SDKELI®

KLM SAFETY LIDAR - PE 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

KLM is suitable for collision prevention of mobile robots. The typical application is automated guided vehicle (AGV) and rail guided vehicle (RGV). KLM is designed to be safe at indoor use which the intended environment is POLLUTION DEGREE 2 according to IEC 61010-1.

- The detection object of KLM must meet the following conditions:
  1) Only protect the objects that go into the detection zone.
  2) KLM cannot detect transparent and translucent objects. The size of objects that go into the detection zone must be greater than or equal to the detection capability of KLM.
- Do not install KLM in the following environments:
  1) Places outside the range of environment specified in the Operation Instructions (temperature, humidity, interference light, impact and vibration).
  2) Places with flammable or explosive gas.
  3) Places with smoke, particles, corrosive chemicals and other substances.
  4) Places that may generate strong light interference (such as direct light) on the 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° and radius of 120m (Max.) through rotational scanning.

Scanning zone configured
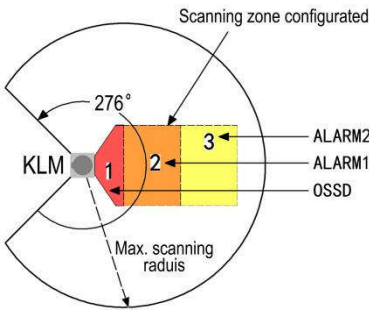
Identification	Meaning	Description
1	Protection zone	OSSD will enter OFF state when any obstacle is detected in protection zone
2	Alarm zone 1	ALARM1 will enter OFF state when any obstacle is detected in alarm zone 1
3	Alarm zone 2	ALARM2 will enter OFF state when any obstacle is detected in alarm zone 2

2. System description

KLM supplies power to its system and monitors the external equipment through the transmission cable connected to the power/output interface. Users can use network interface or USB configuration cable to connect the lidar with the computer, and use the configuration software to set the protection zone of the monitored equipment, read measurement data, or carry out other operations.

Network interface   Power/output interface   Transmission cable

3. Appearance information

Optical window — Nameplate — Wiring diagram — USB interface — Indicator lable

LIDAR MASTER
RESET OSSD ALARM1 ALARM2
SDKELI®

⚠ 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.

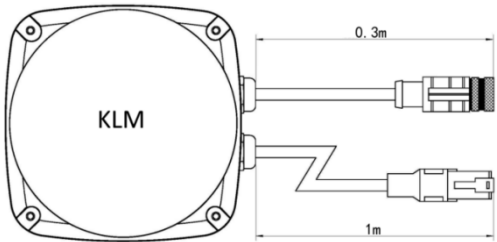| Identification	Indicator	Description
RESET	Reset	Under manual reset mode, red lights when any obstacle is detected in protection zone
OSSD	Output of protection	Red is on when any obstacle is detected in protection zone to make OSSD enter OFF state , and green is on when there is no obstacle
ALARM1	Output of alarm zone 1	Red is on when any obstacle is detected in alarm zone 1 to make ALARM1 enter OFF state , and green is on when there is no obstacle
ALARM2	Output of alarm zone 2	Red is on when any obstacle is detected in alarm zone 2 to make ALARM2 enter OFF state , and green is on when there is no obstacle
8	Digital tube	0 : Detection zone is not configured or there is input signal failure
		1 : The current scanning zone is zone group 1
		2 : The current scanning zone is zone group 2
		3 : The current scanning zone is zone group 3
		4 : The current scanning zone is zone group 4
		5 : The current scanning zone is zone group 5
		6 : The current scanning zone is zone group 6
		7 : The current scanning zone is zone group 7
		8 : The current scanning zone is zone group 8
		9 : The current scanning zone is zone group 9
		10 : The current scanning zone is zone group 10
		11 : The current scanning zone is zone group 11
		12 : The current scanning zone is zone group 12
		13 : The current scanning zone is zone group 13
		14 : The current scanning zone is zone group 14
		15 : The current scanning zone is zone group 15
		16 : The current scanning zone is zone group 16
		S : Fault of OSSD output
		6 : Establish a communication connection with computer
		8 : Flashing during power-on initialization
		9 : KLM configuraiton is successed
		E : Fault of EDM monitor
		F : KLM system fails
		C : Window dirty display, activated when the window is dirty
		When multiple statuses coexist, multiple status words are displayed cyclically

