OMRON

Parallel-Beam Linear Sensor

Z4LA

Infrared Class IIIb Laser Width/Profile Measurement Sensor Providing High Speed Precision Object Measurement and Flexible Operation



- FDA Class IIIb IEC Class 3 Infrared Laser for Use with Z49-SF1 Laser Safety Kit
- 5-micron resolution maximum
- 1 to 5 VDC Linear Output
- Adjustable discrimination output with LED indicator on receiver
- Emitter with laser operation monitor alarm output with *red* LED indicator
- Emitter with laser on *green* LED indicator
- 2 selectable response times of 0.5 or 5 ms
- 0 to 300 mm sensing distance
- 10 mm beam width

Ordering Information

■ SENSOR

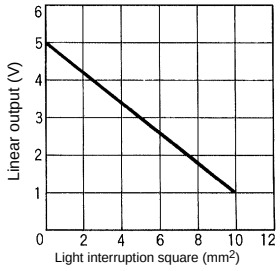
Sensing method	Sensing distance	Sensing width	**Part number**
Through-beam	0 to 300 mm	10 mm	**Z4LA-1030**
Side-view through-beam			**Z4LA-1030-05**

■ ACCESSORIES (ORDER SEPARATELY)

Description	**Part number**
90 degrees side-view adapter for emitter or receiver	**Z4LA-F1**

■ LINEAR OUTPUT VS. LIGHT INTERRUPTION SQUARE

Z4LA-1030
Z4LA-1030-05



- The laser diode emits a parallel beam of infrared light. Through a 10 mm by 1 mm aperture (10 mm^2 area), the receiver monitors the amount of light present.
- The analog output of the receiver is proportional to the amount of light interrupted.
- Zero percent of emitted light interrupted generates a 5 VDC output.
- 100% of emitted light interrupted generates a 1 VDC output.

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Specifications

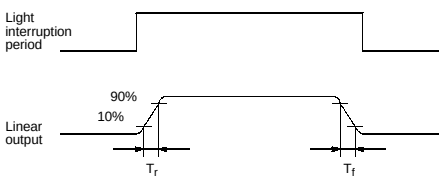
■ RATINGS

Item	Z4LA-1030	Z4LA-1030-05
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.	
Current consumption	80 mA max. (consumed by emitter and receiver)	
Light source	Semiconductor laser (780 nm, 5 mW)	
Measurement width	10 mm	
Sensing distance	0 to 300 mm	
Response time (See Note.)	5 ms or 0.5 ms switch-selectable	
Resolution	5 μm (2 mV at 5 ms response time) 10 μm (4 mV at 0.5 ms response time)	
Minimum target	0.1-mm dia. (opaque)	
Linear output	Output voltage: 1 to 5 VDC Output impedance: 100 Ω; allowable load resistance: 10 KΩ min. Resolution: 2 mV (response time: 5 ms) or 4 mV (response time: 0.5 ms); switch-selectable	
	Temperature influence: Typ. 0.1% FS/°C max.	Temperature influence: 0.2% FS/°C (for sensing distance of 100 mm); 0.4% FS/°C (for sensing distance of 300 mm).
Control output	Discrimination output: NPN open collector (100 mA max. at 30 VDC); residual voltage: 1 V max. LD monitor output (self-diagnostic output): NPN open collector (100 mA max. at 30 VDC); residual voltage: 1 V max.	
Control input	Laser emission OFF: Short-circuit the laser OFF input line and GND line or reduce the laser OFF input to 2 V max. Laser emission ON: Open (with a leakage current of 0.1 mA max.) the laser OFF input line (Linear output HOLD function incorporated)	
Repeat accuracy	5 μm (response time: 5 ms) or 10 μm (response time: 0.5 ms); switch-selectable	
Indicator	Emitter: Laser ON indicator (green LED); alarm indicator (red LED) (self-diagnostic output) Receiver: Discrimination output indicator (red LED)	

■ CHARACTERISTICS

Item	Z4LA-1030	Z4LA-1030-05
Vibration resistance	Destruction: 10 to 150 Hz, 1.5-mm double amplitude for 32 min each in X, Y, and Z directions	
Shock resistance	Destruction: 300 m/s^2 (approx. 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	
Ambient humidity	Operating: 35% to 85% (with no condensation)	
Ambient illuminance	Incandescent lamp: 10,000 lux max. Sunlight: 10,000 lux max.	
Material	Case: diecast aluminum emitter and receiver	
Cable length	2 m emitter and receiver, extendable up to 5 m	
Material	diecast aluminum emitter and receiver	
Weight	Emitter: 150 g (including 2-m cable) Receiver: 150 g (including 2-m cable)	Emitter: 160 g (including 2-m cable) Receiver: 160 g (including 2-m cable)
Attachments	Two mounting brackets, four mounting M4 screw, one screwdriver, five warning labels for laser emission, and one optical axis adjustment label.	

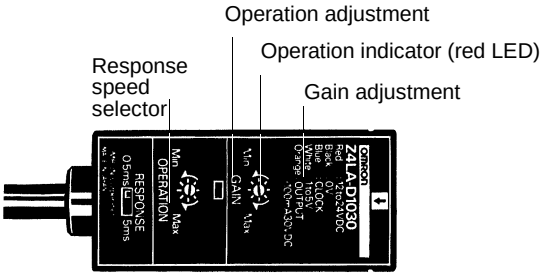
Note: The response time was calculated from the rise time of the linear output (the time required for the linear output to reach 90% of the maximum output from 10% of it) or fall time (the time required for the output to decrease to 10% of the maximum output from 90% of it) when the light interruption curve is rectangular in shape as shown:

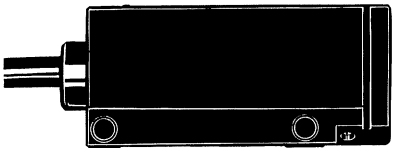


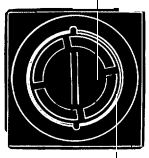
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Nomenclature

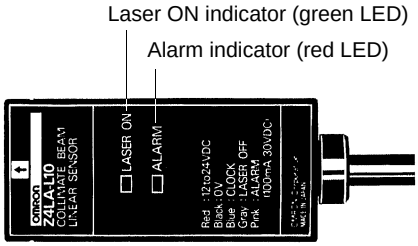
■ Z4LA-D1030 RECEIVER

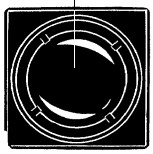






■ Z4LA-L10 EMITTER



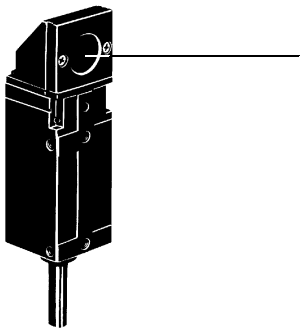




Warning for laser

Part numbers are for reference only. The emitter and receiver are sold as a set and cannot be purchased separately.

■ Z4LA-D1030-05 RECEIVER

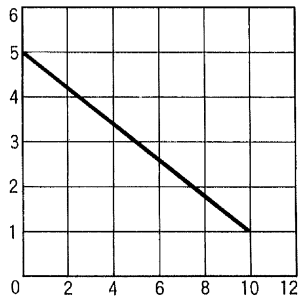


■ Z4LA-L1005 EMITTER



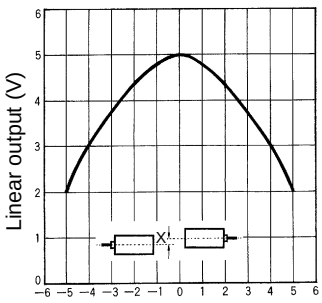
Engineering Data

■ LINEAR OUTPUT VS. LIGHT INTERRUPTION SQUARE



Light interruption square (mm^2)

■ LINEAR OUTPUT VS. PARALLEL DISPLACEMENT CHARACTERISTICS (TYPICAL)

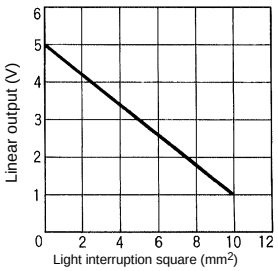
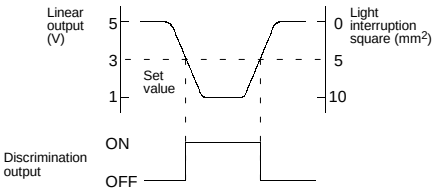
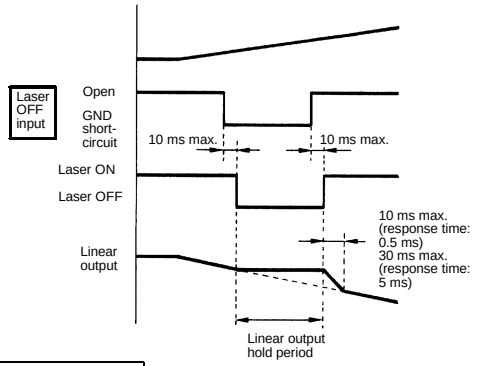


Parallel displacement X (mm)

