



**FH-1050**  
**FH-3050**  
**FH-1050-□0**  
**FH-3050-□0**

**Image Processing System**

**INSTRUCTION SHEET**

Thank you for selecting OMRON product. This sheet primarily describes precautions required in installing and operating the product.

Before operating the product, read the sheet thoroughly to acquire sufficient knowledge of the product. For your convenience, keep the sheet at your disposal.

**TRACEABILITY INFORMATION:**

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 Kyoto, 600-8530 JAPAN

The following notice applies only to products that carry the CE mark:

Notice:  
 This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.



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**Meanings of Signal Words**

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

In order for the product to be used safely, the following indications are used in this book to draw your attention to the cautions. The cautions with the indications describe the important contents for safety.

**⚠ 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**

The following alert symbols are used in this manual.

	Indicates general prohibitions for which there is no specific symbol.
	Indicates the possibility of electric shock under specific conditions.
	Indicates the possibility of explosion under specific conditions.
	Indicates the possibility of laser radiation.
	Indicates the possibility of injury by high temperature under specific conditions.

**Alert statements in this Manual**

The following alert statements apply to the products in this manual. Each alert statement also appears at the locations needed in this manual to attract your attention.

**⚠ WARNING**

This product must be used according to the instruction manual. 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 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.

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.

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**

- 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.

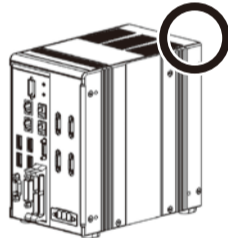
- Power Supply and Wiring
  - Make sure to use the product with the power supply voltage specified by this manual.
  - Use the specified wire size (AWG10 to 16).
  - Keep the power supply wires as short as possible (Max.2m).
  - Use a DC power supply with safety measures against high-voltage spikes(safety extra low-voltage circuits on the secondary side).
  - Do the following confirmations again before turning on the power supply.
    - Is the voltage and polarity of the power supply correct? (24VDC)
    - 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?
    - Is the voltage and polarity of the encoder power(ENC0 VDD / ENC0 GND / ENC1 VDD / ENC1 GND) supply? (5VDC)
- Ground
  - The power supply circuit of the FH Sensor Controller is insulated from the internal circuit.
  - Be sure to use a base to install the camera connected with the FH Sensor Controller. 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-class grounding (with a grounding resistance of 100Ω 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 effected.
  - Check wiring again before turning on the FH Sensor Controller.
- 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 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.
  - 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.
  - The FH Sensor Controller and camera case are hot while power is supplied or directly after the FH Sensor Controller is turned off. Do not touch the case.
  - Be sure to dispose of the product as industrial waste.
  - Do not drop, impose excessive vibration or shock on the product. Doing so may result in malfunction or burning.
  - Since a lithium battery is incorporated, there is a rare case when you are seriously injured due to firing or blowout.

- Regulations and Standards  
 The FH Sensor Controller is compliant with the standards below:  
 EC Directive, 2004/108/EC  
 EN (European Norm), EN61326-1  
 UL standard, UL508

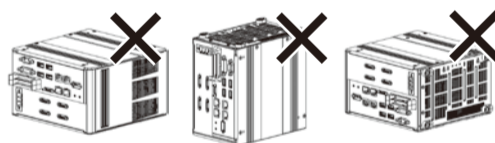
- Regulations of KC marking  
 A 급 기기 (업무용 방송통신기자재)  
 이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

**Precautions for Correct Use**

- Installation and Storage Sites  
 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)
  - No rapid changes in temperature (place where dew does not form)
  - Relative humidity of between 35 to 85 %
  - 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
- Orientation of Product  
 To keep proper ventilation, install the main unit only in the direction below so that the ventilation holes are not blocked.



Do not install in this orientation.



- Ambient Temperature
  - To keep proper air flow, keep the top of the FH Sensor Controller 50mm or more apart from other devices. Install the FH Sensor Controller with a clearance of 30mm on the right, left side, and 15mm for rear planes.
  - 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).
- Noise Resistance
  - Do not install the product in a cabinet containing high-voltage equipment.
  - Do not install the product within 200 mm of power cables.
- Component Installation and Handling
  - Touching Signal Lines  
 To prevent damage from static electricity, use a wrist strap or another device for preventing electrostatic discharges when touching terminals or signal lines in connectors.
  - Handling a USB Memory/SD memory card  
 To remove a USB memory or SD memory card, make sure that data is not being read or written to it.
  - For USB memory, the LED flashes while data is being read or written, so make sure that it is lit steadily before removing the memory.
  - For SD memory card, the SD BUSY LED flashes while data is being read or written, so make sure that it is turned OFF before removing the memory.
- Turning OFF the Power  
 Do not turn OFF the power while a message is being displayed indicating that processing is being performed. Data in memory will be corrupted, and the product may not operate correctly the next time it is started.

