

Laser Displacement Sensor

Z4M

Compact Displacement Sensor with 1.5-micron Resolution Offers Long-distance Measurement for In-line Production Inspection

- High resolution with 3 user-selectable response speed levels, for varying operational needs
- Non-spherical, high precision glass lens assures minimal temperature drift
- Up to 140 mm sensing range
- Automatic sensitivity selection minimizes sensing errors caused by color or surface variations
- Compact sensor head incorporates easy-to-use range indicators
- Amplifier can be DIN-rail mounted
- Connects to the Z49-SF2 Laser Safety Kit to conform to FDA standards



Ordering Information

■ SENSORS

| Sensing distance | Resolution (response speed selected) | Part number |
|-------------------------|---|-------------|
| 40±10 mm (1.57 ±.40in) | 1.5 µm (60 ms) 10 µm (2 ms) 40 µm (0.15 ms) | Z4M-W40 |
| 100±40 mm (3.93 ±1.6in) | 8 µm (500 ms) 30 µm (20 ms) 150 µm (0.7 ms) | Z4M-W100 |

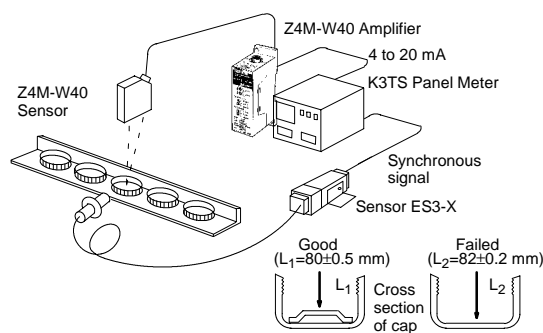
■ ACCESSORIES

| 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 |

Application Examples

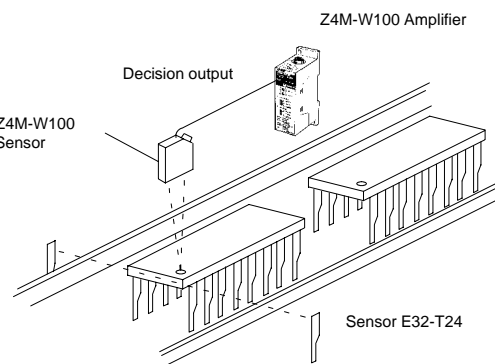
Industry: Assembly Machinery

Application:
Presence/absence of thin cap liner



Industry: Electronics

Application:
IC chip orientation



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 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 incorporated. | |

Note: 1. The **FS (Full Scale) value** (listed in the preceding table) is calculated as follows:

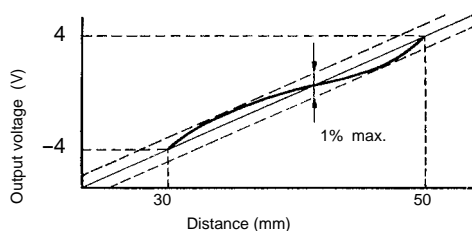
Example: 1% FS on the Z4M-W40

Distance full scale conversion: 20 mm x 0.01 = 0.2 mm

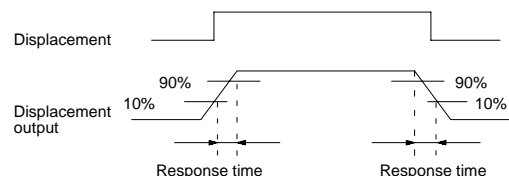
Voltage full scale conversion: 8 V x 0.01 = 80 mV

| 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 \pm 30% | 8 V \pm 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.)



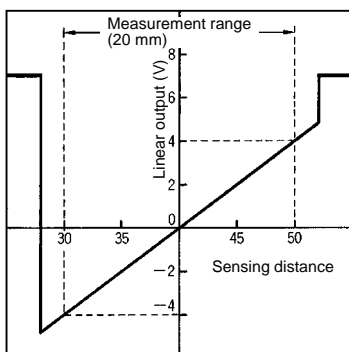
■ CHARACTERISTICS

| | |
|----------------------|--|
| Power supply voltage | 12 to 24 VDC \pm 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 \pm 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 |

