SDKELI®

KLM LIDAR - Measurement Type

OPERATION MANUAL

(May 2022)

CE

Shandong Keli Opto-electronic Technology Co., Ltd.

■ Directives and standards

KLM series lidar (referred to as KLM) meets the following standards:

- European Union Directive EMC Directive 2014/30/EU
- International standard

  EN61496-1(Type3) EN61496-3(Type3)

  EN60825-1(Class 1 laser product)

  EN13849-1：2015(Category3, PLd) EN61326-1：2013

  EN55011：2009+A1:2010

  EN61326-1：2013 EN61000-4-2：2009

  EN61000-4-3：2006+A1:2009+A2:2010

  EN61000-4-4：2004+A1:2010

  EN61000-4-6：2009 EN61000-4-8：2010

  EN61000-4-11：2004

- GB standard

  GB 4028

■ Safety precautions

⚠CAUTION

This is a key information prompting sign.
Sign contents are very important.
Operators must understand content requirements and implement the operations in strict accordance with the requirements, so as to avoid possible accidents.

■ Safety precautions for use

⚠CAUTION

- KLM used as " Class 1 Laser Product " according to IEC 60825-1 does not permit human access to laser radiation in excess of the accessible emission limits of Class 1 for applicable wavelengths and emission duration.
- If KLM is used in a manner not specified by the manufacturer, the detection provided by it may be impaired.
- To examine or replace any parts of KLM should be carried out by the manufacturer or his agent.
- KLM should be selected, installed, overhauled and maintained by professionals. Professionals refer to the people who have been professionally trained and accredited, or people who have a wealth of knowledge, training and experience and the ability to solve such problems.
- To prevent the light from being projected to the ground, the installation height of KLM should not be smaller than 100mm.
- KLM should be used in places less than or equal to 2000m above sea level.
- KLM should be used in accordance with local relevant standards and laws and regulations.
- Users should establish rules and regulations for safe operation and management and implement them effectively.

■ Applications

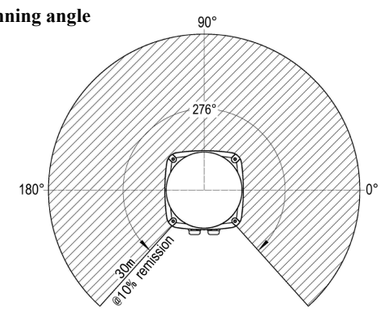
The measurement KLM is applicable to the region detection and navigation of mobile robots and the typical application includes storage robots and service robots.

- The detection objects of KLM must meet the following conditions:
  1) Be able to detect the objects within the scope of ability only.
  2) KLM cannot detect transparent and semitransparent objects.
- Do not install KLM 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 KLM.

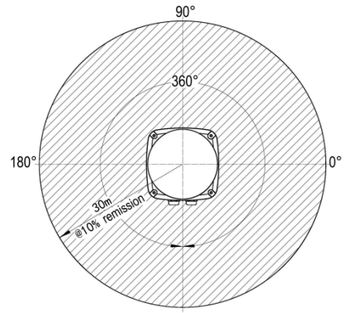
1. Working principles

KLM is designed based on pulsed laser ranging principles to realize the two dimensional zone detection with an angle of 276° or 360° , and radius of 30m @10% reflectance through rotational scanning.

276° scanning angle



360° scanning angle

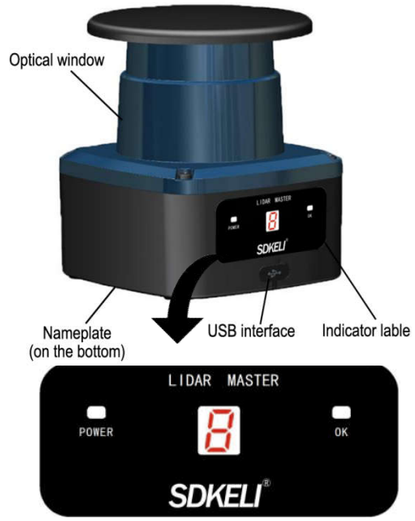


2. System description

KLM supplies power to its system through the transmission cable connected to the power interface. 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.

Network interface Power interface Transmission cable

3. Appearance information



⚠CAUTION

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 scanner.