4. Specification

Series Scan radius Scan angle Output form Installation code

KLM — □□ □□ □□ / □□

Specification	Scan radius	Scan	Output form
KLM-0427PE	4m@1.8% reflectance; 12m@10% reflectance	276°	PNP+Ethernet
KLM-0827PE	8m@1.8% reflectance; 20m@10% reflectance	276°	PNP+Ethernet
KLM-1227PE	12m@1.8% reflectance; 30m@10% reflectance	276°	PNP+Ethernet

Installation code: SZ: Horizontal installation/CZ: Vertical installation
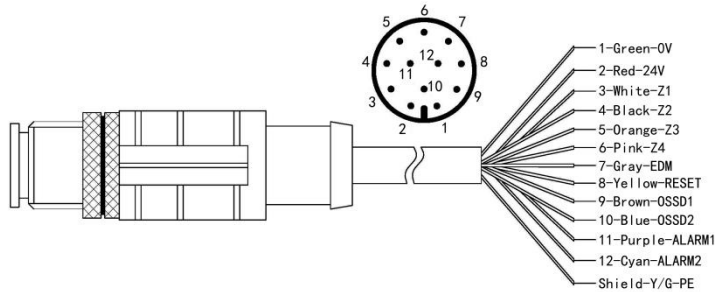
5. Output interface

The power/output interface is a M12-12 core hole head, the cable length is 0.3m. The network connection interface is an RJ45 standard connector, the cable length is 1m.

Output interface	Color	Signal definition	Signal description
	1-Green	0V	Working power supply
	2-Red	24V	
	3-White	Z1	Zone group selection signal. Switching among multiple protection zones can be achieved through the changes in Z1, Z2, Z3 and Z4 input signals
	4-Black	Z2	
	5-Orange	Z3	
	6-Pink	Z4	
	7-Gray	EDM	External contact monitor input signal. When OSSD is ON, EDM=0V; when OSSD is OFF, EDM=24V
	8-Yellow	RESET	When manual rest, input reset signal to release output lock to start again
	9-Brown	OSSD1	2 independent PNP output, ON, maximum Iout = 200mA, Vout≥Vcc-2V OFF, Iout ＜ 1mA, Vout ＜ 2V ON state when there is no obstacle in protection zone, OFF state when there is obstacle in protection zone
	10-Blue	OSSD2	ON state when there is no obstacle in protection zone, OFF state when there is obstacle in protection zone
	11-Purple	ALARM1	2 independent PNP output, ON, maximum Iout = 200mA, Vout≥Vcc-2V OFF, Iout ＜ 1mA, Vout ＜ 2V
	12-Cyan	ALARM2	ON state when there is no obstacle in warning zone, OFF state when there is obstacle in warning zone
	PE	Shield	

Ethernet 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 12-core shielded cable with an M12-12 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.

1-Green-0V
2-Red-24V
3-White-Z1
4-Black-Z2
5-Orange-Z3
6-Pink-Z4
7-Gray-EDM
8-Yellow-RESET
9-Brown-OSSD1
10-Blue-OSSD2
11-Purple-ALARM1
12-Cyan-ALARM2
Shield-Y/G-PE

7. Technical parameters

| Laser light source	Wavelength: 905nm; Class 1 laser product
Max. detection range	30m@10% reflectance, Max.radius120m
Scanning angle range	276°
Angular resolution	0.12°
Measurement error	Typical ≤25mm
Repeat accuracy	±6mm@1sigma[1]
Working voltage	DC11V～DC28V
Power-on time	Typical 8s
Refresh frequency	25Hz
Power consumption	Typical 8W
Output form	PNP + Ethernet
Safety output (OSSD)	PNP×2 (ON state: Maximum I_{OUT}＝200mA, V_{OUT}≥V_{CC}-2V, OFF state: I_{OUT}＜1mA, V_{OUT}＜2V). Overcurrent protection, capacitive load ≤60nF. ON state when there is no obstacle in protection zone and OFF state when there is obstacle in protection zone.
Alarm output (ALARM)	PNP×2 (ON state: Maximum I_{OUT}＝200mA, V_{OUT}≥V_{CC}-2V, OFF state: I_{OUT}＜1mA, V_{OUT}＜2V). Overcurrent protection, capacitive load ≤60nF. ON state when there is no obstacle in warning zone and OFF state when there is obstacle in warning zone.
Dimensions	100mm×100mm×115mm
Ambient temperature	Work: -30℃～50℃; Storage: -40℃～70℃
Ambient humidity	Work: 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

IP code	IP67
EMC	EN61326-1：2013 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

