

Think Automation and beyond...



SE4B

Light Curtains



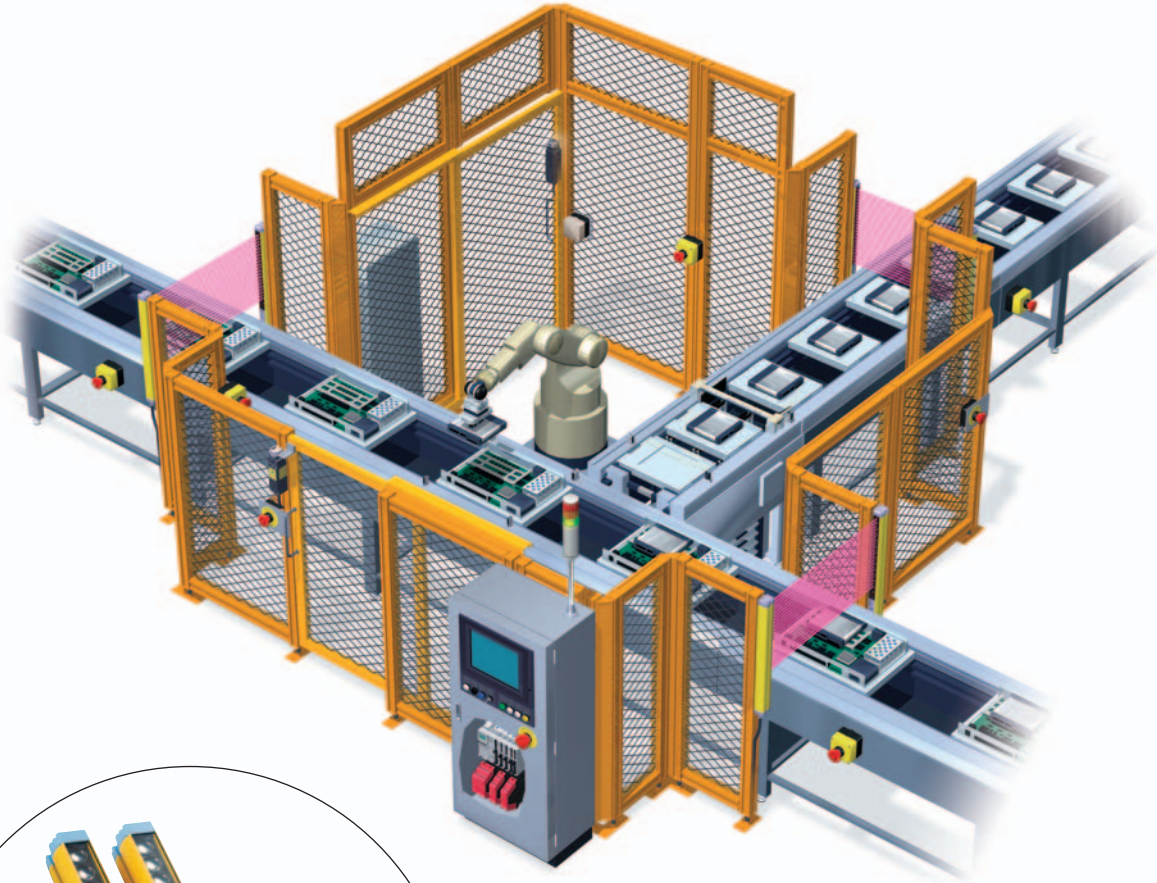
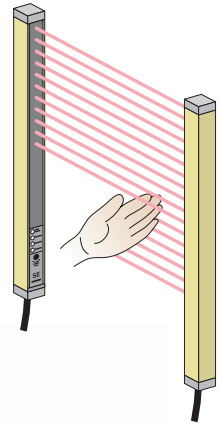
IDEC CORPORATION

(07/06/21)

SE4B Series Light Curtains

Ensures the Safety of Working Environment

- Type 4 light curtains conforming to safety category 4
- Hand-type light curtain detects objects as small as $\varnothing 30$ mm.
- 11 detection ranges: 147 to 1,617 mm



Light Curtains

Light curtains are installed as safeguarding measures for personnel where:

- A safety guard cannot be installed due to structural reasons
- A safety guard is opened/closed frequently
- Safety guards are not necessary, but the hazard must be stopped when a person enters the area.

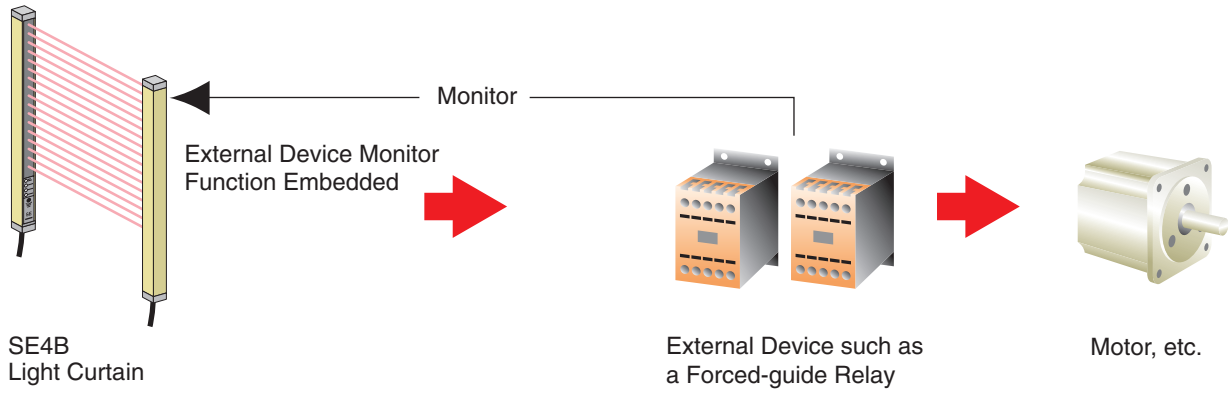
The SE4B Light curtains are electro-sensitive protective equipment complying with EN 61496-1/-2 and safety category (ISO 13849-1).



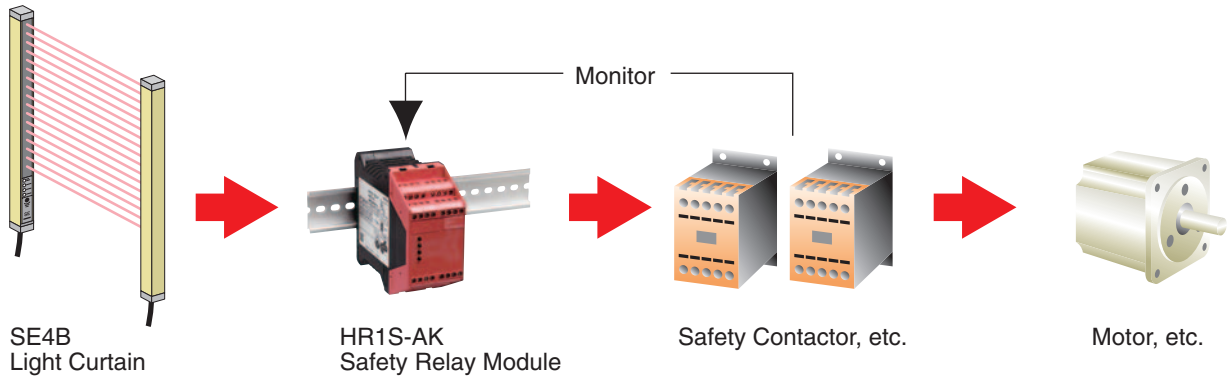
Complying with safety standards:

EN 61496-1, prEN 61496-2, UL 61496-1, UL 61496-2, UL 508, CSA 22.2 No. 14, CSA 22.2 No. 0.8

- External device monitor is installed within the light curtain (see page 9).
A safety category 4 control circuit can be configured even without using a safety relay module.



- The number of outputs can be increased by using the HR1S-AK Safety Relay Module.



- Four LEDs on the receiver show the status of the light curtain (see page 4).

- A battery-powered laser pointer allows for easy adjustment using red laser light.