- Maintenance
  - Turn OFF the power and take safety precautions before conducting inspections. Electrical shock can result from attempting safety inspections with the power turned ON.
  - 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.
- 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
  - 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 so that the measurement result should be checked by the stage/robot if it is within the range of movement of the stage/robot before operation.
  - On a FH Sensor Controller side, supplementarily use operations and branches of the FH Sensor Controller to configure a check flow such as "data should not be externally provided if the data is in a range from-XXXXX to XXXXX "based on the stage/robot's range of movement.

**Basic Configuration**

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

**\* Sensor controller**

The Sensor 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-VS (2m, 5m, 10m, min. bending radius: 69mm)  
 Bend resistant camera cable  
 FZ-VSB (2m, 5m, 10m min. bending radius: 69mm)  
 Right-angle camera cable  
 FZ-VSL (2m,5m,10m min. bending radius: 69mm)  
 Long-distance camera cable  
 FZ-VS2 (15m min. bending radius: 93mm)  
 Long-distance Right-angle camera cable  
 FZ-VSL2 (15m min. bending radius: 93mm)

**\* 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-SC5M2/FZ-S5M2

Intelligent compact camera  
 FZ-SQ010F/FZ-SQ050F/  
 FZ-SQ100F/FZ-SQ100N

Intelligent camera  
 FZ-SLC15/FZ-SLC100

Automatic focus camera  
 FZ-SZC15/FZ-SZC100

**\* 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, min. bending radius: 75mm)

**\* Monitor conversion connector**

FH-VMRGB

**Peripheral Device**

- \* USB memory  
 FZ-MEM2G  
 FZ-MEM8G
- \* SD memory card  
 HMC-SD291  
 HMC-SD491

**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.

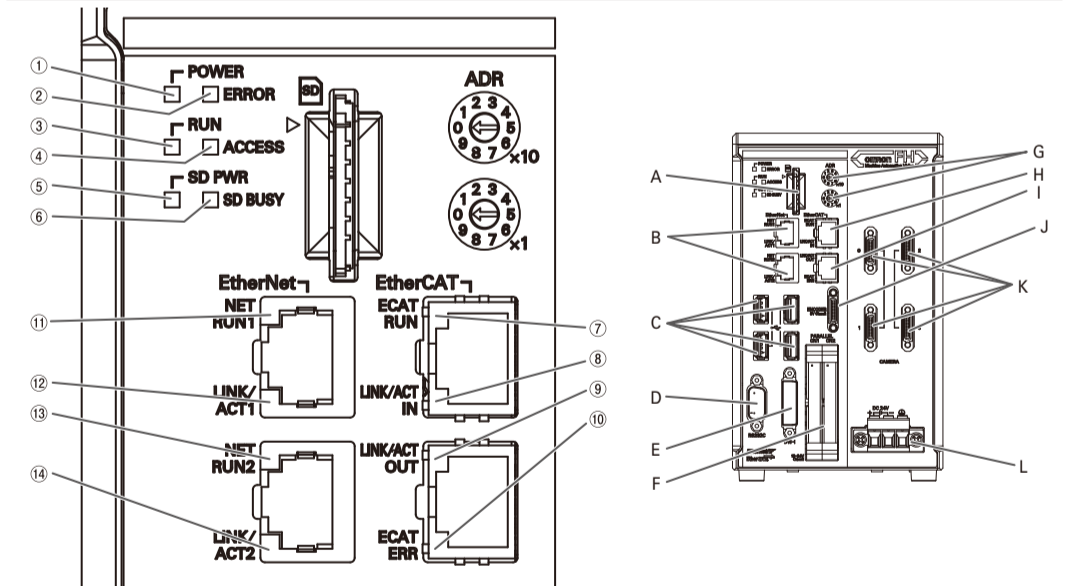
Recommended Model by OMRON:  
 S8VS series  
 S8VS-09024, S8VS-12024  
 S8VS-18024, S8VS-24024  
 S8VS-48024

**Input Device**

Mouse, keyboard  
 (Commercially available USB devices)