Sign	Indicator	Description
OK	Normal	Green is on during normal operation and red is on when there is a fault
POWER	Power	Red is on when power on
8	Nixie tube	1 : It displays data after power-on start-up is completed
		6 : Connect with the computer
		8 : It flashes during power-on initialization
		F : Lidar is in fault sate
		Under coexistence of multiple status, multiple status words are displayed circularly

4. Specification

Series Scan radius Scan angle Output form Installation code

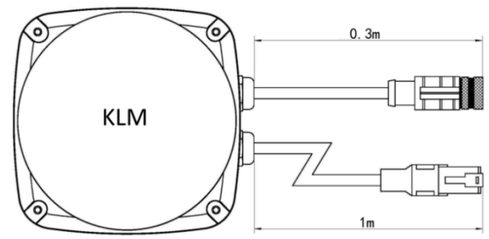
KLM — □□ □□ □□ / □□

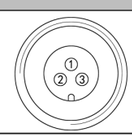
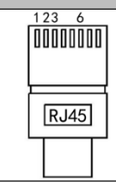
Specification	Scan radius	Scan angle	Output form
KLM-2027DE	20m@10% reflectance 53m@70% reflectance	276°	Ethernet
KLM-3027DE	30m@10% reflectance 80m@70% reflectance	276°	Ethernet
KLM-2036DE	20m@10% reflectance 53m@70% reflectance	360°	Ethernet
KLM-3036DE	30m@10% reflectance 80m@70% reflectance	360°	Ethernet

Installation code: SZ: Horizontal installation/CZ: Vertical installation

5. Output interface

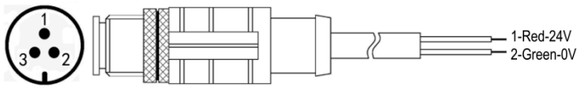
The power output interface is a M12-3 core hole head, the cable length is 0.3m. The network interface is an RJ45 standard connector, the cable length is 1m.



Power interface	Color	Signal definition	Signal description
	1-Red	24V	Working power supply
	2-Green	0V	
Network interface	**Color**		**Signal definition**
	1-White/Orange		TX+
	2-Orange		TX-
	3-White/Green		RX+
	6-Green		RX-

6. Transmission cable

The transmission cable is a 3-core shielded cable with an M12-3 core needle at one end, which is connected to the power output interface, and the other end of each core is stripped and tinned to connect to the device. For the color and function definition of each core, see the power output interface. The standard wiring length of the transmission line is 2m.



7. Technical parameters

Laser light source	Wavelength: 905nm; Class 1 laser product	
Max. detection range	30m@10% reflectance, Max.radius120m	
Scanning angle range	276° /360°	
Scanning angle range	Default 0.12°@25Hz，(configurable,	
Angular resolution	≤25mm（Typical value）	
Repeat accuracy	±6mm@1sigma[1)]	
Temperature drift	360°	±0.6mm/K
	276°	0
Working voltage	DC11V～DC28V	
Power-on time	Typical 8s	
Refresh frequency	Default 25Hz (configurable)	
Power consumption	Typical 8W	
Output	Ethernet UDP protocol output	
Dimensions	100mm×100mm×115mm	
Ambient temperature	Operation	-30℃ to 50℃ (no frost or condensate fog)
	Storage	-40℃ to 70℃
Ambient humidity	Operation	35%RH～85%RH
	Storage	35%RH～95%RH
Anti-light interference	80000Lux	
Shock resistance	Acceleration: 10g; pulse duration: 16ms; Number of collision times: three axes, 1000 ± 10 times per axis	
Vibration resistance	Frequency 10Hz ~ 55Hz; amplitude: 0.35 ± 0.05mm; Number of scans: three axes, 20 times per axis	
Enclosure rating	IP67	
EMC	EN 61326-1: 2013 EN 61000-4-2: 2009 EN 61000-4-3: 2006+A1:2008+A2: 2010 EN 61000-4-4: 2004+A1:2010 EN 61000-4-6: 2009 EN 61000-4-8: 2010 EN 61000-4-11: 004	