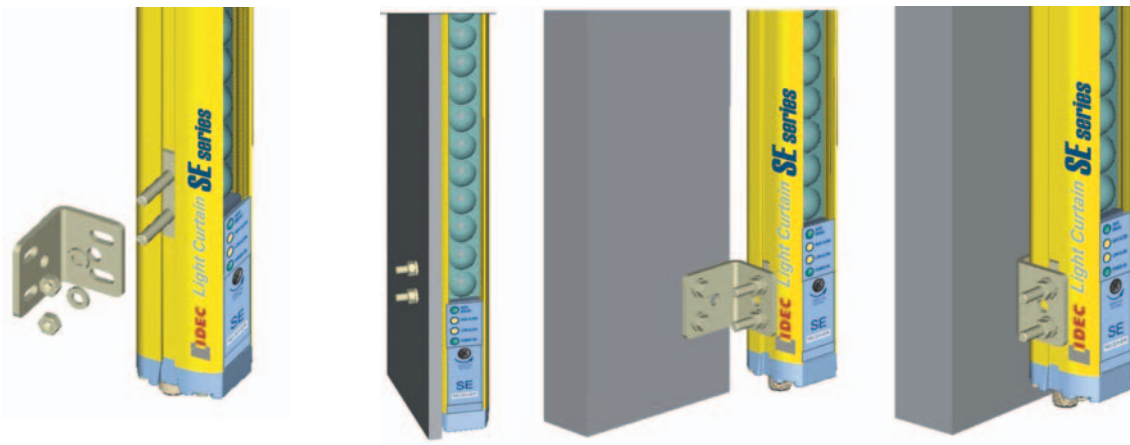
Emitter



Receiver



- Metal and plastic mounting brackets are supplied.



Mounting brackets can be installed in three ways.

LED Status

Receiver

• Alignment

LED Status	Diagnosis	Alignment Level
<ul style="list-style-type: none"> ● SAFE BREAK Red ON ● HIGH ALIGN OFF ● LOW ALIGN OFF ● POWER ON Green ON 	<ul style="list-style-type: none"> • Optics are misaligned completely. 	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 5px;">0%</div> <div style="margin-top: 5px;">100%</div> </div>
<ul style="list-style-type: none"> ● SAFE BREAK Red ON ● HIGH ALIGN Yellow ON ● LOW ALIGN OFF ● POWER ON Green ON 	<ul style="list-style-type: none"> • Optics are misaligned. 	
<ul style="list-style-type: none"> ● SAFE BREAK Red blinking ● HIGH ALIGN Yellow ON ● LOW ALIGN Yellow ON ● POWER ON Green ON 	<ul style="list-style-type: none"> • Optics are misaligned. Safe Break LED blinks in red at a low frequency. Very low alignment. 	
<ul style="list-style-type: none"> ● SAFE BREAK Red blinking ● HIGH ALIGN Yellow ON ● LOW ALIGN Yellow ON ● POWER ON Green ON 	<ul style="list-style-type: none"> • Optics are misaligned. Safe Break LED blinks at a high frequency. Low alignment. 	
<ul style="list-style-type: none"> ● SAFE BREAK Green blinking ● HIGH ALIGN Yellow ON ● LOW ALIGN Yellow ON ● POWER ON Green ON 	<ul style="list-style-type: none"> • Safe Break LED continues to blink at a high frequency, but the LED is now green. Medium alignment. 	
<ul style="list-style-type: none"> ● SAFE BREAK Green blinking ● HIGH ALIGN Yellow ON ● LOW ALIGN Yellow ON ● POWER ON Green ON 	<ul style="list-style-type: none"> • Safe Break LED blinks again in green at a low frequency. Good alignment. 	
<ul style="list-style-type: none"> ● SAFE BREAK Green ON ● HIGH ALIGN Yellow ON ● LOW ALIGN Yellow ON ● POWER ON Green ON 	<ul style="list-style-type: none"> • Safe Break LED is ON. All optics are correctly aligned. 	

Emitter

• Error Indications

LED Status	Diagnosis	Troubleshooting
<ul style="list-style-type: none"> ● SAFE Yellow blinking ● POWER ON Green ON 	Functional failure	<ul style="list-style-type: none"> • Check the power supply. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE OFF ● POWER ON OFF 	Check the power supply	<ul style="list-style-type: none"> • Check the power supply. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE OFF ● POWER ON Green ON 	The power supply voltage is outside of the allowable range	<ul style="list-style-type: none"> • Check the power supply. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE Yellow ON ● POWER ON Green ON 	Normal Operation	

• Error Indication

LED Status	Diagnosis	Troubleshooting
<ul style="list-style-type: none"> ● SAFE BREAK Red blinking ● HIGH ALIGN Yellow blinking ● LOW ALIGN Yellow blinking ● POWER ON Green ON 	Output failure	<ul style="list-style-type: none"> • Check the output connections. • Check if the load characteristics are in accordance with the specifications (see page 6).
<ul style="list-style-type: none"> ● SAFE BREAK OFF ● HIGH ALIGN Yellow blinking ● LOW ALIGN Yellow blinking ● POWER ON Green ON 	Microprocessor failure	<ul style="list-style-type: none"> • Check the positioning of the configuration DIP switches. • Switch OFF and switch ON the device. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE BREAK OFF ● HIGH ALIGN OFF ● LOW ALIGN Yellow blinking ● POWER ON Green ON 	Optical failure	<ul style="list-style-type: none"> • Check unit alignment. • Switch OFF and switch ON the device. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE BREAK Red blinking ● HIGH ALIGN OFF ● LOW ALIGN Yellow blinking ● POWER ON Green ON 	Failure of external switching device (EDM test function)	<ul style="list-style-type: none"> • Control the EDM connections. • Check the compatibility of external switching device with EDM test time (see page 9). • Switch OFF and switch ON the devices. If the error does not clear, replace the external switching device
<ul style="list-style-type: none"> ● SAFE BREAK OFF ● HIGH ALIGN OFF ● LOW ALIGN OFF ● POWER ON OFF 	Power supply failure	<ul style="list-style-type: none"> • Check the power supply. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE BREAK OFF ● HIGH ALIGN OFF ● LOW ALIGN OFF ● POWER ON Green ON 	The power supply voltage is outside of the allowable range.	<ul style="list-style-type: none"> • Check the power supply. • Switch OFF and switch ON the device. If the error does not clear, contact IDEC.
<ul style="list-style-type: none"> ● SAFE BREAK Red ON ● HIGH ALIGN Yellow ON ● LOW ALIGN OFF ● POWER ON Green ON 	Interlock status (manual reset mode)	<ul style="list-style-type: none"> • Manual reset mode: signalling of one or more beam interruption. The Test/Start button has to be pressed to reset normal functioning.
<ul style="list-style-type: none"> ● SAFE BREAK OFF ● HIGH ALIGN OFF ● LOW ALIGN OFF ● POWER ON Green ON 	Normal operation	
<ul style="list-style-type: none"> ● SAFE BREAK Red ON ● HIGH ALIGN OFF ● LOW ALIGN OFF ● POWER ON Green ON 	Optical axis is interrupted	<ul style="list-style-type: none"> • Remove the object. • Check if the optical axes are aligned.

SE4B Series Light Curtains

Type 4 light curtain conforming to safety category 4.

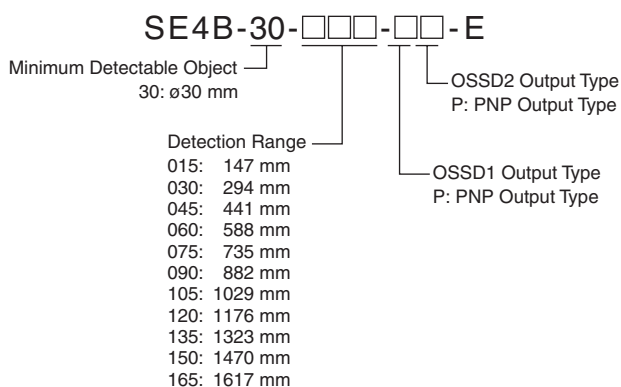
- Hand protection types detecting objects as small as $\varnothing 30$ mm.
- 11 types available depending on the detection range (147 to 1617 mm).
- Long 15m operating distance.
- External device monitor (EDM) function allows for circuit configuration without a safety relay module.
- Complies with safety standards EN 61496-1, prEN 60496-2, UL 61496-1, and UL 61496-2.
- Optical alignment can be confirmed by four LEDs on the receiver.
- Metal and plastic mounting brackets are supplied.
- Anti-vibration and orienting supports are available as optional parts.
- Laser pointer ensures optical alignment of long operating distance.



