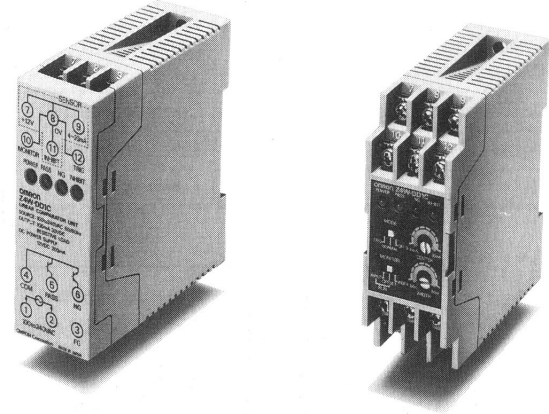


Linear Sensor Controller

Z4W-D

Discriminator, Sensor Power Supply, and Sync Inputs in One Unit. Easy to Use in Combination with Linear Sensors

- Analog input: 4 to 20 mA; Pass/NG outputs.
- High-capacity built-in power supply (200 mA, 12 VDC).
- Sync input for trigger sensor.
- Slim body with track mounting.



Ordering Information

Power supply voltage	Inputs	Outputs	Model
100 to 240 VAC	4- to 20-mA analog, sync, and inhibit	Pass and NG	Z4W-DD1C

Specifications

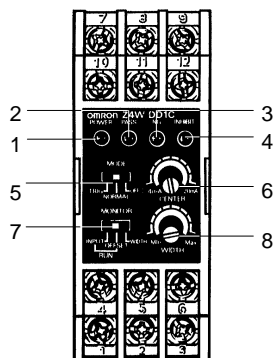
■ Ratings

Power supply voltage		100 to 240 VAC \pm 10%, 50/60 Hz
Power consumption		15 VA max.
Sensor power supply		200 mA max. at 12 VDC \pm 10% (short-circuit protection provided)
Analog sensor		Displacement, proximity linear, pressure linear, and other sensors with analog outputs between 4 and 20 mA DC
Sync input sensor		NPN transistor output. Synced on leading edge.
Inhibit input sensor		NPN transistor output. ON: Pass and NG outputs inhibited
Inputs	Analog input (4 to 20 mA)	4 to 20 mA DC (impedance: 100 Ω max.; 30 mA max.)
	Sync input (TRIG) Inhibit input (INHIBIT)	ON voltage: 0 to 3 V; OFF voltage: 9 to 12 V; short current: 15 mA; maximum voltage: 13.2 V
Response time (Total I/O delay)		TRIG mode: 1 ms max. NORMAL or OFF-DELAY: 5 ms max.
Discrimination range		Reference range: 4 to 20 mA (FS) Tolerance: \pm 1.25% to \pm 25% FS
Internal hysteresis		1% FS max. (total temperature range)
Outputs	Discrimination outputs (Pass/NG)	NPN open collector, 30 VDC, 100 mA max.
	Monitor output (MONITOR)	1 to 5 VDC voltage output (tolerance, input value, and center correction are switch-settable)
Indicators		POWER, PASS (green) NG, INHIBIT (red)
Timer		40 \pm 8 ms (OFF-DELAY mode)
Power-on reset time		400 ms min., 3.5 sec max.

■ Characteristics

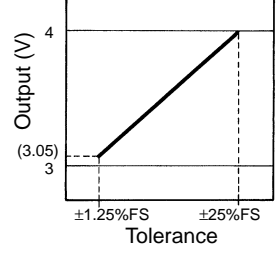
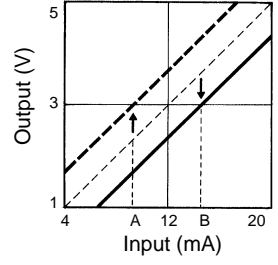
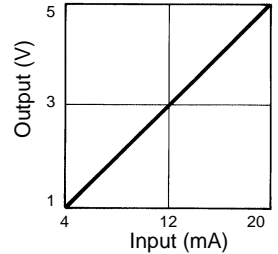
Noise immunity	±1,500 V _{p-p} max.; noise pulse width: 1 ms
Vibration resistance	Destruction: 10 to 150 Hz (0.75-mm double amplitude, 7G max.) for 8 min each in X, Y, and Z directions
Shock resistance	Destruction: 30G for 3 times each in X, Y, and Z directions
Momentary power interruption withstand time	20 ms max.
Ambient temperature	Operating: -10°C to 55°C (with no icing)
Ambient humidity	35% to 85% (with no icing)
Weight	140 g (with terminal cover)

