

INSTRUCTION SHEET

Safety Laser Scanner SE2L-HA05LP SE2L-HA05LPC

Confirm that the delivered product is what you have ordered. Read this guick reference guide to make sure of correct operation. Make sure that the quick reference guide is kept by the end user.

SE2L-HA05LPC is used with an optional connector cable (SE9Z-HS2-C***). (***: 002 = 2m, 005 = 5m, 010 = 10m, 020 = 20m)

Safety precautions

Special markings and symbols are used in this document to alert the reader especially to safety-related issues. Follow strictly the instructions marked by these special markings and symbols to ensure safety during the operation.

Mark	Meaning
A WARNING	Procedures that could lead to dangerous situation, critical injury or death if not carried out properly.

Befer to the SE2L user's manual (B-2490) for details

Read section 11 "Instructions for using SE2L for the first time after purchase" when using the device for the

MARNING

Please read the following guidelines for correct use of the SE2L. Proper handling and usage ensure the SE2L to operate accordingly

(1) Genera

- SE2L is an AOPDDR that detects obstacles within the configured protection zone by detecting diffused optical radiation. Optical radiations are generated and emitted into the configured protection zone. The optical radiations are then rotated by a rotating motor covering the protection zone. The optical radiations are diffused and reflected back towards the receiving unit of the SE2L.
- SE2L is designed to protect human begins or systems by monitoring the hazardous area. It is not designed for the protection from high speed objects or the electro magnetic radiation.
- Pre-operation tests must be performed in order to verify the functionality and the performance of the SE2L. • Do not modify or disassemble SE2L. Such modifications will affect the detection capability leading to injuries or death.
- Do not modify or disassemble SE2L to maintain its housing rating. Such modifications will void the warranty. Operator is referred to a person who is responsible and qualified to operate the SE2L. Operator should have attended appropriate safety-related training and could operate the SE2L correctly.
- A person-in-charge must be assigned and have trained the operator about the correct use of SE2L.
- The person-in-charge is responsible to ensure the proper working environment for SE2L. The person-in-charge is responsible for the compliance with the local safety requirements, standards, rules and regulations, laws of respective nations, states or districts when the SE2L is used in a safety-related system.
- SE2L has been manufactured and shipped under the strict quality control. If you find any defect in the product contact the nearest distributor or sales representative
- IDEC cannot be held responsible for the damages or failure due to misuse of the product by customers or third parties. IDEC cannot take responsibilities for any loss from the misuse except for the responsibilities governed by law
- User should prepare test pieces for detection capability verification. The test piece should emulate the smallest object that is intended to be detected during the operation.
- Maximum level of homogeneous pollution for SE2L is 30%. Warning signal will be displayed if the pollution exceeded the stated limit. However, operator should always keep the optical window in clean condition. Before resetting the interlock of the SE2L, operator must ensure the surrounding is safe especially in the
- protection zone
- During decommission of the SE2L, protective measures must be taken to ensure safety on the protection zone. Protective materials such as guards or light curtain should be used to prevent any passage into the hazardous area
- SE2L including its accessories are subject to change without prior notice for the improvement.
- SE2L should be disposed as industrial waste or in accordance with the local disposal directives. • Do not drop the product. Doing so may lead to damage or failure of the product, and the performance cannot be guaranteed. If it falls on the human body, it may result in injury

(2) Operating environmen

- Make sure that SE2L's operating environment is within the stated specification (temperature, humidity) ambient light, etc.). Using SE2L in the out-of-spec environment may cause malfunction or decrease the detection capacity.
- Do not use or mount SE2L near devices that could generate strong electromagnetic waves as it could
 affect the operation of SE2L. Operating under such environments may cause malfunction or incorrect detection
- Do not use or mount SE2L in dusty, smoky, or misty environments, or where corrosive substances are present. Operating under such environments may decrease the detection capacity of SE2L.
- This product is for indoor use only.

(3) Installation MARNING

- Install the SE2L on a firm surface or structures to avoid displacement of the sensor.
- The SE2L should be firmly mounted using screws. Shock and vibration should not loosen the mounting. SE2L will not operate properly if the protection zone is different from the intended area due to the displacement. Recommended torque for screws is 3N·m.
- Safety distance must be determined before installing SE2L. User must ensure the functionality of the SE2L after installation by placing a test piece in all the protection zone.
- During the installation of the SE2L, protective materials such as guards or light curtain should be used to prevent any passage into the hazardous area.

- B-2487(0) · Reset switch used for interlock, muting and override function should be mounted at a location away from the protection zone. Also the whole protection zone must be visible from the switch location
 - Mutual interference could occur when identical SE2Ls are mounted at the same detection plane SE2L should be mounted at a location which has sufficient space for maintenance.
 - Do not add any protective materials such as glass, transparent cover, etc. in front of the optical window. This would lead to loss of detection capability of the SE2L. • Minimum detectable width varies with the distance.