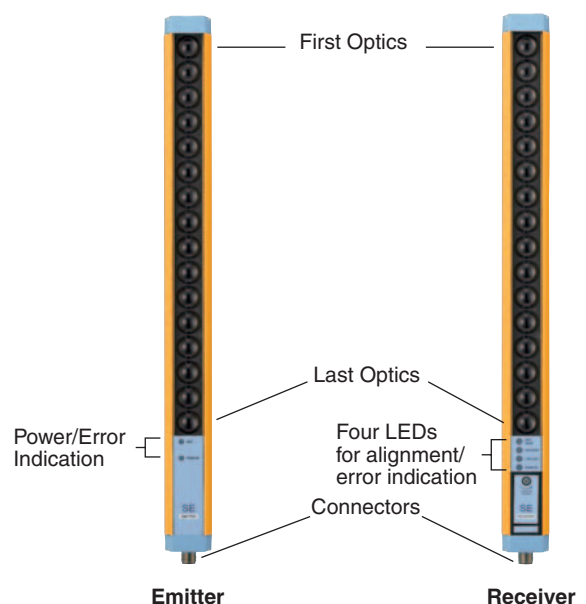
Types

Appearance	Minimum Detectable Object (mm)	Detection Range (mm)	Detection Distance (m)	Response Time (ms)	Type No.	Supplied Mounting Brackets
	$\varnothing 30$	147	0.2 to 15	12	SE4B-30-015-PP-E	Metal: 4 pcs Plastic: 4 pcs
		294		13	SE4B-30-030-PP-E	
		441		15	SE4B-30-045-PP-E	
		588		16	SE4B-30-060-PP-E	
		735		18	SE4B-30-075-PP-E	
		882		19	SE4B-30-090-PP-E	
		1029		21	SE4B-30-105-PP-E	Metal: 6 pcs Plastic: 6 pcs
		1176		22	SE4B-30-120-PP-E	
		1323		24	SE4B-30-135-PP-E	
		1470		25	SE4B-30-150-PP-E	
		1617		26	SE4B-30-165-PP-E	

Type No. Development



Structure



SE4B Series Light Curtains

Specifications

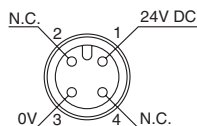
Applicable Standards	UL 61496-1 (TYPE 4) UL 61496-2 (TYPE 4) UL 508 CSA C22.2 No. 14 CSA C22.2 No. 0.8 EN 61496-1 (TYPE 4) prEN 61496-2 (TYPE 4)
Operating Temperature	-10 to +55°C (no freezing)
Relative Humidity	15 to 95% RH (no condensation)
Storage Temperature	-25 to +70°C (no freezing)
Pollution Degree	2
Rated Voltage	24V DC ±20%
Effective Aperture Angle	When detection distance is 3m or more: within ±2.5° (prEN 61496-2)
Current Draw	Emitter: 55 mA maximum Receiver: 125 mA maximum (without load)
Shock Resistance	Damage limits: 16 ms (10G), 1000 shocks in each of 3 axes
Vibration Resistance	Frequency range: 10 to 55 Hz Vibration displacement amplitude: 0.35 mm Frequency change rate: 1 octave per minute Sweep: 20 sweeps in each of 3 axes
Dielectric Strength	500V AC, 1 minute
Insulation Resistance	30 MΩ minimum at 500V DC
Electrical Protection	Class 1 (Note)
Degree of Protection	IP65
Control Output (OSSD1, OSSD2)	PNP output Output current 0.7A maximum (total of 2 outputs)
Control Signal Output Voltage	Power voltage - 1V
Response Time (ON to OFF)	See page 5.
Light Source (emission wavelength)	Infrared LED (880 nm)
Minimum Detectable Object	30 mm (opaque)
Detection Distance	0.2 to 15m
Material	Housing: Aluminum Lens: PMMA
Connector	Emitter (TX): M12 4-pole connector Receiver (RX): M12 8-pole connector
Weight (approx.)	1.2 kg maximum (per 1m)
Accessories	4 or 6 metal and plastic mounting brackets (see page 5) Instruction manual

Note: Electrical Protection	Class 1	Class 3
Protective grounding	Compulsory	N/A
Symbol for connection protective grounding	Compulsory	N/A
Protection by means of extra-voltage with protective separation (SELV and PELV)	Recommended	Obligatory

Note: When using the light curtains, ensure to use only the combination of emitter and receiver delivered in the same packaging.

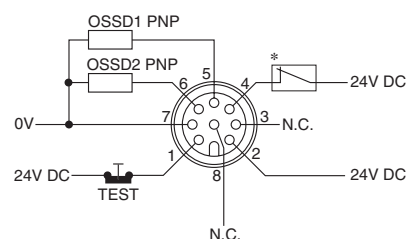
Pin Layout

• Emitter (TX)



- 1 Brown: 24V DC
- 2 White: N.C.
- 3 Blue: 0V
- 4 Black: N.C.

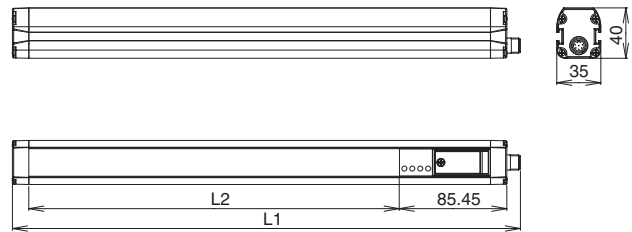
• Receiver (RX)



- 1 White: TEST/START
- 2 Brown: 24V DC
- 3 Green: N.C.
- 4 Yellow: EDM
- 5 Gray: OSSD 1
- 6 Pink: OSSD 2
- 7 Blue: 0V
- 8 Red: N.C.

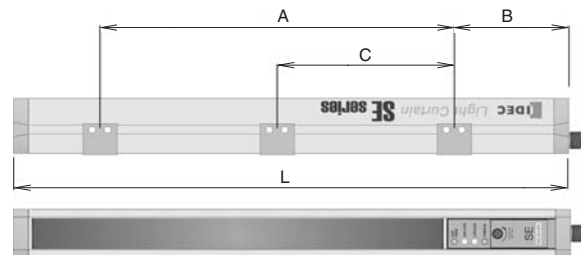
* External Device

Dimensions



Type No.	L1	L2
SE4B-30-015-PP-E	256	147
SE4B-30-030-PP-E	403	294
SE4B-30-045-PP-E	550	441
SE4B-30-060-PP-E	697	588
SE4B-30-075-PP-E	844	735
SE4B-30-090-PP-E	991	882
SE4B-30-105-PP-E	1,138	1,029
SE4B-30-120-PP-E	1,285	1,176
SE4B-30-135-PP-E	1,432	1,323
SE4B-30-150-PP-E	1,579	1,470
SE4B-30-165-PP-E	1,726	1,617

Mounting Bracket Positions



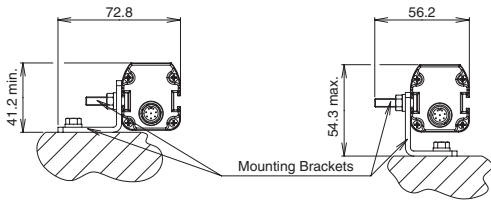
Type No.	L	A	B	C
SE4B-30-015-PP-E	246	86	80	—
SE4B-30-030-PP-E	393	193	100	—
SE4B-30-045-PP-E	540	300	120	—
SE4B-30-060-PP-E	687	387	150	—
SE4B-30-075-PP-E	834	474	180	—
SE4B-30-090-PP-E	981	581	200	—
SE4B-30-105-PP-E	1,128	688	220	—
SE4B-30-120-PP-E	1,275	875	200	438
SE4B-30-135-PP-E	1,422	1,022	200	510
SE4B-30-150-PP-E	1,569	1,121	220	565
SE4B-30-165-PP-E	1,716	1,216	250	608

All dimensions in mm.