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Operation

■ FUNCTIONS

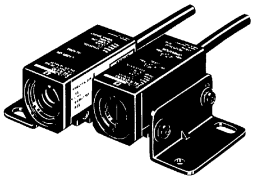
	Classification	Function
OUTPUT	**Linear Output**	The laser diode incorporated emits an even, parallel laser beam. The receiver catches the emitted laser beam through an *aperture* (1 mm wide and 10 mm high) attached to the receiver. The *aperture* determines the sensing zone of the sensor. If the laser beam reaches the sensing zone without being interrupted by the target, the sensor's linear output will be 5 V. If 5 mm^2 of the sensing zone does not receive the laser beam because the emitted beam is partly interrupted by the target, the linear output will be 3 V. If the sensing zone receives no laser beam emission because all emission is interrupted by the target, the linear output will be 1 V. A linear output of 1 V will be put *ON HOLD* for two to four seconds after you turn on the sensor (until the emitter's laser emission starts). Linear Output vs. Light Interruption Square 
	Discrimination Output with Indicator	When the linear output is less than the value that you preset with the operation adjustment on the receiver, the operation indicator (OPERATION, red LED) will light and the discrimination output will turn ON simultaneously. For example, if your preset value is 3 V, the indicator will be ON when 5 mm^2 or more area of the sensing zone receives no laser beam The *discrimination output* is an open collector output (100 mA max. at 30 VDC). 
INPUT	**Laser OFF Input and Linear Output HOLD Function**	The laser OFF input controls laser emission. When the laser OFF input line and GND line are short-circuited (or when the laser OFF input is 2 V max.), laser emission will stop. When the laser OFF input line is open (or when the laser OFF input is more than 2 V), laser emission will continue. When the laser OFF input is used (2 VDC max.), the linear output will be held at the value existing when the laser OFF was engaged. It will not take more than 10 ms for the laser diode to start or stop laser emission. The time required to release the linear output that has been put on hold varies with the response speed as shown here. Light Interruption Square  **Note:** When the laser OFF input is ON, the discrimination output will be prohibited. RESPONSE SW / Release time: 5 ms — 30 ms max.; 0.5 ms — 10 ms max.
INDICATORS	**Laser ON indicator**	When you turn on the Z4LA, the laser ON indicator (green LED) will light and you will be alerted to laser emission. The laser ON indicator will light whether the laser OFF input is ON or OFF. For the purpose of safety, the Z4LA is designed to start laser emission two to four seconds after you turn ON the Z4LA. Linear output will be turned OFF during startup.
	LD Monitor Output Alarm Indicator	The LD monitor output alarm indicator (self-diagnostic output) indicates the condition of laser emission. If laser emission is not intensive enough, the LD monitor output will turn ON and the alarm indicator (red LED) will be ON. This indicates the laser is nearing the end of its life. The LD monitor output is an open collector output (100 mA max. at 30 VDC).
ADJUSTMENTS	**Response Speed Selector**	Select the response speed with the response switch (RESPONSE SW) on the receiver as follows: **Note:** Linear output resolution of 2 mV is equivalent to repeat accuracy of 5 μm. RESPONSE SW / Linear output resolution: 5 ms — 5 μ (2 mV); 0.5 ms — 10 μ (4 mV)

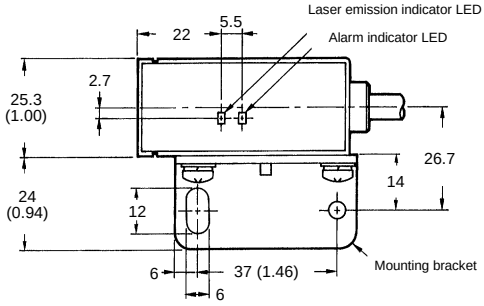
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Dimensions

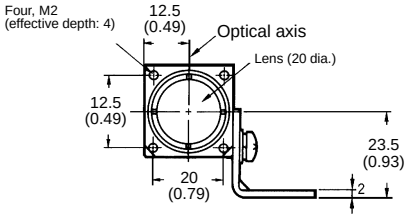
Unit: mm (inch)

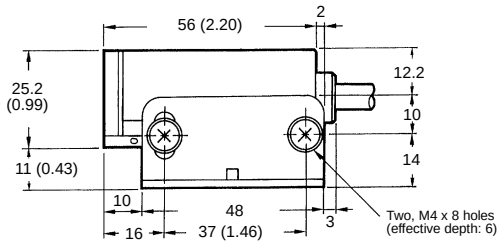
■ Z4LA-1030 (RECEIVER)
Z4LA-L10 (EMITTER)

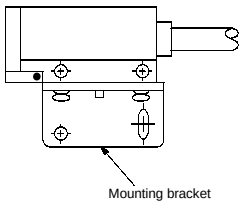




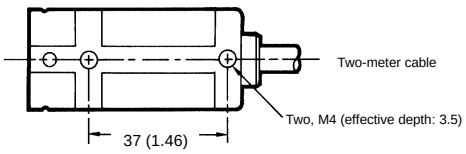
You can attach the Z4LA to the mounting bracket in the direction shown in the following illustration and secure it tightly with M4 screws and washers. The effective screw hole depth is 3.5 mm.



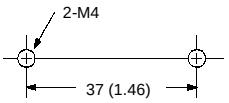




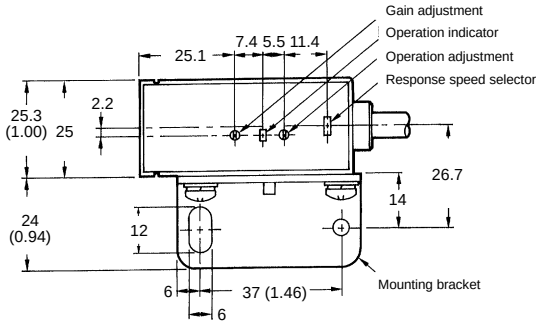
Note: 5.8 dia., 0.12 dia. x 18, 5 core cable, standard length: 2 m



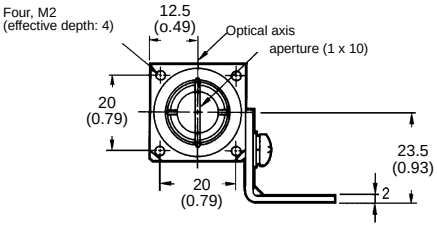
Mounting Holes

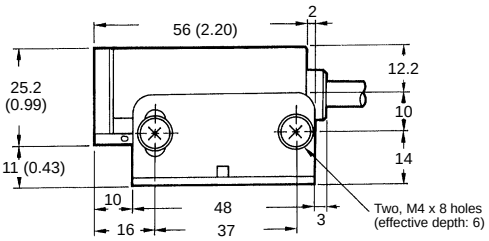


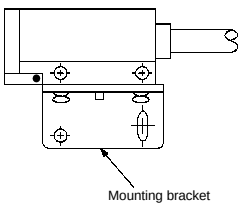
■ Z4LA-D1030
RECEIVER



You can attach the Z4LA to the mounting bracket in the direction shown in the following illustration.