(4) Wirina \land WARNING

- Switch OFF all the power supply during wiring. • If the source of the power supply is taken from a converter, please ensure the power supply fulfills the
- following requirements a) A rated output voltage of 24V DC ±10% (SELV circuit, Overvoltage Category II)
- b) Reinforced insulation or double insulation for the primary and secondary circuit c) Holding time of the output should be above 20ms
- d) The power supply must comply with the requirements of electrical safety and electromagnetic compatibility (EMC) regulations of the respective country, states and district.
- All the input / output signal cables should be installed away from machines power lines and high-voltage
- Use OSSD of the SE2L to control safety-related machine / system. Do not use Warning signals to control safety-related machine as these are non-safety signals.
- Both the OSSD1 and OSSD2 outputs should be connected to the safety-related machines or control system. If OSSD3 and OSSD4 are used they must be connected in the same manner
- Use shield cable for the connection between OSSD signals and safety-related machines or systems.

(5) Configuration 🕂 WARNING

- · Configuration of safety functions are password protected. Only authorized personnel or operator with password are allowed for configuration.
- SE2L will not operate without an initial configuration.
- Pre-operation test must be performed to verify the configurations before operating the SE2L. Increasing the response time of OSSD will increase the stability of SE2L. However, this will reduce the
- detection capability towards moving objects. User must perform risk assessment before using this function.
- Changes made during the configuration must be recorded. Operator can use the report generating function in the SLS Project Designer.

(6) Test and maintenance

🕂 WARNING

- User must perform the following tests and maintenance by referring to the checklists in this manual. a) Pre-operation inspection b) Operation inspection
- c) Daily inspection
- d) Periodical inspection
- * The checklists in this document are provided as basic guidelines while performing the test and maintenance. User must perform additional inspection and maintenance tasks deemed necessary for the respective application.
- Stop the machine and stop using the SE2L if faults are detected during these tests.
- . Clean the optical window when it gets contaminated. If the optical window is damaged it should be replaced by a new one

Specification

Subject		Specification			
Model		SE2L-HA05LP SE2L-HA05LPC			
	Protection range	Max. 5.0m			
	Warning range	Max. 30m (Non-safety)*1			
	Distance tolerance*2				
	Distance capability	rec capability From Black-reflector sheet (1.8%) to Retro- reflector sheet			
	Detection angle	270°			
Detection property	Minimum detectable width	ø30mm (Max. protection. dist.: 1.8m) ø40mm (Max. protection. dist.: 2.5m) ø50mm (Max. protection. dist.: 3.0m) ø70mm / 150mm (Max. protection. dist.: 5.0m			
	Scan frequency	30ms (Rotational speed:	2000rpm)		
	Area pattern	Max. 32 areas (Pair input Max. 128 areas (Fixed in mode)	t mode) put mode / Encoder		
		ON -> OFF	60 to 2010ms		
	Response time	OFF -> ON	270 to 2010ms		
Optics	Element Pulsed laser diode				
	Wavelength 905nm				
	Safety class	Laser Class 1 (IEC 60825-1)			
Туре	Type 3 (IEC 61496-1, IEC 6149				
Functional safety	SIL 2 (Type B, HFT = 1) (IEC 61	508)			
PFH _D	8.1×10^{-8} (T1 = 20 years): When 1.6×10^{-7} (T1 = 20 years): When	8.1×10^{-8} (T1 = 20 years): When master-slave function is not in use. 1.6×10^{-7} (T1 = 20 years): When master-slave function is in use.			
	Size	80.0mm (W) , 80.0mm ((D), 95.0mm (H)		
	Weight	0.8kg (SE2L-HA05LP) 0.5kg (SE2L-HA05LPC)			
L la vala a	Protection	IP65			
nousing	Case material	Body: Aluminum Optical window: Polycark	oonate		
	Connection cable	Flying cable length: 3m (Waterproof connector: 0	SE2L-HA05LP) .3m (SE2L-HA05LPC)		
Power supply	24V DC ±10%: when operation 24V DC -30 / +20%: when ope	using converter power supp ration using battery	bly		
Power	Normal (Without load)	6W			
consumption	Max (With load)	50W			

Subject		Specification
Output types	OSSD1/2 (Safety-related)	Output type (High side SW) Output current (Max. 500mA)* ³ Leak current (Max. 1mA) Cable (AWG 26) Load (L/R = 25ms, C = 1µF)
	OSSD3/4 (Safety-related) / WARNING1/2 (Non-safety)	Output type (High side SW) Output current (Max. 250mA)* ³ Leak current (Max. 1mA) Cable (AWG 28) Load (L/R = 25ms, C = 1µF)
	RES_REQ1 / RES_REQ2 / MUT_OUT1 / MUT_OUT2 / AUX_OUT1 / AUX_OUT2	Output type (PNP transistor) Output current (Max. 200mA) Leak current (Max. 1mA) Cable (AWG 28)
Input types (Safety-related)	Area switching (5 inputs × 2 channels) EDM1 / EDM2 / MUTING1 / MUTING2 / MUTING3 / MUTING4 / OVERRIDE1 / OVERRIDE2 / RESET1 / RESET2 / ENC1_A / ENC1_B / ENC2_A / ENC2_B / ENC3_A / ENC3_B / ENC4_A / ENC4_B	Input Impedance 4.7kΩ Cable (AWG 28)
		USB 2.0 (USB micro type-B connector)
Interface	Configuration	RS-485 (Connection cable)
		Ethernet 100BASE-TX (Water proof connector)
	Temperature	-10 to +50°C (No freezing)
	Storage temperature	-25 to +70°C (No freezing)
	Humidity	95% RH (No condensation)
	Storage humidity	95% RH (No condensation)
	Surrounding intensity*4	Less than 1,500lx
Environmental resistance	Vibration	Frequency range: 10 to 55Hz Sweep rate: 1 octave / min Amplitude: 0.35mm ±0.05mm
	Shock	Acceleration: 100m/s ² Pulse duration: 16ms
	Outdoor operation	Not permitted
	Altitude	Below 2,000m

- *1 Distance when reflectance of the object is 90% or above.
- *2 Additional distance of 200mm is needed when the SE2L is working under highly reflective background.
- *3 Total current supply of OSSD output and Warning output should be below 1.0Å *4 When the light sources located at \geq 5° from the detection plane of SE2L.

