measurement trigger commands.	*Vision System FH/FZ5 series User's Manual for Communications Settings* (Cat. No. Z342)
↓		
Management and Analysis	Save and analyze measurement data and images.	*Vision System FH/FZ5 series User's Manual* (Cat. No. Z365)

3

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3-1 Sensor Controller

3-1-1 FH-1000/FH-3000 Series

Specification

Sensor Controller Series			FH-3000 series			FH-1000 series		
Type			High-speed Controller (4 cores)			Standard Controller (2 cores)		
Sensor Controller Model			FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
Controller Type			BOX type					
Parallel IO			NPN/PNP (common)					
Main Functions	Operation Mode	Standard	Yes					
		Double Speed Multi-input	Yes					
		Non-stop adjustment mode	Yes					
		Multi-line random-trigger mode	Yes (Maximum 8 lines)					
	Parallel Processing		Yes					
	Number of Connectable Camera		2	4	8	2	4	8
	Supported Camera	FH-S series camera	All of the FH-S series cameras are connectable.		All of the FH-S series cameras are connectable.*1	All of the FH-S series cameras are connectable.		All of the FH-S series cameras are connectable.*1
		FZ-S series camera	All of the FZ-S series cameras are connectable.					
	Camera I/F		OMRON I/F					
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).					
	Possible Number of Logging Images to Sensor Controller							
	Possible Number of Scenes		128					
	Operating on UI	USB Mouse	Yes (wired USB and driver is unnecessary type)					
		Touch Panel	Yes (RS-232C/USB connection: FH-MT12)					
	Setup		Create the processing flow using Flow editing.					
	Language		Japanese, English, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Italian					

Sensor Controller Series			FH-3000 series			FH-1000 series		
Type			High-speed Controller (4 cores)			Standard Controller (2 cores)		
Sensor Controller Model			FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
External Interface	Serial Communication		RS-232C × 1					
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)					
		I/F	1000BASE-T × 1	1000BASE-T × 2		1000BASE-T × 1	1000BASE-T × 2	
	EtherNet/IP Communication		Ethernet port (transmission rate: 1Gbps)					
	EtherCAT Communication		Yes (slave)					
	Parallel I/O		• 12 inputs/31 outputs: • Use 1 Line. • Operation mode: Except Multi-line random-trigger mode.					
			• 17 inputs/37 outputs: • Use 2 Lines. • Operation mode: Multi-line random-trigger mode.					
			• 14 inputs/29 outputs: • Use 3 to 4 Lines. • Operation mode: Multi-line random-trigger mode.					
			• 19 inputs/34 outputs: • Use 5 to 8 Lines. • Operation mode: Multi-line random-trigger mode.					
	Encoder Interface		Input voltage: 5 V ± 5% Signal: RS-422A LineDriver Level Phase A/B/Z: 1 MHz					
	Monitor Interface		DVI-I output (Analog RGB & DVI-D single link) × 1					
	USB I/F		USB2.0 host × 4 (BUS Power: Port5 V/0.5 A)					
	SD Card I/F		SDHC × 1					
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Green ACCESS: Yellow					
	Ethernet		NET RUN: Green NET LINK ACT: Yellow	NET RUN1: Green NET LINK ACK1: Yellow NET RUN2: Green NET LINK ACK2: Yellow		NET RUN: Green NET LINK ACT: Yellow	NET RUN1: Green NET LINK ACK1: Yellow NET RUN2: Green NET LINK ACK2: Yellow	
	SD Card		SD POWER: Green SD BUSY: Yellow					
	EtherCAT		EtherCAT RUN LED: Green EtherCAT LINK/ACT IN LED: Green EtherCAT LINK/ACT OUT LED: Green EtherCAT ERR LED: Red					
Power-supply voltage			20.4 VDC to 26.4 VDC					

Sensor Controller Series			FH-3000 series			FH-1000 series		
Type			High-speed Controller (4 cores)			Standard Controller (2 cores)		
Sensor Controller Model			FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
Current consumption	When connected to a Controller	Connected to 2 cameras	5.0 A max.	5.4 A max.	6.4 A max.	4.7 A max.	5.0 A max.	5.9 A max.
		Connected to 4 cameras	---	7.0 A max.	8.1 A max.	---	6.5 A max.	7.5 A max.
		Connected to 8 cameras	---	---	11.5 A max.	---	---	10.9 A max.
	When not connected to Controller	Connected to 2 cameras	4.1 A max.	4.2 A max.	5.2 A max.	3.6 A max.	3.7 A max.	4.5 A max.
		Connected to 4 cameras	---	4.8 A max.	5.6 A max.	---	4.3 A max.	5.0 A max.
		Connected to 8 cameras	---	---	6.8 A max.	---	---	6.2 A max.
Built-in FAN			Yes					
Usage Environment	Ambient temperature range		Operating: 0°C to 50°C Storage: -20 to +65°C (with no icing or condensation)					
	Ambient humidity range		Operating:35 to 85%RH Storage: 35 to 85%RH (with no condensation)					
	Ambient atmosphere		No corrosive gases					
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration: 15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 Vibration direction: up and down/front and behind/left and right			Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration: 15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 Vibration direction: up and down/front and behind/left and right		
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right			Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right		
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min					
	Grounding		Type D grounding (100Ω or less grounding resistance)*2					
External Features	Dimensions		190 mm × 115 mm × 182.5 mm Note Height: Including the rubber feet at the base.					
	Weight		Approx. 3.2 kg	Approx. 3.4 kg	Approx. 3.4 kg	Approx. 3.2 kg	Approx. 3.4 kg	Approx. 3.4 kg
	Degree of protection		IEC60529 IP20					
	Case material		Cover: zinc-plated steel plate Side plate: aluminum (A6063)					

*1. When the 12 megapixels camera: Max. 4 cameras are connectable.
When use except 12 megapixels cameras: Max. 8 cameras are connectable.

*2. Existing third class grounding

Component Names and Functions

	Connector name	Description
(A)	SD memory card installation connector	Install the SD memory card. Do not plug or unplug the SD memory card during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
(B)	Ethernet connector	Connect an Ethernet device. Camera 2ch type: Ethernet port and EtherNet/IP port are sharing use. Camera 4ch/8ch type: Upper port : Ethernet port Lower port : Ethernet port and EtherNet/IP port are sharing use.
(C)	USB connector	Connect a USB device. Do not plug or unplug it during measurement. Measurement time might be affected otherwise.
(D)	RS-232C connector	Connect an external device such as a PLC.
(E)	DVI-I connector	Connect a monitor.
(F)	I/O(Parallel) connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor and PLC.
(G)	EtherCAT address setup volume	Used to set a station address (00 to 99) as an EtherCAT communication device.
(H)	EtherCAT communication connector (IN)	Connect the opposed EtherCAT device.
(I)	EtherCAT communication connector (OUT)	Connect the opposed EtherCAT device.
(J)	Encoder connector	Connect an encoder.
(K)	Camera connector	Connect cameras.
(L)	Power supply terminal connector	Connect a DC power supply. Wire the FH Sensor Controller independently on other devices. Wire the ground line. Be sure to ground the FH Sensor Controller alone. Use an attachment power terminal (male) for installation. For details, refer to *5-3-2 FH-1000/FH-3000 Series* on page 5-8.

	LED name	Description
(A)	POWER LED	Lit while power is ON.
(B)	ERROR LED	Lit when an error has occurred.
(C)	RUN LED	Lit while the layout turned on output setting is displayed.
(D)	ACCESS LED	Blinks while the internal nonvolatile memory is accessed.
(E)	SD POWER LED	Lit while power is supplied to the SD memory card and the card is usable.
(F)	SD BUSY LED	Blinks while the SD memory card is accessed.
(G)	EtherCAT RUN LED	Lit while EtherCAT communications are usable.
(H)	EtherCAT LINK/ACT IN LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
(I)	EtherCAT LINK/ACT OUT LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
(J)	EtherCAT ERR LED	Lit when EtherCAT communications have become abnormal.
(K)	Ethernet NET RUN1 LED	Lit while Ethernet communications are usable.
(L)	Ethernet NET LINK/ACK1	Lit when connected with an Ethernet device, and blinks while performing communications.
(M)	Ethernet NET RUN2 LED	Lit when Ethernet communications are usable.
(N)	Ethernet NET LINK/ACK2 LED	Lit when connected with an Ethernet device, and blinks while performing communications.

Dimensions

Sensor Controllers
FH-series Box-type
FH-3050/-3050-10/-3050-20
FH-1050/-1050-10/-1050-20

(Unit: mm)

3-1-2 FH-L Series

Specification

Sensor Controller Series			FH-L series	
Type			Lite Controller	
Sensor Controller Model			FH-L550	FH-L550-10
Controller Type			BOX type	
Parallel IO			NPN/PNP (common)	
Main Functions	Operation Mode	Standard	Yes	
		Double Speed Multi-input	Yes	
		Non-stop adjustment mode	Yes	
		Multi-line random-trigger mode	No	
	Parallel Processing		Yes	
	Number of Connectable Camera		2	4
	Supported Camera	FH-S series camera	All of the FH-S series cameras are connectable	
		FZ-S series camera	All of the FZ-S series cameras are connectable.	
	Camera I/F		OMRON I/F	
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).	
	Possible Number of Logging Images to Sensor Controller			
	Possible Number of Scenes		128	
	UI Operations	USB Mouse	Yes (wired USB driver-less type)	
		Touch Panel	Yes (RS-232C/USB connection: FH-MT12)	
	Setup		Create the processing flow using Flow editing.	
	Language		Japanese, English, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Italian	
External Interface	Serial Communication		RS-232C × 1	
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)	
		I/F	1000BASE-T × 1	
	EtherNet/IP Communication		Ethernet port (transmission rate: 1 Gbps)	
	EtherCAT Communication		No	
	Parallel I/O		• High-speed input: 1 • Normal speed: 9 • High-speed output: 4 • Normal speed: 23	
	Encoder Interface		None	
	Monitor Interface		DVI-I output (Analog RGB & DVI-D single link) × 1	
	USB I/F		USB2.0 host × 1: BUS Power: Port 5 V/0.5 A USB3.0 × 1: BUS Power: Port 5 V/0.5 A	
	SD Card I/F		SDHC × 1	
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Green ACCESS: Yellow	
	Ethernet		NET RUN: Green NET LINK ACT: Yellow	
	SD Card		SD POWER: Green SD BUSY: Yellow	
	EtherCAT		None	

Sensor Controller Series			FH-L series	
Type			Lite Controller	
Sensor Controller Model			FH-L550	FH-L550-10
Power-supply voltage			20.4 VDC to 26.4 VDC	
Current consumption	When connected to a Controller	Connected to 2 cameras	3.5 A max.	3.7 A max.
		Connected to 4 cameras	---	5.9 A max.
		Connected to 8 cameras	---	---
	When not connected to Controller	Connected to 2 cameras	1.5 A max.	1.7 A max.
		Connected to 4 cameras	---	2.0 A max.
		Connected to 8 cameras	---	---
Built-in FAN			No	
Usage Environment	Ambient temperature range		Operating: 0°C to 55°C Storage: -25 to +70°C	
	Ambient humidity range		Operating and Storage: 10 to 90%RH (with no condensation)	
	Ambient atmosphere		No corrosive gases	
	Vibration tolerance		5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s^2 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)	
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right	
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min	
	Grounding		Type D grounding (100 Ω or less grounding resistance)*1	
External Features	Dimensions		200 mm × 80 mm × 130 mm	
	Weight		Approx. 1.5 kg	Approx. 1.5 kg
	Degree of protection		IEC60529 IP20	
	Case materials		PC	

*1. Existing third class grounding

Component Names and Functions

	LED name	Description
(A)	PWR LED	Lit while power is ON.
(B)	ERROR LED	Lit when an error has occurred.
(C)	RUN LED	Lit while the layout turned on output setting is displayed.
(D)	ACCESS LED	Blinks while the internal nonvolatile memory is accessed.
(E)	SD PWR LED	Lit while power is supplied to the SD memory card and the card is usable.
(F)	SD BUSY LED	Lit when access to the SD memory card.
(G)	Ethernet NET RUN LED	Lit while Ethernet communications are usable.
(H)	Ethernet NET LINK/ACT LED	Blinks when connected with an Ethernet device, and blinks while performing communications.

	Connector name	Description
(A)	SD memory card installation connector	Install the SD memory card. Do not plug or unplug the SD memory card during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
(B)	USB 2.0 connector	Connects to USB 2.0. Do not insert or remove during loading or writing of measurement or data. The measurement time can be longer or data can be damaged.
(C)	USB 3.0 connector	Connects to USB 3.0. Do not insert or remove during loading or writing of measurement or data. The measurement time can be longer or data can be damaged. USB 3.0 has a high ability to supply the bus power. Use the Sensor Controller by combining USB 3.0, faster transport can be realized.
(D)	Ethernet connector	Connect an Ethernet device. Shared Ethernet port and EtherNet/IP port.
(E)	RS-232C connector	Connect an external device such as a programmable controller
(F)	Monitor connector	Connect a monitor.
(G)	Parallel connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor.
(H)	Camera connector	Connect a camera.
(I)	Power supply terminal connector	Connect a DC power supply. Wire the controller independently on other devices. Wire the ground line. Be sure to ground the FH Sensor Controller alone. Use the attachment power terminal connector (male) of FH-XCN-L series. For details, refer to *5-3 Sensor Controller Installation* in this manual.

Dimensions

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-1-3 FZ5-600/FZ5-800/FZ5-1100/FZ5-1200 Series

Specification

● FZ5-1200 Series

Sensor Controller Series			FZ5-1200 series			
Type			High-speed Controller			
Sensor Controller Model			FZ5-1200	FZ5-1205	FZ5-1200-10	FZ5-1205-10
Controller Type			Liquid Crystal Display type			
Parallel IO			NPN	PNP	NPN	PNP
Main Functions	Operation Mode	Standard	Yes			
		Double Speed Multi-input	Yes			
		Non-stop adjustment mode	Yes			
		Multi-line random-trigger mode	Yes (Maximum 2 lines)			
	Parallel Processing		Yes			
	Number of Connectable Camera		2		4	
	Supported Camera	FH-S series camera	Not connectable			
		FZ-S series camera	All of the FZ-S series cameras are connectable.			
	Camera I/F		OMRON I/F			
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).			
	Possible Number of Logging Images to Sensor Controller					
	Possible Number of Scenes		128 *1			
	Operating on UI	USB Mouse	Yes (wired USB driver-less type)			
		Touch Panel	No (RS-232C/USB connection: FH-MT12)			
	Setup		Create the processing flow using Flow editing.			
	Language		Japanese, English, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Italian			
External Interface	Serial Communication		RS-232C/422 × 1			
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)			
		I/F	1000BASE-T × 1			
	EtherNet/IP Communication		Ethernet port (transmission rate: 100 Mbps)			
	EtherCAT Communication		No			
	Parallel I/O		13 inputs/26 outputs			
	Encoder Interface		None			
	Monitor Interface		Analog RGB video output × 1			
	USB I/F		USB2.0 host × 4 (BUS Power: Port 5 V/0.5 A)			
	SD Card I/F		None			
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Yellow			
	Ethernet		NET RUN: Green NET LINK ACT: Yellow			
	SD Card		None			
	EtherCAT		None			
Power-supply voltage			20.4 VDC to 26.4 VDC			

Sensor Controller Series			FZ5-1200 series			
Type			High-speed Controller			
Sensor Controller Model			FZ5-1200	FZ5-1205	FZ5-1200-10	FZ5-1205-10
Current consumption	When connected to a Controller	Connected to 2 cameras	5.0 A max.		7.5 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---		---	
	When not connected to Controller	Connected to 2 cameras	3.7 A max.		4.9 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
Built-in FAN			Yes			
Usage Environment	Ambient temperature range		Operating: 0°C to 45°C (When the Built-in FAN is set to slow rotation.) Operating: 0°C to 50°C (When the Built-in FAN is set to fast rotation.) Storage: -20 to +65°C			
	Ambient humidity range		Operating and Storage: 35 to 85%RH (with no condensation)			
	Ambient atmosphere		No corrosive gases			
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration:15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 times Vibration direction: up and down/front and behind/left and right			
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right			
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms, Period: 300ms, Application time: 1 min. • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min			
	Grounding		Type D grounding (100Ω or less grounding resistance)*2			
External Features	Dimensions		260 mm × 308 mm × 83 mm		260 mm × 308 mm × 104 mm	
	Weight		Approx. 3.2 kg		Approx. 3.4 kg	
	Degree of protection		IEC60529 IP20			
	Case material		ABS			

*1. This can be increased up to 1024 using the Scene group conversion tool.

*2. Existing third class grounding

● FZ5-1100 Series

Sensor Controller Series			FZ5-1200 series			
Type			High-speed Controller			
Sensor Controller Model			FZ5-1200	FZ5-1205	FZ5-1200-10	FZ5-1205-10
Controller Type			Liquid Crystal Display type			
Parallel IO			NPN	PNP	NPN	PNP
Main Functions	Operation Mode	Standard	Yes			
		Double Speed Multi-input	Yes			
		Non-stop adjustment mode	Yes			
		Multi-line random-trigger mode	Yes (Maximum 2 lines)			
	Parallel Processing		Yes			
	Number of Connectable Camera		2		4	
	Supported Camera	FH-S series camera	Not connectable			
		FZ-S series camera	All of the FZ-S series cameras are connectable.			
	Camera I/F		OMRON I/F			
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).			
	Possible Number of Logging Images to Sensor Controller					
	Possible Number of Scenes		128 *1			
	Operating on UI	USB Mouse	Yes (wired USB driver-less type)			
		Touch Panel	No (RS-232C/USB connection: FH-MT12)			
	Setup		Create the processing flow using Flow editing.			
	Language		Japanese, English, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Italian			
External Interface	Serial Communication		RS-232C/422 × 1			
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)			
		I/F	1000BASE-T × 1			
	EtherNet/IP Communication		Ethernet port (transmission rate: 100 Mbps)			
	EtherCAT Communication		No			
	Parallel I/O		13 inputs/26 outputs			
	Encoder Interface		None			
	Monitor Interface		Analog RGB video output × 1			
	USB I/F		USB2.0 host × 4 (BUS Power: Port 5 V/0.5 A)			
	SD Card I/F		None			
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Yellow			
	Ethernet		NET RUN: Green NET LINK ACT: Yellow			
	SD Card		None			
	EtherCAT		None			
Power-supply voltage			20.4 VDC to 26.4 VDC			
Current consumption	When connected to a Controller	Connected to 2 cameras	5.0 A max.		7.5 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---		---	
	When not connected to Controller	Connected to 2 cameras	3.7 A max.		4.9 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
Built-in FAN			Yes			

Sensor Controller Series			FZ5-1200 series			
Type			High-speed Controller			
Sensor Controller Model			FZ5-1200	FZ5-1205	FZ5-1200-10	FZ5-1205-10
Usage Environment	Ambient temperature range		Operating: 0°C to 45°C (When the Built-in FAN is set to slow rotation.) Operating: 0°C to 50°C (When the Built-in FAN is set to fast rotation.) Storage: -20 to +65°C			
	Ambient humidity range		Operating and Storage: 35 to 85%RH (with no condensation)			
	Ambient atmosphere		No corrosive gases			
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration:15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 times Vibration direction: up and down/front and behind/left and right			
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right			
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms, Period: 300ms, Application time: 1 min. • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min			
	Grounding		Type D grounding (100Ω or less grounding resistance)*2			
External Features	Dimensions		260 mm × 308 mm × 83 mm		260 mm × 308 mm × 104 mm	
	Weight		Approx. 3.2 kg		Approx. 3.4 kg	
	Degree of protection		IEC60529 IP20			
	Case material		ABS			

*1. This can be increased up to 1024 using the Scene group conversion tool.

*2. Existing third class grounding

● FZ5-800 Series

Sensor Controller Series			FZ5-800 series			
Type			Standard Controller			
Sensor Controller Model			FZ5-800	FZ5-805	FZ5-800-10	FZ5-805-10
Controller Type			Liquid Crystal Display type			
Parallel IO			NPN	PNP	NPN	PNP
Main Functions	Operation Mode	Standard	Yes			
		Double Speed Multi-input	Yes			
		Non-stop adjustment mode	Yes			
		Multi-line random-trigger mode	Yes			
	Parallel Processing		No			
	Number of Connectable Camera		2		4	
	Supported Camera	FH-S series camera	Not connectable			
		FZ-S series camera	All of the FZ-S series cameras are connectable. (When the 5 megapixel camera is connected, the maximum connectable camera is 2.)			
	Camera I/F		OMRON I/F			
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).			
	Possible Number of Logging Images to Sensor Controller					
	Possible Number of Scenes		128 *1			
	Operating on UI	USB Mouse	Yes (wired USB driver-less type)			
		Touch Panel	No (RS-232C/USB connection: FH-MT12)			
	Setup		Create the processing flow using Flow editing.			
	Language		Japanese, English, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Italian			
External Interface	Serial Communication		RS-232C/422 × 1			
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)			
		I/F	1000BASE-T × 1			
	EtherNet/IP Communication		Ethernet port (transmission rate: 100 Mbps)			
	EtherCAT Communication		No			
	Parallel I/O		• 1 line mode: 13 inputs/26 outputs • 2 line random trigger mode: 17 inputs/29 outputs			
	Encoder Interface		None			
	Monitor Interface		Analog RGB video output × 1 for maintenance			
	USB I/F		USB2.0 host × 4 (BUS Power: Port 5V)			
	SD Card I/F		None			
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Yellow			
	Ethernet		NET RUN: Green NET LINK ACT: Yellow			
	SD Card		None			
	EtherCAT		None			
Power-supply voltage			20.4 VDC to 26.4 VDC			
Current consumption	When connected to a Controller	Connected to 2 cameras	5.0 A max.		7.5 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
	When not connected to Controller	Connected to 2 cameras	3.7 A max.		4.9 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			

Sensor Controller Series			FZ5-800 series			
Type			Standard Controller			
Sensor Controller Model			FZ5-800	FZ5-805	FZ5-800-10	FZ5-805-10
Built-in FAN			Yes			
Usage Environment	Ambient temperature range		Operating: 0°C to 45°C (When the built-in FAN is set to slow rotation.) Operating: 0°C to 50°C (When the built-in FAN is set to fast rotation.) Storage: -20 to +65°C			
	Ambient humidity range		Operating and Storage: 35 to 85%RH (with no condensation)			
	Ambient atmosphere		No corrosive gases			
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration: 15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 times Vibration direction: up and down/front and behind/left and right			
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right			
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms, Period: 300ms, Application time: 1 min. • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min			
	Grounding		Type D grounding (100Ω or less grounding resistance)*2			
External Features	Dimensions		260 mm × 308 mm × 83 mm		260 mm × 308 mm × 104 mm	
	Weight		Approx. 3.2 kg		Approx. 3.4 kg	
	Degree of protection		IEC60529 IP20			
	Case material		ABS			

*1. This can be increased up to 1024 using the Scene group conversion tool.

