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Find the *OMRON Z4M-W100RA* at our website: ***Click HERE***

OMRON

Laser Displacement Sensor

Z4M

Infrared Class IIIb Laser Displacement Sensor Provides High Speed, Precision Distance Measurement, Quick Setup and Flexible Operation

- FDA Class IIIb IEC Class 3 infrared laser for use with Z49-SF2 Laser Safety Kit
- 1.5 micron resolution maximum
- −4 to +4 VDC analog output
- Automatic sensitivity setting
- Far and near range indicators on amplifier
- Stability indicator on sensor
- 3 selectable response times
- Up to 140-mm sensing distance



Ordering Information

■ SENSOR

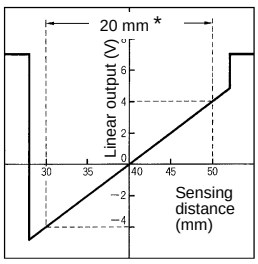
Sensing distance ± measurement range	Resolution (at response time)	**Part number**
40 ± 10 mm (1.57 ± 0.40 in)	1.5 μm (60 ms)	**Z4M-W40**
	10 μm (2 ms)	
	40 μm (0.15 ms)	
100 ± 40 mm (3.93 ± 1.57 in)	8 μm (500 ms)	**Z4M-W100**
	30 μm (20 ms)	
	150 μm (0.7 ms)	

■ ACCESSORIES (ORDER SEPARATELY)

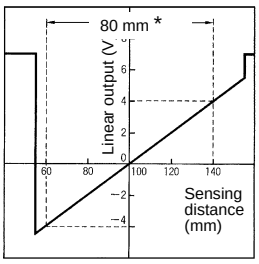
Description		**Part number**
Extension cable	3 m (9.84 ft)	**Z49-C1 3M**
	8 m (26.25 ft)	**Z49-C1 8M**
Laser safety kit	—	**Z49-SF2**

■ LINEAR OUTPUT VS. SENSING DISTANCE

Z4M-W40



Z4M-W100



Conditions When Linear Output Of the Sensor Is Locked Between 6 and 8 V:

- On startup, for 3 to 10 seconds after the sensor is turned on. (No laser emission on startup for safety reasons.)
- When the target is outside the measurement range.
- When the enable output is OFF.

* Indicates the measurement range

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Specifications

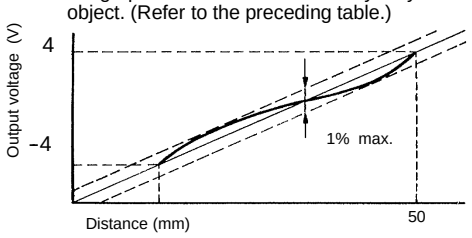
■ RATINGS

Part Number	Z4M-W40	Z4M-W100
Measurement range	±10 mm	±40 mm
Measurement point	40 mm	100 mm
Offset adjustment range	±10 mm	±40 mm
Span adjustment range	0.4 V/mm ±30%	0.1 V/mm ±30%
Light source	Infrared semiconductor laser with a wavelength of 780 nm and an output of 3 mW max., class 3B (IEC), class IIIb (FDA),	
Spot diameter	1 mm dia. max. (at measurement point)	1 x 2 mm max. (at measurement point)
	The spot diameter is defined by $1/e^2$ (13.5%) of the sensor's laser beam center. There is light leakage outside the defined spot, and the environment of the object may influence sensing accuracy. Reduce the influence of the environment as much as possible.	
Resolution at selected response speed	1.5 μm (60 ms), 10 μm (2 ms), 40 μm (0.15 ms)	8 μm (500 ms), 30 μm (20 ms), 150 μm (0.7 ms)
	The resolution is the peak-to-peak displacement conversion value of the analog output (Condition: white alumina ceramic at the measurement point.)	
Linearity (See Note 2.)	1% FS (See Note 1.)	1.5% FS (See Note 1.)
Response time (See Note 3.)	0.15 ms/2 ms/60 ms switch-selectable	0.7 ms/20 ms/500 ms switch-selectable
Sensitivity selector	WHITE/BLACK/AUTO switch-selectable	
Temperature characteristics (at measurement point)	Sensor: 0.03% FS/°C Amplifier: 0.03% FS/°C	Sensor: 0.02% FS/°C Amplifier: 0.03% FS/°C
Range indicators	Outside range, abnormal volume of light: NEAR indicator and FAR indicator blink. Near: NEAR indicator is lit. Measurement point: NEAR indicator and FAR indicator are lit. Far: FAR indicator is lit. **Note:** The range indicators, located on the sensor and amplifier, are also used as laser warning lights (green).	
Stability indicator (amplifier)	Stable operating range: Green Possible operating range: Not lit Insufficient or excessive light: Red	
Linear output	-4 to 4 V/30 to 50 mm Output impedance: 100 Ω	-4 to 4 V/60 to 140 mm Output impedance: 100 Ω
	It is possible to adjust the linear output of the Sensor to between -5 and 5 V with span adjustment.	
Enable output	NPN open collector, 50 mA max. at 40 VDC; residual voltage: 1 V max.	
Laser emission ON input	Short-circuited with the 0-V terminal (residual voltage: 2 V max.): Laser emission is turned OFF. Open (current leakage: 0.1 mA max.): Laser emission is turned ON. Linear output, indicators, and enable output holding function are incorporated.	

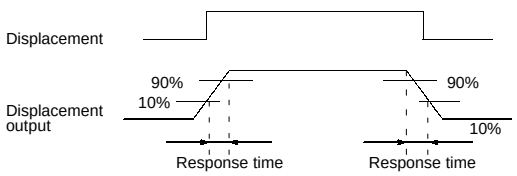
Note: 1. The **FS (Full Scale) value** (listed in the preceding table) is calculated as follows:
Example: 1% FS on the Z4M-W40
Distance full scale conversion: 20 mm x 0.01 = 0.2 mm
Voltage full scale conversion: 8 V x 0.01 = 80 mV

Part Number	Z4M-W40	Z4M-W100
Distance full scale	20 mm	80 mm
Voltage full scale (The value changes according to the span to be adjusted.)	8 V ±30%	8 V ±30%

2. The **linearity of the sensor** is checked with a white alumina ceramic object. The peak-to-peak value deviated from the displacement linear output voltage is within the specified range as shown in the graph. The deviation value may vary with the object. (Refer to the preceding table.)



3. The **response speed of the sensor** is the time required for the analog displacement output to increase from 10% to 90% of the full value (at the rise time) or decrease from 90% to 10% of the full value (at the fall time). To decrease the error ratio to within 1% at the rise time, the time required will be two or three times as long as the specified value. (Refer to the preceding table.)



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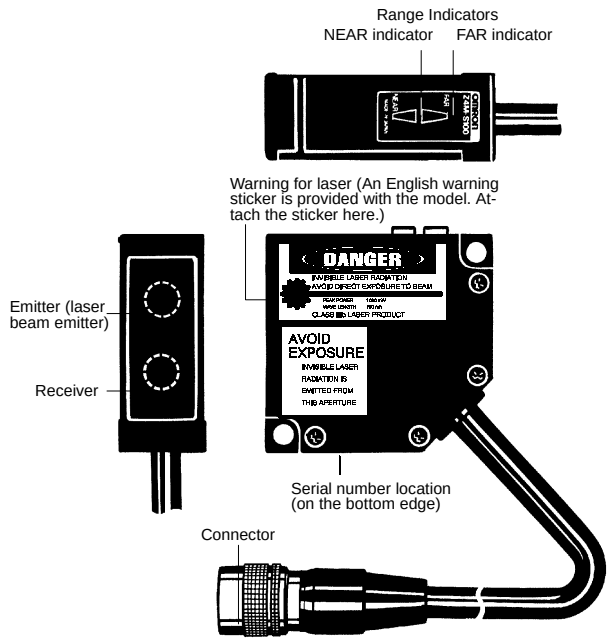
■ CHARACTERISTICS