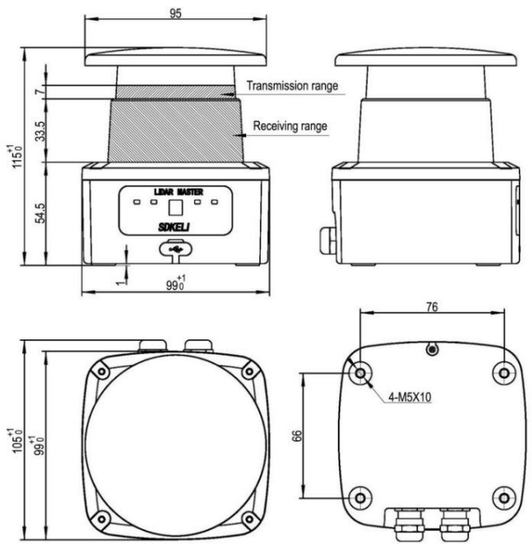
1）This value is obtained by testing the target plate with 10% reflectivity at a distance of 80cm from KLM.

8. Ethernet configuration

Default IP address: 192.168.0.10

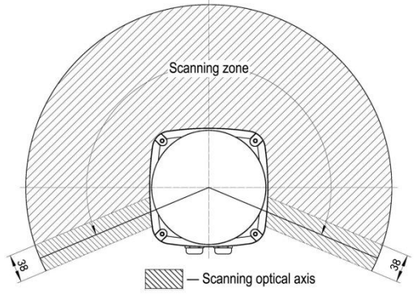
Port number: 2112

9. Overall dimensions



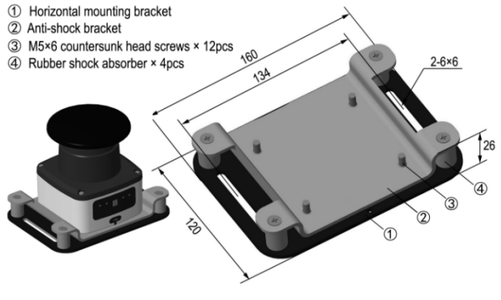
⚠ CAUTION

In the scanning zone set by the user, when the scanning optical axis is at any angle, it is necessary to ensure that the optical receiving area (set scanning area + scanning optical axis radius) is free of obstructions, see the shaded area shown in the figure below.In the scanning area set by the user, when the scanning optical axis is at any angle, it is necessary to ensure that the optical receiving area (set scanning area + scanning optical axis radius) is free of obstructions, see the shaded area shown in the figure .

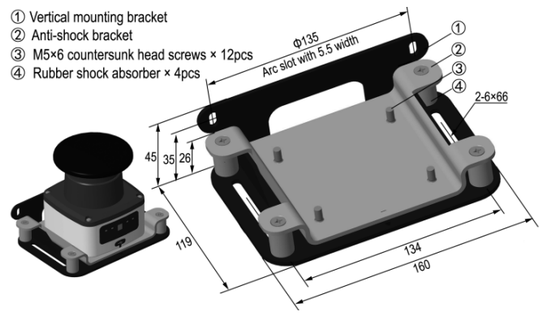


10. Installation

■ **Horizontal installation (SZ)**



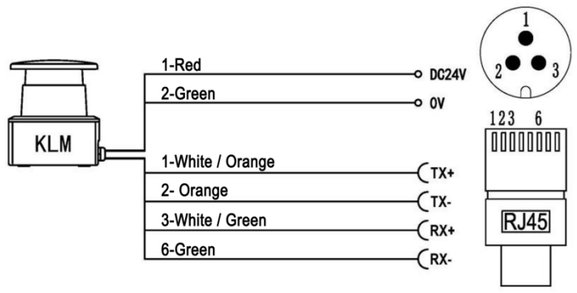
■ **Vertical installation (CZ)**



⚠ CAUTION

- Try to keep KLM away from the vibration area during installation.
- During installation, ensure the parallelism between the installation plane and the scanning plane to prevent false triggering caused by the inability of detecting obstacles or detecting obstacles other than the target due to the inclination of the scanning plane.

11. Wiring



⚠ CAUTION

- Please read this manual carefully before wiring.
- Wiring must be conducted when the power is cut off.
- Double insulation or reinforced insulation must be used between all input and output interfaces and dangerous voltage. Otherwise, electric shock may be caused.
- The cable must be kept away from high-voltage wires and power lines.
- It is strictly forbidden for users to replace the cable without permission.
- Conduct correct wiring after defining the signal meanings of all terminals.

12. 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. For the method of changing the lidar IP address, please refer to the "KLM Lidar Configuration Software User Manual".

Q2. Use of front USB port

1) 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.