*2. Existing third class grounding

● FZ5-600 Series

Sensor Controller Series			FZ5-600 series			
Type			Standard Controller			
Sensor Controller Model			FZ5-600	FZ5-605	FZ5-600-10	FZ5-605-10
Controller Type			Liquid Crystal Display type			
Parallel IO			NPN	PNP	NPN	PNP
Main Functions	Operation Mode	Standard	Yes			
		Double Speed Multi-input	Yes			
		Non-stop adjustment mode	Yes			
		Multi-line random-trigger mode	No			
	Parallel Processing		No			
	Number of Connectable Camera		2		4	
	Supported Camera	FH-S series camera	Not connectable			
		FZ-S series camera	All of the FZ-S series cameras are connectable. (When the 5 megapixel camera is connected, the maximum connectable camera is 2.)			
	Camera I/F		OMRON I/F			
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).			
	Possible Number of Logging Images to Sensor Controller					
	Possible Number of Scenes		128			
	Operating on UI	USB Mouse	Yes (wired USB driver-less type)			
		Touch Panel	No (RS-232C/USB connection: FH-MT12)			
	Setup		Create the processing flow using Flow editing.			
	Language		Japanese, English, Simplified Chinese, Traditional Chinese			
External Interface	Serial Communication		RS-232C/422 × 1			
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)			
		I/F	100BASE-TX × 1			
	EtherNet/IP Communication		Ethernet port (transmission rate: 100 Mbps)			
	EtherCAT Communication		No			
	Parallel I/O		• 13 inputs/26 outputs			
	Encoder Interface		None			
	Monitor Interface		Analog RGB video output × 1 for maintenance			
	USB I/F		USB2.0 host × 4 (BUS Power: Port 5V)			
	SD Card I/F		None			
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Yellow			
	Ethernet		NET RUN: Green NET LINK ACT: Yellow			
	SD Card		None			
	EtherCAT		None			
Power-supply voltage			20.4 VDC to 26.4 VDC			
Current consumption	When connected to a Controller	Connected to 2 cameras	5.0 A max.		7.5 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
	When not connected to Controller	Connected to 2 cameras	3.7 A max.		4.9 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
Built-in FAN			Yes			

Sensor Controller Series			FZ5-600 series			
Type			Standard Controller			
Sensor Controller Model			FZ5-600	FZ5-605	FZ5-600-10	FZ5-605-10
Usage Environment	Ambient temperature range		Operating: 0°C to 45°C (When the built-in FAN is set to slow rotation.) Operating: 0°C to 50°C (When the built-in FAN is set to fast rotation.) Storage: -20 to +65°C			
	Ambient humidity range		Operating and Storage: 35 to 85%RH (with no condensation)			
	Ambient atmosphere		No corrosive gases			
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration: 15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 times Vibration direction: up and down/front and behind/left and right			
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right			
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 2kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms, Period: 300ms, Application time: 1 min. • I/O line Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms/0.75ms, Period: 300ms, Application time: 1 min			
	Grounding		Type D grounding (100Ω or less grounding resistance)*1			
External Features	Dimensions		260 mm × 308 mm × 83 mm		260 mm × 308 mm × 104 mm	
	Weight		Approx. 3.2 kg		Approx. 3.4 kg	
	Degree of protection		IEC60529 IP20			
	Case material		ABS			

*1. Existing third class grounding

Component Names and Functions

Camera 2ch type	Camera 4ch type
FZ5-120□	FZ5-120□-10
FZ5-110□	FZ5-110□-10
FZ5-80□	FZ5-80□-10
FZ5-60□	FZ5-60□-10

	Connector name	Description
(1)	POWER LED	Lit while power is ON.
(2)	RUN LED	Lit while the layout turned on output setting is displayed.
(3)	ERROR LED	Lit when an error has occurred.
(4)	I/O connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor.
(5)	Camera connector	Connect cameras.
(6)	Power and Ground terminal	Connect a DC power supply. Wire the power supply unit independently of other devices. After wiring, replace the terminal cover.
(7)	Power and Ground terminal	Connect the ground wire. Make sure that the controller is grounded with a separate ground wire.
(8)	Monitor connector (analog RGB)	For FZ5-600/FZ5-1100 series, cannot connect the monitor. For use this connector, contact OMRON representative. FZ5-800 Series/FZ5-1200 Series: Connect monitor.
(9)	RS-232C/RS-422 connector	Connect an external device such as a personal computer or PLC.
(10)	USB connector	Connect a USB device. Do not plug or unplug it during measurement. Measurement time might be affected otherwise. However, when connecting two or more USB memories, do not connect them to adjacent ports. Doing so may cause the USB memories to come into contact, resulting in malfunction or damage.
(11)	Ethernet connector	Connect Ethernet device.
(12)	Touch pen (holder)	A touch pen is stored.

Dimensions

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-1-4 FZ5-L Series

Specification

Sensor Controller Series			FZ5-L series			
Type			Standard Controller			
Sensor Controller Model			FZ5-L350	FZ5-L355	FZ5-L350-10	FZ5-L355-10
Controller Type			BOX type			
Parallel IO			NPN	PNP	NPN	PNP
Main Functions	Operation Mode	Standard	Yes			
		Double Speed Multi-input	Yes			
		Non-stop adjustment mode	Yes			
		Multi-line random-trigger mode	No			
	Parallel Processing		No			
	Number of Connectable Camera		2		4	
	Supported Camera	FH-S series camera	Not connectable			
		FZ-S series camera	All of the FZ-S series cameras are connectable. (When the 5 megapixels camera is connected, the maximum connectable camera is 2.)			
	Camera I/F		OMRON I/F			
	Possible Number of Captured Images		Refer to *About Number of Logging Images* or *About Max. Number of Loading Images during Multi-input* in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).			
	Possible Number of Logging Images to Sensor Controller					
	Possible Number of Scenes		128			
	Operating on UI	USB Mouse	Yes (wired USB driver-less type)			
		Touch Panel	No			
	Setup		Create the processing flow using Flow editing.			
	Language		Japanese, English, Simplified Chinese, Traditional Chinese			
External Interface	Serial Communication		RS-232C × 1			
	Ethernet Communication	Protocol	Non-procedure (TCP/UDP)			
		I/F	1000BASE-T × 1			
	EtherNet/IP Communication		Ethernet port (transmission rate: 100 Mbps)			
	EtherCAT Communication		No			
	Parallel I/O		11 inputs/26 outputs			
	Encoder Interface		None			
	Monitor Interface		Analog RGB video output × 1			
	USB I/F		USB2.0 host × 2 (BUS Power: Port5 V/0.5 A)			
	SD Card I/F		None			
Indicator Lamps	Main		POWER: Green ERROR: Red RUN: Yellow			
	Ethernet		NET RUN: Yellow (only when GigE is connected) NET LINK ACT: Green			
	SD Card		None			
	EtherCAT		None			
Power-supply voltage			20.4 VDC to 26.4 VDC			

Sensor Controller Series			FZ5-L series			
Type			Standard Controller			
Sensor Controller Model			FZ5-L350	FZ5-L355	FZ5-L350-10	FZ5-L355-10
Current consumption	When connected to a Controller	Connected to 2 cameras	4.0 A max.		5.5 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
	When not connected to a Controller	Connected to 2 cameras	2.6 A max.		2.9 A max.	
		Connected to 4 cameras	---			
		Connected to 8 cameras	---			
Built-in FAN			No			
Usage Environment	Ambient temperature range		Operating: 0°C to 50°C Storage: -20 to +65°C			
	Ambient humidity range		Operating and Storage: 35 to 85%RH (with no condensation)			
	Ambient atmosphere		No corrosive gases			
	Vibration tolerance		Oscillation frequency: 10 to 150 Hz Half amplitude: 0.1 mm Acceleration: 15 m/s^2 Sweep time: 8 minute/count Sweep count: 10 times Vibration direction: up and down/front and behind/left and right			
	Shock resistance		Impact force: 150 m/s^2 Test direction: up and down/front and behind/left and right			
	Noise immunity	Fast Transient Burst	• DC power Direct infusion: 1kV, Pulse rising: 5ns, Pulse width: 50ns, Burst continuation time: 15ms, Period: 300ms			
	Grounding		---			
External Features	Dimensions		209 mm × 80 mm × 182.3 mm Note Height: Including the rubber feet at the base.			
	Weight		Approx. 1.8 kg			
	Degree of protection		IEC60529 IP20			
	Case material		Steel plate			

Component Names and Functions

	Connector name	Description
(1)	POWER LED	Lit while power is ON.
(2)	RUN LED	Lit while the layout turned on output setting is displayed.
(3)	ERROR LED	Lit when an error has occurred.
(4)	I/O connector (control lines, data lines)	Connect the controller to external devices such as a sync sensor.
(5)	Camera connector	Connect cameras.
(6)	Power	Connect a DC power supply. Wire the power supply unit independently of other devices. After wiring, replace the terminal cover.
(7)	Monitor connector (analog RGB)	Connect a monitor.
(8)	RS-232C connector	Connect an external device such as a personal computer.
(9)	USB connector	Connect a track ball, mouse and USB memory. A total of four USB ports are provided and any of them can be used. However, when connecting two USB memories, do not connect them to adjacent ports. Doing so may cause the USB memories to come into contact, resulting in malfunction or damage.
(10)	Ethernet connector	Connect the controller to a computer.

Dimensions

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-2 Camera

3-2-1 High-speed digital CMOS Camera (FH-S camera series)

Precautions for Safe Use

About connection of FH-1000, FH-3000, or FH-L series Sensor Controller and FH-SC12/FH-SM12 (12 megapixels camera).

- When you connect the Sensor Controller to the FH-SC12/FH-SM12, do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Specification

Model	FH-SM	FH-SC	FH-SM02	FH-SC02
Image elements	CMOS image elements (1/3-inch equivalent)		CMOS image elements (2/3-inch equivalent)	
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)		2040 (H) × 1088 (V)	
Imaging area H × V (opposing corner)	4.8 × 3.6 (6.0 mm)		11.26 × 5.98 (12.76 mm)	
Pixel size	7.4 (μm) × 7.4 (μm)		5.5 (μm) × 5.5 (μm)	
Shutter function	Electronic shutter: Shutter speeds can be set from 20 μs to 100 ms.		Electronic shutter: Shutter speeds can be set from 25 μs to 100 ms.	
Partial function	1 to 480 lines	2 to 480 lines	1 to 1088 lines	2 to 1088 lines
Frame rate (Image Acquisition Time)	308 fps (3.3 ms)		219 fps (4.6 ms) *1	
Lens mounting	C mount			
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating: 0 to 40°C, Storage: -25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 85%RH (with no condensation)			
Weight	Approx. 105 g		Approx. 110 g	
Accessories	Instruction Sheet			

*1. Frame rate in high speed mode when the camera is connected using two camera cables.

Model	FH-SM04	FH-SC04	FH-SM12	FH-SC12
Image elements	CMOS image elements (1-inch equivalent)		CMOS image elements (1.76-inch equivalent)	
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	2040 (H) × 2048 (V)		4084 (H) × 3072 (V)	
Imaging area H × V (opposing corner)	11.26 × 11.26 (15.93 mm)		22.5 × 16.9 (28.14 mm)	
Pixel size	5.5 (μm) × 5.5 (μm)		5.5 (μm) × 5.5 (μm)	
Shutter function	Electronic shutter: Shutter speeds can be set from 25 μs to 100 ms.		Electronic shutter: Shutter speeds can be set from 60 μs to 100 ms.	
Partial function	1 to 2048 lines	2 to 2048 lines	4 to 3072 lines (4-line increments)	
Frame rate (Image Acquisition Time)	118 fps (8.5 ms) *1		38.9 fps (25.7 ms) *1	
Lens mounting	C mount		M42 mount	
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating: 0 to 40°C, Storage: -25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 85%RH (with no condensation)			
Weight	Approx. 110 g		Approx. 320 g	
Accessories	Instruction Sheet			

*1. Frame rate in high speed mode when the camera is connected using two camera cables.

Model			FH-SM02	FH-SC02	FH-SM04	FH-SC04	FH-SM12	FH-SC12
Image Acquisition Time	2 Cables *1	High Speed Mode*2	4.6 ms		8.5 ms		25.7 ms	
		Standard Mode	9.7 ms		17.9 ms		51.3 ms	
	1 Cables	High Speed Mode *2	9.2 ms		17.0 ms		51.3 ms	
		Standard Mode	19.3 ms		35.8 ms		102.0 ms	

*1. Two Camera ports of the controller are used per one camera.

*2. Up to 5 m Camera Cable length.

Dimensions

● 0.3 Megapixels Camera: FH-SC/-SM

● 2 Megapixels Camera: FH-SC02/-SM02 and 4 Megapixels Camera: FH-SC04/-SM04

● 12 Megapixels Camera: FH-SC12/-SM12

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-2-2 Digital CMOS Cameras: FH-S Camera Series

Specification

Model	FH-SM05R	FH-SC05R
Image Elements	CMOS image elements (1/2.5-inch equivalent)	
Color/Monochrome	Monochrome	Color
Effective Pixels	2592 (H) × 1944 (V)	
Imaging area H × V (opposing corner)	5.70 × 4.28 (7.13 mm)	
Pixel Size	2.2 (μm) × 2.2 (μm)	
Scan Type	Progressive	
Shutter Method	Rolling shutter	
Shutter Function	Electronic shutter; Shutter speeds can be set from 500 to 10000 ms in multiples of 50 μs	
Frame Rate (Image Acquisition Time)	14 fps (71.7 ms)	
Lens Mounting	C mount	
Field of vision, Installation distance	Selecting a lens according to the field of vision and installation distance	
Ambient temperature range	Operating: 0 to +40°C Storage: -30 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating: 35 to 85%RH Storage: 35 to 85%RH (with no condensation)	
Weight	Approx. 52 g	
Accessories	Instruction Sheet	

Dimensions

3-2-3 Digital CCD/CMOS Cameras: FZ-S Camera Series

Specification

Model	FZ-S	FZ-SC	FZ-S2M	FZ-SC2M	FZ-S5M2	FZ-SC5M2	FZ-S5M3	FZ-SC5M3
Image elements	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)		Interline transfer reading all pixels, CCD image elements (1/1.8-inch equivalent)		Interline transfer reading all pixels, CCD image elements (2/3-inch equivalent)		CCD image elements (2/3-inch equivalent)	
Color/Monochrome	Monochrome	Color	Monochrome	Color	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)		1600 (H) × 1200 (V)		2448 (H) × 2044 (V)		2448 (H)×2048 (V)	
Imaging area H × V (opposing corner)	4.8 × 3.6 (6.0 mm)		7.1 × 5.4 (8.9 mm)		8.4 × 7.1 (11 mm)		8.4×7.1 (11 mm)	
Pixel size	7.4 (μm) × 7.4 (μm)		4.4 (μm) × 4.4 (μm)		3.45 (μm) × 3.45 (μm)		3.45 (μm) × 3.45 (μm)	
Shutter function	Electronic shutter: select shutter speeds from 20 μs to 100 ms							
Partial function	12 to 480 lines		12 to 1200 lines		12 to 2044 lines		4 to 2048 lines	
Frame rate (Image Acquisition Time)	80 fps (12.5 ms)		30 fps (33.3 ms)		16 fps (62.5 ms)		25.6 fps (39.2 ms)	
Lens mounting	C mount							
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance							
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to +40°C Storage: -25 to +65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85%RH (with no condensation)							
Weight	Approx. 55 g		Approx. 76 g		Approx.140 g		Approx. 85 g	
Accessories	Instruction Sheet							

Dimensions

● 0.3 Megapixels Camera: FZ-S/-SC

(Unit: mm)

● 2 Megapixels Camera: FZ-S2M/-SC2M

(Unit: mm)

● 5 Megapixels Camera: FZ-S5M2/-SC5M2

● 5 Megapixels Camera: FZ-S5M3/-SC5M3

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-2-4 High-speed Digital CCD Cameras : FZ-SH Camera Series

Specification

Model	FZ-SH	FZ-SHC
Image elements	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)	
Color/Monochrome	Monochrome	Color
Effective pixels	640 (H) × 480 (V)	
Imaging area H × V (opposing corner)	4.8 × 3.6 (6.0 mm)	
Pixel size	7.4 (μm) × 7.4 (μm)	
Shutter function	Electronic shutter: select shutter speeds from 1/10 to 1/50,000 s	
Partial function	12 to 480 lines	
Frame rate (Image Acquisition Time)	204 fps (4.9 ms)	
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance	
Ambient temperature range	Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35 to 85% RH (with no condensation)	
Weight	Approx. 105 g	
Accessories	Instruction Sheet	

Dimensions

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-2-5 Small Digital CCD Cameras: FZ-S Camera Series

Specification

Model	FZ-SF	FZ-SFC	FZ-SP	FZ-SPC
Image elements	Interline transfer reading all pixels, CCD image elements (1/3-inch equivalent)			
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)			
Imaging area H × V (opposing corner)	4.8 × 3.6 (6.0 mm)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 20 μm to 100 ms			
Partial function	12 to 480 lines			
Frame rate (Image Acquisition Time)	80 fps (12.5 ms)			
Lens mounting	Special mount (M10.5 P0.5)			
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating of camera amp: 0 to 50°C Operating of camera head: 0 to 45°C Storage: -25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35 to 85%RH (with no condensation)			
Minimum bending radius between camera head and camera amplifier	12.7mm			
Weight	Approx. 150 g			
Accessories	Instruction Sheet, installation bracket, Four mounting brackets (M2 × 4)		Instruction Sheet	

Dimensions

● Camera Head

a) Flat Camera: FZ-SF/-SFC

b) Pen-shaped Camera: FZ-SP/-SPC

Camera Amplifier

- Flat Camera
- Pen-shaped Camera

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-2-6 Intelligent Compact Digital CMOS Camera: FZ-S camera Series

Specification

Model	FZ-SQ010F	FZ-SQ050F	FZ-SQ100F	FZ-SQ100N
Image elements	CMOS color image elements (1/3-inch equivalent)			
Color/Monochrome	Color			
Effective pixels	752 (H) × 480 (V)			
Imaging area H × V (opposing corner)	4.51 × 2.88 (5.35 mm)			
Pixel size	6.0 (μm) × 6.0 (μm)			
Shutter function	1/250 to 1/32,258			
Partial function	8 to 480 lines			
Frame rate (Image Acquisition Time)	60 fps (16.7 ms)			
Field of vision	7.5 × 4.7 to 13 × 8.2 mm	13 × 8.2 to 53 × 33 mm	53 × 33 to 240 × 153 mm	29 × 18 to 300 × 191 mm
Installation distance	38 to 60 mm	56 to 215 mm	220 to 970 mm	32 to 380 mm
LED class *1	Risk Group2			
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C			
Ambient humidity range	Operating and storage: 35 to 85%RH (with no condensation)			
Weight	Approx. 150 g		Approx. 140 g	
Accessories	Mounting bracket (FQ-XL) Polarizing filter attachment (FQ-XF1) Instruction Sheet Warning label			

*1. Applicable standards: IEC62471-2

Dimensions

- **Narrow view: FZ-SQ010F**
- **Standard view: FZ-SQ050F**

*1. The mounting brackets can be connected to either side.

Wide View

- Long-distance: FZ-SQ100F
- Short-distance: FZ-SQ100N

*1. The mounting brackets can be connected to either side.

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-3 Camera Cable

3-3-1 Camera Cables and Right-angle Camera Cable

Specification

Model	FZ-VS3 (2 m)	FZ-VSL3 (2 m)
Shock resistiveness (durability)	10 to 150 Hz Single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath, connector: PVC	
Minimum bending radius	69 mm	
Weight	Approx. 170 g	

Dimensions

- **Camera Cable: FZ-VS3**

- **Right-angle Camera Cable: FZ-VSL3**

*1. Cable is available in 2 m/3 m/5 m/10 m.

*2. Each camera cables has polarity.
Please ensure that the name plate side of the cable is connected to the controller.

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-3-2 Bend resistant Camera Cable and Bend resistant Right-angle Camera Cable

Specification

Model	FZ-VSB3 (2 m)	FZ-VSLB3 (2 m)
Shock resistiveness (durability)	10 to 150 Hz Single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath, connector: PVC	
Bend performance *1	U-bend flexing: 1 million times or more Bending radius: 50 mm Stroke: 300 mm Speed: 30/minute	
Minimum bending radius	69 mm	
Weight	Approx. 180 g	

*1. This data values are for reference only and not guaranteed values.

Dimensions

● Bend resistant Camera Cable: FZ-VSB3

*1. Cable is available in 2 m/3 m/5 m/10 m.

*2. Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.

● Bend resistant Right-angle Camera Cable: FZ-VSLB3

*1. Cable is available in 2 m/3 m/5 m/10 m.

*2. Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-3-3 Long-distance Camera Cable and Long-distance Right-angle Camera Cable

Specification

Model	FZ-VS4 (15 m)	FZ-VSL4 (15 m)
Shock resistiveness (durability)	10 to 150 Hz Single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath, connector: PVC	
Minimum bending radius	78 mm	
Weight	Approx. 1400 g	

Dimensions

- **Long-distance Camera Cable: FZ-VS4**

*1. Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.

*2. Cable is available in 15 m.

- **Long-distance Right-angle Camera Cable: FZ-VSL4**

*1. Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.

*2. Cable is available in 15 m.

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

3-3-4 Cable Connection Table

For connection of camera cables, refer to the following table.

Camera Cable for FH-S Camera Series

Name	Model of Sensor Controller	Length	High-speed digital CMOS Camera (Standalone)				
			0.3 megapixel camera	2 megapixel camera		4 megapixel camera	
			FH-SM/SC	FH-SM02/SC02		FH-SM04/SC04	
			---	High speed	Standard	High speed	Standard
Camera cable Right-angle Camera cable	FZ-VS3 FZ-VSL3	2 m	○	○	○	○	○
		3 m	○	○	○	○	○
		5 m	○	○	○	○	○
		10 m	○	×	○	×	○
Bend resistant Camera cable Bend resistant Right-angle Camera cable	FZ-VSB3 FZ-VSLB3	2 m	○	○	○	○	○
		3 m	○	○	○	○	○
		5 m	○	○	○	○	○
		10 m	○	×	○	×	○
Long-distance Camera cable Long-distance Right-angle Camera cable	FZ-VS4 FZ-VSL4	15 m	○	×	○	×	○

Name	Model of Sensor Controller	Length	High-speed digital CMOS Camera (Stand-alone)		Digital CMOS Camera
			12 megapixel camera		5 megapixel camera
			FH-SM12/SC12		FH-SC05R/SM05R
			High speed	Standard	---
Camera cable Right-angle Camera cable	FZ-VS3 FZ-VSL3	2 m	○	○	○
		3 m	○	○	○
		5 m	○	○	○
		10 m	×	○	○
Bend resistant Camera cable Bend resistant Right-angle Camera cable	FZ-VSB3 FZ-VSLB3	2 m	○	○	○
		3 m	○	○	○
		5 m	○	○	○
		10 m	×	○	○
Long-distance Camera cable Long-distance Right-angle Camera cable	FZ-VS4 FZ-VSL4	15 m	×	○	○

Camera Cable for FZ-S Camera Series

Name	Model of Sensor Controller	Length	Digital CCD/CMOS Camera (Standalone)		
			0.3 megapixel camera	2 megapixel camera	5 megapixel camera
			FZ-S/SC	FZ-S2M/SC2M	FZ-S5M□/SC5M□
Camera cable Right-angle Camera cable	FZ-VS3 FZ-VSL3	2 m	○	○	○
		3 m	○	○	○
		5 m	○	○	○
		10 m	○	○	×
Bend resistant Camera cable Bend resistant Right-angle Camera cable	FZ-VSB3 FZ-VSLB3	2 m	○	○	○
		3 m	○	○	○
		5 m	○	○	○
		10 m	○	○	×
Long-distance Camera cable Long-distance Right-angle Camera cable	FZ-VS4 FZ-VSL4	15 m	○	○	×

Name	Model of Sensor Controller	Length	Small Digital CCD Camera (Standalone) Flat type/pen type	High-speed digital CCD Camera (Standalone)	Intelligent Compact Digital CMOS Camera
			FZ-SF/SFC FZ-SP/SPC	FZ-SH/SHC	FZ-SQ□
Camera cable Right-angle Camera cable	FZ-VS3 FZ-VSL3	2 m	○	○	○
		3 m	○	○	○
		5 m	○	○	○
		10 m	○	○	○
Bend resistant Camera cable Bend resistant Right-angle Camera cable	FZ-VSB3 FZ-VSLB3	2 m	○	○	○
		3 m	○	○	○
		5 m	○	○	○
		10 m	○	○	○
Long-distance Camera cable Long-distance Right-angle Camera cable	FZ-VS4 FZ-VSL4	15 m	○	○	○

3-3-5 Cable Extension Units

You can extent the distance between the Sensor Controller and Camera by using cable extension units.

Specification

Model	FZ-VSJ
Power supply voltage*1	11.5 to 13.5 VDC
Current consumption*2	1.5 A max.
Ambient temperature range	Operating: 0 to 50°C; Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35 to 85% (with no condensation)
Weight	Approx. 240 g
Accessories	Instruction Sheet and 4 mounting screws

*1. A 12-VDC power supply must be provided to the Cable Extension Unit when connecting the Intelligent Compact Digital Camera, or the Lighting Controller.

*2. The current consumption shows when connecting the Cable Extension Unit to an external power supply.

Dimensions

Additional Information

We have the 2D CAD data or 3D CAD data.
You can download CAD data from www.fa.omron.co.jp.

Maximum Extension Length Using Cable Extension Units FZ-VSJ

Item	Model	Transmission speed *1	No. of CH used for connection*2	Maximum cable length using 1 Camera Cable*1	Max. number of connectable Extension Units	Using Cable Extension Units FZ-VSJ	
						Max. cable length	Connection configuration
High-speed digital CMOS Cameras	FH-SM/SC	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
	FH-SM02/SC02 FH-SM04/SC04 FH-SM12/SC12	Standard	1	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
			2	15 m (Using FZ-VS4/VSL4)	4*3	45 m	[Configuration 2] Camera cable: 15 m × 6 Extension Unit: 4
		High speed	1	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 m × 3 Extension Unit: 2
			2	5 m (Using FZ-VS□/VSL□)	4*3	15 m	[Configuration 4] Camera cable: 5 m × 6 Extension Unit: 4
Digital CMOS Cameras	FH-SC05R FH-SM05R	---	---	15m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
Digital CCD/CMOS Cameras	FZ-S/SC FZ-S2M/SC2M	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
	FZ-S5M□/SC5M□	---	---	5 m (Using FZ-VS□/VSL□)	2	15 m	[Configuration 3] Camera cable: 5 m × 3 Extension Unit: 2
Small Digital CCD Cameras Flat type/pen type	FZ-SF/SFC FZ-SP/SPC	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
High-speed digital CCD Cameras	FZ-SH/SHC	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2
Intelligent Compact Digital CMOS Cameras	FZ-SQ□	---	---	15 m (Using FZ-VS4/VSL4)	2	45 m	[Configuration 1] Camera cable: 15 m × 3 Extension Unit: 2

*1. The FH-S□□□ enables switching between standard and high speed modes. In high speed mode, images can be transferred approximately two times faster than in standard mode, but the connectable cable length will be shorter.

