

SDKELI®



LS Series Laser Lidar -
Measurement Type

OPERATION MANUAL

(August 2022)



(The picture is for reference only, the actual item may be different from the picture shown.)

Shandong Keli Opto-electronic Technology Co., Ltd.

Directives and standards

LS Series laser lidar (referred to as LS) meets the requirements of the following standards:

- **European Union Directive** EMC Directive 2014/108/EC
- **International Standard**
EMI: EN61326-1: 2013
EN55011: 2009 + A1: 2010
EMS: EN 61326-1: 2013
EN 61000-4-2: 2009
EN 61000-4-3: 2006 + A1: 2009 + A2: 2010
EN 61000-4-4: 2004 + A1: 2010
EN 61000-4-6: 2009
EN 61000-4-8: 2010
EN 61000-4-11: 2004
- **GB Standard** GB 4028

Safety precautions

The following safety warning signs are used to warn of potential personal injury. Be sure to obey all safety information with these signs, so as to avoid possible injury.



This is the key information prompt sign.

Sign contents are very important.

Operators must understand the contents and conduct operations in strict accordance with the requirements, so as to avoid possible safety accidents.



This is the safety warning sign.

Sign contents are very important.

Operators must strictly enforce the safety information prompted by the signs, so as to avoid possible safety accidents

Safety precautions for use



- Before using LS, read this manual carefully to understand the procedures and requirements of installation, operation and setting.
- LS should be selected, installed, overhauled and maintained by professionals. Professionals refer to the personnel who have been professionally trained and obtained accredited qualifications, or those who have a wealth of knowledge, training and experience and have owned the ability to solve such problems.
- To prevent light path from playing on the ground, the installation height of LS should be $\geq 200\text{mm}$. Try to keep LS away from the vibration area during installation.
- Measures should be taken to prevent water vapor, dust and other substances from entering LS when USB interface is open. In order to reach the protection grade of IP65 in use, please close and compress the black seal cover on the USB interface.
- Do not let LS drop.
- The use of LS should meet the local relevant standards and laws and regulations.
- Users should establish the rules and regulations for safe operation and management and implement them effectively.

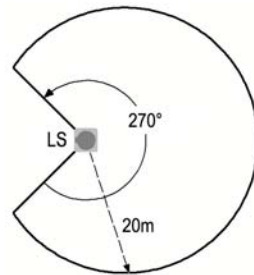
Applications

The measurement LS is applicable to the region detection and navigation of mobile robots and the typical application includes storage robots and service robots.

- The detection objects of LS must meet the following conditions:
 - 1) Be able to detect the objects within the scope of ability only.
 - 2) LS cannot detect transparent and semitransparent objects.
- Do not install LS in the following environments:
 - 1) Places outside the scope of environment parameters (temperature, humidity, interference light, impact vibration, etc.) specified in this Operation Instructions.
 - 2) Places with flammable and explosive gas.
 - 3) Places with dense smoke, particles, corrosive chemicals and other substances.
 - 4) Places that may have strong light interference (e.g. direct light) with LS.

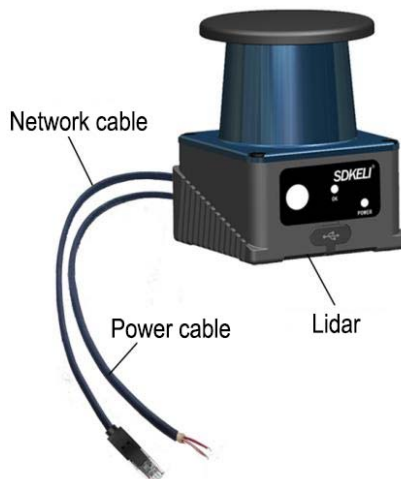
1. Working principle

LS is designed based on pulsed laser ranging principles to realize the two dimensional zone detection with an angle of 270° and radius of 20m through rotational scanning.



2. System description





LS supplies power to its system through the power cable. Users can use network interface or USB configuration cable to connect the lidar with the computer, monitor or read the measurement data through the configuration software.



3. Appearance information



Be sure to press the black sealing cover on the USB interface tightly to prevent moisture, dust, etc. from entering the LS, so as not to affect the use and life of the lidar.