2 Dimensions



* Refer to the SE2L user's manual for details on the water-proof connector of SE2L-HA05LPC.



4 Function

SE2L's function can be configure using the SLS Project Designer

(1) Scanning area

- Scanning area of SE2L consists of protection zone and warning zones. Maximum 128 sets of area can be configured. Further, two combinations for protection and warning zones can be selected for the operation. a) Protection zone, Warning zone 1 and Warning zone 2
- b) 2 Protection zones (Dual protection)
- In dual protection mode, two protection zones can be independently configured with one SE2L. This allows a single SE2L to provide safety protection for two devices simultaneously
- Protection and warning zones can be configured by using SLS Project Designer.

Protection zone

- Protection zone is safety-critical and directly connected to the OSSD signal.
- When an obstacle is detected in the protection zone, SE2L will switch the OSSD from ON-state to OFF-state (which should trigger
- a switch to stop a machine or AGV).
- For mobile applications, the OSSD signal can be used as the emergency stop signal. Figure 1 shows the examples of protection
- zone configured using manual mode and teaching mode respectively. User must configure these zones accordingly to ensure hazardous area is completely protected.



Fig.1 Protection zone configured using manual mode

Warning zone

- Warning zones are non-safety zones and are connected to Warning1 and Warning2 outputs. When the obstacle is detected in the warning zones, SE2L will switch the respective warning signal from ON-state to OFF-state. Warning signals can be used as an alert signal to avoid human beings or objects from approaching near the protection zone
- For mobile applications, warning signals can be used for reducing the speed of automatic guided vehicle (AGV) to avoid collision.

(2) OSSD

- OSSD is safety-related signal. When humans or objects are detected in the protection zone, the OSSD signal will switch to OFF-state from ON-state. OSSD signal has the self-diagnostic function which tests the signal periodically. Signal is continuously switched to OFF-state when an error is detected during the diagnostic
- Output states of OSSD1 and OSSD2 signal are identical. Both signals should be connected to the safety related machines or control system to fulfill the required safety level. If OSSD3 and OSSD4 are used they must be connected in the same manner.

(3) Interlock function

Interlock is a function to prevent automatic restart of the OSSD signal switching from OFF-state to ONstate. The following functions can be configured using the SLS Project Designer. OSSD1/2, RES REQ1 and RESET1 are for protection zone 1. OSSD3/4, RES_REQ2 and RESET2 are for protection zone 2. OSSD, RES_REQ and RESET are used to represent them throughout this document.

Automatic restart

- SE2L will restart automatically when interlock function is disabled or the restart interlock function is set "auto" when interlock is enabled. When obstacle from the protection zone is removed, OSSD signals switch from OFF-state to ON-state automatically
- However, if SE2L is in the lockout state due to error, OSSDs will remain in OFF-state even if the interlock function is disabled

Manual restart

- When interlock function is set to manual restart mode, even if the detected obstacles or system error is removed, OSSD signals will remain in OFF-state. An external reset input signal is required to release the interlock which allows the SE2L to switch to normal operation. RES_REQ signal will be switched to ONstate when obstacles disappear from protection zone.
- SE2L will resume normal operation only after confirming the reset signal (RESET). The duration of the reset signal should be more than 500 ms. After RES_REQ signal becomes ON and reset signal is confirmed, the OSSD signal will switch to ON-state after the lapse of the configured delay time. If OSSD's OFF-state is due to an internal fault, it will remain in OFF-state even when reset signal is provided. Delay can be configured in the range of 1s to 6s.

Manual start

Start interlock setting has only manual mode. Start interlock is a function which keeps the OSSD in OFFstate during the start-up until an external reset input is applied. The RES_REQ signal switches to ON-state after the SE2L completes initial routines and ready to accept the RESET input. When RESET input is applied, OSSD will switch to ON-state if no object is detected in the protection zone. The duration of the reset input should be more than 500ms. Delay can be configured in the range of 1s to

(4) External device monitoring (EDM) function

EDM is a function that monitors the state of the input signal from the controlled machine or automated quided vehicle (AGV). EDM is configured using the SLS Project Designer. When EDM function is enabled, any fault detected in EDM signal will switch the OSSD signal to OFF-state. Logic of EDM signal should be always inverse of the OSSD signal. EDM input signal ON / OFF delay is configurable to match the user's system.

Please do not connect EDM input when this function is not needed. When protection zone 2 is configured, the same circuit and timing chart are applied to OSSD3, OSSD4, and EDM2.

(5) Muting function

Muting function temporarily suspends the safety function in the configured zone of SE2L when the specified conditions are fulfilled. In the muting state OSSD remains in the ON-state even when an object is detected in the configured muting zone. Two independent hard wired input signals are provided to start and end the muting function. Muting zone is configured using the SLS Project Designer. When muting inputs fulfill the muting start conditions, SE2L will suspend the safety function for the muting zone within

Muting start condition Muting function will start when the following conditions are fulfilled:

- a) There are no objects in the protection zone and the OSSD is in ON-state.
- b) The two independent hard wired muting input signals are switched to ON-state in the predefined sequence within the pre-set time interval. However, the switching interval between two input signals should not be 0.