*2. The FH-S□□□ has two channels to connect Camera Cables. Connection to two channels makes image transfer two times faster than connection to one channel: high speed mode using two channels can transfer approximately four times as many images as standard mode using one channel.

*3. Each channel can be used to connect up to two Cable Extension Units: up to four extension units, two channels × two units, can be connected by using two channels.

Connection Configuration

Connection configuration of FH-1000 or FH-3000 Sensor Controller and Camera are the bellows.

	Connection configuration using the maximum length of Camera Cables	Remarks
Configuration 1		
Configuration 2		
Configuration 3		
Configuration 4		

*1. Select the Camera Cables between the Controller and Extension Unit, between the Extension Units, and between the Extension Unit and Camera according to the connected Camera.
Different types or lengths of Camera Cables can be used for (1), (2), and (3) as well as for (4), (5), and (6). However, the type and length of Camera Cable (1) must be the same as those of Camera Cable (4), (2) must be the same as (5), and (3) must be the same as (6).

3-4 Lens

3-4-1 C-mount Lens for 1/3-inch Image Sensor

FH-S, FZ-SH, and FZ-S are recommended.

Specification

Model	3Z4S-LE SV-03514V	3Z4S-LE SV-04514V	3Z4S-LE SV-0614V	3Z4S-LE SV-0813V
Appearance/Dimensions (mm)				
Focal length	3.5 mm	4.5 mm	6 mm	8 mm
Aperture (F No.)	1.4 to Close	1.4 to Close	1.4 to Close	1.3 to Close
Filter size	---	---	M27.0 P0.5	M25.5 P0.5
Maximum sensor size	1/3 inch	1/3 inch	1/3 inch	1/3 inch
Mount	C mount			

Model	3Z4S-LE SV-1214V	3Z4S-LE SV-1614V	3Z4S-LE SV-2514V	3Z4S-LE SV-3518V
Appearance/Dimensions (mm)				
Focal length	12 mm	16 mm	25 mm	35 mm
Aperture (F No.)	1.4 to Close	1.4 to Close	1.4 to Close	1.8 to Close
Filter size	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5
Maximum sensor size	1/3 inch	1/3 inch	1/3 inch	1/3 inch
Mount	C mount			

Model	3Z4S-LE SV-5018V	3Z4S-LE SV-7527V	3Z4S-LE SV-10035V
Appearance/Dimensions (mm)			
Focal length	50 mm	75 mm	100 mm
Aperture (F No.)	1.8 to Close	2.7 to Close	3.5 to Close
Filter size	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5
Maximum sensor size	1/3 inch	1/3 inch	1/3 inch
Mount	C mount		

3-4-2 C-mount Lens for 2/3-inch Image Sensor

FZ-S□2M, FZ-S□5M□, and FH-S□05R are recommended.

3Z4S-LE SV-7525H and 3Z4S-LE SV-10028H are also available to use FH-S□02/FH-S□04.

Specification

Model	3Z4S-LE SV-0614H	3Z4S-LE SV-0814H	3Z4S-LE SV-1214H	3Z4S-LE SV-1614H	3Z4S-LE SV-2514H
Appearance/Dimensions (mm)	42 dia. 57.5	39 dia. 52.5	30 dia. 51.0	30 dia. 47.5	30 dia. 36.0
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm
Aperture (F No.)	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16	1.4 to 16
Filter size	M40.5 P0.5	M35.5 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5
Maximum sensor size	2/3 inch	2/3 inch	2/3 inch	2/3 inch	2/3 inch
Mount	C mount				

Model	3Z4S-LE SV-3514H	3Z4S-LE SV-5014H	3Z4S-LE SV-7525H	3Z4S-LE SV-10028H
Appearance/Dimensions (mm)	44 dia. 45.5	44 dia. 57.5	36 dia. 49.5 [WD:∞] to 54.6 [WD:1200]	39 dia. 66.5 [WD:∞] to 71.6 [WD:2000]
Focal length	35 mm	50 mm	75 mm	100 mm
Aperture (F No.)	1.4 to 16	1.4 to 16	2.5 to Close	2.8 to Close
Filter size	M35.5 P0.5	M40.5 P0.5	M34.0 P0.5	M37.5 P0.5
Maximum sensor size	2/3 inch	2/3 inch	1 inch	1 inch
Mount	C mount			

3-4-3 C-mount Lens for 1-inch Image Sensor

FH-S□02 and FH-S□04 are recommended.
When the focal distance is 75 m or 100 m, 3Z4S-LE SV-7525H and 3Z4S-LE SV-10028H are also available.

Specification

Model	3Z4S-LE VS-0618H1	3Z4S-LE VS-0814H1	3Z4S-LE VS-1214H1	3Z4S-LE VS-1614H1N
Appearance/Dimensions (mm)	64.5 dia. 57.2	57 dia. 59	38 dia. 48.0[WD:∞] to 48.5[WD:300]	38 dia. 45.0[WD:∞] to 45.9[WD:300]
Focal length	6 mm	8 mm	12 mm	16 mm
Aperture (F No.)	1.8 to 16	1.4 to 16	1.4 to 16	1.4 to 16
Filter size	Can not be used a filter	M55.0 P0.75	M35.5 P0.5	M30.5 P0.5
Maximum sensor size	1 inch	1 inch	1 inch	1 inch
Mount	C mount			

Model	3Z4S-LE VS-2514H1	3Z4S-LE VS-3514H1	3Z4S-LE VS-5018H1
Appearance/Dimensions (mm)	38 dia. 33.5[WD:∞] to 35.6[WD:300]	38 dia. 35.0[WD:∞] to 39.1[WD:300]	44 dia. 44.5[WD:∞] to 49.5[WD:500]
Focal length	25 mm	35 mm	50 mm
Aperture (F No.)	1.4 to 16	1.4 to 16	1.8 to 16
Filter size	M30.5 P0.5	M30.5 P0.5	M40.5 P0.5
Maximum sensor size	1 inch	1 inch	1 inch
Mount	C mount		

3-4-4 M42-mount Lens for Large Image Sensor

FH-S□12 is recommended.

Specification

Model	3Z4S-LE VS-L1828/M42-10	3Z4S-LE VS-L2526/M42-10	3Z4S-LE VS-L3528/M42-10
Appearance/Dimensions (mm)			
Focal length	18 mm	25 mm	35 mm
Aperture (F No.)	2.8 to 16	2.6 to 16	2.8 to 16
Filter size	M55.0 P0.75	M55.0 P0.75	M62.0 P0.75
Maximum sensor size	1.8 inch		
Mount	M42 mount		

Model	3Z4S-LE VS-L5028/M42-10	3Z4S-LE VS-L8540/M42-10	3Z4S-LE VS-L10028/M42-10
Appearance/Dimensions (mm)			
Focal length	50 mm	85 mm	100 mm
Aperture (F No.)	2.8 to 16	4.0 to 16	2.8 to 16
Filter size	M62.0 P0.75	M52.0 P0.75	M52.0 P0.75
Maximum sensor size	1.8 inch		
Mount	M42 mount		

3-4-5 Lenses for Small Camera

FH-SF, FZ-SF, FZ-SFC, FZ-SP, and FZ-SPC are recommended.

Specification

Model	FZ-LES3	FZ-LES6	FZ-LES16	FZ-LES30
Appearance/Dimensions (mm)				
Focal length	3 mm	6 mm	16 mm	30 mm
Aperture (F No.)	2.0 to 16	2.0 to 16	3.4 to 16	3.4 to 16

3-4-6 Vibration and Shock Resistant C-mount Lens for 2/3-inch Image Sensor

FH-S□05R, FH-S□, FZ-S□2M, FZ-S□5M□, FZ-SH□, and FZ-S□ are recommended.

Specification

Model	3Z4S-LE VS-MC15-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 25.4[0.03×] to 29.5[0.3×]								
Focal length	15 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.03 ×			0.2 ×			0.3 ×		
Aperture (fixed F No.)*2	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm)*3	183.1	512.7	732.4	4.8	13.4	19.2	2.3	6.5	9.2
Maximum sensor size	2/3 inch								
Mount	C Mount								

Model	3Z4S-LE VS-MC20-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 23.0[0.04×] to 30.5[0.4×]								
Focal length	20 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.04 ×			0.25 ×			0.4 ×		
Aperture (fixed F No.)*2	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm)*3	110.8	291.2	416.0	3.4	9.0	12.8	1.5	3.9	5.6
Maximum sensor size	2/3 inch								
Mount	C Mount								

Model	3Z4S-LE VS-MC25N-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 26.5[0.05×] to 38.0[0.5×]								
Focal length	25 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.05 ×			0.25 ×			0.5 ×		
Aperture (fixed F No.)*2	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm)*3	67.2	188.2	268.8	3.2	9.0	12.8	1.0	2.7	3.8
Maximum sensor size	2/3 inch								
Mount	C Mount								

Model	3Z4S-LE VS-MC30-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 24.0[0.06×] to 35.7[0.45×]								
Focal length	30 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.06 ×			0.15 ×			0.45 ×		
Aperture (fixed F No.)*2	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm)*3	47.1	131.9	188.4	8.2	22.9	32.7	1.1	3.2	4.6
Maximum sensor size	2/3 inch								
Mount	C Mount								

Model	3Z4S-LE VS-MC35-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 32.0[0.26×] to 45.7[0.65×]								
Focal length	35 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.26 ×			0.3 ×			0.65 ×		
Aperture (fixed F No.)*2	1.9	5.6	8	1.9	5.6	8	1.9	5.6	8
Depth of field (mm)*3	2.8	8.4	11.9	2.2	6.5	9.2	0.6	1.7	2.5
Maximum sensor size	2/3 inch								
Mount	C Mount								

Model	3Z4S-LE VS-MC50-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 44.5[0.08×] to 63.9[0.48×]								
Focal length	50 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.08 ×			0.2 ×			0.48 ×		
Aperture (fixed F No.)*2	2	5.6	8	2	5.6	8	2	5.6	8
Depth of field (mm)*3	33.8	75.6	108.0	6.0	13.4	19.2	1.3	2.9	4.1
Maximum sensor size	2/3 inch								
Mount	C Mount								

Model	3Z4S-LE VS-MC75-□□□□□*1								
Appearance/Dimensions (mm)	31 dia. 70.0[0.14×] to 105.5[0.62×]								
Focal length	75 mm								
Filter size	M27.0 P0.5								
Optical magnification	0.14 ×			0.2 ×			0.62 ×		
Aperture (fixed F No.)*2	3.8	5.6	8	3.8	5.6	8	3.8	5.6	8
Depth of field (mm)*3	17.7	26.1	37.2	9.1	13.4	19.2	1.3	1.9	2.7
Maximum sensor size	2/3 inch								
Mount	C Mount								

*1. Insert the aperture into □□□□□ in the model number as follows.

F=1.9 to 3.8: blank

F=5.6: FN056

F=8: FN080

*2. F-number can be selected from maximum aperture, 5.6, and 8.0.

*3. When circle of least confusion is 40 µm.

3-4-7 High-resolution Telecentric Lens for C-mount Lens for 2/3-inch Image Sensor

FZ-S□, FZ-SH□, FZ-S□2M, FZ-S□5M□, or FH-S□ are recommended.

Specification

Model *1			3Z4S-LE VS-TCH05 -65□□□□	3Z4S-LE VS-TCH05 -110□□□□	3Z4S-LE VS-TCH1 -65□□□□	3Z4S-LE VS-TCH1 -110□□□□
Optical magnification (±5%)			0.5 ×		1.0 ×	
Field of view (±5%) (V × H) (mm)	FH-SC/-SM	1/3 inch equivalent	9.6 × 7.2		4.8 × 3.6	
	FH-S□05R	1/2.5 inch equivalent	11.4 × 8.56		5.7 × 4.28	
	FZ-SC/-S	1/3 inch equivalent	9.6 × 7.2		4.8 × 3.6	
	FZ-SC2M/-S2M	1/1.8 inch equivalent	14.0 × 10.6		7.0 × 5.3	
	FZ-SC5M□/-S5M□	2/3 inch equivalent	16.8 × 14.2		8.4 × 7.1	
WD (mm) *2			75.3	110.8	68.8	110.3
Effective FNO			9.42	9.49	9.94	10.49
Depth of field (mm) *3			3	3.04	0.8	0.84
Resolution (μm) *4			12.43	12.9	6.71	6.99
TV distortion			0.02%	0.02%	0.01%	0.02%
Maximum sensor size			2/3 inch		2/3 inch	

Model *1			3Z4S-LE VS-TCH1.5 -65□□□□	3Z4S-LE VS-TCH1.5 -110□□□□	3Z4S-LE VS-TCH2 -65□□□□	3Z4S-LE VS-TCH2 -110□□□□
Optical magnification (±5%)			1.5 ×		2.0 ×	
Field of view (±5%) (V × H) (mm)	FH-SC/-SM	1/3 inch equivalent	3.2 × 2.4		2.4 × 1.8	
	FH-S□05R	1/2.5 inch equivalent	3.8 × 2.85		2.85 × 2.14	
	FZ-SC/-S	1/3 inch equivalent	3.2 × 2.4		2.4 × 1.8	
	FZ-SC2M/-S2M	1/1.8 inch equivalent	4.7 × 3.5		3.5 × 2.7	
	FZ-SC5M□/-S5M□	2/3 inch equivalent	5.6 × 4.7		4.2 × 3.6	
WD (mm) *2			65	110.8	65	110.8
Effective FNO			11.8	11.97	13.6	13.5
Depth of field (mm) *3			0.4	0.43	0.3	0.27
Resolution (μm) *4			5.24	5.33	4.53	4.53
TV distortion			0.01%	0.02%	0.03%	0.03%
Maximum sensor size			2/3 inch		2/3 inch	

Model *1			3Z4S-LE VS-TCH4 -65□□□□	3Z4S-LE VS-TCH4 -110□□□□
Optical magnification (±5%)			4.0 ×	
Field of view (±5%) (V × H) (mm)	FH-SC/-SM	1/3 inch equivalent	1.2 × 0.9	
	FH-S□05R	1/2.5 inch equivalent	1.43 × 1.07	
	FZ-SC/-S	1/3 inch equivalent	1.2 × 0.9	
	FZ-SC2M/-S2M	1/1.8 inch equivalent	1.8 × 1.3	
	FZ-SC5M□/-S5M□	2/3 inch equivalent	2.1 × 1.8	
WD (mm) *2			65	110.8
Effective FNO			17.91	22.2
Depth of field (mm) *3			0.09	0.11
Resolution (μm) *4			3	3.73
TV distortion			0.02%	0.03%
Maximum sensor size			2/3 inch	

*1. Insert the shape into □□□□ in the model number as follows.
Straight: -O
Coaxial: CO-O

*2. The working distance is the distance from the end of the lens to the sensor.

*3. The depth of field is calculated using a permissible circle of confusion diameter of 0.04 mm.

*4. The resolution is calculated using a wavelength of 550 nm.

Note 1. Fixing the lens or other reinforcement may be required depending on the installation angle or operating environment (vibration/shock).
When fixing the lens, insulate the lens from the fixture.

2. The above specifications are values calculated from the optical design and can vary depending on installation conditions.

3-4-8 Extension Tubes

Specification

Lenses	For M42 mount Lenses*1	For C mount Lenses*1	For Small Digital CCD Cameras
Model	3Z4S-LE VS-EXR/M42	3Z4S-LE SV-EXR	FZ-LESR
Contents	Set of 5 tubes (20 mm, 10 mm, 8 mm, 2 mm, and 1 mm) Maximum outer diameter: 47.5 mm dia.	Set of 7 tubes (40 mm, 20 mm,10 mm, 5 mm, 2.0 mm, 1.0 mm, and 0.5 mm) Maximum outer diameter: 30 mm dia.	Set of 3 tubes (15 mm,10 mm, 5 mm) Maximum outer diameter: 12 mm dia.

*1. Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these Extension Tubes are placed over the threaded section of the Lens or other Extension Tube, the connection may loosen when more than one 0.5-mm, 1.0-mm or 2.0-mm Extension Tube are used together.

Reinforcement is required to protect against vibration when Extension Tubes exceeding 30 mm are used.

When using the Extension Tube, check it on the actual device before using it.

3-4-9 Meaning of Optical Chart

Select lens appropriate for the camera.

For more details, refer to *Vision Accessory Catalog* (Cat. No. Q198).

How-to View the Optical Chart

The X axis of the optical chart shows the field of vision (mm)*1,

The Y axis of the optical chart shows the camera installation distance (mm) or WD *2.

*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.

*2. The vertical axis represents WD for small cameras.

Optical Chart

● Normal Lenses (Seven Types)

a) Digital Camera (Standalone):
FZ-S□, FZ-SH□, or FH-S□ (Using 3Z4S-LE SV-V Series)

b) Digital CCD Camera (Standalone):
FZ-S□2M (Using 3Z4S-LE SV-H Series)

c) Digital CCD/CMOS Camera (Standalone):
FZ-S□5M□ (Using 3Z4S-LE SV-H Series)

d) Digital CMOS Camera (Standalone):
FH-S□05R

e) Small Digital CCD Camera:
FZ-SP□/FZ-SF□ (FZ-LE S Series)

f) High-speed Digital CMOS Camera (Standalone):
FH-S□02 (Using 3Z4S-LE VS-H1 Series)

g) High-speed Digital CMOS Camera (Standalone):
FH-S□04 (Using 3Z4S-LE VS-H1 Series)

h) High-speed Digital CMOS Camera (Standalone):
FH-S□12 (Using 3Z4S-LE VS-L/M42 Series)

● Vibration/Shock-resistance Lens (Six Types)

a) Digital Camera (Standalone):
FZ-S□, FZ-SH□, or FH-S□ (Using 3Z4S-LE VS-MC Series)

b) Digital Camera (Standalone):
FZ-S□2M (Using 3Z4S-LE VS-MC Series)

c) Digital CCD/CMOS Camera (Standalone):
FZ-S□5M□ (Using 3Z4S-LE VS-MC Series)

d) Digital CMOS Camera (Standalone):
FH-S□05R, 5 million-pixel (Using 3Z4S-LE VS-MC Series)

e) Digital CMOS Camera (Standalone)
FH-S□05R 500Mega-pixel (3Z4S-LE VS-MC Series)

f) High-speed Digital CMOS Camera (Standalone):
FZ-S□02 (Using 3Z4S-LE VS-MCH Series)

g) High-speed Digital CMOS Camera (Standalone):
FH-S□04 (Using 3Z4S-LE VS-MCH Series)

h) High-speed Digital CMOS Camera (Standalone):
FH-S□12 (Using 3Z4S-LE VS-MCL/M42 Series)

3-5 Lighting, Lighting Controller, and Cables

Describes the typical example of Lighting or Lighting Controller.

Appearance	Description			Model
---	External Lighting		---	FLV series
			---	FL series
	Lighting Controller (Required to control external lighting from a Controller)	For FLV-Series	Camera Mount Lighting Controller	FLV-TCC series
			Analog Lighting Controller	FLV-ATC series
		For FL-Series	Camera Mount Lighting Controller	FL-TCC series
	For Intelligent Compact Digital Camera		Mounting Bracket	FQ-XL
			Precise Mounting Brackets	FQ-XL2
			Polarizing Filter Attachment (Packaged item)	FQ-XF1

Additional Information

For Lighting, Lighting Controller, or and Lighting Options, refer to *Vision Accessory Catalog* (Cat. No. Q198).

3-6 Touch Panel Monitor and Cable

Touch Panel Monitor of FH-MT12 is connectable FH-1000, FH-3000, and FH-L Sensor Controller whose software is Ver. 5.32 or later.

For connection of Touch Panel Monitor and FH Sensor Controller, the monitor cable for video and touch panel cable are necessary.

Precautions for Safe Use

About connection of FH-1000, FH-3000, FH-L series Sensor Controller and FH-MT12.

Do not ground the plus (+) terminal of the 24VDC power source when the Sensor Controller is connected to the FH-MT12 with a USB cable.
Doing so may cause a short circuit of the internal circuit, resulting in a malfunction.

Specification

● Touch Panel Monitor

Model		FH-MT12
Major Function	Display area	12.1 inch
	Resolution	1024 (V) × 768 (H)
	Number of color	16,700,000 colors (8 bit/color)
	Brightness	500 cd/m^2 (Typ)
	Contrast Ratio	600:1 (Typ)
	Viewing angle	Left and right: each 80°, upward: 80°, downward: 60°
	Backlight Unit	LED, edge-light
	Backlight lifetime	About 100,000 hour
	Touch panel	4wire resistive touch screen
External interface	Video input	analog RGB
	Touch panel signal	USB
		RS-232C
Ratings	Power supply voltage	24 VDC±10%
	Current consumption	0.5 A
	Insulation resistance	Between DC power supply and Touch Panel Monitor FG: 20 MΩ or higher (rated voltage 250 V)
Operating environment	Ambient temperature range	Operating: 0 to 50°C, Storage: -20 to +65°C (with no icing or condensation)
	Ambient humidity range	Operating and Storage: 20 to 85%RH (with no icing or condensation)
	Ambient environment	No corrosive gas
	Vibration resistance	10 to 150 Hz, one-side amplitude 0.1 mm (Max. acceleration 15 m/s^2) 10 times for 8 minutes for each three direction
	Degree of protection	Panel mounting: IP65 on the front
Operation		Touch pen
Structure	Mounting	Panel mounting, VESA mounting
	Weight	Approx. 2.6 kg
	Material	Front panel: PC/PBT, Front Sheet: PET, Rear case: SUS

Component Names and Functions

	Name	Description
(1)	LED indicator lamp	Lit up green when power is ON. Lit up orange when video signal is no input. Unlit when power is OFF.
(2)	VESA mounting hole	Mounting hole for VESA 75 mm × 75 mm.
(3)	VESA mounting hole	Mounting hole for VESA 100 mm × 100 mm.
(4)	USB retaining bracket	Retaining bracket for USB cable.
(5)	Power supply terminal	Connect a 24 VDC power supply.
(6)	Monitor connector (analog RGB)	Connect a monitor cable for analog RGB.
(7)	OSD Menu button	The button to activate the OSD menu.
(8)	RS-232C	Connect a serial communication port for touch panel communication.
(9)	USB (TypeB)	Connect a USB port (Type B) for touch panel communication.
(10)	Touch pen	Use for operation of touch panel.
(11)	Touch pen holder	Put touch pen in it when not using. Paste it on the monitor by double-sided tape.
(12)	Mounting Brackets	Use them to mount the panel.

For operation at launch OSD, refer to the *Model FH-MT12 INSTRUCTION SHEET*.

Touch Panel Cable

Use the USB cable for the connection cable of Touch Panel Monitor.

Use RS-232C cable for the connection cable of Touch Panel Monitor in the following cases.

- When the distance Touch Panel Monitor and FH Sensor Controller is 5 m or more.
- Cannot use the Touch Panel cable because the USB port of FH Sensor Controller is used for the other I/O connection.

● Touch Panel Monitor Cables

Model	FH-VMDA (2 m)	FH-VUAB (2 m)	XW2Z-200PP-1 (2 m)
Cable type	DVI-Analog Conversion Cable	USB Cable	RS-232C Cable
Vibration resistance	10 to 150 Hz, one-side amplitude 0.1 mm, 10 times for 8 minutes for each three direction		
Ambient Temperature	Operating Condition: 0 to 50°C, Storage Condition: -10 to 60°C (with no icing or condensation)		
Ambient Humidity	Operating and Storage Condition: 35 to 85%RH (with no icing or condensation)		
Ambient environment	No corrosive gases		
Material	Cable outer sheath, Connector: PVC		Cable outer sheath: PVC, Connector: ABS/Ni Plating
Minimum bend radius	36 mm	25 mm	59 mm
Weight	Approx.220 g	Approx.75 g	Approx.162 g

Connection Example

● USB Connection (Cable Length Up to 5 m)

● RS-232C Connection (Cable Length Up to 10 m)

A video signal cable and an operation signal cable are required to connect the Touch Panel Monitor.

Signal	Cable	2 m	5 m	10 m
Video signal	DVI-Analog Conversion Cable	○	○	○
Touch panel operation signal	USB Cable	○	○	×
	RS-232C Cable	○	○	○

Wiring

The power connection for the Touch Panel Monitor is on the back side of the Monitor.