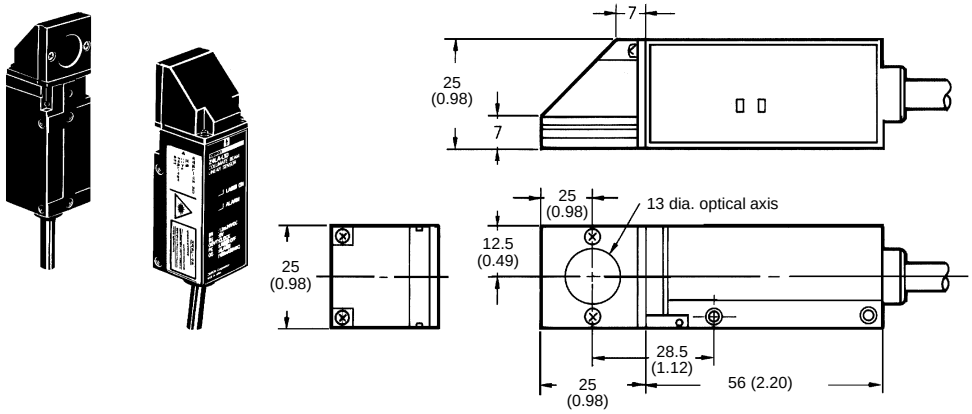


Note: 5.8 dia., 0.12 dia. x 18, 5-core cable, standard length: 2 m

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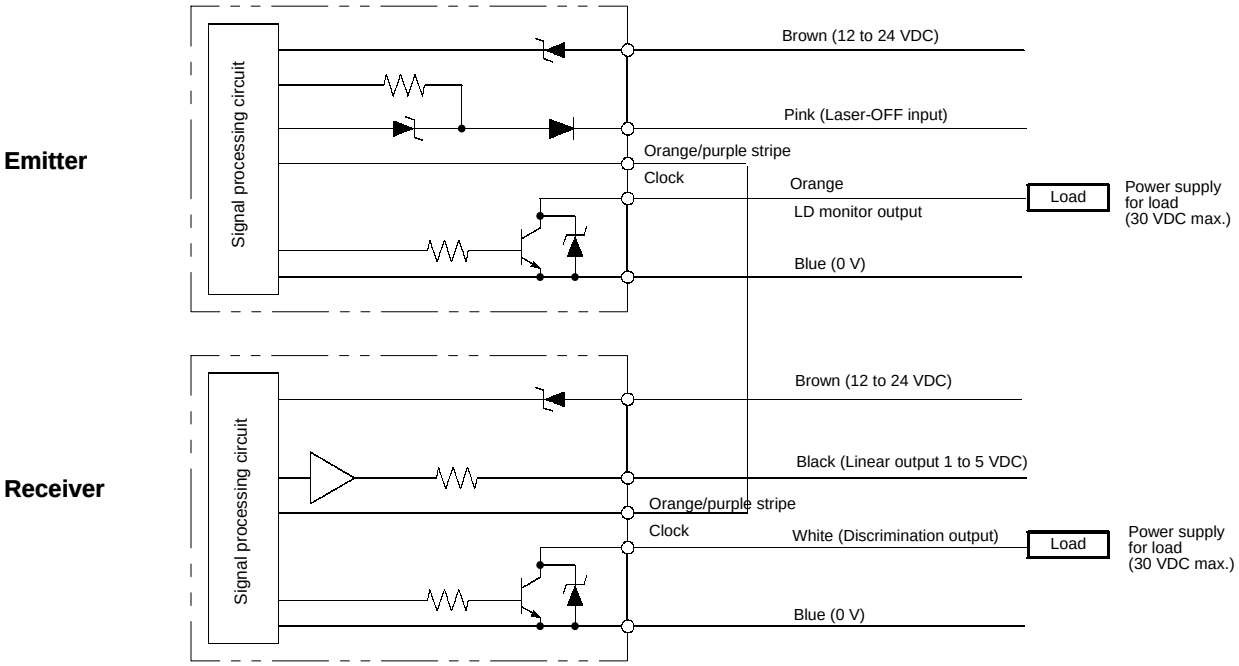
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■ Z4LA-1030-05

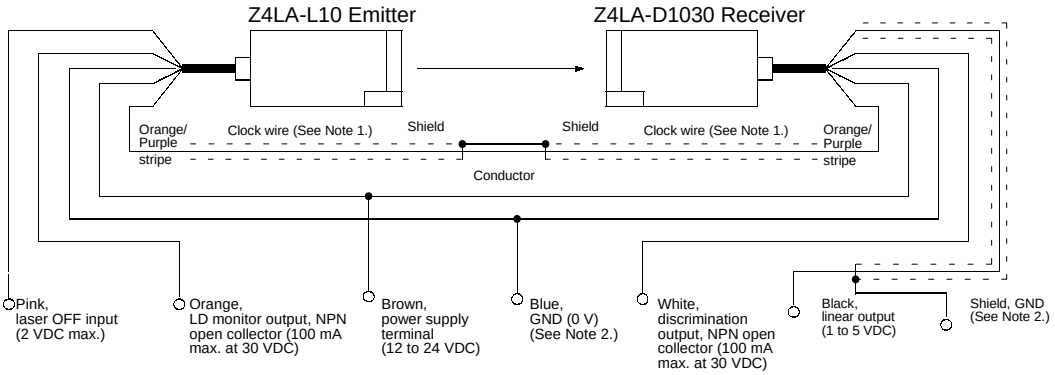


Installation

■ OUTPUT CIRCUIT DIAGRAM



■ EMITTER/RECEIVER CONNECTIONS



Note: 1. Connect the conductor and shield wire of the CLOCK wire on the emitter to those on the receiver.

2. The shield line and blue GND line on the receiver are internally connected to each other. Connect the brown line and blue GND line to the power supply. The black line and shield wire are for the linear output of the Z4LA.

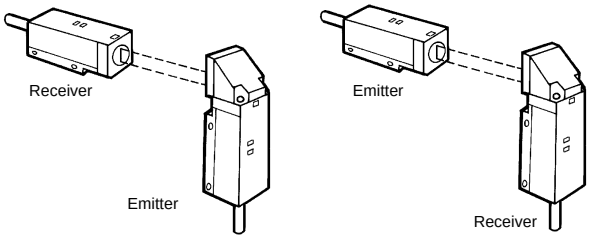
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■ HANDLING AND MOUNTING OF THE Z4LA-1030-05 SIDE-VIEW MODEL

Do not apply a strong impact to the side-view model.

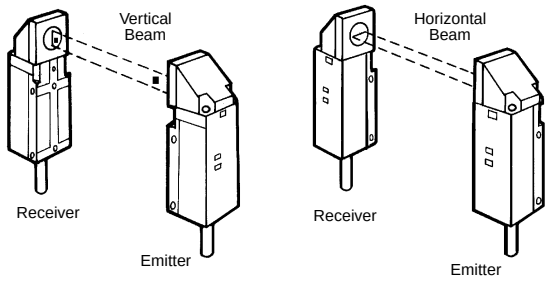
A Special Option

The side-view model can be installed for use with an emitter, or the receiver can be used alone.



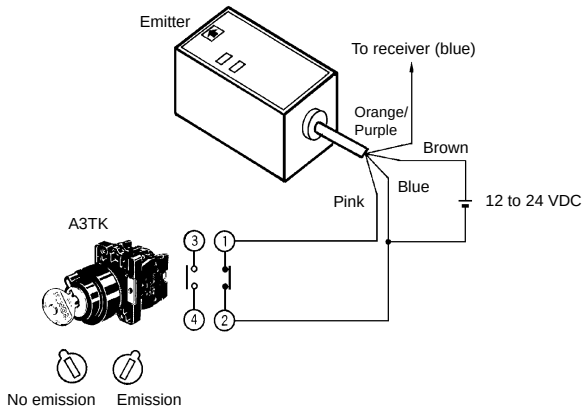
Mounting the Side-View Model

1. The side-view mounting is initially located on the front side of the emitter and receiver when shipped. Change the location as desired.
2. Be careful not to touch the inside of the sensor when changing the mounting position of the side-view model. The high-performance reflection mirror inside the sensor may deteriorate in performance if it is dirty.



3. Since the laser beam functions in *one direction*, give special attention to the direction the sensor is facing; carefully check the mounting direction.
4. Secure the reflector with the tightening torque of 0.15 N • m.

■ LASER-OFF INPUT CONNECTION



Connect the laser-OFF input line (gray) and the GND line (blue) to the normally closed contacts of the switch so that laser emission is effective only when you insert the key in the lock and turn the key clockwise.

If you connect the A3TK Key Switch to the laser-OFF input line of the emitter, you can control the laser emission of the Z4LA with the key switch.

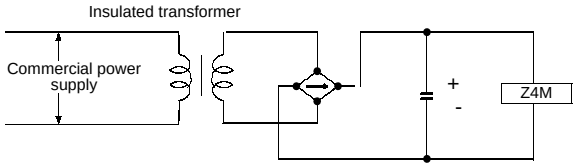
Make sure that the laser beam will not be caught by human eyes directly or indirectly by reflection. If there may be laser beam reflection by any objects around the emitter at the time of adjustment, apply a paint with a low light reflection ratio to the objects.

We recommend the user post a warning that alerts people of laser radiation at an appropriate place near the Z4LA.

■ 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.



■ WIRING

The 2 m cable for the emitter and receiver is extendable up to 5 m.

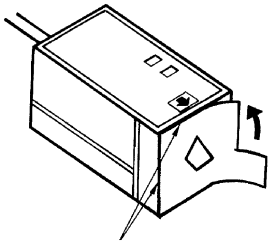
DANGER!
Do not wire the power supply cable for the Z4M Sensor in the same conduit with high-voltage lines or power lines. The result would be interference, damage, or malfunction.

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Operation

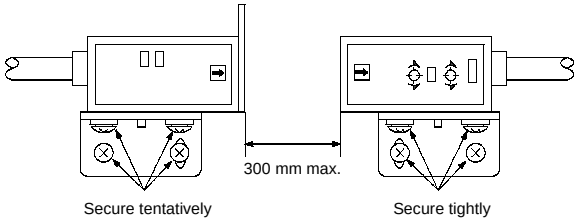
■ OPTICAL AXIS ADJUSTMENT

Carefully paste the optical axis adjustment label to the emitter's panel where the lens is located so that the edge of the label is flush with the edge of the emitter. (Refer to the illustration below.)



The edge of the label must coincide with the edge of the emitter.

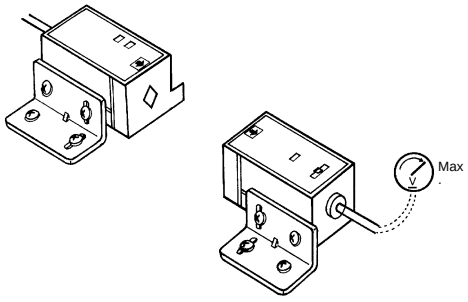
The emitter and receiver are DIN-track mounted before shipping. Adjust the emitter and receiver so that the lens sides of the emitter and receiver will face each other (matched precisely) at a distance of 0 to 300 mm. The direction of the arrow mark on top of the emitter and that on the receiver should match direction. Make sure that the laser beam will not be directed toward human eyes directly (or indirectly by reflection). You should secure the emitter with screws tentatively until the final adjustment of the emitter and receiver is completed.