Item	Z4M-W40	Z4M-W100
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.	
Current consumption	120 mA max.	
Dielectric strength	Sensor: 1,000 VAC, 50/60 Hz for 1 min. Amplifier: 300 VAC, 50/60 Hz for 1 min.	
Vibration resistance	Destruction: 10 to 55 Hz (1.5-mm double amplitude) for 32 minutes each in X, Y, and Z directions	
Shock resistance	Destruction: 300 m/s^2, 30G for 3 times each in ±X, Y, and Z directions	
Ambient temperature	Operating: 0° to 50°C (32° to 122°F) with no icing	
Ambient humidity	Operating: 35% to 85% (with no condensation)	
Ambient illumination	Operating: 3,000 lux max. (incandescent lamp)	
Weight	Sensor: Approx. 180 g (6.35 oz.) with 2-m cable Amplifier: Approx. 200 g (7.05 oz.) without cable	
Material	Sensor: Aluminum diecast Amplifier: ABS	
Enclosure rating	IP40	
Accessories supplied	Flat-blade screwdriver for sensor adjustment, FDA Caution Label	

Nomenclature

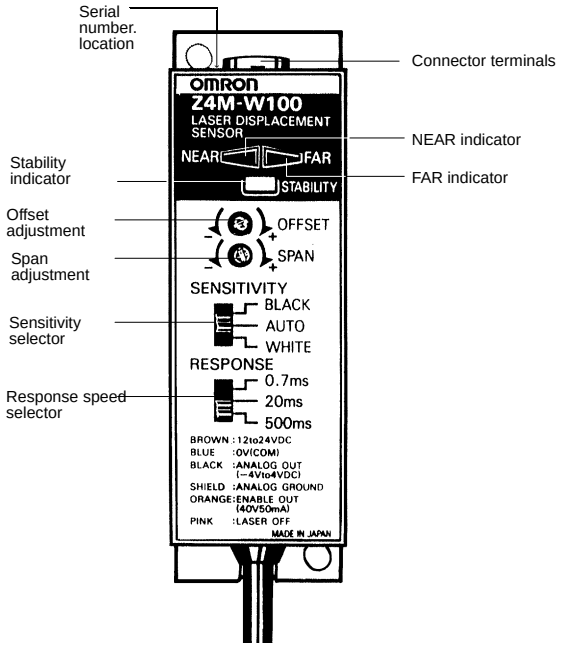
■ SENSOR

Z4M-S40 (for Z4M-W40)
Z4M-S100 (for Z4M-W100)



■ AMPLIFIER

Z4M-W40 (for Z4M-W40)
Z4M-W100(for Z4M-W100)

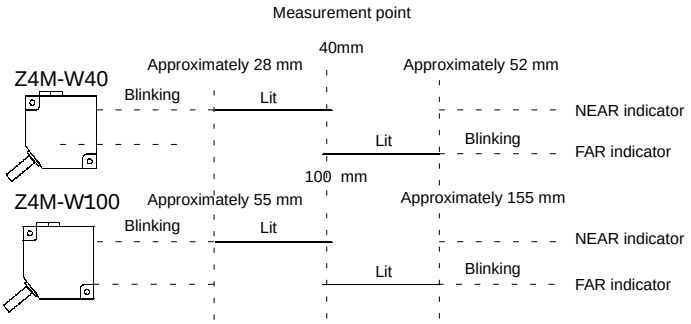


COMPATIBILITY NOTICE
The Z4M Laser Displacement Sensor and Amplifier are adjusted as a set, and they have the same Serial No. Neither (sensor or amplifier) can be used with another Amplifier or Sensor having a different Serial No.

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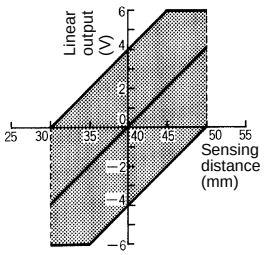
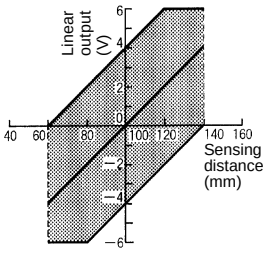
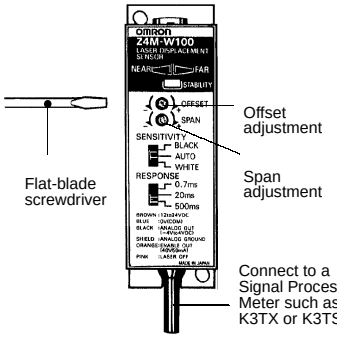
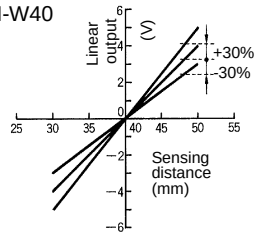
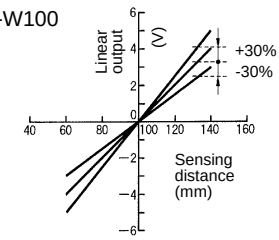
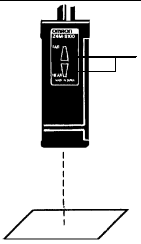
Operation

■ FUNCTIONS

	Classification	Functions
OUTPUT	**Linear Output (Amplifier)**	An analog voltage signal based on measuring distance will be output from the output line (black shield wire). Voltage output: -4 to 4 V/30 to 50 mm (Z4M-W40), -4 to 4 V/60 to 140 mm (Z4M-W100) Output impedance: 100 Ω (typical). The linear output will be locked between 6 and 8 V when the enable output is OFF.
	Enable Output (Amplifier)	The enable output is ON when the sensor is performing a displacement measuring operation. The enable output is OFF when there is no object in front of the sensor or if the light reflected from the object is insufficient or too intense. An open collector output of 50 mA at 40 VDC maximum can be obtained. When measuring a metal or glossy object, the enable output may be ON even if the object is outside the measurement range.
INPUT	**Laser OFF Input (Amplifier)**	The laser-OFF input controls laser emission. Laser emission is turned ON when there is no laser-OFF input (with a current leakage of 0.1 mA max.) and it is turned OFF when the laser-OFF input is short-circuited to the 0-V terminal (with a residual voltage of 2 V max.). When laser emission is turned OFF, the linear output, indicators, and the enable output of the sensor are *on hold*. There will be a drift of 0.1% FS/s when the analog output of the sensor is *on hold*. The response time required to turn laser emission ON or OFF is 3 ms max.
INDICATORS	**Range Indicators — NEAR and FAR (Sensor and Amplifier).** These indicators are also used as laser warning lights.	The FAR green indicator and NEAR green indicator will be lit when the target is within the measurement range of the Sensor. When the target is outside the measurement range or in the case of insufficient or excessive light, both the NEAR and FAR indicators will blink. If the target is near the sensor but within the measurement range, only the NEAR indicator will blink. Mount the sensor so that both the NEAR indicator and FAR indicator will be lit when the target is in front of the sensor. To alert the user that the laser beam is turned ON when the laser-OFF input is turned OFF, the NEAR indicator and FAR indicator act as laser warning lights. When the sensor is turned ON, either the NEAR indicator or the FAR indicator or both of the indicators will either be lit or will blink. When the laser-OFF input is ON, the indicator(s) will not blink or be lit. 
	Stability Indicator (Amplifier)	The indicator will be lit in green when the target is within the measurement range and the receiver receives light intense enough to be reflected from the object. When the indicator is green, the sensor's measuring operation is stable. If the indicator is not lit in green while the sensitivity selector is set to WHITE; set it to BLACK or AUTO for a more stable measuring operation. Normal output can be obtained even if the indicator is not lit in green. The indicator will be lit in red when there is no object in front of the sensor or if the light reflected from the object is either insufficient or too intense. If the indicator is red, check if the sensitivity selector is set correctly (according to the reflection ratio of the target).
	Laser Emission Delaying Function (Sensor and Amplifier)	When the sensor is turned ON, the range indicators (green) will blink for 3 to 10 seconds, alerting the user to laser emission; during this time, the linear output is locked between 6 and 8 V. After this time, the laser beam will be turned ON.