Muting stop condition

- Muting function will stop when any one of the condition below is fulfilled:
- a) One of the muting inputs switches to OFF-state. b) When the muting state exceeds the predefined maximum muting time.
- c) Objects are detected in the protection zone which is not covered by the muting zone.
- d) Error is detected by the self-diagnostics function.
- e) During muting state when the area is switched to another area.

Muting override function

Muting override is a function to recover SE2L when the OSSD is switched to OFF-state due to muting related errors by temporarily suspending the safety function. Override function is active when the override input (OVERRIDE 1/2) and the reset input (RESET1/2) are switched in a sequence.

(6) Reference monitoring function

Reference monitoring is a function to monitor the displacement of the SE2L or the structure used as reference boundary.

Access protection

An example of reference monitor function used for access protection is shown in figure 2. Reference segments should be configured on each surface for displacement detection. Reference segments should be configured such that displacement can be easily detected. The OSSD will switch to OFF-state when access penetration is detected, and also if the distance between SE2L and the reference structure changes. This function is compulsory for vertical applications



Fig.2 Front view of the access detection using reference monitor function

* This function can be also used in area protection applications. Refer to the user's manual for details.

(7) Area sequence function Area sequence is a function to monitor sequences of area switching

When this function is activated, OSSD signal will switch to OFF-state if the switching pattern is other than the configured sequence. This function prevents the machine to operate with random protection zone.

From each area, switching selection to maximum 128 other areas is possible when configuring the area sequence And, it is necessary to specify 1 or more areas to avoid error.

Area switching sequence

When the area sequence function is disabled, the SE2L can switch from an area to any other area. (Figure 3) When the area sequence function is enabled, the SE2L can switch from an area to specified areas only. (Figure 4)

Area sequence function is recommended for control systems where switching area sequences can be configured



(When disabled)



(8) Response time

Response times of OSSD signal, OFF response time and ON response time are configurable individually for each area using the SLS Project Designer. The response time for Warning 1/2 may differ from that for the OSSD. In dual protection mode, it is possible to set different response times for protection zone 1 and 2. Table 1 shows the possible configurable values.

When longer response time is configured, the stability of SE2L can be increased. However, longer response time requires longer safety distance. User must perform risk assessment before configuring the response time. Addition of maximum 1 cycle (30ms) has to be taken into account for the area switching.

Table-1 Response time of SE2L

				Response	e time (ms)			
	60	90	120	150	180	210	240	270
	300	330	360	390	420	450	480	510
	540	570	600	630	660	690	720	750
OFF (ON -> OFF)	780	810	840	870	900	930	960	990
	1020	1050	1080	1110	1140	1170	1200	1230
	1260	1290	1320	1350	1380	1410	1440	1470
	1500	1530	1560	1590	1620	1650	1680	1710
	1740	1770	1800	1830	1860	1890	1920	1950
	1980	2010						

				Response	time (ms)			
								270
	300	330	360	390	420	450	480	510
	540	570	600	630	660	690	720	750
ON	780	810	840	870	900	930	960	990
(OFF -> ON)	1020	1050	1080	1110	1140	1170	1200	1230
	1260	1290	1320	1350	1380	1410	1440	1470
	1500	1530	1560	1590	1620	1650	1680	1710
	1740	1770	1800	1830	1860	1890	1920	1950
	1980	2010						

(9) Area switching

A maximum of 128 areas of area can be configured in SE2L. However, the maximum configurable area number differs depending on the selected function such as, muting and dual protection. Table-2 shows the maximum configurable area number according to the used mode.

External input signals are provided in SE2L for switching the area. It is necessary to provide correct signals to switch the area. Area input delay setting extends the wait time for signals to reach the stable state. Configure the necessary delay required for the system to provide stable input signal to SE2L. The default is 30ms. Area in use will be displayed in the 7-segment LED of SE2L. 3-digit area numbers will be scrolled on the display.

Table-2 Input combination f	for area	switching
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		Max.	Max.		
Mode	Protection	internal input	Pair input mode	Fixed input mode	Max. encoder area
Standard	1	10	32	128	-
	2	10	32	128	-
FDM	1	8	16	70	-
EDIVI	2	8	16	70	-
	1	4	4	6	-
MUTING / EDM	2	2	2	2	-
Encoder*1	1	6	7	-	128* ²
	2	6	7	-	128* ²

*1 Muting function mode cannot be used if encoder input mode is selected

*2 Among the 8 input patterns, at least one pattern must be used for encoder input. Other 7 remaining patterns can be selected to be used as static input or not in use. A pattern with encoder input mode can nave maximum 128 sets of area

Area switching (Pair input mode).

In the pair input mode of area switching, input signals are always used in pairs, such as IN_A and IN_ \overline{A} . State of one signal will be always in the opposite state of the other in this mode. Table-3 shows the state of input signals in the pair input mode for switching to the respective area.