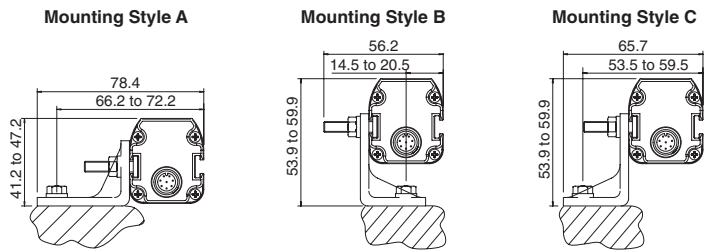
SE4B Series Light Curtains

Dimensions

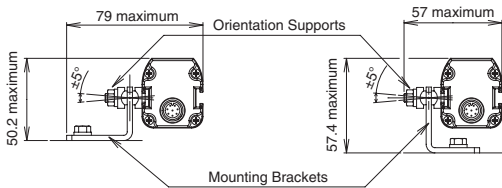
• Metal Mounting Bracket SE9Z-ST-KSTD



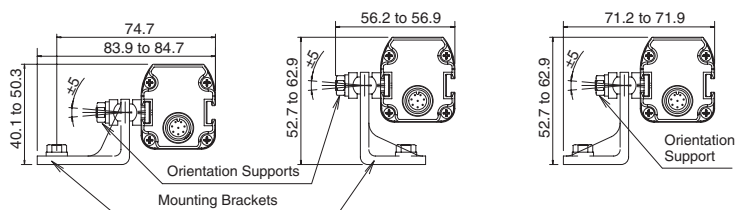
• Plastic Mounting Bracket SE9Z-ST-KPMP



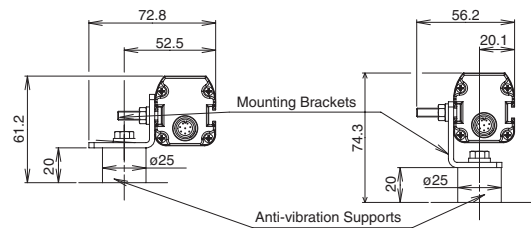
• Metal Mounting Bracket + Orientation Support SE9Z-ST-KSTD + SE9Z-K□SU



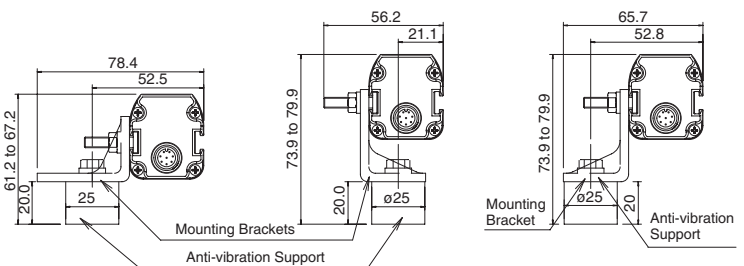
• Plastic Mounting Bracket + Orientation Support SE9Z-ST-KPMP + SE9Z-ST-K□SU



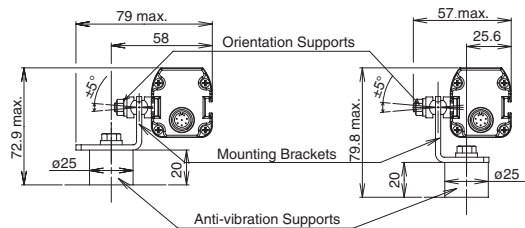
• Metal Mounting Bracket + Anti-vibration Support SE9Z-ST-KSTD + SE9Z-ST-K□AV



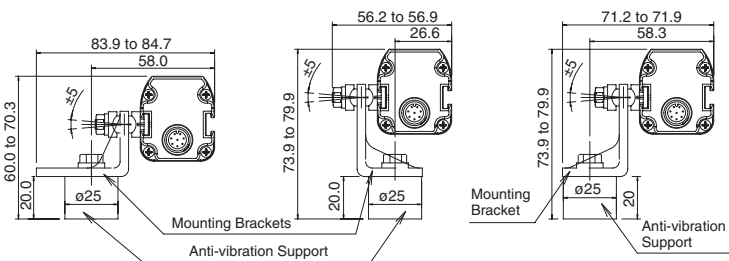
• Plastic Mounting Bracket + Anti-vibration Support SE9Z-ST-KPMP + SE9Z-ST-K□AV



• Metal Mounting Bracket + Orientation Support + Anti-vibration Support SE9Z-ST-KSTD + SE9Z-ST-K□SU + SE9Z-ST-K□AV



• Plastic Mounting Bracket + Orientation Support + Anti-vibration Support SE9Z-ST-KPMP + SE9Z-ST-K□SU + SE9Z-ST-K□AV

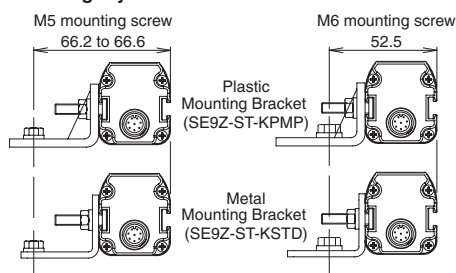


Interchangeability of Metal and Plastic Mounting Brackets

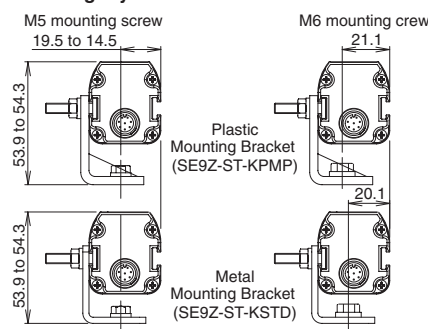
The SE4B series light curtain can be installed using either plastic mounting bracket SE9Z-ST-KPMP or metal mounting bracket SE9Z-ST-KSTD.

The following figures show the dimensions and adjustable ranges for installation using the two types of mounting brackets in three mounting styles. These two mounting brackets are almost interchangeable, except for Mounting Style B, which uses M6 screws as shown below.

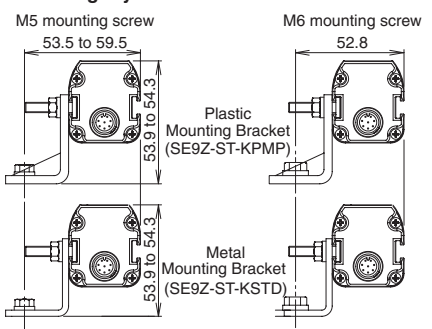
Mounting Style A



Mounting Style B

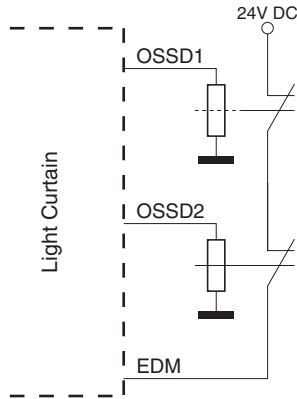


Mounting Style C



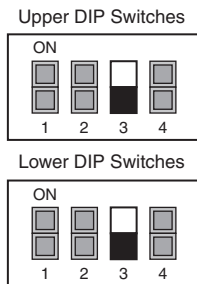
EDM Function

The external device monitoring (EDM) function controls external devices such as safety relays by verifying the status of OSSD1 and OSSD2. As shown below, the EDM input monitors the NC contact of an external safety relay. Detecting failures, such as contact welding, initiates lockout status, stopping the machine operation.

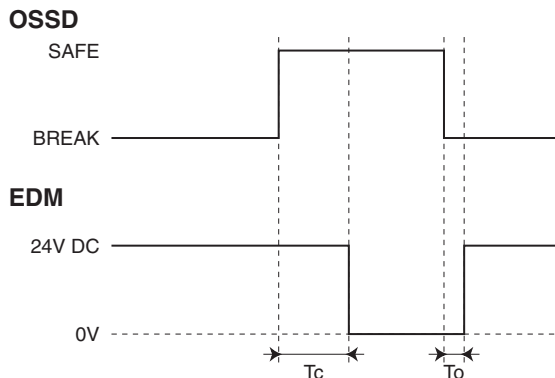


OSSD: Output signal switching device (switching output)

To use EDM function, turn off DIP switch #3 in both upper and lower rows as shown below. The DIP switches are located behind the lid on the bottom of receiver.