(This table continues on the next page.)

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	Classification	Functions
ADJUSTMENT	**Sensitivity Selector (Amplifier)**	Set the sensitivity selector according to the reflection ratio of the object. If the color of the object is white, set it to WHITE. If the color of the object is black, set it to BLACK. If the color of the object is not white or black, set it to AUTO. When the sensitivity selector is set to AUTO, the enable output may be ON even if the object is outside the measurement range. Under these conditions, set the sensitivity selector to WHITE so that the number of possible errors can be minimized.
	Response Speed Selector (Amplifier)	Select the response speed by taking the required response speed and resolution into consideration. Response speed Fast: Resolution Low Response speed Slow: Resolution High
	Offset Adjustment (Amplifier)	Before shipping, the output is adjusted so that will be approximately 0 V when a white ceramic target is in the middle of the measurement range. The output voltage must be within ±5 V, or the linearity of the output cannot be guaranteed. Z4M-W40  Z4M-W100   To set the sensor output to 0 V at the standard distance, connect a Signal Processor (such as K3NX or K3TS) to the output terminal of the sensor. Place a standard target in front of the sensor and use the *offset adjustment* to adjust the output.
	Span Adjustment (Amplifier)	Before shipping, the output is adjusted to approximately 8 V at Full Scale using a white ceramic object, so the user may not need to adjust the span. Using span adjustment, it is possible to adjust the full scale of the voltage (±30%) that is output when the object is within the measurement range. Z4M-W40  Z4M-W100  Span adjustment changes the ratio of the output voltage (displacement) to the distance. Use span adjustment to change the actual voltage-distance relationship to either a higher output voltage at the same distance or to a lower output voltage. When there are changes in material or color in the target, and a 1:1 ratio is not obtained, span adjustment is used to modify the voltage output level. To calibrate the displacement output, adjust the span as follows. 1. Locate the target at the standard distance and adjust the offset adjustment. 2. Move the object for a specified distance and set the span adjustment so that the voltage will change correctly, according to the displacement. Follow these steps to convert ±4 V to ±5V. 1. Connect a *Signal Process Meter* to the sensor and move the object so that the output will be 4 V. 2. Use the span adjuster to adjust the voltage to 5 V.
	Axis and Distance Adjustment	 Both the FAR and NEAR indicators are lit when the target is at the measurement point. • The Z4M uses an infrared laser beam. The spot of the beam, however, can be confirmed in the dark by locating blue paper at the measurement point so that the beam will be reflected by the blue paper. The Sensor incorporates a laser beam delaying circuit, so the laser will start emitting 3 to 10 seconds after the Sensor is turned ON. • Ensure that the center of the object displacement will be in the center of the Sensor's measurement range.

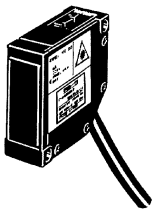
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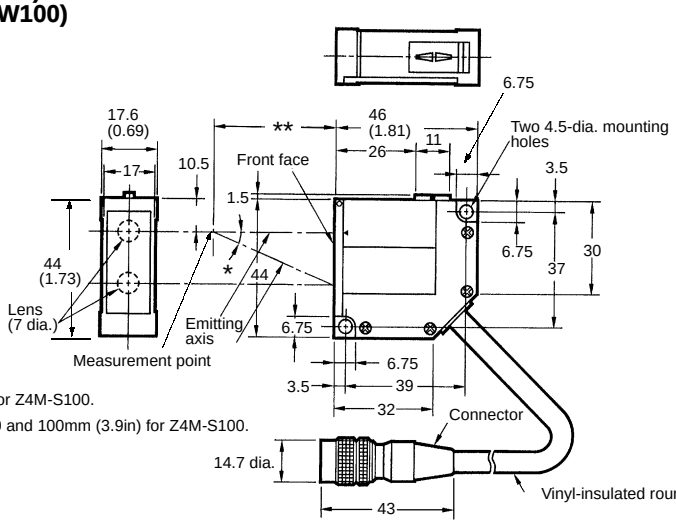
Dimensions

Unit: mm (inch)

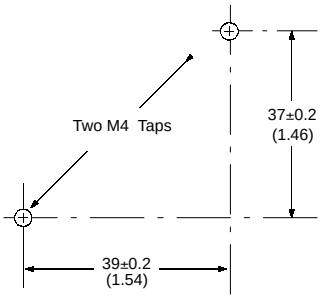
■ SENSOR

Z4M-S40 (for Z4M-W40)
Z4M-S100 (for Z4M-W100)





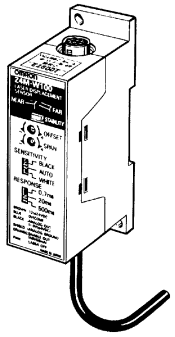
Mounting Holes

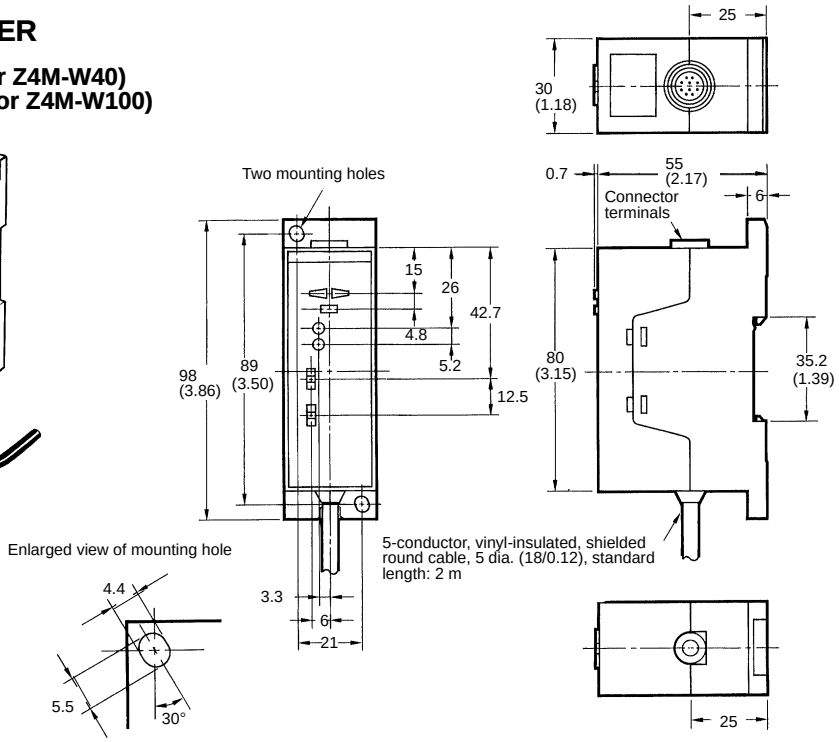


* 23° for Z4M-S40 and 11° for Z4M-S100.
** 40mm (1.6in) for Z4M-S40 and 100mm (3.9in) for Z4M-S100.