Area	IN_A	IN_B	IN_Ā	IN_B
Area 1	ON	ON	OFF	OFF
Area 2	OFF	ON	ON	OFF
Area 3	ON	OFF	OFF	ON
Area 4	OFF	OFF	ON	ON

Area switching (Fixed input mode)

In this mode, a fixed number of input signals among the used inputs must be at ON-state to determine the area number. The number of ON input signals should be half of the used input signals for switching the area correctly. For example, if the maximum user area is configured as 3, then 4-input signals (IN A, IN A IN_B, IN_B) will be used for the area switching and any 2-input signals among them should be always at ON-state to determine the area number

Area numbers for the corresponding input states are shown in Table-4. Please note that the same area will have different input states depending on the used number of input signals

Table-4 Input combination for area switching in fixed input mode (In the case of 4 input signals)

Area	IN_A	IN_Ā	IN_B *1	IN_B *1
Area 1	OFF	OFF	ON	ON
Area 2	OFF	ON	OFF	ON
Area 3	ON	OFF	OFF	ON
Area 4	OFF	ON	ON	OFF
Area 5	ON	OFF	ON	OFF
Area 6	ON	ON	OFF	OFF

*1 Use signals IN_E and IN_E in place of IN_B and IN_B when using the muting function.

(10) Increment encoder

In SE2L there are 2 pairs of encoder input terminals for connecting 2 units of dual channel incremental encoder signals. Area will be switched depending on the encoder speed. Direction of travel is detected by encoder's phase A and phase B signal that have the phase difference of 90°. Installing 2 incremental encoders allows for the speed and rotating direction of both encoders to be constantly monitored to detect abnormal travel and stop the AGV.

(11) Ethernet communication

Measurement data of SE2L can be obtained from the Ethernet communication. For the communication specification of SE2L, refer to the communication manual (B-2492).

Water proof Ethernet connector is located at the back of SE2L. To connect sensor with PC use an Optional Ethernet cable (SE9Z-HS2-XCD13),

Ethernet Setting

a)	Default setting
	Factory default value is shown below.
	IP address: 192.168.0.10
	Subnet mask: 255.255.255.0
	Default gateway: 192.168.0.254
	Port number: 10940
b)	Changing the IP address
	IP address can be changed by using SLS Project Designer.
	Refer to section 7.13 and 7.9.1 for details of the user's manual.

(12) Function to configure SE2L by SD card

Configuration generated by SLS Project Designer can be saved in a SD card. It is possible to transfer the setting directly from the SD Card to SE2L without connecting to a PC.

Unless otherwise specified, the term SD card in the user's manual refers to a Micro SD / SDHC card. The type of SD card should be Micro SD card when this function is used. Create a project file with set the serial number and password of the SE2L and save it on the SD card using SLS Project Designer. When the SD card is inserted to the specified SE2L, settings are automatically transferred. Setting will not be transferred to the unspecified SE2L.

(13) Master / slave function

Maximum 4 units of SE2L can be interconnected using RS-485 for Master / slave operation. One unit will function as a master unit communicating with up to 3 units that function as slaves via safety communication channel. Use the SLS Project Designer to configure the devices. Area switching of the slave unit is linked with the master unit while the slave units transmit the object

detection information to the master which controls the OSSD. It is also possible to use each slave unit's OSSD. Figure 5 shows the connection example.



Fig.5 Connection example (When OSSD of slaves are not in use)

5 Light interference

SE2L uses pulsed laser for object detection. Light sources in the surrounding could interfere with its operation leading to false detection. User should examine the surroundings environments before installing the SE2L. Some of the light sources that could interfere with SE2L are as below.

- (1) Incandescent light (4) Flashing beacon
- (2) Fluorescent light (5) Sunlight
- (3) Stroboscopic light (6) Infrared light sources

In case the light source cannot be avoided during the operation, SE2L should be installed with the light source located at ±5° or more from the detection plane to prevent the interference (Figure 6)



Fig.6 SE2L installation to prevent light interference



Mutual interference 6

Cautions are required while using two or more units of SE2L or identical products as pulsed laser signal from one another could lead to false detection. Figures below show the installation method for avoiding the mutual interference

(1) Changing the height of installation

Install at different heights to separate the mutual detection plane by 5° or more.



(2) Changing the angle of installation

Change the installation angle of SE2L by 5° or more from the mutual detection plane.



(3) Adding a shield between SE2Ls

Add a shield between SE2L s such that laser beam of one unit cannot reach the other to avoid the possible mutual interference



Fig.12 Parallel installation

7 Highly reflective background

Measured value will be longer than the actual distance of the object due to highly reflective background leading to wrong detection. When a highly reflective background cannot be avoided in the operating environment, an additional distance of 200mm must be added to the distance tolerance of 100mm while configuring the protection and warning zones. (Figure 13)



Fig.13 Additional distance under highly reflective background

8 Limited detection capability zone

The limited detection capability zone is defined as a region between the optical window and start of the detection zone. The limited detection capability zone of the SE2L is 90mm from the origin of SE2L. (Figure 14)

Presence of object with low reflectance may not be detected in this zone.



9 Wiring

Wiring example and cautions are shown bellow.

(1) Precautions

During electric wiring make sure that all devices are disconnected from power supply. Switch off all the power supply during wiring. Confirm that power supply is OFF.

