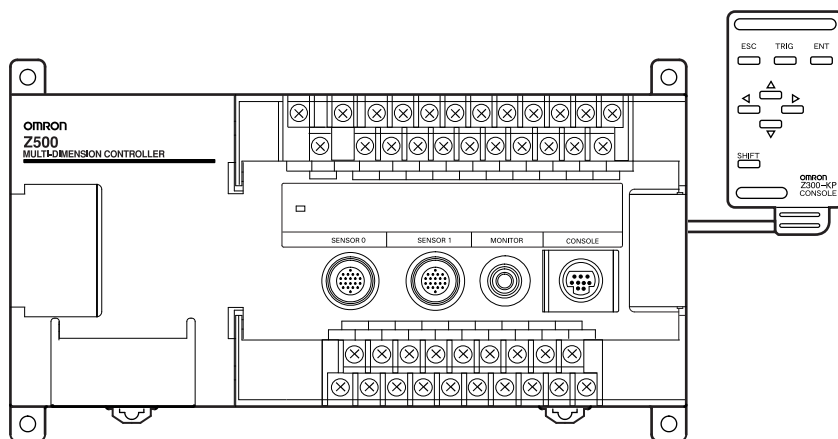


Multi-Dimensional Controller

Z500

Setup Manual



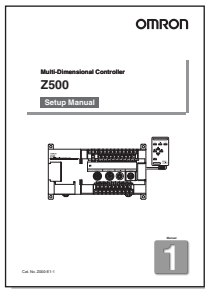
Manual

1

About this Manual

Please read the following manuals carefully and be sure you understand the information provided before attempting to install or operate the Z500.

Manual 1: Setup Manual



Cat. No. Z158-E1-1

Installation

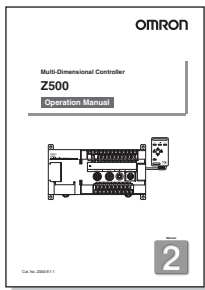


Wiring

This manual describes the hardware for the Z500 (Multi-Dimensional Controller) and how to install the components.

Be sure to read this manual first.

Manual 2: Operation Manual



Cat. No. Z159-E1-1

Starting the Z500 and Positioning the Workpiece



Adjusting Images



Setting Measurement Conditions and Executing



Outputting to External Devices

SECTION 2 Basic Operations

This section describes how to start the Z500 and how to display images on the monitor.

SECTION 3

Menus for Conversational Menu

- Basic settings required for measurement
- Measurement of consistent workpieces

Menus for Conversational Menu

Settings can be made easily by entering information as requested - just as though you are having a conversation with the Z500.

SECTION 4 Menus for Expert Menu

- Customized settings
- Detailed settings
- Measurement of workpieces placed at different positions

Menus for Expert Menu

More detailed setting, such as position compensation for workpieces placed at different positions, can be made.

SECTION 7 I/O Format

This section provides details on the inputs and outputs used for communications with external devices via terminal blocks or RS-232C.

- Communications settings
- I/O format
- Timing for communications

Multi-Dimensional Controller
Z500
Z500-MC10
Setup Manual

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Manual



Special or Critical Applications

When the Z500 will be used in one of the conditions or applications listed below, allow extra safety margins in ratings and functions, add extra safety feature such as fail-safe systems, and consult your OMRON representative.

- Operating conditions or environments which are not described in the manual
- Nuclear power control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement equipment, or safety equipment
- Other systems, machines, and equipment that may have a serious influence on lives and property and require extra safety features

Product Availability

Some of the products listed may not be available in some countries. Please contact your nearest OMRON sales office by referring to the addresses provided at the back of this manual.

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No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

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Precaution on Safety

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

**DANGER**

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

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

**WARNING**

Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

Laser Safety

This manual uses the following signs and symbols to ensure safe operation of the Z500. These signs and symbols are important for avoiding injury to people or damage to the product. Be sure to pay attention to them. Their meanings are given below.

Warning

 WARNING	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
--	--

Signs and Symbols

	Laser Beam Hazard Cautions to Indicate Potential Laser Beam Hazard
---	--

Safety precautions for using laser equipment



WARNING

Do not to expose your eyes to the laser radiation either directly or indirectly (i.e., after reflection from a mirror or shiny surface). The laser radiation has a high power density and exposure may result in loss of sight.

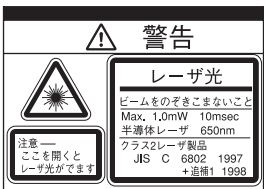


The Z500 series uses laser as the light source and is classified as shown below according to the IEC standard (IEC60825-1).

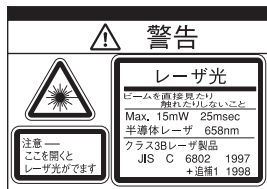
	Z500-SW2	Z500-SW17
Wavelength	650 nm	658 nm
Maximum pulse duration	10 ms	17.5 ms
Cycle	0.5 to 10 ms	0.5 to 25 ms
Peak power	1 mW max.	15 mW max.
Class	2	3B

Labeling on Laser Use

The Z500 has, on the side of its sensor, a warning label as shown below.



Z500-SW2



Z500-SW17

Safety Device

The Z500 is equipped with laser radiation warning lamp and laser off input circuit. Interlocking unit can be configured in the external circuit.

Unless the product is in **Run** Mode, however, laser off input from the external circuit is disabled. This ensures stable measurement. Be sure to use laser-shielding safety goggles when installing or adjusting Z500-SW17.

Safety Instructions

- Use laser enclosure device to prevent specular object from reflecting laser beam.
When used without an enclosure, be sure to avoid a laser path from eye level.
- Safe distance (Nominal Optical Hazard Distance: NOHD) is approximately 1 m; it is advisable, however, to terminate the laser on its path if possible. Non-reflective, flattening material is recommendable for termination.
- Be sure to use laser-shielding safety goggles when installing or adjusting Z500-SW17.

Outline of IEC60825 Standard

The following are the safety measures to be taken by the user for each type of laser equipment.

Classification Requirements	Class 1	Class 2	Class 3A	Class 3B*	Class 4
Remote interlock	Not required			Connect to room or door circuits	
Key control	Not required			Remove key when not in use	
Beam attenuator	Not required			When in use prevents inadvertent exposure	
Emission indicator device	Not required			Indicates laser is energized	
Warning signs	Not required			Follow precautions on warning signs	
Beam path	Not required	Terminate beam at end of useful length			
Specular reflection	Not required			Prevent unintentional reflections	
Eye protection	Not required			Required if engineering and administrative procedures not practicable and MPE exceeded	
Protective clothing	Not required			Sometimes required	Specific requirements
Training	Not required		Required for all operator and maintenance personnel		
* With respect to the requirements of remote interlock connector, key control, beam attenuator, and emission indicator, Class 3B laser products not exceeding five times the AEL of Class 2 in the wavelength range of 400 nm to 700 nm are to be treated as Class 3A laser products.					

Re-labeling

Two different labels are provided, to be used selectively according to countries.

- for use in the U.S.: FDA label
- for use in countries other than the U.S.: Warning label

Be sure to turn off the sensor before replacing the label, or your hand or other body parts may be exposed to the hazardous laser beam radiating from the sensor.

Use in the U.S.

When a laser product mounted on a certain device is to be used in the U.S., it has to meet the requirements set forth by the FDA (regulations for laser products set forth by the Food and Drug Administration). Three different FDA labels are enclosed in the package. Attach them to the sensor body.

Applications have been approved by CDRH (Center for Devices and Radiological Health) for Z500-SW17. Z500-SW2 should not be used in the U.S. at this moment since the application for this model has not been approved yet.

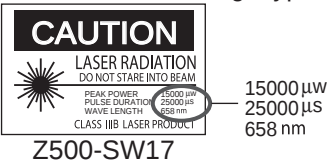
FDA Labels for Laser Products

The Z500 is designed to be built into the finished system unit. Refer to the following technical standard for installation.

21CFR1040.10 and 1040.11

FDA Labels

Class III B Caution logo type



Aperture Label



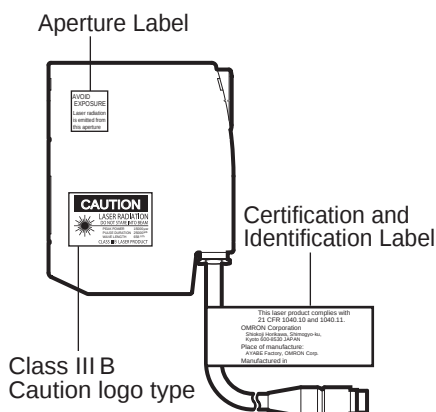
Certification and Identification Label



Be sure to attach FDA labels; do not attach English WARNING labels by mistake.

Areas to Attach Labels

Z500-SW17

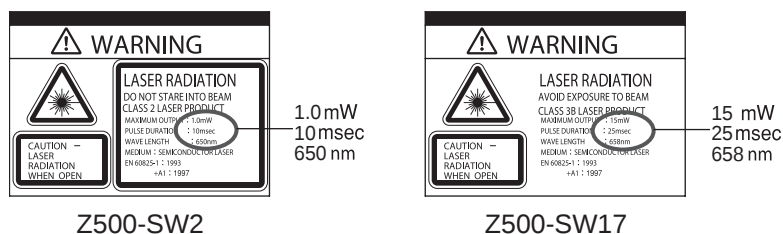


Use in Countries Other than the U.S.

Replace the warning label in Japanese on the sensor main body with the attached English one upon use in countries other than the U.S. Attach the label in the area where the original Japanese warning label was provided.

European EN60825-1 standard is applied to products exported to European countries. The Z500 conforms to the standard.

Warning Labels



Export of the Products

Z500-SW2 is considered as special freight under the Foreign Exchange and Foreign Trade Laws and therefore requires a license for export. As for other countries, observe the laws specified by each country.

Caution

Installation Environment Precautions

**CAUTION**

Do not use the Z500 in environments with flammable or explosive gases.

**CAUTION**

Install the Z500 away from high-voltage devices and moving machinery to allow safe access during operation and maintenance.

Power Supply and Wiring Precautions

**CAUTION**

Use the Z500 with the power supply voltages specified in this manual.

**CAUTION**

Use crimp terminals for wiring. Do not connect the power supply wires by just twisting stranded wire and connecting directly to the terminals.

**CAUTION**

Use the wire and crimp terminals of the proper sizes as specified in this manual.

**CAUTION**

Confirm that wiring has been performed correctly before turning ON the power supply.

**CAUTION**

Cover the terminal blocks with the Terminal Block Protection Covers. Uncovered terminal blocks can result in electric shock.

**CAUTION**

Use a DC power supply with countermeasures against high-voltage spikes (safe extra low-voltage circuits on the secondary side).

**CAUTION**

Be sure to securely tighten the screws when mounting the Z500.

Other Precautions

**CAUTION**

Do not attempt to dismantle, repair, or modify the Z500.

**CAUTION**

Dispose of the Z500 as industrial waste.

Notice

The Z500 is highly reliable and resistant to most environment factors. The following guidelines, however, must be followed to ensure reliability and optimum use of the Z500.

Installation of the Controller

Installation Site

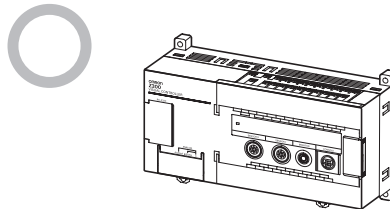
Do not install the Z500 in locations subjected to the following conditions:

- Ambient temperature outside of 0 to +50 °C
- Condensation due to rapid temperature fluctuations
- Relative humidities outside 35 to 85%
- Corrosive or flammable gases
- Dust, salt, or iron particles
- Direct vibration or shock
- Reflection of intense light
(such as other laser beams or electric arc-welding machine)
- Strong magnetic fields
- Direct sunlight
- Water, oil, or chemical fumes or spray

Mounting of the Controller

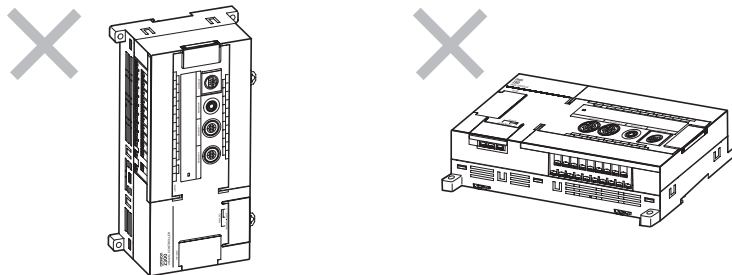
To improve heat dissipation, install the Controller in the following direction only:

CORRECT



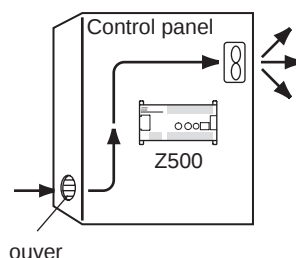
Do not install the Controller in the orientations shown in the following diagram.

INCORRECT



Ambient temperature

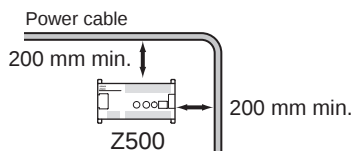
- Maintain a minimum clearance of 50 mm above and below the Z500 to improve air circulation.
- Do not install the Z500 immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient temperature exceed 50 °C.
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50 °C so that the ambient temperature never exceeds 50 °C.

**Ambient Illumination**

- Do not let the ambient illumination exceed 3000lx.
- When using the Z500 near lighting equipment that turns ON and OFF continuously, reduce the influence of the light by, for example, using a light baffle.

Noise resistance

- Do not install the Z500 in a cabinet containing high-voltage equipment.
- Do not install the Z500 within 200 mm of power cables.

**Sensor Maintenance**

Install the Sensor in a clean environment and keep the filter on the front panel of the Sensor free from oil and dust. If affected by oil or dust, clean the filter as follows:

- Use a blower brush (used to clean camera lenses) to blow large dust particles from the surface. Do not blow the dust away with your mouth.
- Use a soft cloth (for lenses) with a small amount of alcohol to remove the remaining dust. Do not use a scrubbing action when cleaning as scratches on the filter could result in the Sensor malfunctioning.

Environment

The Sensor cannot accurately detect the following types of objects:

- * Objects with an extremely low reflection ratio
- * Objects with a small curvature
- * Largely inclined objects

Component Installation and Handling

Components

The Sensor and Console must be products designed specifically for the Z500.