Connect the 24 VDC power source.

- Keep the power supply wires as short as possible. (Max.2 m)
- If UL's certification is required, use a UL class II power supply.
- Use the cables and crimping terminals with the specified dimensions.
  Do not directly connect an electric wire that is simply twisted to the terminal block.
  - Recommended wire size: AWG 13 to 22 (0.326 to 2.62 mm^2)
  - Terminal screw: M4 (Tightening torque: 1.0 N•m)
  - Crimping Terminal

Dimensions

Note 1. Panel thickness: 1.6 to 4.8 mm

2. No burr allowed

● DVI-Analog Conversion Cable for Touch Panel Monitor: FH-VMDA

*1. Cable is available in 2 m/5 m/10 m.

● RS-232C Cable for Touch Panel Monitor: XW2Z-□□□PP-1

*1. Cable is available in 2 m/5 m/10 m.

● USB Cable for Touch Panel Monitor: FH-VUAB

*1. Cable is available in 2 m/5 m.

3-7 LCD and Cable

Specification

● LCD Monitor

Model	FZ-M08
Size	8.4 inches
Type	Liquid crystal color TFT
Resolution	1,024 × 768 dots
Input signal	Analog RGB video input 1 channel
Power supply voltage	21.6 to 26.4 VDC
Current consumption	Approx. 0.7 A max.
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35 to 85%RH (with no condensation)
Weight	Approx. 1.2 kg
Accessories	Instruction Sheet and 4 mounting brackets

● LCD Monitor Cable

Model	FZ-VM
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times
Ambient temperature range	Operation: 0 to 50°C Storage: -20 to 65°C (with no icing or condensation)
Ambient humidity range	Operation and storage: 35 to 85%RH (with no condensation)
Ambient atmosphere	No corrosive gases
Material	Cable sheath: heat-resistant PVC Connector: PVC
Minimum bending radius	75 mm
Weight	Approx. 170 g

Precautions for Correct Use

- Use the DVI-Analog Conversion Cable for Touch Panel Monitor: FH-VMDA when connect the following Sensor Controllers to the LCD monitor: FZ-M08:
  - FH-1000 Sensor Controller
  - FH-3000 Sensor Controller
  - FH-L Sensor Controller
- FZ-VM cable can use by combining the DVI-I -RGB Conversion Connector: FH-VMRGB.

Component Names and Functions

● Front View

● Rear

	Name	Description
(1)	LED indicator lamp (for power)	Lit up green when power is ON.
(2)	LED indicator lamp (for SYNC)	Lit up orange while the video signal is input.
(3)	Power connection terminal	Connect power unit for 24 VDC.
(4)	Video input (RGB)	Video input terminal (RGB)
(5)	MENU button	OSD operating button (MENU button)
(6)	+ button	OSD operating button (+ button)
(7)	- button	OSD operating button (- button)
(8)	AUTO button	OSD operating button (AUTO button)
(9)	VESA mounting hole (M4)	Mounting hole for VESA 75 mm × 75 mm

Wire

The power connection for the Touch Panel Monitor is on the back side of the Monitor.

Connect the 24 VDC power source.

- Keep the power supply wires as short as possible (maximum 10 m).
- If UL recognition is required, use a UL class II power supply.

  Regarding installation, do not use the VESA mounting but fix the monitor unit using the board mounting.

Dimensions

Panel cut drawing (Unit: mm)

● Monitor Cable: FZ-VM

(Unit: mm)

*1. Cable: 2m and 5m

● DVI-I -RGB Conversion Connector: FH-VMRGB

(Unit: mm)

3-8 Sysmac Studio

When you connect the FH-1000 or FH-3000 Sensor Controller and Sysmac Studio Standard Edition/Version Edition, use the latest version.

FH Series	Version of FH Series	Corresponding version of Sysmac Studio Standard Edition/Vision Edition
FH-3050 (-□) FH-1050 (-□)	Version 5.60	Supported by version 1.15 or higher
	Version 5.50	Supported by version 1.14.89 or higher.
	Version 5.30	Supported by version 1.10.80 or higher.
	Version 5.20	Supported by version 1.10 or higher.
	Version 5.10	Supported by version 1.07.43 or higher.
	Version 5.00	Supported by version 1.07 or higher. Not supported by version 1.06 or lower.

4

Handling and Installation Environment

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4-1 All Series

WARNING	
This product must be used according to this manual or Instruction Sheet. Failure to observe this may result in impairment of functions and performance of the product.	
This product is not designed or rated for ensuring safety of persons. Do not use it for such purposes.	
A lithium battery is built into the Sensor Controller and may occasionally combust, explode, or burn if not treated properly. Dispose of the Sensor Controller as industrial waste, and never disassemble, apply pressure that would deform, heat to 100°C or higher, or incinerate the Sensor Controller.	

Precautions for Safe Use

Installation Environment

- Do not use the product in areas where flammable or explosive gases are present.
- Install the product so that air can flow freely through its cooling vents.
- Clean the ventilation holes and fan outlet regularly to prevent dust and particles from clogging them. If they are blocked, heat is trapped inside, causing a malfunction.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.
- Make sure to tighten all installation screws securely.

Handling of Sensor Controller

- Do not attempt to dismantle, repair, or modify the product.
- Do not drop the product nor apply excessive vibration or shock to the product.
  Doing so may cause malfunction or burning.
- This product is heavy. Be careful not to drop it while handling.
- When disposing of the product, treat it as an industrial waste.
- A lithium battery is incorporated, so a severe injury may rarely occur due to ignition or explosion.

Precautions for Correct Use

Installation and Storage Sites

- Install and store the product in a location that meets the following conditions:
  - No rapid changes in temperature (place where dew does not form)
  - No presence of corrosive or flammable gases
  - Place free of dust, salts and iron particles
  - Place free of vibration and shock
  - Place out of direct sunlight
  - Place where it will not come into contact with water, oils or chemicals
  - Place where is near no high-voltage instrument or power machine
  - Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
  - Do not install the product in a cabinet containing high-voltage equipment.
  - Do not install the Sensor Controller within 200 mm of power cables.

Handling of Sensor Controller

- Touching Signal Lines

  When touching a terminal part or a signal wire in a connector, take anti-static measures using a wrist strap or another device to prevent damage from static electricity.
- Handling a USB Memory/SD memory card

  Before removing a USB memory device or SD memory card, make sure that data is not being read or written to them.

Maintenance

- Lightly wipe off dirt with a soft cloth.
- Do not use thinners or benzene.
- Clean the lens with a lens-cleaning cloth or air brush.
- Dirt on the image element must be removed using an air brush.

4-2 FH-1000/FH-3000 Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 50°C (-20 to +65°C in storage)
  - Relative humidity of between 35 to 85%RH
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).

Orientation of Product

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

- For good ventilation, provide a clearance of 50 mm or more above the sensor controller away from other devices in the normal floor mounting. For the right and left sides, provide a clearance of 30 mm or more, and for the back side, 15 mm or more. These clearances are also required when mounting multiple sensor controllers side by side. For the back mounting, the back-side clearance of 15 mm is nor required.

Handling a SD memory card

- Before removing SD memory card, make sure that data is not being read or written to it.
- Do not insert an SD memory card in the reverse orientation, at an angle, or in a twisting manner.
- For an SD memory card, the SD BUSY LED of Sensor Controller flashes while data is being read or written.
  Make sure that the LED stops flashing before removing the card.

4-3 FH-L Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 55°C (-25 to +70°C in storage)
  - Relative humidity of between 10 to 90%RH
- Do not let the ambient temperature exceed 55°C (131°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 55°C (131°F) so that the ambient temperature never exceeds 55°C (131°F).

Orientation of Product

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

- For good ventilation, provide a clearance of 50 mm or more above the Sensor Controller away from other devices in the normal floor mounting. For the right and left sides, back side, for other devices, or Sensor Controller 25 mm or more.

Handling SD memory card

- Before removing a SD memory card, make sure that data is not being read or written to it.
- For an SD memory card, the SD BUSY LED of Sensor Controller flashes while data is being read or written.
  Make sure that the LED stops flashing before removing the card.
- Do not insert an SD memory card in the reverse orientation, at an angle, or in a twisting manner.

4-4 FZ5 Series

Precautions for Safe Use

Installation method

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 50°C (-20 to +65°C in storage)
  - Relative humidity of between 35 to 85%RH
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).

Precautions for Correct Use

- Although the LCD panel is manufactured with precision technology, there are cases where some products are shipped with traces of pixel defects. This is due to the structural reason of LCD and is not a failure.
- When you operate the touch panel monitor, please go at a single point touch operation. If you touch at the same time two or more points, the product will not be able to correctly recognize the touch position.
- Applying excessive force to the touch panel may scratch it, resulting in damage. Do not press the touch panel forcibly nor press it with any sharp object.
- Maintain a minimum clearance of 50 mm above and below the Controller to improve air circulation. A minimum clearance of 10 mm between other devices must also be maintained on the right and left sides of the product. However, if the adjacent devices do not generate heat, provide at least 50 mm of clearance from the top of the Controller. For the clearance at the bottom and sides, follow the mounting method.

4-5 FZ5-L Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 50°C (-20 to +65°C in storage)
  - Relative humidity of between 35 to 85%RH
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).

Installation method

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

- To keep proper air flow, keep the top of the FH Sensor Controller 50 mm or more apart from other devices. Install the FH Sensor Controller with a clearance of 25 mm on the right, left side, and back.

5

Setup and Wiring

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5-1 When turning ON and OFF

5-1-1 All Series

⚠WARNING

Do not connect AC power source to Sensor Controller.
If connects AC power source, it might be a cause of the failure.

Do not touch the terminals while the power supply is ON.
Doing so may result in electrical shock.

⚠CAUTION

Danger of burns. Do not touch the case while the LED is ON or just after power is turned OFF, since it remains extremely hot.

Precautions for Safe Use

- Do the following confirmations again before turning on the power supply.
  - Is the voltage and polarity of the power source set correctly? (DC24V for positive terminal. DC0V for negative terminal.)
  - Is not the load of the output signal short-circuited?
  - Is the load current of the output signal appropriate?
  - Is not the mistake found in wiring?
- Ground the Sensor Controller independently.
  If sharing the ground line with other devices or connecting it with a building beam, the Sensor Controller might be adversely effected.
- Always turn OFF the Sensor Controller's power before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- Illumination is normal immediately after the power supply is turned ON. Do not look directly into the illumination light.
- After confirming that this product is started up, communicate with the high-order device.
- Should you notice any abnormalities, immediately stop use, turn OFF the power supply, and contact your OMRON representative.

Precautions for Correct Use

Turning OFF the Power

When a message is displayed indicating that a task is in progress, do not turn OFF the power. Doing so causes the data in the memory to be corrupted, resulting in the product not operating properly upon the next start-up.
Do not turn OFF during saving data to Sensor Controller.

When turns OFF, conform the followings proceedings have completed and then operate again.

- When saves using Sensor Controller:
  Confirm the save processing is completed and next operation is possible.
- When saves using communication command:
  Intended command is completed. BUSY signal is turned OFF.

Maintenance

Turn OFF the power and safety measures before maintenance.

5-1-2 FH-1000/FH-3000 Series

Precautions for Safe Use

- Re-confirm the followings before turning ON the power.
  - Is the correct voltage and polarity of the power (ENC0_VDD/GND ENC1_VDD/GND) which supplies to encoder cable (DC5)?
- Re-check the ground wire before turning ON the power.

5-1-3 FH-L Series

Precautions for Safe Use

- Confirm the following before turning ON.
  - Is the voltage and polarity of the power source set correctly? (DC24V for positive terminal. DC0V for negative terminal.)
  - Make sure to connect the earth (FG) only to the grounding terminal.

5-1-4 FZ5 Series

Precautions for Correct Use

RESET signal

Do not input RESET immediately after turning ON the power. If you want to use RESET input to synchronize with the timing of startup, turn ON the RESET signal 15 seconds after turning ON the power of the Sensor Controller.

5-1-5 FZ5-L Series

Precautions for Safe Use

Do not touch the fluorescent light or halogen lamp while in operation, or immediately after turning OFF the power.

Precautions for Correct Use

RESET signal

Do not input RESET immediately after turning ON the power. If you want to use RESET input to synchronize with the timing of startup, turn ON the RESET signal 15 seconds after turning ON the power of the Sensor Controller.

5-2 Fail-Safe Measures

The fail-safe measures are the same for each series. Confirm the following instructions.

⚠WARNING

Please take external safety measures so that the system as a whole should be on the safe side even if a failure of a Sensor Controller or an error due to an external factor occurred. An abnormal operation may result in serious accident.	⚠
Please take fail-safe measures on your side in preparation for an abnormal signal due to signal conductor disconnection and/or momentary power interruption. An abnormal operation may result in a serious accident.	⚠

Precautions for Safe Use

- If you wish to operate a stage and/or a robot using a measurement result from a FH Sensor Controller (e.g. axis movement amount output based on calibration/alignment measurement), always take safety measures before operation so that measurement results are re-checked by the stage/robot if it is within the range of movement of the stage/robot.

Precautions for Correct Use

Fail-Safe Measures

- When controlling stages and robots using the measurement results from the Sensor Controller (axis movement output based on calibration and alignment measurement), always take fail-safe measures within the stage and robot systems, such as checking whether the data obtained from the measurement results is within the range of movement of the stages and robots.
- On the Sensor Controller side, use logical operations and conditional branches in a complementary way to add a check process based on the range of movement of the stages and robots, for example, "data is not externally output if in a range of -XXXXX to XXXXX."

Communication with High-order Device

After confirming that this product is started up, communicate with the high-order device. During start-up, an indefinite signal may be output from the high-order interface. To avoid this problem, clear the receiving buffer of your device at initial operations.

5-3 Sensor Controller Installation

5-3-1 All Series

Precautions for Safe Use

Power Supply and Wiring

- Make sure to use the product with the power supply voltage specified by this manual.
- Use a DC power supply with safety measures against high-voltage spikes (safety extra low-voltage circuits on the secondary side).
- Make sure to tighten all installation screws securely.

5-3-2 FH-1000/FH-3000 Series

Precautions for Safe Use

Power Supply and Wiring

- Keep the power supply wires as short as possible (Max. 2 m).
- Use the wire of a suitable size (AWG 10 to 16) according to the current consumption.

Ground

- The power supply circuit of the FH Sensor Controller is insulated from the internal circuit.
- When the connected camera to FH Sensor Control comes packaged with a base, make sure to mount with the base.
  Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.
- Perform Class D grounding (with a grounding resistance of 100 Ω or less).
- Keep the ground line as short as possible by setting the grounding point as close as possible.
- Ground the FH Sensor Controller independently. If sharing the ground line with other devices or connecting it with a building beam, the Sensor Controller might be adversely affected.

Connect the FH-1000 / FH-3000 Series to FH-MT12

When you connect the Sensor Controller to the FH-MT12 via USB cable, do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Connect the FH-1000 / FH-3000 Series to FH-SC12/FH-SM12 (12 megapixels camera)

When you connect the Sensor Controller to the FH-SC12/FH-SM12, do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Precautions for Correct Use

When connecting the sensor controller and monitor with a switcher and splitter

Do not use devices that may require re-recognition of the monitor by the sensor controller. Re-recognition of the monitor may have an effect on measurement speed.

Connection of Terminal Block of FH-1000/FH-3000 Series

Connecting of Sensor Controller's terminal block in order to connect package the terminal block connector (male; FH-XCN).

Use the specified wire size (AWG10 to 16) and keep the power supply wires as short as possible (Max. 2 m).

1 Insert the end of the signal line (electric wire) into the terminal block connector (male), and tighten the three screws on the connector top to fix the wire. Recommended tightening torque: 0.7-0.8 N•m

2 Connect the wire and power source to the terminal block connector (male) depending on the indicated terminal block connector.

Indicate of terminal block connector	Function
+	Connect the DC output positive (+V) of 24VDC power.
-	Connect the DC output positive (-V) of 24VDC power.
⏚	Connect the earth.

3 Insert the terminal block connector (male) to the terminal block connector (female) of Sensor Controller.

4 Tightens and fix the left and right screws for the terminal block connector (male). (Recommended tightening torque: 0.7 N•m to 0.8 N•m)

(Unit: mm)

Recommended Power Source of FH-1000/FH-3000 Series

Power source types for FH series differ depending on the number of cameras due to current consumption differences. Refer to the following table to use the appropriate type. When you connect your camera to the lighting via Light Controller, the current consumption is same as when the Intelligent Compact Digital camera is connected.

Item	Camera Type	No. of cameras connected	FH-3050	FH-3050-10	FH-3050-20
Recommended Power Source S8VK-G S8VS	Intelligent Compact Digital Camera	2	S8VK-G12024 S8VS-12024	S8VK-G24024 S8VS-18024	S8VK-G24024 S8VS-18024
		4	---	S8VK-G24024 S8VS-18024	S8VK-G24024 S8VS-24024
		8	---	---	S8VS-48024
	Camera 0.3, 2, 4, 5,12 megapixels	2	S8VK-G12024 S8VS-12024	S8VK-G24024 S8VS-18024	S8VK-G24024 S8VS-18024
		4	---	S8VK-G24024 S8VS-18024	S8VK-G24024 S8VS-18024
		8	---	---	S8VK-G24024 S8VS-18024

Item	Camera type	No. of cameras connected	FH-1050	FH-1050-10	FH-1050-20
Recommended Power Source S8VK-G S8VS	Intelligent Compact Digital Camera	2	S8VK-G12024 S8VS-12024	S8VK-G12024 S8VS-12024	S8VK-G24024 S8VS-18024
		4	---	S8VK-G24024 S8VS-18024	S8VK-G24024 S8VS-24024
		8	---	---	S8VS-48024
	Camera 0.3, 2, 4, 5,12 megapixels	2	S8VK-G12024 S8VS-09024	S8VK-G12024 S8VS-09024	S8VK-G12024 S8VS-12024
		4	---	S8VK-G12024 S8VS-12024	S8VK-G12024 S8VS-12024
		8	---	---	S8VK-G24024 S8VS-18024

Mounting of FH-1000/FH-3000 Series

- Tighten the screws securely when installing the product.
- For good ventilation, provide a clearance of 50 mm or more above the sensor controller away from other devices in the normal floor mounting. For the right and left sides, provide a clearance of 30 mm or more, and for the back side, 15 mm or more. These clearances are also required when mounting multiple sensor controllers side by side. For the back mounting, the back-side clearance of 30 mm is nor required.
- Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the Sensor Controller within 200 mm of power cables.

● Side Mounting

* Recommended tightening torque: 1.2 N•m to 1.3 N•m
* The tolerance is ±0.2 mm.

● Bottom Mounting

* Do not remove the Insulating leg. Fix the Insulating leg to secure the ventilation path.
* Recommended tightening torque: 0.54 N•m to 0.6 N•m
* The tolerance is ±0.2 mm.

5-3-3 FH-L Series

Precautions for Safe Use

Power Supply and Wiring

- Keep the power supply wires as short as possible (Max.2 m).
- Use the specified wire size (AWG12 to 16).
- Recommended power source for FH-L series: OMRON S8VK-G□□□24 or S8VS-□□□24.

Ground

- The power supply circuit of the Sensor Controller is not insulated from the internal circuit.
- When the connected camera to Sensor Control comes packaged with a base, make sure to mount with the base. Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.
- It is short-circuited with FG of the customer device when installing it directly because the case of the controller is connected with SG (0 V).
- Do not ground the plus (+) terminal when the FH-L series Sensor Controller is connected to the FH-SC12/FH-SM12. Doing so may cause a short circuit of the internal circuit, resulting in a malfunction.

Connect the FH-L series Sensor Controller to the FH-MT12 Touch panel monitor.

When you connect the Sensor Controller to the FH-MT12 via USB cable, do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

When connect the FH-L series Sensor Controller to the FH-SC12/FH-SM12: 12 megapixels camera

When you connect the Sensor Controller to the FH-SC12/FH-SM12, do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Connection of Terminal Block of FH-L Series

Connect to the terminal block by using the terminal connector, male: FH-XCN-L, which is packaged with Sensor Controller.

Use the wire of a suitable size (AWG 12 to 16) according to the current consumption. Keep the power supply wires as short as possible: Max. 2m.

1 Insert the end of the signal line, electric wire, into the terminal block connector (male).

Tighten the three screws on the connector top to secure the wire.
Recommended tightening torque: 0.5 - 0.6 N•m

2 Insert the terminal block connector (male) into the terminal block connector (female) on the FH Sensor Controller side.

Power Terminal Connector	Function
+	Connect to the DC output terminal +V of 24 VDC.
-	Connect to the DC output terminal -V of 24 VDC.
⏚	Connect to the earth.

3 Secure the terminal block connector (male) by tightening the screws on the right and left sides of it with a flathead screwdriver. Recommended tightening torque: 0.5 - 0.6 N•m

Recommended Power Source for FH-L Series

The power source connected to the FH-L series Sensor Controller changes the power consumption depending on the number of camera. Refer to the following table.
When you connect the camera using lighting Controller, the power consumption is same when connect to the Intelligent Compact Digital Camera.

Item	Camera Type	Number of Camera	FH-L□□□	FH-L□□□-□□
Recommended Power Source S8VK-G S8VS	Intelligent Compact Digital Camera	2	S8VK-G12024 S8VS-09024	S8VK-G112024 S8VS-09024
		4	---	S8VK-G12024 S8VS-12024
	Camera of 0.3/2/4/5/12 million pixels	2	S8VK-G-06024 S8VS-06024	S8VK-G-06024 S8VS-06024
		4	---	S8VK-G-06024 S8VS-06024

Mounting of FH-L Series

- Make sure to tighten all installation screws securely.
- For good ventilation, provide a clearance of 50 mm or more above the sensor controller away from other devices in the normal floor mounting. For the right and left sides, provide a clearance of 30 mm or more, and for the back side, 15 mm or more. These clearances are also required when mounting multiple sensor controllers side by side. For the back mounting, the back-side clearance of 15 mm is nor required.
- Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the Sensor Controller within 200 mm of power cables.

● Mounting the base of the Sensor Controller (Floor mounting)

- Recommended tightening torque: 0.54 N•m to 0.6 N•m
- The tolerance: ±0.2 mm

Mounting of the Back Side

- Recommended tightening torque: 0.54 N•m to 0.6 N•m
- The tolerance: ±0.2 mm

Mounting the DIN rail

1 Mount DIN rail mounting bracket: FH-XDM-L, to the four mount holes on the back of the Sensor Controller.

2 Mount the DIN rail.

- Recommended tightening torque: 0.54 N•m to 0.6 N•m
- The tolerance: ±0.2 mm

- Dimensions of DIN rail mounting bracket: FH-XDM-L

(Unit: mm)

- When mounting the DIN rail, for improvement of heat dissipation, install the product in the following orientation only.

- Do not install in this orientation.

Set DIN rail bottom of the Sensor Controller.

Set DIN rail above of the Sensor Controller.

Set DIN rail vertical of the Sensor Controller.

Set DIN rail horizontal of the Sensor Controller.

- When mounting the Sensor Controller to the DIN rail, click the rail stoppers, hook the part of A to rail one to the end, and then push up the rail stoppers with pushing to B direction.

- When removing, insert a flat-head screwdriver to the part of C and pull off.

- The back clearance of DIN rail when mount the DIN rail is 16.1mm.

- The following items are recommended for mounting DIN rail.

Name	Model	Manufacturer	Note
DIN35 mm rail	NS 35/ 7,5 PERF	PHOENIX CONTACT	• Length: 75.5/95.5/115.5/200 cm • Material: Iron • Surface: Conductive
End plate	NS 35/ 15 PERF	PHOENIX CONTACT	• Length: 75.5/95.5/115.5/200 cm • Material: Iron • Surface: Conductive
End plate	CLIPFIX 35	PHOENIX CONTACT	Need 2 pieces each Sensor Controller.

- DIN rail Dimensions

  NS 35/7,5 PERF

  NS 35/15 PERF

- End plate

For screw or washer, refer to the followings.

(a): Length between head of screw and fastening surface.

Model	Screw Diameter	(a)
NS 35/ 7,5 PERF	M6	4.6 mm max.
NS 35/ 15 PERF	M6	10 mm max.

5-3-4 FZ5 Series

Precautions for Safe Use

Power Supply and Wiring

- Never connect AC power to this product. Connecting an AC power source may cause a malfunction.
- The recommended power supply is S8VS-□□□24 (made by OMRON) or S8VK-G-□□□24 (made by OMRON).
- Keep the power supply wires as short as possible (Max.10 m).
- Use the cables and crimping terminals with the specified dimensions.
  Do not directly connect an electric wire to the terminal lock that is simply twisted.
- Recommended wire size: AWG16 to 13 (1.31 to 2.63 mm^2)
- Terminal screw: M4 (Tightening torque: 1.4 N·m)
- Crimping Terminal

  8.5 mm max. 8.5 mm max.
- After wiring, replace the terminal cover.