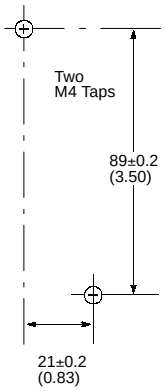
■ AMPLIFIER

Z4M-W40C (for Z4M-W40)
Z4M-W100C (for Z4M-W100)



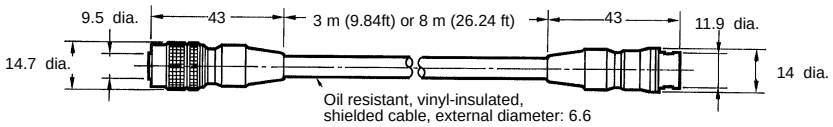


Mounting Holes

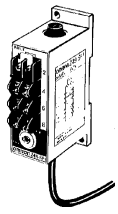


■ ACCESSORIES (SOLD SEPARATELY)

Extension Cable Z49-C1



Laser Safety Kit
Z49-SF2

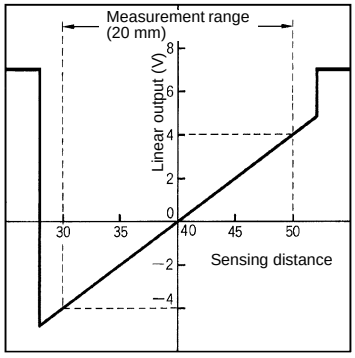


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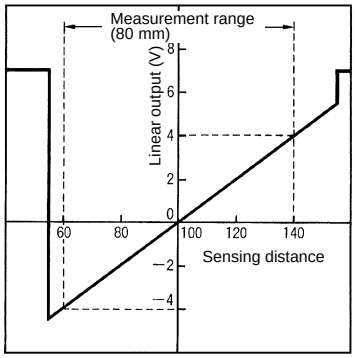
Engineering Data

■ LINEAR OUTPUT vs. SENSING DISTANCE

Z4M-W40



Z4M-W100



Conditions When Linear Output Of the Sensor Is Locked Between 6 and 8 V:

- On startup, for 3 to 10 seconds after the sensor is turned on. (No laser emission on startup for safety reasons.)
- When the target is outside the measurement range.
- When the enable output is OFF.

■ SPOT DIAMETER (TYPICAL EXAMPLE)

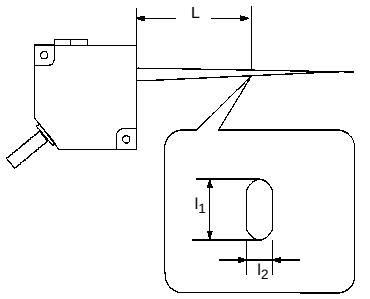
Z4M-W40

Distance L	30 mm (1.18 in)	40 mm (1.57 in)	50 mm (1.97 in)
l_1	1.2 mm (0.047 in)	0.6 mm (0.024 in)	0.2 mm (0.008 in)
l_2	0.6 mm (0.024 in)	0.3 mm (0.012 in)	0.1 mm (0.004 in)

Z4M-W100

Distance L	60 mm (2.36 in)	100 mm (3.94 in)	140 mm (5.51 in)
l_1	2 mm (0.079 in)	1.4 mm (0.055 in)	0.7 mm (0.028 in)
l_2	1 mm (0.039 in)	0.7 mm (0.028 in)	0.4 mm (0.016 in)

Spot diameter is defined by $1/e^2$ (13.5%) of the sensor's laser beam center.



Cross-section of the beam.

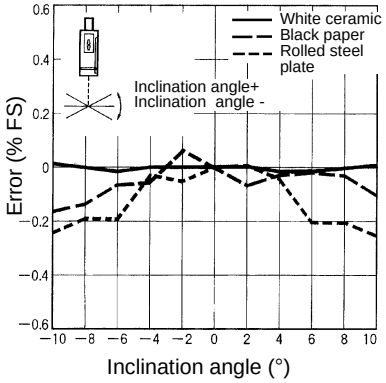
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■ ANGLE CHARACTERISTICS (TYPICAL EXAMPLE)

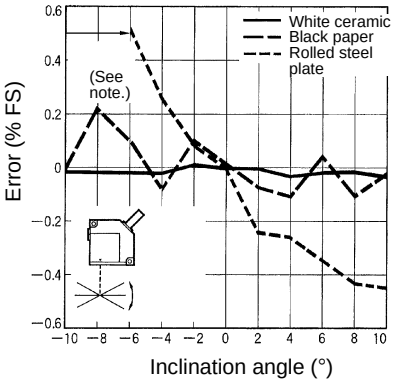
The angle characteristics were obtained by detecting an object with different angles of inclination at the measurement point and plotting the linear output error resulting from each operation.

Z4M-W40

Inclined Object



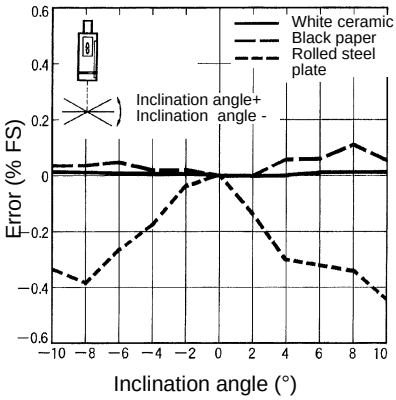
Obliquely Positioned Object



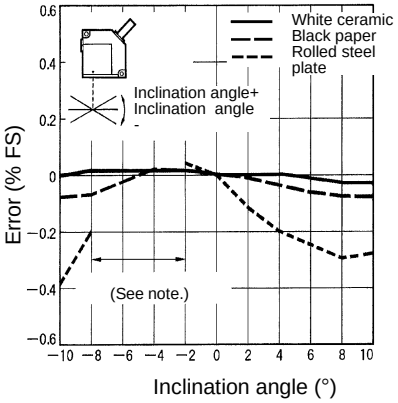
Note: Rolled steel cannot be measured, due to excessive light reflection.

Z4M-W100

Inclined Object



Obliquely Positioned Object



Note: Rolled steel cannot be measured, due to excessive light reflection.

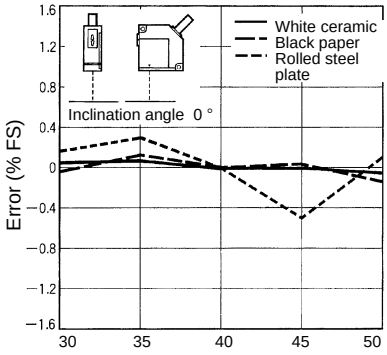
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■ LINEARITY CHARACTERISTICS vs. OBJECTS (TYPICAL EXAMPLE)

Linearity characteristic curves are obtained by detecting an object at different positions within the measurement range and plotting the linear output error resulting from each operation.

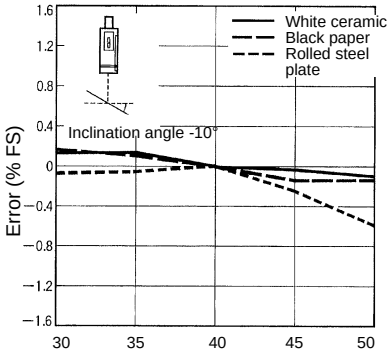
Z4M-W40

Inclined Object



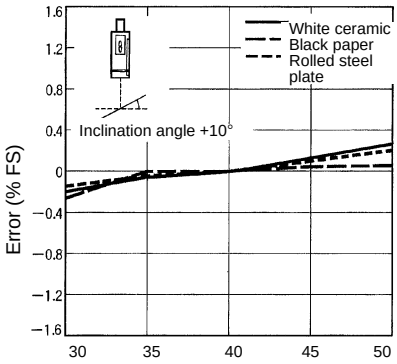
Measurement point (distance in mm)

Inclined Object



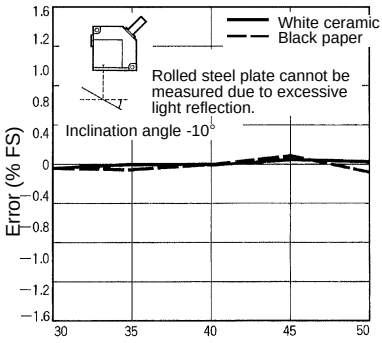
Measurement point (distance in mm)

Inclined Object



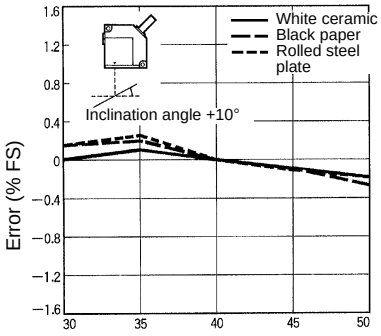
Measurement point (distance in mm)