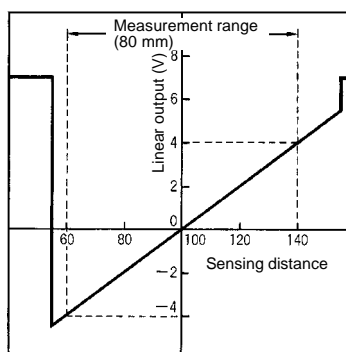
Engineering Data

■ LINEAR OUTPUT vs. SENSING DISTANCE

Z4M-W40



Z4M-W100



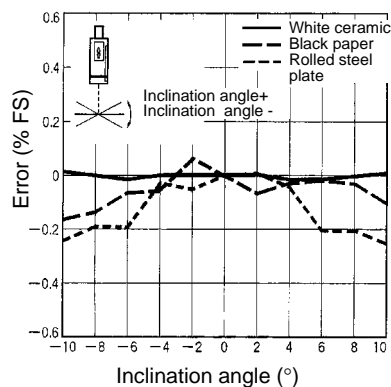
Note: The linear output of the Sensor is locked between 6 and 8 V when the object is outside the measurement range or when the enable output is OFF. It is also locked between 6 and 8 V for 3 to 10 s after the Sensor is turned on, at which time there is no laser emission.

■ ANGLE CHARACTERISTICS (TYPICAL EXAMPLE)

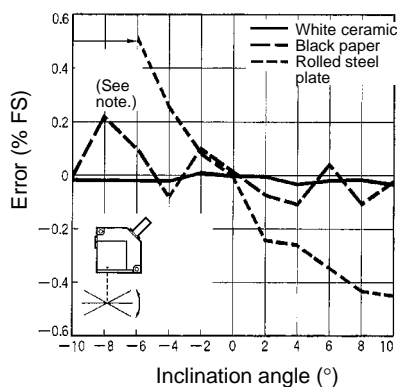
The angle characteristics were obtained by detecting an object with different angles of inclination at the measurement point and plotting the linear output error resulting from each operation.

Z4M-W40

Inclined Object



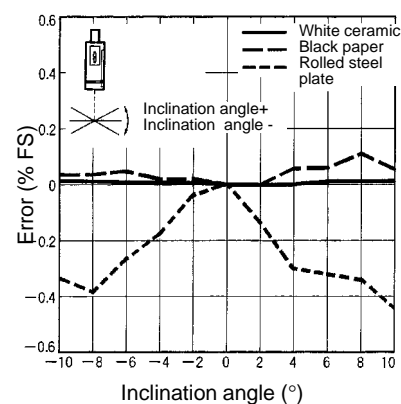
Obliquely Positioned Object



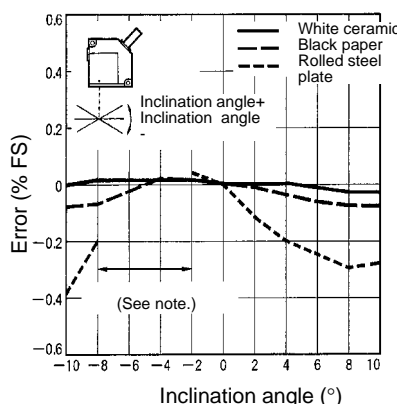
Note: Rolled steel cannot be measured due to excessive light reflection.

Z4M-W100

Inclined Object

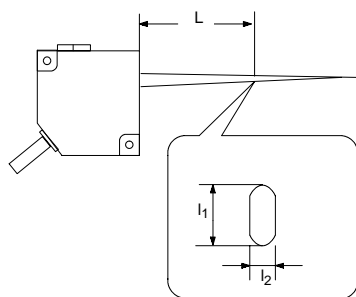


Obliquely Positioned Object



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

■ SPOT DIAMETER (TYPICAL EXAMPLE)



Cross section of the beam.

