

Lightweight scanning lidar



Features

- *Application:* Obstacle detection and navigation for small autonomous vehicles and drones
- *Key features:* Small and lightweight
Upgradable through the **LightWare Studio** application
- *Measuring range:* 0.2 ... 50 m (80% reflective, large target)
- *Size:* 53 mm x 44 mm x 37 mm
- *Weight:* 48.3 grams
- *Measuring speed:* Up to 20,000 points per second (configurable)
- *Interfaces:* Serial, I2C and USB
- *Integration:* User APIs, **LightWare Studio**
- *Safety:* Eye safe laser emission Class 1M
- *Environmental:* Open frame, no IP rating

Table of contents

Overview	3
Specifications	4
Quickstart guide	5
Safety instructions	6
Labelling	6
Laser radiation information	6
Hardware	7
Dimension drawings	7
Revision history	7

Product ordering codes

Model family	Model name	Model description
SF45	SF45/B (50 m)	Open frame scanning lidar sensor, max 50 m

Disclaimer

Information found in this document is used entirely at the reader's own risk and whilst every effort has been made to ensure its validity, neither LightWare Optoelectronics (Pty) Ltd nor its representatives make any warranties with respect to the accuracy of the information contained herein.

1. Overview

The SF45/B is a small, lightweight scanning lidar ideal for obstacle detection by small autonomous vehicles. The horizontal field of view can be adjusted from a few degrees up to 320 degrees to suit the application. Objects up to 50m away can be detected and avoided by finding clear pathways using simple navigation commands. The SF45/B is tolerant to changes in background lighting conditions, wind and noise.

The following capabilities are included in the SF45/B as standard:

- Streaming of live readings.
- Alarms when an obstacle is detected.
- Configurable update rate and scanning angle.
- Internal status monitoring.

Additional features may be added through **LightWare Studio**:

- Servo driver for a second axis of motion.
- Measurement to the nearest detected surface (first return).
- Measurement to the farthest detected surface (last return).
- Selectable filters to adjust the dynamic response to moving targets.
- Navigation tools.
- Custom features.

The following communication interfaces are available:

- A micro USB port that connects to a PC running the **LightWare Studio** application for visualisation of results, to make configuration changes and for upgrading the firmware.
- A serial port (3.3V logic level) with configurable baud rate to connect to a host controller.
- An I2C serial bus (3.3V logic level, external pull up resistors required) with configurable address as an alternative to the serial port when multiple devices are connected on a common bus.
- Two general purpose outputs.

Application software support is available from the LightWare **API** repository.

The SF45/B scanning lidar is rated laser Class 1M eye safe. Do not view the laser with magnifying optics such as microscopes, binoculars or telescopes.

2. Specifications

Performance	
Range	0.2 ... 50 m (white wall in daylight conditions)
Linear Resolution	1 cm
Angular Resolution	< 0.2 deg
Update rate	Up to 20,000 readings per second and 5 sweeps per second.
Accuracy	±10 cm
Connections	
Power supply voltage	4.5 V ... 5.5 V
Power supply current	300 mA (typical)
Outputs & interfaces	Serial and I2C (3.3 V), micro USB, general purpose outputs
Mechanical	
Dimensions	53 mm x 44 mm x 37 mm
Weight	48g (excluding cables)
Optical	
Laser safety	Class 1M (refer to www.lightware.co.za/safety for full details)
Optical aperture	28 mm x 15 mm
Beam divergence	< 0.5°
Environmental	
Operating temperature	-10 ... +50°C
Approvals	FDA: 1710193-000 (2019/08)
Enclosure rating	N/A
Accessories	
Main cable	7 way - individual wires, unterminated
USB cable	USB cable - DigiKey AE10418-ND
Default settings	
Serial port settings	115200 baud, 8 data bits, 1 stop bit, no parity, no handshaking
I2C address	0x66 (Hex), 102 (Dec)
Update rate	388 readings per second
Main cable connections	
1	GPIO / LED driver
2	GPIO / servo driver
3	TXD/SDA - serial data transmit or I2C data
4	RXD/SCL - serial data receive or I2C clock
5	GND - power supply negative
6	GND - power supply negative
7	+ 5 V - power supply positive (4.5 V to 5.5 V at 500 mA)

3. Quickstart guide

Caution

The SF45/B scanning lidar contains a laser and should never be aimed at a person or an animal. Do not look at the beam directly with optical instruments.

- Download the **LightWare Studio** application to your PC or laptop.
- Install and start the application by following the prompts.
- Connect the SF45/B to the PC using the USB cable provided.
- The SF45/B will automatically be detected by the application.
- Settings options will be displayed in the main window along with a visualisation of the data coming from the SF45/B.
- Change the settings to suit your application.
- Unplug the USB cable.

Once the settings have been entered, your host controller can communicate with the SF45/B through the serial or I2C ports. API support is available from the LightWare **API** repository. To test the serial and I2C ports the **LightWare Communication Adaptor** is available.

Firmware updates and additional features will become available from time to time. These can be installed into the SF45/B using the USB port and the **LightWare Studio** application.

4. Safety instructions

The SF45/B emits ionizing laser radiation. The level of the laser emission is Class 1M which indicates that the laser beam is safe to look at with the unaided eye but must not be viewed using binoculars or other optical devices. Notwithstanding the safety rating, avoid looking into the beam and switch the unit off when working in the area.

Caution

The use of optical instruments with this product will increase eye hazard.

The SF45/B should not be disassembled or modified in any way. The laser eye safety rating depends on the mechanical integrity of the optics and electronics so if these are damaged do not continue using the SF45/B. There are no user serviceable parts and maintenance or repair must only be carried out by the manufacturer or a qualified service agent.

No regular maintenance is required for the SF45/B but if the lenses start to collect dust then they may be wiped with suitable lens cleaning materials.

4.1. Labelling



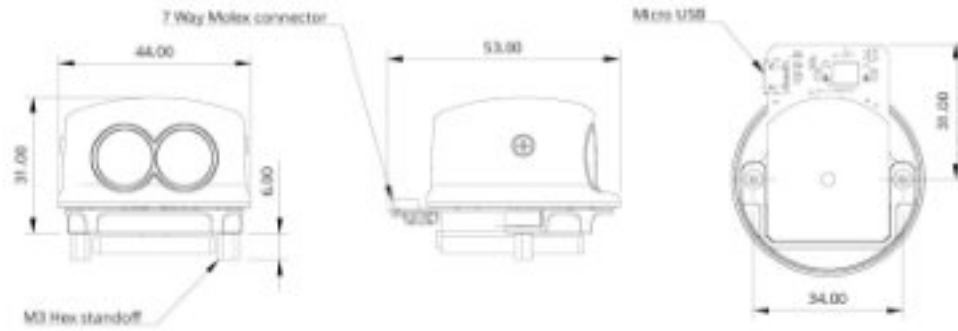
Laser radiation information and product identification labels

4.2. Laser radiation information

Specification	Value / AEL	Notes
Eye safety classification	Class 1M	
Laser wavelength	905 nm	
Pulse width	15 ns	
Pulse frequency	20 kHz	
Average power	< 2.5 mW	
NOHD	0.5 m	Distance beyond which binoculars with may be used safely

5. Hardware

5.1. Dimension drawings



Dimension drawings, units in mm



Precautions

Ensure that nothing is in the path of the laser beam.

Ensure that no shiny or highly reflective surfaces are near the path of the beam.

Secure the cable with zip ties to protect it from pulling on the connectors.

2. Revision history

Revision	Date	Comments
Rev 0	2019/10/22	First edition
Rev 1	2020/09/04	Update correct weight, default update rate and key features.