Nomenclature



No.	Name	Function
1	Power indicator (POWER: green)	Lit when power is on and the Sensor power supply output is available. Not lit when power is off or the Sensor power supply output is short-circuited (the +12 V and 0 V terminals are short-circuited).
2	PASS output indicator (PASS: green)	Lit when the PASS signal (a discrimination output) is ON.
3	NG output indicator (NG: red)	Lit when the NG signal (a discrimination output) is ON.
4	Inhibit input indicator (INHIBIT: red)	Lit when an INHIBIT signal (an inhibit input at terminal 11) is accepted. The PASS and NG signals will be turned OFF.
5	Mode selector (MODE)	<p>TRIG: A discrimination operation is effective when the synchronous input is ON (at the rising edge). The result is held until the next synchronous input is received. No discriminating operation is effective when the INHIBIT signal is ON, even if the TRIG signal is ON.</p> <p>NORMAL: Discrimination output from analog output signals of the Linear Sensor is available. No discrimination output is available when the INHIBIT signal is ON. The Z4W-D resumes operation 5 ms (max.) after the INHIBIT signal turns OFF.</p> <p>OFF-D: Discrimination output from analog output signals of the Linear Sensor is available. The PASS signal can be held for approximately 40 ms in OFF-delay operation. Even if the PROHIBIT signal is ON, the PASS signal is held when the OFF-delay function is effective. No discrimination output is available when the PROHIBIT input is ON. The Z4W-D resumes operation 5 ms (max.) after the INHIBIT signal turns OFF.</p>
6	Center adjuster (CENTER)	A value of 4 to 20 mA can be set on the adjuster (a two-turn variable resistor) as the standard value for discrimination.

No.	Name	Function
7	Monitor selector (MONITOR)	<p>RUN: For INPUT or OFFSET signals. Set to this position when the Z4W-D is in operation.</p> <p>INPUT: An input signal of 4 to 20 mA is converted into a 1 to 5 V signal and output to the monitor terminal.</p> <p>OFFSET: An input signal of 4 to 20 mA is converted into a 1 to 5 V signal and output to the monitor terminal. With the dial turned to the OFFSET position, the standard value set is converted into a 3-V signal.</p> <p>----- Monitor output with standard value A _____ Monitor output with standard value B</p> <p>WIDTH: The tolerance value set is converted into an electrical signal and output to the monitor terminal.</p> <p>The relationship between the monitor output voltage and tolerance is as follows: $V_x (V) = \text{Monitor output voltage}$ $\pm W_o (\% \text{ FS}) = \text{Tolerance}$ $V_x = 3 + W_o \times 1/25$</p>
8	Width adjuster (WIDTH)	The tolerance value can be set within the range of $\pm 25\%$ FS (using a two-turn variable resistor and indicator).



Operation

■ Main Functions of the Linear Sensor Controller

When used in conjunction with a Displacement Sensor (or any other Linear Sensor that has a DC output of 4 to 20 mA) in product discrimination operations, the Linear Sensor Controller differentiates between acceptable products (products within the permissible range of dimensions (PASS)) and defective products (products outside the permissible range of dimensions (NG)).

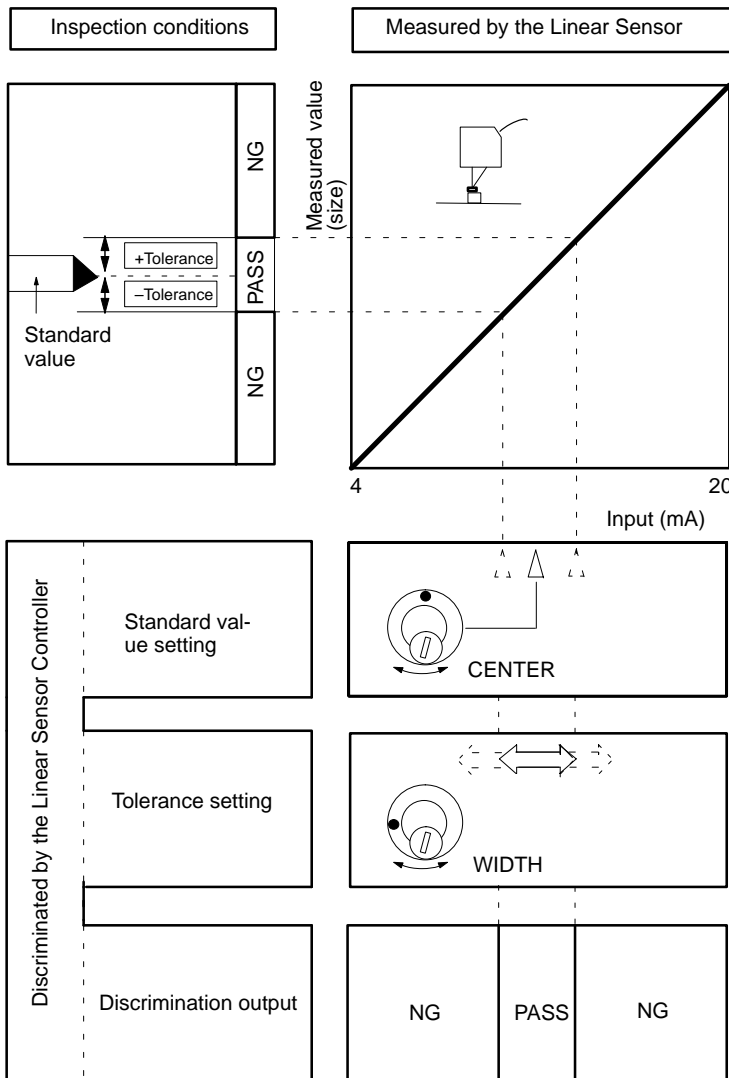
The permissible range of dimensions is set using the two controllers on the front panel of the Z4W-D. When the Linear Sensor or Displacement Sensor is used in combination with the Linear Sensor Controller to test product dimensions, the permissible range of dimensions is defined as follows:
 Standard value ± tolerance

The standard value and tolerance for the given product are set on the two adjusters.

