2D Laser Scanners

LSE Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Major Features

- Monitoring zone up to 90 °, 5.6 × 5.6 m
- Supports up to 4 channels
- Small size (W 125 × H 80.3 × L 88 mm) suitable for various installation environments
- Ethernet communication support
- atLiDAR, PC-only software support

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime / disaster prevention devices, etc.)
Failure to follow this instruction may result in economic loss, personal injury or fire.

02. Do not use the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.
Failure to follow this instruction may result in fire or explosion.

03. This product is not safety sensor and does not observe any domestic nor international safety standard.
Do not use this product with the purpose of injury prevention or life protection, as well as in the place where economic loss maybe expected.

04. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire.

05. Check connections and connect cables.
Failure to follow this instruction may result in fire.

06. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Do not stare at the laser emitter.
Failure to follow this instruction may result in eye damage.

02. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.

03. Use dry cloth to clean the unit. Do not use water or organic solvent when cleaning the unit.
Failure to follow this instruction may result in fire.

04. Do not apply high pressure to the laser scanner to clean it.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage / current or Class 2, SELV power supply device.
- After supplying power, the sensor performs self-check for about 10 sec. When self-checking, error occurrence, remote control setting, and teaching, the laser scanner outputs the same as it sensed obstacle.
- Mutual optical interference between laser scanners and photoelectric sensors may result in malfunction.
- Mutual optical interference between laser scanners may result in malfunction.
- Objects cannot be scanned when covering the front cover of the laser scanner.
- When the laser scanner is moved to another position, use it after re-teaching (Teach-in).
- Do not drop the unit. It may cause malfunction.
- Installing the laser scanner in the place where smoke, fog, dust, or corrosion is heavy may result in malfunction.
- When installing the laser scanner outdoors, take protective measures. Otherwise, it may result in product damage.
- Keep away from high voltage lines or power lines to prevent inductive noise. In case of installing power line and input signal line closely, use line filter or varistor at power line and shield wire at input signal line.
- Do not use the laser scanner near the equipment which generates strong magnetic force or high frequency noise.

CE KC

- Cover with shields, hoods, or etc. to prevent direct incidence of strong light (direct rays of sunlight, incandescent) into the laser scanner beam spread angle.
- When fastening the laser scanner with the bracket, align with the mark line.
- When mounting the bracket onto an external object, remove the wire fixture so that the wire of the laser scanner is not pressed.
- Fix the laser scanner in position with the fixing screw. Vibration may result in malfunction.
- When IP address of the laser scanner and wireless router is same, the communication does not connected. Set the wireless network (Wifi) to "Disable" in the network settings of the Windows operating system.
- This unit may be used in the following environments.
  - Indoors / Outdoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category II

Product Components

- Product
- 3 mm allen wrench × 1
- M2.6 × L6 Tapping screw × 2
- Instruction manual
- Bracket × 1

Software

Download the installation file and the manuals from the Autonics website.

■ atLiDAR

atLiDAR is the management program for laser scanner installation, parameter settings, status information and monitoring data, etc.
This program communicates with the laser scanner via Ethernet communication.

Manual

For proper use of the product, refer to the manuals and be sure to follow the safety considerations in the manuals.
Download the manuals from the Autonics website.

Sold Separately

- Remote control: RMC-LS

Network Setting

The laser scanner must be set identical with PC Network setting.

01. Go to "Start > Control Panel > Network and Sharing Center > Change adapter settings > Ethernet > Properties".
Double click"Internet Protocol Version 4 (TCP/IPv4) > Properties".

02. [Advanced] > Click the [Add] button of IP Address and add the laser scanner IP address.

IP address	192.168.0.3 to 192.168.0.254
Subnet mask	255.255.255.0

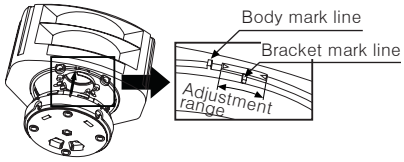
Order of Installation

For more information, refer to the atLiDAR software manual.

01. Install the laser scanner.

- Fix the bracket to the installation position using 4 hex socket bolts of above 5 mm.
- Pass the power, I / O and Ethernet cable through the holes in the bracket.
- After aligning one of the three indicator lines between the wrench holes on the side of the bracket with the indicator line on the main body, turn CW direction to be fixed. Rotate only within the adjustment range (-5 to 5°).
  Refer to [Figure 1].
- Fix the hole in the bottom front of the main body to the bracket using M2.6 × L6 Tapping screw and screw driver.
- Adjust the bracket thilt angle (-3 to 3°) depending on the situation with a hexagon wrench in the wrench hole on the side of the bracket.