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) |

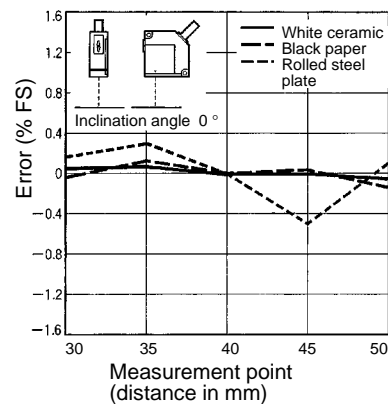
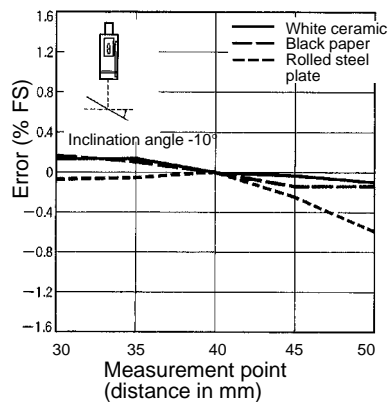
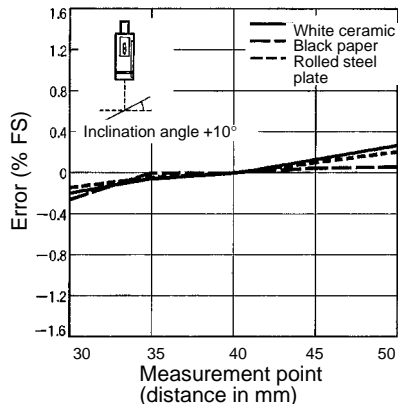
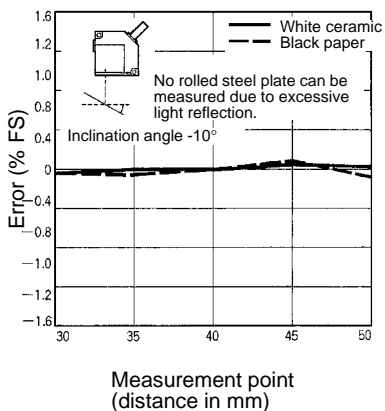
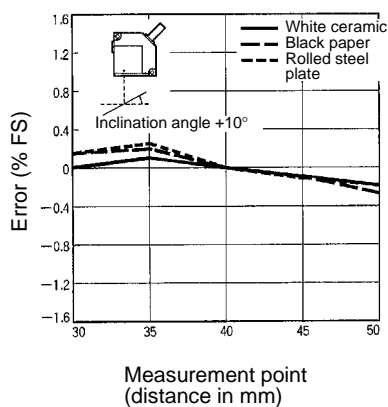
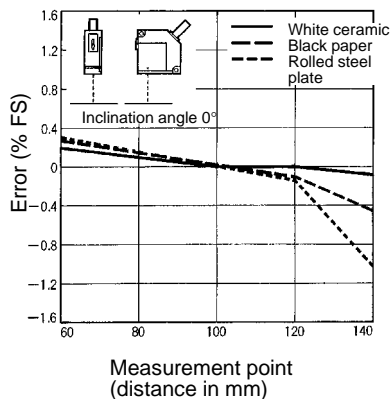
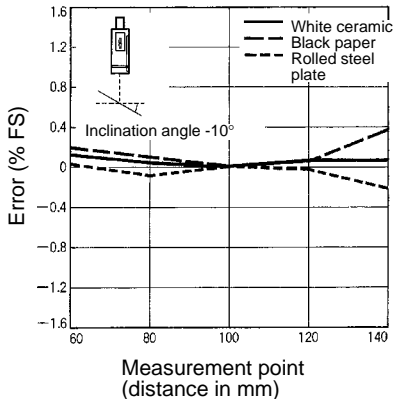
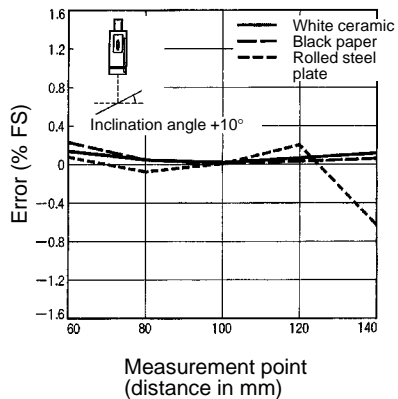
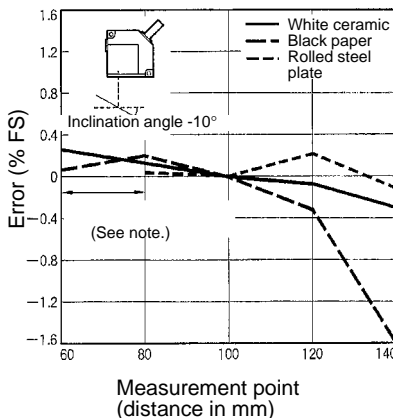
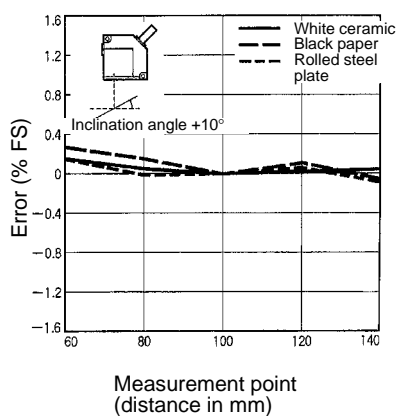
Z4M-W100

| 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.