(2) Power supply

Make sure that power supply is within the range of 24V DC ±10%. For battery operation, power supply should be within the range of 24V DC -30% / +20%. SE2L could be damaged if rated output voltage exceeds this range

(3) Wiring example

Standard (With maximum 32 sets of area)



R1 and R2: External equipment (Safety relay, Electromagnetic contactor) S1: Interlock reset switch *1 Refer to section 4 "Function (9)" for details on area switching.

Color	Signal	Function	Description	Pin No.**	AWG
Brown	+24V DC	Power	Power supply: 24V DC	1	22
Bule	OV DC	Power	Power supply: 0V DC	2	22
Red	OSSD1	Output	Protection zone output 1	3	26
Yellow	OSSD2	Output	Protection zone output 2	4	26
Red / Black	OSSD3/ Warning1	Output	Protection zone output 3 / Warning zone output 1	5	28
Yellow / Black	OSSD4/ Warning2	Output	Protection zone output 4 / Warning zone output 2	6	28
Purple	IN_A	Input	Area switching input A	7	28
Gray	IN_B/ MUTING3/ ENC3_A/ ENC4_A	Input	Area switching input B / Muting input 3 / Encoder input 3_A / Encoder input 4_A	8	28
White	IN_C/ OVERRIDE1/ ENC1_A	Input	Area switching input C / Override input 1 / Encoder input 1_A	9	28
Pink	IN_D/ MUTING1/ ENC1_B	Input	Area switching input D / Muting input 1 / Encoder input 1_B	10	28
Green	IN_E/ EDM1/ ENC3_A/ ENC4_A	Input	Area switching input E / External device monitoring 1 / Encoder input 3_A / Encoder input 4_A	11	28
Purple / Black	IN_Ā	Input	Area switching input A invert	12	28
Gray / Black	IN_B/ MUTING4/ ENC3_B/ ENC4_B	Input	Area switching input B invert / Muting input 4 / Encoder input 3_B / Encoder input 4_B	13	28
White / Black	IN_C/ OVERRIDE2/ ENC2_A	Input	Area switching input C invert / Override input 2 / Encoder input 2_A	14	28
Pink / Black	IN_D/ MUTING2/ ENC2_B	Input	Area switching input D invert / Muting input 2 / Encoder input 2_B	15	28
Green / Black	IN_Ē/ EDM2/ ENC3_B/ ENC4_B	Input	Area switching input E invert / External device monitoring 2 / Encoder input 3_B / Encoder input 4_B	16	28
Yellow / Green	RESET1/ ENC3_A/ ENC4_A	Input	Reset input 1 / Encoder input 3_A / Encoder input 4_A	17	28
Yellow / Blue	RESET2/ ENC3_B/ ENC4_B	Input	Reset input 2 / Encoder input 3_B / Encoder input 4_B	18	28
Orange	RES_REQ1/ MUT_OUT1/ AUX_OUT1	Output	RES_REQ1: Request output 1 MUT_OUT1: Muting state output 1 AUX_OUT1: Synchronous signal / Error / Window contamination error / Window contamination warning.	19	28
Orange / Black	RES_REQ2/ MUT_OUT2/ AUX_OUT2	Output	RES_REQ2: Request output 2 MUT_OUT2: Muting state output 2 AUX_OUT2: Synchronous signal / Error / Window contamination error / Window contamination warning.	20	28
White / Blue (TP)	RS-485 +	Communication	Communication protocol RS-485	21	28
White / Red (TP)	RS-485 –	Communication	Communication protocol RS-485	22	28
Shield wire	FG	_	Frame ground	Case	-

*1 Pin number of SE2L-HA05LPC

(4) Wire color and function





Fig.16 OSSD / Warning output circuit

Other output circuit RES_REQ1, RES_REQ2, MUT_OUT1, MUT_OUT2, AUX_OUT1, AUX_OUT2 outputs are PNP type.



Fig.17 Other output circuit

 Input circuit
 Figure 18 shows the input circuit for the area inputs, EDM1, EDM2, RESET1, RESET2, MUTING 1, MUTING 2, MUTING 3, MUTING4, OVERRIDE 1, and OVERRIDE 2 signals.



Fig.18 Input circuit

10 Troubleshooting

(1) Troubleshootir	ng	1		
Situation	Possible reason	Solution suggestion		
	Power supply is OFF	Make sure the power supply is ON.		
	Over voltage	Check the supply voltage.		
SE2L is not	Under voltage	Check the condition of the connector cable.		
operating	Cable is damaged	Replace with a new cable.		
	Configuration is incomplete	Reconfigure SE2L.		
	PC trouble	Check the PC's specification. Make sure the specification is compatible.		
SE2L is not		Close the other unrelated applications and reconnect.		
connected		Make sure the power supply is ON.		
SIS Project	Power supply is OFF	Check the supply voltage.		
Designer		Check the condition of the connector cable.		
	USB cable is not connected to USB port	Make sure the USB is connected to both PC and SE2L.		
	Power supply is OFF	Make sure the power supply is ON.		
Measurement		Check the supply voltage. Check the condition of the connector cable. Make sure the USB is connected to both PC and SE2L. Make sure the power supply is ON. Check the supply voltage. Check the condition of the connector cable. Check the error number in the 7-segment table. Restart SE2L if it is blinking. Mount SE2L at a location free from light interference. Re to section 5 for light interference counter measures.		
data is not	SE2L is in error /	Check the condition of the connector cable.		
displayed	lockout state	Check the error number in the 7-segment table. Restart SE2L if it is blinking.		
	Light interference	Mount SE2L at a location free from light interference. Refer to section 5 for light interference counter measures.		
	Mutual interference	Refer to section 6 for mutual interference counter measures.		
OSSD remain	Contaminated optical window	Check for any contamination or damage on the optical window.		
OFF even though the	Floor is detected	Make sure floor is not detected. Reconfigure the detection area.		
zone is free from obstacle	Background is detected	Make sure that the background is not inside the detection area. Reconfigure the detection area.		
zone is free from obstacle	Lockout state due to self-diagnostic function	Check the description of the error number and perform the possible solution as suggested.		
	SE2L is interlocked	Check the configuration of the interlock function. If RES_REQ is ON, supply SE2L with RESET signal.		