A Photoelectric Sensor (Synchronization Sensor) can be used together with the Linear Sensor and Linear Sensor Controller for synchronization.

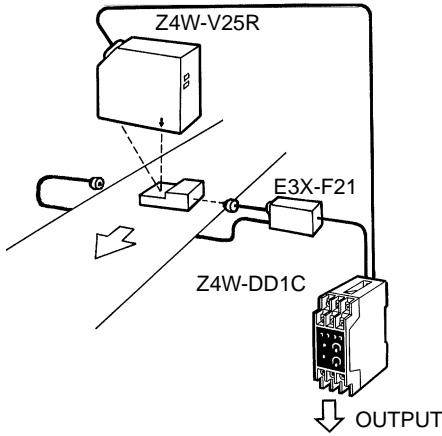
Power (up to 200 mA at 12 VDC) can be supplied to the Linear Sensor and the Synchronization Sensor via the Linear Sensor Controller.

By checking the voltage of the monitor terminals with the Panel Meter or a multimeter, the standard value and tolerance set by the two adjusters on the front panel of the Linear Sensor Controller can be monitored and confirmed.

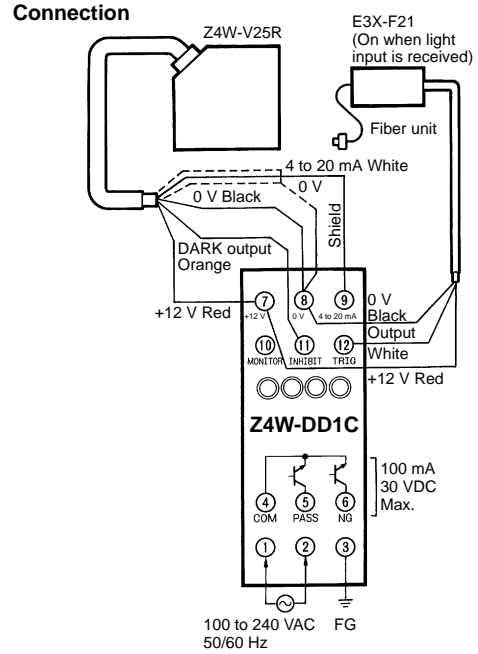


Application Example

1. Checking Part Sizes



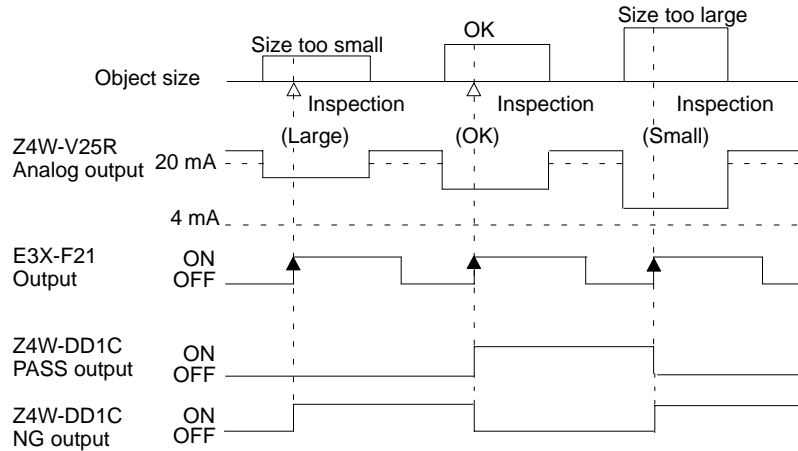
The size of molded parts is measured by the Displacement Sensor synchronized with the Fiber Photoelectric Sensor to produce a PASS or NG output. To use a reflective type sensor, select the mode in which the Photoelectric Sensor is ON when a light input signal is detected.



Z4W-DD1C Mode Selector Switch

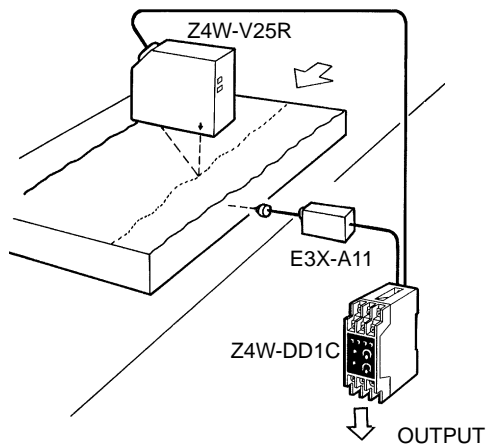
Mode selector switch (MODE)	TRIG
Monitor selector switch (MONITOR)	RUN