■ LINEARITY CHARACTERISTICS vs. OBJECTS (TYPICAL EXAMPLE)

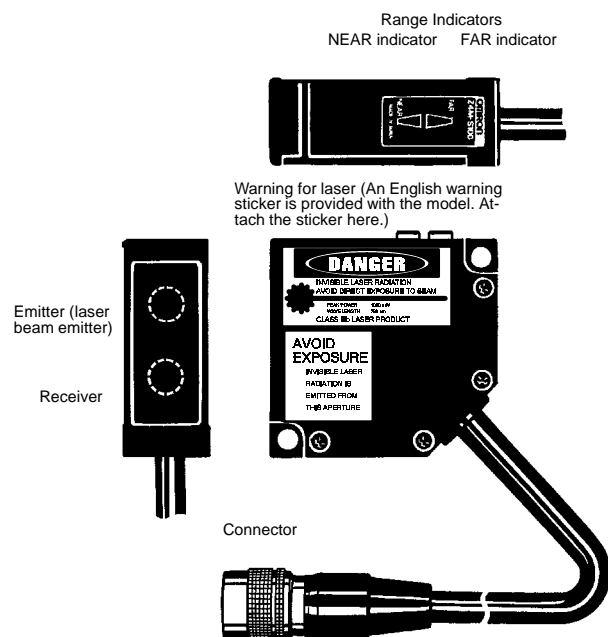
Linearity characteristic curves are obtained by detecting an object at different positions within the measurement range and plotting the linear output error resulting from each operation.

Z4M-W40**Inclined Object****Inclined Object****Inclined Object****Obliquely Positioned Object****Obliquely Positioned Object****Z4M-W100****Inclined Object****Inclined Object****Inclined Object****Obliquely Positioned Object****Obliquely Positioned Object**

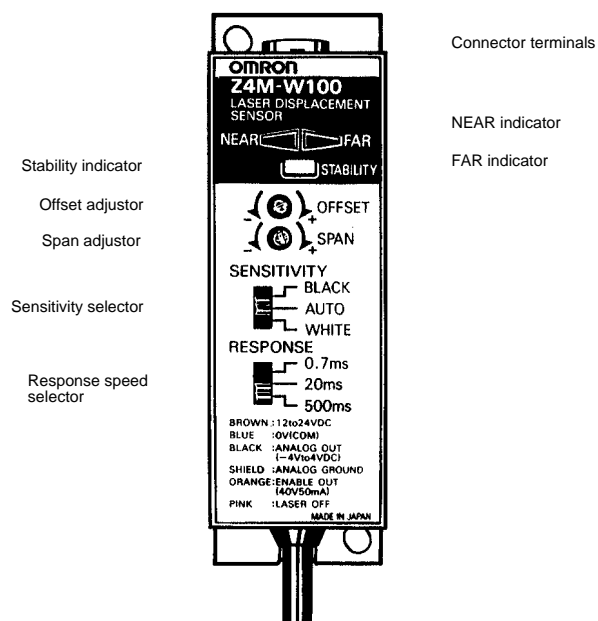
Note: Rolled steel cannot be measured due to excessive light reflection.

Nomenclature

■ SENSOR



■ AMPLIFIER



Operation

FUNCTIONS

| Classification | Functions |
|---|---|
| Range indicators (NEAR and FAR), also used as laser warning lights (Sensor and Amplifier) | <p>The FAR green indicator and NEAR green indicator will be lit when the object is within the measurement range of the Sensor.</p> <p>When the object is outside the measurement range or in the case of insufficient or excessive light, both the NEAR and FAR indicators will blink.</p> <p>If the object is near the Sensor but within the measurement range, only the NEAR indicator will blink.</p> <p>Mount the Sensor so that both the NEAR indicator and FAR indicator will be lit when the object is placed in front of the Sensor.</p> <p>To alert the user that the laser beam is turned ON when the laser OFF input is turned OFF, the NEAR indicator and FAR indicators 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 the indicator(s) will not blink or be lit.</p> |
| Stability indicator (Amplifier) | <p>The indicator will be lit in green when the object 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.</p> <p>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.</p> <p>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 object).</p> |
| Sensitivity selector (Amplifier) | <p>Set the sensitivity selector according to the reflection ratio of the object.</p> <p>If the color of the object is white, set it to WHITE.</p> <p>If the color of the object is black, set it to BLACK.</p> <p>If the color of the object is not white or black, set it to AUTO.</p> <p>When the sensitivity selector is set to AUTO, the enable output may be ON even if the object is outside the measurement range, in which case set the sensitivity selector to WHITE so that the number of errors that may occur can be minimized.</p> |
| Response speed selector (Amplifier) | <p>Select the response speed by taking the required response speed and resolution into consideration.</p> <p>Response speed Fast: Resolution Low</p> <p>Response speed Slow: Resolution High</p> |
| Offset adjuster (Amplifier) | <p>Offset adjustment is possible at any position within the measurement range since the output will be 0 V.</p> <p>The output voltage must be within ± 5 V, or the linearity of the output cannot be guaranteed.</p> <p>The output is adjusted before shipping, so that it will be approximately 0 V when the object is in the middle of the measurement range.</p> |