Ground

- The controller power circuit is not insulated from its internal circuit.
- When grounding the 24 V DC power supply' s positive terminal, do not ground the controller' s FG terminal or the PLC' s FG terminal. [①, ②] Since the PC' s shell and the SG (0V) are connected inside the PC, current would run through the route shown in the figure below and cause burnout.
- As in the case with a PC, you can safely ground the controller' s FG terminal without a problem when there is no possibility that the SG (0V) and the FG will short-circuit. For information about the PLC wiring, check the specifications of your PLC before wiring.
- Be sure to use a pedestal when connecting a camera to the controller. [③] As the shell of the camera is the SG (0V), it can cause short-circuiting between the SG (0V) and the FG if a pedestal is not used.
- To avoid receiving an electric shock when grounding a positive terminal, do not touch the SG (0V) (camera, power supply terminal).

- Circuit ground (0 VDC) and frame ground are connected together. When connecting a non-isolated device or a non-isolated interface to the controller, take appropriate actions to avoid communication failures or damage to the mentioned ports.
- By the following case, make the connections so that the FG terminal of the connected device has the same electrical potential as the controller. A difference in electrical potential between the connected device and the controller may cause failure or malfunction.
- Ground the FG terminal of the non-isolated device
- Ground the SG (0 VDC) terminal of the isolated device or the non-isolated device
- Ground the SG (0 VDC) terminal of the controller

Precautions for Correct Use

The LCD panel used for the LCD-integrated type has been made using precision technology, and sometimes a few pixels are missing in the panel. This is due to the structure of the LCD panel, and is not a malfunction.

Connection of Terminal Block of FZ5 Series

Use the cables and crimping terminals with the specified dimensions.
Keep the power supply wires as short as possible (Max.10 m).
Wire the power supply unit independently of other devices.
Do not directly connect an electric wire to the terminal block that is simply twisted.
Make sure that the controller is grounded with a separate ground wire.
After wiring, replace the terminal cover.

Recommended Power Source for FZ5 Series

Power source types for FZ5 series differ depending on the number of cameras due to current consumption differences. Refer to the following table to use the appropriate type. When you connect your camera to the lighting via Light Controller, the current consumption is same as when the Intelligent Compact Digital camera is connected.

FZ5-1200 Series/FZ5-800 Series

Item	Camera Type	Number of Cameras	FZ5-80□	FZ5-80□-10	FZ5-120□	FZ5-120□-10
Recommended Source S8VK-G S8VS	Intelligent Compact Digital Camera	2	S8VK-G12024 S8VS-12024	S8VK-G24024 S8VS-18024	S8VK-G12024 S8VS-12024	S8VK-G24024 S8VS-18024
		4	---		---	
	0.3/2/5 megapixel camera	2	S8VK-G12024 S8VS-09024	S8VK-G12024 S8VS-12024	S8VK-G12024 S8VS-09024	S8VK-G12024 S8VS-12024
		4	---		---	

FZ5-1100 Series/FZ5-600 Series

Item	Camera Type	Number of Cameras	FZ5-60□	FZ5-60□-10	FZ5-110□	FZ5-110□-10
Recommended Source S8VS	Intelligent Compact Digital Camera	2	S8VS-12024	S8VS-18024	S8VS-12024	S8VS-18024
		4	---		---	
	0.3/2/5 megapixel camera	2	S8VS-09024	S8VS-12024	S8VS-09024	S8VS-12024
		4	---		---	

Mounting of the FZ5 Series

- Make sure to tighten all installation screws securely.
- Maintain a minimum clearance of 50 mm above the controller to improve air circulation. Install the FZ5 Sensor Controller with a clearance of 30 mm on the right, left side, and 10 mm for rear planes. However, if the adjacent devices do not generate heat, provide at least 50 mm of clearance from the top of the Controller. For the clearance at the bottom and sides, follow the mounting method.
- Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).
- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the Sensor Controller within 200 mm of power cables.

● Panel mounting

(1) Make a mount hole on the panel.

Panel thickness range: 1.6 to 4.8 mm
Panel material: Metal (iron, aluminum or stainless)

(2) Insert the LCD integrated controller into the hole, from the front panel.

(3) Use the bracket (supplied with the product) to secure the controller and the panel.

Tightening torque: 0.5 to 0.6 N•m

• Mounting the controller to the optional desktop stand.

The controller can be placed on a desk by attaching the optional desktop stand (FZ-DS) to the rear of the controller.

* For details, refer to the Instruction Sheet of the desktop stand.

• Mounting the controller to the optional VESA attachment unit.

VESA-compatible mounting of the controller is possible by attaching the optional VESA attachment unit (FZ-VESA) to the rear of the controller.

* For details, refer to the Instruction Sheet of the VESA attachment

5-3-5 FZ5-L Series

Precautions for Safe Use

Power Supply and Wiring

- Keep the power supply wires as short as possible (Max.10 m).
- Use the cables and crimping terminals with the specified dimensions. Do not directly connect an electric wire to the terminal lock that is simply twisted.
- Recommended wire size: 1.31 to 2.63 mm^2
- Terminal screw: M4 (Tightening torque:1.4 N·m)
- Crimping Terminal

Ground

- The controller power circuit is not insulated from its internal circuit.
- When the connected camera to the Sensor Control comes packaged with a base, make sure to mount with the base. As the housing of the camera is the SG (0 V), it can cause short-circuiting between the SG (0 V) and the FG if a spacer is not used.
- It is short-circuited with FG of the customer device when installing it directly because the case of the controller is connected with SG (0 V).
- Do not ground the 24 VDC power supply's positive terminal. If the positive terminal is grounded, it causes the electric shock when you touch the SG (0 V) such as case of the controller or the camera.

Connection of Terminal Block of FZ5-L Series

Use the cables and crimping terminals with the specified dimensions.
Keep the power supply wires as short as possible (Max.10 m).
Wire the power supply unit independently of other devices.
Do not directly connect an electric wire to the terminal block that is simply twisted.
After wiring, replace the terminal cover.

Recommended Power Source for FZ5-L Series

Power source types for FZ5-L series differ depending on the number of cameras due to current consumption differences. Refer to the following table to use the appropriate type. When you connect your camera to the lighting via Light Controller, the current consumption is same as when the Intelligent Compact Digital camera is connected.

FZ5-L Series

Item	Camera Type	Number of Camera	FZ5-L35□	FZ5-L35□-10
Recommended Source S8VS	Intelligent Compact Digital Camera	2	S8VS-12024	S8VS-18024
		4	---	
	Camera of 0.3/2/5 million pixels	2	S8VS-09024	S8VS-09024
		4	---	

Mounting of the FZ5-L Series

- Make sure to tighten all installation screws securely.
- Maintain a minimum clearance of 50 mm above the controller to improve air circulation.
  A minimum clearance of 25 mm between other devices must also be maintained on the right, left and back sides of product.
- Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the Sensor Controller within 200 mm of power cables.

Note Fix without removing the insulation leg because neither the ventilation route is closed nor the case are connected with FG.

5-4 Setup Touch Panel Monitor or Monitor

Describes the notifications of Sensor Controller when you setup Touch Panel Monitor or Monitor.

For handling or functions of monitor, refer to each of instruction sheet.

5-4-1 All Series

Precautions for Safe Use

- Use only the cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the power of the Sensor Controller and peripheral devices before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

5-4-2 FH-1000/FH-3000 Series

Precautions for Safe Use

- Please insert DVI-I connector perpendicularly so that the connector resin part and pin are not rubbing against each other. Damaged pin may cause contact failure due to generation and invasion of resin powder.
- When you connect FH-1000 series or FH-3000 series to the FH-MT12 via USB cable:
  Do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Precautions for Correct Use

When connect the Sensor Controller and monitor with a switcher and splitter

Do not use devices that make the Sensor Controller recognize the monitor again when switching operation is performed. Re-recognition process in switching operation has an effect such as a delay in measurement time.

When fix the DVI connector

If difficult to fix the bilateral screws of DVI connector, once loosen these. Then retry to fix, again.

5-4-3 FH-L Series

Precautions for Safe Use

- Please insert monitor connector perpendicularly so that the connector resin part and pin are not rubbing against each other. Damaged pin may cause contact failure due to generation and invasion of resin powder.
- When you connect FH-L series to the FH-MT12 via USB cable:
  Do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Precautions for Correct Use

When connecting the sensor controller and monitor with a switcher and splitter

Do not use devices that make the Sensor Controller recognize the monitor again when switching operation is performed. Re-recognition process in switching operation has an effect such as a delay in measurement time.

When fix the DVI connector

If difficult to fix the bilateral screws of DVI connector, once loosen these. Then retry to fix, again.

5-4-4 FZ5 Series

Precautions for Safe Use

Please insert monitor connector perpendicularly so that the connector resin part and pin are not rubbing against each other. Damaged pin may cause contact failure due to generation and invasion of resin powder.

5-4-5 FZ5-L Series

Precautions for Safe Use

Please insert monitor connector perpendicularly so that the connector resin part and pin are not rubbing against each other. Damaged pin may cause contact failure due to generation and invasion of resin powder.

5-5 Camera Installation

Guidelines and precautions for Sensor Controller installation when cameras are also installed.

For handling and function information for specific cameras, refer to the appropriate instruction sheet.

5-5-1 All Series

⚠WARNING

Since camera that can be connected with this product emits a visible light that may have an adverse effect on the eyes, do not stare directly into the light emitted from the LED. If a specular object is used, take care not to allow reflected light enter your eyes.

⚠CAUTION

Danger of burns. Do not touch the case while the LED is ON or just after power is turned OFF, since it remains extremely hot.

Precautions for Safe Use

- Use only the camera and cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the power of the Sensor Controller and peripheral devices before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.
- While the power is ON or immediately after the power is turned OFF, the Sensor Controller and camera case are still hot. Do not touch the case.

Precautions for Correct Use

Maintenance

- Turn OFF the power and ensure the safety before maintenance.
- Clean the lens with a lens-cleaning cloth or air brush.
- Lightly wipe off dirt with a soft cloth.
- Dirt on the image element must be removed using an air brush.
- Do not use thinners or benzene.
- When installing / replacing the camera, reset the parameter settings of the corresponding Camera Image Input processing item.

5-5-2 FH-1000/FH-3000 Series

Precautions for Safe Use

Ground

When the connected camera to the Sensor Control comes packaged with a base, make sure to mount with the base.
Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.

Connection the FH-1000/FH-3000 series to the FH-SC12/FH-SM12 (12 megapixels)

When you connect FH-1000 series or FH-3000 series to the FH-SC12/FH-SM12:
Do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Mounting of Ferrite core

Mount the ferrite core attached to the camera cable to near the Sensor Controller.

Camera cable mounting

When you connect the cable to the Sensor Controller, secure the minimum bending radius of the cable or cable connector.

Name	Model	Minimum bending radius	Connector length
Camera Cable	FZ-VS3	69 mm	30 mm
Right-angle Camera Cable	FZ-VSL3		
Bend resistant Camera Cable	FZ-VSB3		
Bend resistant Right-angle Camera Cable	FZ-VSLB3		
Long-distance Camera Cable	FZ-VS4	78 mm	42 mm
Long-distance Right-angle Camera Cable	FZ-VSL4		

5-5-3 FH-L Series

Precautions for Safe Use

Ground

When the connected camera to the Sensor Control comes packaged with a base, make sure to mount with the base.
Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.

Connect the FH-1000/FH-3000 series Sensor Controller to the FH-SC12 / FH-SN12: 12 megapixels camera

When you connect FH-L series to the FH-SC12 or FH-SM12:
Do not ground the positive terminal of DC24V power source. The internal circuit is possible to be given damage, it can be cause the failure.

Camera cable mounting

Secure the minimum bending radius of the cable or cable connector.

Name	Model	Minimum bending radius	Connector length
Camera Cable	FZ-VS3	69 mm	30 mm
Right-angle Camera Cable	FZ-VSL3		
Bend resistant Camera Cable	FZ-VSB3		
Bend resistant Right-angle Camera Cable	FZ-VSLB3		
Long-distance Camera Cable	FZ-VS4	78 mm	42 mm
Long-distance Right-angle Camera Cable	FZ-VSL4		

5-5-4 FZ5 Series

Precautions for Safe Use

When the connected camera to the Sensor Control comes packaged with a base, make sure to mount with the base.
Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.

5-5-5 FZ5-L Series

Precautions for Safe Use

Ground

When the connected camera to the Sensor Control comes packaged with a base, make sure to mount with the base.
Since the enclosure of the camera main body made of metals is short-circuited with the internal circuit, the internal circuit might be short-circuited with FG if no base is used, so that failures or malfunctions may be caused.

5-6 Insert SD Memory Card or USB memory

Precautions for Correct Use

When removing USB memory

- Confirm the SD memory card of USB memory is not in running, and then remove it.
- Before removing a USB memory device or SD memory card, make sure that data is not being read or written to them.
- When a message is displayed indicating that a task is in progress, do not turn OFF the power.

- Do not insert or remove USB memory during measurement, loading, and writing.
  There is the possibility of measurement time or damage of data.
- When you connect the USB memory using USB hub, the drive name after launching can be changed.
  If you want to ensure the drive name does not change, connect to the USB port directly without using USB hub.

5-6-1 FH-1000/FH-3000 Series

Precautions for Correct Use

Handling of SD memory card

- When you touch a terminal part of SD memory card, antistatic is required by using a wrist strap or others.
- Do not insert an SD memory card in the reverse orientation, at an angle, or in a twisting manner.

Removing SD memory card

- Before removing a SD memory card, make sure that data is not being read or written to them.
- For an SD memory card, the SD BUSY LED of Sensor Controller flashes while data is being read or written.
  Make sure that the LED stops flashing before removing the card.
- When a message is displayed indicating that a task is in progress, do not turn OFF the power.

Do not insert or remove SD memory card during measurement, loading, and writing.
There is the possibility of measurement time or damage of data.

Additional Information

For external memory device, refer to the Using External Memory Devices in *Vision System FH/FZ5 Series User's Manual* (Cat. No. Z365).

5-6-2 FH-L Series

Precautions for Correct Use

Handling of SD memory card

- When you touch a terminal part of SD memory card, antistatic is required by using a wrist strap or others.
- Do not insert an SD memory card in the reverse orientation, at an angle, or in a twisting manner.

Removing SD memory card

- Before removing a SD memory card, make sure that data is not being read or written to them.
- For an SD memory card, the SD BUSY LED of Sensor Controller flashes while data is being read or written.
  Make sure that the LED stops flashing before removing the card.
- When a message is displayed indicating that a task is in progress, do not turn OFF the power.
  Doing so causes the data in the memory to be corrupted, resulting in the product not operating properly upon the next start-up.

Do not insert or remove SD memory card during measurement, loading, and writing.
There is the possibility of measurement time or damage of data.

Additional Information

For external memory device, refer to the Using External Memory Devices in *Vision System FH/FZ5 Series User's Manual* (Cat. No. Z365).

5-6-3 FZ5 Series

Additional Information

For external memory device, refer to the Using External Memory Devices in *Vision System FH/FZ5 Series User's Manual* (Cat. No. Z365).

5-7 Use by Connecting Software

Sysmac Studio FH tool, FZ_FH Remote Operation tool, and Simulation Software are dedicated software.

5-7-1 Sysmac Studio FH Tool

Sysmac Studio FH tool is supported only FH-1000 and FH-3000 series.

When you purchase these series newly, both software DVD and icons are required.

Additional Information

For Sysmac Studio FH tool, refer to the *Vision System FH Series Operation Manual for Sysmac Studio* (Cat. No. Z343).

5-7-2 FZ_FH Remote Operation Tool

FZ_FH Remote Operation tool is supported all of the series; FH-1000, FH-3000, FH-L, FZ5, and FZ5-L series.

When you purchase these series newly, both software DVD and license are required.

Additional Information

For details of FZ_FH Remote Operation tool, refer to *Remotely Operating the Controller (Remote Operation)* section in the *Vision System FH/FZ5 series User's Manual* (Cat. No. Z365).

5-7-3 Simulation Software

Using the Simulation Software, you can check the operation or functions of Vision System FH/FZ5 series on a PC.

Additional Information

For using the Simulation Software, refer to the description of *How To Use Simulation Software*.

5-8 Installation in a Control Panel

When the Sensor Controller is being installed in a cabinet or control panel, be sure to provide proper ambient conditions as well as access for operation and maintenance.

5-8-1 All Series

Precautions for Safe Use

Installation Environment

- Do not use the product in areas where flammable or explosive gases are present.
- Install the product so that air can flow freely through its cooling vents.
- Clean the vent hole and discharge opening to prevent dust or particles from blocking them. Blocked cooling vents or discharge opening of the fan increasing heat inside, causing malfunction of the product.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.
- Make sure to tighten all installation screws securely.

Accessibility for Operation and Maintenance

- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

Precautions for Correct Use

Installation and Storage Sites

Install and store the product in a location that meets the following conditions:

- No rapid changes in temperature (place where dew does not form)
- No presence of corrosive or flammable gases
- Place free of dust, salts and iron particles
- Place free of vibration and shock
- Place out of direct sunlight
- Place where it will not come into contact with water, oils or chemicals
- Place where is near no high-voltage instrument or power machine

Ambient Temperature

Do not install the product immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.

Noise Resistance

- Do not install the product in a cabinet containing high-voltage equipment.
- Do not install the Sensor Controller within 200 mm of power cables.

Ambient temperature and humidity

- Panels have been reduced in size due to space-saving and miniaturization in devices and systems, and the temperature inside the panel may be at least 10 to 15°C higher than outside the panel. Implement the following measures against overheating at the installation site and in the panel, and allow a sufficient margin for the temperature.
- The Controller may not start normally if the temperature is below 0°C when the power is turned ON. Maintain an air temperature of at least approximately 5°C inside the panel, by implementing measures such as installing a low-capacity space heater in the panel. Alternatively, leave the Controller power ON to keep the Controller warm.
- Rapid temperature changes can cause condensation to occur, resulting in malfunctioning due to short-circuiting. When there is a possibility of this occurring, take measures against condensation, such as leaving the Controller power ON at night or installing a heater in the control panel to keep it warmer.

Vibration and Shock

The Controller is tested for conformity with the sine wave vibration test method (IEC 60068-2-6) and the shock test method (IEC 60068-2-27) of the Environmental Testing for Electrotechnical Products. It is designed so that malfunctioning will not occur within the specifications for vibration and shock. If, however, the Controller is to be used in a location in which it will be directly subjected to regular vibration or shock, then implement the following countermeasures:

- Separate the control panel from the source of the vibration or shock. Or secure the Controller and the panel with rubber padding to prevent vibration.
- Make the building or the floor vibration-resistant.
- To prevent shock when other devices in the panel such as electromagnetic contactors operate, secure either the source of the shock or the Controller with rubber padding.

Accessibility for Operation and Maintenance

- To ensure safe access for operation and maintenance, separate the Controller as much as possible from high-voltage equipment and power machinery.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.
- Consider the physical size of USB memory, or SD memory card as these will be inserted in to the mounted Sensor Controller.

5-8-2 FH-1000/FH-3000 Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 50°C (-20 to +65°C in storage)
  - Relative humidity of between 35 to 85%RH
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122° F).

Orientation of Product

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

- For good ventilation, provide a clearance of 50 mm or more above the Sensor Controller away from other devices in the normal floor mounting. For the right and left sides, provide a clearance of 30 mm or more, and for the back side, 15 mm or more. These clearances are also required when mounting multiple sensor controllers side by side. For the back mounting, the back-side clearance of 15 mm is nor required.

Accessibility for Operation and Maintenance

When you connect the cable to the Sensor Controller, secure the minimum bending radius of the cable or cable connector.

Name	Model	Minimum bending radius	Connector length
Camera Cable	FZ-VS3	69 mm	30 mm
Right-angle Camera Cable	FZ-VSL3		
Bend resistant Camera Cable	FZ-VSB3		
Bend resistant Right-angle Camera Cable	FZ-VSLB3		
Long-distance Camera Cable	FZ-VS4	78 mm	42 mm
Long-distance Right-angle Camera Cable	FZ-VSL4		

Installation in a Control Panel

- Make sure to tighten all installation screws securely.
- To keep proper air flow, keep the top of the FH Sensor Controller 50 mm or more apart from other devices. Install the FH Sensor Controller with a clearance of 30 mm on the right and left side, and 15 mm for rear planes. The clearance is required for installing multiple units side-by-side.

● Side Mounting

(Unit: mm)

* Recommended tightening torque: 1.2 N•m to 1.3 N•m
* The tolerance is ±0.2 mm.

● Bottom Mounting

(Unit: mm)

* Do not remove the Insulating leg. Fix the Insulating leg to secure the ventilation path.
* Recommended tightening torque: 0.54 N•m to 0.6 N•m
* The tolerance is ±0.2 mm.

5-8-3 FH-L Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 55°C (-25 to +70°C in storage)
  - Relative humidity of between 10 to 90% RH

Orientation of Product

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

- To keep proper air flow, keep the top of the FH Sensor Controller 50 mm or more apart from other devices. Install the FH Sensor Controller with a clearance of 30 mm on the right and left side, and 15 mm for rear planes. The clearance is required for installing multiple units side-by-side. For the back mounting, the back-side clearance of 15 mm is nor required.

Accessibility for Operation and Maintenance

When you connect the cable to the Sensor Controller, secure the minimum bending radius of the cable or cable connector.

Name	Model	Minimum bending radius	Connector length
Camera Cable	FZ-VS3	69 mm	30 mm
Right-angle Camera Cable	FZ-VSL3		
Bend resistant Camera Cable	FZ-VSB3		
Bend resistant Right-angle Camera Cable	FZ-VSLB3		
Long-distance Camera Cable	FZ-VS4	78 mm	42 mm
Long-distance Right-angle Camera Cable	FZ-VSL4		

Installation in a Control Panel

- Make sure to tighten all installation screws securely.
- To keep proper air flow, keep the top of the FH Sensor Controller 50 mm or more apart from other devices. Install the FH Sensor Controller with a clearance of 30 mm on the right and left side, and 15 mm for rear planes. The clearance is required for installing multiple units side-by-side. For the back mounting, the back-side clearance of 15 mm is nor required.

● Mounting the base of the Sensor Controller (Floor mounting)

- Recommended tightening torque: 0.54 N•m to 0.6 N•m
- The tolerance: ±0.2 mm

Mounting of the Back Side

- Recommended tightening torque: 0.54 N•m to 0.6 N•m
- The tolerance: ±0.2 mm

Mounting the DIN rail

1 Mount DIN rail mounting bracket: FH-XDM-L, to the four mount holes on the back of the Sensor Controller.

2 Mount the DIN rail.

- Recommended tightening torque: 0.54 N•m to 0.6 N•m
- The tolerance: ±0.2 mm

- Dimensions of DIN rail mounting bracket: FH-XDM-L

(Unit: mm)

- When mounting the DIN rail, for improvement of heat dissipation, install the product in the following orientation only.

- Do not install in this orientation.

Set DIN rail bottom of the Sensor Controller.

Set DIN rail above of the Sensor Controller.

Set DIN rail vertical of the Sensor Controller.

Set DIN rail horizontal of the Sensor Controller.

- When mounting the Sensor Controller to the DIN rail, click the rail stoppers, hook the part of A to rail one to the end, and then push up the rail stoppers with pushing to B direction.

- When removing, insert a flat-head screwdriver to the part of C and pull off.

- The back clearance of DIN rail when mount the DIN rail is 16.1mm.

- The following items are recommended for mounting DIN rail.

Name	Model	Manufacturer	Note
DIN35 mm rail	NS 35/ 7,5 PERF	PHOENIX CONTACT	• Length: 75.5/95.5/115.5/200 cm • Material: Iron • Surface: Conductive
End plate	NS 35/ 15 PERF	PHOENIX CONTACT	• Length: 75.5/95.5/115.5/200 cm • Material: Iron • Surface: Conductive
End plate	CLIPFIX 35	PHOENIX CONTACT	Need 2 pieces each Sensor Controller.

- DIN rail Dimensions

  NS 35/7,5 PERF

  NS 35/15 PERF

- End plate

For screw or washer, refer to the followings.

(a): Length between head of screw and fastening surface.

Model	Screw Diameter	(a)
NS 35/ 7,5 PERF	M6	4.6 mm max.
NS 35/ 15 PERF	M6	10 mm max.

5-8-4 FZ5 Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 50°C (-20 to +65°C in storage)
  - Relative humidity of between 35 to 85%RH
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).
- For good ventilation, provide a clearance of 50 mm or more above the Sensor Controller away from other devices in the normal floor mounting. For the back side, 10 mm or more. These clearances are also required when mounting multiple sensor controllers side by side. For the back mounting, the back-side clearance of 15 mm is nor required. However, if the adjacent devices do not generate heat, provide at least 50 mm of clearance from the top of the Controller.