Mark	Indicator	Color	Description
OK	Normal	Green	It is on during normal operation and off when there is a fault
POWER	Power	Red	It is on when power is connected
8	Digital tube	Red	 : It displays data after power-on start-up is completed
			 : It builds communication connection with computer
			 : It flashes during power-on initialization (with interval of 1 second)
			 : There is a fault in the LS system
			Under coexistence of multiple status, multiple status words are displayed circularly (with interval of 1 second)

4. Specification

Series	Maximum scan radius	Scan angle	Output form	Maximum measurement error	Angle resolution	Installation code
LS(2)	□□	27	□□ /	□	□□ /	□□
Specification	Maximum scan radius	Output form	Maximum measurement error	Angle resolution		
LS-1027DE/M03	10m@70% reflectance	Ethernet, can provide ROS, windows, linux driver	±4cm@1sigma	0.33°		
LS-1027DE/H03	4m@10% reflectance		±2cm@1sigma			
LS-2027DE/M03	20m@70% reflectance	Ethernet, can provide ROS, windows, linux driver	±4cm@1sigma	0.33°		
LS-2027DE/H03	8m@10% reflectance		±2cm@1sigma			
LS2-1027DE/M03	10m@70% reflectance	Ethernet, can provide ROS, windows, linux driver	±4cm@1sigma	0.33°		
LS2-1027DE/H03	4m@10% reflectance		±2cm@1sigma			
LS2-2027DE/M03	20m@70% reflectance	Ethernet, can provide ROS, windows, linux driver	±4cm@1sigma	0.33°		
LS2-2027DE/H03	8m@10% reflectance		±2cm@1sigma			

Scan angle: 270°

Installation code:

SZ: Horizontal installation

CZ: Vertical installation

FZ: Scatter shield installation

5. Transmission cable

- There is RJ45 standard connector at the output end of network cable, and the cable length is 1 m.

No.	Core color	Signal definition
1	White/orange	TX+
2	Orange	TX-
3	White/green	RX+
4	Green	RX-

- The structure of power cable is shown below, and the standard wire length is 1 m.



Core color	Signal definition	Signal description
Red	24V	Working power supply
Green	0V	

6. Technical parameters

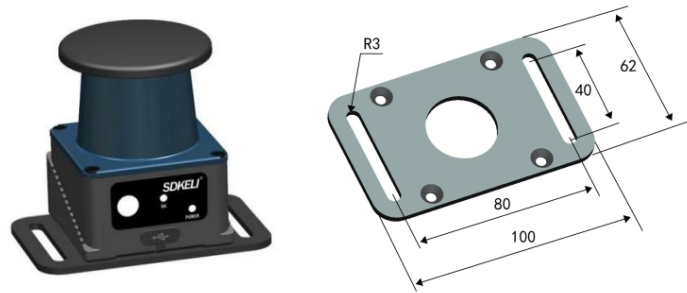
Optical characteristics		
Laser light source	905nm wavelength, Class 1 laser product	
Max. scan radius	20m@70% reflectance	
Scan angle	270°	
Angle resolution	0.33°	
Response time	High precision 36ms/r	Basic type 43ms/r
Max. measurement error	High precision ±2cm	Basic type ±4cm
Electrical / mechanical parameters		
Voltage supply	DC9V to DC30V	
Power-on and start-up time	Typical 8s	
Power consumption	Typical 3W	
Output	Ethernet output	
Dimensions	62×64×84.2mm	
Cable length	Standard cable length is 1 m	
Environmental characteristics		
Ambient temperature	Work: -10℃ to 50℃ (no frost or condensate fog) Storage: -40℃ to 70℃	
Ambient humidity	Working: 35%RH to 85%RH Storage: 35%RH to 95%RH	
Ambient light immunity	15000Lux	
Shock resistance	Acceleration: 10g; pulse duration: 16ms; Number collisions: three axes, 1000 ± 10 times per axis	
Vibration resistance	Frequency: 10Hz to 55Hz; Amplitude: 0.35±0.05mm; Number of scans: three axes, 20 times per axis	
Enclosure rating	IP65	
Electromagnetic compatibility (EMC)	EMI	EN61326-1: 2013 EN55011: 2009 + A1: 2010
	EMS	EN61326-1: 2013 EN61000-4-2: 2009 EN61000-4-3: 2006+A1:2008+A2:2010 EN61000-4-4: 2004+A1:2010 EN61000-4-6: 2009 EN61000-4-8: 2010 EN61000-4-11: 2004