Obliquely Positioned Object



Measurement point (distance in mm)

Obliquely Positioned Object

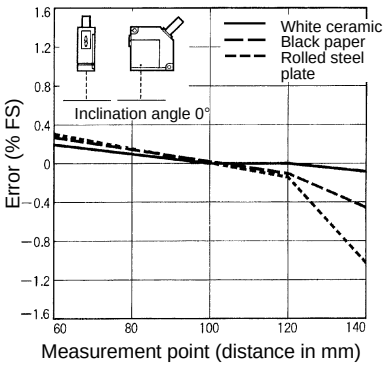


Measurement point (distance in mm)

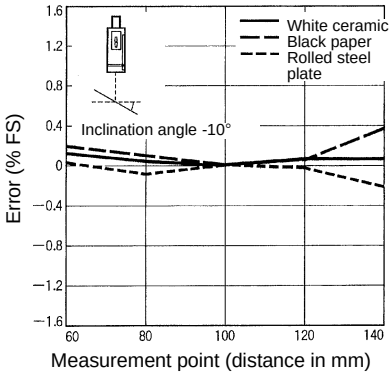
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Z4M-W100

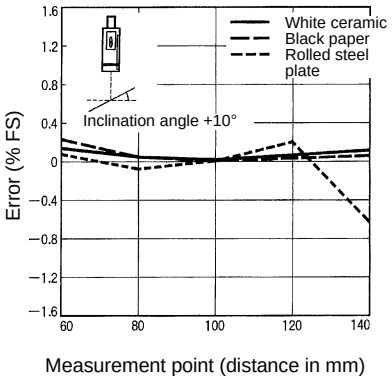
Inclined Object



Inclined Object

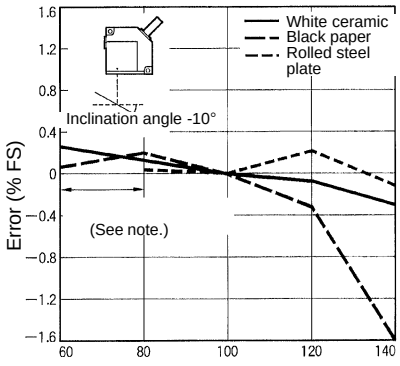


Inclined Object

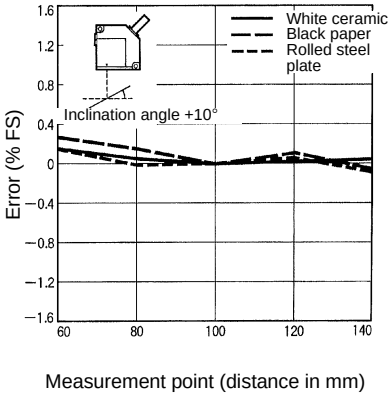


Note: Rolled steel cannot be measured, due to excessive light reflection.

Obliquely Positioned Object



Obliquely Positioned Object

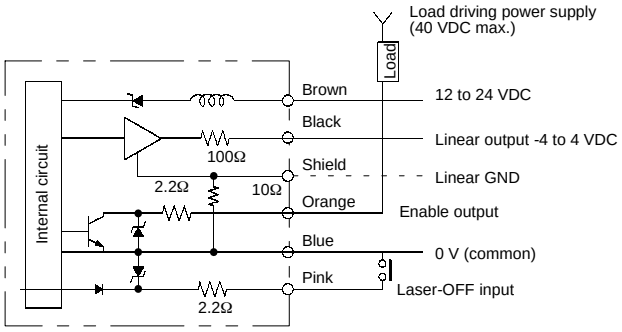


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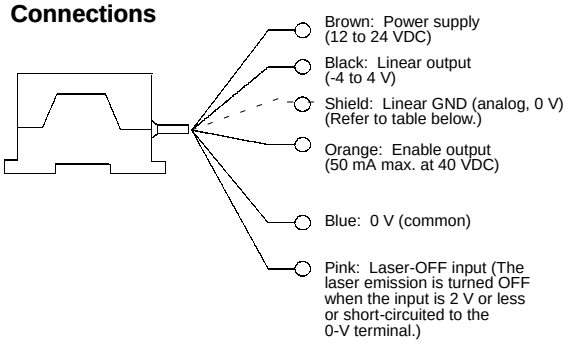
Installation

■ ELECTRICAL CONNECTIONS FOR AMPLIFIER

Output Circuit Diagram



Connections



Note: 1. Do not mount the Z4M to a DIN rail for use in a place with excessive vibration.

2. Use connectors to connect the Sensor to the amplifier. Do not turn or twist the cable, or cable disconnection may result.

Wiring Guide

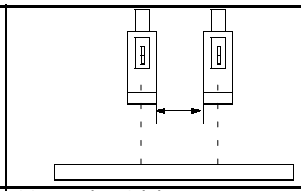
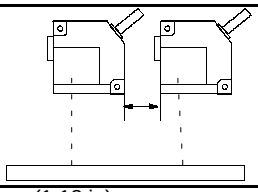
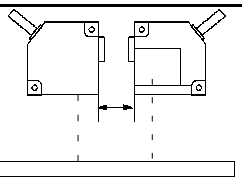
The 0-V (blue) and linear GND (shielded) line are internally connected with a resistor. Use the 0-V (blue) line for the power supply and use the shield wire (linear GND) and linear output (black) line for linear output.

Wire the sensor correctly, or the sensor may be damaged. Refer to the wiring precautions provided within the *Precautions* Section.

Power supply terminal	Connect a power supply with a capacity of 120 mA minimum at 12 to 24 VDC. If high resolution is required, connect an independent regulated power supply to the Sensor.
0 V	Used as the common terminal for the enabled output and laser OFF input.
Enable output	Turned on with open collector output when the Sensor can be operated (when the stability indicator is not red).
Laser-OFF input	The laser emission of the Sensor will be turned OFF by short-circuiting the laser-OFF input line with the 0-V terminal (with a residual voltage of 2 V max.), and the linear output of the sensor will be ON HOLD at this time.
Linear output	-4 to 4 V will be output according to the displacement value. Wire the sensor correctly, or the sensor may be damaged. The linear output line must not be in contact with any other line.
Linear GND	Used as a ground (0 V) terminal for the linear output of the Sensor. Connect this line to the input device.

■ MUTUAL INTERFERENCE

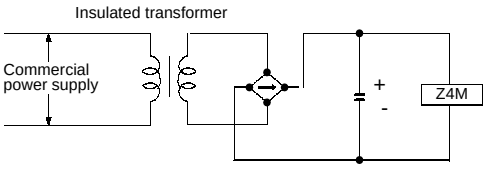
Separate each Sensor as specified in the following table when using more than two Sensors in close proximity to each other.

Installation direction			
Z4M-W40	30 mm (1.18 in)	30 mm (1.18 in)	60 mm (2.36 in)
Z4M-W100	60 mm (2.36 in)	60 mm (3.15 in)	80 mm (3.15 in)

■ POWER SUPPLY

Use an insulated transformer for the power supply of the Z4M, as shown in the illustration provided.

Do not use an autotransformer. Use of an auto-transformer may cause the Z4M to malfunction.



■ WIRING

DANGER!
Do not wire the power supply cable for the Z4M Sensor in the same conduit with high-voltage lines or power lines. The result would be interference, damage, or malfunction.

A Z49-C1 Extension Cable can be connected to the Sensor cable or to the amplifier cable. The total length of the Sensor cables or amplifier cables must not exceed 10 m (32.91 ft.). To extend the amplifier cable, use a shielded cable of the same kind.

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Configuring Z4M with A Controller and Output Boards

■ SELECTING A CONTROLLER — ORDERING INFORMATION

Use a Signal Process Meter to display the linear output of the Z4M-WR.