Installation in a Control Panel

● Panel mounting

(1) Make a mount hole on the panel.

Panel thickness range: 1.6 to 4.8 mm
Panel material: Metal (iron, aluminum or stainless)

(2) Insert the LCD integrated controller into the hole, from the front panel.

(3) Use the bracket (supplied with the product) to secure the controller and the panel.

Tightening torque: 0.5 to 0.6 N•m

• Mounting the controller to the optional desktop stand.

The controller can be placed on a desk by attaching the optional desktop stand (FZ-DS) to the rear of the controller.

* For details, refer to the Instruction Sheet of the desktop stand.

• Mounting the controller to the optional VESA attachment unit.

VESA-compatible mounting of the controller is possible by attaching the optional VESA attachment unit (FZ-VESA) to the rear of the controller.

* For details, refer to the Instruction Sheet of the VESA attachment

5-8-5 FZ5-L Series

Precautions for Correct Use

Ambient Temperature

- Install and store the product in a location that meets the following conditions:
  - Surrounding temperature of 0 to 50°C (-20 to +65°C in storage)
  - Relative humidity of between 35 to 85%RH
- Do not let the ambient temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).

Installation method

- For good heat dissipation, install the product only in the position shown below so as not to block the ventilation holes.

- Do not install the product in the following positions.

- For good ventilation, provide a clearance of 50 mm or more above the sensor controller away from other devices in the normal floor mounting. For the right and left sides, provide a clearance of 30 mm or more, and for the back side, 15 mm or more. These clearances are also required when mounting multiple sensor controllers side by side. For the back mounting, the back-side clearance of 15 mm is nor required.

Installation in a Control Panel

Note Fix without removing the insulation leg because neither the ventilation route is closed nor the case are connected with FG.

6

I/O Interface

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6-1 Parallel Interface

Parallel interfaces vary by Sensor Controller series. Refer to the appropriate series for information.

6-1-1 All Series

Precautions for Safe Use

- Use only the cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the power of the FH-L series Sensor Controller and peripheral devices before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

Precautions for Correct Use

- Check the following items on the communications cables that are used in the network.
  - Are there any breaks?
  - Are there any shorts?
  - Are there any connector problems?
- When you connect the cable to the communications connectors on devices, firmly insert the communications cable connector until it locks in place.
- Do not lay the communications cables together with high-voltage lines.
- Do not lay the communications cable near devices that generate noise.
- Do not lay the communications cables in locations subject to high temperatures or high humidity.
- Do not lay the communications cables in locations subject to excessive dirt and dust or to oil mist or other contaminants.

6-1-2 FH-1000/FH-3000 Series

Parallel interface are common NPN/PNP type. An appropriate wiring is required according on the external device.

Encoder interface (open corrector type) is also included.

Encoder interface (open corrector type) is ENCTRIG_A*, ENCTRIG_B*, and ENCTRIG_Z*.

Wire the pins to Encoder appropriately.

Interface Specification

- Specifications differ by number of pins
- Encoder interface (open corrector type) is ENCTRIG_A*(8 pins,11pins), ENCTRIG_B* (12 to 13pins, or ENCTRIG_Z*' (4 to 5pin). The frequency response of Encoder interface (open corrector type) is 4 KHz.

● [Input]

Applicable signals/

- No.14 pin:
  Connect the COMIN1 terminal when using these signals.
- No.37 to 46 pins:
  Connect the COMIN2 terminal when using these signals.

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current *1	5 mA min.
ON voltage *1	8.8 V min.
OFF current *2	0.5 mA max.
OFF voltage *2	1.1 V max.
ON delay	5 ms max.
OFF delay	0.7 ms max.

*1. ON current and ON voltage:
Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal

*2. OFF current and OFF voltage:
Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal

[Input]

Applicable signals/

- No.4 to 6, 9 to 11 pins:
  Connect the COMIN1 terminal when using these signals.
- No.7, 8, 12, 13 pins:
  Connect the COMIN0 terminal when using these signals.

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current *1	5 mA min.
ON voltage *1	8.8 V min.
OFF current *2	0.5 mA max.
OFF voltage *2	0.8 V max.
ON delay	0.1 ms max.
OFF delay	0.1 ms max.
Maximum frequency response	4 KHz

*1. ON current and ON voltage:
Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:
Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Output]

Applicable signals/

- No.15 to 19 pin, No.28 to 32pin:
  Connect the COMOUT0 terminal when using these signals.
- No.48 to 57 pins:
  Connect the COMOUT2 terminal when using these signals.
- No.58 to 66 pins:
  Connect the COMOUT3 terminal when using these signals.

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current *1	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

*1. The current value must be the specified load current or lower. Exceeding the specified current value may cause damage of the output circuit.

[Output]

Applicable signals/

- No.20 to 27 pins:
  Connect the COMOUT1 and COMIN0 terminals when using these signals.

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current *1	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

*1. The current value must be the specified load current or lower. Exceeding the specified current value may cause damage of the output circuit.

Cable. I/O connector and Terminal Block

Use the following parallel I/O cable.

Item	Model	Description	Remark
Parallel I/O Cable	XW2Z-S013-□	FH series only Cable length: 2 m, 5 m Minimum bending radius: 10 mm	• 2 Cables are required for all I/O signals. • This cable is the type of one side flat cable and another side connector. • Connect the parallel I/O cable with more than the minimum bending radius. • Insert the cables length into □ in the model number as follows. 2 = 2 m, 5 = 5 m
Parallel I/O Cable for Connector-terminal Conversion Unit	XW2Z-□□□EE	FH series only Cable length: 0.5 m, 1 m, 1.5 m, 2 m, 3 m 5 m Minimum bending radius: 83.2 mm	• 2 Cables are required for all I/O signals. • Connect the parallel I/O cable with more than the minimum bending radius. • Insert the cables length into □ in the model number as follows. 050 = 0.5 m, 100 = 1 m, 150 = 1.5 m, 200 = 2 m, 300 = 3 m, 500 = 5 m • Connector-Terminal Block Conversion Units can be connected (Recommended Connector-Terminal Block Conversion Unit: OMRON XW2R-□34GD-T)
Connector-Terminal Block Conversion Units, General-purpose devices	XW2R-□34G-T		• Insert the wiring into □ in the model number as follows. Phillips screw = J, Slotted screw (rise up) = E, Push-in spring = P Refer to the XW2R Series catalog (Cat. No. G077) for details.

● XW2Z-S013-□

*1. Cable is available in 2 m/5 m.

Pin Layout

Terminal assignments and signal names should be set according to the FH Sensor Controller's operation mode settings. Verify that the wiring conforms to that.

Additional Information

For Operation Mode, refer to the Setting the Operation Mode in *Vision System FH/FZ5 Series* (Cat. No. Z365).

	No	I/O	XW2Z-S013 -□ Wire color	XW2R-□34G-T Connector-Terminal Block Conversion Units, General-purpose devices	Signal name				Remarks
					In the 1-line mode	In the 2-line random mode	In the 3 to 4-line random mode	In the 5 to 8-line random mode	
CN1	1	---	Red	A1	COMIN0				COMIN0 to 2: Common 0 to 2 for input signals COMOUT0 to 3: Common 0 to 3 for output signals DI0 to 7: Command inputs DILINE0 to 2: Command inputs (line specified) DSA0 to 1: Data transmission request ENCTRIG_A0 to 1: Encoder trigger input (phase A) ENCTRIG_B0 to 1: Encoder trigger input (phase B) ENCTRIG_Z0 to 1: Encoder trigger input (phase Z) STEP0 to 7: Measurement trigger input ACK: Instruction execution completion flag BUSY0 to 7: ON during processing DO0 to 15: Data output ERROR: ON when an error occurs *4 ERROR0 to 3: ON when an error occurs GATE0 to 1: ON during configured output time OR0 to 7: Overall judgement result READY0 to 7: ON when image input is allowed RUN0 to 3: ON while the layout turned on output setting is displayed SHTOUT0 to 7: Shutter output STGOUT0 to 7: Strobe trigger output *3
	2	---	Gray	B1	COMIN1				
	3	---	Gray	A2	Vacant				
	4	IN	Gray	B2	STEP0/ENC-TRIG_Z0*1	STEP0/ENC-TRIG_Z0*2	STEP0	STEP0	
	5	IN	Green	A3	Unused*5	STEP1/ENC-TRIG_Z1*2	STEP1	STEP1	
	6	IN	Gray	B3	Unused*5	Unused*5	STEP2	STEP2	
	7	IN	Gray	A4	Unused*5	Unused*5	STEP3	STEP3	
	8	IN	Gray	B4	ENC-TRIG_A0*1	ENC-TRIG_A0*2	Unused*5	Unused*5	
	9	IN	Gray	A5	Unused*5	Unused*5	Unused*5	STEP4	
	10	IN	Green	B5	Unused*5	Unused*5	Unused*5	STEP5	
	11	IN	Gray	A6	Unused*5	ENC-TRIG_A1*2	Unused*5	STEP6	
	12	IN	Gray	B6	Unused*5	ENC-TRIG_B1*2	Unused*5	STEP7	
	13	IN	Gray	A7	ENC-TRIG_B0*1	ENC-TRIG_B0*2	Unused*5	Unused*5	
	14	IN	Gray	B7	Unused*5	DILINE0			
	15	OUT	Green	A8	RUN0	RUN0	RUN0	READY0	
	16	OUT	Gray	B8	READY0	READY0	READY0	BUSY0	
	17	OUT	Gray	A9	BUSY0	BUSY0	BUSY0	OR0	
	18	OUT	Gray	B9	OR0	OR0	OR0	READY1	
	19	OUT	Gray	A10	ERROR0	ERROR0	ERROR0	BUSY1	
	20	OUT	Green	B10	STGOUT0*3 /SHTOUT0				
	21	OUT	Gray	A11	STGOUT1*3 /SHTOUT1				
	22	OUT	Gray	B11	STGOUT2*3 /SHTOUT2				
	23	OUT	Gray	A12	STGOUT3*3 /SHTOUT3				
	24	OUT	Gray	B12	STGOUT4*3 /SHTOUT4				
	25	OUT	Green	A13	STGOUT5*3 /SHTOUT5				
	26	OUT	Gray	B13	STGOUT6*3 /SHTOUT6				
	27	OUT	Gray	A14	STGOUT7*3 /SHTOUT7				
	28	OUT	Gray	B14	Unused*5	RUN1	RUN1	OR1	
	29	OUT	Gray	A15	Unused*5	READY1	READY1	READY2	
	30	OUT	Green	B15	Unused*5	BUSY1	BUSY1	BUSY2	
	31	OUT	Gray	A16	Unused*5	OR1	OR1	OR2	
	32	OUT	Gray	B16	Unused*5	ERROR1	ERROR1	READY3	
	33	---	Gray	A17	COMOUT0				
	34	---	Gray	B17	COMOUT1				

	No	I/O	XW2Z-S013 -□ Wire color	XW2R-□34G-T Connector-Terminal Block Conversion Units, General-purpose devices	Signal name				Remarks
					In the 1-line mode	In the 2-line random mode	In the 3 to 4-line random mode	In the 5 to 8-line random mode	
CN2	35	---	Red	A1	COMIN2				COMIN0 to 2: Common 0 to 2 for input signals COMOUT0 to 3: Common 0 to 3 for output signals DI0 to 7: Command inputs DILINE0 to 2: Command inputs (line specified) DSA0 to 1: Data transmission request ENCTRIG_A0 to 1: Encoder trigger input (phase A) ENCTRIG_B0 to 1: Encoder trigger input (phase B) ENCTRIG_Z0 to 1: Encoder trigger input (phase Z) STEP0 to 7: Measurement trigger input ACK: Instruction execution completion flag BUSY0 to 7: ON during processing DO0 to 15: Data output ERROR: ON when an error occurs *4 ERROR0 to 3: ON when an error occurs GATE0 to 1: ON during configured output time OR0 to 7: Overall judgement result READY0 to 7: ON when image input is allowed RUN0 to 3: ON while the layout turned on output setting is displayed SHTOUT0 to 7: Shutter output STGOUT0 to 7: Strobe trigger output *3
	36	---	Gray	B1	Vacant				
	37	IN	Gray	A2	DSA0	DSA0	DILINE1	DILINE1	
	38	IN	Gray	B2	Unused*5	DSA1	Unused*5	DILINE2	
	39	IN	Green	A3	DI0				
	40	IN	Gray	B3	DI1				
	41	IN	Gray	A4	DI2				
	42	IN	Gray	B4	DI3				
	43	IN	Gray	A5	DI4				
	44	IN	Green	B5	DI5				
	45	IN	Gray	A6	DI6				
	46	IN	Gray	B6	DI7				
	47	---	Gray	A7	Vacant				
	48	OUT	Gray	B7	ACK				
	49	OUT	Green	A8	GATE0	GATE0	RUN2	BUSY3	
	50	OUT	Gray	B8	Unused*5	GATE1	READY2	OR3	
	51	OUT	Gray	A9	DO0	DO0	BUSY2	READY4	
	52	OUT	Gray	B9	DO1	DO1	OR2	BUSY4	
	53	OUT	Gray	A10	DO2	DO2	ERROR2	OR4	
	54	OUT	Green	B10	DO3	DO3	RUN3	READY5	
	55	OUT	Gray	A11	DO4	DO4	READY3	BUSY5	
	56	OUT	Gray	B11	DO5	DO5	BUSY3	OR5	
	57	OUT	Gray	A12	DO6	DO6	OR3	READY6	
	58	OUT	Gray	B12	DO7	DO7	ERROR3	BUSY6	
	59	OUT	Green	A13	DO8	DO8	Unused*5	OR6	
	60	OUT	Gray	B13	DO9	DO9	Unused*5	READY7	
	61	OUT	Gray	A14	DO10	DO10	Unused*5	BUSY7	
	62	OUT	Gray	B14	DO11	DO11	Unused*5	OR7	
	63	OUT	Gray	A15	DO12	DO12	Unused*5	Unused*5	
	64	OUT	Green	B15	DO13	DO13	Unused*5	Unused*5	
	65	OUT	Gray	A16	DO14	DO14	Unused*5	Unused*5	
	66	OUT	Gray	B16	DO15	DO15	Unused*5	ERROR*4	
	67	---	Gray	A17	COMOUT2				
	68	---	Gray	B17	COMOUT3				

*1. To use a measurement trigger input, use the STEP signal. To use an encoder input, use ENCTRIG_A0/B0/Z0.

*2. In the 2-line random mode, to use a measurement trigger input and a line of encoder input, use ENCTRIG_A0/B0/Z0 and STEP1.

*3. This is the signal used when using a strobe signal for the FH Sensor Controller.

*4. Error signal which is used Line 0 to 8.

*5. Do not connect anything for Unused.

Internal Specifications for Parallel Interface

Parallel interface is NPN/PNP in common. An appropriate wiring is required according on the external device.

● [Input]

Applicable signals/

- No.14 pin:
  Connect COMIN1 terminal, when you use this signal.
- No.37 to 46 pins:
  Connect the COMIN2 terminal when using these signals.

a) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

b) Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

● [Input]

Applicable signals/

- No.4 to 6, 9 to 11 pins:
  Connect the COMIN1 terminal when using these signals.
- No.7, 8, 12, 13 pins:
  Connect the COMIN0 terminal when using these signals.

a) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

b) Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

● [Output]

Applicable signals/

- No.15 to 19 pin, No.28 to 32pin:
  Connect the COMOUT0 terminal when using these signals.
- No.48 to 57 pins:
  Connect the COMOUT2 terminal when using these signals.
- No.58 to 66 pins:
  Connect the COMOUT3 terminal when using these signals.

- Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

- Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

● [Output]

Applicable signals/

- No.20 to 27 pins:
  Connect the COMOUT1 and COMIN0 terminals when using these signals.

a) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

b) Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

6-1-3 FH-L Series

Parallel interface are common NPN/PNP type. An appropriate wiring is required according on the external device.

Interface Specification

Interface Specification

Specifications differ by number of pins

[Input]

Applicable signals/

- No.37, 39 to 46 pins:
  Connect the COMIN2 terminal when using these signals.

Item	Specifications
Input voltage	±10%
ON current *1	5 mA min.
ON voltage *1	8.8 V min.
OFF current *2	0.5 mA max.
OFF voltage *2	1.1 V max.
ON delay	5 ms max.
OFF delay	0.7 ms max.

*1. ON current and ON voltage:
Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:
Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Input]

Applicable signals/

- No.4 pin:
  Connect the COMIN1 terminal when using these signals.

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current *1	5 mA min.
ON voltage *1	8.8 V min.
OFF current *2	0.5 mA max.
OFF voltage *2	0.8 V max.
ON delay	0.1 ms max.
OFF delay	0.1 ms max.
Maximum frequency response	4 KHz

*1. ON current and ON voltage:
Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:
Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Output]

Applicable signals/

- No.15 to 19 pin:
  Connect the COMOUT0 terminal when using these signals.
- No.48, 49, 51 to 57 pins:
  Connect the COMOUT2 terminal when using these signals.
- No.58 to 66 pins:
  Connect the COMOUT3 terminal when using these signals.

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current *1	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

*1. The current value must be the specified load current or lower. Exceeding the specified current value may cause damage of the output circuit.

[Output]

Applicable signals/

- No.20 to 23 pins:
  Connect the COMOUT1 and COMIN0 terminals when using these signals.

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current *1	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

*1. The current value must be the specified load current or lower. Exceeding the specified current value may cause damage of the output circuit.

Cable. I/O connector and Terminal Block

Use the following parallel I/O cable.

Item	Model	Description	Remark
Parallel I/O Cable	XW2Z-S013-□	FH series only Cable length: 2 m, 5 m Minimum bending radius: 10 mm	• 2 Cables are required for all I/O signals. • This cable is the type of one side flat cable and another side connector. • Connect the parallel I/O cable with more than the minimum bending radius. • Insert the cables length into □ in the model number as follows. 2 = 2 m, 5 = 5 m
Parallel I/O Cable for Connector-terminal Conversion Unit	XW2Z-□□□EE	FH series only Cable length: 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 5 m Minimum bending radius: 83.2 mm	• 2 Cables are required for all I/O signals. • Connect the parallel I/O cable with more than the minimum bending radius. • Insert the cables length into □ in the model number as follows. 050 = 0.5 m, 100 = 1 m, 150 = 1.5 m, 200 = 2 m, 300 = 3 m, 500 = 5 m • Connector-Terminal Block Conversion Units can be connected (Recommended Connector-Terminal Block Conversion Unit: OMRON XW2R-□34GD-T)
Connector-Terminal Block Conversion Units, General-purpose devices	XW2R-□34G-T		• Insert the wiring into □ in the model number as follows. Phillips screw = J, Slotted screw (rise up) = E, Push-in spring = P Refer to the XW2R Series catalog (Cat. No. G077) for details.

● XW2Z-S013-□

*1. Cable is available in 2 m/5 m.

Pin Layout

	No	I/O	XW2Z-S013-□ Wire color	XW2R-□34G-T Connector-Terminal Block Conversion Units, General-purpose devices	Signal name	Remarks
CN1	1	---	Red	A1	COMIN0	COMIN0 to 2: Common 0 to 2 for input signals COMOUT0 to 3: Common 0 to 3 for output signals DI0 to 7: Command inputs DSA0: Data transmission request STEP0: Measurement trigger input ACK: Instruction execution completion flag BUSY0: ON during processing DO0 to 15: Data output ERROR0: ON when an error occurs GATE0: ON during configured output time OR0: Overall judgement result READY0: ON when image input is allowed RUN0: ON while the layout turned on output setting is displayed SHTOUT0: Shutter output signal STGOUT0 to 3: Strobe trigger output
	2	---	Gray	B1	COMIN1	
	3	---	Gray	A2	Vacant	
	4	IN	Gray	B2	STEP0	
	5	IN	Green	A3	Vacant	
	6	IN	Gray	B3	Vacant	
	7	IN	Gray	A4	Vacant	
	8	IN	Gray	B4	Vacant	
	9	IN	Gray	A5	Vacant	
	10	IN	Green	B5	Vacant	
	11	IN	Gray	A6	Vacant	
	12	IN	Gray	B6	Vacant	
	13	IN	Gray	A7	Vacant	
	14	IN	Gray	B7	Vacant	
	15	OUT	Green	A8	RUN0	
	16	OUT	Gray	B8	READY0	
	17	OUT	Gray	A9	BUSY0	
	18	OUT	Gray	B9	OR0	
	19	OUT	Gray	A10	ERROR0	
	20	OUT	Green	B10	STGOUT0/ SHTOUT0	
	21	OUT	Gray	A11	STGOUT1	
	22	OUT	Gray	B11	STGOUT2	
	23	OUT	Gray	A12	STGOUT3	
	24	OUT	Gray	B12	Vacant	
	25	OUT	Green	A13	Vacant	
	26	OUT	Gray	B13	Vacant	
	27	OUT	Gray	A14	Vacant	
	28	OUT	Gray	B14	Vacant	
	29	OUT	Gray	A15	Vacant	
	30	OUT	Green	B15	Vacant	
	31	OUT	Gray	A16	Vacant	
	32	OUT	Gray	B16	Vacant	
	33	---	Gray	A17	COMOUT0	
	34	---	Gray	B17	COMOUT1	

	No	I/O	XW2Z-S013-□ Wire color	XW2R-□34G-T Connector-Terminal Block Conversion Units, General-purpose devices	Signal name	Remarks
CN2	35	---	Red	A1	COMIN2	COMIN0 to 2: Common 0 to 2 for input signals COMOUT0 to 3: Common 0 to 3 for output signals DI0 to 7: Command inputs DSA0: Data transmission request STEP0: Measurement trigger input ACK: Instruction execution completion flag BUSY0: ON during processing DO0 to 15: Data output ERROR0: ON when an error occurs GATE0: ON during configured output time OR0: Overall judgement result READY0: ON when image input is allowed RUN0: ON while the layout turned on output setting is displayed SHTOUT0: Shutter output signal STGOUT0 to 3: Strobe trigger output
	36	---	Gray	B1	Vacant	
	37	IN	Gray	A2	DSA0	
	38	IN	Gray	B2	Vacant	
	39	IN	Green	A3	DI0	
	40	IN	Gray	B3	DI1	
	41	IN	Gray	A4	DI2	
	42	IN	Gray	B4	DI3	
	43	IN	Gray	A5	DI4	
	44	IN	Green	B5	DI5	
	45	IN	Gray	A6	DI6	
	46	IN	Gray	B6	DI7	
	47	---	Gray	A7	Vacant	
	48	OUT	Gray	B7	ACK	
	49	OUT	Green	A8	GATE0	
	50	OUT	Gray	B8	Vacant	
	51	OUT	Gray	A9	DO0	
	52	OUT	Gray	B9	DO1	
	53	OUT	Gray	A10	DO2	
	54	OUT	Green	B10	DO3	
	55	OUT	Gray	A11	DO4	
	56	OUT	Gray	B11	DO5	
	57	OUT	Gray	A12	DO6	
	58	OUT	Gray	B12	DO7	
	59	OUT	Green	A13	DO8	
	60	OUT	Gray	B13	DO9	
	61	OUT	Gray	A14	DO10	
	62	OUT	Gray	B14	DO11	
	63	OUT	Gray	A15	DO12	
	64	OUT	Green	B15	DO13	
	65	OUT	Gray	A16	DO14	
	66	OUT	Gray	B16	DO15	
	67	---	Gray	A17	COMOUT2	
	68	---	Gray	B17	COMOUT3	

Note When the signal is vacant, do not connect anything.

Internal Specifications for Parallel Interface

Parallel interface is NPN/PNP in common. An appropriate wiring is required according on the external device.

● [Input]

Applicable signals/

- No.37, 39 to 46 pin:
  Connect the COMIN2 terminal when using these signals.

a) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

b) Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

● [Input]

Applicable signals/

- No.4 pin:
  Connect the COMIN1 terminal when using these signals.

a) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

b) Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

● [Output]

Applicable signals/

- No. 15 to 19 pin:
  Connect the COMOUT0 terminal when using these signals.
- No. 48, 49, 51 to 57 pins:
  Connect the COMOUT2 terminal when using these signals.
- No.58 to 66 pins:
  Connect the COMOUT3 terminal when using these signals.

- Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

- Internal Specification for PNP Connection

Item	Specifications
Internal circuit diagram	

● [Output]

Applicable signals/

- No.20 to 23 pins:
  Connect the COMOUT1 and COMIN0 terminals when using these signals.

a) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

b) Internal Specification for NPN Connection

Item	Specifications
Internal circuit diagram	

6-1-4 NPN Input/Output for FZ5 Series

Parallel interface differs the appropriated Sensor Controller depending on NPN output and PNP output. Parallel interface is NPN/PNP in common. An appropriate wiring is required according on the external device.

Encoder interface (open corrector type) is also included.