(2) Error number list

Table 5 shows the error number of the SE2L. These error numbers' information is displayed on the 7-segment display of the SE2L. If the SE2L is unable to resume normal operation, please contact the nearest distributor or sales representative for support.

Table-5 Error number list (Examples)

Frror No.	Details	Possible reason	Solution suggestion
45	Setting error / Incomplete setting	Reconfigure SE2L.	Automatic recovery or Input reset. (During Interlock setting)
4F	Encoder direction error	Confirm the encoder input status.	Automatic recovery or Input reset. (During Interlock setting)
50	Encoder error	Check that the difference in speed between Encoder 3 and Encoder 4 is less than the tolerance.	Automatic recovery or Input reset. (During Interlock setting)
55	Encoder angular velocity error	Make sure the angular velocity is correctly configured.	Automatic recovery or Input reset. (During Interlock setting)
56	Invalid area error	Confirm the input status during area switching.	Automatic recovery or Input reset. (During Interlock setting)
57	Area Input Connection Error	Confirm the input status during area switching.	Automatic recovery or Input reset. (During Interlock setting)
59	Area sequence error	Confirm area switching sequence.	Automatic recovery or Input reset. (During Interlock setting)
5b 5F	Encoder speed error	Make sure the encoder speed is correctly configured.	Automatic recovery or Input reset. (During Interlock setting)
5C	Encoder error	Confirm the encoder input status.	Automatic recovery or Input reset. (During Interlock setting)
5d	Encoder speed error	Make sure the encoder speed is correctly configured.	Restart the power supply.
5E	Invalid area error (During Encoder is valid)	Confirm the input status during area switching.	Automatic recovery or Input reset. (During Interlock setting)
60 to 63	Motor error	Mount the sensor in a way that the vibration, bump stated in the specification does not exceed.	Automatic recovery or Input reset. (During Interlock setting)
64	Master / Slave communication error	Confirm the connection between master and slave.	Automatic recovery or Input reset. (During Interlock setting)
70	Optical interference / High reflective background	Mount SE2L at a location free from light interference. Refer to section 5 for light interference counter measures.	Automatic recovery or Input reset. (During Interlock setting)
72	Operating temperature error	Make sure that operating temperature is within specification.	Restart the power supply.
74	Power supply error	Make sure that voltage is within the specification.	Restart the power supply.
7C	OSSD excess current error	Make sure the OSSD load is within the specification.	Restart the power supply.
7d	Slave unit 1 error	Check the error code on slave unit 1.	Automatic recovery or Input reset. (During Interlock setting)
7E	Slave unit 2 error	Check the error code on slave unit 2.	Automatic recovery or Input reset. (During Interlock setting)
7F	Slave unit 3 error	Check the error code on slave unit 3.	Automatic recovery or Input reset. (During Interlock setting)
80	Master unit error	Check the error code on master unit.	Automatic recovery or Input reset. (During Interlock setting)
84, 85 b9 to C0	Object in limited detection zone or contamination on the optical window	Clean the optical window (refer to section 8.5 of the manual). Further, remove any objects present inside the zone with limited detection capability (refer to section 5.4 of the manual) of SE2L.	Automatic recovery or Input reset. (During Interlock setting)
86	Mutual interference error	Mount SE2L at a location free from mutual interference. Refer to section 6 mutual interference for counter measures.	Automatic recovery or Input reset. (During Interlock setting)
8F	SD card detection error	Check the setting file in the SD card Check the SD card specifications.	Restart the power supply.
95 to 9A A8, AC	OSSD diagnostic error	Check the OSSD output wire.	Restart the power supply.
A6	EDM1 input connection	Check the EDM1 input wire.	Restart the power supply.