**Component Names and Functions**

LED name	Description
① POWER LED	Lit while power is ON.
② ERROR LED	Lit when an error has occurred.
③ RUN LED	Lit while the layout turned on output setting is displayed.
④ ACCESS LED	Blinks while the internal nonvolatile memory is accessed.
⑤ SD POWER LED	Lit while power is supplied to the SD memory card and the card is usable.
⑥ SD BUSY LED	Blinks while the SD memory card is accessed.
⑦ EtherCAT RUN LED	Lit while EtherCAT communications are usable.
⑧ EtherCAT LINK/ACT IN LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
⑨ EtherCAT LINK/ACT OUT LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
⑩ EtherCAT ERR LED	Lit when EtherCAT communications have become abnormal.
⑪ EtherNet NET RUN1 LED	Lit while EtherNet communications are usable.
⑫ EtherNet NET LINK/ACK1 LED	Lit when connected with an EtherNet device, and blinks while performing communications.
⑬ EtherNet NET RUN2 LED	Lit when EtherNet communications are usable.
⑭ EtherNet NET LINK/ACK2 LED	Lit 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 EtherNet connector	Connect an EtherNet device. <table border="1" style="width: 100%;"> <tr> <th>Camera 2ch type</th> <th>Camera 4ch / 8ch type</th> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td colspan="2">Upper port : Ethernet port Lower port : Ethernet port and EtherNet/IP port are sharing use.</td> </tr> </table>	Camera 2ch type	Camera 4ch / 8ch type			Upper port : Ethernet port Lower port : Ethernet port and EtherNet/IP port are sharing use.	
Camera 2ch type	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	Camera connector No. is consistent with Camera Image Input No. of Sensor controller software. Check and connect them.						
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. Perform wiring using the attached terminal block connector as referring to the description of wiring that connector.						

## Parallel Interface

Common use to all NPN/PNP models. Wire appropriately according to the specification of the external device.

### Internal Specification (for NPN Connection)

[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.

Input voltage	12-24VDC ±10%
ON current *1	Min. 5mA
ON voltage *1	Min. 8.8V
OFF current *2	Max. 0.5mA
OFF voltage *2	Max. 1.1V
ON delay	5ms or less
OFF delay	0.7ms or less

Internal circuit diagram

\*1 ON current/voltage means the current or voltage value to activate the terminal. The ON voltage value is the potential difference between COM IN 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.

Output voltage	12-24VDC ±10%
Load current *	45mA or less
ON residual voltage	2V or less
OFF leakage current	0.2mA or less

Internal circuit diagram

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

### Internal Specification (for PNP Connection)

[Input] Applicable signals/  
No.14 pin : Connect the COMIN1 terminal when using these signals.  
No.37 to 46 pin : Connect the COMIN2 terminal when using these signals.

Input voltage	12-24VDC ±10%
ON current *1	Min. 5mA
ON voltage *1	Min. 8.8V
OFF current *2	Max. 0.5mA
OFF voltage *2	Max. 1.1V
ON delay	5ms or less
OFF delay	0.7ms or less

Internal circuit diagram

\*1 ON current/voltage means the current or voltage value to activate the terminal. The ON voltage value is the potential difference between COM IN and each input terminal.

[Output] Applicable signals/  
No.15 to 19 pin, No.28 to 32 pin : 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.

Output voltage	12-24VDC ±10%
Load current *	45mA or less
ON residual voltage	2V or less
OFF leakage current	0.2mA or less

Internal circuit diagram

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

### I/O Connectors

The role of terminals varies depending on the settings of FH Sensor Controller. Check the settings and perform correct wiring.