When the EDM function is in effect, the EDM input changes according to the OSSD status.



When the EDM function is in effect, T_c (set delay time for EDM to turn off after OSSD changes from BREAK to SAFE) and T_o (set delay time for EDM to turn on after OSSD changes from SAFE to BREAK) are as follows.

$$T_c \geq 350 \text{ ms}$$

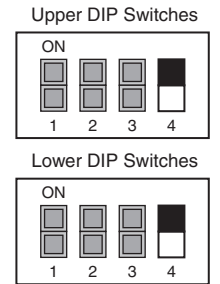
$$T_o \geq 100 \text{ ms}$$

Exceeding the delay time initiates lockout status, stopping the machine operation. Connecting the inapplicable equipment may cause malfunction.

Reset Function

The OSSD output turns off (BREAK status) when the light curtain detects the interruption of light beams. To turn on the OSSD (SAFE status) for reset, auto or manual reset can be selected using the DIP switches.

For automatic reset, turn on DIP switches #4 in both upper and lower rows. For manual reset, turn them off.



(Automatic Reset Status)

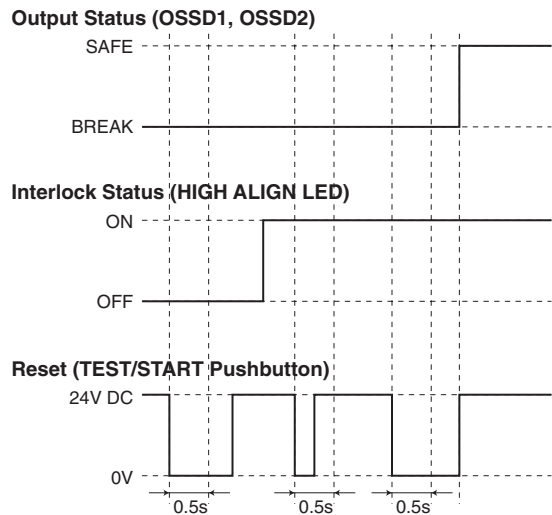
Automatic Reset:

The light curtain becomes BREAK status when an object interrupts the light beams. Removing the object, the light curtain is reset automatically, restarting the operation.

Manual Reset:

The light curtain becomes BREAK status when an object interrupts the light beams. Removing the object alone does not restart the operation of light curtain automatically. Restarting requires a start input (TEST/START input).

Time Chart (Manual Reset)

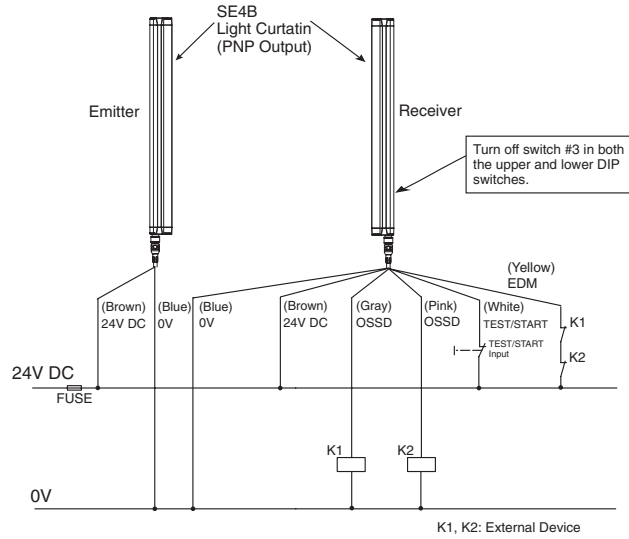


TEST/START input must turn off for 0.5s minimum.

SE4B Series Light Curtains

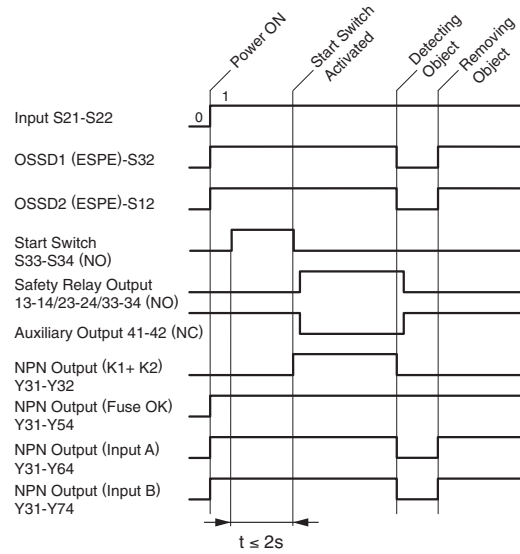
Wiring Example

Basic Configuration (EDM Function Enabled)

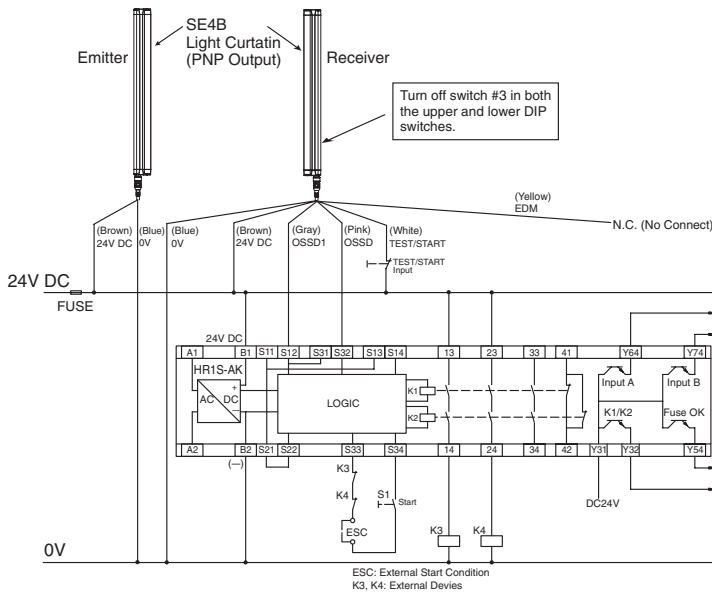


HR1S-AK Safety Relay Module Operation Chart

Using the OSSD output of the light curtain



Wiring with Safety Relay Module (EDM Function Disabled)



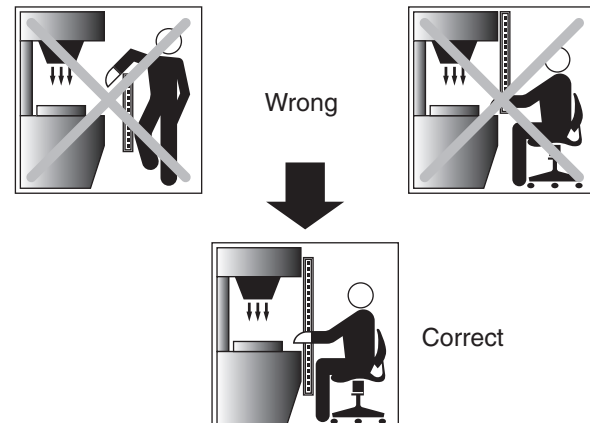
The above diagram illustrates an example using IDEC's HR1S-AK safety relay module.



Notices with this mark explain caution and detailed information about the characteristics of safety equipment for better understanding of the product's function. Precautions for installation are also described. Inattention might cause personal injury or death.

Installation

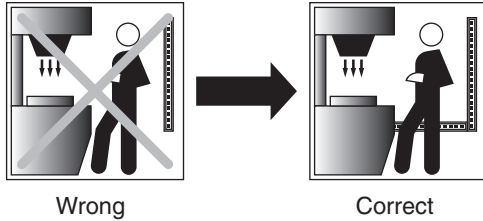
Install the light curtain carefully.





The light curtain must be positioned carefully so that the danger zone cannot be accessed without passing through the light beams. Wrong installation examples on page 10 are dangerous because the operator can access the danger zone either over or under the light curtain.

As shown in the example of correct installation, a light curtain must be high enough to cover the danger zone completely.



Because the machine should not start while the operator is inside the danger zone, install a light curtain so that either a part of or the entire body of the operator remains in the detection area.