Item	K3NX Signal Process Meter	K3TS Signal Process Meter
Unit		 **Note:** K3TS requires an Output Board for correct operation. K3TS requires a minimum of five cooperative outputs.
Part number	**K3NX-VD□ C** **1=**100 to 240 VAC supply voltage **2=**12 to 24 VDC supply voltage	**K3TS-SD1□B** **1=**100 to 240 VAC supply voltage **2=**12 to 24 VDC supply voltage
Features	DC voltage input; separate present value, and setpoint value LEDs; scaling function and forced zero function included; five level discrimination output with output boards.	DC voltage input; high-speed sampling of 1.04 ms; two-input operation; forced zero function and other versatile functions incorporated.

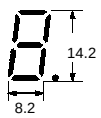
■ SELECTING OUTPUT BOARDS — ORDERING INFORMATION

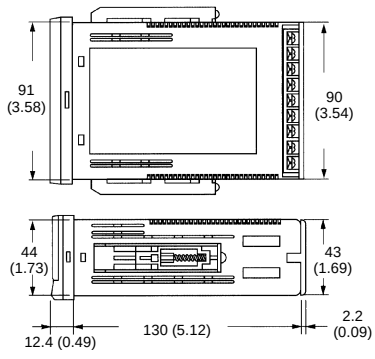
Output type	Output configuration	Part number	
		K3TS Meter	**K3NX Meter**
Comparative relay contact output	3 outputs (H, PASS, L); all SPDT	**K31-C1**	
Comparative transistor output	5 outputs (HH, H, PASS, L, LL); PASS is SPDT; others are SPST-NO	**K31-C2**	
Linear output	5 outputs (HH, H, PASS, L, LL); PASS is SPDT; others are SPST-NC	**K31-C5**	
	5 outputs (HH, H, PASS, L, LL); all NPN open collector	**K31-T1**	
	5 outputs (HH, H, PASS, L, LL); all PNP open collector	**K31-T2**	
	4 to 20 mA	**K31-L1**	
	1 to 5 VDC	**K31-L2**	
	1 mV/digit	**K31-L3**	
BCD	4 1/2 digit	**K31-B2**	
Serial communication	RS-232C	**K31-S1**	**K31-FLK1**
	RS-485	**K31-S2**	**K31-FLK2**
	RS-422	**K31-S3**	**K31-FLK3**
Combination output and communications boards	4 to 20 mA linear output and 5 NPN open collector outputs	**K31-L4**	
	1 to 5 VDC linear output and 5 NPN open collector outputs	**K31-L5**	
	mV/digit linear output and 5 NPN open collector outputs	**K31-L6**	
	BCD output and 5 NPN open collector outputs	**K31-B4**	
	RS-485 serial output and 5 NPN open collector outputs	**K31-S5**	**K31-FLK5**
	RS 422 serial output and 5 NPN open collector outputs	**K31-S6**	**K31-FLK6**

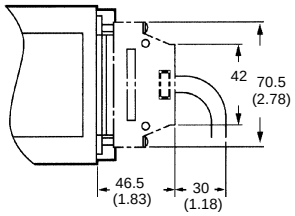
■ K3NX METER DIMENSIONS

Unit: mm (inch)

PV Display

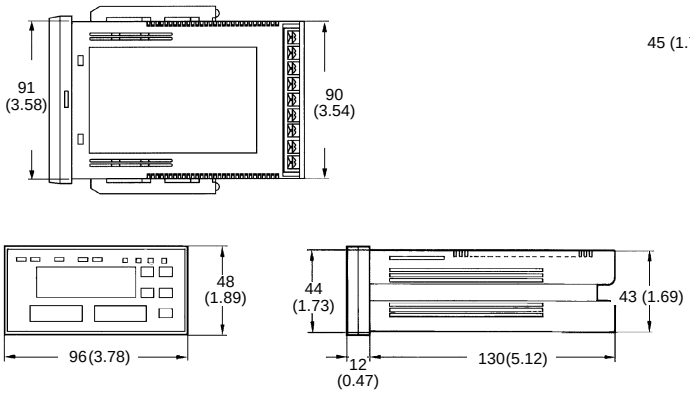




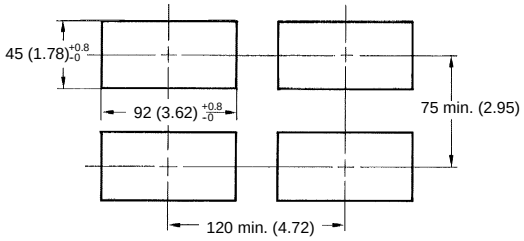


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■ K3TS METER DIMENSIONS

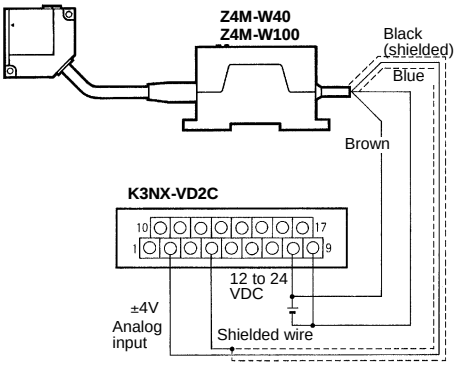


■ PANEL CUTOUTS FOR K3NX OR K3TS



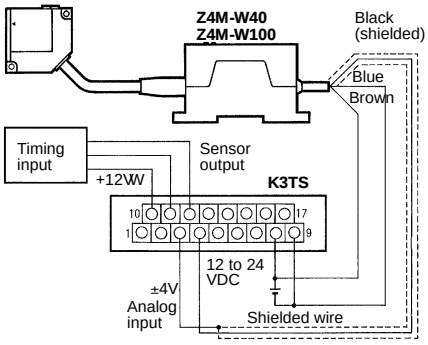
■ ELECTRICAL CONNECTIONS TO A SIGNAL PROCESS METER

K3NX Process Meter



1. Choose an appropriate K3NX model according to the application.
2. Refer to the K3NX data sheet for operational instructions in detail.
3. If a K3NX model is used with an AC power supply, connect an independent DC power supply to the Z4M Laser Displacement Sensor.

K3TS Process Meter



1. Choose an appropriate K3TS model according to the application.
2. Use an input range of 9.999 (±9.999 V). For the K3TS operation in detail, refer to the *K3TS Signal Processor Operation Manual*.
3. If a K3TS model is used with an AC power supply, connect an independent DC power supply to the Z4M Laser Displacement Sensor.

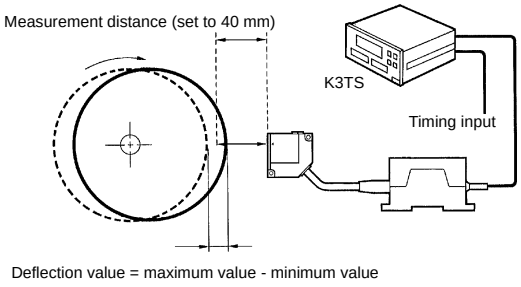
■ OPERATIONAL EXAMPLES: Z4M SENSOR AND K3TS SIGNAL PROCESS METER

Measuring Eccentricity

Using the scaling function, it is possible to convert the Sensor's output (±4 V) into the actual measured dimension of the object for display.

By selecting the appropriate measurement mode that corresponds to the application, necessary data can be easily obtained. In the following application, the peak-to-peak hold mode is used to measure the eccentricity of an object by measuring the difference between the maximum and minimum values while the timing input is ON.

Note: Use a pushbutton switch to turn ON the timing input while measuring eccentricity.



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Precautions

■ LASER BEAM SAFETY

The laser incorporated by the Z4M has a central oscillating wavelength of 780 nm and a maximum optical output of 3 mW.

Follow the instructions on this data sheet for the adjustment and installation of the Z4M.

DANGER!
Never look directly into the laser beam.