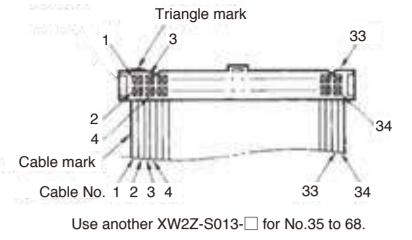
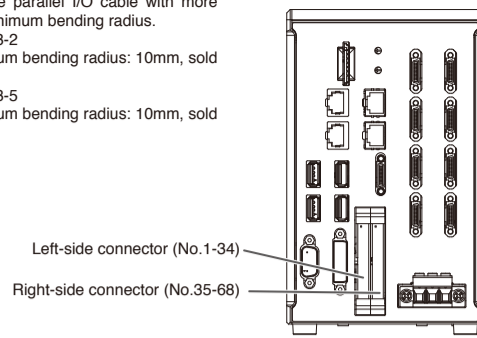
No	I/O	Signal name				Remarks
		In the 1-line mode	In the 2-line random mode	In the 3 to 4-line random mode	In the 5 to 8-line random mode	
1	—	COMIN0				
2	—	COMIN1				
3	—	Vacant				
4	IN	STEP0/ENCRIG_Z0 (*1)	STEP0/ENCRIG_Z0 (*2)	STEP0	STEP0	
5	IN	Unused (*5)	STEP1/ENCRIG_Z1 (*2)	STEP1	STEP1	
6	IN	Unused (*5)	Unused (*5)	STEP2	STEP2	
7	IN	Unused (*5)	Unused (*5)	STEP3	STEP3	
8	IN	ENCRIG_A0 (*1)	ENCRIG_A0 (*2)	Unused (*5)	Unused (*5)	
9	IN	Unused (*5)	Unused (*5)	Unused (*5)	STEP4	
10	IN	Unused (*5)	Unused (*5)	Unused (*5)	STEP5	
11	IN	Unused (*5)	ENCRIG_A1 (*2)	Unused (*5)	STEP6	
12	IN	Unused (*5)	ENCRIG_B1 (*2)	Unused (*5)	STEP7	
13	IN	ENCRIG_B0 (*1)	ENCRIG_B0 (*2)	Unused (*5)	Unused (*5)	
14	IN	Unused (*5)	DILINE0			
15	OUT	RUN0	RUN0	READY0		
16	OUT	READY0	READY0	READY0	BUSY0	
17	OUT	BUSY0	BUSY0	BUSY0	OR0	
18	OUT	OR0	OR0	OR0	READY1	
19	OUT	ERROR0	ERROR0	ERROR0	BUSY1	
20	OUT	STGOUT0 (*3)/SHOUT0	STGOUT0 (*3)/SHOUT0	STGOUT0 (*3)/SHOUT0	STGOUT0 (*3)/SHOUT0	
21	OUT	STGOUT1 (*3)	STGOUT1 (*3)/SHOUT1	STGOUT1 (*3)/SHOUT1	STGOUT1 (*3)/SHOUT1	
22	OUT	STGOUT2 (*3)	STGOUT2 (*3)	STGOUT2 (*3)/SHOUT2	STGOUT2 (*3)/SHOUT2	
23	OUT	STGOUT3 (*3)	STGOUT3 (*3)	STGOUT3 (*3)/SHOUT3	STGOUT3 (*3)/SHOUT3	
24	OUT	STGOUT4 (*3)	STGOUT4 (*3)	STGOUT4 (*3)/SHOUT4	STGOUT4 (*3)/SHOUT4	
25	OUT	STGOUT5 (*3)	STGOUT5 (*3)	STGOUT5 (*3)	STGOUT5 (*3)/SHOUT5	
26	OUT	STGOUT6 (*3)	STGOUT6 (*3)	STGOUT6 (*3)/SHOUT6	STGOUT6 (*3)/SHOUT6	
27	OUT	STGOUT7 (*3)	STGOUT7 (*3)	STGOUT7 (*3)	STGOUT7 (*3)/SHOUT7	
28	OUT	Unused (*5)	RUN1	RUN1	OR1	
29	OUT	Unused (*5)	READY1	READY1	READY2	
30	OUT	Unused (*5)	BUSY1	BUSY1	BUSY2	
31	OUT	Unused (*5)	OR1	OR1	OR2	
32	OUT	Unused (*5)	ERROR1	ERROR1	READY3	
33	—	COMOUT0				
34	—	COMOUT1				
35	—	COMIN2				
36	—	Vacant				
37	IN	DSA0	DSA0	DILINE1	DILINE1	
38	IN	Unused (*5)	DSA1	Unused (*5)	DILINE2	
39	IN	D10				
40	IN	D11				
41	IN	D12				
42	IN	D13				
43	IN	D14				
44	IN	D15				
45	IN	D16				
46	IN	D17				
47	—	Vacant				
48	OUT	ACK				
49	OUT	GATE0	GATE0	RUN2	BUSY3	
50	OUT	Unused (*5)	GATE1	READY2	OR3	
51	OUT	DO0	DO0	BUSY2	READY4	
52	OUT	DO1	DO1	OR2	BUSY4	
53	OUT	DO2	DO2	ERROR2	OR4	
54	OUT	DO3	DO3	RUN3	READY5	
55	OUT	DO4	DO4	READY3	BUSY5	
56	OUT	DO5	DO5	BUSY3	OR5	
57	OUT	DO6	DO6	OR3	READY6	
58	OUT	DO7	DO7	ERROR3	BUSY6	
59	OUT	DO8	DO8	Unused (*5)	OR6	
60	OUT	DO9	DO9	Unused (*5)	READY7	
61	OUT	DO10	DO10	Unused (*5)	BUSY7	
62	OUT	DO11	DO11	Unused (*5)	OR7	
63	OUT	DO12	DO12	Unused (*5)	Unused (*5)	
64	OUT	DO13	DO13	Unused (*5)	Unused (*5)	
65	OUT	DO14	DO14	Unused (*5)	Unused (*5)	
66	OUT	DO15	DO15	Unused (*5)	ERROR (*4)	
67	—	COMOUT2				
68	—	COMOUT3				

\*1 To use a measurement trigger input, use the STEP signal. To use an encoder input, use ENCRIG\_A0/B0/Z0.  
\*2 In the 2-line random mode, to use a measurement trigger input and a line of encoder input, use ENCRIG\_A0/B0/Z0 and STEP1.  
\*3 This is the signal used when using a strobe signal for the FH Sensor Controller.  
\*4 This is the ERROR signal commonly used in 1 to 8-line modes.  
\*5 Do not connect anything for Unused.