[Figure 1]



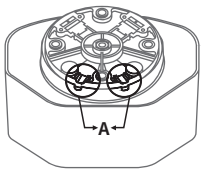
02. Install the laser scanner program, atLiDAR, to PC.
Download the software provided by Autonics website.

03. Connect the laser scanner and the PC, and set the network.
Refer to the Network Setting.

04. Laser scanner function setting
Use atLiDAR or remote controller, set each function to adequate the installation environment of the laser scanner and the obstacles to be detected.

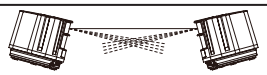
Cautions for Installation

- Install the unit correctly with the usage environment, location, and the designated specifications.
- Impact with hard objects or excessive bending of the wire lead-out may result in damage on the waterproof function.
- Please use after testing. Check if the indicator is working properly depending on whether the obstacle exists.
- In case of insufficient space between the cable and the mounting surface, excessive force may be applied on the cable.
  The part **A** may require to be cut if necessary.



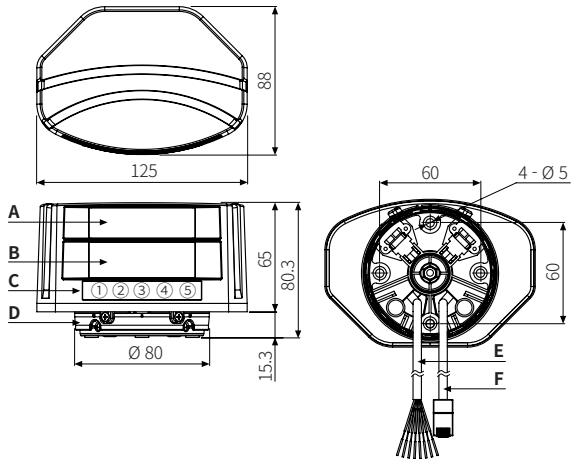
⚠ Caution: When using the tools, be careful not to be wounded.

- To prevent mutual interference when installing multiple devices, refer to the below.

	Tilt the devices and install them so that the scanning planes are tilted to each other.
Screen 	Install a screen to block direct laser beam interference between the devices.

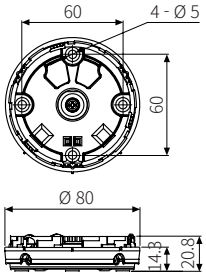
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.



A	Laser emitter	**C**	Indicators	**E**	Power, I / O cable
B	Laser receiver	**D**	Bracket	**F**	Ethernet cable

■ Bracket



Connections

■ Power, I / O cable

Color	Signal	Function
Brown	+V	+V
Blue	GND	GND
Yellow	OUT1_A	Obstacle detection output
Green	OUT1_B	
Red	OUT2_A	Error status output
Gray	OUT2_B	
Black	IN_A	Output test mode
White	IN_B	

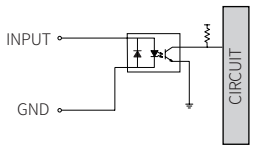
■ Ethernet cable

Pin	Signal
1	TX+
2	TX-
3	RX+
4	-
5	-
6	RX-
7	-
8	-

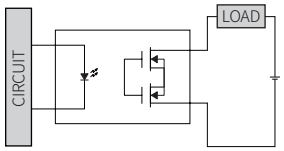
- The input / output signals can operate in both direction regardless of the polarity.
- When the photocoupler input is not used, do not wire both end of input terminal, or supply power under 3 VDC⎓.