Make sure that the laser beam will not be directly or indirectly reflected into human eyes. The safety distance is approximately 1 m for the Z4M-W40 and 2 m for the Z4M-W100.

If there is a possibility of laser beam reflection by any objects around the emitter at the time of adjustment, apply paint with a low light reflection ratio to the objects.

The Sensor incorporates a laser emission warning light and a laser OFF input circuit. It is possible to interlock laser emission via an external circuit.

To easily incorporate the most effective safety measures, use the Z4M in combination with the Z49-SF2 Laser Safety Kit (sold separately)

■ LASER REGULATIONS

Meeting FDA Regulations

The Z4M is classified as a Class IIIb laser in the U.S. The FDA regulations require the user to ensure the following:

Safety Interlocks

Safety interlocks are fitted to each part of the protective housing to prevent the emission of radiation during maintenance.

Laser Radiation Emission Indicator

The system incorporates an emission indicator which gives a visible or audible signal from 2 to 20 seconds before and during radiation emission. Visible indicators should be visible to users wearing laser protection glasses.

Remote Interlocked Connector

A remote interlock connector between a remote controller and the control panel is incorporated. The potential difference between terminals should be no greater than 130 Vrms

The Z4M Laser Displacement Sensor meets the standards required by the U.S. Food and Drug Administration (FDA). OMRON has also reported to the Center for Devices and Radiological Health (CDRH). The report includes the condition that the Sensor be used as part of a larger system.

■ ENVIRONMENT

Install the sensor in clean environment ensuring that the filter on Sensor's front panel is kept free from oil and dust.

Do not use the Laser Displacement Sensor in a strong electromagnetic field or in an environment where the operation of the Sensor can be affected by the reflection of intensive light (such as light from a laser beam or electric arc welding.

The Laser Displacement Sensor cannot accurately detect objects that are mirror-like, transparent, inclined or have an extremely small reflection ratio (smaller than the Sensor's sensing spot diameter).

Laser Beam Attenuator

The system is permanently fitted with an attenuator to prevent the user from being subjected to radiation levels in excess of the allowable emission limit.

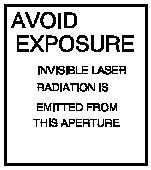
■ LABELS (FDA REGULATIONS)

Attach the following three FDA labels to the Sensor body prior to use.

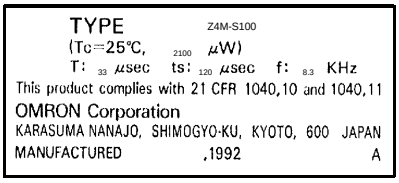
Danger Label



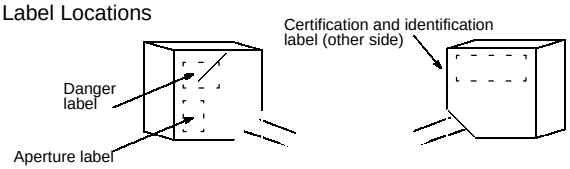
Aperture Label



Certification and Identification Label



Label Locations



■ MAINTENANCE AND REPAIRS

Do not attempt repairs or maintenance of the Z4M. The Z4M contains no user serviceable parts. Refer all servicing to an authorized OMRON agent.

DANGER!
Never disassemble the Sensor. Users expose themselves to the risk of laser radiation if they disassemble the device.

■ CLEANING

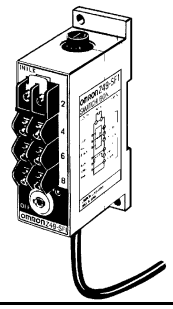
If the filter is affected by oil or dust, clean it as follows:

1. Use a small air blowing device (like that used to clean camera lenses) to remove dust particles from the surface. Do not attempt to blow the dust away with your mouth.
2. Use a soft cloth (for lenses) moistened with alcohol to remove the remaining dust. Do not use a scrubbing action when cleaning; a scratch on the filter could result in Sensor malfunctioning.

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Configuring Z4M with the Z49-SF2 Laser Safety Kit

■ ORDERING INFORMATION — Z49-SF2 LASER SAFETY KIT

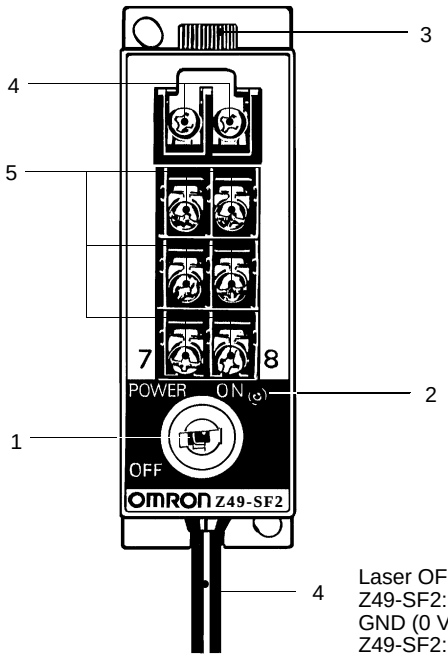
Item/description	Characteristics/features	Applicable sensors	**Part number**
Laser Safety Kit 	• Dedicated Laser Safety Kit for Z4M; conforms to Safety Standards (JIS C6802). • With the Z49-SF2 Laser Safety Kit, the Z4M can meet the requirements of various safety standards. **Note:** Become fully aware of the contents of the safety standards and the precautions before using the Z49-SF2 Laser Safety Kit. • Controller incorporates key switch, interlock terminal, and laser warning light. • Beam Cover that can intercept the laser beam is provided. • The slim controller can be DIN-track mounted.	Z4M-W40 Z4M-W100	**Z49-SF2**

■ Z49-SF2 SPECIFICATIONS

Item	Z49-SF2 (for Z4M)
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.
Current consumption	10 mA max. (excluding the current consumption of the sensor)
Indicator	Green laser warning light (power indicator)
Insulation resistance	20 MΩ (at 500 VDC)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Vibration resistance	10 to 55 Hz (1.5-mm double amplitude) for 32 min each in X, Y, and Z directions
Shock resistance	300 m/s^2 (30G) for 3 times each in ±X, Y, and Z directions
Ambient temperature	Operating: 0°C to 50°C (32°F to 122°F) with no icing Storage: −15°C to 60°C (5°F to140°F) with no icing
Ambient humidity	Operating: 35% to 85% (with no condensation)
Weight	Approx. 200 g (with cable)
Cable length	2 m (6.56 ft.)
Material	Case: ABS Beam cover: SUS
Enclosure rating	IEC60529; IP40
Attachments	One beam cover for Z4M One laser emission warning label for Z4M

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■ NOMENCLATURE FOR Z49-SF2



No.	Name	Functions
1	**Key Switch**	Turns ON and OFF the emitter of the Z4M Sensor connected to the terminals of the Laser Safety Kit as well as the internal circuitry of the Laser Safety Kit.
2	**Laser Warning Light** (i.e., power indicator, or laser emission indicator)	When the Z4M Sensor is emitting a laser beam or ready to emit a laser beam, the green indicator is lit. The green indicator is lit by turning the key switch ON and the indicator goes OFF by turning the key switch OFF.
3	**Fuse**	This fuse protects the power supply in case terminal 3 (power terminal) and terminal 8 (GND) are short-circuited. Use a glass tube fuse (5.2 dia. x 20 mm) with a capacity of 0.5 A at 125 V.
4	**Interlock Terminals** (terminals 1 and 2) Laser off input (Z49-SF2: Orange) GND (0 V) (Z49-SF2: Orange/purple stripe)	Used to connect an interlock switch for safety. When terminals 1 and 2 are open, the laser emission of the Z4M will stop. The terminals are short-circuited with a short bar before shipping. Laser emission will also stop by short-circuiting the laser OFF input line to the 0-V terminal or dropping the input voltage to 2 V or below. The relationship between the laser OFF input and interlock terminals are as follows: When the interlock terminals are *open*, no laser emission is turned on regardless of the condition of the laser OFF input. If the laser OFF input is dropped to 2 V or below or short-circuited to the 0-V terminal, no laser emission is turned on whether the interlock terminals are opened or short-circuited. The laser warning light is lit whether the laser emission of the Z4M is turned ON or NOT turned ON.
5	**Sensor Terminals** (terminals 3 to 8)	Used to connect the Laser Safety Kit to the emitter of the Z4M Sensor (in the case of Z49-SF2).