■ CHECK THE SUPPLY VOLTAGE

Connect a voltmeter or digital panel meter to the emitter or receiver to check the supply voltage or linear output voltage.

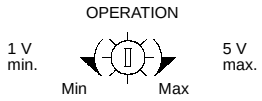
When you have completed all connections, apply power to the emitter and receiver. Laser emission will start when the laser ON indicator on the emitter is lit. Attach a voltmeter to the receiver to monitor the analog output. Move the emitter up and down or left and right without a target in the sensing area to find the position where the maximum output voltage is obtained.



Remove the optical axis adjustment seal and make sure that the output voltage is 5 V. If not, adjust the gain adjuster on the receiver so that the output voltage will be 5 V. Do not touch the gain adjuster after you have completed optical axis adjustment.

■ SETTING OF DISCRIMINATION OUTPUT

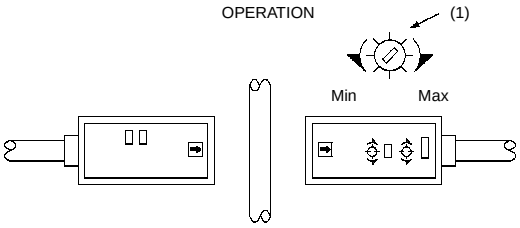
When you turn the operation adjustment clockwise to the end, the discrimination output will be set to 5 V. When you turn it counterclockwise to the other end, the output will be 1 V. The control output (orange wire) on the emitter will be ON when the linear output is the same or less than the voltage that you preset. For example, if you set it to 3 V, the control output is ON when the linear output is 1 to 3 V.



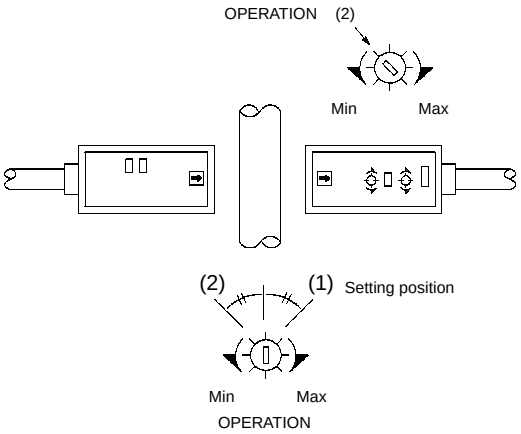
If you use the Z4LA to detect an object, adjust the operation adjuster so that the operation indicator is ON when the sensor detects the object and the indicator is OFF when there is no sensing object in the sensing area.

If you need to use the Z4LA for delicate discrimination of objects, such as round rods for example, set the operation adjustment as follows:

1. Place a thin round rod in the sensing area. Slowly turn the operation adjuster clockwise until the operation indicator is ON (this is position 1).



2. Place a thick round rod in the sensing area. Slowly turn the operation adjustment counterclockwise until the operation indicator is off (this is position 2).



3. Set the operation adjustment in the center of position 1 and position 2.

⚠ WARNING

Do not use adjustment procedures other than what is described on this Z4LA data sheet, or you will be exposed to hazardous laser radiation.

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Configuring Z4LA with A Controller and Output Boards

■ SELECTING A CONTROLLER — ORDERING INFORMATION

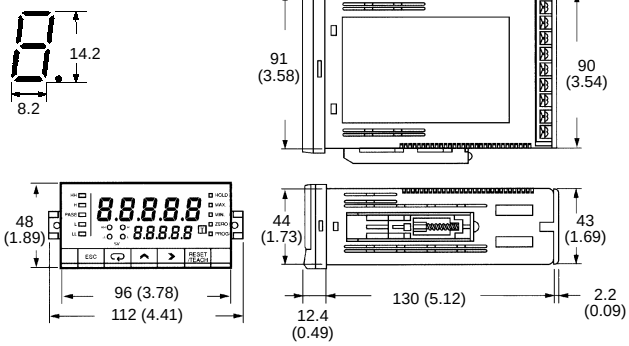
The Z4LA incorporates a single discrimination output. If more than one discrimination output or a display of the output values is required, use the Z4LA in combination with any of the following products.

Item	K3NX Intelligent Signal Processor	K3TS Intelligent Signal Processor	CQM1-LSE01/02 Linear Sensor Interface Unit
Unit			
Part number	**K3NX-VD□□-□□**	**K3TS-SD□□□-□□**	**CQM1-LSE01/02**
Features	High-precision digital panel meter with an operational error of ±0.1%. Five-level discrimination. Scaling function and forced zero function incorporated.	High-speed sampling of 1.04 ms. Two-input operation. Forced zero function and other versatile functions incorporated.	High-speed sampling of 1 ms (0.3 ms for timing input) without a CQM1 program.

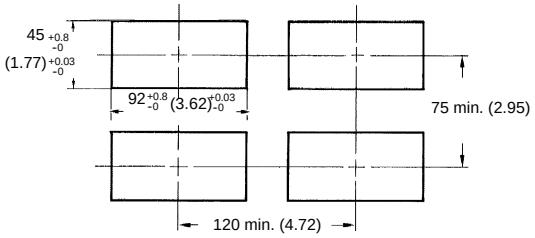
■ K3NX METER DIMENSIONS

Unit: mm (inch)

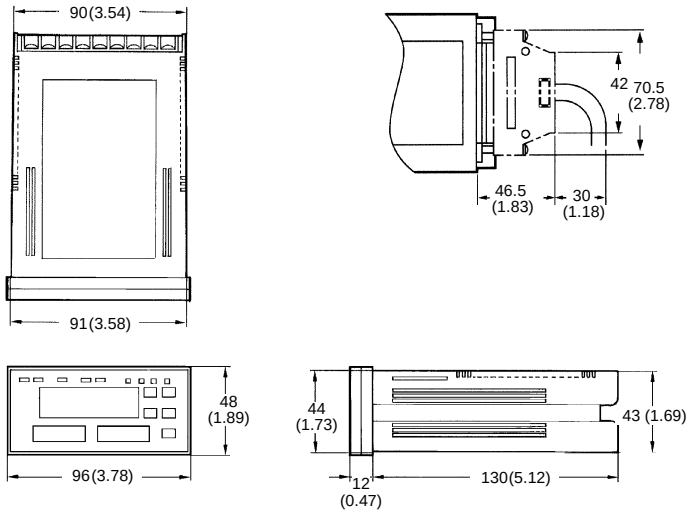
PV Display



■ PANEL CUTOUTS FOR K3NX OR K3TS



■ K3TS METER DIMENSIONS



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■ K3NX (5-DIGIT) PROCESS METER

Model Number Legend:

Base Units and Output Boards can be ordered individually or as sets.

Base Units

K3NX - V D □ □
1 2 3 4

Output Boards

K31 - □ □ □ □
5 6 7 8

Base Units with Output Boards

K3NX - V D □ □ - □ □ □ □
1 2 3 4 5 6 7 8

Base Units

Model/description	Part number	
	Supply voltage	
	100 to 240 VAC	12 to 24 VDC
Basic Models These models provide a present value LED and front-panel control keys. Can be connected to any Output Board, or can be used for display only without an Output Board. 	K3NX-VD1A	K3NX-VD2A
Set Value LED Models These models provide a present value LED, set value LED, and front-panel control keys. Can be connected to Relay, Transistor, or Combination Output Boards. 	K3NX-VD1C	K3NX-VD2C

Available Output Board Combinations

Output type	Output configuration	Output boards	Base units	
			Basic	Set Value LED Display
Relay contact	3 outputs: H, PASS, L (SPDT)	K31-C1	Yes	Yes
	5 outputs: HH, H, L, LL (SPST-NO), and PASS (SPDT)	K31-C2	Yes	Yes
	5 outputs: HH, H, L, LL (SPST-NC), and PASS (SPDT)	K31-C5	Yes	Yes
Transistor	5 outputs (NPN open collector)	K31-T1	Yes	Yes
	5 outputs (PNP open collector)	K31-T2	Yes	Yes
BCD (see note)	5-digit output (NPN open collector)	K31-B2	Yes	---
Linear	4 to 20 mA DC	K31-L1	Yes	---
	1 to 5 VDC	K31-L2	Yes	---
	1 mV/10 digits	K31-L3	Yes	---
	0 to 5 VDC	K31-L7	Yes	---
	0 to 10 VDC	K31-L8	Yes	---
Communication boards (see note)	RS-232C	K31-FLK1	Yes	---
	RS-485	K31-FLK2	Yes	---
	RS-422	K31-FLK3	Yes	---
Combination output and communication boards	BCD output + 5 transistor outputs (NPN open collector)	K31-B4	Yes	Yes
	4 to 20 mA + 5 transistor outputs (NPN open collector)	K31-L4	Yes	Yes
	1 to 5 V + 5 transistor outputs (NPN open collector)	K31-L5	Yes	Yes
	1 mV/10 digits + 5 transistor outputs (NPN open collector)	K31-L6	Yes	Yes
	0 to 5 VDC + 5 transistor outputs (NPN open collector)	K31-L9	Yes	Yes
	0 to 10 VDC + 5 transistor outputs (NPN open collector)	K31-L10	Yes	Yes
	RS-232C + 5 transistor outputs (NPN open collector)	K31-FLK4	Yes	Yes
	RS-485 + 5 transistor outputs (NPN open collector)	K31-FLK5	Yes	Yes
	RS-422 + 5 transistor outputs (NPN open collector)	K31-FLK6	Yes	Yes

Note: For details, refer to the *Communication Operation Manual.*

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■ K3TS INTELLIGENT SIGNAL PROCESSORS

Model Number Legend

Base Units and Output Boards can be ordered individually or as sets.