7. Measurement data

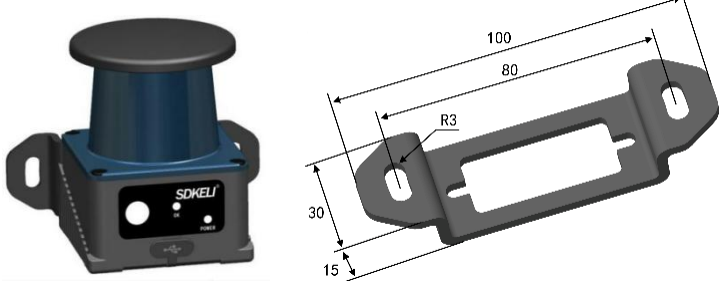
Measurement value (X)	Meaning
X=1	System failure
1 < X≤50000	Normal measurement value (cm)
X > 50000	The target does not exist or the object reflectivity is low

8. Installation

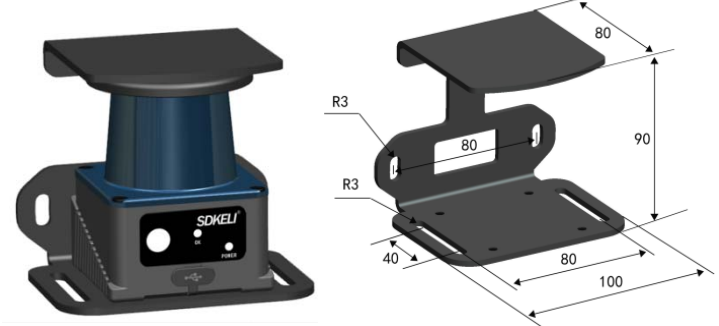
- Horizontal installation (SZ)



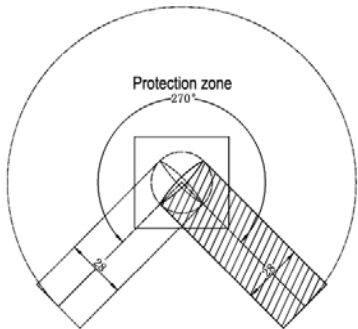
- Vertical installation (CZ)



- Scatter shield installation (FZ)



- 1) To prevent the light from being projected to the ground, the installation height of LS should not be smaller than 200mm.
- 2) Try to keep LS away from the vibration area during installation.
- 3) During installation, there should be no obstacles in the optical receiving area shown in the figure below.

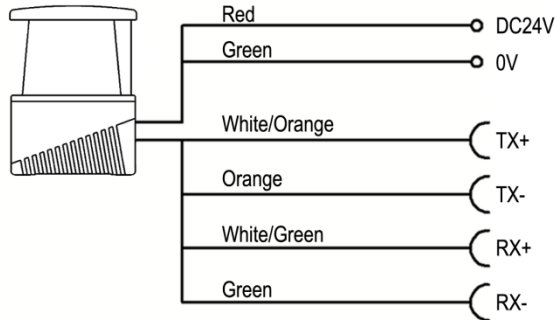


9. Ethernet configuration

Default IP address: 192.168.0.10

Port number: 2112

10. Wiring



WARNING

- Please read this manual carefully before wiring.
- Wiring must be conducted after the power is cut off.
- Double insulation or reinforced insulation must be used between all input and output interfaces and dangerous voltages.
- LS cables must be kept away from high-voltage wires and power lines.
- Users should not replace the cable without permission.
- Conduct correct wiring after defining the signal meaning of all terminals.

11. Common problems and solutions

Q1. Lidar cannot obtain data through the network port

- 1) Whether the lidar network interface is connected to the computer network port.
- 2) The default IP address of the lidar is 192.168.0.10. During the test process of the direct connection between the lidar and the computer, the computer IP address needs to be configured as an IP in the format of 192.168.0.xx, that is, it is in the same network segment as the radar IP to communicate normally.
- 3) If the lidar network interface is connected to the router (or switch), please ensure that the radar IP is the same as the router's assigned network segment, that is, the router's assigned network segment is at 192.168.0.xx;
- 4) The lidar can also modify the IP address through the front USB and the window software provided by us to meet the requirements of the same network segment as the computer.

Q2. Use of front USB port

The front USB port connected to the computer though the configuration cable can be used for demonstration and debugging, and the lidar scanning outline can be displayed through the host computer, and it is not used for lidar data output.