Timing Chart

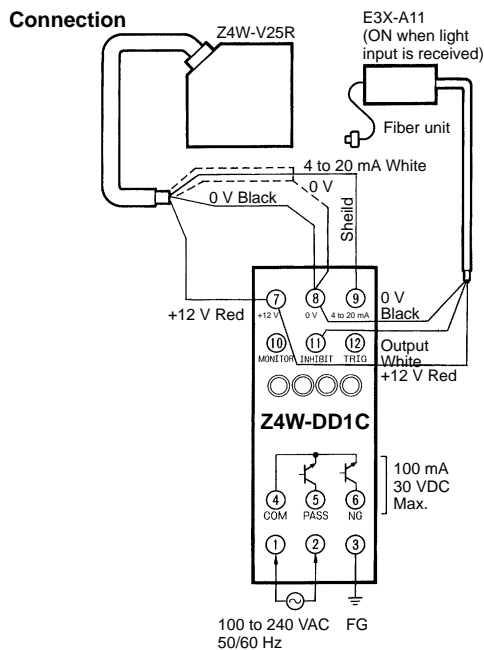


- Note:**
1. When no object is in front of the Displacement Sensor in the DARK state, both the PASS output and NG output of the Z4W-DD1C, synchronized by the TRIG input, are OFF. However, by disconnecting the DARK output of the Displacement Sensor from terminal 11 (INHIBIT) of the Z4W-DD1C, the NG output of the Z4W-DD1C in the DARK state turns ON.
 2. If the user does not want the Z4W-DD1C output signals to be retained because the Z4W-DD1C is connected to a PC or a Counter, refer to the third application example, "Checking the Packing of Bottle Tops."

2. Checking Plate Flatness



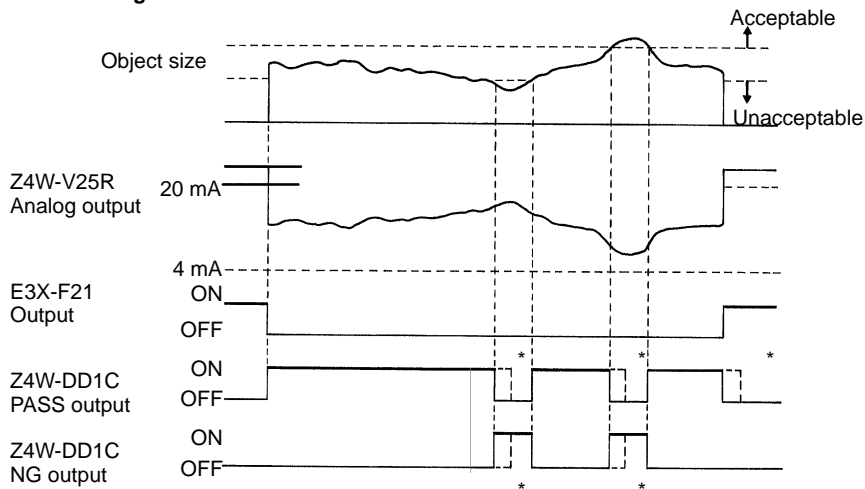
While the plates are measured by the Displacement Sensor, the NG signal is output by the Linear Sensor Controller whenever the thickness of the plates deviates outside the permissible range. When the Fiber Photoelectric Sensor is connected to the INHIBIT terminal of the Z4W-DD1C, the Fiber Photoelectric Sensor operates such that the INHIBIT signal is ON when an object is detected and OFF when no object is detected. The Z4W-DD1C operates only when an object is detected.



Z4W-DD1C Mode Selector Switch

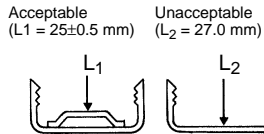
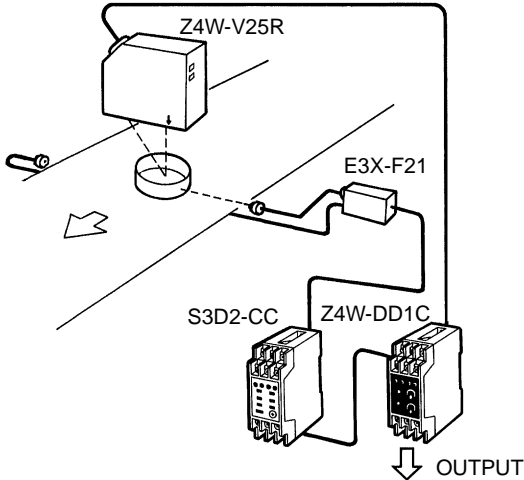
Mode selector switch (MODE)	NORMAL or OFF-D
Monitor selector switch (MONITOR)	RUN

Timing Chart



Note: When the Z4W-DD1C selector switch is set to OFF-D, a PASS output OFF-delay of approximately 40 ms results, illustrated by asterisks in the above timing chart.

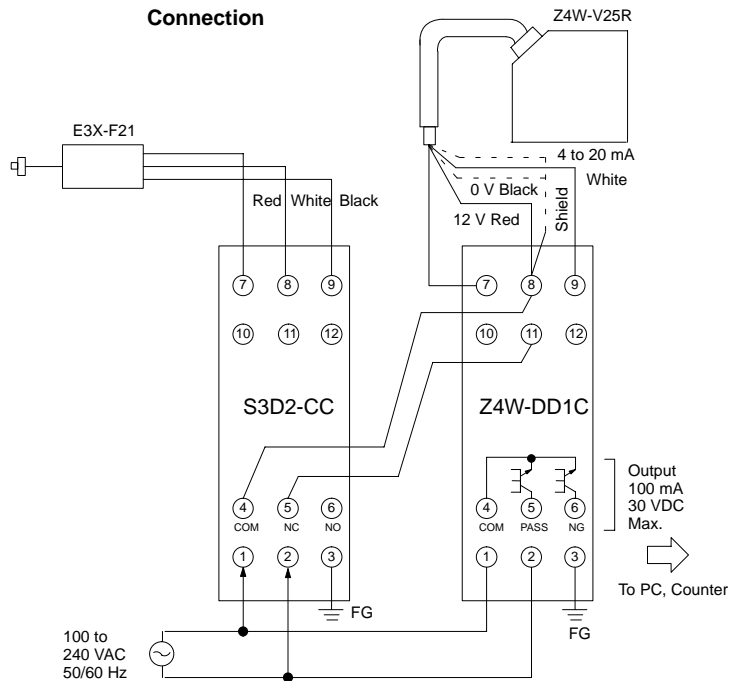
3. Checking the Packing inside Bottle Tops