Circuit

■ Photocoupler input



■ PhotoMOS relay output



Specifications

Model	LSE-4A5R2
Emitting property	Infrared laser
Laser class	CLASS 1
Wave length band	905 nm
Max. pulse output power	75 W
Response time	Typ. 20 to 80 ms + monitoring time
Scanning mode	Motion and presence
Monitoring zone	0.3 × 0.3 m to 5.6 × 5.6 m [01]
Front contamination	Normal operation with max. 30 % contamination of one material
Min. size of the scanning target [02]	At detection distance of 3 m: ≈ W 2.1 × H 2.1 × L 2.1 cm At detection distance of 5 m: ≈ W 3.5 × H 3.5 × L 3.5 cm
Angular resolution	0.4°
Aperture angle	90°
Object reflectivity	≥ 2 %
Laser scanner angle	-45°, 0°, 45°
Bracket rotation angle [03]	-5 to 5°
Bracket tilt angle	-3 to 3°
Life expectancy	≤ 6.8 years
Approval	CE KC
Korean Railway Standards	KRS SG 0068
Unit weight (package)	≈ 0.58 kg (≈ 0.96 kg)

01) At object reflectivity: 10 %
02) At object reflectivity: 90 % (Kodak Gray card R-27, White)
03) Indicates the laser scanner adjustment range.

Power supply	24 VDC⎓ ± 20 %
Power consumption	≤ 8 W
Communication interface	Ethernet (TCP/IP) 10BASE-T
Input	Photocoupler input H [01]: ≥ 8 - 30 VDC⎓, L: ≤ 3 VDC⎓
Output	PhotoMOS relay output Galvanic isolation, non-polarity Resistive load: 30 VDC⎓ / 24 VAC∼, ≤ 80 mA Output resistance: 30 Ω Switching time: t_{ON} = 5 ms, t_{OFF} = 5 ms
Insulation resistance	≥ 5 MΩ (500 VDC⎓ megger)
Dieletric strength	500 VAC∼ 50 / 60 Hz for 1 minute
Vibration	≤ 2 G (18.7 m/s²)
Shock	30 G / 18 ms
Ambient illuminance	Sunlight: ≤ 100,000 lx
Ambient temperature [02]	-30 to 60 °C (no freezing or condensation)
Ambient humidity	0 to 95 %RH, storage: 0 to 95 %RH (no freezing or condensation)
Protection structure	IP67 (IEC standard)
Cable spec.	Power, I / O cable: Ø 5 mm, 8-wire, 5 m Ethernet cable: Ø 5 mm, 4-wire, 3 m, shield cable, RJ45 connector
Wire spec.	AWG26 (0.16 mm, 7-core), insulator outer diameter: Ø 1 mm
Material	PC

01) Operates as output test mode and outputs obstacle detection output and error status output.
02) Ambient temperature in power supplied status is -30 to 60°C and in power cut status is -10 to 60°C.

Control Input / Output Status

Output / Input	OUT1 (obstacle detection output)		OUT2 (error status output)	
ON	ON	-	ON	-
OFF	ON	• Obstacle detection • Teaching • Error status • Scanning ready	ON	• Error status • Scanning ready
	OFF	• Obstacle non-detection	OFF	• Normal status

Indicators

Indicators	① (green)	② (green)	③ (green)	④ (red)	⑤ (orange)
Function	Ethernet connection	Power	Remote control operation	Operation	Error

• The operation of indicator not stated in the description is unrelated with the status.

■ Indicator by situation

Status		①	②	③	④	⑤
Comm. cable connection		ON	-	-	-	-
Scanning waiting sequence	1	-	OFF			ON
	2	-	OFF		ON	
	3	-	OFF	ON		
	4	-	OFF	Flashing (twice in every 0.5 sec)		
Scanning		-	Flashing (every 1 sec)	OFF	-	OFF
Obstacle detection		-	Flashing (every 1 sec)	OFF	ON	OFF
Teaching		-	Flashing (every 1 sec, for 35 sec)	OFF	Flashing (every 1 sec, for 35 sec)	OFF
Output test mode		-	Flashing (every 0.05 sec)	OFF	-	OFF

■ Error indicator

Status		①	②	③	④	⑤
Voltage error [01]	1	-				Flahing (3 times in every 0.2 sec)
	2	-				Flashing (1 time in every 1 sec)
	3	-				OFF (2 sec)
Temperature error [01]	1	-				Flashing (1 time in every 0.2 sec)
	2	-				Flashing (3 times in every 1 sec)
	3	-				OFF (2 sec)

01) Repeat 1 to 3 step.

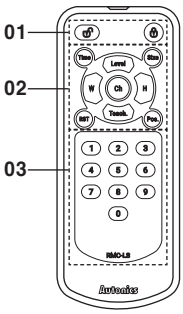
■ Remote control input key waiting

Status	①	②	③	④	⑤
Password	-	OFF	Flashing (every 0.05 sec)	OFF	OFF
Menu	-	OFF	Flashing (every 0.3 sec)	OFF	OFF
Number	-	OFF	Flashing (every 0.05 sec)	OFF	OFF

Sold Separately: Remote Control

■ RMC-LS

Each function can be set by the combination of the menu keys and the number keys. Refer to "Function Setting: Remote Control".