- Sensor (Z500-SW2 and Z500-SW17)
- Console (Z300-KP)

Connecting Cables

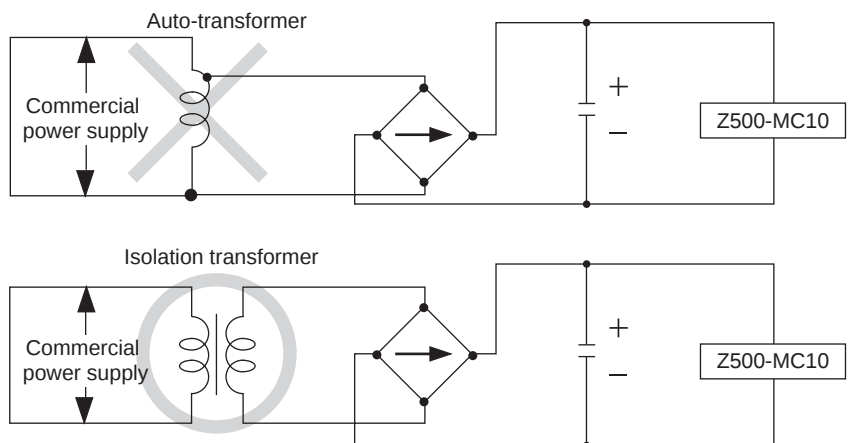
Always turn OFF the Z500's power before connecting or disconnecting cable.

Touching Signal Lines in Connectors or Terminals

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.

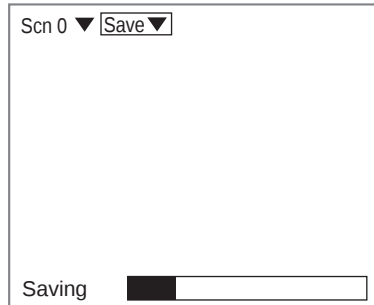
Wiring

When using a transformer for the Z500's driving power supply, use an isolation transformer in the way shown below. Do not use an auto-transformer. Doing so may result in equipment failure.



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 destroyed, and the Z500 may not operate correctly the next time it is started.



Using the RESET Signal

Do not input the RESET input immediately after power is turned ON. When using the RESET input to synchronize startup timing, wait at least 1 second after the Z500's power supply is turned ON before turning ON the RESET terminal.

Securing the Video Monitor (When Using the Recommended F150-M09)

If the video monitor case is metallic, observe the following precautions to prevent noise interference, because the video monitor case is connected to the 0V line in the internal circuits.

- Do not ground the video monitor.
- Do not ground the metallic part of the connector.
- Secure the video monitor with plastic screws if it is being mounted to a metallic surface.

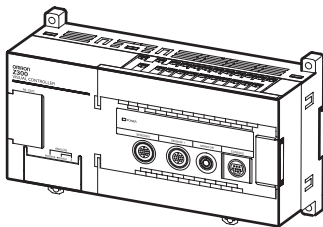
Warming Up

After turning ON the power supply, allow the Z500 to stand for at least 30 minutes before use. The circuits are unstable immediately after the power supply is turned ON and attempting measurement may result in inconsistent measurement values.

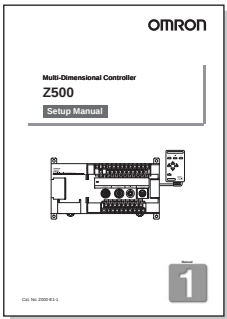
Confirming Package Contents

Check the contents of the package as soon as you receive the Z500.
It is extremely rare for components to be missing, but contact the nearest OMRON representative if any of the following items are missing.

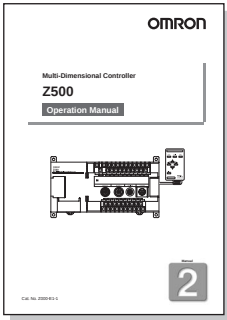
Z500 Controller Qty: 1



Manual 1: Setup Manual (This Manual) Qty: 1



Manual 2: Operation Manual Qty: 1



Editor's Note

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

**NOTICE**

Indicates information required to take full advantage of the functions and performance of the product. Incorrect application methods may result in the loss or damage to the product. Read and follow all precautionary information.

**CHECK**

Indicates points that are important in using product functions or in application procedures.

**REFERENCE**

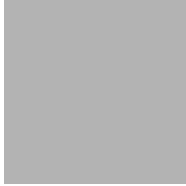
Indicates where to find related information.

**HELP**

Indicates information helpful in operation.

OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.



SECTION 1

Wiring and Connection

1-1 Basic System Configuration	18
1-2 Component Names and Functions	20
1-3 Power Supply and Ground	22

1-1 Basic System Configuration



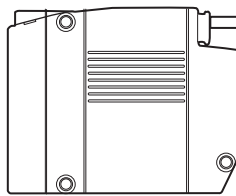
NOTICE

- The following diagram shows the basic Z500 system configuration. Some of the components shown in the configuration diagram are special OMRON products that cannot be substituted with comparable devices. These items are indicated with an asterisk.
- Always turn OFF the power supply before connecting or disconnecting cables. The peripheral device may be damaged if connected or disconnected with the power supply turned ON.

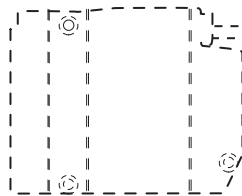
Sensor

Z500-SW2 (2-m cable)

Z500-SW17 (2-m cable)

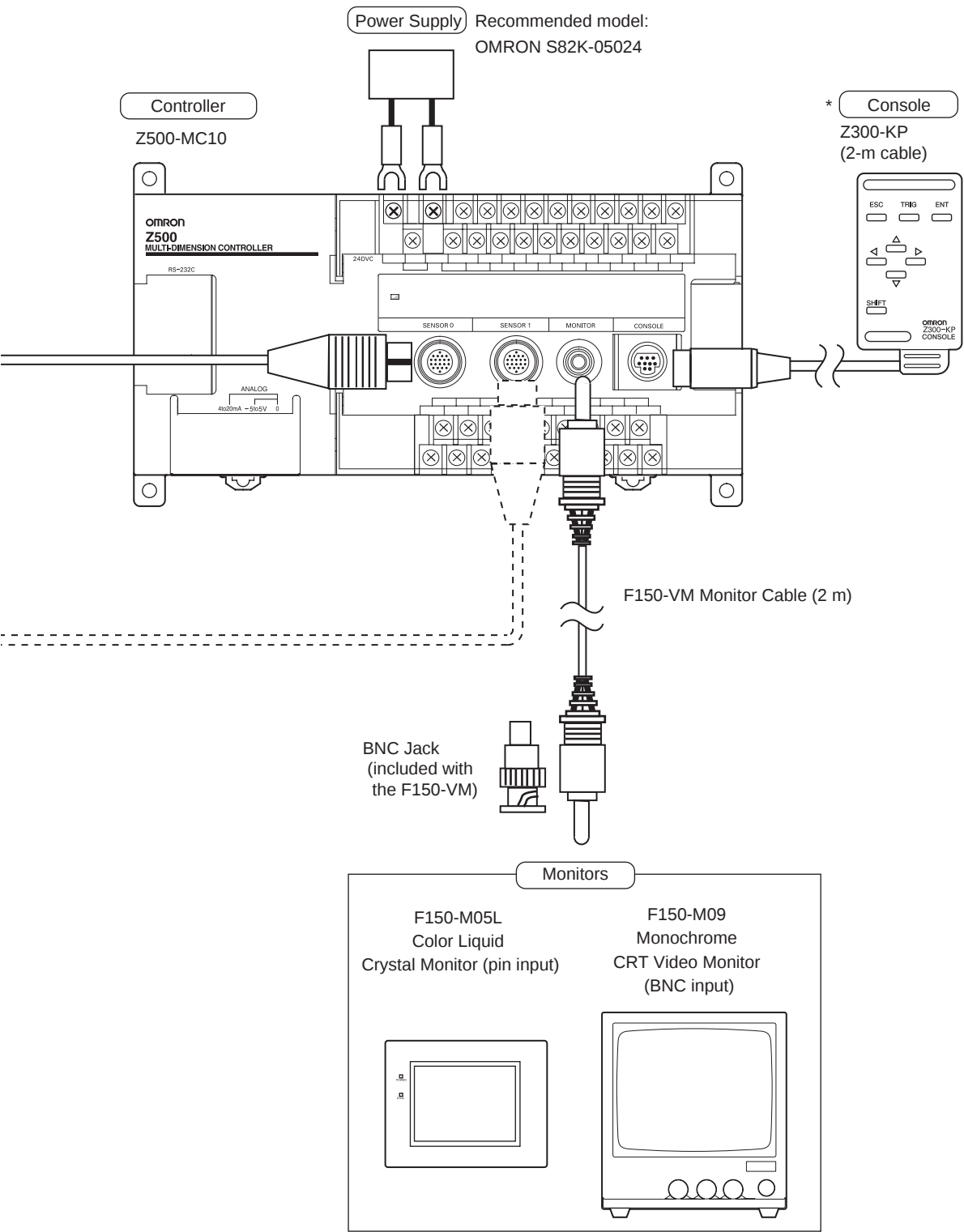


* Sensor Extension Cable
Z309-SC1 (3 m, 8 m, or 13 m)
Specify the required cable length when ordering.



CHECK

Up to 2 Sensors can be connected.

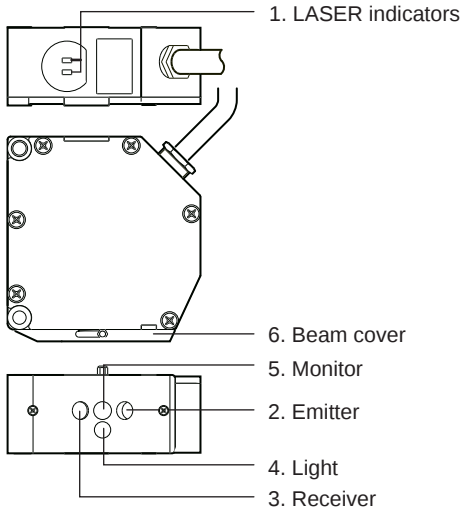


The Monitor is used to check the image and display menu where making settings.

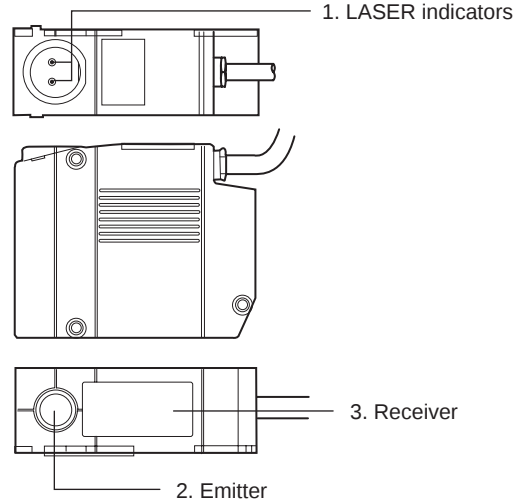
1-2 Component Names and Functions

1-2-1 Sensor

Z500-SW2

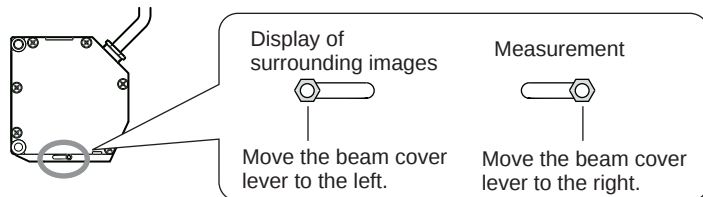


Z500-SW17



1. Provides laser beam warning indicators.
 - For 15 to 25 seconds after the power supply is turned ON, both indicators will be OFF indicating that the laser beam is OFF.
 - When the laser beam turns ON, both indicators will light.
 - When the laser beam turns OFF, both indicators will turn OFF.
2. Emits laser beam.
3. Receives laser beam.
4. Light used when displaying surrounding images.
5. Captures surrounding images.
6. Used for switching between display of surrounding images and measurement.

To display surrounding images, move the beam cover lever to the left. To perform measurement, move the lever to the right.

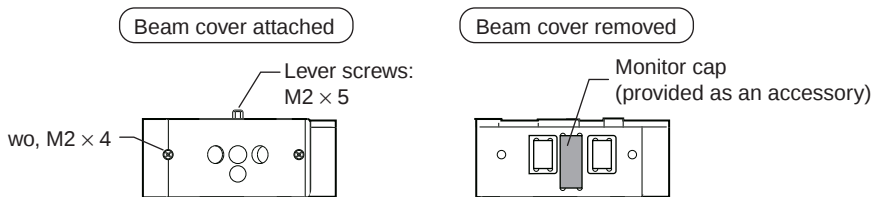


Tighten the lever screws with a flat-bladed screwdriver to a torque in the range 0.15 to 0.3 N·m (1.5 to 3 kgf·cm).

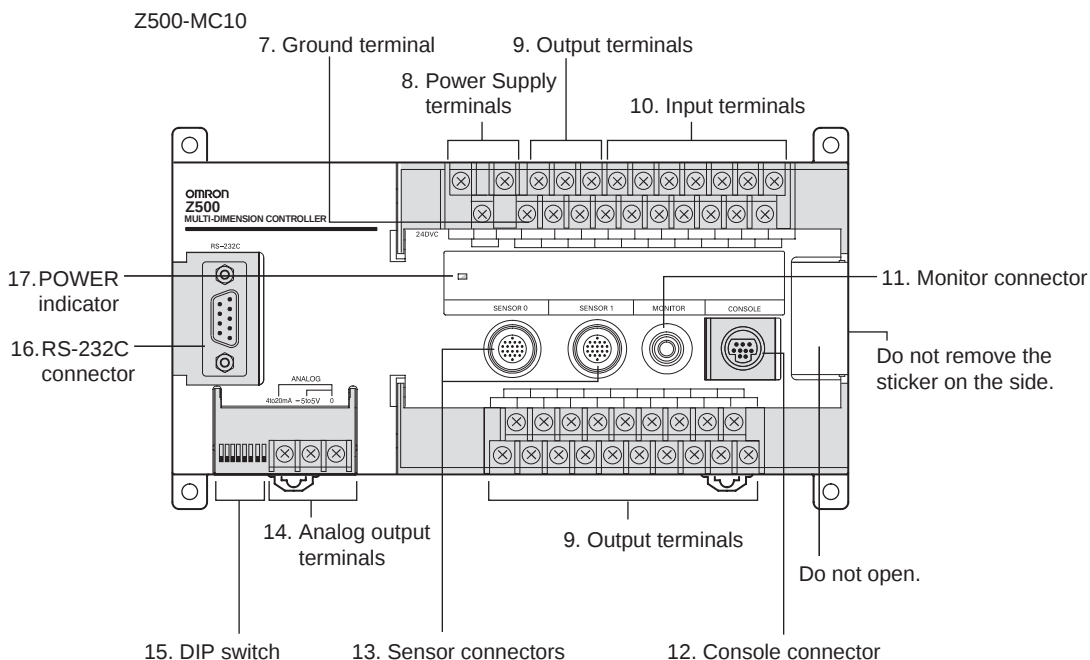


When Using the Z500-SW2

- When performing measurement with the beam cover removed, attach the monitor cap provided with the Sensor over the Light and Monitor in the way shown on the next page.
- When displaying surrounding images, be sure to attach the beam cover. Surrounding images cannot be displayed correctly without the beam cover attached.



