Ultra small and light Lidar

Features

- *Application:*   *Space and weight constraint LiDAR applications*

- *Key features:*   *Multiple return signals, signal strength, noise measurement etc.*

  *Upgradable through the **LightWare Studio** application*

- *Measuring range:*   *0.2 ... 50 m (80% reflective, large target)*

- *Size:*   *22 x 34 x 21 millimeters*

- *Weight:*   *8.8 grams*

- *Measuring speed:*   *48 to 388 readings per second (configurable)*

- *Interfaces:*   *Serial and I2C*

- *Integration:*   *User APIs, **LightWare Studio***

- *Safety:*   *Eye safe laser emission Class 1M*

- *Environmental:*   *Open frame, no IP rating*

bsi.
ISO
9001:2015
Quality
Management

FM 654831

Table of contents

Product ordering codes

Model family	Model name	Model description
SF000	SF000/B	Open frame 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 SF000 is an ultra small and light laser rangefinder designed for size and weight constraint applications. Using a time-of-flight system to make very fast and accurate distance and speed measurements, accuracy is not affected by the colour or texture of the surface, nor the angle of incidence of the laser beam. The SF000 is virtually immune to background light, wind and noise, making it an ideal sensor to detect unexpected obstacles.

The SF000 can take up to 388 readings per second and the configurable features and multiple hardware interfaces make the SF000 easy to connect with different types of controllers.

Operating from a regulated 5 V DC supply, the SF000 includes two communication interfaces:

- A serial port (3.3V logic level, 5V tolerant) with configurable baud rate to connect to a host controller.
- An I2C serial bus (3.3V logic level and 3.3k pull up resistors, 5V tolerant) with configurable address as an alternative to the serial port when multiple devices are connected on a common bus.

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

The SF000 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)
Resolution	1 cm
Update rate	48 ... 388 readings per second
Accuracy	±10 cm
Connections	
Power supply voltage	4.5 V ... 5.5 V
Power supply current	100 mA
Outputs & interfaces	Serial and I2C (3.3V logic, 5V tolerant)
Mechanical	
Dimensions	22 mm x 34 mm x 21 mm
Weight	8.8 g (excluding cables)
Optical	
Laser safety	Class 1M (refer to www.lightware.co.za/safety for full details)
Optical aperture	10 mm
Beam divergence	< 1.0°
Environmental	
Operating temperature	-10 ... +40°C
Approvals	FDA: 1710193-000 (2020/09)
Enclosure rating	N/A
Accessories	
Main cable	
Default settings1	
Serial port settings	115200 baud, 8 data bits, 1 stop bit, no parity, no handshaking
I2C address	0x66 (Hex), 102 (Dec)
Update rate	48 readings per second
Main cable connections	
Pin - 1	Servo 1 control output (3.3V)
Pin - 2	SDA - I2C data line
Pin - 3	TXD - serial data transmitted (SCL - I2C clock line)
Pin - 4	RXD - serial data received (SDA - I2C data line)
Pin - 5	GND - power supply negative
Pin - 6	+ 5 V - power supply positive (4.5 V to 5.5 V at 100 mA)

**Please note that when connecting to the device using I2C, both pins 2 and 4 need to be used together as the SDA line.

3. Quickstart guide

Caution

The SF000 laser rangefinder 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 SF000 to the PC using the serial cable provided connected to a serial to USB converter.
- The SF000 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 SF000.
- Change the settings to suit your application.
- Unplug the USB cable.

Once the settings have been entered, your host controller can communicate with the SF000 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 SF000 using the serial port and the **LightWare Studio** application.

4.   Safety instructions

The SF000 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 SF000 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 SF000. 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 SF000 but if the lenses start to collect dust then they may be wiped with suitable lens cleaning materials.

4.1.   Labelling
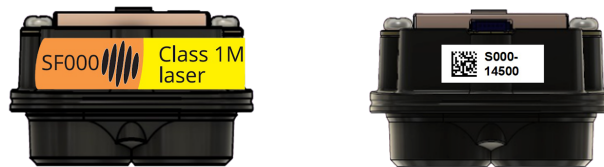
Laser radiation information and product identification labels

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	< 3.0 mW	
NOHD	15 m	Distance beyond which binoculars with may be used safely

5. Hardware

5.1. Dimension drawings
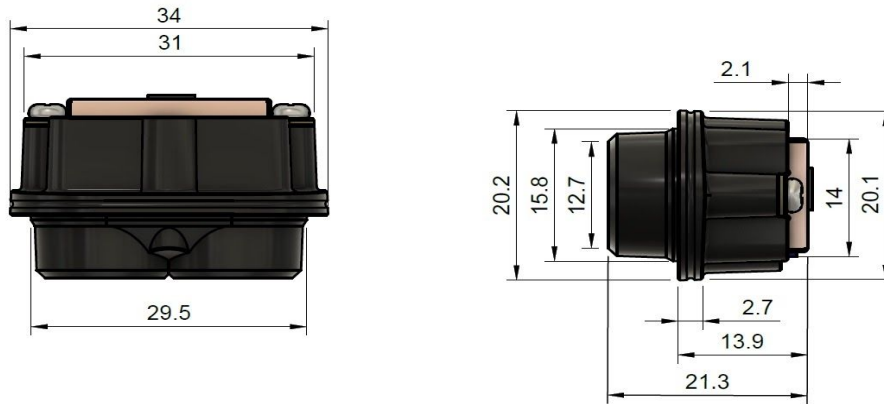
Dimension drawings, units in mm

5.2. Installation

SF000 requires a clear line-of-sight to measure distance to a target surface. It can be mounted with a vertical or horizontal lens orientation.

They can be mounted in a downward facing orientation for altimetery, terrain following or precision landing applications. For terrain following, install the rangefinder at an angle to reduce lag time in reaction. The angle depends on the speed traveled, and the overall system lag, but should be between 20 and 45 degrees. They can be mounted forward facing orientation for sense-and-avoid or position-hold applications.
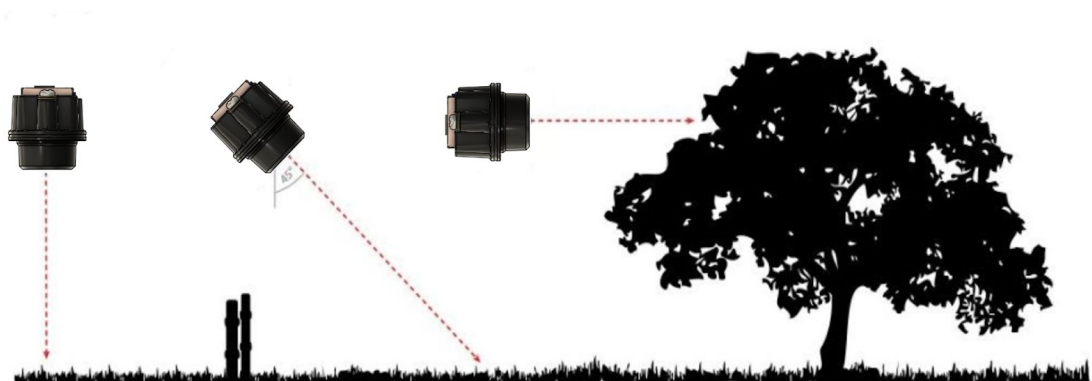
Mounting accessories can be purchased, or downloaded from the LightWare website.

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.

6.   Revision history

Revision	Date	Comments
Rev 1	2020/11/18	FDA accession number added,notification that I2C pins 2 and 4 need to be used as for SDA
Rev 0	2020/08/03	First edition