The number of acceptable objects as well as the number of unacceptable objects are counted by Counter or PC.

The bottle tops are measured by the Displacement Sensor. By using the one-shot timer function of the S3D2 Sensor Controller in combination with the Fiber Photoelectric Sensor, the Z4W-DD1C operates only when a bottle top is within the detection spot of the Displacement Sensor. With a Counter or PC connected to the Linear Sensor Controller, the operation of counting is simple since only one pulse signal (PASS or NG) is output for each bottle top. If a reflective type fiber is used, select the mode in which the Photoelectric Sensor is ON when a light input signal is detected.

Connection

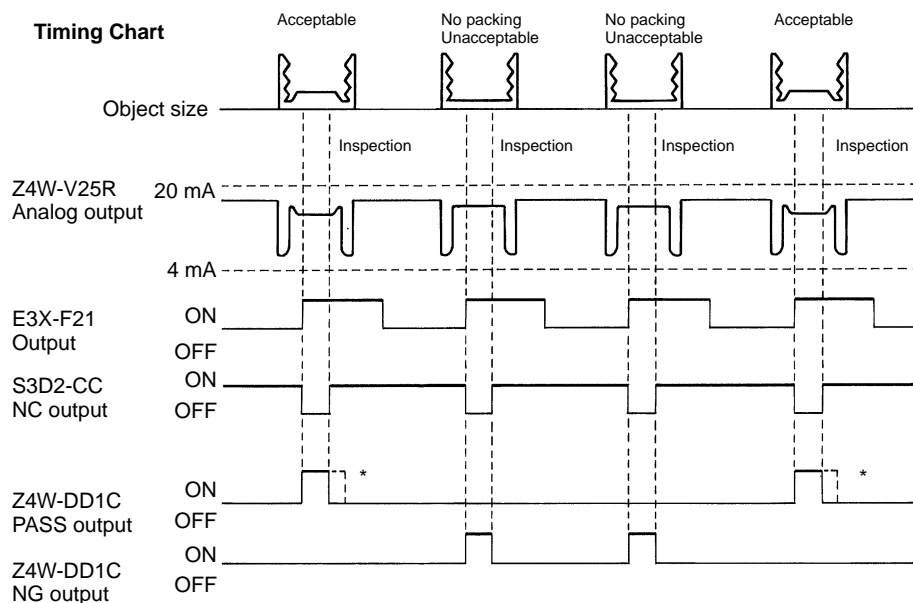


Z4W-DD1C Mode Selector Switch

Mode selector switch (MODE)	NORMAL or OFF-D
Monitor selector switch (MONITOR)	RUN

S3D2-CC Mode Selector Switch

IN1	NORM	
MODE	OR	
IN2	NORM	IN2 can be at any position since it is not used.
SYNC		
TIMER	ON	
RANGE	0.1 s	
TIMER MODE	O.S	



Note: When the Z4W-DD1C Mode Selector Switch is set to the OFF-D position, an output OFF-delay of approximately 40 ms results, illustrated by asterisks in the timing chart.

■ Sensors Driven by Synchronous or INHIBIT Inputs

Sensors with Relay Outputs

The Z4W-D responds instantly to an input signal. Take care to prevent the Z4W-D from malfunctioning when connecting a relay output type sensor to the Z4W-D, since noise caused by contact bouncing, relay chattering, or the snap-action switch may be mistaken as an input signal to the Z4W-D.

Incompatible Sensors

The Linear Sensor Controller cannot be connected to a Sensor that does not have a NPN open-collector output. Therefore two-wire type, voltage output type, or AC type Sensors cannot be connected to the Linear Sensor Controller.

Discrimination Output

If a noise-generating component such as an inductive load is connected to the Linear Sensor Controller, a surge absorbing element (a diode for example) should be connected with the load.

■ Operations

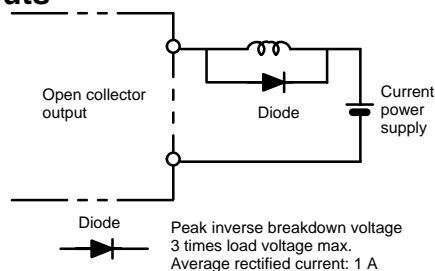
Sensor Connection

Before connecting any sensors to the Z4W-DD1C, refer to the instruction manuals for the sensor models (such as the Linear Sensor and Synchronization Sensor) you will use. Also refer to the connection examples on page 10, and the application examples on pages 5 to 8.