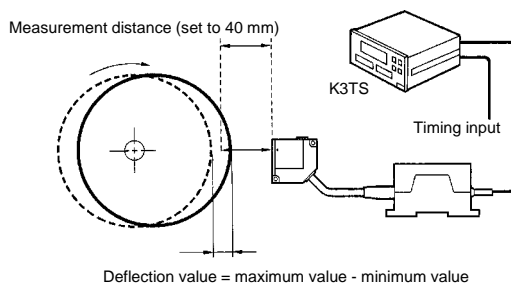
| Classification | Functions |
|---|---|
| Span adjuster (Amplifier) | <p>The output is adjusted to approximately 8 V FS before shipping.</p> <p>The span adjustment changes the ratio of the output current (displacement) to the distance. By using the span adjustment, the actual current-distance relationship can be changed to either a higher output current at the same distance or to a lower output current. When there are changes in material or color in the target object, and a 1:1 ratio is not obtained, span adjustment is used to modify the current output level.</p> <p>With the span adjuster, it is possible to adjust the full scale of the voltage ($\pm 30\%$) that is output when the object is within the measurement range.</p> <p>For the step-by step Operating/Adjusting procedure refer to – <i>Span Adjustment</i> (in a subsequent section).</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> <p>Z4M-W40</p> </div> <div style="text-align: center;"> <p>Z4M-W100</p> </div> </div> |
| Enable output (Amplifier) | <p>The enable output is ON when the Sensor is performing a displacement measuring operation.</p> <p>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.</p> <p>An open collector output of 50 mA at 40 VDC maximum can be obtained.</p> <p>In the case of measuring an metal or glossy object, the enable output may be ON even if the object is outside the measurement range.</p> |
| Linear output (Amplifier) | <p>An analog voltage signal according to the measuring distance will be output from the output line (black shield wire).</p> <p>Voltage output: -4 to 4 V/30 to 50 mm (Z4M-W40), -4 to 4 V/60 to 140 mm (Z4M-W100)</p> <p>Output impedance: 100 Ω (typical)</p> <p>The linear output will be locked between 6 and 8 V when the enable output is OFF.</p> |
| Laser OFF input (Amplifier) | <p>The laser OFF input controls laser emission.</p> <p>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.).</p> <p>When laser emission is turned Off, the linear output, indicators, and the enable output of the Sensor are on hold.</p> <p>There will be a drift of 0.1% FS/s when the analog output of the Sensor is on hold.</p> <p>The response time required to turn laser emission ON or OFF is 3 ms max.</p> |
| Laser emission delaying function (Sensor and Amplifier) | <p>When the Sensor is turned ON, the range indicators (green) will blink for 3 to 10 s, 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.</p> |

■ OPERATIONAL EXAMPLES: Z4M SENSOR AND K3TS INTELLIGENT DIGITAL PANEL 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.

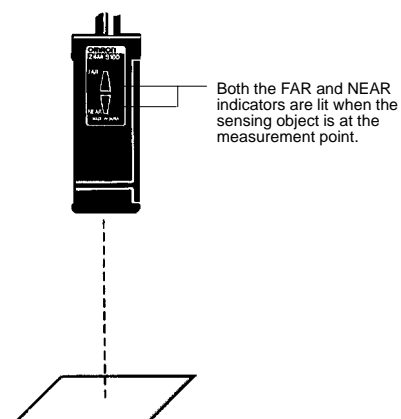
■ K3TS PANEL METER SETTINGS

| | |
|----------------|---|
| Level 3 | |
| fun1:a | One linear Sensor only. IN A is used. |
| fun2:off | No previous average comparison. |
| fun3:pp-h | Peak-to-peak hold. |
| Level 2 | |
| in:9.999 | ± 9.999 V is selected as the input mode. |
| ave:8 | The number of measuring operations used to obtain the average. |
| t-d:0.00 | Timing delay setting. Set to 0. |
| Level 1 | |
| cst0 to cst7: | Select HH, H, L, or LL for determining the eccentricity of an object when the comparison output is used. |
| scal: | Converts the -4 to 4V output of the Z4M into the actual dimension. If the Z4M-W40 is used, the linear output will increase by 0.4 V with a displacement value of 1 mm. The output will be 0 V when the object is in the center of the measurement range (40 mm between the object and the Sensor) and the output will be 0.4 V when the distance between the object and the Sensor is 41 mm. The output value is used for scaling. |
| X2:0000 | When the linear output is 0V. |
| Y2:0000 | A distance of 40 mm between the object and the Sensor is regarded as the standard distance (0 mm). |
| X1:0400 | The linear output is 0.4 V (400 mV). |
| Y1:1000 | When the sensing distance is 41 mm, the difference between the sensing distance and the standard distance is 1 mm. |
| 0.000 | Set the decimal points of Y2 and Y1. |
| prot: | Prohibits comparison set point change in the RUN mode. After all settings have been completed, set to on. |

■ ADJUSTING/OPERATING

Axis and Distance Adjustment

1. 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 s after the Sensor is turned on.
2. Ensure that the center of the object displacement will be in the center of the Sensor's measurement range.