Encoder interface (open corrector type) is ENCTRIG_A0, ENCTRIG_B0, and ENCTRIG_Z0

Wire the pins to Encoder appropriately.

● NPN I/O type

- Camera 2ch type: FZ5-1200/FZ5-1100/FZ5-800/FZ5-600
- Camera 4ch type: FZ5-1200-10/FZ5-1100-10/FZ5-800-10/FZ5-600-10

Interface Specification

- Specifications differ by number of pins
- Encoder interface (open corrector type) is ENCTRIG_A0 (B2pin), ENCTRIG_B0 (B3pin), and ENCTRIG_Z0 (B4 pin). The frequency response of Encoder interface (open corrector type) is 0.95 KHz.

● [Input]

Applicable signals/

RESET, DI0 to DI7, DSA0, DSA1

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current *1	5 mA min.
ON voltage *1	8.8 V min.
OFF current *2	0.5 mA max.
OFF voltage *2	1.1 V max.
ON delay	5 ms max.
OFF delay	0.7 ms max.

*1. ON current and ON voltage:
Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:
Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Input]

Applicable signals/

STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current*1	5 mA min.
ON voltage*1	8.8 V min.
OFF current*2	0.5 mA max.
OFF voltage*2	0.8 V max.
ON delay	0.1 ms max.
OFF delay	0.1 ms max.
Maximum frequency response	0.95 KHz

*1. ON current and ON voltage:
Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:
Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Output]

Applicable signals/

BUSY0, RUN/BUSY1, OR0 to 1, GATE0 to 1, ERROR, DO0 to 15, READY0 to 1

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

[Output]

Applicable signals/

STGOUT0 to 3

When STGOUT0 to 3 are used, connect the COM IN terminal.

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

Cable. I/O Connector and Terminal Block

Use the following parallel I/O cable.

Connect the parallel I/O cable (FZ-VP or FZ-VPX (optional)) ensuring minimum bend radius or larger.

Pin Layout

Terminal assignments and signal names should be set according to the FH Sensor Controller's operation mode settings. Verify that the wiring conforms to that.

Additional Information

For Operation Mode, refer to the Setting the Operation Mode in *Vision System FH/FZ5 Series* (Cat. No. Z365).

No.	Signal name	Wire color	Mark		Function
			Color	Shape	
A1	COMIN	Orange	Red	■	Common for input signals
A2	ENCTRIG_A1*2	Gray	Red	■	Encoder trigger input (Phase A)
A3	ENCTRIG_B1*2	White	Red	■	Encoder trigger input (Phase B)
A4	STEP1*2/ ENCTRIG_Z1*2	Yellow	Red	■	Measurement trigger input/ Encoder trigger input (Phase Z)
A5	DSA1*2	Pink	Red	■	Data send request signal
A6	DI1	Orange	Red	■■	Command inputs
A7	DI3	Gray	Red	■■	
A8	DI5	White	Red	■■	
A9	DI7	Yellow	Red	■■	
A10	STGOUT1	Pink	Red	■■	Strobe trigger output*1
A11	STGOUT3	Orange	Red	■■■	Strobe trigger output*1
A12	ERROR	Gray	Red	■■■	ON when there is an error.
A13	COMOUT1	White	Red	■■■	Common for output signals
A14	GATE1*2	Yellow	Red	■■■	ON for the set output time
A15	OR1*2	Pink	Red	■■■	Overall judgment result
A16	READY1*2	Orange	Red	■■■■	ON when image input is allowed
A17	COMOUT2	Gray	Red	■■■■	Common for output signals
A18	DO1	White	Red	■■■■	Data output
A19	DO3	Yellow	Red	■■■■	
A20	DO5	Pink	Red	■■■■	
A21	DO7	Orange	Red	▬▬▬	
A22	DO9	Gray	Red	▬▬▬	
A23	DO11	White	Red	▬▬▬	
A24	DO13	Yellow	Red	▬▬▬	
A25	COMOUT3	Pink	Red	▬▬▬	Common for output signals
B1	RESET	Orange	Black	■	Controller restart
B2	ENCTRIG_A0	Gray	Black	■	Encoder trigger input (Phase A)
B3	ENCTRIG_B0	White	Black	■	Encoder trigger input (Phase B)
B4	STEP0/ENCTRIG_Z0	Yellow	Black	■	Measurement trigger input/ Encoder trigger input (Phase Z)
B5	DSA0	Pink	Black	■	Data send request signal
B6	DI0	Orange	Black	■■	Command inputs
B7	DI2	Gray	Black	■■	
B8	DI4	White	Black	■■	
B9	DI6	Yellow	Black	■■	
B10	STGOUT0	Pink	Black	■■	Strobe trigger output*1
B11	STGOUT2	Orange	Black	■■■	Strobe trigger output*1

No.	Signal name	Wire color	Mark		Function
			Color	Shape	
B12	RUN/BUSY1*2	Gray	Black	■■■	*3
B13	BUSY0	White	Black	■■■	ON during processing
B14	GATE0	Yellow	Black	■■■	ON for the set output time
B15	OR0	Pink	Black	■■■	Overall judgment result
B16	READY0	Orange	Black	■■■■	ON when image input is allowed
B17	DO0	Gray	Black	■■■■	Data output
B18	DO2	White	Black	■■■■	
B19	DO4	Yellow	Black	■■■■	
B20	DO6	Pink	Black	■■■■	
B21	DO8	Orange	Black	■■■■■■■■	
B22	DO10	Gray	Black	■■■■■■■■	
B23	DO12	White	Black	■■■■■■■■	
B24	DO14	Yellow	Black	■■■■■■■■	
B25	DO15	Pink	Black	■■■■■■■■	

- Handling the output common terminals
  COMOUT1: STGOUT0 to 3, RUN/BUSY1, ERROR, BUSY0, OR0 to 1, GATE0 to 1
  COMOUT2: READY0 to 1, DO0 to 7
  COMOUT3: DO8 to 15

*1. This is a signal that is used when the strobe device is connected to the Controller.

*2. This signal is only available in the Random trigger mode.

*3. ON while the layout turned on output setting is displayed/ON during processing

Internal Specifications for Parallel Interface

a) [Input]
Applicable signals/
RESET, DI0 to DI7, DSA0, DSA1

Item	Specifications
Internal circuit diagram	

b) [Input]
Applicable signals/
STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1

Item	Specifications
Internal circuit diagram	

c) [Output]
Applicable signals:
BUSY0, RUN/BUSY1, OR0 to 1, GATE0 to 1, ERROR, DO0 to 15, READY0 to 1

Item	Specifications
Internal circuit diagram	

d) [Output]
Applicable signals:
STGOUT0 to 3
When STGOUT0 to 3 are used, connect the terminal.

Item	Specifications	
Internal circuit diagram	**FZ5-600 Series/ FZ5-1100 Series:**	
	FZ5-800 Series/ FZ5-1200 Series:	

6-1-5 PNP Input/Output for FZ5 Series

Parallel interface differs the appropriated Sensor Controller depending on NPN output and PNP output. Encoder interface (open corrector type) is also included.

Encoder interface (open corrector type) is ENCTRIG_A0, ENCTRIG_B0, and ENCTRIG_Z0

Wire the pins to Encoder appropriately.

● PNP I/O type

- Camera 2ch type: FZ5-1205/FZ5-1105/FZ5-805/FZ5-605
- Camera 4ch type: FZ5-1205-10/FZ5-1105-10/FZ5-805-10/FZ5-605-10

Interface Specification

- Specifications differ by number of pins.
- Encoder interface (open corrector type) is ENCTRIG_A0 (B2pin), ENCTRIG_B0 (B3pin), and ENCTRIG_Z0 (B4 pin). The frequency response of Encoder interface (open corrector type) is 0.95 KHz.

● [Input]

Applicable signals:

RESET, DI0 to DI7, DSA0, DSA1

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current*1	5 mA min.
ON voltage*1	8.8 V min.
OFF current*2	0.5 mA max.
OFF voltage*2	1.1 V max.
ON delay	5 ms max.
OFF delay	0.7 ms max.

*1. ON current and ON voltage:

Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:

Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Input]

Applicable signals/

STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1

Item	Specifications
Input voltage	12 to 24 VDC ±10%
ON current*1	5 mA min.
ON voltage*1	8.8 V min.
OFF current*2	0.5 mA max.
OFF voltage*2	0.8 V max.
ON delay	0.1 ms max.
OFF delay	0.1 ms max.
Maximum frequency response	0.95 KHz

*1. ON current and ON voltage:

Those mean the current or voltage to turn ON from OFF. The ON voltage value is the potential difference between COMIN and each input terminal.

*2. OFF current and OFF voltage:

Those mean the current or voltage to turn OFF from ON. The OFF voltage value is the potential difference between COMIN and each input terminal.

[Output]

Applicable signals:

BUSY0, RUN/BUSY1, OR0 to 1, GATE0 to 1, ERROR, DO0 to 15, READY0 to 1

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

[Output]

Applicable signals:

STGOUT0 to 3

When STGOUT0 to 3 are used, connect the COMIN terminal.

Item	Specifications
Output voltage	12 to 24 VDC ±10%
Load current	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.2 mA max.

Cable. I/O connector and Terminal Block

Use the following parallel I/O cable.

Connect the parallel I/O cable (FZ-VP or FZ-VPX (optional)) ensuring minimum bend radius or larger.

Pin Layout

Terminal assignments and signal names should be set according to the FH Sensor Controller's operation mode settings. Verify that the wiring conforms to that.

Additional Information

For Operation Mode, refer to the Setting the Operation Mode in *Vision System FH/FZ5 Series* (Cat. No. Z365).

No.	Signal name	Wire color	Mark		Function
			Color	Shape	
A1	COMIN	Orange	Red	■	Common for input signals
A2	ENCTRIG_A1*2	Gray	Red	■	Encoder trigger input (Phase A)
A3	ENCTRIG_B1*2	White	Red	■	Encoder trigger input (Phase B)
A4	STEP1*2/ ENCTRIG_Z1*2	Yellow	Red	■	Measurement trigger input/ Encoder trigger input (Phase Z)
A5	DSA1*2	Pink	Red	■	Data send request signal
A6	DI1	Orange	Red	■■	Command inputs
A7	DI3	Gray	Red	■■	
A8	DI5	White	Red	■■	
A9	DI7	Yellow	Red	■■	
A10	STGOUT1	Pink	Red	■■	Strobe trigger output*1
A11	STGOUT3	Orange	Red	■■■	Strobe trigger output*1
A12	ERROR	Gray	Red	■■■	ON when there is an error.
A13	COMOUT1	White	Red	■■■	Common for output signals
A14	GATE1*2	Yellow	Red	■■■	ON for the set output time
A15	OR1*2	Pink	Red	■■■	Overall judgment result
A16	READY1*2	Orange	Red	■■■■	ON when image input is allowed
A17	COMOUT2	Gray	Red	■■■■	Common for output signals
A18	DO1	White	Red	■■■■	Data output
A19	DO3	Yellow	Red	■■■■	
A20	DO5	Pink	Red	■■■■	
A21	DO7	Orange	Red	▬▬▬	
A22	DO9	Gray	Red	▬▬▬	
A23	DO11	White	Red	▬▬▬	
A24	DO13	Yellow	Red	▬▬▬	
A25	COMOUT3	Pink	Red	▬▬▬	Common for output signals
B1	RESET	Orange	Black	■	Controller restart
B2	ENCTRIG_A0	Gray	Black	■	Encoder trigger input (Phase A)
B3	ENCTRIG_B0	White	Black	■	Encoder trigger input (Phase B)
B4	STEP0/ENCTRIG_Z0	Yellow	Black	■	Measurement trigger input/ Encoder trigger input (Phase Z)
B5	DSA0	Pink	Black	■	Data send request signal
B6	DI0	Orange	Black	■■	Command inputs
B7	DI2	Gray	Black	■■	
B8	DI4	White	Black	■■	
B9	DI6	Yellow	Black	■■	
B10	STGOUT0	Pink	Black	■■	Strobe trigger output*1
B11	STGOUT2	Orange	Black	■■■	Strobe trigger output*1

No.	Signal name	Wire color	Mark		Function
			Color	Shape	
B12	RUN/BUSY1*2	Gray	Black	■■■	*3
B13	BUSY0	White	Black	■■■	ON during processing
B14	GATE0	Yellow	Black	■■■	ON for the set output time
B15	OR0	Pink	Black	■■■	Overall judgment result
B16	READY0	Orange	Black	■■■■	ON when image input is allowed
B17	DO0	Gray	Black	■■■■	Data output
B18	DO2	White	Black	■■■■	
B19	DO4	Yellow	Black	■■■■	
B20	DO6	Pink	Black	■■■■	
B21	DO8	Orange	Black	▬▬▬	
B22	DO10	Gray	Black	▬▬▬	
B23	DO12	White	Black	▬▬▬	
B24	DO14	Yellow	Black	▬▬▬	
B25	DO15	Pink	Black	▬▬▬	

- Handling the output common terminals
  COMOUT1: STGOUT0 to 3, RUN/BUSY1, ERROR, BUSY0, OR0 to 1, GATE0 to 1
  COMOUT2: READY0 to 1, DO0 to 7
  COMOUT3: DO8 to 15

*1. This is a signal that is used when the strobe device is connected to the Controller.

*2. This signal is only available in the Random trigger mode.

*3. ON while the layout turned on output setting is displayed/ON during processing

Internal Specifications for Parallel Interface

● [Input]

Applicable signals:

RESET, DI0 to DI7, DSA0, DSA1

Item	Specifications
Internal circuit diagram	

● [Input]

Applicable signals:

STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1

Item	Specifications
Internal circuit diagram	

● [Output]

Applicable signals:

BUSY0, RUN/BUSY1, OR0 to 1, GATE0 to 1, ERROR, DO0 to 15, READY0 to 1

Item	Specifications
Internal circuit diagram	

● [Output]

Applicable signals:

STGOUT0 to 3

When STGOUT0 to 3 are used, connect the COMIN terminal.

Item	Specifications	
Internal circuit diagram	**FZ5-600 Series/ FZ5-1100 Series:**	
	FZ5-800 Series/ FZ5-1200 Series:	

6-1-6 FZ5-L Series

Parallel interface is NPN/PNP in common. An appropriate wiring is required according on the external device. Correctly wiring is required depending on the NPN output, PNP output, and the external device.

- NPN I/O type: FZ5-L350/FZ5-L350-10
- PNP I/O type: FZ5-L355/FZ5-L355-10

Interface Specification

Item	NPN I/O type	PNP I/O type
Input specification	ON: Shorted to 0 V, or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	ON: Shorted to power supply voltage, or power supply voltage -1.5 V min. OFF: Open (leakage current: 0.1 mA max.)
Output specification	NPN open collector 24 VDC, 50 mA max. residual voltage: 1.2 V max.	PNP open collector 24 VDC, 50 mA max. residual voltage: 1.2 V max.

Cable. I/O Connector and Terminal Block

Use the following parallel I/O cable.

Connect the parallel I/O cable (FZ-VP or FZ-VPX (optional)) ensuring minimum bend radius or larger.

Pin Layout

No.	Signal name	Wire color	Mark		Function
			Color	Shape	
A1	Vacant	Orange	Red	■	
A2	Vacant	Gray	Red	■	
A3	Vacant	White	Red	■	
A4	Vacant	Yellow	Red	■	
A5	Vacant	Pink	Red	■	
A6	DI1	Orange	Red	■■	Command inputs
A7	DI3	Gray	Red	■■	
A8	DI5	White	Red	■■	
A9	DI7	Yellow	Red	■■	
A10	STGOUT1	Pink	Red	■■	Strobe trigger output*1
A11	STGOUT3	Orange	Red	■■■	Strobe trigger output*1
A12	ERROR	Gray	Red	■■■	ON when there is an error.
A13	Vacant	White	Red	■■■	
A14	Vacant	Yellow	Red	■■■	
A15	Vacant	Pink	Red	■■■	
A16	Vacant	Orange	Red	■■■■	
A17	Vacant	Gray	Red	■■■■	
A18	DO1	White	Red	■■■■	Data output
A19	DO3	Yellow	Red	■■■■	
A20	DO5	Pink	Red	■■■■	
A21	DO7	Orange	Red	▮▮▮▮▮▮▮▮	
A22	DO9	Gray	Red	▮▮▮▮▮▮▮▮	
A23	DO11	White	Red	▮▮▮▮▮▮▮▮	
A24	DO13	Yellow	Red	▮▮▮▮▮▮▮▮	
A25	Vacant	Pink	Red	▮▮▮▮▮▮▮▮	
B1	RESET	Orange	Black	■	Controller restart
B2	Vacant	Gray	Black	■	
B3	Vacant	White	Black	■	
B4	STEP0	Yellow	Black	■	Measurement trigger input
B5	DSA0	Pink	Black	■	Data send request signal
B6	DI0	Orange	Black	■■	Command inputs
B7	DI2	Gray	Black	■■	
B8	DI4	White	Black	■■	
B9	DI6	Yellow	Black	■■	
B10	STGOUT0	Pink	Black	■■	Strobe trigger output*1
B11	STGOUT2	Orange	Black	■■■	Strobe trigger output*1
B12	RUN	Gray	Black	■■■	ON while the layout turned on output setting is displayed ON during processing
B13	BUSY0	White	Black	■■■	ON during processing
B14	GATE0	Yellow	Black	■■■	ON for the set output time
B15	OR0	Pink	Black	■■■	Overall judgement result
B16	READY0	Orange	Black	■■■■	ON when image input is allowed

No.	Signal name	Wire color	Mark		Function
			Color	Shape	
B17	DO0	Gray	Black	■■■■	Data output
B18	DO2	White	Black	■■■■	
B19	DO4	Yellow	Black	■■■■	
B20	DO6	Pink	Black	■■■■	
B21	DO8	Orange	Black	▬▬▬	
B22	DO10	Gray	Black	▬▬▬	
B23	DO12	White	Black	▬▬▬	
B24	DO14	Yellow	Black	▬▬▬	
B25	DO15	Pink	Black	▬▬▬	

*1. In camera 2ch type, only STGOUT0 and STGOUT1 can be used.

Note 1. The wire color and the mark correspond to FZ-VP.
Ask your OMRON sales representative for details.

2. No. corresponds to the terminal number of FZ-VPX.

Internal Specifications for Parallel Interface

- **NPN I/O type: FZ5-L350/FZ5-L350-10**

- **PNP I/O type: FZ5-L355/FZ5-L355-10**

6-1-7 Other (Parallel Converter Cable)

When you change to connect the F series, FZ5 series, or FZ5-L series to FH series Sensor Controller, you can convert by using the appropriate parallel converter cable of FH-VPX series under the usable condition.

Applicable Model		Applicable signal	Applicable parallel convert cable	Usable Condition
FZ□ series	F160-C10	Yes	FH-VPX-FZ	• Do not use RESET signal.*1 • Use with COMIN and COMUT are same power source.
FZ□-L35x series	F160-C10	Yes	FH-VPX-FZL	• Do not use RESET signal.*1
F160 series	F160-C10	Yes	FH-VPX-F160	• Do not use RESET signal.*1 • Use with COMIN and COMOUT are same power source. • Do not use DI5 and DI6.
	F160-C10CP	No	---	---
	F160-C10CF	No	---	---
F210 series	F210-C10	Yes	FH-VPX-F210	• Do not use RESET signal.*1 • Use with COMIN and COMOUT are same power source. • Do not use DI8 and DI9.
	F210-C10-ETN	Yes	FH-VPX-F210	
F500 series	F500-C10	Yes	FH-VPX-F210	
F250 series		No	---	---
F270 series		No	---	---

*1. Even if RESET signal cannot be use by conversion, conversion is possible to convert satisfying other usable condition.

FH-VPX-FZ

● Connection Structure

Connector No.	Connection Destination	Special Notes
CN1	Connect to the parallel port CN1 of the FH Sensor Controller.	Even if you connect the revers CN1 and CN2, Sensor Controller does not perform. It is immune to breakdown.
CN2	Connect to the parallel port CN2 of the FH Sensor Controller.	
CN3	Connect to the Parallel I/O cable FZ-VP□.	

● Cable (FH-VPX-FZ)

Pin Layout

FZ-VP side connection connector		FH side connection Connector		
Pin No.	Signal name	Pin No.		Signal name
CN3		CN1	CN2	
1	COMIN	1	---	COMIN0
		2	---	COMIN1
		---	1	COMIN2
2	ENCTRIG,A1	11	---	STEP1/ENCTRIG,A1
3	ENCTRIG,B1	12	---	STEP1/ENCTRIG,B1
4	STEP1/ENCTRIG,Z1	5	---	STEP1/ENCTRIG,Z1
5	DSA1	---	4	DSA1
6	DI1	---	6	DI1
7	DI3	---	8	DI3
8	DI5	---	10	DI5
9	DI7	---	12	DI7
10	STGOUT1	21	---	STGOUT1/SHTOUT1
11	STGOUT3	23	---	STGOUT3
12	ERROR	19	---	ERROR0
13	COMOUT1	33	---	COMOUT0
		34	---	COMOUT1
14	GATE1	---	16	GATE1
15	OR1	31	---	OR1
16	READY1	29	---	READY1
17	COMOUT2	---	33	COMOUT2
18	DO1	---	18	DO1
19	DO3	---	20	DO3
20	DO5	---	22	DO5
21	DO7	---	24	DO7
22	DO9	---	26	DO9
23	DO11	---	28	DO11
24	DO13	---	30	DO13
25	COMOUT3	---	34	COMOUT3
26	RESET	---		---
27	ENCTRIG_A0	8	---	ENCTRIG_A0
28	ENCTRIG_B0	13	---	ENCTRIG_B0
29	STEP0/ENCTRIG,Z0	4	---	STEP0/ENCTRIG,Z0
30	DSA0	---	3	DSA0
31	DI0	---	5	DI0
32	DI2	---	7	DI2
33	DI4	---	9	DI4
34	DI6	---	11	DI6
35	STGOUT0	20	---	STGOUT0/SHTOUT0
36	STGOUT2	22	---	STGOUT2
37	RUN	15	---	RUN0
38	BUSY0	17	---	BUSY0
39	GATE0	---	15	GATE0
40	OR0	18	---	OR0
41	READY0	16	---	READY0
42	DO0	---	17	DO0
43	DO2	---	19	DO2
44	DO4	---	21	DO4
45	DO6	---	23	DO6
46	DO8	---	25	DO8
47	DO10	---	27	DO10
48	DO12	---	29	DO12
49	DO14	---	31	DO14
50	DO15	---	32	DO15

Note COMOUT is unified in 1 system with shorting PIN No.13, No.17, and No.25.

FH-VPX-FZL

● Connection Structure

Connector No.	Connection Destination	Special Notes
CN1	Connect to the parallel port CN1 of the FH Sensor Controller.	Even if you connect the revers CN1 and CN2, Sensor Controller does not perform. It is immune to breakdown.
CN2	Connect to the parallel port CN2 of the FH Sensor Controller.	
CN3	Connect to the Parallel I/O cable FZ-VP□.	---
CN4	Connect to 24 V power source depending on the PN/PNP polarity as below table.	Connect to the Parallel I/O cable FZ-VP□. • When power source and DI0 are non-isolated and no problem: Possible to connect the power source same as FH series. • When you want to isolate the power source and DI0: Disposable to use the power source of FH series. Connect the other power source to CN4. Recommendation: S8VS series DC24V.

*1. COM terminal polarity of NPN/PNP

	NPN	PNP
COMIN	+V	-V
COMOUT	-V	+V

- **Cable (FH-VPX-FZL)**

Pin Layout

FZ-VP side connection connector			FH side connection Connector		
Pin No.		Signal name	Pin No.		Signal name
CN3	CN4		CN1	CN2	
---	1	---	1	---	COMIN0
			2	---	COMIN1
			---	1	COMIN2
	2	---	33	---	COMOUT0
			34	---	COMOUT1
	2	---	---	33	COMOUT2
	2	---	---	33	COMOUT3
A1	---	---	---	---	---
A2		---	---	---	---
A3		---	---	---	---
A4		---	---	---	---
A5		---	---	---	---
A6		DI1	---	6	DI1
A7		DI3	---	8	DI3
A8		DI5	---	10	DI5
A9		DI7	---	12	DI7
A10		STGOUT1	21	---	STGOUT1/SHTOUT1
A11		STGOUT2	23	---	STGOUT3
A12		ERROR	19	---	ERROR0
A13		---	---	---	---
A14		---	---	---	---
A15		---	---	---	---
A16		---	---	---	---
A17		---	---	---	---
A18		DO1	---	18	DO1
A19		DO3	---	20	DO3
A20		DO5	---	22	DO5
A21		DO7	---	24	DO7
A22		DO9	---	26	DO9
A23		DO11	---	28	DO11
A24		DO13	---	30	DO13
A25		---	---	---	---
B1	---	RESET	---	---	---
B2		---	---	---	---
B3		---	---	---	---
B4		STEP0	4	---	STEP0/ENCTRIG,Z0
B5		DSA0	---	3	DSA0
B6		DI0	---	5	DI0
B7		DI2	---	7	DI2
B8		DI4	---	9	DI4
B9		DI6	---	11	DI6
B10		STGOUT0	20	---	STGOUT0/SHTOUT0
B11		STGOUT2	22	---	STGOUT2
B12		RUN/BUSY1	15	---	RUN0
B13		BUSY0	---	---	BUSY0
B14		GATE0	---	15	GATE0
B15		OR0	18	---	OR0
B16		READY0	16	---	READY0
B17		DO0	---	17	DO0
B18		DO2	---	19	DO2
B19		DO4	---	21	DO4
B20		DO6	---	23	DO6
B21		DO8	---	25	DO8

FZ-VP side connection connector			FH side connection Connector		
Pin No.		Signal name	Pin No.		Signal name
CN3	CN4		CN1	CN2	
B22	---	DO10	---	27	DO10
B23		DO12	---	29	DO12
B24		DO14	---	31	DO14
B25		DO15	---	32	DO15

Note 1. PIN_No.1 of CN4 is unified in 1 system with shorting COMIN0-2 of FH series.