Base Units

K3TS - S D □ □ □
1 2 3 4 5

Output Boards

K31 - □ □
6 7

Base Units with Output Boards

K3TS - S D □ □ □ - □ □
1 2 3 4 5 6 7

Model/description			Part number	
			Supply voltage	
			100 to 240 VAC	12 to 24 VDC
Set Value LED Models These models provide a present value LED, set value LED, and front-panel control keys. Can be connected to Relay, Transistor, or Combination Output Boards.		Standard	**K3TS-SD11B**	**K3TS-SD12B**
		Forced zero RAM	**K3TS-SD21B**	**---**
		Display shift function	**K3TS-SD31B**	**---**
Thumbwheel Switch Models These models provide a present value LED, thumbwheel switches for the set value, and front-panel control keys. Can be connected to K31-C1, K31-T1, K31-T2, and K31-B4 Output Boards.		Standard	**K3TS-SD11D**	**K3TS-SD12D**

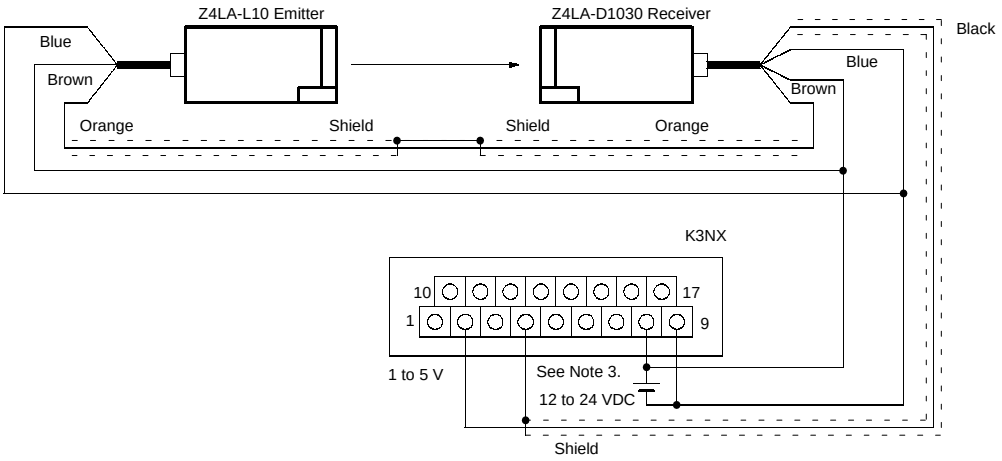
■ AVAILABLE OUTPUT BOARD COMBINATIONS

Output type	Output configuration	Output boards	Base units	
			Set value LED Display	Thumbwheel Switches
Relay contact	3 outputs: H, PASS, L (SPDT)	K31-C1	Yes	Yes
	5 outputs: HH, H, L, LL (SPST-NO), and PASS (SPDT)	K31-C2	Yes	---
	5 outputs: HH, H, L, LL (SPST-NC), and PASS (SPDT)	K31-C5	Yes	---
Transistor	5 outputs (NPN open collector)	K31-T1	Yes	Yes**
	5 outputs (PNP open collector)	K31-T2	Yes	Yes**
BCD*	4-digit output (NPN open collector)	K31-B2	---	---
Linear	4 to 20 mA DC	K31-L1	---	---
	1 to 5 VDC	K31-L2	---	---
	1 mV/digit	K31-L3	---	---
	0 to 5 VDC	K31-L7***	---	---
	0 to 10 VDC	K31-L8***	---	---
Communication boards*	RS-232C	K31-S1	---	---
	RS-485	K31-S2	---	---
	RS-422	K31-S3	---	---
Combination output and communication boards	BCD output + 5 transistor outputs (NPN open collector)	K31-B4***	Yes	Yes**
	4 to 20 mA + 5 transistor outputs (NPN open collector)	K31-L4***	Yes	---
	1 to 5 V + 5 transistor outputs (NPN open collector)	K31-L5***	Yes	---
	1 mV/digit + 5 transistor outputs (NPN open collector)	K31-L6***	Yes	---
	0 to 5 VDC + 5 transistor outputs (NPN open collector)	K31-L9***	Yes	---
	0 to 10 VDC + 5 transistor outputs (NPN open collector)	K31-L10***	Yes	---
	RS-485 + 5 transistor outputs (NPN open collector)	K31-S5***	Yes	---
	RS-422 + 5 transistor outputs (NPN open collector)	K31-S6***	Yes	---

*For details, refer to *K3TS Communication Output-type Intelligent Signal Processor Operation Manual*.
**Only H, PASS, and L outputs are available as transistor outputs on Thumbwheel Switch Models.
*** Special specifications

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■ COMBINATION WITH K3NX INTELLIGENT SIGNAL PROCESSOR

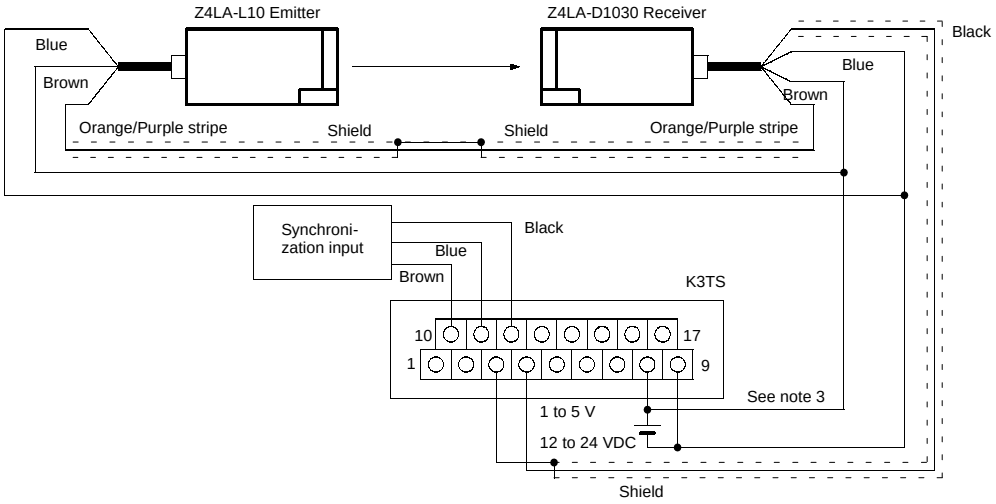


Note: 1. Choose an appropriate model of K3NX according to the application.

2. Refer to the datasheet for the K3NX for operational instruction in detail.

3. If you use a K3NX model with an AC power supply, connect an independent DC power supply for the Z4LA.

■ COMBINATION WITH K3TS INTELLIGENT SIGNAL PROCESSOR



Note: 1. Choose an appropriate model of K3NX according to the application.

2. Refer to the datasheet for the K3NX for operational instruction in detail.

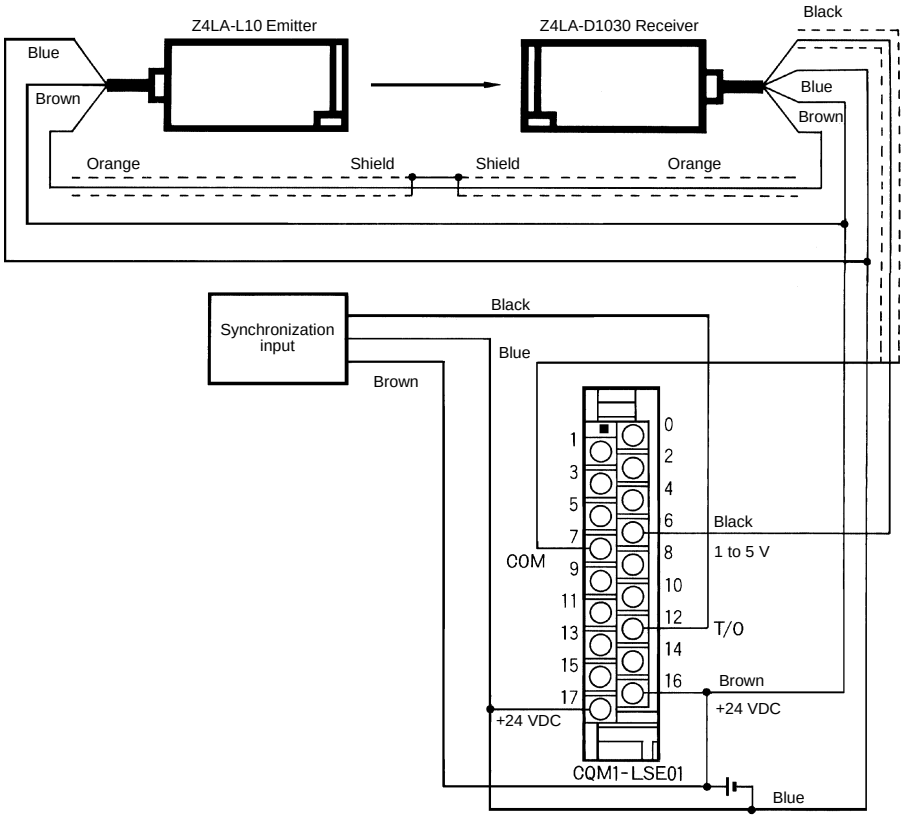
3. If you use a K3NX model with an AC power supply, connect an independent DC power supply for the Z4LA.