1-2-2 Controller



Shading indicates parts that are lifted to see the terminals underneath.

7. Connected to the ground wire.
8. Connected to the power supply.
9. Connected to external devices such as a PLC.
10. Connected to external devices such as a PLC.
11. Connected to the monitor.
12. Connected to a console.
13. Connected to the sensor.
14. Connected when using analog output.
15. Do not use. (Turn OFF the DIP switch.)
16. Connected to external devices such as a personal computer or PLC.
17. Lit while power is ON.

1-3 Power Supply and Ground

Wire the power supply and the ground to their respective terminals. Tighten the screws to a torque of between 0.5 and 0.6 N·m. After wiring, confirm that the wiring is correct.



NOTICE

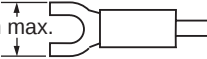
Re-cover the terminal blocks with the Terminal Block Protection Covers.
Uncovered terminal blocks can result in electric shock.

1-3-1 Crimp Terminals and Cables

The terminal block uses M3 terminal screws.

Use appropriate crimp terminals for M3 screws as shown below.

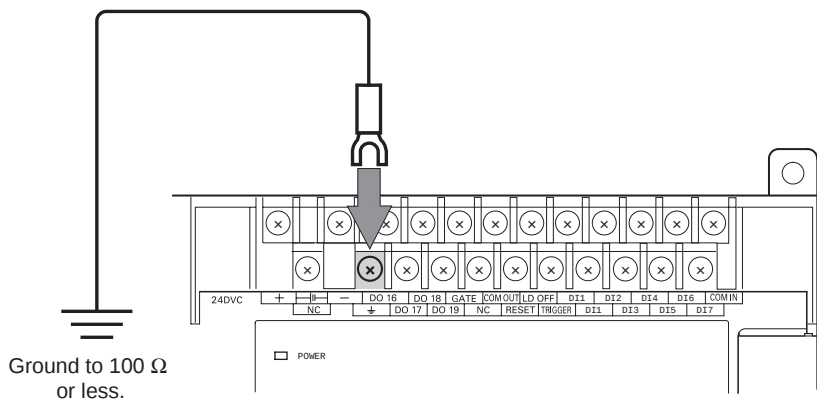
Recommended Crimp Terminals

Type	Manufacturer	Model	Recommended wire size
Forked 	J.S.T. Mfg Co., Ltd.	V1.25-N3A	1.31 to 1.65 mm ²
Round 	J.S.T. Mfg Co., Ltd.	V1.25-MS3	

1-3-2 Ground Wiring

To avoid grounding problems, do not share the ground wire with any other devices or wire the ground to the building's steel framing. Always connect a ground wire to the Z500's ground terminal.

Use a grounding point that is as close as possible and keep the ground wiring as short as possible.



1-3-3 Wiring the Power Supply

Wire the Power Supply Unit independently of other devices. In particular, keep the power supply wired separately from inductive loads.
Use a power supply that meets the following specifications.

Recommended Power Supply

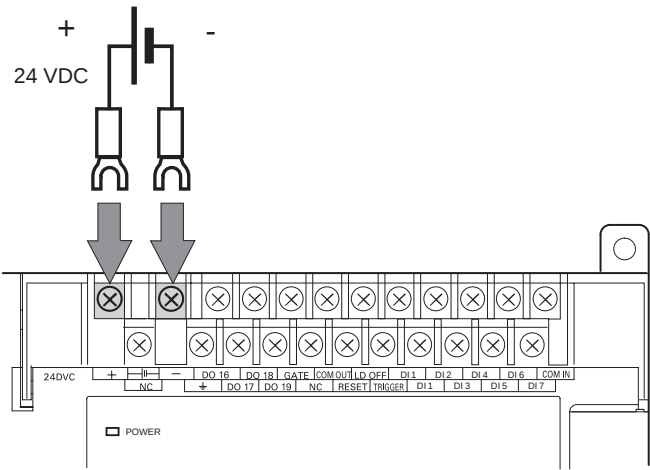
Output current	Power supply voltage
1.6 A min.	24 VDC (21.6 to 26.4VDC)

Recommended Model

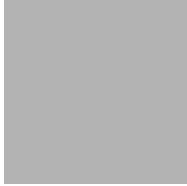
Manufacturer	Model
OMRON Corp.	S82K-05024



- Use a DC power supply with countermeasures against high-voltage spikes (safe extra low-voltage circuits on the secondary side). Excessively high voltages can result in electric shock.
- If UL recognition is required, use a UL class II power supply.
- Keep the power supply wiring as short as possible.



MEMO



Z500
Setup Manual

SECTION 2

Installation

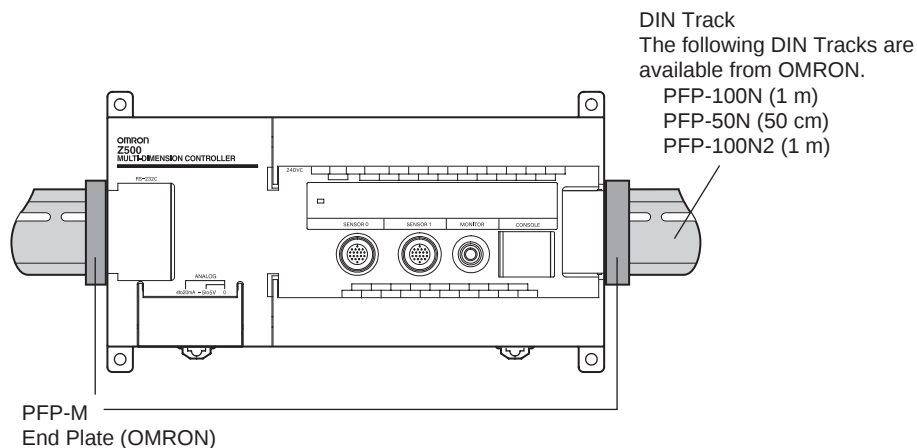
2-1 Mounting the Controller	26
2-2 Mounting the Sensor	28

2-1 Mounting the Controller

There are two ways to mount the Controller: DIN Track mounting or surface-mounting.

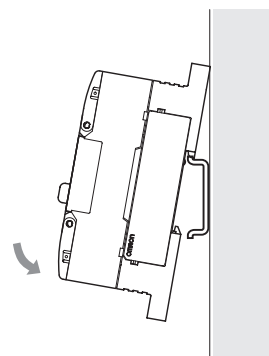
2-1-1 DIN Track Mounting

The Controller can be easily mounted to or removed from 35-mm DIN Track.



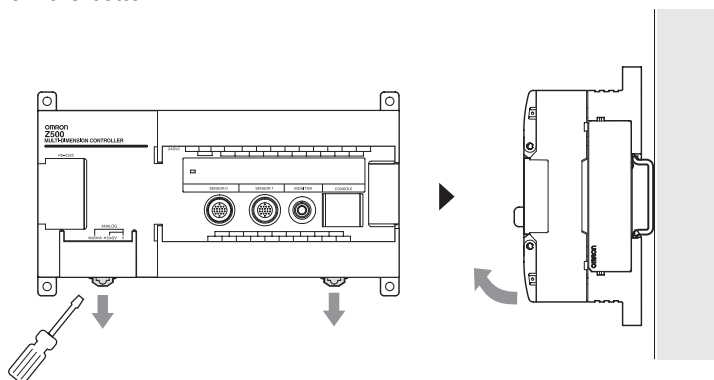
Mounting the Controller

Hook the Controller into the DIN Track as shown in the diagram and then press in at the bottom until the Controller locks into place.

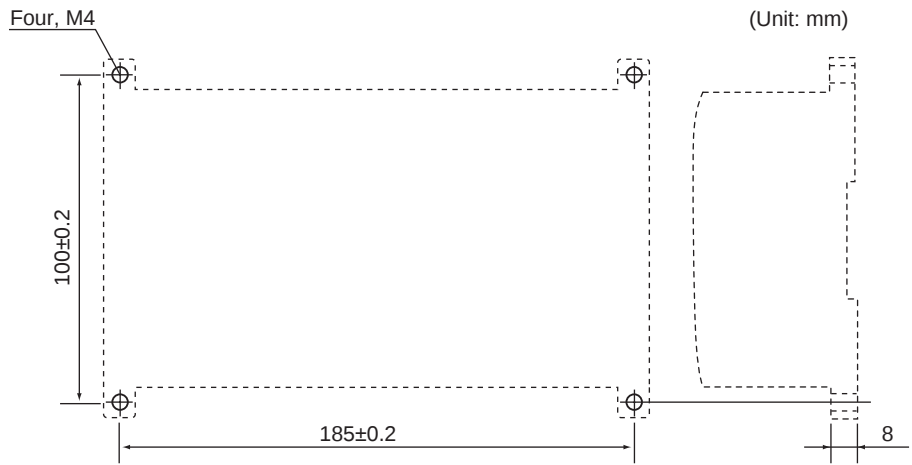


Removing the Controller

Use a flat-bladed screwdriver to pull the hook down and then pull out the Controller from the bottom.



2-1-2 Surface Mounting



2-2 Mounting the Sensor

Up to 2 Sensors can be connected per Controller.



NOTICE

Only controllers designed specifically for the Z500 can be used.

Using another type of controller may result in damage to the sensor or controller.

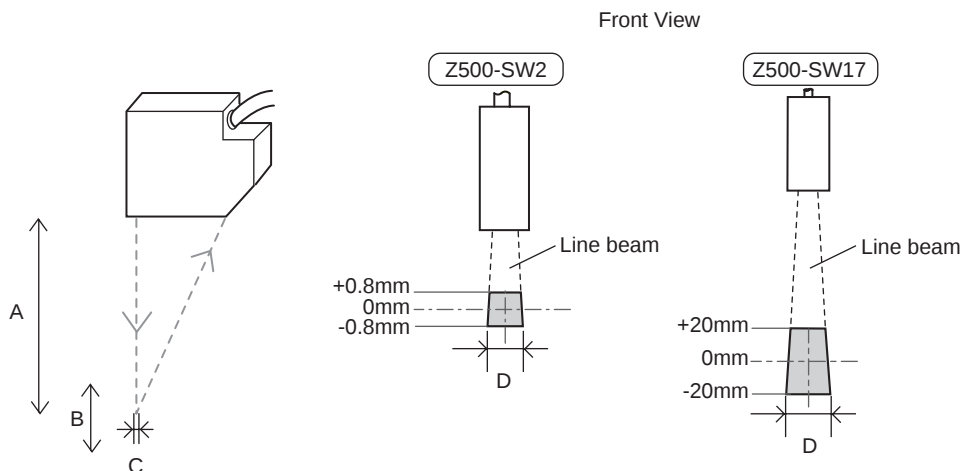
2-2-1 Sensor Types

Type	Distance to measurement center (A)	Measurement range		Spot diameter (C)
		Height (B)	Width (D)	
Super High-precision Model Z500-SW2	20 mm	± 0.8 mm	B= +0.8 mm : 4.0 mm (The width of the measurement region is 2.2 mm.) B= 0 mm : 4.0 mm (The width of the measurement region is 2.3 mm.) B= -0.8 mm : 4.0 mm (The width of the measurement region is 2.4 mm.)	B= +0.8 mm : 40 μ m B= 0 mm : 20 μ m B= -0.8 mm : 40 μ m
Long-range Model Z500-SW17	100 mm	± 20 mm	B= +20 mm : 40 mm (The width of the measurement region is 14.5 mm.) B= 0 mm : 45 mm (The width of the measurement region is 17.3 mm.) B= -20 mm : 50 mm (The width of the measurement region is 20.1 mm.)	B= +20 mm : 280 μ m B= 0 mm : 60 μ m B= -20 mm : 280 μ m



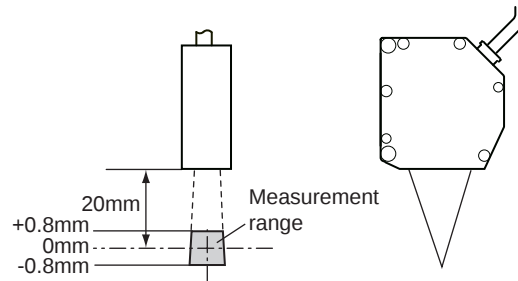
CHECK

Distance to measurement center (A), Height (B), Width (D), and Spot diameter (C)