Offset Adjustment

Offset adjustment is made using a white ceramic object before shipping, so the user may not need to adjust the output.

To set the Sensor output to 0 V at the standard distance, connect an Intelligent Panel Meter (such as K3TX or K3TS) to the output terminal of the Sensor. Place a standard object in front of the Sensor and adjust the output with the offset adjuster.

Span Adjustment

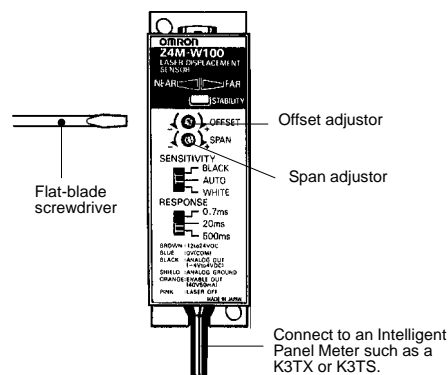
Span adjustment is made using a white ceramic object before shipping, so the user may not need to adjust the span.

To calibrate the displacement output, adjust the span as follows.

1. Locate the object at the standard distance and adjust the offset adjustment.
2. Move the object for a specified distance and adjust the span adjuster so that the voltage will change properly according to the displacement.

Follow these steps to convert ± 4 V to ± 5 V.

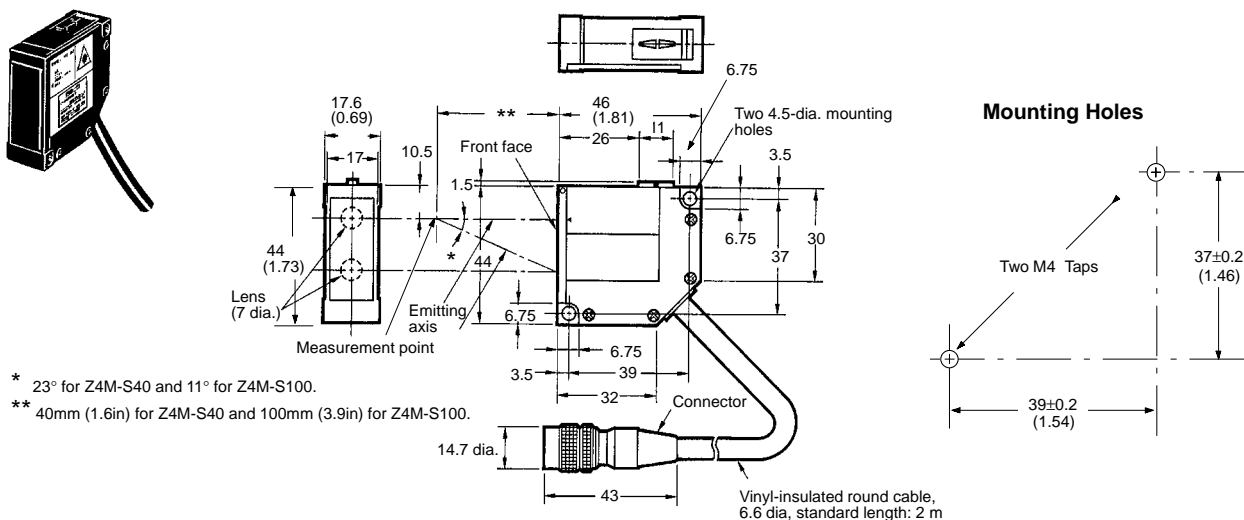
1. Connect an Intelligent Panel Meter to the Sensor and move the object so that the output will be 4 V.
2. Use the span adjuster to adjust the voltage to 5 V.



Dimensions

Unit: mm (inch)