Do not switch power on when connecting the sensors to the Z4W-DD1C. If power is required for the purpose of adjustment (such as for the adjustment of the axis of a sensor), make sure nothing is connected to the output terminals (terminals 4, 5, or 6 (PASS and NG)) of the Z4W-DD1C before power is turned ON.

Setting Standard Value

1. To register the Linear Sensor Controller with the desired standard value, adjust the Linear Sensor so that its output value will be as large as the desired standard value. To discriminate between objects with the Displacement Sensor for example, prepare a standard sized product to be measured by the Sensor first.
2. Set the Z4W-DD1C Mode Selector Switch to the NORMAL position.
3. Turn the WIDTH controller counterclockwise to the MIN position.



4. Turn the CENTER controller clockwise or counterclockwise and set the controller to the position where the PASS LED is lit. If the PASS LED is lit for a wide range of positions, set the controller in the middle of the range. If the PASS LED does not light with the CENTER controller in any position, turn the WIDTH controller clockwise slightly.

Setting the Tolerance

1. To register the Linear Sensor Controller with the desired tolerance, adjust the Linear Sensor so that its output value will be as large as the desired threshold value (i.e. the standard value plus the tolerance or the standard value minus the tolerance). In operation with the Displacement Sensor for example, an object of threshold dimensions must be measured by the Sensor. Set the Z4W-DD1C Mode Selector Switch to the NORMAL position.
2. Set the Z4W-DD1C Mode Selector Switch to the NORMAL position.
3. Turn the WIDTH controller clockwise slowly from the MIN position. Set the controller to the position where the PASS LED is lit and the NG LED is OFF.

Setting the Mode Selector Switch

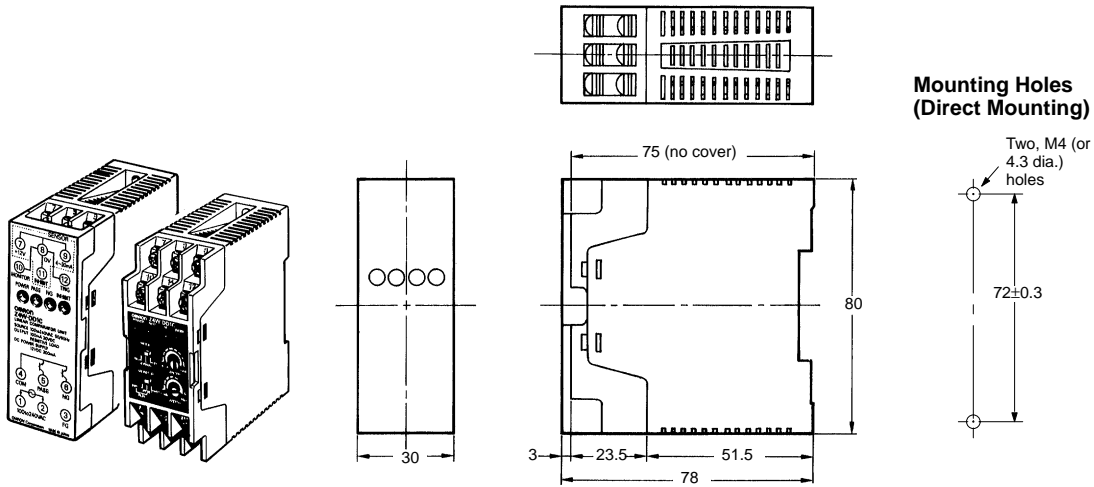
The Mode Selector Switch is set to RUN to operate the Z4W-DD1C (refer to the table). After selecting RUN, wire the output terminals (terminals 4, 5, and 6 (PASS/NG)).

Switch	Position of the selector switch	
Mode selector switch	TRIG	In this position, if the Synchronization Sensor is connected to the Linear Sensor Controller via terminal 12 (TRIG), the discrimination operation is available every time the output of the Synchronization Sensor is ON. The Linear Sensor Controller holds the result until the next discrimination operation.
	NORMAL	This position can be selected if the Synchronization Sensor is not used. This position can be selected if the Synchronization Sensor is connected to the Linear Sensor Controller via terminal 11 (INHIBIT) and the Synchronized Sensor is set so that it will have no output when there is no object. While there is no object, the discrimination output is OFF. With a counter connected to the Linear Sensor Controller, counting is simple.
	OFF-D	There is no difference between operation in the NORMAL position and the OFF-D position except the OFF-delay function. In this position, an OFF-delay of 40 ms results. If the PC is connected to the Linear Sensor Controller with this position selected, only the PASS output is available.
Monitor selector switch	RUN (INPUT or OFFSET)	

Note: MONITOR output
In Monitor Modes by measuring the monitor output voltage with a multimeter or Panel Meter, the standard and tolerance values set can be monitored. Refer to page 2 "Nomenclature."

Dimensions

Note: All units are in millimeters unless otherwise indicated.

