High speed laser altimeter for accurate mapping and obstacle detection.

Features

- *Application:* Long distance (200m) high speed LiDAR applications

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

  Upgradable through the **LightWare Studio** application

- *Measuring range:* 0.2 ... 200 m (80% reflective, large target)

- *Size:* 30 x 56.5 x 50 millimeters

- *Weight:* 35 grams

- *Measuring speed:* 49 to 20000 readings per second (configurable)

- *Interfaces:* Serial, I2C, USB, Analog and Alarm output

- *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
SF30	SF30/D (200 m)	Open frame LiDAR sensor, max 200 m

Disclaimer

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1.   Overview

The SF30 high speed laser rangefinder is designed to detect obstacles or create maps from moving ground-based or aerial vehicles. 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 SF30 is virtually immune to background light, wind and noise, making it an ideal sensor to detect unexpected obstacles.

The SF30 can take up to 20010 readings per second and can be incorporated into scanning systems to create 2D SLAM maps or 3D images. The configurable features and multiple hardware interfaces make the SF30 easy to connect with different types of controllers.

Operating from a regulated 5 V DC supply, the SF30 includes a USB interface, serial port, analog port, and alarm and that can be easily connected to a flight controller or a standard processing platform. Each interface on the SF30 can be configured using a simple software menu that is accessible through the built-in, micro-B USB port. The interfaces are as follows:

USB	Connects to a Terminal application for alarm set-point, update rate and exposure time customisation
Serial	Provides distance readings and other communications to an embedded host controller
I2C	Provides distance readings and other communications to an embedded host controller
Analog	An analog voltage proportional to the distance reading
Alarm	A logic level signal that warns when the distance measured is below a preset value.
Synchronisation	Clock pulse output synchronised with the Laser firing pulse.

Readings can be taken as isolated "snapshots" at a moment determined by the update rate and exposure time settings, or they can be combined using a digital filter into a smoothed time series. At the full speed of 20010 readings per second, a single flash of laser light is used to take a measurement. The synchronisation signal marks the instant of the laser flash ensuring that the time of the measurement is known precisely.

There are three communication interfaces 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 and 3.3k pull up resistors) 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 SF30/D 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 … 200 m (white wall in daylight conditions)
Resolution	1 cm
Update rate	49 … 20000 readings per second
Accuracy	±10 cm
Connections	
Power supply voltage	4.5 V … 5.5 V
Power supply current	250 mA
Outputs & interfaces	Serial and I2C (3.3 V), micro USB, Analog (0 … 2.048V), Alarm (0 … 3.3V)
Mechanical	
Dimensions	30 mm x 56.5 mm x 50 mm
Weight	35 g (excluding cables)
Optical	
Laser safety	Class 1M (refer to www.lightware.co.za/safety for full details)
Optical aperture	51 mm
Beam divergence	< 0.2°
Environmental	
Operating temperature	-10 … +50°C
Approvals	FDA:1410968-002 (2018/09)
Enclosure rating	N/A
Accessories	
Main cable	LightWare 7-way cable
USB cable	USB cable - DigiKey AE10418-ND
Default settings	
Serial port settings	921600 baud, 8 data bits, 1 stop bit, no parity, no handshaking
I2C address	0x66 (Hex), 102 (Dec)
Update rate	49 readings per second
Main cable connections	
Green - 1	SCL - I2C clock line
White - 2	SDA - I2C data line
Yellow - 3	TXD - serial data transmitted
Orange - 4	RXD - serial data received
Blue - 5	Analog - Analog Distance output
Black - 6	GND - power supply negative
Red - 7	+ 5 V - power supply positive (4.5 V to 5.5 V at 100 mA)

3.   Quickstart guide

Caution

The SF30/D 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 SF30/D to the PC using the USB cable provided.
- The SF30/D 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 SF30/D.
- Change the settings to suit your application.
- Unplug the USB cable.

Once the settings have been entered, your host controller can communicate with the SF30/D 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 SF30/D using the USB port and the **LightWare Studio** application.