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■ LINEAR SENSOR INTERFACE UNITS

Type/description	Analog input	Analog output	Part number
Standard	1 point	—	CQM1-LSE01
With monitor output	1 point	1 point	CQM1-LSE02

■ COMBINATION WITH CQM1-LSE LINEAR SENSOR INTERFACE UNIT



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Application Examples

■ PLATE WIDTH INSPECTION (Z4LA AND K3TS)

In this example, the left edge of the plate is measured by an emitter and receiver and the right edge of the plate is measured by the other emitter and receiver, the results of which are input to the K3TS. The K3TS converts the results into actual thickness values in 2-input operation mode K (A + B).

K3TS Settings
Level 3

fun1: k-ab (K–(A+B))
fun2: off (No previous average comparison)
fun3: norn (Normal)

Level 2

in: 1-5 (1 to 5 V)

Level 1

cst0 to cst7:
[Example: Checks if the objects are within a thickness of 50 (standard thickness) ±0.5 mm.]
hh = 52.00
h = 50.50
l = 49.50
ll = 48.00
(Adjust according to the object)

Scaling Example

If the object width is 50 mm (standard width), each Z4LA has an output of 3 V (3,000 mV) due to the optical interruption range (5 mm) of each Z4LA, in which case value K must be set so that K – (A + B) will be 0. Therefore, value K is 6,000 mv and is obtained from the following.

K – (A + B) = 0
K = A + B
= 3000 + 3000 (mV)
= 6000 (mV)

Use the value with a sheet width of 40 mm and that with a sheet width of 60 mm as scaling values.
When the sheet width is 40 mm, each Z4LA has an output of 5,000 mV due to the optical interruption range (0 mm) of each Z4LA. Therefore, value Y2 is 40.00 mm and is obtained from the following.

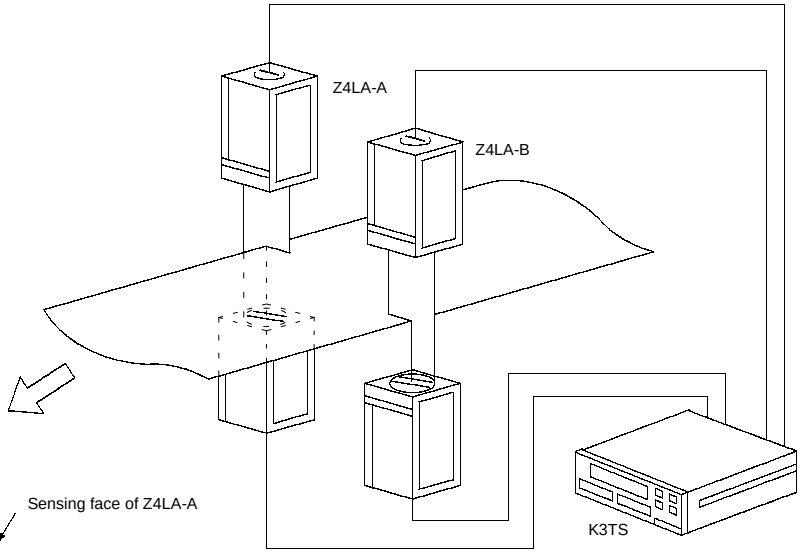
$X2 = K - (A_2 + B_2)$
$= 6000 - (5000 + 5000)$
$= -4000$ (mV)
Y2 = 40.00 (mm)

When the sheet width is 60 mm, each Z4LA has an output of 1,000 mV due to the optical interruption range (10 mm) of each Z4LA. Therefore value Y1 is 60.00 mm and is obtained from the following.

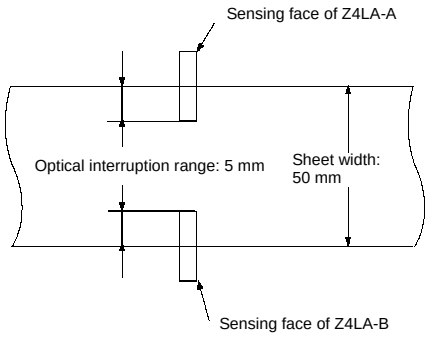
$X1 = K - (A_1 + B_1)$
$= 6000 - (1000 + 1000)$
$= +4000$ (mV)
Y1 = 60.00 (mm)

Therefore, the set values are as follows.

scal: $X_2 = -4000$, $Y_2 = 40.00$
$X_1 = 4000$, $Y_1 = 60.00$
kset = 50.00
(Values X1 and X2 are in mV.)



Set each Z4LA so that each Z4LA has an optical interruption range of 5 mm when the object has a width of 50 mm (standard width).



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■ HOLE SIZE INSPECTION

In this example, the hole size of the object is measured by the K3TS using its peak hold function and timing delay function.

K3TS Settings
Level 3

fun1: a (A only)
fun2: off (No previous average comparison)
fun3: pp-h (Peak-to-peak hold)

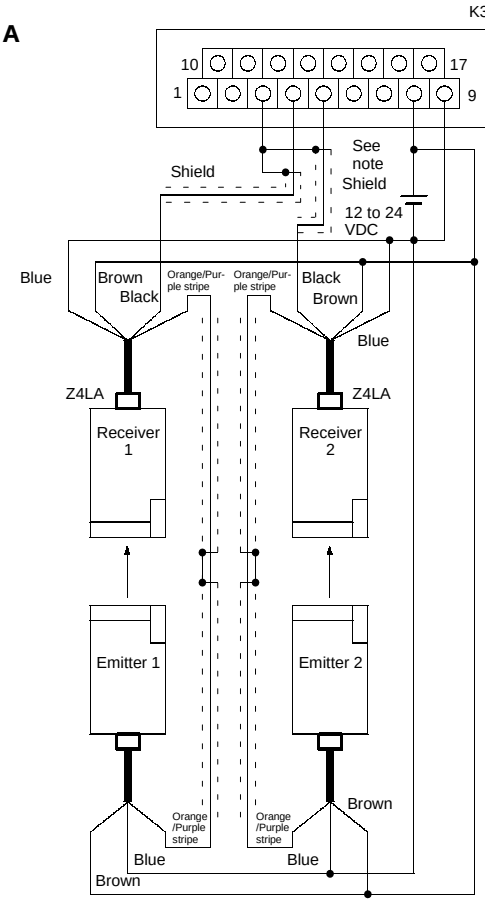
Level 2

in: 1-5 (1 to 5 V)
t-d: (Input the necessary timing input delay time.)

Level 1

cst0 to cst7:
(When the comparative output is used, set HH, H, L, and LL)
scal: X_2 = 5000, Y_2 = 10.00
If the hole size is 10 mm, the linear output will be 5 V.
X_1 = 1000, Y_1 = 00.00
If the hole size is 0 mm, the linear output will be 1 V.
(Values X1 and X2 are in mV.)