In the case where the light curtain cannot be installed in proximity of danger zone, install a light curtain horizontally, as shown above, to prevent horizontal access of operator.

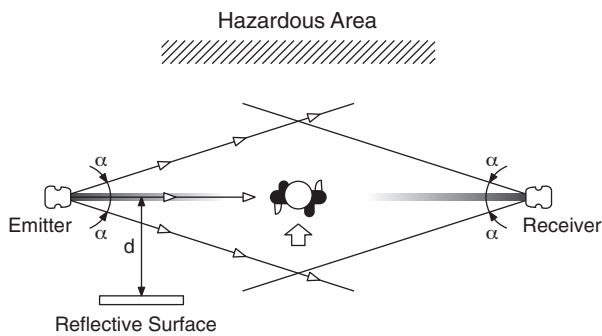
Minimum Distance from Reflective Surface



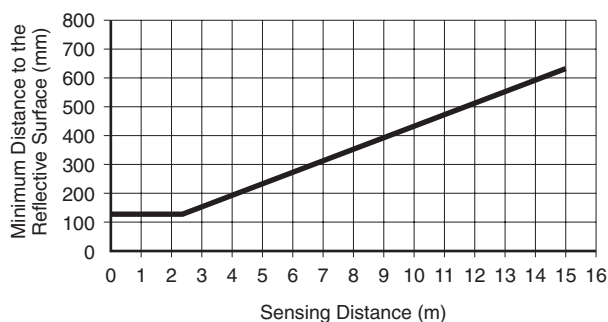
Reflective surfaces placed near the light beams (over, under, or laterally) can cause retro-reflections, which can prevent objects in the detection area from being detected.

If the receiver detects reflections from reflective surfaces, the object might not be detected even when it interrupts the light beams.

Make sure to install light curtains according to the minimum distance from reflective surfaces.



Minimum distance depends on the detection distance between the emitter and receiver. The following chart shows the minimum distance.

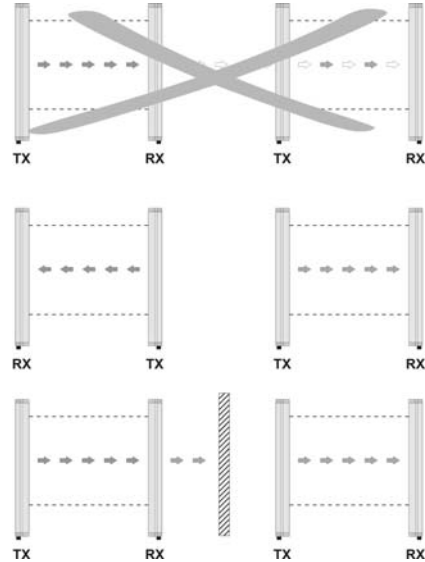


Installing Multiple Light Curtains



When installing multiple light curtains adjacently, make sure that an emitter does not interfere with the receiver of other light curtains.

The following figure shows an example which can cause interference and two correct arrangements. Incorrect arrangement of light curtains can cause interference, causing possible malfunction.



Minimum Distance when Installing Light Curtains

Based on EN 999 (Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body), the minimum distance between the light curtain and the danger zone can be calculated in the following formula.

Vertical (normal) access to the light curtain

$$S = KT + C$$

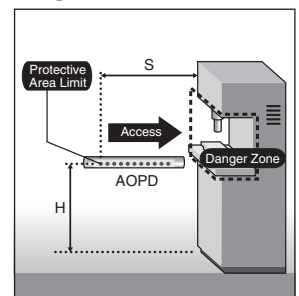
where

S: The minimum distance in millimeters, from the danger zone to the light curtain

K: A parameter in millimeters per second, derived from data on approach speeds on the body or parts of the body

T: The overall stopping time of the system, i.e., the total time, in seconds, from the detection of object by the light curtain to the cessation of the hazard

C: An additional distance, in millimeters, based on intrusion towards the danger zone prior to actuation of the light curtain



AOPD: Active Opto-electronic Protective Device

For light curtain, the following conditions are applied.

$$K = 2000 \text{ mm/s}$$

$$T = \text{Response time of light curtain (second)} + \text{Response time of machine (second)}$$

$$C = 8 \times (\text{minimum detectable object } d \text{ in mm} - 14 \text{ mm})$$

When minimum distance S is less than 100 mm, apply $S = 100$.

When minimum distance S is greater than 500 mm, apply $K = 1600$ (mm/s). If the recalculation results in the minimum distance of less than 500 (mm), apply $S = 500$.

Note: Minimum detectable object d is 30 mm for the SE4B light curtains.

SE4B Series Light Curtains

Parallel access to the light curtain

$$S = KT + C$$

where

S: The minimum distance in millimeters, from the danger zone to the light curtain

K: A parameter in millimeters per second, derived from data on approach speeds on the body or parts of the body

T: The overall stopping time of the system, i.e., the total time, in seconds, from the detection of object by the light curtain to the cessation of the hazard

C: An additional distance, in millimeters, based on intrusion towards the danger zone prior to actuation of the light curtain

For light curtain, the following conditions are applied.

$$K = 1600 \text{ mm/s}$$

$$T = \text{Response time of light curtain (second)} + \text{Response time of machine (second)}$$

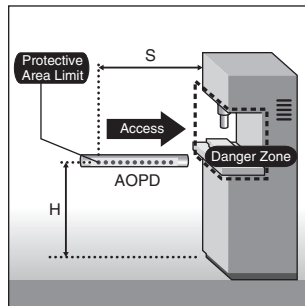
$$C = 1200 - 0.4 \times H \text{ (light beam height in mm, not less than 850 mm)}$$

The height H should not be greater than 1000 mm.

$$15 \times (d - 50) \leq H \leq 1000 \text{ mm}$$

If H is greater than 300 mm, there is a risk of inadvertent undetected access beneath the light beams. This should be taken into consideration during a risk assessment.

Note: Minimum detectable object d is 30 mm for the SE4B light curtains.



Angled access to the light curtains

Light curtains which are positioned at angles greater than 5° and less than 85° are accessed at angles (β).

When β is less than 30° , use the vertical access formula.

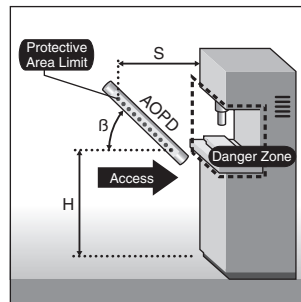
When β is greater than 30° , use the parallel access formula.

The formula to derive the minimum distance S shall apply to the beam furthest from the danger zone. This beam may be used up to a maximum height of the light curtain of 1000 mm.

The lowest allowable height of the light curtain shall be calculated as follows.

$$H = 15 (d - 50 \text{ mm})$$

Note: Minimum detectable object d is 30 mm for SE4B light curtain.



Safety Precautions

The following precautions must be observed carefully in order to use the SE4B light curtains correctly and safely.

- The stopping mechanism of a machine must be electrically controllable.
- This control system must be able to instantly stop dangerous movement of the machine during all the phases of the working cycle.
- Read the instruction manual before installation and wiring of the light curtains. Observe the safety standards and regulations of relevant countries and regions where operating the light curtains. Perform a risk assessment before operation.
- The light curtains must be securely placed in a position where the access to the danger zone is not possible without interrupting the beams.
- The personnel operating in the dangerous area must be well trained and must have adequate knowledge of all the operating procedures of the light curtain.
- The TEST/START inputs must be located outside the danger zone as the operator has to check the danger zone during Reset and

Test operations.