4. Safety instructions

The SF30/D 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 SF30/D 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 SF30/D. 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 SF30/D but if the lenses start to collect dust then they may be wiped with suitable lens cleaning materials.

4.1. Labelling
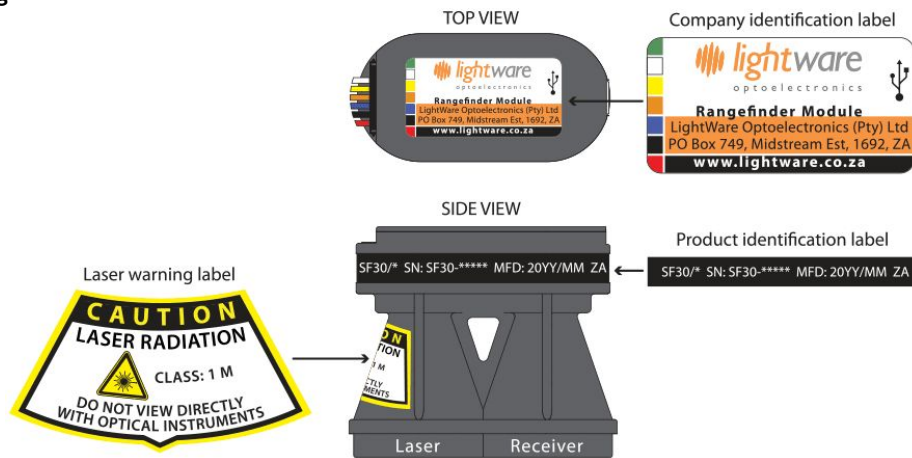
Laser radiation information and product identification labels

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	< 6.5 mW	
NOHD	15 m	Distance beyond which binoculars with may be used safely

5. Hardware

5.1. Dimension drawings
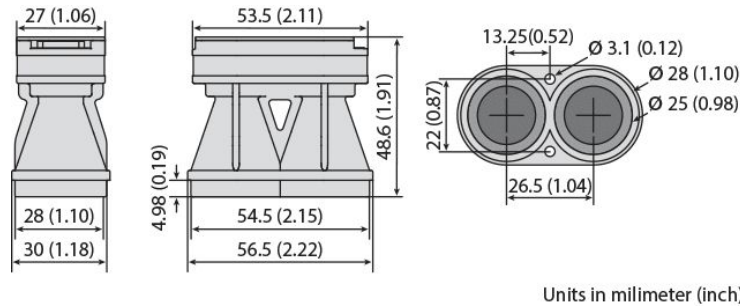
Dimension drawings, units in mm

5.2. Installation

SF30/D 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.
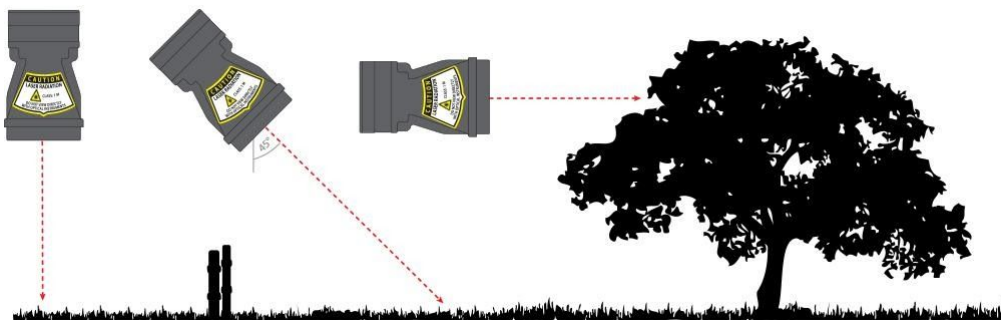
The LW30 housing has two 3.1 mm diameter holes (22 mm separation), which can be used for mounting directly onto an airframe or into an enclosure. The front lens section has a ridge for landing and sealing purposes.

Several 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.

2. Revision history

Revision	Date	Comments
Rev 0	2020/02/05	First edition