01. UN-LOCK / LOCK

02. Menu key

Time: Monitoring time
Size: Scanning target size
RST: Initialization to factory default
Pos.: Sensor position
Ch: Activated channel (s)
Level: Sensitivity
W: Width of the monitoring zone or concentrated monitoring zone
H: Height of the monitoring zone or concentrated monitoring zone
Teach.: Teaching

03. Number key

Function Setting: Remote Control

Initial entry differs depending on whether a password is set.
This description is for the password not set.

- Password is not set: (🔓)
- Password is set: (🔓) > Password
- If any key is not entered for 1 min after entering the (🔓) key, the laser scanner is scanning mode.

■ Sensor position

(🔓) > Pos. > Number key setting > (🔒) twice

Set the view and mounting position based on the view of the main body in the detection area.

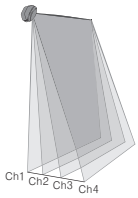
- e.g.) If the user sees the top of the laser scanner and is installed on the left, Set Top view + Left position.

Number key	SV	
	View	Position
0	Bottom	Center
1		Left (factory default)
2		Right
3	Top	Center
4		Left
5		Right

■ Activated channel (s)

(🔓) > Ch > (Each channel: Ch1 to Ch4) Number key setting > (🔒) twice

The laser scanner has 4 channels (Ch1, Ch2, Ch3, Ch4). Activate the channel (s) for obstacle detection.



Number key	SV
0	Not activated
1	Activated (factory default)

■ Monitoring zone: W (width) × H (height)

(🔓) > W (width) or H (height) > 0 > All Chs (0) or Select the set Ch (1 to 4) > Number key setting > (🔒) twice

If the mounting position is on left-right, set the width and height of the detection range for each channel. (it can be set in 0.1 m increments.)
If the mounting position is in the center, the detection range W (width) × H (height) = 5.6 × 5.6 m is fixed.

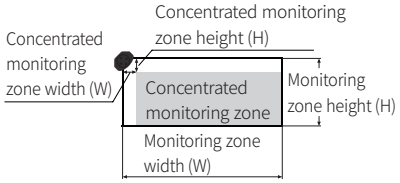
Number key	SV	Factory default
05 to 60	0.5 to 6.0 m	6.0 m

■ Concentrated monitoring zone

(🔓) > W (width) or H (height) > 1 > All Chs (0) or Select the set Ch (1 to 4) > Number key setting > (🔒) twice

If the mounting position is on the left-right, set the unnecessary area to exclude from the obstacle area for each channel. (it can be set in 10 cm increments.)

Number key	SV
0	OFF (factory default)
1	10 cm
2	20 cm
3	30 cm



■ Sensitivity level

(🔓) > Level > Number key setting > (🔒) twice

Set the object detection sensitivity of laser scanner.

Number key	SV	Description
1	Most sensitive (factory default)	Indoor installation
2	Sensitive	-
3	Insensitive	-
4	Most insensitive	Installation in snow and rain environment avaiable

■ Minimum size of the scanning target

(🔓) > Size > Number key setting > (🔒) twice

Set the size of minimum detection object.

- e.g.) Detecting the object over W 5 × H 5 × L 5 cm, set as 5 cm.

Number key	SV
0	OFF [01]
1	≈ 5 cm (factory default)
2	≈ 10 cm
3	≈ 15 cm
4	≈ 20 cm

01) At detection distance of 3 m: detectable the objects over W 2.1 × H 2.1 × L 2.1 cm
At detection distance of 5 m: detectable the objects over W 3.5 × H 3.5 × L 3.5 cm

■ Monitoring time

(🔓) > Time > Number key setting > (🔒) twice

When an obstacle is scanned, obstacle detection output occurs after monitoring time. By setting monitoring time longer, the laser scanner scans monitoring zone repeatedly and scans obstacles without being affected by snow or rain. (it can be set in 100 ms incremental.)

Number key	SV
0	OFF
1	100 ms (factory default)
2	200 ms
…	…
9	900 ms

■ Output

(🔓) > RST > 4 > Number key setting > (🔒) twice

Set the output type between obstacle detection output (OUT 1) and error status output (OUT 2).