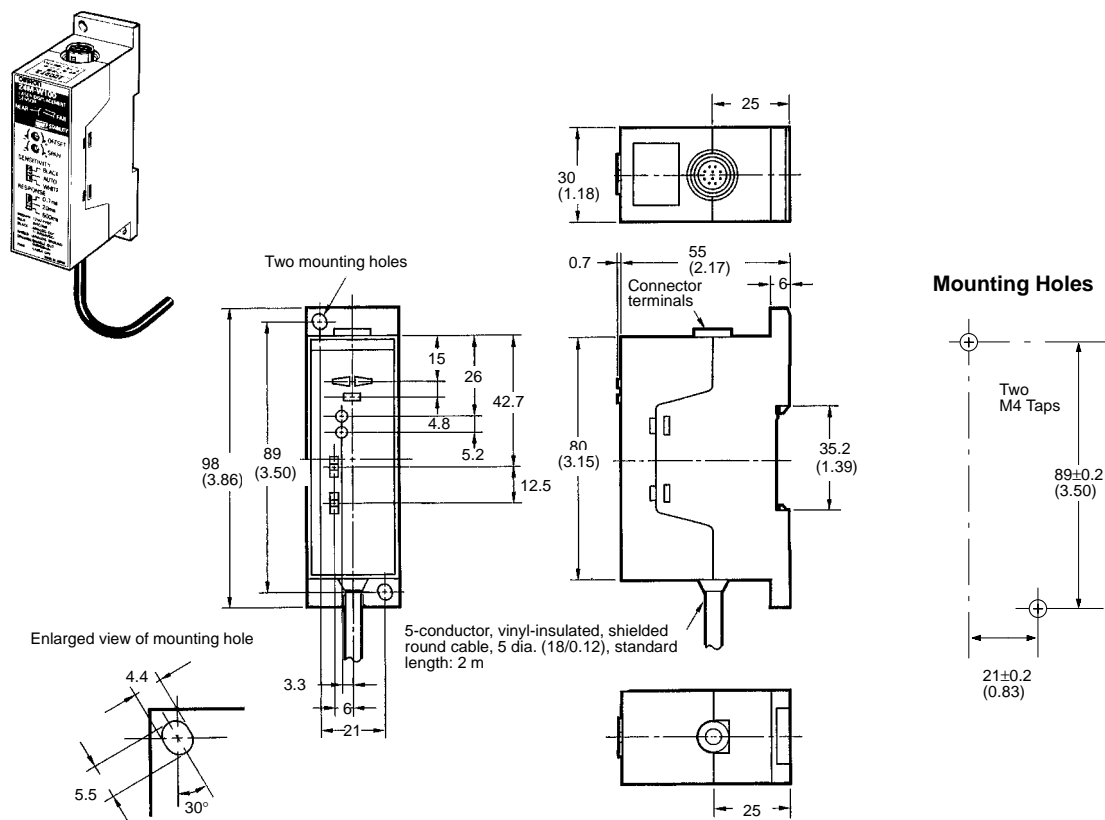
■ SENSOR: Z4M-S40 (FOR Z4M-W40), Z4M-S100 (FOR Z4M-W100)



* 23° for Z4M-S40 and 11° for Z4M-S100.

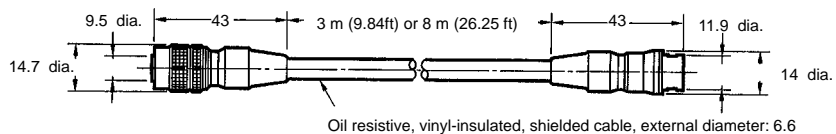
** 40mm (1.6in) for Z4M-S40 and 100mm (3.9in) for Z4M-S100.

■ AMPLIFIER: Z4M-W40C(FOR Z4M-W40), Z4M-W100C (FOR Z4M-W100)

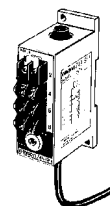


■ ACCESSORIES (SOLD SEPARATELY)

Extension Cable, Z49-C1



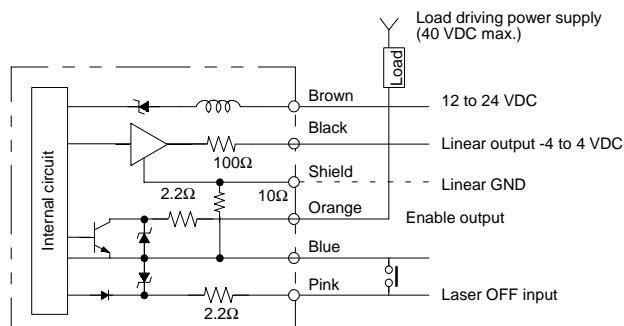
Laser Safety Kit, Z49-SF2



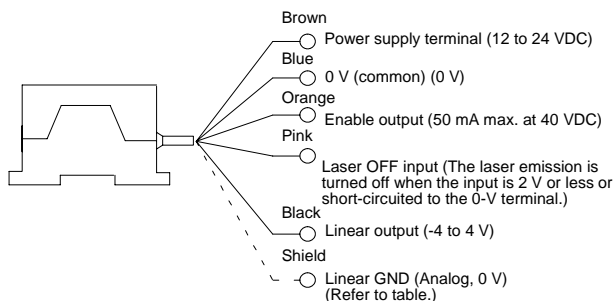
Installation

■ ELECTRICAL CONNECTIONS

Output Circuit Diagram



Connections



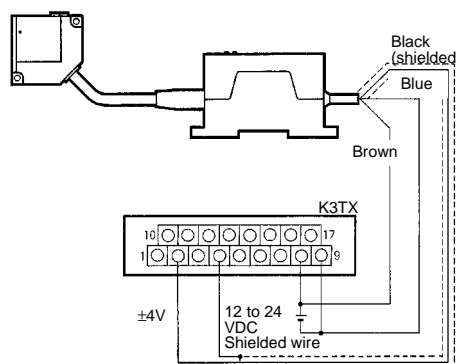
- Note: 1. Do not mount the Z4M to a DIN rail for use in a place with excessive vibration.
2. Use connectors to connect the Sensor to the amplifier. Do not turn or twist the cable, or cable disconnection may result.