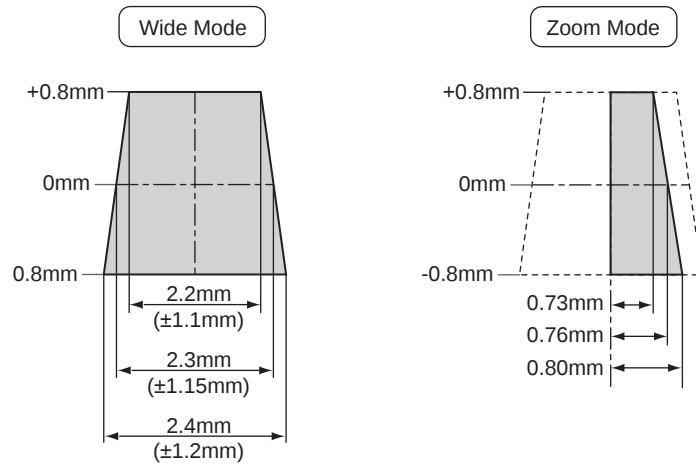


2-2-2 Measurement Range

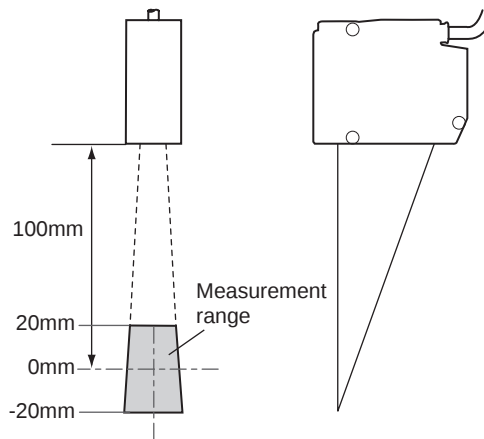
Super High-precision Model: Z500-SW2



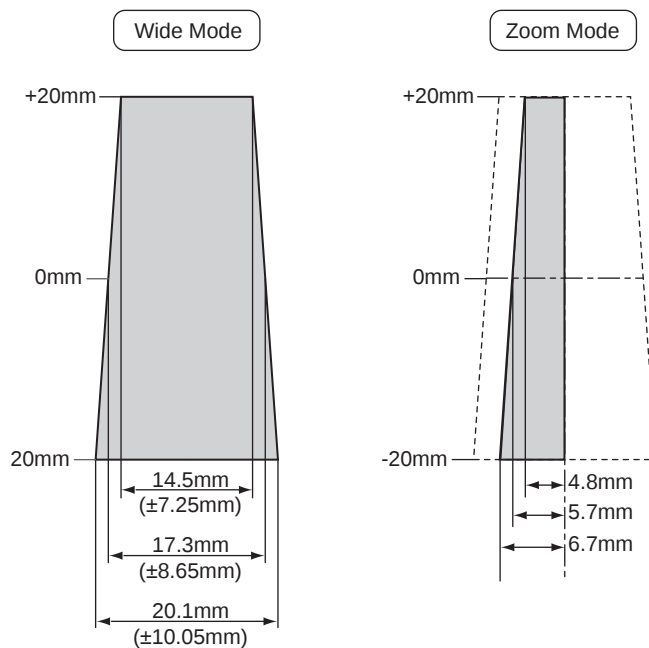
Relation between Measurement Mode and Measurement Range



Long-range Model: Z500-SW17



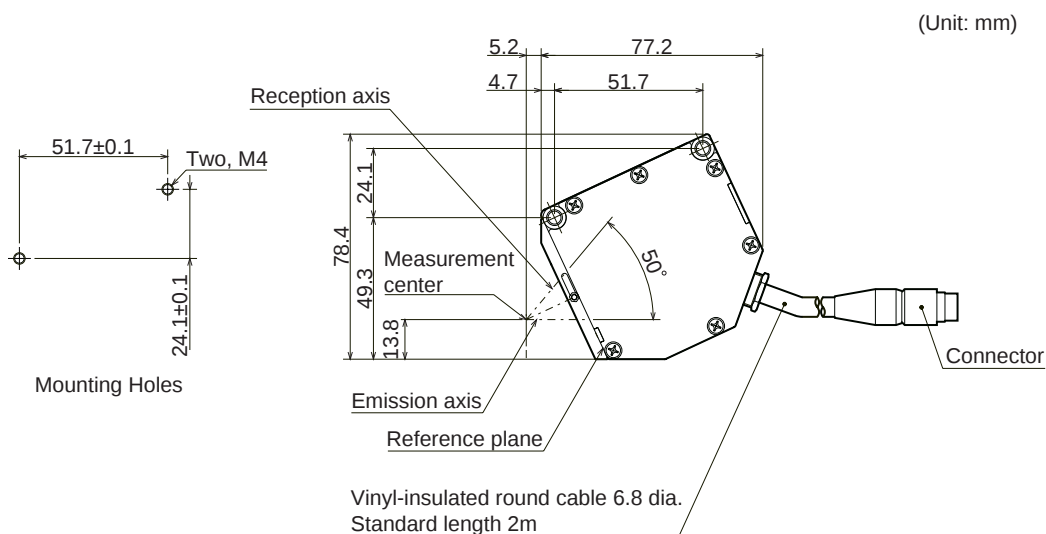
Relation between Measurement Mode and Measurement Range



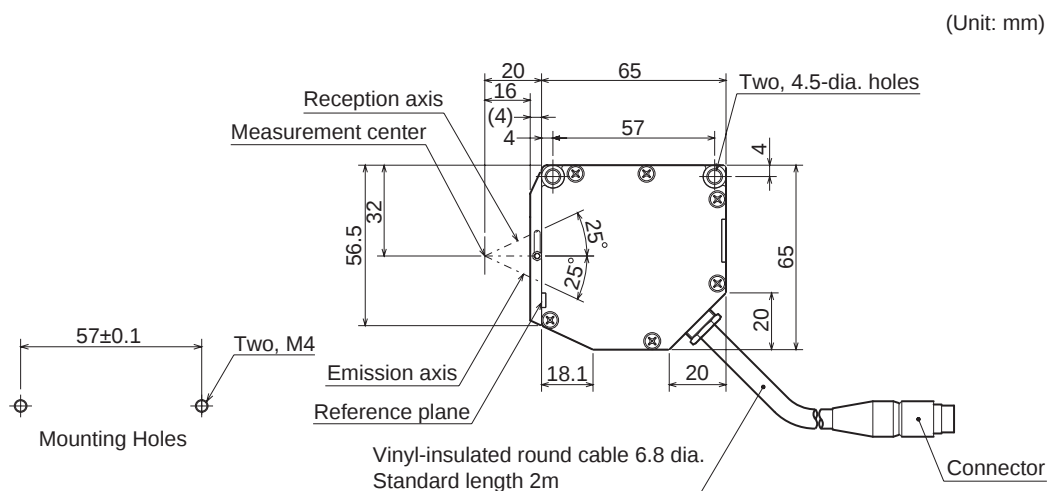
2-2-3 Mounting Dimensions

Super High-precision Model: Z500-SW2

• Dimensions for Diffuse Reflection

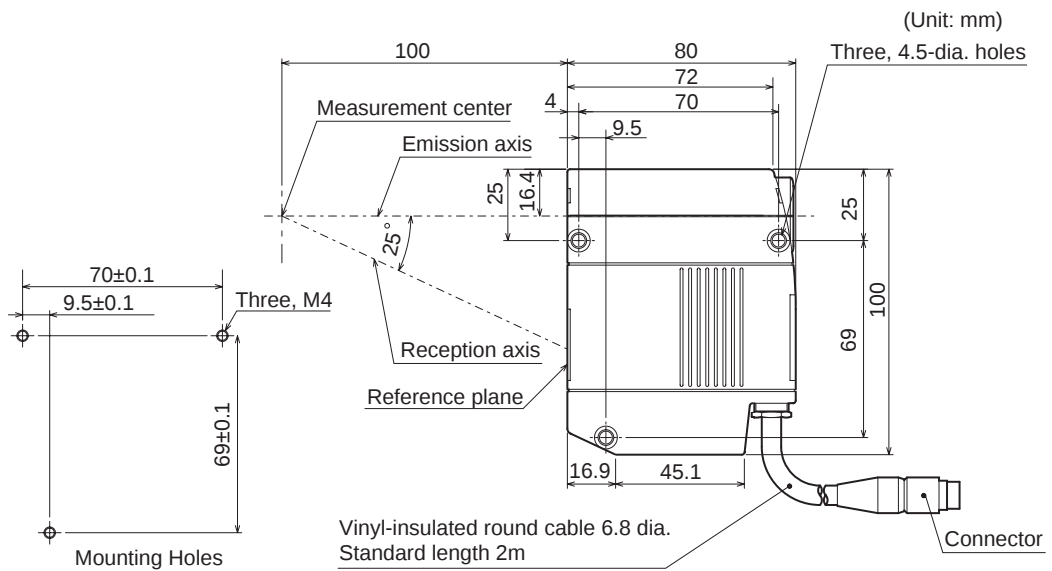


• Dimensions for Mirror Reflection

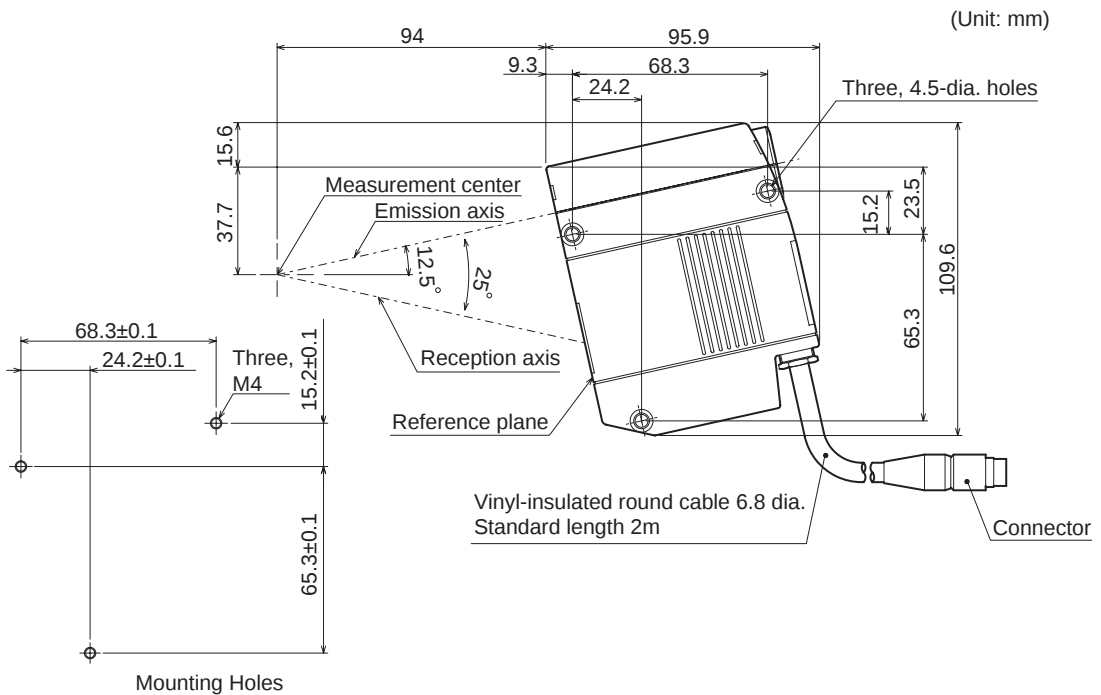


Long-range Model: Z500-SW17

• Dimensions for Diffuse Reflection



• Dimensions for Mirror Reflection



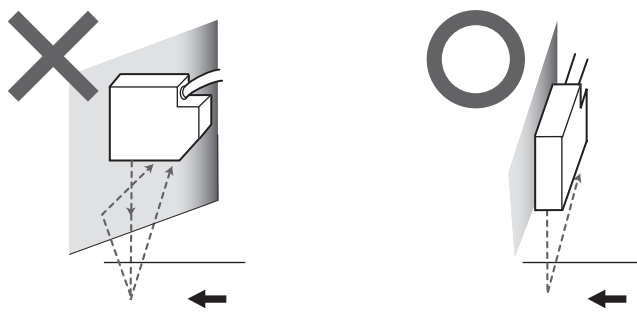
2-2-4 Mounting Orientation

Mounting Near Walls

Errors will occur if light reflected off a wall surface is received by the Sensor.

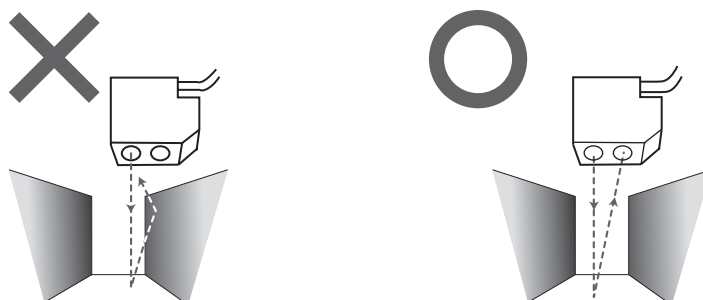
If it is not possible to mount the Sensor away from the wall, mount in the way shown below, i.e., so that the plane containing the emission axis and the reception axis is parallel to the wall surface.

Also, applying matt black coating to the wall surface will help to reduce the amount of light reflected.



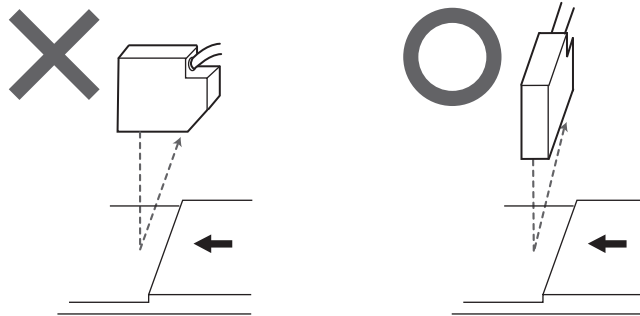
Narrow Grooves or Indentations

If measurement is performed in an indentation between two walls, or in a groove, mount the Sensor in the way shown below, i.e., so that the path along the emission and reception axes is not interrupted by a wall.



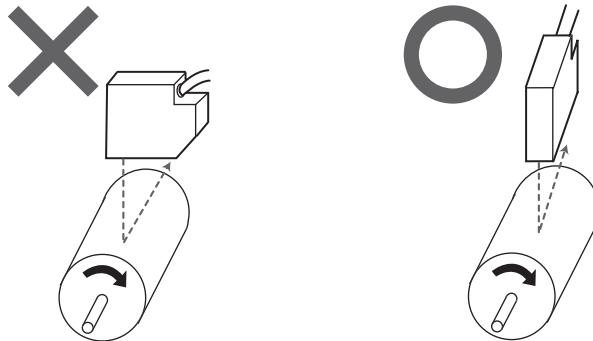
Level Differences

When measuring workpieces with level differences, the influence of the level difference can be minimized by mounting the Sensor so that the plane containing the emission axis and the reception axis is parallel to the boundary between the different levels.



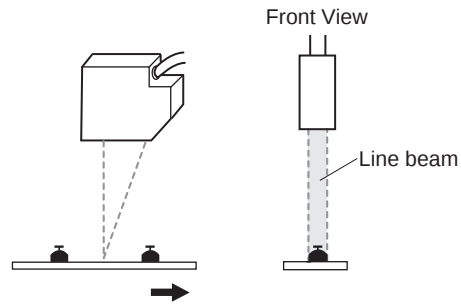
Rotating Workpieces

When measuring rotating workpieces, the influence of position displacement and blurring of the rotating workpiece can be minimized by mounting the Sensor so that the plane containing the emission axis and the reception axis is parallel to the axis of rotation.



Projections

When measuring the tops of projections on the workpieces, mount the Sensor so that the entire projection passes through the line beam.