### Connection

Connect the parallel I/O cable with more than the minimum bending radius.  
XW2Z-S013-2 (2m, minimum bending radius: 10mm, sold separately)  
XW2Z-S013-5 (5m, minimum bending radius: 10mm, sold separately)

### Pin Assignment



## Encoder Interface (Line Driver Type)

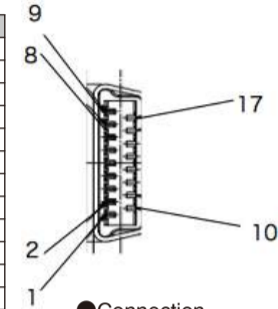
### Specification of Encoder Interface (Line Driver Output Type)

Item	Specifications
Input voltage	Input voltage : 5VDC±5% Signal level : EIA Standard, RS-422-A line driver level
Input impedance *1	120Ω±5%
Differential input voltage	High-level input voltage   0.1V, Low-level input voltage   -0.1V
Hysteresis voltage	60mV
Maximum response frequency *2	Phase A/B: single-phase 4MHz (multiplying phase difference of 1MHz by 4 times), Phase Z: 1MHz (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.

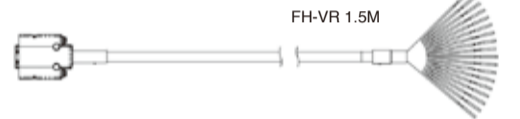
### I/O Connector

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 (5VDC)
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 (0V)
7	ENC0 Z+	Orange	Signal : Ch1 Z-Phase(+)
8	ENC0 Z-	Orange/Red	Signal : Ch1 Z-Phase(-)
9	NC	—	Not connected
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 (5VDC)
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 (0V)
16	ENC1 Z+	Yellow	Signal : Ch2 Z-Phase(+)
17	ENC1 Z-	Yellow/Red	Signal : Ch2 Z-Phase(-)



### Connection

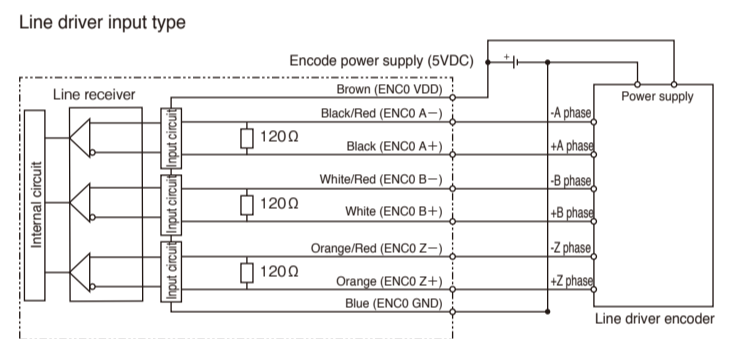
Connect the encoder cable with more than the minimum bending radius. FH-VR 1.5M (1.5m, minimum bending radius: 65mm, sold separately)



### Circuit Schematics

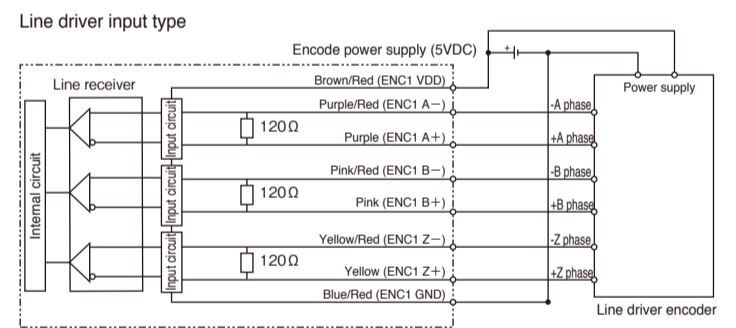
#### Line driver input type

#### CH1



#### Line driver input type

#### CH2



## Camera cable

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 the "Cameras/Cables Connection Table". Be sure to secure at least the minimum bending radius of the cable.