Error No.	Details	Possible reason	Solution suggestion		
A7	EDM2 input connection error	Check the EDM2 input wire.	Restart the power supply.		
A9	RESET input error	Check the RESET input wire.	Restart the power supply.		
AA	Reference monitor error	Check for the displacement of reference structure or SE2L position.	Automatic recovery or Input reset. (During Interlock setting)		
C1	Optical window is removed or contaminated	Replace or clean the optical window.	Restart the power supply.		
C7	Master-slave setting error	Different area input modes are used for the master and slave. Check the settings.	Restart the power supply.		
C8	Master-slave setting error	Check that there is only one master configured.	Restart the power supply.		
C9	Master-slave setting error	Dual Protection mode in master and slave unit is not the same. Check configuration.	Restart the power supply.		
CA	Master-slave setting error	Active area count in master and slave unit is not the same. Check configuration.	Restart the power supply.		
Cb	Master-slave setting error	Encoder function activation in master and slave unit is not the same. Check configuration.	Restart the power supply.		
СС	Master-slave setting error	Number of encoders activated in master and slave unit is not the same. Check configuration.	Restart the power supply.		
Cd	Master-slave setting error	Encoder pattern count in master and slave unit is not the same. Check configuration.	Restart the power supply.		
CE	Adjustment of the optical window is incomplete after replacement	Adjust the optical window after replacement.	Automatic recovery or Input reset. (During Interlock setting)		
CF	SE2L is not configured	Configure SE2L.	Automatic recovery or Input reset. (During Interlock setting)		
d3 to E6	Configuration is incomplete	Reconfigure SE2L.	Restart the power supply.		
FO	SD card initialization error	Remove the card and try again.	Automatic recovery or Input reset. (During Interlock setting)		
F1	SD card file content error	Check the setting file in the SD card.	Automatic recovery or Input reset. (During Interlock setting)		
Errors other than the above (42 to E9)	Device Error	Make sure that FG wire is correctly to the ground. Also check the surrounding disturbance of the operating environment. Mount the sensor within the stated vibration, bump in the specification. Replace SE2L if it does not recover even after restoring the power supply. Contact the nearest distributor or sales representative for the renair	Restart the power supply.		

*1 Error numbers are represented by: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, and F. *2 In 7-segment display "B" and "D" will display as "b" and "d".

4

11 Instructions for using SE2L for the first time after purchase

SE2L does not operate without initial configuration. Please download the configuration application "SLS Project Designer"(ver.3.1.0 or later) from our website. After installing it on your PC, please configure the SE2L.

(1) Configuration Procedure

a) Run the installed SLS Project Designer software.b) Following application window will appear. Select [Create new configuration] and click [OK] button.

File Edit Connections	Options Window Language Help				
♠ D • D 🗎	0.00				
	· · · · · · · · · · · · · · · · · · ·	Ve1.132 = 1	EZ-HARP +		
	Den Denote Transformer Den Denotemente Den	0 =			
				_	
					504

c) The following screen will be displayed. Click the [Connect] button to connect to the SE2L.

File Edit Connections Ontions

d) The message [Device configuration is incomplete! Please reconfigure the device.] will appear. Click [OK]. The following password dialog box will appear. Enter the default password [12345678] and click [OK].



e) The following configuration window will appear. Refer to chapter 7 of the user's manual to complete configuration and write to the SE2L.

SLS Project	Designer 3.1.0b0 -*				-		×
e Edit Con	nections Options Window	Language Help					
		() T T Ver1.1X	✓ SE2L-HA05LP				
	Configu	ration Monitor	Report	Diagnostic			
	Read from sensor	Function	Area 🌩	Confirm 🌩 Tr	ansmit to sensor		
Product inform	nation						
roduct identity	Undefined						
					Size limit : I	4 characters	
lser name Ur	ndefined						
					Size limit : I	50 characters	
Date		202	24/09/06				
Ethernet infor	mation						
P address	192.168.0.10						
Subnet mask	255.255.255.0						
Default gateway	192.168.0.254						
TCP Retransmission t	ime out 2 sec 💌						

Configuration is completed.

12 Declaration of Conformity

EU declaration of conformity Identification of the Product: Safety Laser Scanner Name and address of Manufacturer: IDEC CORPORATION 2-6-64 Nishimiyahara, Yodogawa-ku, Osaka 532-0004 Japan Name and address of the authorized representative and authorized to compile the technical file: APEM SAS 55, Avenue Edouard Herriot BP1, 82303 Caussade Cedex, France This declaration of conformity is issued under the sole responsibility of the manufacturer. Object of the declaration: Series Name: SE2L Series Model No.: SE2L-HA05LP and SE2L-HA05LPC The object of the declaration described above is in conformity with the relevant EU harmonization legislation: 2006/42/EC Machinery Directive 2014/30/EU Electromagnetic Compatibility Directive 2011/65/EU and (EU)2015/863 Restriction of the use of certain hazardous substances (RoHS) Directive Applied Union harmonized legislation and references to the relevant harmonization standards used or references the other technical specifications in relation to which conformity is declared. (2014/30/EU) EN 55011:2016+A1:2017+A11:2020 EN IEC 61000-6-4:2019 EN IEC 61496-1:2020 (Type 3 ESPE) EN IEC 61000-6-2:2019 EN IEC 62061:2021 (Regarding EMC requirement: refer to EN61326-3-1:2017 maximum SIL2) (2006/42/EC) EN IEC 61496-1:2020 (Type 3 ESPE) IEC 61496-3:2018 (Type 3 ESPE) IEC 61508-1:2010 (SIL 1-2) IEC 61508-2:2010 (SIL 1-2) IEC 61508-3:2010 (SIL 1-2) IEC 61508-4:2010 (SIL 1-2) EN IEC 62061:2021 (maximum SIL2) EN ISO 13849-1:2015 (Cat. 3, PL d) (2011/65/EU) EN IEC 63000:2018 Where applicable, the notified body: TÜV SÜD Product Service GmbH Certification Body (NB No.0123) Ridlerstaße 65, 80339 Munich, Germany

Additional Information: Certtificate No.: Z10 013332 0528 Rev.00

User support

The instruction sheet, user's manual and communication manual for SE2L can be downloaded from as follow. https://product.idec.com/?product=SE2L-HA





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http://www.idec.com