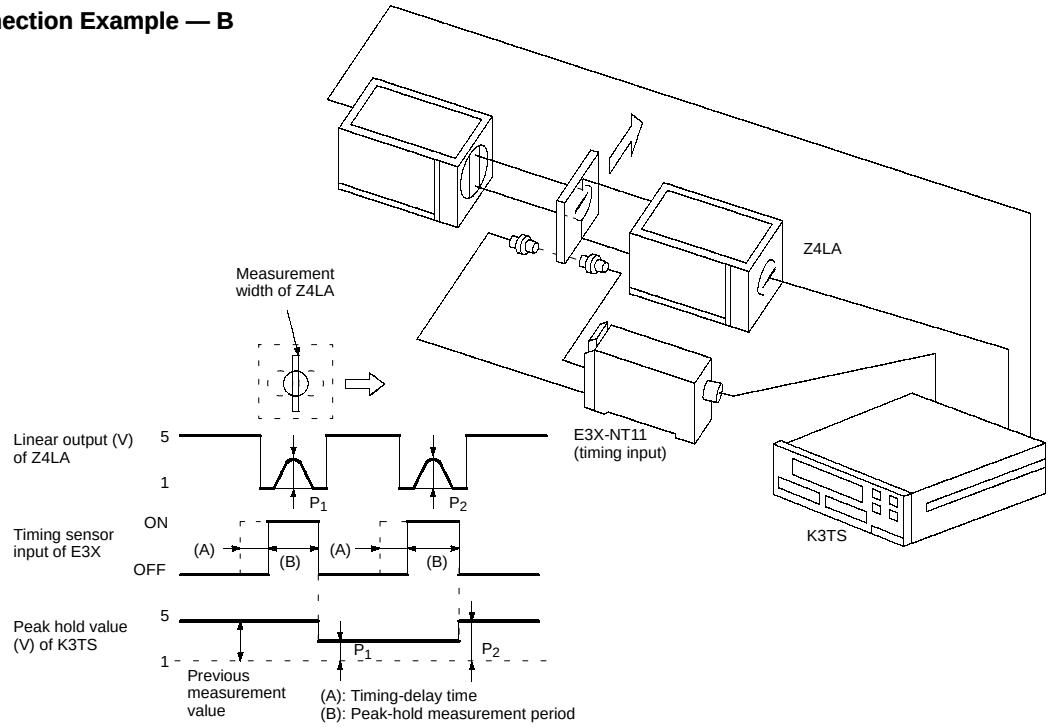
Connection Example — A

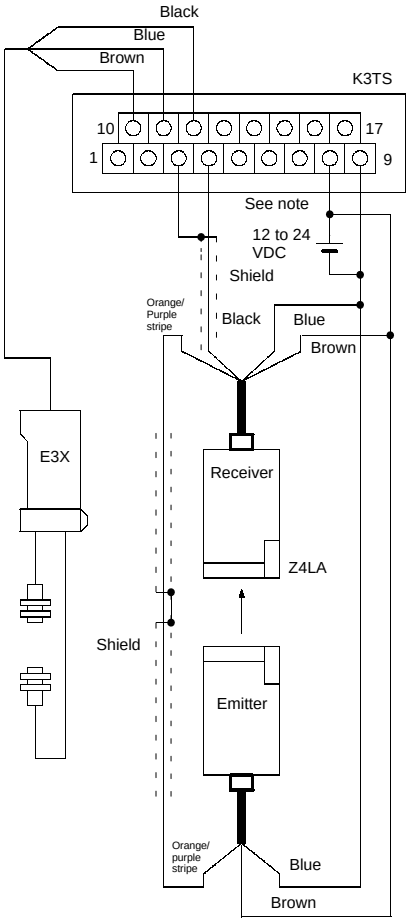


Note: If you use a K3TS model with an AC power supply, connect an independent DC power supply for the Z4LA.

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Connection Example — B





Note: If you use a K3TS model with an AC power supply, connect an independent DC power supply for the Z4LA.

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Precautions

■ LASER BEAM

Laser Control

The Z4LA Parallel-beam Linear Sensor meets the standards required by the Food and Drug Administration (FDA) of the US. 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)

To export the Z4LA to the US, be sure to pack the three FDA labels which are shown below. These labels are to be attached to the Sensor body before use in the US.

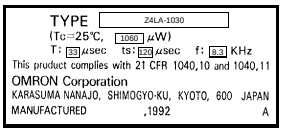
Danger Label



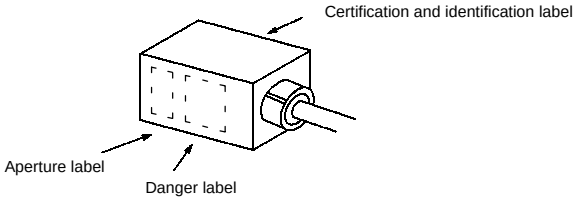
Aperture Label



Certification and Identification Label



Label Location



■ USER SAFETY REQUIREMENTS

The Z4LA is classified as a Class IIIb laser in the US. As a result, under FDA regulations, it is the responsibility of the user to ensure the following.

1) Safety Interlocks

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

2) Laser Radiation Emission Indicator

The system incorporates an emission indicator which provides 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.

3) 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.

4) Laser Beam Attenuator

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

■ MAINTENANCE AND REPAIRS

1. Users should not try to carry out repairs or maintenance of Z4LA, which contains no user serviceable parts. Refer all servicing to an authorized OMRON agent.
2. Never disassemble the Sensor. Users expose themselves to the risk of laser radiation if they disassemble the device.

Note: The laser diode generates Class IIIb laser radiation.

⚠ Caution

1. Users expose themselves to the risk of laser radiation if they use the Z4LA for any purposes other than those described in this datasheet.
2. The Z4LA is a class IIIb laser product. Avoid looking at the laser beam as much as possible.

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■ CORRECT USE

⚠ Caution

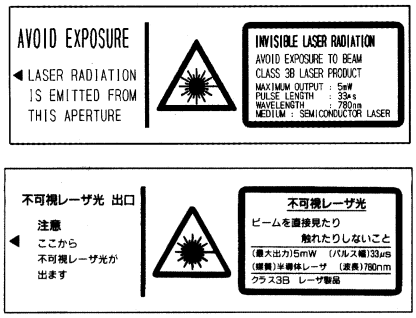
Be careful not to expose your eyes directly to the laser beam or indirectly to the laser beam reflected from mirror surfaces. Due to the high power density of the laser beam, users may lose their eyesight upon exposure.

1) Laser Safety Instructions

Be sure to read the previous *Laser Beam* section before using the Sensor.

The oscillating center wavelength of the laser used for the Z4LA is 780 nm and its maximum optical output is semiconductor laser of 5 mW. The Z4LA belongs to the Class IIIb under JIS C6802. A warning label indicating Class IIIb, as shown below, is attached to the side of the emitter.

Danger Label



When installing or making adjustments, be sure to follow the instructions shown in *Operation* and *Installation*.

Unnecessary laser radiation can be prevented by finishing surfaces where laser might be reflected with wooden materials or paint.

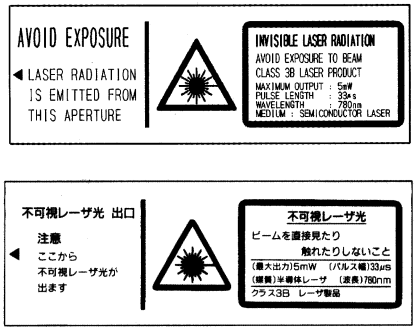
The posting of warning indications is recommended in areas where laser radiation must be under control.

The Sensor has a LASER ON indicator and a LASER OFF input circuit, allowing the formation of an external interlock circuit. When used in combination with a separately sold Laser Safety Kit (Z49-SF1), safety requirements specified in JIS C6802 and the Labor Safety and Hygiene Law are easily satisfied.

2) Laser Safety Kit

Be sure to attach the following warning label provided with the Laser Safety Kit on the emitter of the Z4LA before use.

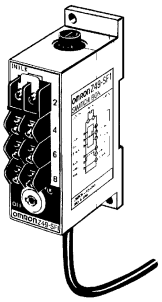
Label Provided with the S49-SF1



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Configuring Z4LA with the Z49-SF1 Laser Safety Kit

■ ORDERING INFORMATION — Z49-SF1 LASER SAFETY KIT

Item	Characteristics/features	Applicable sensors	**Part number**
Laser Safety Kit 	• Dedicated Laser Safety Kit for Z4LA; conforms to Safety Standards (JIS C6802). • With the Z49-SF1 Laser Safety Kit, the Z4LA can meet the requirements of various safety standards. **Note:** Become fully aware of the contents of the safety standards and precautions before using the Z49-SF1 Laser Safety Kit. • Controller incorporates key switch, interlock terminal, and laser warning light. • Beam Cover intercepts the laser beam is provided. • Slim controller can be DIN-track mounted.	Z4LA-1030 Z4LA-1030-05	**Z49-SF1**

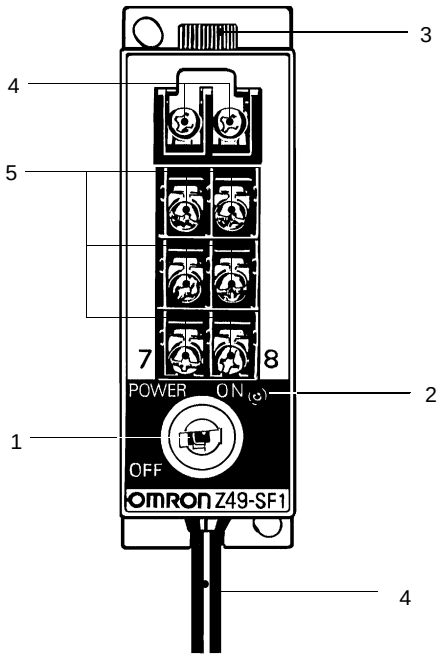
■ Z49-SF1 SPECIFICATIONS

Characteristics

Item	Z49-SF1 (for Z4LA)
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 Z4LA One laser emission warning label for Z4LA

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■ NOMENCLATURE FOR Z49-SF1



No.	Item	Functions
1	**Key switch**	Turns ON and OFF the emitter of the Z4LA (in the case of Z49-SF1) 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 Z4LA 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-SF1: Pink) GND (0 V) (Z49-SF1: Blue)	Used to connect an interlock switch for safety. When terminals 1 and 2 are open, the laser emission of the Z4LA 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 (pink line for the Z49-SF1) 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 regardless of whether the interlock terminals are opened or short-circuited. The laser warning light is lit whether the laser emission of the Z4LA 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 Z4LA (in the case of Z49-SF1).