- The function of the external device monitoring (EDM) is active only when the specific wire is correctly connected to the device.
- The SE4B light curtain has not received the type approval provided by Article 44-2 of the Industrial Safety and Health Law of Japan, and cannot be used in Japan as a safety device for pressing or shearing machines provided by article 42 of the law.
- When installing the SE4B light curtains, make sure that malfunction is not caused by grounding failure.
- When using the light curtains, ensure to use only the combination of emitter and receiver delivered in the same packaging.
- Read the instructions carefully for correct functioning before powering the light curtain.
- Plastic mounting bracket SE9Z-ST-DPMP prevents the light curtains from malfunctioning, due to electric noise, by establishing a floating condition on the light curtain.
- Do not ground the SE4B light curtains when using the plastic mounting bracket SE9Z-ST-DPMP, otherwise the light curtains will be subject to electrical noise. Ensure light curtains are not grounded inadvertently by contacting with conductive parts such as screws.
- Connect light curtains to the systems of extra low voltage (SELV or PELV) in order to separate and protect from hazardous voltage.
- Use a power unit which complies with the regulations and standards of relevant countries or regions on EMC (electromagnetic compatibility) and electric equipment safety.
- When using the plastic mounting bracket SE9Z-ST-DPMP, tighten the screws using washers to the torque values shown below.
 - M5 screw: 2.6 to 3.5 N·m
 - M6 screw: 3.9 to 4.9 N·m
- Especially when light curtains are installed in mounting style A shown on page 6, make sure that the light curtains do not touch metal parts of the mounting surface.

Maintenance

The following is a list of recommended inspection and maintenance operations that should be performed periodically by qualified personnel.

Inspection

- Using the test piece (SE9Z-TP-30) sold separately, interrupt all light beams of the light curtain one beam at a time, and make sure that the test piece is detected by all beams.
- Press the TEST/START button, and make sure that OSSD output opens (the red BREAK LED is ON and the controlled machine stops).
- Make sure that the response time for the machine to stop (including the response time of the light curtain and of the machine) is within the limits defined by the calculation of the safety distance (see page 11).
- Make sure the distance between the danger zone and the light curtain is in accordance with the safety distance described on page 11.
- Make sure that any access to the danger zone of the machine is only possible by passing through the detection area of light curtain.
- Make sure that the wiring of light curtain and the external equipment is not damaged.

The frequency of performing inspections depends on the application and the operating conditions of the light curtain.

Maintenance

The SE4B light curtains do not require any particular maintenance, with the exception of the cleaning of the front surfaces of the optics.

When cleaning, use a cotton cloth dampened with water.

Under any circumstances, do not use:

- alcohol or solvents
- wool or synthetic cloths

General Information

The light curtains achieve their safety function only when they are installed correctly in accordance with the standards and regulations in effect. If there is no expertise to install the light curtains correctly, contact IDEC.

In the event of short-circuit, the light curtains are protected by auto-resetting type fuses.

After the fuse is blown, turn off the power supply and wait for 20 seconds. The fuse restarts automatically, starting the operation of light curtain.

A power failure caused by interferences may cause the opening of outputs temporarily, but the safety function of light curtains will not be lost.

Warranty

The SE4B light curtains are under a 1 year warranty from the ship date. IDEC will not be liable for any damages to persons or properties caused by non-observance of the installation and operating instructions.

The warranty will not cover damages caused by incorrect installation, incorrect use and accidental causes such as bumps or falls.

In the event the SE4B light curtains do not function properly, return the emitter and receiver for repair or replacement.

In case the SE4B light curtains should fail, contact IDEC.

Optical Axes Alignment Procedures

The emitter and receiver must be aligned to achieve normal operation of the light curtain.

The emitter and receiver are aligned perfectly when the optic axes of the first and last beams of the emitter coincide with their counterparts on the receiver. Two yellow LED indicators (HIGH ALIGN, LOW ALIGN) make alignment easy.

Alignment Procedure

Before starting alignment of optical axes, install and wire the light curtain according to the instructions on pages 10 and 11.

1. Turn power off to the light curtain.
 2. Press the TEST/START button and keep it pressed (OFF – contact is open).
 3. Turn on the power.
 4. Release the TEST/START button (ON - contact is closed).
 5. On emitter, check POWER ON and SAFE LEDs. The emitter is running correctly when they are both turned ON (POWER ON is green; SAFE is yellow).
 6. Check the LED condition of receiver.
 - ① POWER ON is green; SAFE/BREAK is red → optical axes are misaligned.
 - ② POWER ON is green; SAFE/BREAK is green → optical axes are aligned (HIGH ALIGN and LOW ALIGN turn yellow when the optical axes are aligned completely)
 7. To align the optical axes, follow the steps below.
 - ① Secure the receiver, and position the emitter until LOW ALIGN turns yellow. The optical axes of the lowest optics are aligned now.
 - ② Turn the emitter until HIGH ALIGN turns yellow. The top LED (SAFE/BREAK) turns green.
 - ③ Adjust the alignment further by observing the blinking frequency of SAFE/BREAK LED. See the LED status table on the right for details.
- Note: The green LED lighting, or blinking, is the necessary condition for alignment. The light curtains, in some cases, can be aligned and normally functioning, even without the alignment procedure. Ensure that the green light of the LED is ON and steady.
- ④ Determine the area where the SAFE LED is steadily ON by making small adjustments – for the first and then for the second unit – then place both units in the centre of this area.
8. Mount the two units firmly using pins and brackets.
 9. Turn off the power to the light curtain.
 10. Turn on the power to the light curtain.
 11. Confirm that the green LED is ON on the receiver (the beams are not interrupted, SAFE) and that the LED turns red when beams, even one of them, are interrupted (detecting an object, BREAK).
 12. The above confirmation procedure can be performed by using the optional test piece (SE9Z-TP-30). See page 7.

Receiver Alignment Level

LED Status	Diagnosis	Alignment Level
SAFE BREAK: Red ON HIGH ALIGN: OFF LOW ALIGN: OFF POWER ON: Green ON	Optics are misaligned completely.	
SAFE BREAK: Red ON HIGH ALIGN: Yellow ON LOW ALIGN: OFF POWER ON: Green ON	Optics are misaligned.	
SAFE BREAK: Red blinking HIGH ALIGN: Yellow ON LOW ALIGN: Yellow ON POWER ON: Green ON	Optics are misaligned. Safe Break LED blinks at an F1 frequency. Red-colored LED. Very low alignment.	
SAFE BREAK: Red blinking HIGH ALIGN: Yellow ON LOW ALIGN: Yellow ON POWER ON: Green ON	Optics are misaligned. Safe Break LED blinks at an F2 frequency higher than F1. Low alignment.	
SAFE BREAK: Green blinking HIGH ALIGN: Yellow ON LOW ALIGN: Yellow ON POWER ON: Green ON	Safe Break LED continues to blink at an F2 frequency, but the LED is now green. Medium alignment.	
SAFE BREAK: Green blinking HIGH ALIGN: Yellow ON LOW ALIGN: Yellow ON POWER ON: Green ON	Safe Break LED blinks again at an F1 frequency minor than F2. LED always green. Good alignment.	
SAFE BREAK: Green ON HIGH ALIGN: Yellow ON LOW ALIGN: Yellow ON POWER ON: Green ON	Safe Break LED permanently ON. All optics correctly aligned.	

Notes on Operating Environment

- Do not use light curtains for machines which cannot be stopped suddenly by electrical control.
- In order to prevent light curtains from malfunctioning, take ground-ing into consideration depending on the operating environment.
- Do not install or use light curtains in areas subject to the following conditions, otherwise malfunction or damage of the light curtain may occur.
 - Inductive equipment or heat source
 - Strong electromagnetic waves
 - Direct vibrations or shocks
 - High concentration of dust
 - Toxic gas
 - Oil, chemicals, organic solvents
 - Constant exposure to water or high humidity resulting in condensa-tion

HR1S Series Safety Relay Modules

HR1S-AK311144 / -AK311144P / -AK351144 / -AK351144P

- Combination of SE4B light curtains and HR1S series safety relay modules conforms to safety category 4.
- Removable terminal type available for easy maintenance.