Number key	SV	
	Obstacle detection output (OUT1)	Error status output (OUT2)
0	Normally open	Normally open (factory default)
1		Normally closed
2	Normally closed	Normally open
3		Normally closed
4	Normally open	Pulse
5	Normally closed	

■ Teaching

(🔓) > Teach. > 0 (teaching) or 1 (initialization)

This function is to familiarize the space which is set by the monitoring zone width (W) and height (H) in advance. (Teaching takes 35 seconds.)
Objects whithin the detection range are not detected while teaching.

- Re-teach when the environment has been changed or objects are added or removed in same area.
- Operate teaching in the environment free from snow, rain, fog, hail, or mutual interference of another laser scanner.
- For re-install the unit teaching already at no teaching required area, initial the unit.

■ Password

Set password: (🔓) > (🔒) > Password SV > (🔒) twice
Delete password: (🔓) > Password > Password > (🔒) > 7 > (🔒)

Restrict the access of settings by changing password. When setting password, the password function is activated. (Setting range: 0000 to 9999)
Please use the password function for preventing mutual interference of several units or malfunction.

- When losing the set password, re-supply the power and set the password again in 10 minutes.

■ Factory default initialization

(🔓) > RST > 0

The laser scanner's settings and IP, except password initializes as factory default.

■ IP initialization

(🔓) > RST > 1

The laser scanner's IP address initializes as factory default.

Checking SV

(key) > 9 > Keys for entering each function

The setting value can be checked through the remote controller and the indicator on the laser scanner for each function.

Theindicator flashes as much as the value of the numeric keys. For more detailed setting value, refer to Function Setting: Remote Control.

Function	Entering Key	Indicator
Sensor position	Pos.	③ + ④ (flash)
Activated channel (s) 01)	Ch	Channels' ③ + ④ (flash) Between Ch ② + ③ + ④ + ⑤ (flash once)
Monitoring zone 02)	W or H > 0 > Ch No.	Integer value ③ + ④ (flash) Decimal point ② + ③ + ④ + ⑤ (flash once) Decimal value ③ + ④ (flash)
Concentrated monitoring zone	W or H > 1 > Ch No.	Channels' ③ + ④ (flash)
Sensitivity level	Level	③ + ④ (flash)
Minimum size of the scanning target	Size	③ + ④ (flash)
Monitoring time	Time	③ + ④ (flash)
Output	RST > 4	③ + ④ (flash)

01) Activated Ch1, Ch3 and not activated Ch2, Ch4
③ + ④ (flash once) > ② + ③ + ④ + ⑤ (flash twice) > ③ + ④ (flash once) ② + ③ + ④ + ⑤ (flash once)

02) When checking the height after setting as W 3.4 × H 4.9 m
③ + ④ (flash 4 times) > ② + ③ + ④ + ⑤ (flash once) > ③ + ④ (flash 9 times)

Troubleshooting

Check the normal operation status of laser scanner periodically.

Error	Causes	Troubleshooting
Power indicator (②, green) OFF	Supply the power voltage.	Check the rated power supply.
	Wrong polarity connection of power supply	Check the Connection diagram when wiring the unit.
Error indicator (⑤, orange) flashing	Voltage error	Use the unit within the rated voltage.
	Temperature error	Use the unit within the specified ambient temperature.
	Inside error	Contact the seller.
Relay output is ON without objects within teaching area	Detection by external environment (snow, rain, or hail, etc.)	Change the settings: sensitivity level, scanning target size, monitoring time.
	There is the equipment which generates strong magnetic force or high frequency noise (motor, generator, or power cable, etc.) near the laser scanner.	Install the laser scanner away from the equipment which generates strong magnetic force or high frequency noise.
Laser scanner does not react for remote control operation.	The batteries' life cycle of the remote control is over.	Change the batteries.
	Wrong direction control of the remote control	Operate the remote control towards the near laser scanner.
After pressing the (key) key of remote control, the setting is not available.	Password incorrect.	Turn OFF the power and re-supply the power, the password is available to reset.
		Contact the seller.
atLiDAR (PC program) and the laser scanner does not connected.	LAN connector connection error	Check the PC and LAN connector connection part.
	IP address is not same.	Check the IP address of the laser scanner and the user PC.
	IP address of the laser scanner and wireless router is same.	Set the wireless network (Wifi) to "Disable" in the network settings of the Windows operating system.