2-2-5 Mounting Distance

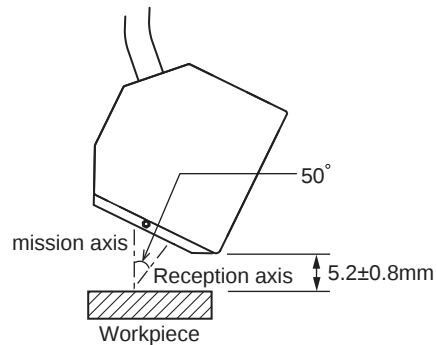
After selecting the Sensor mounting status in the menu item **Environment**, mount the Sensor in a location where the status can be measured correctly.



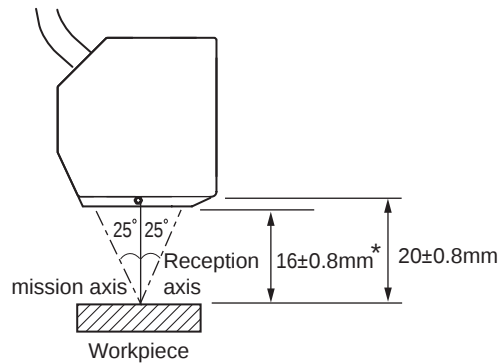
Refer to page 146 in the *Operation Manual*.

Super High-precision Model: Z500-SW2

• Dimensions for Diffuse Reflection



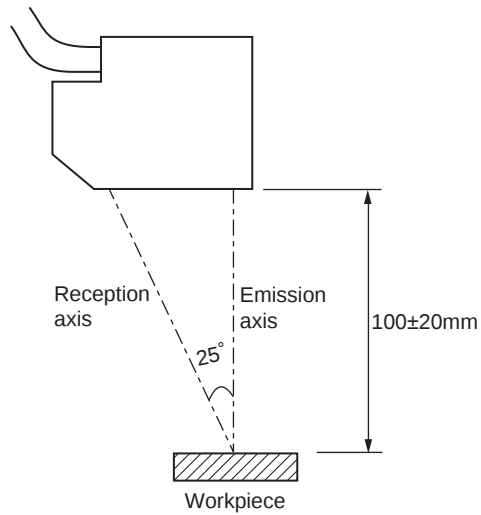
• Dimensions for Mirror Reflection



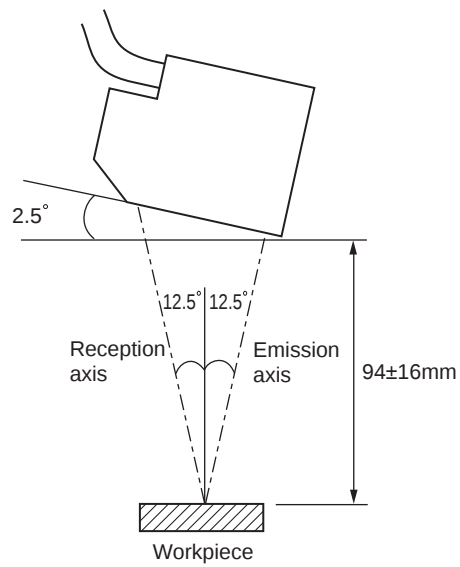
* Beam cover attached

Long-range Model: Z500-SW17

• Dimensions for Diffuse Reflection



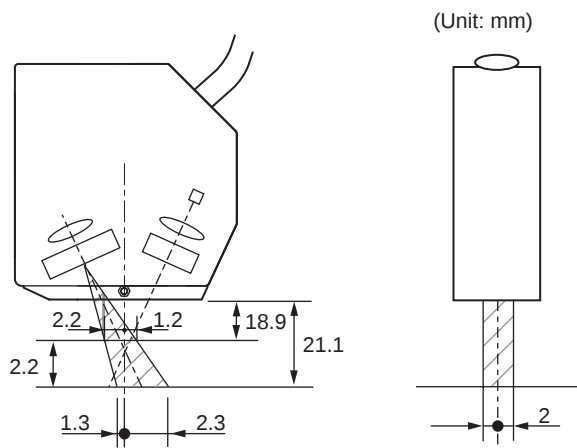
• Dimensions for Mirror Reflection



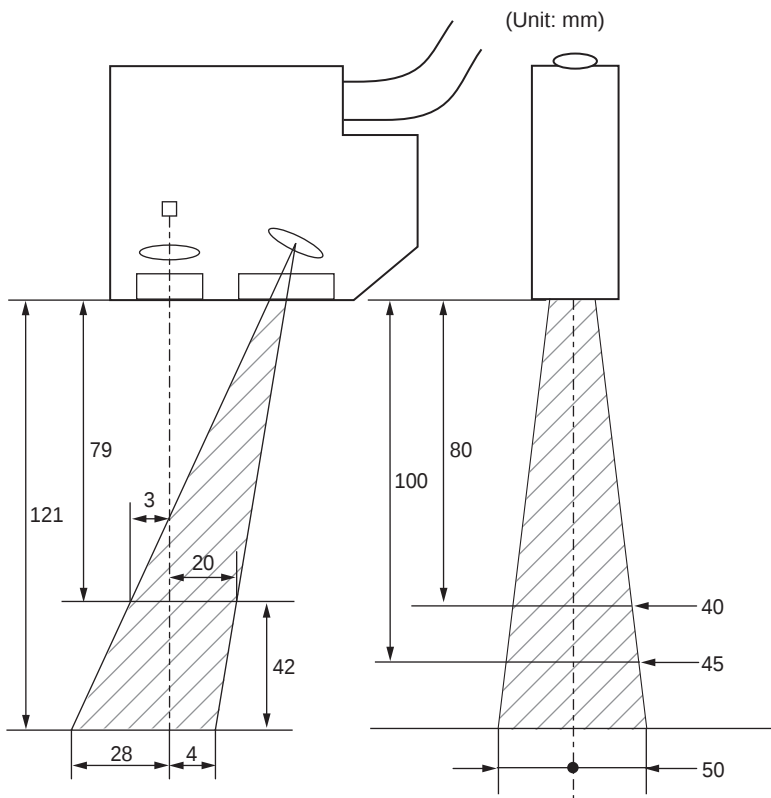
2-2-6 Mutual Interference

When using 2 or more Sensors mounted adjacently, make sure that the spots (shown below) for other Sensors are outside the shaded areas.

Super High-precision Model: Z500-SW2



Long-range Model: Z500-SW17





SECTION 3

Connecting External Devices

3-1	Terminal Block Connections	40
3-2	RS-232C Connections	44
3-3	Linear Sensor Controller Connections	46

3-1 Terminal Block Connections

This section explains how to connect I/O to the Z500 through its terminal block to input signals such as measurement commands or output signals such as measurement results.
Refer to the *Operation manual* for details on I/O formats.



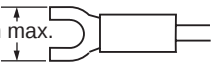
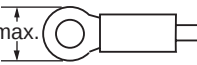
NOTICE

Re-cover the terminal blocks with the Terminal Block Protection Covers. Uncovered terminal blocks can result in electric shock.

3-1-1 Crimp Terminals and Cables

The terminal block uses M3 terminal screws.
Use appropriate crimp terminals for M3 screws as shown below. Tighten the screws to a torque of between 0.5 and 0.6 N·m.

Recommended Crimp Terminals

Type	Manufacturer	Model	Recommended wire size
Forked 	J.S.T. Mfg Co., Ltd.	V1.25-N3A	1.31 to 1.65 mm ²
Round 	J.S.T. Mfg Co., Ltd.	V1.25-MS3	

3-1-2 Internal Specifications



Use a DC power supply with countermeasures against high-voltage spikes (safe extra low-voltage circuits on the secondary side). Excessively high voltages can result in electric shock.

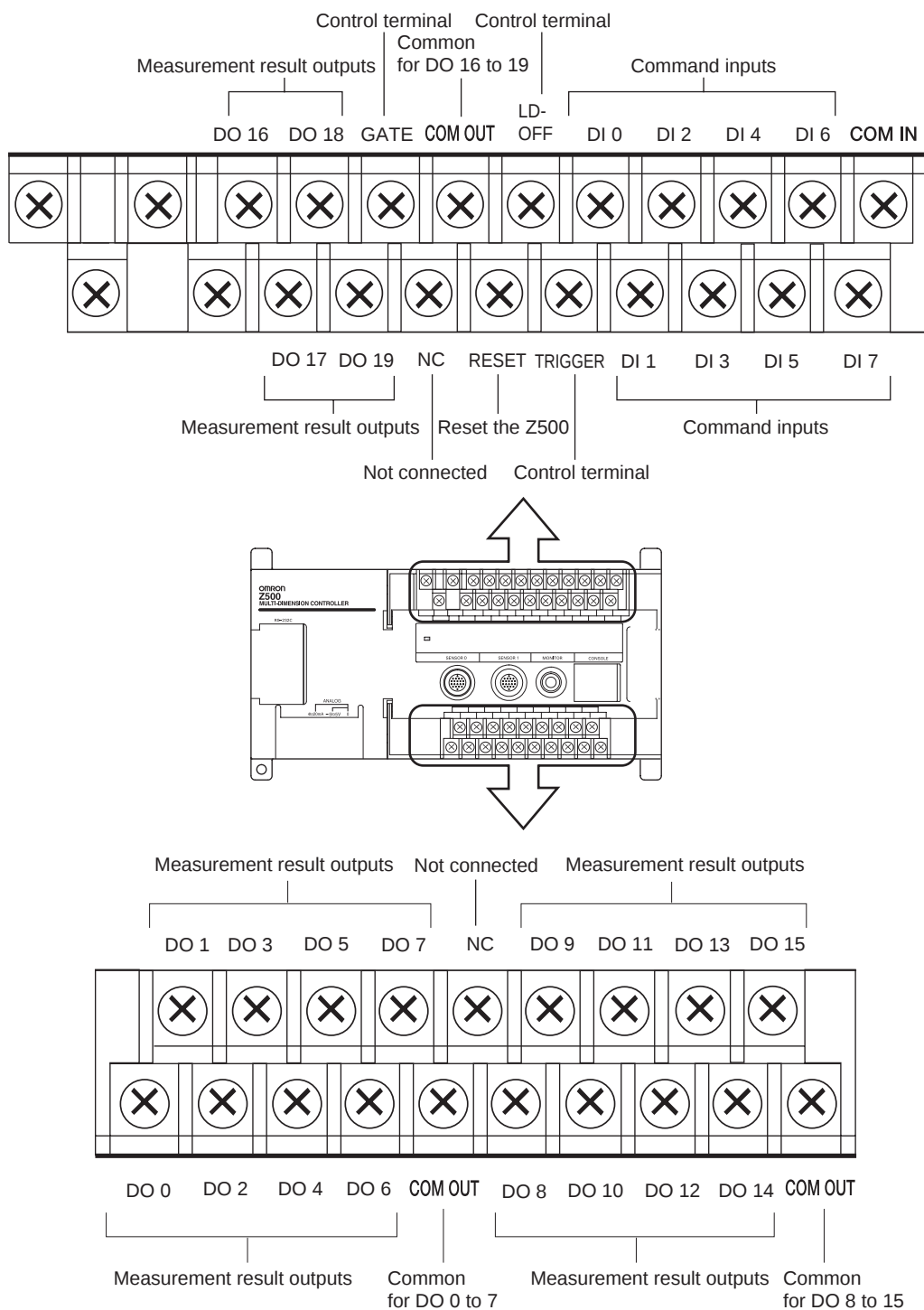
Input Specifications

Input voltage	12 to 24 VDC $\pm 10\%$
ON current	5 to 15 mA
ON voltage	8.8 V max.
OFF current	0.1 mA max.
OFF voltage	4.5 V min.
ON delay	RESET input: 10 ms max.
	Other inputs: 0.5 ms max.
OFF delay	RESET input: 15 ms max.
	Other inputs: 0.7 ms max.
Internal circuit	

Output Specifications

Output voltage	12 to 24 VDC $\pm 10\%$
Load current	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.1 mA max.
Internal circuit	

3-1-3 Terminal Names



Refer to page 152 in the *Operation Manual* for details on control terminal function.



NOTICE

- Do not reverse the connections of the signal terminals and COM terminals.
- Using the RESET Signal

Do not input the RESET input immediately after turning ON the power. When using RESET input to synchronize startup timing, wait at least 1 second after turning ON the Z500's power supply before turning ON the RESET terminal.



CHECK

The initial status of the output terminals is OFF. The terminals, however, may turn ON for approximately 0.5 seconds when the power is turned ON.
Be sure to allow for this when connecting to an external device.

3-2 RS-232C Connections

The Z500's RS-232C port can be used to connect input signals such as measurement triggers or output signals such as measurement results. Additionally, data that has been set in the Z500 can be backed up in a personal computer.

Refer to the *Operation manual* for details on communications settings and I/O formats.



NOTICE

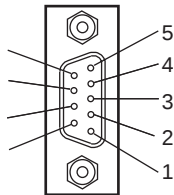
In some situations, the RS-232C terminal transmits signals whether the power supply is ON, OFF, or RESET.

Be sure to allow for this when connecting to an external device.

3-2-1 Connector

The Z500's RS-232C connector uses 9-pin D-SUB female connectors.

Pin arrangement



Pin No.	Signal	Function
1	FG (GND)	Protective frame ground
2	SD (TXD)	Send Data
3	RD (RXD)	Receive Data
4	RS (RTS)	Request to Send
5	CS (CTS)	Clear to Send
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	SG (GND)	Signal ground

Use a compatible connector.

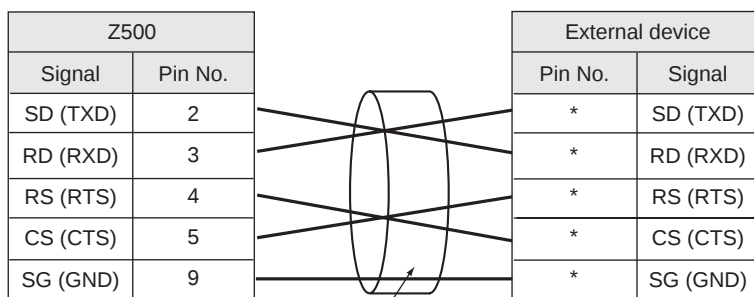
Recommended Plug and Hood

Type	Manufacturer	Model
Plug	OMRON Corp.	XM2A-0901
Hood	OMRON Corp.	XM2S-0911

Standard Wiring

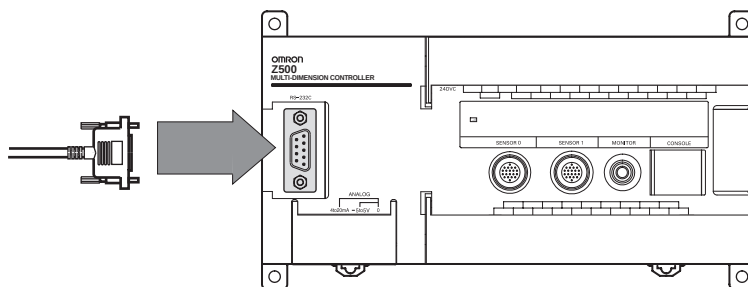
Z500		External device	
Signal	Pin No.	Pin No.	Signal
SD (TXD)	2	*	SD (TXD)
RD (RXD)	3	*	RD (RXD)
RS (RTS)	4	*	RS (RTS)
CS (CTS)	5	*	CS (CTS)
SG (GND)	9	*	SG (GND)

Wiring for RS/CS Control



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

Align the connector with the socket and press the connector straight into place. Tighten the two screws on the edges of the connector.