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-SF1

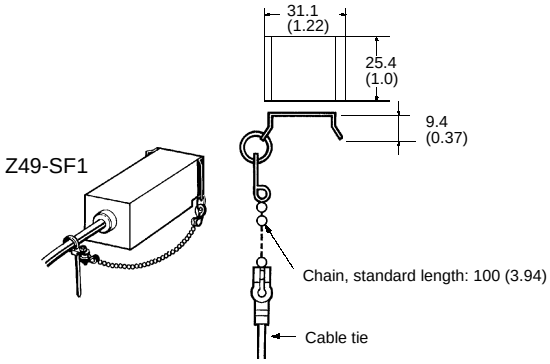
Beam Cover

Z49-SF1

1. Attach the beam cover to the front panel (from where the laser beam is emitted) of the Z4LA-L10 when the Z4LA-L10 is not in use.

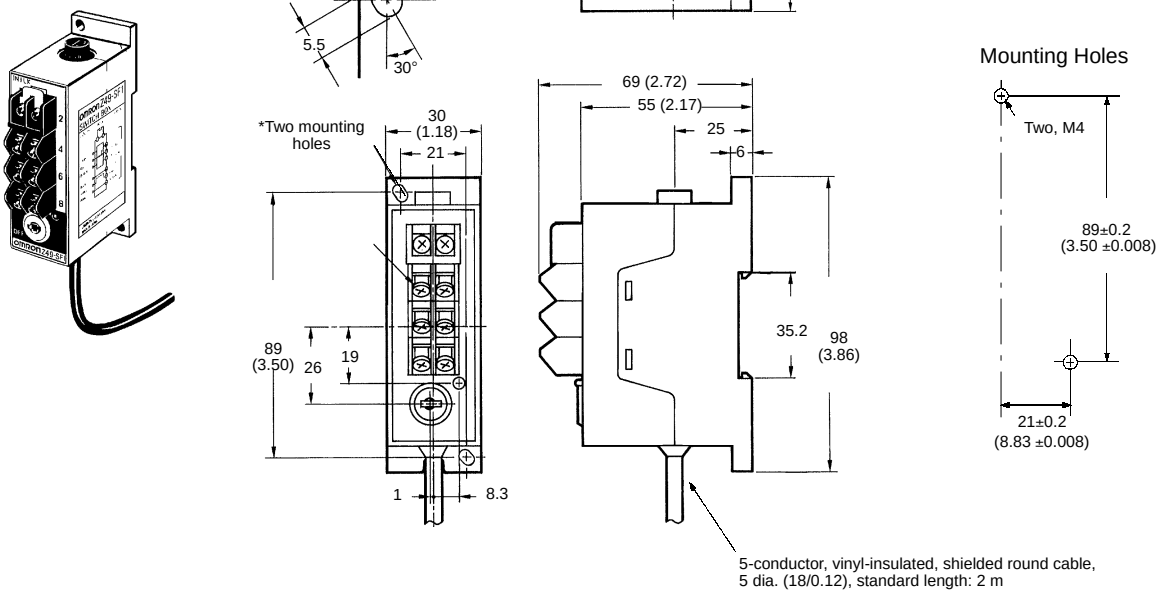
   Note: The beam cover will protect human eyes from accidental laser radiation.

2. Attach a clamp to the cable of the Z4LA-L10. The unnecessary part of the clamp should be cut off with a nipper.



■ DIMENSIONS — Z49-SF1

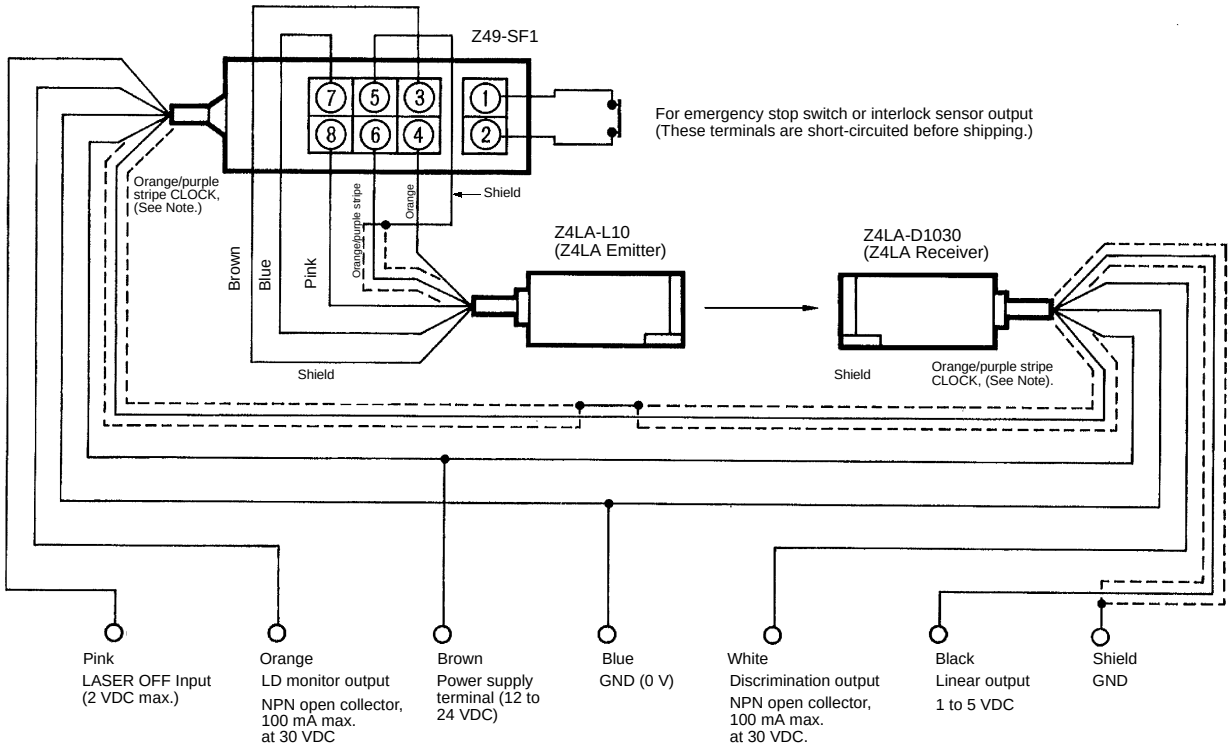
Unit: mm (inch)



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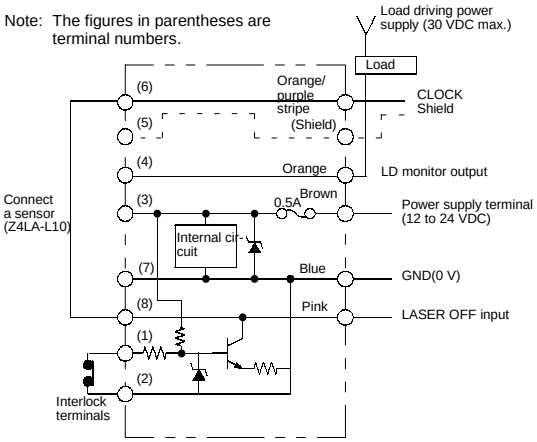
■ Z49-SF1 CONNECTIONS

Connect the Z4LA-L10 Emitter to the terminals of the Z49-SF1.



Note: The Z49-SF1 and Z4LA Receivers both have a CLOCK wire (blue wire). Connect the conductor and shield of the Z49-SF1's CLOCK wire with those of the Z4LA Receiver's CLOCK wire.

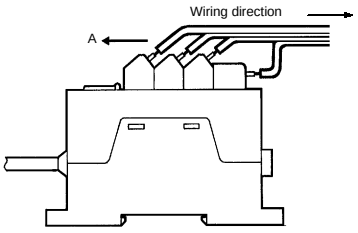
■ Z49-SF1 CIRCUIT DIAGRAM



■ Z49-SF1 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-SF1 or Z4LA in the same conduit with high voltage lines or power lines in order to prevent interference, damage, or malfunctioning.

Labels (Attachments)

The Z4LA abide by IEC's Class 3B and FDA's Class IIIb regulations, thus warning labels must be attached to the sensor body before use.

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

OMRON®

OMRON ELECTRONICS LLC
One East Commerce Drive
Schaumburg, IL 60173
1-800-55-OMRON

OMRON ON-LINE
Global - http://www.omron.com
USA - http://www.omron.com/oei
Canada - http://www.omron.com/oci

OMRON CANADA, INC.
885 Milner Avenue
Scarborough, Ontario M1B 5V8
416-286-6465

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