Laser OFF input	**Interlock terminals**	
	Open	**Short-circuited**
Open	Laser emission stops	Laser emission starts
2 V max.; or short-circuit to 0-V terminal	Laser emission stops	Laser emission stops

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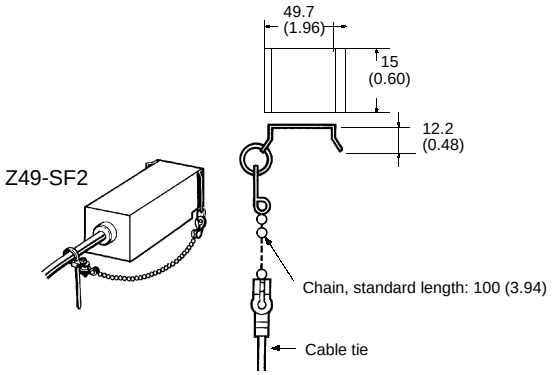
■ OPERATION — Z49-SF2 SAFETY KIT

Z49-SF2 Beam Cover

1. Attach the beam cover to the front panel (from where the laser beam is emitted) of the Z4M Sensor is not in use.

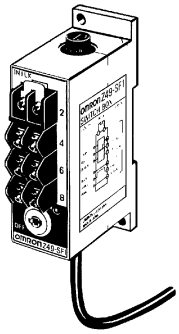
   Note: The beam cover will protect human eyes from accidental laser radiation.

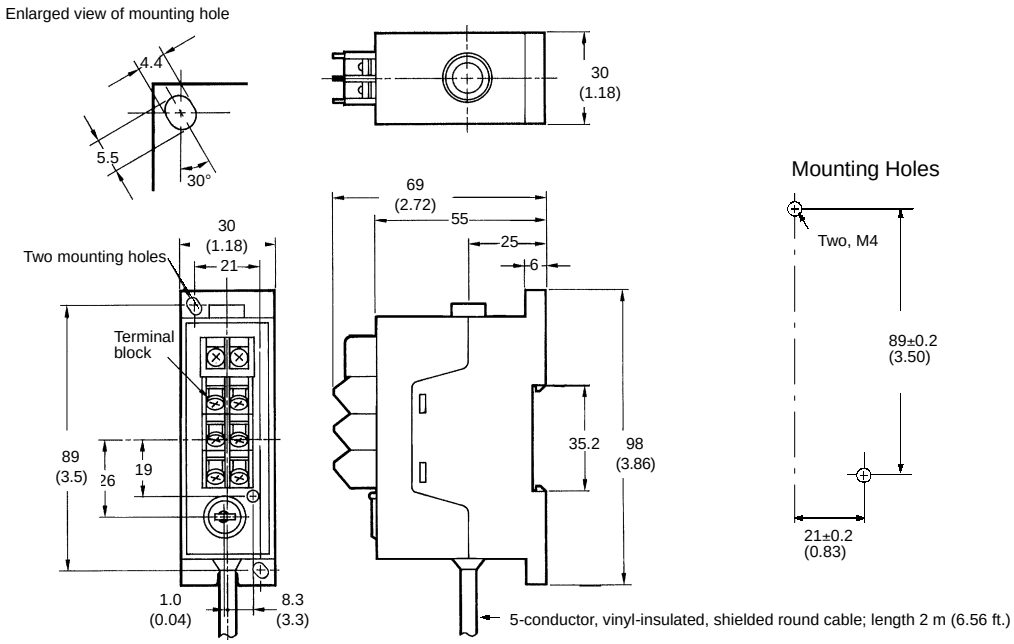
2. Attach a clamp to the cable of the Z4M Sensor The unnecessary part of the clamp should be cut off with a nipper.



■ DIMENSIONS — Z49-SF2 CONTROLLER

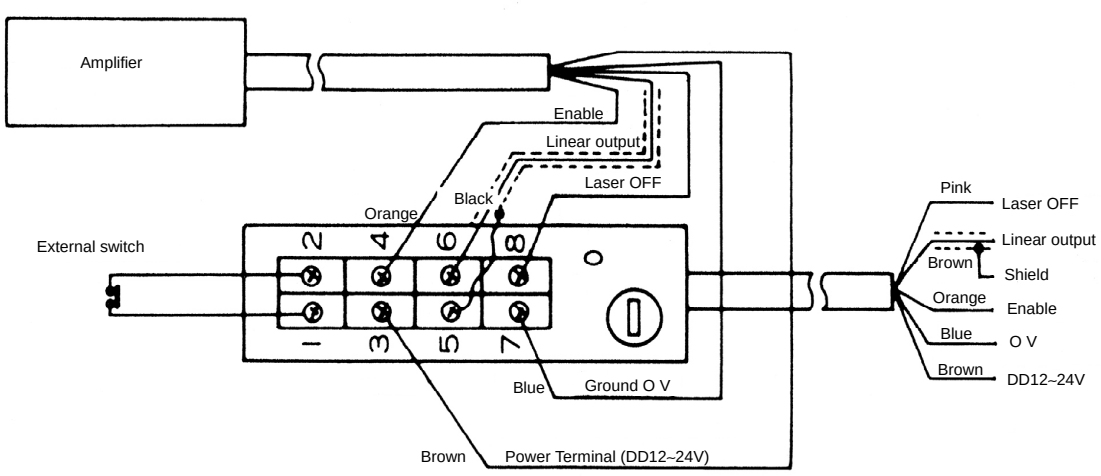
Unit: mm (inch)



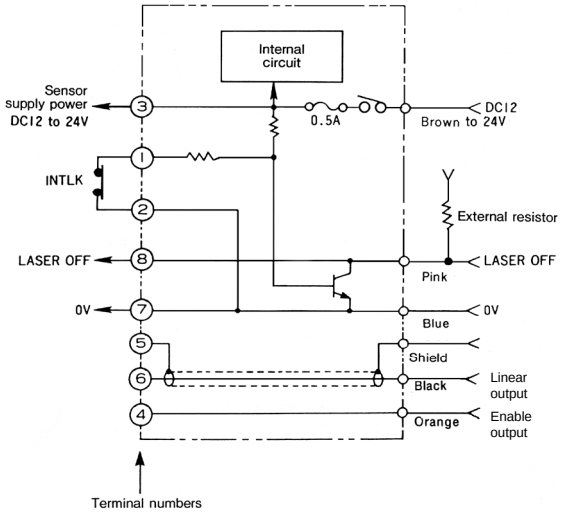


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■ Z49-SF2 CONNECTIONS



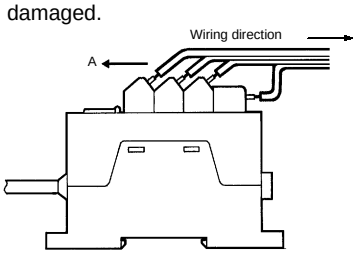
■ I/O CIRCUIT DIAGRAM — Z49-SF2



■ Z49-SF2 PRECAUTIONS

Wiring Direction

Wire in the direction as shown in the following illustration. Do not pull the wires in the A direction, or the terminals may be damaged.



Wiring

Do not run wires for the Z49-SF2 or Z4M in the same conduit with high voltage lines or power lines in order to prevent interference, damage, or malfunctioning.

Labels (Attachments)

The Z4M abides by IEC's Class 3B and FDA's Class IIIb regulations; thus warning labels must be attached to the sensor body before use.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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