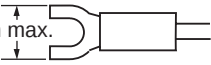
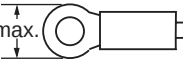
- Always turn OFF the power supply before connecting or disconnecting cables. The peripheral device may be damaged if connected or disconnected with the power supply turned ON.
- Always tighten the connector screws.

3-3 Linear Sensor Controller Connections

3-3-1 Crimp Terminals and Cables

The terminal block uses M3 terminal screws.
Use appropriate crimp terminals for M3 screws as shown below.
Tighten the screws to a torque of between 0.5 and 0.6 N·m.

Recommended Crimp Terminals

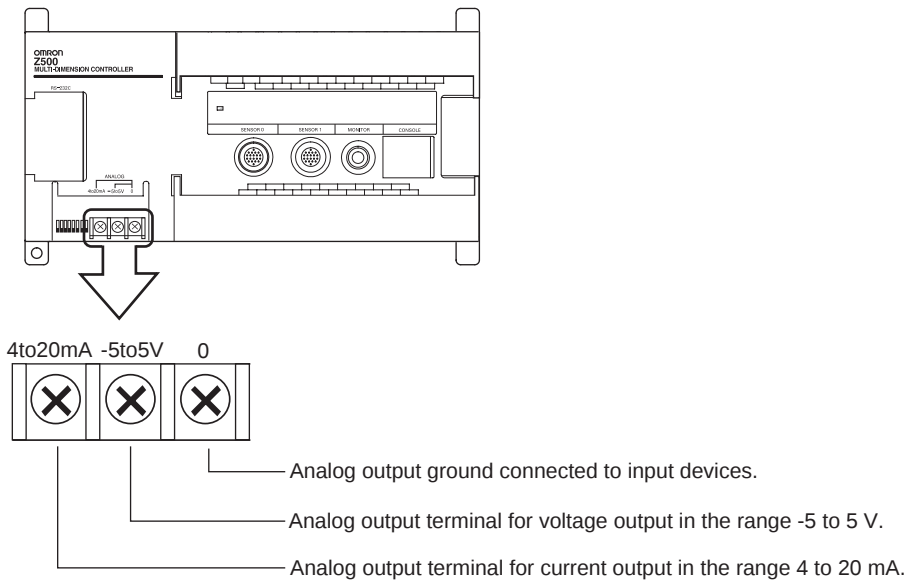
Type	Manufacturer	Model	Recommended wire size
Forked 	J.S.T. Mfg Co., Ltd.	V1.25-B3A	1.31 to 1.65 mm ²
Round 	J.S.T. Mfg Co., Ltd.	V1.25-MS3	

3-3-2 Terminal Names

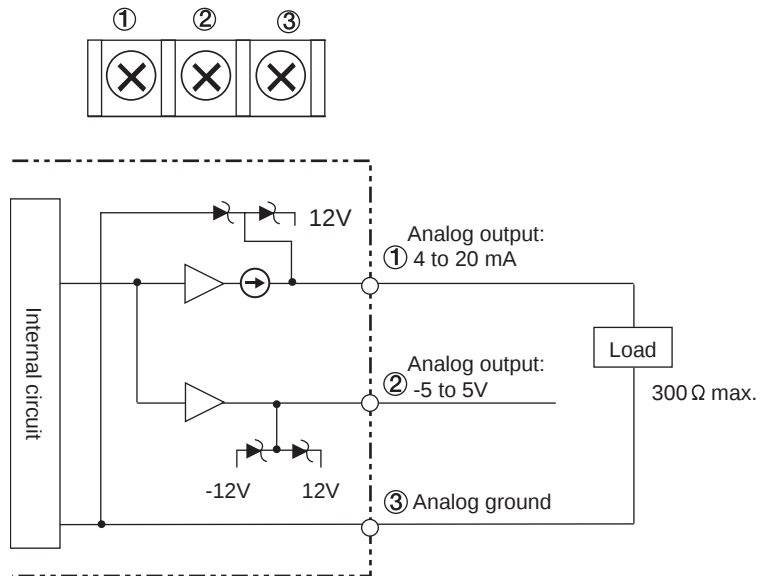


NOTICE

Re-cover the terminal blocks with the Terminal Block Protection Covers. Uncovered terminal blocks can result in electric shock.

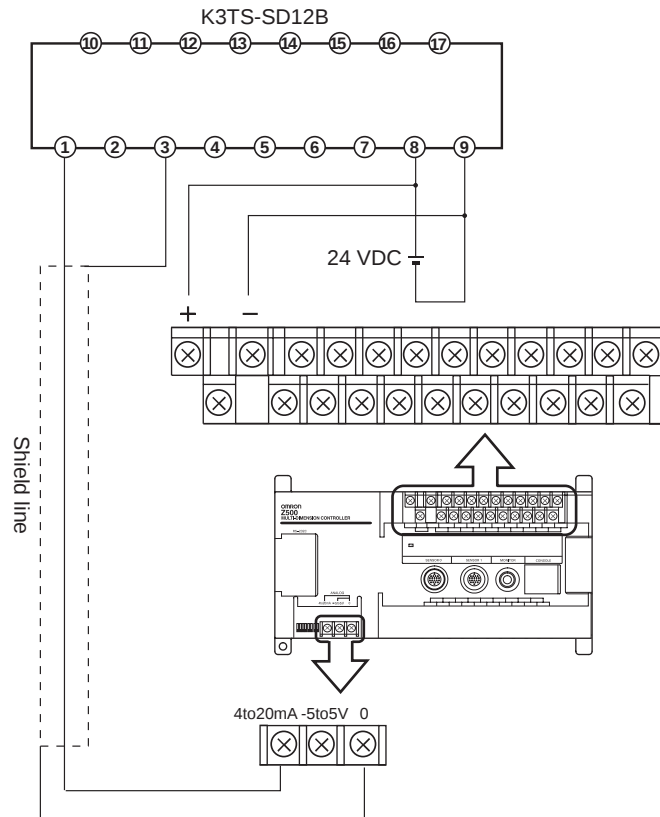


3-3-3 Internal Specifications

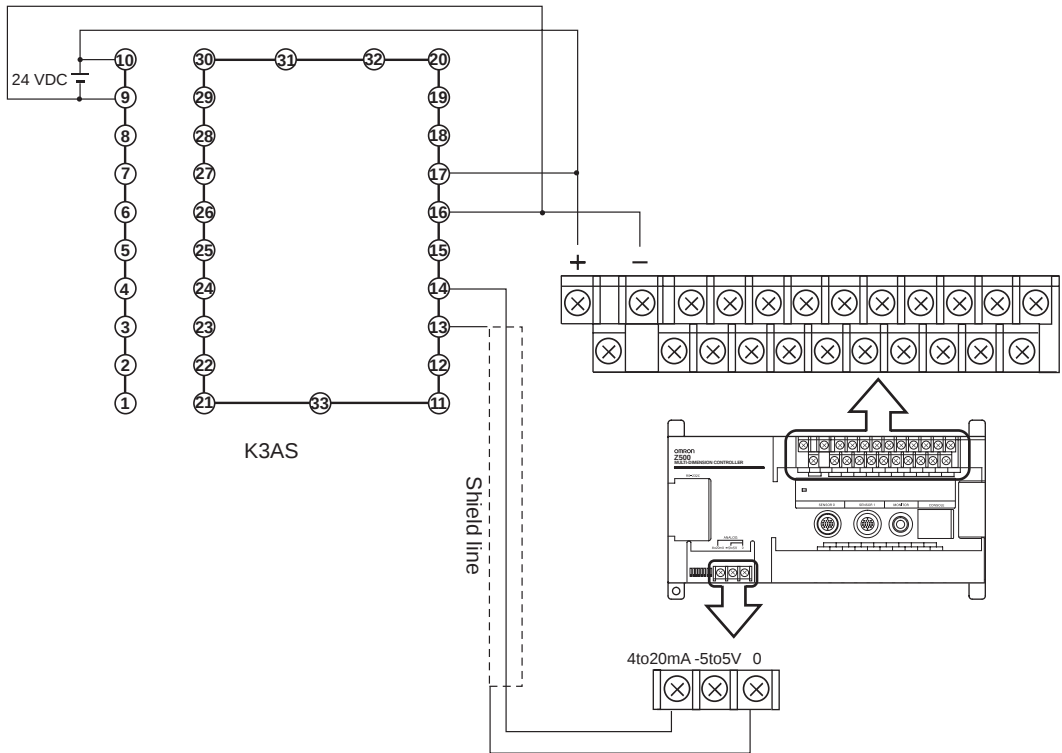


3-3-4 Connection Examples for the Linear Sensor Controller

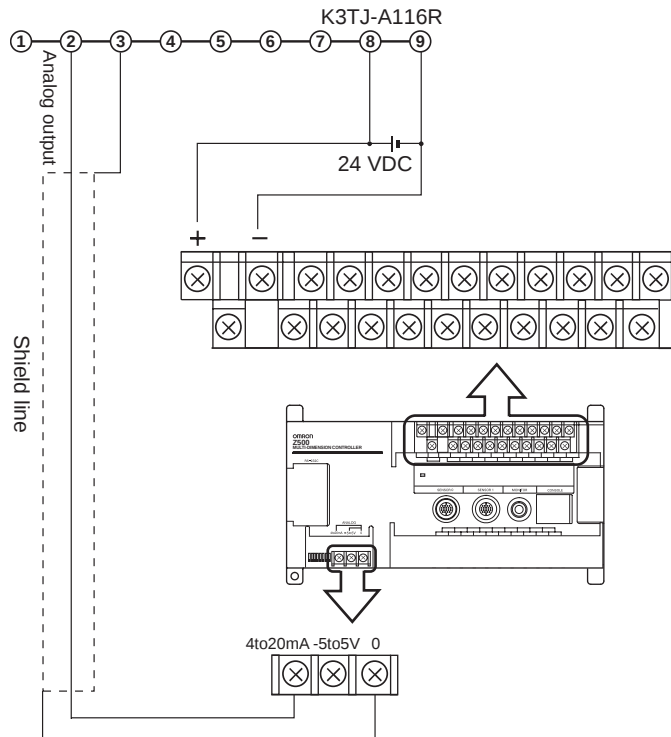
Connecting to the Linear Sensor Digital Panel Meter (K3TS)



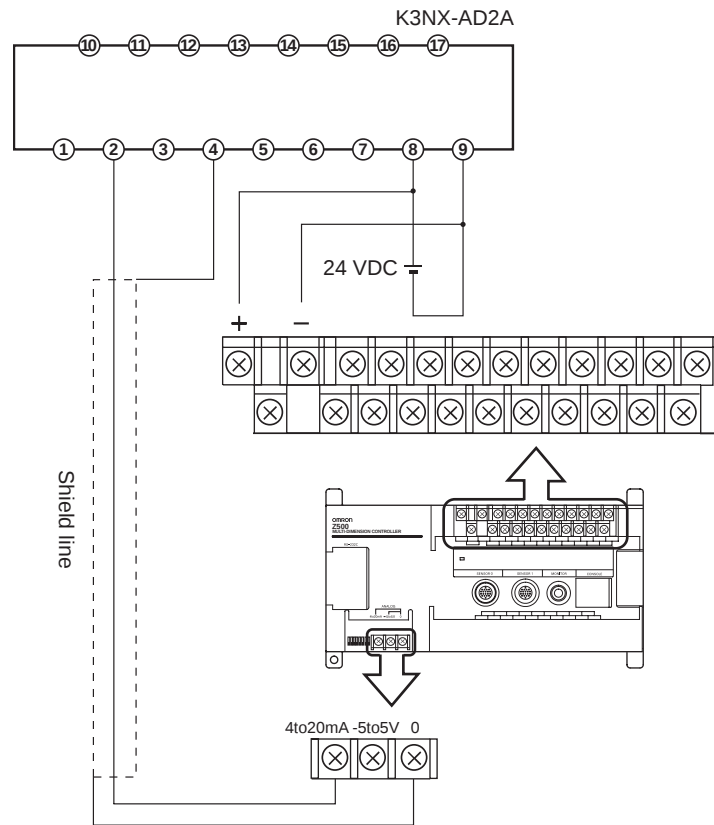
Connecting to the Linear Sensor Controller (K3AS)



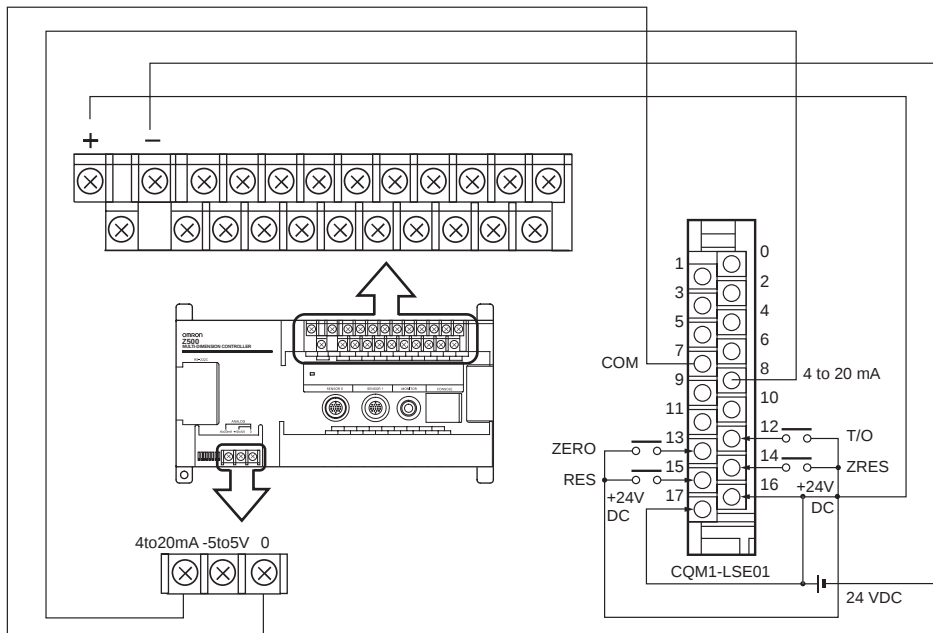
Connecting to the Scaling Meter (K3TJ)



Connecting to the Digital Panel Meter (K3NX)



Connecting to the Linear Sensor Interface Unit (CQM1-LSE)



MEMO



SECTION 4

Troubleshooting and Maintenance

4-1 Troubleshooting	52
4-2 Maintenance	54
4-3 Specifications and Dimensions	55

4-1 Troubleshooting

This section provides information on hardware errors and remedies to be taken. Refer to this section before requesting service from your OMRON representative.