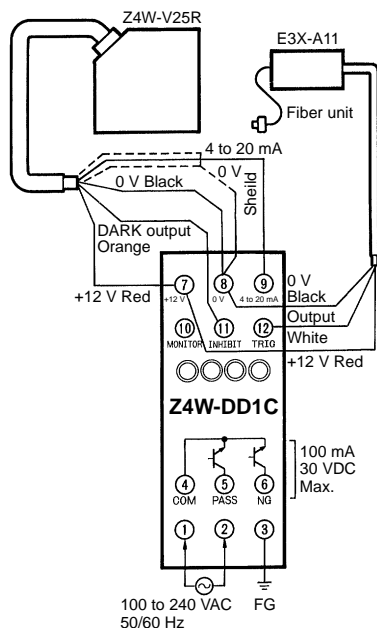


Installation

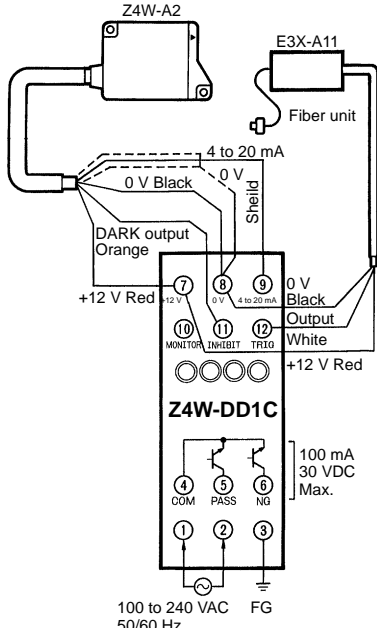
■ Connections

A Linear Sensor model with a current output of 4 to 20 mA (such as an E4DA Ultrasonic Displacement Sensor, E3XA or E3SA Analog Photoelectric Sensor) can be connected to linear input terminal 9 (4 to 20 mA).

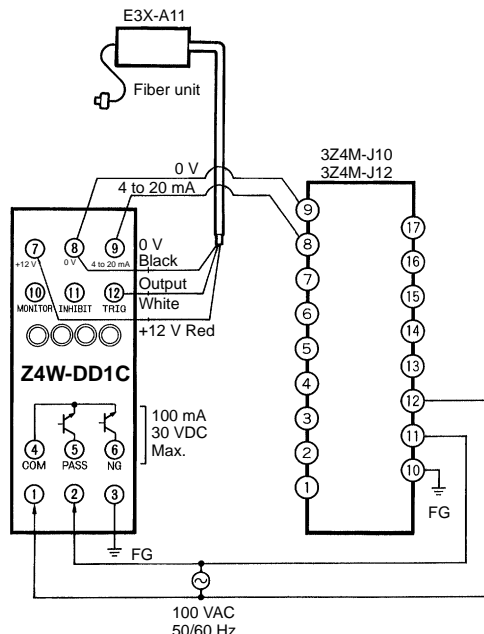
Connection with a Z4W-V Displacement Sensor



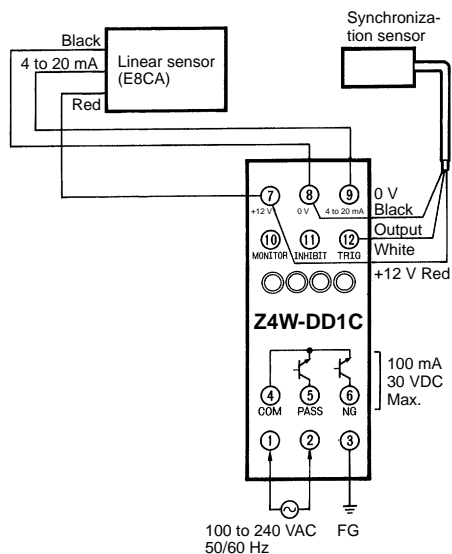
Connection with a Z4W-A Displacement Sensor



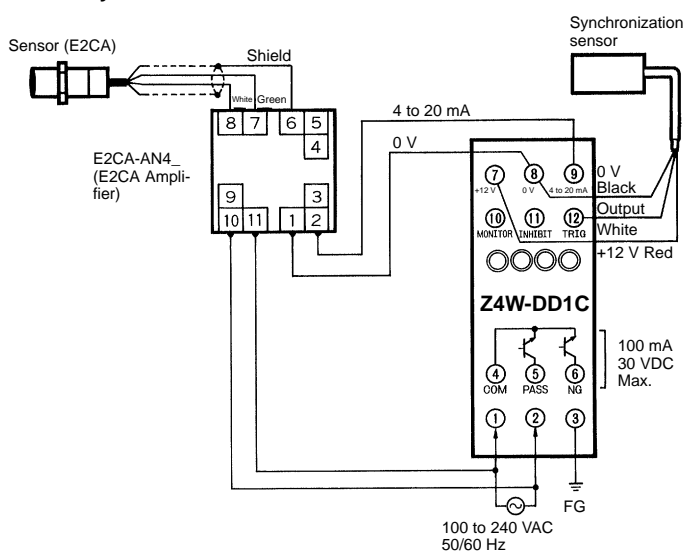
Connection with a 3Z4M-J10/J12 Displacement Sensor