### Cameras/Cables Connection Table(Connecting to FH-S Series Camera)

Type of camera	Model	Cable length	High-speed CMOS cameras *			
			300,000-pixel FH-SM/SC	2 million-pixel FH-SM02/SC02	4 million-pixel FH-SM04/SC04	
			High speed mode of transmission speed select	Standard mode of transmission speed select	High speed mode of transmission speed select	Standard mode of transmission speed select
Camera Cable	FZ-VS	2m	Yes	Yes	Yes	Yes
Right-angle camera cable	FZ-VSL	5m	Yes	Yes	Yes	Yes
		10m	Yes	No	Yes	No
		2m	Yes	Yes	Yes	Yes
Bend resistant camera cable	FZ-VSB	5m	Yes	Yes	Yes	Yes
		10m	Yes	No	Yes	No
Long-distance camera cable	FZ-VS2	15m	Yes	No	Yes	No
Long-distance right-angle camera cable	FZ-VSL2	15m	Yes	No	Yes	Yes

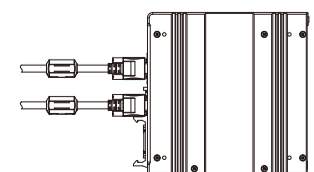
\* High-speed CMOS camera is only for the FH series.

### Cameras/Cables Connection Table(Connecting to FZ-S Series Camera)

Type of camera	Model	Cable length	Digital CCD cameras			Small digital CCD cameras Pen type/flat type	High-speed CCD camera	Intelligent compact CMOS cameras	Intelligent CCD cameras Autofocus CCD cameras
			300,000-pixel FZ-S/SC	2 million-pixel FZ-S2M/SC2M	5 million-pixel FZ-S5M2/SC5M2				
Camera Cable	FZ-VS	2m	Yes	Yes	Yes	Yes	Yes	Yes	
Right-angle camera cable	FZ-VSL	5m	Yes	Yes	Yes	Yes	Yes	Yes	
		10m	Yes	Yes	No	Yes	Yes	No	
		2m	Yes	Yes	Yes	Yes	Yes	Yes	
Bend resistant camera cable	FZ-VSB	5m	Yes	Yes	Yes	Yes	Yes	Yes	
		10m	Yes	Yes	No	Yes	Yes	No	
Long-distance camera cable	FZ-VS2	15m	Yes	Yes	No	Yes	Yes	No	
Long-distance right-angle camera cable	FZ-VSL2	15m	Yes	Yes	No	Yes	Yes	No	

### Mounting of Ferrite core

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



## EtherCAT Interface

- 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.
- I/O Connector** Use an 8-pin shielded RJ45 modular connector of category 5e or higher.

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	-

## Wiring

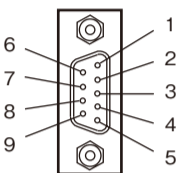
The cable is maximum 100m long.  
However, some cables do not guarantee 100m. If conductor is a twisted cable, transmission performance generally becomes worse than that of straight cables, so that 100m cannot be guaranteed. For details, contact the cable manufacturer.

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

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

## RS-232C(Serial) Interface

### I/O Connector



### Wiring

The maximum cable length is 15m.

FH Sensor Controller		External device to be connected	
Signal name	Pin No.	Pin No.	Signal name
RD	2	*	RD
SD	3	*	SD
GND	5	*	GND

RS/CS control cannot be used.

Use a shielded cable.

Use a compatible connector.

### Recommended items

	Manufacturer	Model
Sockets	OMRON Corporation	XM3D-0921
Hood	OMRON Corporation	XM2S-0913



Pin numbers will depend on the external device being connected. Refer to the manual for the personal computer or PLC being connected.

## Connection Method

Align the connector with the socket and press it straight into place, then fix it with the screws on both sides of the connector.

- Turn OFF the power supply before connecting or disconnecting a Parallel I/O Cable.
- Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.

## Wiring

**[Important]** - Wiring cables incorrectly might cause failures.

### Connection of Terminal Block

- 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: 0.7-0.8N·m
- Insert the terminal block connector (male) into the terminal block connector (female) on the FH Sensor Controller side.
- Fix the terminal block connector (male) by tightening the screws on the right and left sides of it with a flathead screwdriver.  
Recommended tightening torque: 0.7-0.8N·m

Pin No.	Display	Signal name	Function
1	+	24V	Input power supply voltage (24VDC)
2	-	0V	Input power supply voltage (0V)
3	⊕	GND	Input GND.

The power supply connected to the FH Sensor Controller varies depending on the number of connected cameras and types. Use it accordingly.