Connection Errors

Problem	Probable cause	References
The Power indicator is not lit.	- The Power Supply is not connected properly. - The 24-VDC (21.6 to 26.4-VDC) supply voltage has dropped.	p.22
The Video Monitor is blank.	- The power to the Video Monitor is not ON. - The Monitor Cable is not connected properly. - The Video Monitor is malfunctioning. - When using a Liquid Crystal Monitor, the power supply capacity is insufficient.	p.19
The Video Monitor image is not clear.	- There is electric noise entering from the power supply or cables. - The Monitor Cable is not connected properly.	—
Cannot make key inputs from the console.	The Console Cable is not correctly connected.	p.19
No images are displayed.	- The Sensor cable is not connected to the Controller correctly. - There is no workpiece inside the measurement range. - The Sensor is not mounted in the correct position.	p.19 p.28



HELP

Terminal Block Errors

Problem	Probable cause	References
Trigger signals (input signals) are not received.	• The cables are not correctly wired. • The signal line is disconnected. • The Z500 is not in Run mode.	p.40
Signals cannot be output externally.	• The trigger signal has not been input. • The cables are not correctly wired. • The signal line is disconnected. • The Z500 is not in Run mode.	p.40



HELP

RS-232C Communication Errors

Problem	Probable cause	References
No communications are possible.	• The cables are not correctly wired. • The Z500's communications specifications do not match those of the external device. • The Z500 is not in Run mode.	p.44
The Unit operates well initially, but after a while there is no response from the Z500.	• The reception buffer on the external device (e.g., personal computer) is full. Check that settings allow the data to be properly received.	—

4-2 Maintenance

In order to ensure performance, carry out the maintenance procedures given below.



NOTICE

- Turn OFF the power and take safety precautions before conducting inspections. Electric shock can result from attempting safety inspections with the power turned ON.
- Do not use thinners or benzene to clean the Z500.

4-2-1 Cleaning

Optical Filter on Front Panel of Sensor

- Use a blower brush (used to clean camera lenses) to blow large dust particles from the surface. Do not blow the dust away with your mouth.
- Use a soft cloth (for lenses) with a small amount of alcohol to remove the remaining dust.



NOTICE

Do not use a scrubbing action when cleaning as scratches on the filter could result in the Sensor malfunctioning.

Cleaning of Equipment

Remove dirt on equipment by gently wiping with a soft cloth.

4-2-2 Regular Inspections

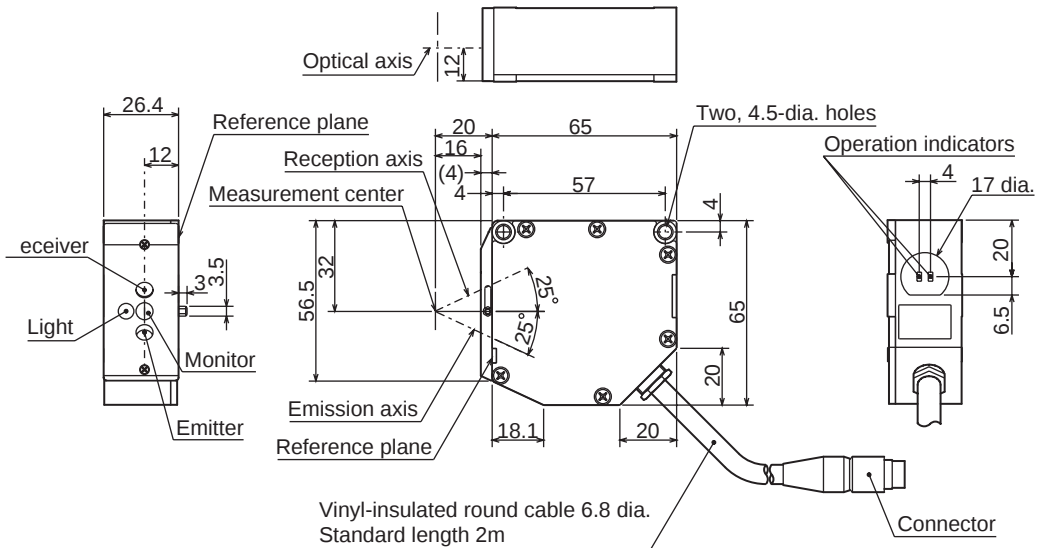
Inspection point	Details	Tools required
Power supply	The voltage measured at the power supply terminals must be 24 VDC + 10 %/ - 10 %.	Circuit tester
Ambient temperature	The operating ambient temperature inside the cabinet must be between 0 and 50 °C	Thermometer
Ambient humidity	The operating ambient humidity inside the cabinet must be between 35% and 85%.	Hygrometer
Installation	Each component must be firmly secured. Each cable connector must be correctly inserted and locked.	Phillips screwdriver

4-3 Specifications and Dimensions

4-3-1 Sensor

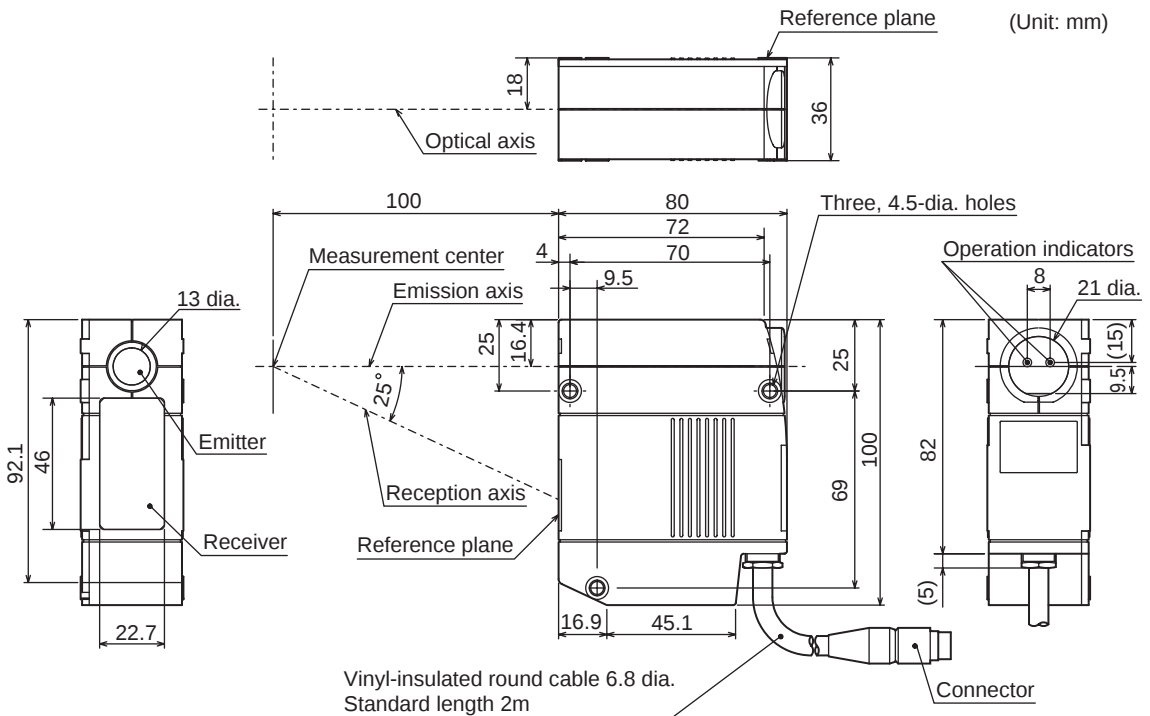
Z500-SW2 Sensor

(Unit: mm)



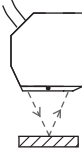
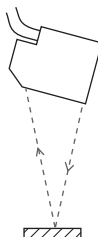
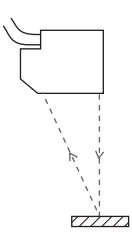
Z500-SW17 Sensor

(Unit: mm)

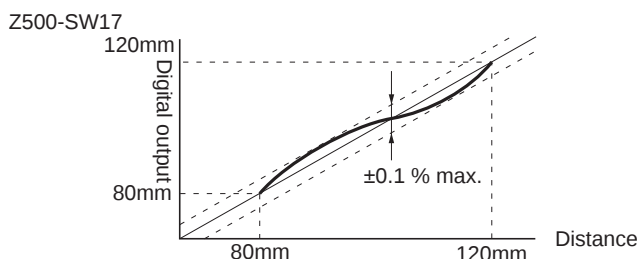


SECTION 4

Troubleshooting and Maintenance

Model		Z500-SW2 (Super High-precision Model)		Z500-SW17 (Long-range Model)	
Run Mode		Mirror reflection	Diffuse reflection	Mirror reflection	Diffuse reflection
					
Distance to measurement center		20 mm (with beam cover attached: 16 mm)	5.2 mm	94 mm	100 mm
Measurement range		±0.8 mm		±16 mm	±20 mm
Light source		Visible-light semiconductor laser (Wavelength 650 nm, 1 mW max., Class 2)		Visible-light semiconductor laser (Wavelength 658 nm, 15 mW max., Class 3B)	
Beam dimensions (See note 1.)		Reference distance: 20 μm × 4 mm TYP. (Measurement region: 2 mm)		Reference distance: 60 μm × 45 mm TYP. (Measurement region: 17 mm)	
Linearity		±0.1 %F.S. (See note 2.)	±0.1 %F.S. (See note 3.)	±0.1 %F.S. (See note 4.)	
Resolution		0.1 μm (See note 5 and 6.)		1 μm (See note 7 and 8.)	
Sampling period		9.96 ms			
LED indicators (LASER indicators)		Lit while laser is ON.			
Temperature characteristic (See note 9.)		±0.01 %F.S./°C			
Environment resistance	Degree of protection	IP64		IP66 (See note 10.)	
	Ambient operating illumination (receiver side)	Illumination at light-receiving surface: 3,000 lx max., incandescent light			
	Ambient temperature	Operating: 0 to 50 °C (with no icing or condensation) Storage: -15 to 60 °C (with no icing or condensation)			
	Ambient humidity	Operating and storage: 35 % to 85 % (with no condensation)			
	Vibration resistance	10 to 150 Hz (double amplitude: 0.35 mm) for 8 min each in X, Y, and Z directions			
Materials		Controller: Die-cast aluminum Cable sheathing: Heat-resistant chlorinated vinyl Connector: zinc alloy and brass			
Cable length		2 m			
Minimum bending radius		68 mm			
Weight		Approx. 350g		Approx. 600g	

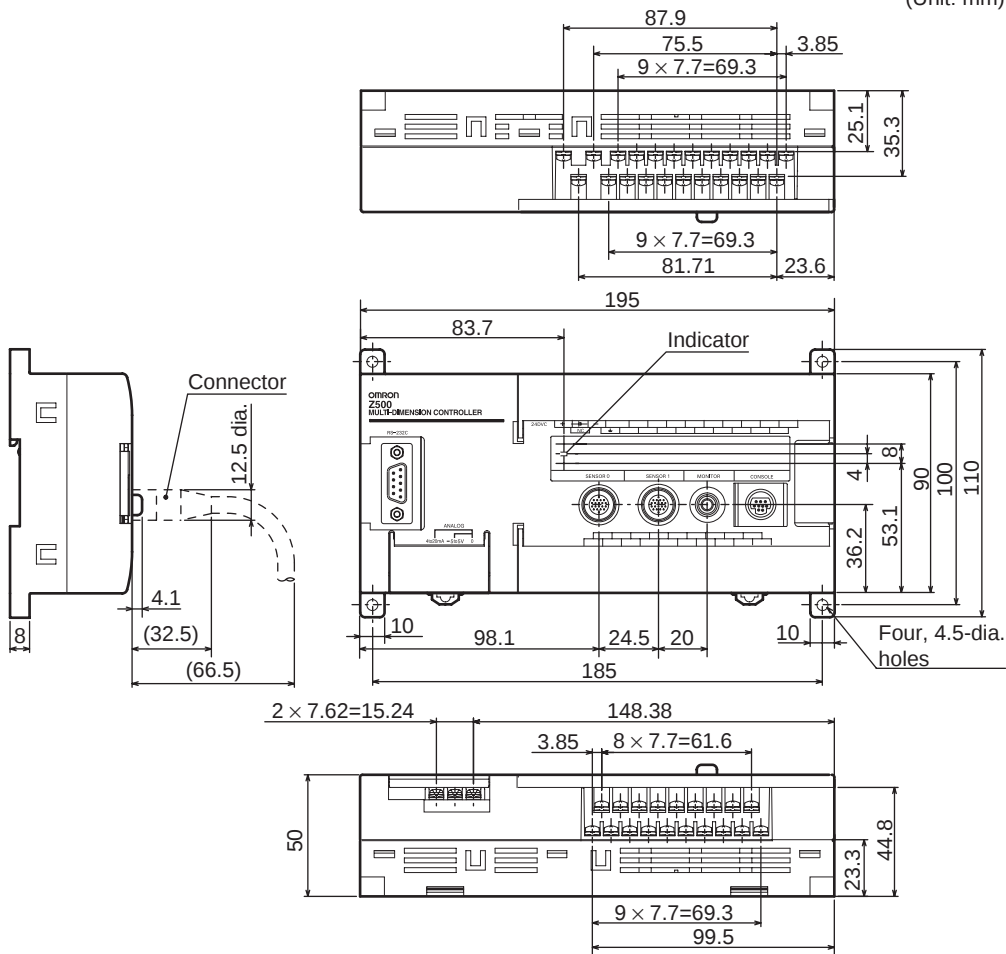
- Note 1:** Defined at $1/e^2$ (13.5%) of the density at the light center. Light may, however, be present outside this range and if the reflection factor of the light around the workpiece is high compared to the workpiece, measurement may be affected.
- Note 2:** Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard quartz glass. The linearity varies with the type of workpiece.
- Note 3:** Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard SUS blocks. The linearity varies with the type of workpiece.
- Note 4:** Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard white alumina ceramics. The linearity varies with the type of workpiece.