2. PIN_No.2 of CN4 is unified in 1 system with shorting COMOUT0-3 of FH series.

FH-VPX-F160

● Connection Structure

Connector No.	Connection Destination	Special Notes
CN1	Connect to the parallel port CN1 of the FH Sensor Controller.	Even if you connect the revers CN1 and CN2, Sensor Controller does not perform. It is immune to breakdown.
CN2	Connect to the parallel port CN2 of the FH Sensor Controller.	
CN3	Connect to the Parallel I/O cable F160-VP.	

● Cable

(Unit: mm)

● Pin Layout

F160-VP side connection connector		FH side connection connector		
Pin No.	Signal name	Pin No.		Signal name
CN3		CN1	CN2	
A1	RESET	---		---
A2	STEP	4	---	STEP0/ENCTRIG,Z0
A3	DI0	---	5	DI0
A4	DI2	---	7	DI2
A5	DI4	---	9	DI4
A6	DI6	---	---	---
A7	DI8	---	45	DI6
A8	STGOUT0	20	---	STGOUT0/SHTOUT0
A9	RUN	15	---	RUN0
A10	BUSY	17	---	BUSY0
A11	OR	18	---	OR0
A12	DO0	---	17	DO0
A13	DO2	---	19	DO2
A14	DO4	---	21	DO4
A15	DO6	---	23	DO6
A16	DO8	---	25	DO8
A17	DO9	---	26	DO9
A18	DO11	---	28	DO11
A19	DO13	---	30	DO13
A20	DO15	---	32	DO15
B1	COMIN	1	---	COMIN0
		2	---	COMIN1
		---	1	COMIN2
B2	DSA	---	3	DSA0
B3	DI1	---	6	DI1
B4	DI3	---	8	DI3
B5	DI5	---	---	---
B6	DI7	---	10	DI5
B7	DI9	---	12	DI7
B8	STGOUT1	21	---	STGOUT1/SHTOUT1
B9	ERROR	19	---	ERROR0
B10	GATE	---	15	GATE0
B11	COMOUT1	33	---	COMOUT
B12	DO1	---	18	DO1
B13	DO3	---	20	DO3
B14	DO5	---	22	DO5
B15	DO7	---	24	DO7
B16	COMOUT2	34	---	COMOUT
B17	DO10	---	27	DO10
B18	DO12	---	29	DO12
B19	DO14	---	31	DO14
B20	COMOUT3	---	33	COMOUT
		---	34	

Note COMOUT is unified in 1 system with shorting B11, B16, and B20.

FH-VPX-F210

● Connection Structure

Connector No.	Connection Destination	Special Notes
CN1	Connect to the parallel port CN1 of the FH Sensor Controller.	Even if you connect the revers CN1 and CN2, Sensor Controller does not perform. It is immune to breakdown.
CN2	Connect to the parallel port CN2 of the FH Sensor Controller.	
CN3	Connect to the Parallel I/O cable F160-VP.	

● Cable

(Unit: mm)

● PIN Layout

F160-VP side connection connector		FH side connection connector		
Pin No.	Signal name	Pin No.		Signal name
CN3		CN1	CN2	
A1	RESET	---		---
A2	STEP	4	---	STEP0/ENCTRIG,Z0
A3	DI0	---	5	DI0
A4	DI2	---	7	DI2
A5	DI4	---	9	DI4
A6	DI6	---	11	DI6
A7	DI8	---		---
A8	STGOUT0	20	---	STGOUT0/SHTOUT0
A9	RUN	15	---	RUN0
A10	BUSY	17	---	BUSY0
A11	OR	18	---	OR0
A12	DO0	---	17	DO0
A13	DO2	---	19	DO2
A14	DO4	---	21	DO4
A15	DO6	---	23	DO6
A16	DO8	---	25	DO8
A17	DO9	---	26	DO9
A18	DO11	---	28	DO11
A19	DO13	---	30	DO13
A20	DO15	---	32	DO15
B1	COMIN	1	---	COMIN0
		2	---	COMIN1
		---	1	COMIN2
B2	DSA	---	3	DSA0
B3	DI1	---	6	DI1
B4	DI3	---	8	DI3
B5	DI5	---	10	DI5
B6	DI7	---	12	DI7
B7	DI9	---		---
B8	STGOUT1	21	---	STGOUT1/SHTOUT1
B9	ERROR	19	---	ERROR0
B10	GATE	---	15	GATE0
B11	COMOUT1	33	---	COMOUT0
B12	DO1	---	18	DO1
B13	DO3	---	20	DO3
B14	DO5	---	22	DO5
B15	DO7	---	24	DO7
B16	COMOUT2	34	---	COMOUT1
B17	DO10	---	27	DO10
B18	DO12	---	29	DO12
B19	DO14	---	31	DO14
B20	COMOUT3	---	33	COMOUT2
		---	34	COMOUT3

Note COMOUT is unified in 1 system with shorting B11, B16, and B20.

6-2 Encoder Interface

Encoder interface (open corrector type) is supported only FH-1000 and FH-3000 series.

Precautions for Safe Use

- Do the following confirmations again before turning on the power supply.
  - Is the voltage and polarity of the encoder power (ENC0 VDD/ENC0 GND/ENC1 VDD/ENC1 GND) supply? (5 VDC)
- Use only the cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the FH Sensor Controller's power before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

Precautions for Correct Use

- Check the following items on the communications cables that are used in the network.
  - Are there any breaks?
  - Are there any shorts?
  - Are there any connector problems?
- When you connect the cable to the communications connectors on devices, firmly insert the communications cable connector until it locks in place.
- Do not lay the communications cables together with high-voltage lines.
- Do not lay the communications cable near devices that generate noise.
- Do not lay the communications cables in locations subject to high temperatures or high humidity.
- Do not lay the communications cables in locations subject to excessive dirt and dust or to oil mist or other contaminants.

Interface Specification

Item	Specifications
Input voltage	Input voltage: 5 VDC ±5% Signal level: EIA Standard, RS-422-A line driver level
Input impedance*1	120 Ω ±5%
Differential input voltage	High-level input voltage: 0.1 V Low-level input voltage: -0.1 V
Hysteresis voltage	60 mV
Maximum response frequency*2	Phase A/B/Z: 1 MHz (When using an I/O cable, model FH-VR 1.5M)

*1. Value when the terminal resistance function is used.

*2. Use this interface as paying attention to the cable length and response frequency of the encoder used.

Cable. I/O Connector and Terminal Block

Use the following Encoder cable: FH-VR 1.5 M (1.5 m, Min. bending radius: 65 mm).

● Encoder Cable

*1. Cable is available in 1.5 m.

Pin Layout

No	Signal name	Color	Remarks
1	ENC0 A+	Black	Signal: Ch1 A-Phase(+)
2	ENC0 A-	Black/Red	Signal: Ch1 A-Phase(-)
3	ENC0 VDD	Brown	Power: Power supply for Ch1 (5 VDC)
4	ENC0 B+	White	Signal: Ch1 B-Phase(+)
5	ENC0 B-	White/Red	Signal: Ch1 B-Phase(-)
6	ENC0 GND	Blue	Power: Signal ground for Ch1 (0 V)
7	ENC0 Z+	Orange	Signal: Ch1 Z-Phase(+)
8	ENC0 Z-	Orange/Red	Signal: Ch1 Z-Phase(-)
9	NC	---	---
10	ENC1 A+	Purple	Signal: Ch2 A-Phase(+)
11	ENC1 A-	Purple/Red	Signal: Ch2 A-Phase(-)
12	ENC1 VDD	Brown/Red	Power: Power supply for Ch2 (5 VDC)
13	ENC1 B+	Pink	Signal: Ch2 B-Phase(+)
14	ENC1 B-	Pink/Red	Signal: Ch2 B-Phase(-)
15	ENC1 GND	Blue/Red	Power: Signal ground for Ch2 (0 V)
16	ENC1 Z+	Yellow	Signal: Ch2 Z-Phase(+)
17	ENC1 Z-	Yellow/Red	Signal: Ch2 Z-Phase(-)

Encoder Circuit Schematics

Line driver input type CH1 (Line 0)	
Line driver input type CH2 (Line 1)	

6-3 EtherCAT Interface

EtherCAT interface is supported only FH-1000, FH-3000 series.

Precautions for Safe Use

- Use only the cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the FH Sensor Controller's power before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

Precautions for Correct Use

- Check the following items on the communications cables that are used in the network.
  - Are there any breaks?
  - Are there any shorts?
  - Are there any connector problems?
- When you connect the cable to the communications connectors on devices, firmly insert the communications cable connector until it locks in place.
- Do not lay the communications cables together with high-voltage lines.
- Do not lay the communications cable near devices that generate noise.
- Do not lay the communications cables in locations subject to high temperatures or high humidity.
- Do not lay the communications cables in locations subject to excessive dirt and dust or to oil mist or other contaminants.

Cable

- Connect a straight LAN cable.
- Use an STP cable of category 5e or higher, which is shielded double with an aluminum tape and a braided cord.
- The cable is maximum 100 m long. However, some cables do not guarantee 100 m. If conductor is a twisted cable, transmission performance generally becomes worse than that of straight cables, so that 100 m cannot be guaranteed. For details, contact the cable manufacturer.

I/O Connector

- Electrical specifications: Conforming to IEEE 802.3 standards. Use RJ45 8-pin Modular Connector (conforming to ISO 8877),
- When selecting a connector, confirm that it is applicable to the cable that will be used. Confirm the following items: Conductor size, conductor type (solid wire or twisted wire), number of twisted pairs (2 or 4), outer diameter, etc.

Pin Layout

Pin assignment

Pin No.	Signal name	Abbreviation	Signal direction
1	Transmission data +	TD +	Out
2	Transmission data -	TD -	Out
3	Reception data +	RD +	In
4	Not connected	NC	---
5	Not connected	NC	---
6	Reception data -	RD -	In
7	Not connected	NC	---
8	Not connected	NC	---
Connector hood	Security ground	FG	---

● Wring

- Connect both ends of the cable shield with the connector hood.
- Use the T568A wiring method as mentioned above.

Pin No.	Wire color	Wire color	Pin No.
1	White·Green	White·Green	1
2	Green	Green	2
3	White·Orange	White·Orange	3
4	Blue	Blue	4
5	White·Blue	White·Blue	5
6	Orange	Orange	6
7	White·Brown	White·Brown	7
8	Brown	Brown	8
Connector hood	Shielded cable	Shielded cable	Connector hood

6-4 Ethernet Interface

Ethernet port of Sensor Controller is used for EtherNet/IP or Serial (Ethernet) communication. The Ethernet port can be changed depending on Sensor Controller series. Be sure to check the series you are attempting to use.

Precautions for Safe Use

- Use only the cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the FH Sensor Controller's power before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

Precautions for Correct Use

- Check the following items on the communications cables that are used in the network.
  - Are there any breaks?
  - Are there any shorts?
  - Are there any connector problems?
- When you connect the cable to the communications connectors on devices, firmly insert the communications cable connector until it locks in place.
- Do not lay the communications cables together with high-voltage lines.
- Do not lay the communications cable near devices that generate noise.
- Do not lay the communications cables in locations subject to high temperatures or high humidity.
- Do not lay the communications cables in locations subject to excessive dirt and dust or to oil mist or other contaminants.

6-4-1 FH-1000/FH-3000 Series

Ethernet port differ depending on the Sensor Controller series. Refer to the followings, and confirm the number of ports.

- FH-1050/FH-3050 (Camera 2ch type); Ethernet port is 1.
- FH-1050-□0/FH-3050-□0 (Camera 4ch and 8ch type): Ethernet port is 2.

Camera 2ch type	Camera 4ch/8ch type
Ethernet port and EtherNet/IP port are sharing use.	• Upper port: Ethernet port • Lower port: Ethernet port and EtherNet/IP port are sharing use.

Cable

- Connect the LAN cable with a straight or cross cable.
- Use an STP (shielded twisted-pair) cable of category 5, 5e, or higher. Applicable EtherNet/IP communications cables and connectors vary depending on the used baud rate.
- For 100Base-TX and 10Base-T, use an STP (shielded twisted-pair) cable of category 5 or higher. You can use either a straight or cross cable.
- For 1000Base-T, use an STP (shielded twisted-pair) cable (double shielding with aluminium tape and braiding) of category 5e or higher.

I/O Connector

- Electrical specifications: Conforming to IEEE 802.3 standards. Use RJ45 8-pin Modular Connector (conforming to ISO 8877).
- When selecting a connector, confirm that it is applicable to the cable that will be used. Confirm the following items: Conductor size, conductor type (solid wire or twisted wire), number of twisted pairs (2 or 4), outer diameter, etc.

Pin Layout

● 10Base-T and 100Base-TX

Connector pin	Signal name	Abbr.	Signal direction
1	Transmission data +	TD +	Output
2	Transmission data -	TD -	Output
3	Reception data +	RD +	Input
4	Not used.	---	---
5	Not used.	---	---
6	Reception data -	RD -	Input
7	Not used.	---	---
8	Not used.	---	---

● 1000Base-T

Connector pin	Signal name	Abbr.	Signal direction
1	Communication data DA +	BI_DA +	Input/output
2	Communication data DA -	BI_DA -	Input/output
3	Communication data DB +	BI_DB +	Input/output
4	Communication data DC +	BI_DC +	Input/output
5	Communication data DC -	BI_DC -	Input/output
6	Communication data DB -	BI_DB -	Input/output
7	Communication data DD +	BI_DD +	Input/output
8	Communication data DD -	BI_DD -	Input/output

Wire

Describes the connection processing to connector hood of shield as the following. The connection processing is changed according to the transfer speed.

- 10BASE-T/100BASE-TX

  Connects the shield of its both ends to each of connector hoods. Connects the shield of only one side of switching hub to connector hoods.
- 1000BASE-T

  Connects the shield of its both ends to each of connector hoods.

6-4-2 FH-L Series

Cable

- Connect the LAN cable with a straight or cross cable.
- Use an STP (shielded twisted-pair) cable of category 5, 5e, or higher. Applicable EtherNet/IP communications cables and connectors vary depending on the used baud rate.
- For 100Base-TX and 10Base-T, use an STP (shielded twisted-pair) cable of category 5 or higher. You can use either a straight or cross cable.
- For 1000Base-T, use an STP (shielded twisted-pair) cable (double shielding with aluminium tape and braiding) of category 5e or higher.

I/O Connector

- Electrical specifications: Conforming to IEEE 802.3 standards. Use RJ45 8-pin Modular Connector (conforming to ISO 8877).
- When selecting a connector, confirm that it is applicable to the cable that will be used. Confirm the following items: Conductor size, conductor type (solid wire or twisted wire), number of twisted pairs (2 or 4), outer diameter, etc.

Pin Layout

● 10Base-T and 100Base-TX

Connector pin	Signal name	Abbr.	Signal direction
1	Transmission data +	TD +	Output
2	Transmission data -	TD -	Output
3	Reception data +	RD +	Input
4	Not used.	---	---
5	Not used.	---	---
6	Reception data -	RD -	Input
7	Not used.	---	---
8	Not used.	---	---

● 1000Base-T

Connector pin	Signal name	Abbr.	Signal direction
1	Communication data DA +	BI_DA +	Input/output
2	Communication data DA -	BI_DA -	Input/output
3	Communication data DB +	BI_DB +	Input/output
4	Communication data DC +	BI_DC +	Input/output
5	Communication data DC -	BI_DC -	Input/output
6	Communication data DB -	BI_DB -	Input/output
7	Communication data DD +	BI_DD +	Input/output
8	Communication data DD -	BI_DD -	Input/output

Wiring

Describes the connection processing to connector hood of shield as the following. The connection processing is changed according to the transfer speed.

- 10BASE-T/100BASE-TX

  Connects the shield of its both ends to each of connector hoods. Connects the shield of only one side of switching hub to connector hoods.
- 1000BASE-T

  Connects the shield of its both ends to each of connector hoods.

6-4-3 FZ5 Series

Cable

- Connect the LAN cable with a straight or cross cable.
- Use an STP (shielded twisted-pair) cable of category 5, 5e, or higher.

I/O Connector

- Electrical specifications: Conforming to IEEE 802.3 standards. Use RJ45 8-pin Modular Connector (conforming to ISO 8877).
- When selecting a connector, confirm that it is applicable to the cable that will be used. Confirm the following items: Conductor size, conductor type (solid wire or twisted wire), number of twisted pairs (2 or 4), outer diameter, etc.

Pin Layout

● 10Base-T and 100Base-TX

Connector pin	Signal name	Abbr.	Signal direction
1	Transmission data +	TD +	Output
2	Transmission data -	TD -	Output
3	Reception data +	RD +	Input
4	Not used.	---	---
5	Not used.	---	---
6	Reception data -	RD -	Input
7	Not used.	---	---
8	Not used.	---	---

● 10Base-T (FZ5-1200 Series / FZ5-800 Series only)

Connector pin	Signal name	Abbr.	Signal direction
1	Communication data DA +	BI_DA +	Input/output
2	Communication data DA -	BI_DA -	Input/output
3	Communication data DB +	BI_DB +	Input/output
4	Communication data DC +	BI_DC +	Input/output
5	Communication data DC -	BI_DC -	Input/output
6	Communication data DB -	BI_DB -	Input/output
7	Communication data DD +	BI_DD +	Input/output
8	Communication data DD -	BI_DD -	Input/output

Wire

Connect the shield to connector hoods as described below.

- Connect the shields at both ends of the cables to connector hoods. Connect only the shield at the end of the cable on the Ethernet switch side to the connector hood.

6-4-4 FZ5-L Series

Cable

- Connect the LAN cable with a straight or cross cable.
- Use an STP (shielded twisted-pair) cable of category 5, 5e, or higher. Applicable EtherNet/IP communications cables and connectors vary depending on the used baud rate.
- For 100Base-TX and 10Base-T, use an STP (shielded twisted-pair) cable of category 5 or higher. You can use either a straight or cross cable.
- For 1000Base-T, use an STP (shielded twisted-pair) cable (double shielding with aluminium tape and braiding) of category 5e or higher.

I/O Connector

- Electrical specifications: Conforming to IEEE 802.3 standards. Use RJ45 8-pin Modular Connector (conforming to ISO 8877).
- When selecting a connector, confirm that it is applicable to the cable that will be used. Confirm the following items: Conductor size, conductor type (solid wire or twisted wire), number of twisted pairs (2 or 4), outer diameter, etc.

Pin Layout

● 10Base-T and 100Base-TX

Connector pin	Signal name	Abbr.	Signal direction
1	Transmission data +	TD +	Output
2	Transmission data -	TD -	Output
3	Reception data +	RD +	Input
4	Not used.	---	---
5	Not used.	---	---
6	Reception data -	RD -	Input
7	Not used.	---	---
8	Not used.	---	---

● 1000Base-T

Connector pin	Signal name	Abbr.	Signal direction
1	Communication data DA +	BI_DA +	Input/output
2	Communication data DA -	BI_DA -	Input/output
3	Communication data DB +	BI_DB +	Input/output
4	Communication data DC +	BI_DC +	Input/output
5	Communication data DC -	BI_DC -	Input/output
6	Communication data DB -	BI_DB -	Input/output
7	Communication data DD +	BI_DD +	Input/output
8	Communication data DD -	BI_DD -	Input/output

Wire

Describes the connection processing to connector hood of shield as the following. The connection processing is changed according to the transfer speed.

- 10BASE-T/100BASE-TX

  Connects the shields of both its ends to each of the connector hoods. Connects the shield of only one side of switching hub to connector hoods.
- 1000BASE-T

  Connects the shield of both its ends to each of the connector hoods.

6-5 Serial Interface

Serial interface of Sensor Controller differs by series.

Refer to the correct information for the series you are using.

6-5-1 All Series

Precautions for Safe Use

- Use only the cables designed specifically for the product. Use of other products may result in malfunction or damage of the product.
- Always turn OFF the FH Sensor Controller's power before connecting or disconnecting a camera or cable. Connecting the cable with power supplied may result in damage of the camera or peripheral devices.
- For the cable that is flexed repeatedly, use the robotic cable type (Bend resistant camera cable) to prevent damages.
- Do not apply torsion stress to the cable. It may damage the cable.
- Secure the minimum bending radius of the cable. Otherwise the cable may be damaged.

Precautions for Correct Use

- Check the following items on the communications cables that are used in the network.
  - Are there any breaks?
  - Are there any shorts?
  - Are there any connector problems?
- When you connect the cable to the communications connectors on devices, firmly insert the communications cable connector until it locks in place.
- Do not lay the communications cables together with high-voltage lines.
- Do not lay the communications cable near devices that generate noise.
- Do not lay the communications cables in locations subject to high temperatures or high humidity.
- Do not lay the communications cables in locations subject to excessive dirt and dust or to oil mist or other contaminants.

Cable

- Use a shielded twisted-pair communication cable.
- Maximum cable length is 15 m.

How to Connect

- Align the connector with the socket and press it straight into place, then secure it with the screws on both sides of the connector.

6-5-2 FH-1000, FH-3000, and FH-L Series

RS-232C interface is used in FH-1000, FH-3000, and FH-L series.

Input and output Connector

Prepare the suitable connector. Recommended connector is the following table.

	Manufacturer	Model
Sockets	OMRON Corporation	XM3D-0921
Hood	OMRON Corporation	XM2S-0911

Pin Layout

D-Sub9 Male type connector is used in Sensor Controller.

Pin No.	Signal name	Function
1	NC	Not connected
2	RD	Data reception
3	SD	Data transmission
4	NC	Not connected
5	GND	Signal ground
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

Wiring

- Bundle each cable with SG (signal ground) as a twisted pair cable. Connect the bundled SG cables with the connector on the Sensor Controller and the connector on the other device.
- Connect the communication cable shield to the RS-232C connector shell (FG) on the Sensor Controller.
- The pin numbering will differ depending on type and model of the connected external device.

6-5-3 FZ5 Series

RS-232C and RS-422 are used in FZ5 series in common.

Input and output Connector

Prepare the suitable connector. Recommended connector is the following table.

	Manufacturer	Model
Plug	OMRON Corporation	XM3A-0921
Hood	OMRON Corporation	XM2S-0911

Pin Layout

D-Sub9 Male type connector is used in Sensor Controller.

Pin No.	Signal name	Function
1	SDB(+)	For RS-422
2	SD/SDA(-)	For RS-232C/RS-422
3	RD/RDA(-)	For RS-232C/RS-422
4	RDB(+)	For RS-422
5	NC	Not connected
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	GND	Signal ground

Wiring

- Bundle each cable with SG (signal ground) as a twisted pair cable. Connect the bundled SG cables with the connector on the Sensor Controller and the connector on the other device.
- Connect the communication cable shield to the RS-232C connector shell (FG) on the Sensor Controller.
- The pin numbering will differ depending on type and model of the connected external device.

● RS-232C

● RS-422

6-5-4 FZ5-L Series

RS-232C interface is used in FZ5-L series.

Input and Output Connector

Prepare the suitable connector. Recommended connector is the following table.

	Manufacturer	Model
Plug	OMRON Corporation	XM3A-0921
Hood	OMRON Corporation	XM2S-0911

Pin Layout

D-Sub9 Male type connector is used in Sensor Controller.

Pin No.	Signal name	Function
1	NC	Not connected
2	SD	For RS-232C
3	RD	For RS-232C
4	NC	Not connected
5	NC	Not connected
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	GND	Signal ground

Wiring

- Bundle each cable with SG (signal ground) as a twisted pair cable. Connect the bundled SG cables with the connector on the Sensor Controller and the connector on the other device.
- Connect the communication cable shield to the RS-232C connector shell (FG) on the Sensor Controller.
- The pin numbering will differ depending on type and model of the connected external device.

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