Types

Ordering Type No.	Terminal Style	Rated Voltage
HR1S-AK311144	Integrated Terminal Block	24V AC
HR1S-AK311144P	Removable Terminal Block	24V DC
HR1S-AK351144	Integrated Terminal Block	120V AC
HR1S-AK351144P	Removable Terminal Block	24V DC

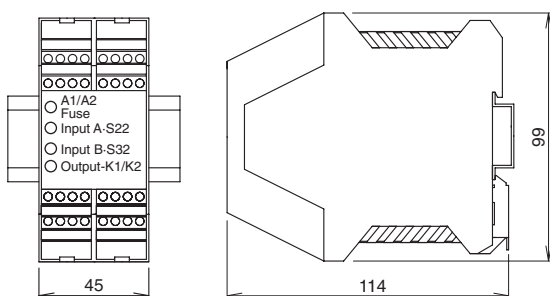
Specifications

Operating Temperature	-10 to 55°C (no freezing)		
Degree of Protection	Terminal: IP20, Housing: IP40		
Rated Voltage	HR1S-AK311144(P): 24V AC (-15 to +10%) 50/60 Hz 24V DC (-15 to +10%) HR1S-AK351144(P): 120V AC (-15 to +10%) 50/60 Hz 24V DC (-15 to +10%)		
Power Consumption	120V AC: 6 VA maximum 24V AC: 5 VA maximum 24V DC: 3W maximum		
Overcurrent Protection	Electronic		
Control Circuit Voltage	24V		
Safety Category	4 (EN954-1)		
Response Time	40 ms maximum		
Input Synchronization Time	S1 → S2: 2 sec S2 → S1: 4 sec Automatic start: Unlimited		
Overvoltage Category	III		
Pollution Degree	2		
Rated Insulation Voltage	300V		
Maximum Input Resistance	28Ω		
No. of Output Circuits	Safety Circuit	3NO	
	Auxiliary Contacts	Contact	1NC
		Transistor	4NO
Output Contact Ratings	Safety Circuit	AC-15	C300 (1800VA/180VA)
		DC-13	24V/1.5A, L/R = 50 ms
	Auxiliary Circuits	AC-15	C300 (1800VA/180VA)
		DC-13	24V/1.5A, L/R = 50 ms
	Transistor Circuit	24V/20 mA	
Minimum Applicable Load	17V/10 mA (initial value)		
Operating Frequency	1200 operations/h maximum		
Rated Current	Safety circuit output total: 18A maximum Each safety circuit output: 6A maximum		
Wire Size	HR1S-AK311144: 2.5 mm ² × 1, 0.75 mm ² × 2 maximum HR1S-AK311144P: 2.5 mm ² × 1, 1.5 mm ² × 2 maximum HR1S-AK351144: 2.5 mm ² × 1, 0.75 mm ² × 2 maximum HR1S-AK351144P: 2.5 mm ² × 1, 1.5 mm ² × 2 maximum		
Weight (approx.)	HR1S-AK311144(P): 300g HR1S-AK351144(P): 400g		

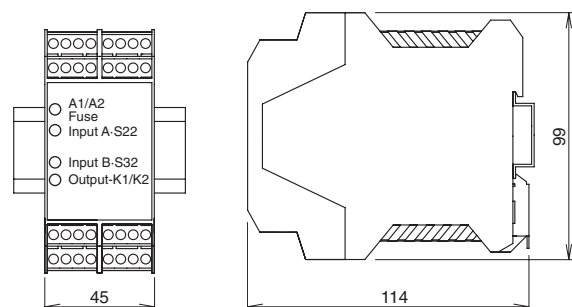
- Use a 4A fuse (Type gL) or a 6A fast blow fuse for power line and output line protection.

Dimensions

• HR1S-AK311144/-AK351144



• HR1S-AK311144P/-AK351144P Removable Terminal Type

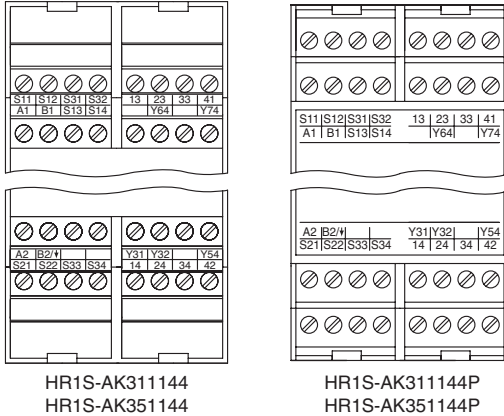


All dimensions in mm.

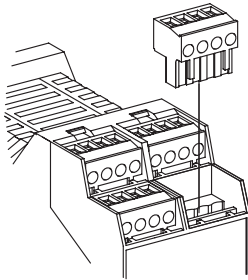
LED Indication

- A1/A2 Fuse: Turns on when power voltage is normal. Turns off when power is interrupted or the electronic fuse blows.
- Input A-S22: Turns on when S21-S22 is closed.
- Input B-S32: Turns on when S31-S32 is closed.
- Output K1/K2: Turns on when the safety outputs of 13-14, 23-24, and 33-34 are closed.

Terminal Arrangement



- The terminal blocks of the HR1S-AK311144P/-AK351144P can be removed and installed as shown below, allowing for easy installation and replacement of modules.



⚠ Residual Risk (EN292-1, 5.5)

Wiring diagrams in this catalog have been tested under actual operating conditions. HR1S safety relay modules can be used in a safety circuit by connecting to the safety equipment compliant to applicable standards. Consider residual risk in the following circumstances.

1. When circuits other than described in this catalog are used.
2. When the applicable standards of machine operation are not observed, or when the machine is not adjusted or maintained properly (observe a strict maintenance schedule).
3. When the contacts of relays and contactors for connection are not forced guided compliant with EN 50205.

Instructions

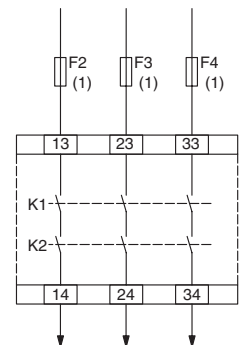
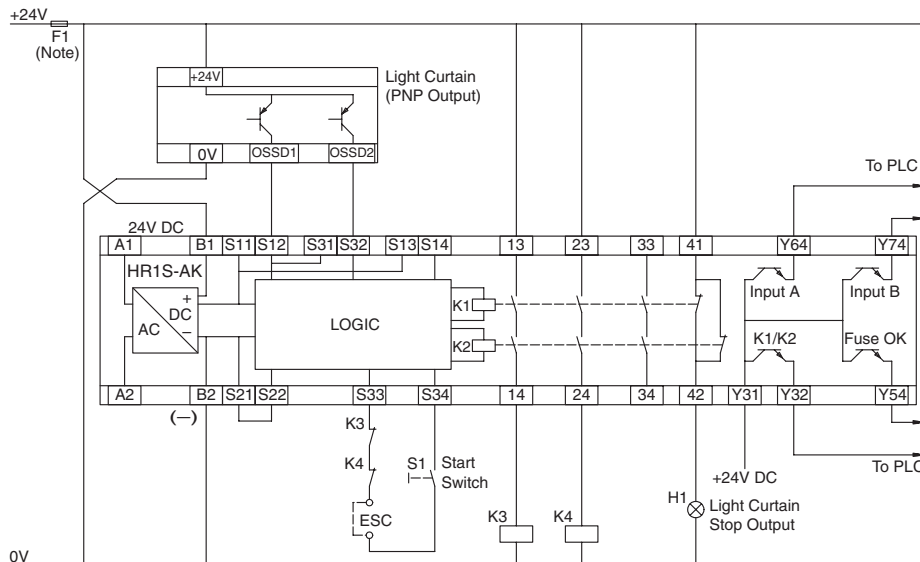
HR1S Safety Relay Modules

- Do not disassemble the safety relay modules. Do not damage the seal.
- Failure to observe the following instructions may cause accidents that result in death or serious injuries.
 - **Connect the wires according to the wiring diagrams shown in this catalog.**
 - **Connect the wires according to applicable standards.**
 - **The contacts of relays and contactors must be forced guided compliant with EN 50205.**
 - **When maintaining or adjusting the machines, observe a strict regular maintenance schedule.**
- Turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety relay module in order to avoid electric shock or fire. Otherwise death or serious injury may be caused.
- When installing and wiring, keep a sufficient distance from inverters or power lines.
- Use 13-14, 23-24, and 33-34 outputs for stop category 0 compliant with EN 60204-1/EN 418.
- Do not use 41-42, Y31-Y32, Y31-Y54, Y31-Y64, or Y31-Y74 outputs for safety-related circuits.

HR1S-AK Wiring Diagram with Light Curtain

Note: Be sure to connect terminals to correct power supply.
AC power: A1-A2
DC power: B1-B2

Applicable safety category depends on the function of connected safety equipment. Confirm the function of safety equipment before use.



Note: Use a 4A fuse (Type gL) or a 6A fast blow fuse for power and output line protection.

Specifications and other descriptions are subject to change without notice.



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