- Note 5:** Displacement conversion value for peak-to-peak of displacement output. These figures are for measurement of OMRON standard quartz glass (mirror reflection) or OMRON standard SUS blocks (diffuse reflection) at the measurement center. In magnetic fields, it may not be possible to maintain resolution performance characteristics.
- Note 6:** These figures are for when the Sensor is connected to the Z500-MC10, the average number of measurements is 16.
- Note 7:** Displacement conversion value for peak-to-peak of displacement output (for measurement of OMRON standard white alumina ceramic at the measurement center). In strong magnetic fields, it may not be possible to maintain resolution performance characteristics.
- Note 8:** With the Z500-MC10, at an average number of measurements of 64.
- Note 9:** Value for measurement with the space between the Sensor and the workpiece (white alumina ceramic) secured with an aluminum jig.
- Note 10:** Enquire separately about products conforming to IP67.

Z500-MC10 Controller

(Unit: mm)



Item		Specification
General specifications	Supply voltage	21.6 to 26.4 VDC
	Current consumption	1A max. (with 2 Sensors connected)
	Insulation resistance	20 MΩ min. between all DC external terminals and GR terminal (100 VDC Megger, with internal surge absorber removed)
	Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)
	Leakage current	10 mA max.
	Noise resistance	1,500 Vp-p; Pulse width: 0.1 μs/1 μs; Rising edge: 1-ns pulse
	Vibration resistance	10 to 150 Hz (double amplitude: 0.1 mm) for 8 min each in X, Y, and Z directions
	Shock resistance	200m/s ² , 3 times each in 6 directions

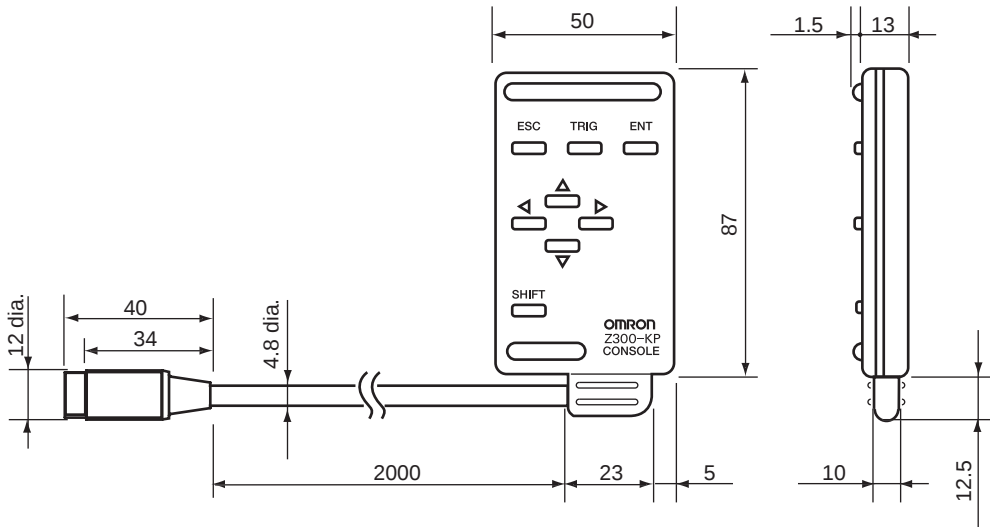
Item		Specification
General specifications	Ambient temperature	Operating: 0 to 50 °C (with no icing or condensation) Storage: -15 to 60 °C (with no icing or condensation)
	Ambient humidity	Operating and storage: 35 % to 85 % (with no condensation)
	Ambient environment	No corrosive gases
	Ground	Ground the Z500's ground terminal to less than 100 Ω
	Degree of protection	IEC60529 IP20 (in-panel)
	Case material	Controller: ABS
Performance specifications	Number of Sensors that can be mounted	2
	Number of scenes	16
	Average	Average number of times (9 stages, 1 to 256 times)
	Light intensity tracking function	Automatic (The light intensity tracking range can be specified.) Fixed (Select from 31 stages.) Multiple (The light intensity range can be specified.)
	Measurement item	Select from the following 8 types: Height, Step: 2 pts, Step: 3 pts, Edge position, Width, Edge center, Peak/Bottom, Define
	Region specification	Region specification of line beam and displacement direction is possible.
	Hold functions	Sampling, peak, bottom, peak-to-peak, and average
	Measurement data	8 outputs max. per scene
	Equations	Equations are performed with respect to the measurement results. Four-rule equation: +, -, ×, ÷, plus () Functional equation: ABS (), MAX (), MIN (), AVE ()
	Results output	- Judgement output A (HIGH, PASS, LOW, ERROR) - RS-232C output - Terminal block output (Number of simultaneous outputs: 4) - Judgement output B (OK, NG) - Terminal block output (Number of simultaneous outputs: 8) - Measurement value output (measurement value) - RS-232C output - Analog output
	Terminal block	11 input points: <u>TRIGGER</u> , <u>LD-OFF</u> , <u>RESET</u> , and <u>DI0</u> to <u>DI7</u> 21 output points: <u>DO0</u> to <u>DO19</u> and <u>GATE</u>
	Monitor interface	1 channel (for pin jack or overscan monitor)
	Analog output resolution	The full scale for output can be divided into a maximum of 40,000 gradations. Resolution (See note.) 0.25 mV (± 5V) 0.4 μA (4 to 20 μA)
	Weight	Approx. 700g (Controller only)

Note: For measurement at an average number of times of 64 with an OMRON K3AS Linear Sensor Controller connected.

4-3-3 Console

Z300-KP Console

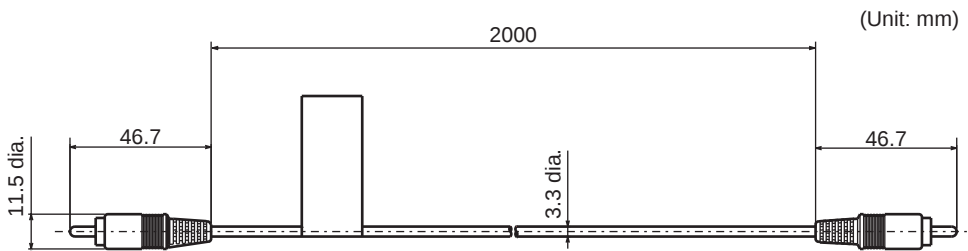
(Unit: mm)



Item		Specification
General specifications	Vibration resistance	10 to 150 Hz; single-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
	Shock resistance	196 m/s ² ; 3 times each in 6 directions
	Ambient temperature	Operating: 0 to +50 °C (with no icing or condensation) Storage: -25 to +65 °C (with no icing or condensation)
	Ambient humidity	Operating and storage: 35 % to 85 % (with no condensation)
	Ambient environment	No corrosive gases
	Degree of protection	IEC60529 IP20 (in-panel)
	Minimum bending radius	75 mm
	Materials	Console: ABS Cable sheathing: Heat-resistant chlorinated vinyl Connector: PC and PBT
Weight		Approx. 135g

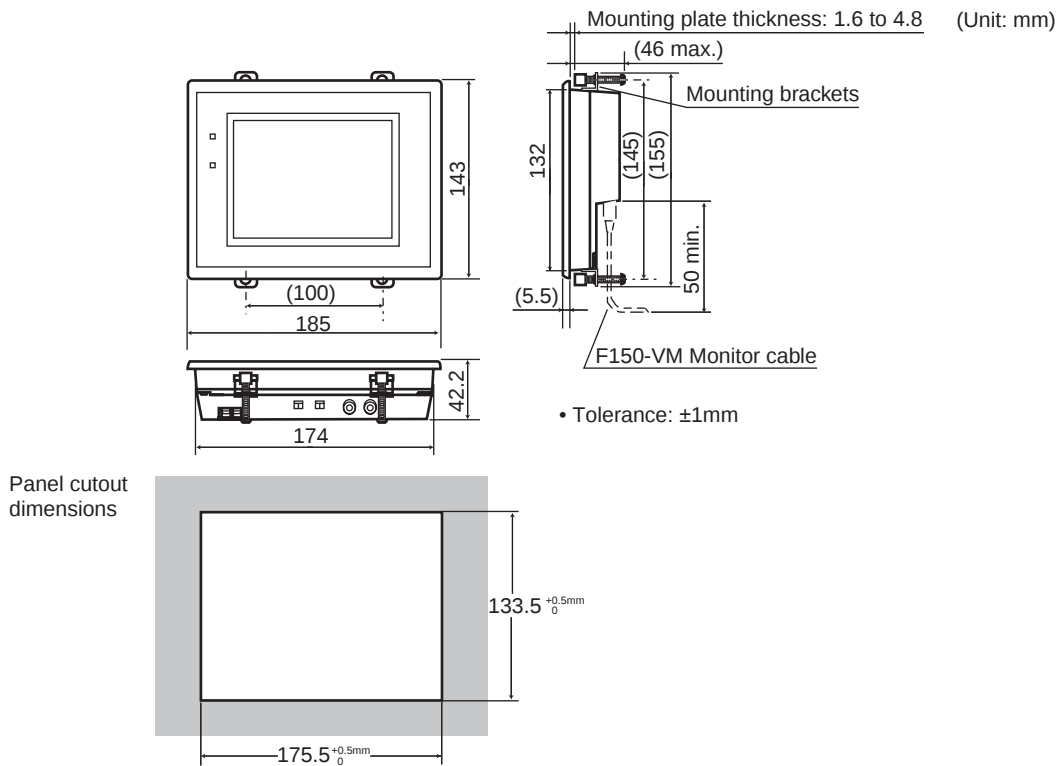
4-3-4 Monitor Cable

F150-VM Monitor Cable



Item		Specification
General specifications	Vibration resistance	10 to 150 Hz; single-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
	Shock resistance	196 m/s ² ; 3 times each in 6 directions
	Ambient temperature	Operating: 0 to +50 °C (with no icing or condensation) Storage: -25 to +65 °C (with no icing or condensation)
	Ambient humidity	Operating and storage: 35 % to 85 % (with no condensation)
	Ambient environment	No corrosive gases
	Materials	Cable sheathing: Super heat-resistant chlorinated vinyl Connector: PVC
	Minimum bending radius	50 mm
Weight		Approx. 40g
Accessories		BNC Jack Adapter

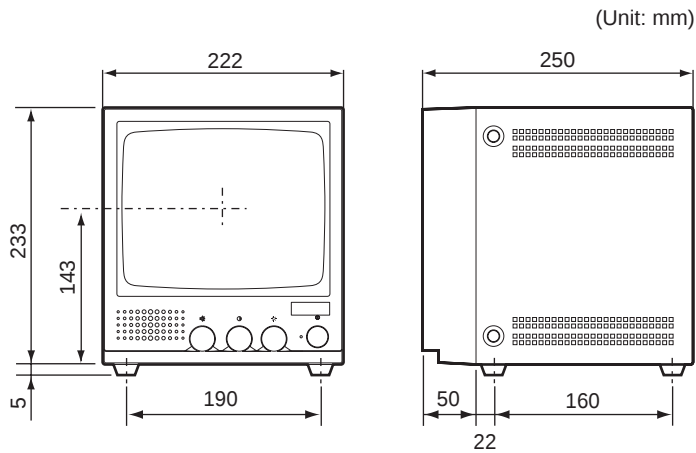
4-3-5 Color Liquid Crystal Monitor

F150-M05L Color Liquid Crystal Monitor

Item		Specification
General specifications	Supply voltage	20.4 to 26.4 VDC
	Current consumption	700 mA max.
	Vibration resistance	10 to 150 Hz; single-amplitude: 0.1 mm; maximum acceleration: 15 m/s ² , 10 times for 8 minutes each in 3 directions
	Shock resistance	150 m/s ² , 3 times each in 6 directions
	Ambient temperature	Operating: 0 to +50 °C (with no icing or condensation) Storage: -25 to +65 °C (with no icing or condensation)
	Ambient humidity	Operating and storage: 35 % to 85 % (with no condensation)
	Ambient environment	No corrosive gases
	Degree of protection	IEC60529 IP20
	Materials	Case: ABS/PC Display surface: PMMA (Acrylic)
	Panel size	5.5 inches (111.36 × 83.52 mm (H × V))
Performance specifications	Panel type	TFT color liquid crystal
	Resolution	320 × 240 dots
	Image pitch	0.348 (H) × 0.348 (V) mm
	Contrast	85:1 (typical)
	Viewable angle	25° up/down and 50° left/right (with a contrast ratio > 10)
	Luminance	250 cd/m ² (typical)
	Backlight	Cold cathode fluorescent light
	Response speed	60 ms max.
	Input signal	NTSC composite video (1.0 V/75 Ω termination)
Weight		Approx. 1 kg
Accessories		4 mounting brackets

4-3-6 Video Monitor

F150-M09 Video Monitor



Item		Specification
General specifications	Supply voltage	85 to 264 VAC, 50/60 Hz
	Power consumption	20 W max.
	Vibration resistance	5 to 100 Hz; 0.16-mm double-amplitude or acceleration of 7.35 m/s ² (whichever is smaller), 6 times for 10 minutes each in 3 directions
	Ambient temperature	Operating: -10 to +50 °C (with no icing or condensation) Storage: -20 to +65 °C (with no icing or condensation)
	Ambient humidity	Operating and storage: 10 % to 90 % (with no condensation)
	Ambient environment	No corrosive gases
	Materials	Front: ABS plastic Metal part: SECC (galvanized steel sheet)
Performance specifications	CRT size	9 inch (164 × 123 mm (H × V))
	CRT type	Monochrome CRT
	Resolution	800 TV lines min. (at center)
	System	Number of scanning lines: 600 Horizontal frequency: 15.75 kHz Field frequency: 60 Hz
	I/O impedance	75 Ω, high impedance (selectable)
	I/O level and polarity	Composite image signal: 1 V (peak to peak) Image: 0.7 V (peak to peak), positive Synchronization: 0.3 V (peak to peak), negative
	Input signal	NTSC composite video (1.0 V/75 Ω termination)
Weight		Approx. 4.5 kg

Revision History

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

at. No. Z158-E1-1



Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	February 2002	Original production

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