| | |
|------------------------------|--|
| 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.), at which time the linear output of the Sensor will be on hold. |
| 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 (0V) terminal for the linear output of the Sensor. Connect this line to the input device. |

- Note: 1. 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.
2. Wire the sensor correctly, or the sensor may be damaged. Refer to the wiring precautions provided within the *Precautions* section.

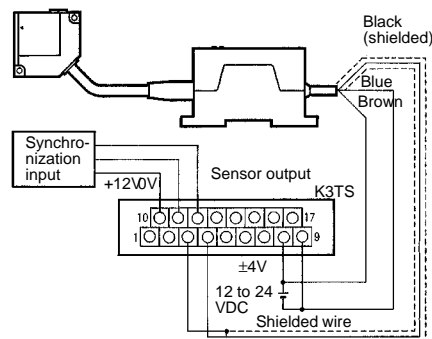
Connection with K3TX Intelligent Digital Panel Meter

- Choose an appropriate K3TX model according to the application.
- Refer to the K3TX data sheet for operational instructions in detail.
- If a K3TX model is used with an AC power supply, connect an independent DC power supply to the Z4M Laser Displacement Sensor.



Connection with K3TS Intelligent Digital Panel Meter

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



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.

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.

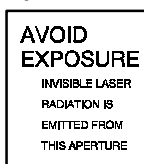
Labels (FDA Regulations)

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

Danger Label



Aperture Label



Remote Interlocked Connector

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

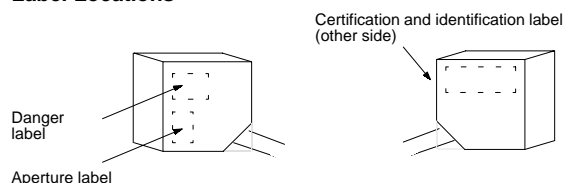
Laser Beam Attenuator

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.

Certification and Identification Label

| | |
|---|-------------------------|
| TYPE | Z4M-S100 |
| (T _c = 25°C, | 2100 μW) |
| T: 33 μsec | ts: 120 μsec f: 8.3 KHz |
| This product complies with 21 CFR 1040.10 and 1040.11 | |
| OMRON Corporation | |
| KARASUMA NANAJO, SHIMOGYO-KU, KYOTO, 600 JAPAN | |
| MANUFACTURED ,1992 A | |

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!

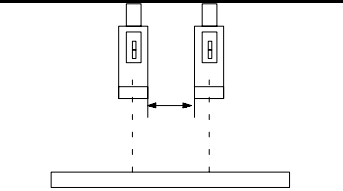
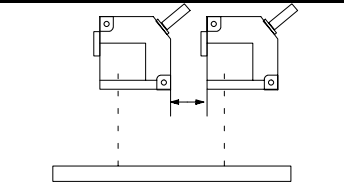
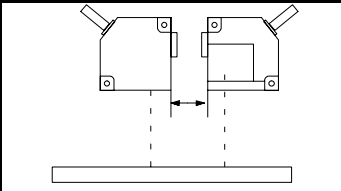
Never disassemble the Sensor. Users expose themselves to the risk of laser radiation if they disassemble the device.

COMPATIBILITY

The Z4M Laser Displacement Sensor and amplifier are adjusted as a set, and they have the same serial number. This Sensor or amplifier cannot be used with another amplifier or Sensor.

MUTUAL INTERFERENCE

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

| Installing 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) |

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 is subjected to the reflection of intensive light (such as, light from a laser beam or an electric arc welding machine).

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).

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 the Sensor malfunctioning.

WIRING

DANGER!

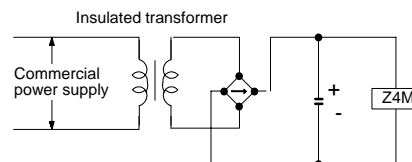
Do not wire the power supply cable for the Z4M Sensor in the same conduit with high-voltage lines or power lines. The result would be interference, damage, or malfunction.

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.

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 autotransformer may cause the Z4M to malfunction.



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

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