### Recommended power supply

Item	Camera type	No. of cameras connected	High-speed controller				Standard controller	
			FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20
Recommended power supply: S8VS	Intelligent camera	2	S8VS-12024	S8VS-18024	S8VS-18024	S8VS-12024	S8VS-12024	S8VS-18024
		4	-	S8VS-24024	S8VS-24024	-	S8VS-24024	S8VS-24024
		8	-	-	S8VS-48024	-	-	S8VS-48024
	Camera of 0.3/2/4/5 million pixels	2	S8VS-12024	S8VS-18024	S8VS-18024	S8VS-09024	S8VS-09024	S8VS-12024
		4	-	S8VS-18024	S8VS-18024	-	S8VS-12024	S8VS-12024
		8	-	-	S8VS-18024	-	-	S8VS-18024

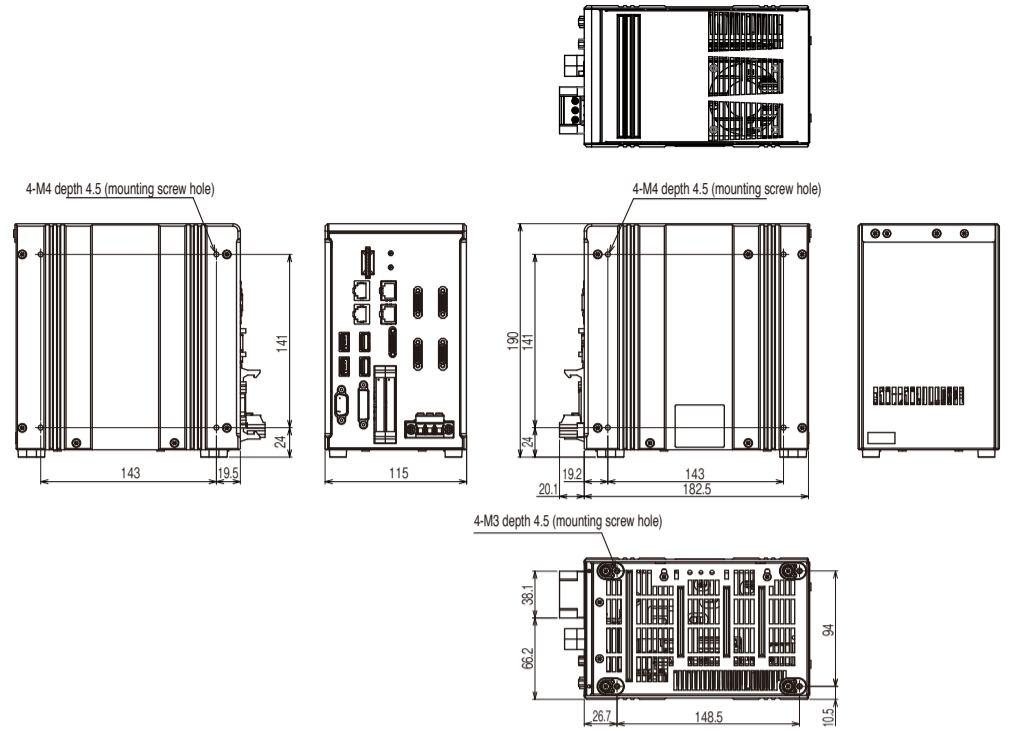
## Ratings/Characteristics

Type	Model	NPN	PNP	High-speed controller			Standard controller									
				FH-3050	FH-3050-10	FH-3050-20	FH-1050	FH-1050-10	FH-1050-20							
Major functions	Controller type	BOX type														
	High-grade (HG) processing item	-														
	Number of cameras	2	4	8	2	4	8									
	Type of connected camera	All cameras can be connected (FZ-S/FH-S series)														
External interface	Number of scenes	128														
	Operation	Mouse or similar device														
	Settings	Create processing flows by editing them (with a guidance).														
	Serial communications	RS-232C 1 CH														
	Ethernet communications	Non-procedural (TCP/UDP) 100BASE-T														
	EtherNet/IP communications	1port	2port	2port	1port	2port	2port									
	EtherCAT communications	1 port (Ethernet port and EtherNet/IP port are sharing use.) Transmission speed : 100Mbps (100BASE-TX)														
	Parallel I/O	In 1-line mode : 12 inputs, 31 outputs. In the 2-line random trigger mode : 17 inputs, 37 outputs. In the 3 to 4-line random trigger mode : 14 inputs, 29 outputs. In the 5 to 8-line random trigger mode : 19 inputs, 34 outputs.														
	Encoder I/F	RS422-A line driver level. Phase A/B: single-phase 4MHz (multiplying phase difference of 1MHz by 4 times), Phase Z: 1MHz														
	Monitor I/F	DVI-I output 1ch														
Ratings	USB I/F	4 ch (supports USB 1.1 and 2.0)														
	SD memory card I/F	SDHC standard, Class 4 or higher recommended														
	Power supply voltage	20.4 to 26.4VDC														
	Current consumption *	When an intelligent compact camera or autofocus camera is connected	2 connected 5.0A or less	4 connected 7.0A or less	8 connected 11.5A or less	2 connected 4.1A or less	4 connected 4.8A or less	8 connected 6.8A or less	4.7A or less	5.0A or less	5.9A or less	6.5A or less	7.5A or less	10.9A or less	4.5A or less	5.0A or less