Connection with a E8CA or E8AA Pressure Linear Sensor

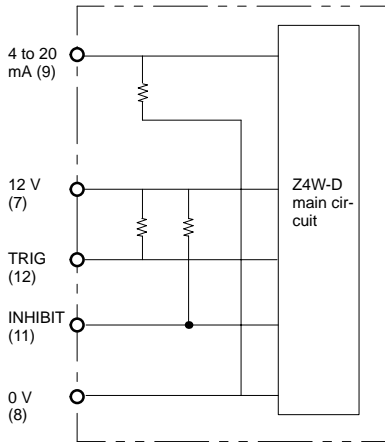


Connection with a E2CA Proximity Linear Sensor

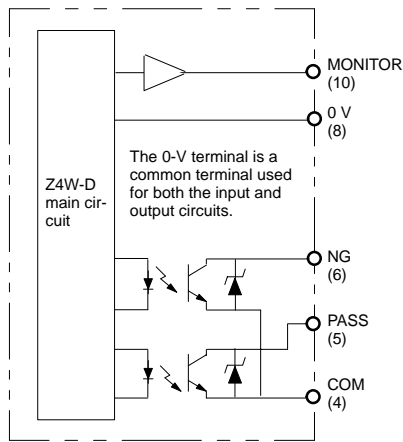


I/O Circuits

Input Circuit

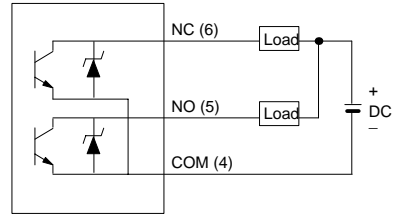


Output Circuit



Connection of Loads

Loads are connected to the collector.



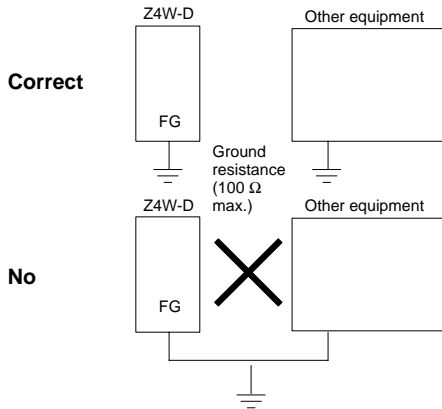
Precautions

Operation and Wiring

Connect the power supply to the power supply terminal correctly. The supply voltage must be 100 to 240 VAC ±10%.

FG is a ground terminal. When using the Z4W-D in an environment where the Z4W-D is exposed to excess noise, the FG terminal must be grounded with a ground resistance of 100 Ω max.

Ground FG independently. Grounding FG via the ground lines of other equipment or connecting FG to the building substructure may result in the malfunction of the Z4W-D due to noise interference.

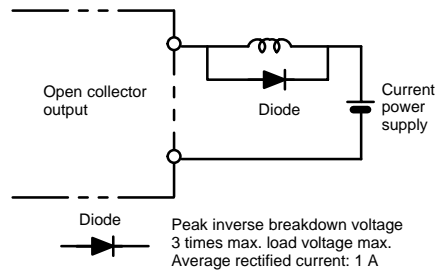


Wire the input and output lines of the Z4W-D separately to avoid malfunction due to noise.

Power lines carrying large currents (such as power lines supplying motors) must be kept at least 20 cm away from the Z4W-D.

Output

If a noise-generating component such as an inductive load is connected to the Linear Sensor Controller, a surge absorbing element (a diode for example) should be connected with the load. In this case, the cathode of the diode must be connected to the positive terminal of the power supply.



Power Supply when Operating with Sensor

The power supply reset time of the Z4W-D is 0.4 s. Power can be supplied to the Sensor via the sensor power supply terminals of the Z4W-D. In this case, however, the response time of the sensor connected should be 0.4 s or less. Use of a sensor with a response time larger than 0.4 s results in the sensor malfunctioning upon switching on power.

If power is supplied to the Sensor via an independent power supply, switch on the Sensor power first before switching on the Z4W-D power ON. Switches power to the Z4W-D ON first produces a momentary output.

Upon power being applied to the Z4W-D, a delay of 0.4 to 3.5 s occurs before the Z4W-D becomes operational.

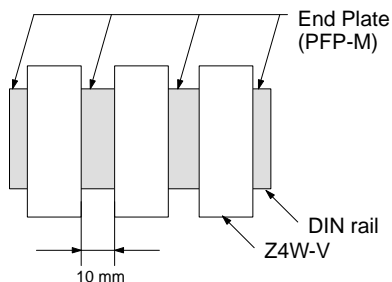
The Z4W-D will have a momentary output when power is turned OFF.

Mounting within a Control Panel

Take heat radiation into consideration when mounting the Z4W-D in a control panel.

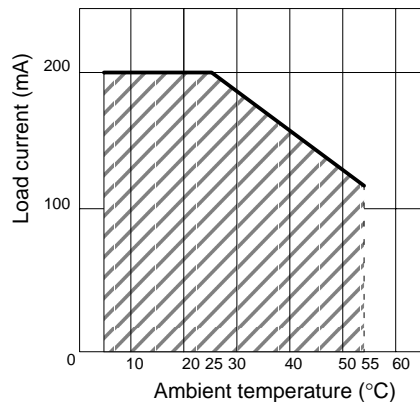
Installation Close Proximity

Z4W-D Linear Sensor Controllers can be installed close proximity of each other, though a minimum gap of 10 mm must be maintained between the Controllers.



Note: A PFP-M End Plate may be used to ensure a gap of 10 mm is attained.

Refer to the graph below if Controllers are to be installed close proximity of each other.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E218-E1-1 **In the interest of product improvement, specifications are subject to change without notice.**

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Printed in Japan
0791-2M (0791)