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

Transmission range
Receiving range
4-M5X10
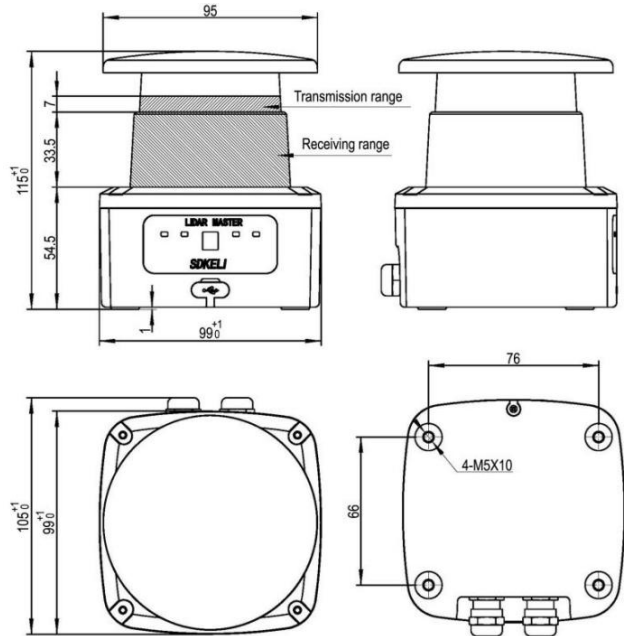
CAUTION

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 .
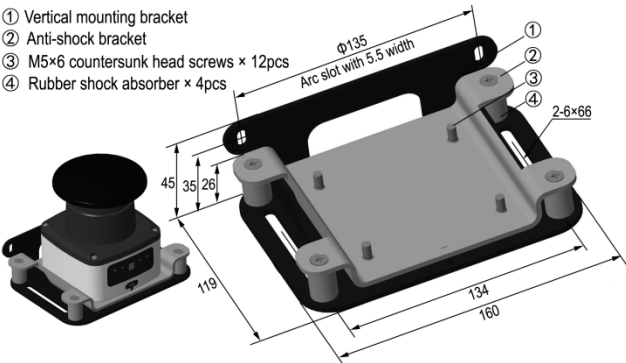
Scanning zone

— Scanning optical axis

10. Installation

■ Horizontal installation (SZ)

① Horizontal mounting bracket
② Anti-shock bracket
③ M5×6 countersunk head screws × 12pcs
④ Rubber shock absorber × 4pcs
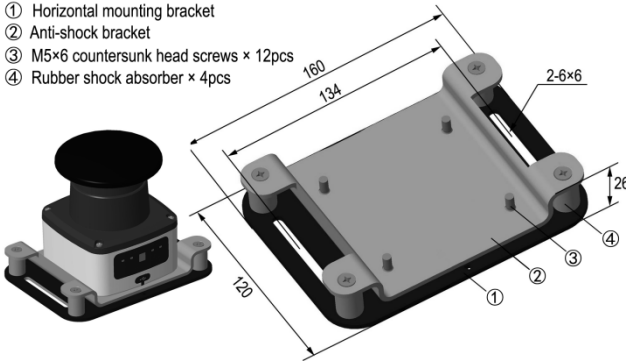
■ Vertical installation (CZ)

① Vertical mounting bracket
② Anti-shock bracket
③ M5×6 countersunk head screws × 12pcs
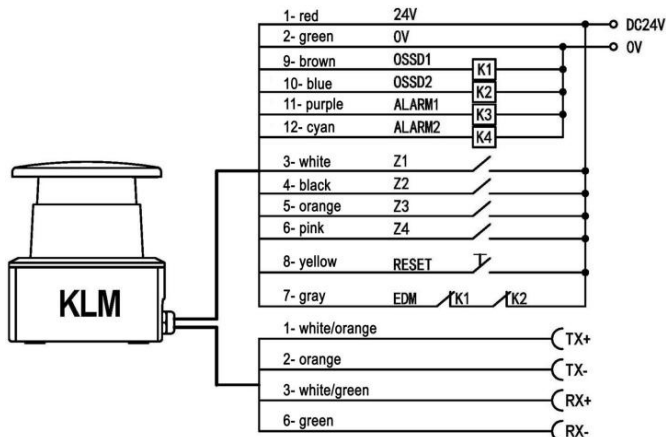④ Rubber shock absorber × 4pcs

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

1- red	24V	DC24V
2- green	0V	0V
9- brown	OSSD1	K1
10- blue	OSSD2	K2
11- purple	ALARM1	K3
12- cyan	ALARM2	K4
3- white	Z1	
4- black	Z2	
5- orange	Z3	
6- pink	Z4	
8- yellow	RESET	
7- gray	EDM	K1 K2
1- white/orange		TX+
2- orange		TX-
3- white/green		RX+
6- green		RX-

KLM

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.