Operating environment	Insulation resistance	Between DC power supply and FH Sensor Controller FG: 20MΩ or higher (rated voltage 250V)														
	Noise resistance	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		Cramp : 1KV Pulse rising: 5ns Pulse width: 50ns Burst continuation time: 15ms/0.75ms Period: 300ms Application time: 1 min											
	Ambient temperature range	Operating: 0 to 50 °C Storage: -20 to +65 °C (with no icing nor no condensation)														
	Ambient humidity range	Operating and storage: 35 % to 85 % (no condensation)														
	Ambient environment	No corrosive gases														
Dimensions	Grounding	Type D grounding (100Ω or less grounding resistance) *Conventional type 3 grounding														
	Degree of protection	IEC60529 IP20														
	Environmental conditions	Indoor use Maximum altitude of 2,000m Supply voltage fluctuations of +10%, -15% of the rated voltage Installation category 1 Pollution degree 2														
Content	Dimensions	190mm(H) × 115mm(W) × 182.5mm(D)														
	Weight	Approx. 3.2kg	Approx. 3.4kg	Approx. 3.4kg	Approx. 3.2kg	Approx. 3.4kg	Approx. 3.4kg									
	Case materials	Cover: zinc-plated steel plate, Side plate: aluminum (A6063)														

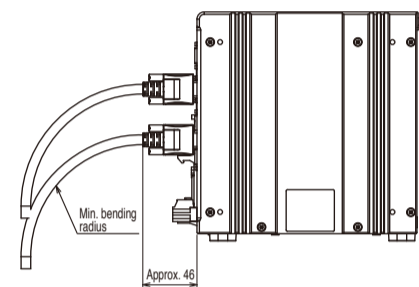
\* The value of power consumption applies when the maximum number of cameras of each FH Sensor Controller is connected with 24VDC.  
When connecting the lighting with strobe controller, the consumption current is the same as when the intelligent camera is connected.

## Dimensions

(Unit: mm)



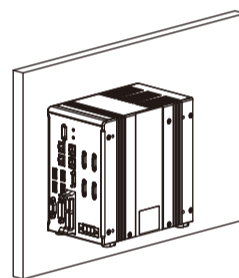
### Camera cable mounting



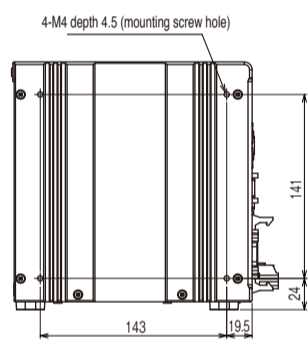
## Mounting

Tighten the screws securely when installing the product.

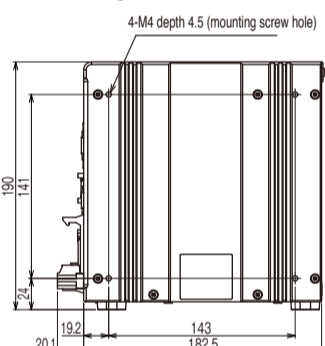
### Side Mounting



### Left side

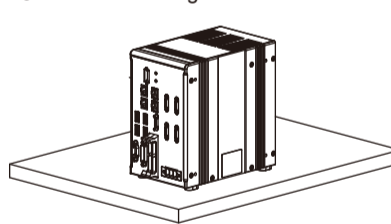


### Right side

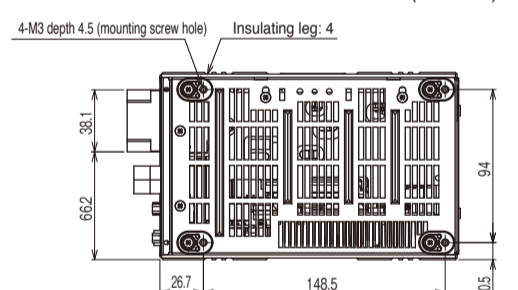


- \* Recommended tightening torque: 1.2N·m to 1.3N·m
- \* The tolerance is ± 0.2mm.

### Bottom Mounting



### Bottom



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

## Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

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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OMRON Corporation

June, 2013

## 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](http://www.dtsc.ca.gov/hazardouswaste/perchlorate)