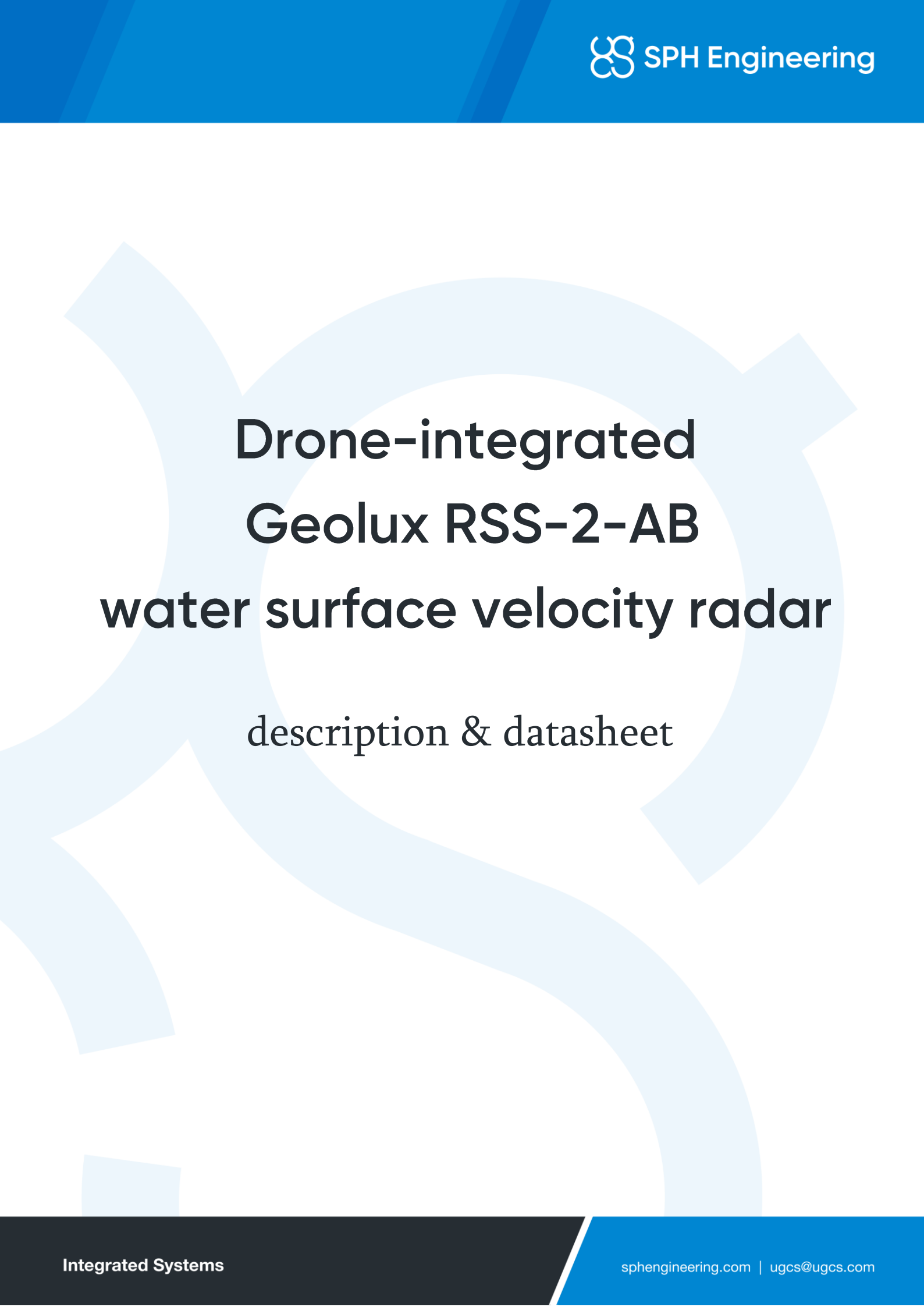




Drone-integrated Geolux RSS-2-AB water surface velocity radar

description & datasheet

Overview



Geolux RSS-2-AB Doppler radar payload enables airborne measurement of surface flow velocity in rivers and streams at very high spatial resolution. The radar payload is based on the Geolux RSS-2-300W surface velocity radar. The original Geolux RSS-2-300W surface velocity radar has been designed for static operation from a fixed mounting platform above the river, but it has been customized to allow installation on the UAV, to allow integration with the UAV on-board computer, and to ensure that the measured data is transferred in real-time since the payload is attached to a moving platform.

The main advantage of using a sensor on a UAV is the ability to perform measurements in hard-to-reach places without existing infrastructure. The entire process is automated thanks to the onboard computer SkyHub and UgCS Mission Planning software. The sensor installed on the UAV can perform measurements at a specified point.

Geolux RSS-2-300W surface velocity Doppler radar is a continuous-wave (CW) Doppler-radar operating in K-band, at 24.125 GHz. This part of the electromagnetic spectrum is freely available in most of the world. This means that the radar sensor can be operated without the need for a specific license for the use of the electromagnetic spectrum. The effective isotropic radiated power (EIRP) for the radar is below 100 mW, which is well below any health/safety limits.

Geolux RSS-2-AB and all necessary to use it on the drones were developed and tested in the frame of UAWOS (Unmanned Airborne Water Observing System) project: <https://uawos.dtu.dk>.

Description of the surface velocity radar

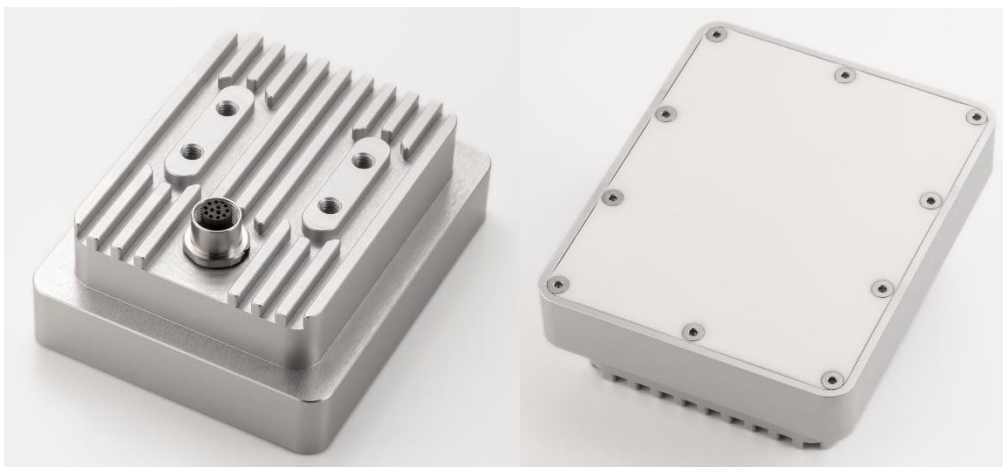


Figure 1: Geolux RSS-2-AB Doppler radar payload

The surface velocity payload radar sensor is enclosed in anodized aluminum enclosure, with IP68 rating. IP68 protects the electronics inside the enclosure even if the instrument is submerged into the water. On the front side of the instrument there is PTFE (Teflon) antenna cover. On the back side of the instrument there is a circular M12

connector for the cable that provides power supply to the instrument, and communication interfaces for connecting to the on-board computer. The connector is also IP68 rated and sealed.

There is no setup required. The instrument starts making surface velocity measurements as soon as the power supply is connected to the instrument.



Figure 2: Geolux RSS-2-AB surface velocity radar payload installed on the UAV

The radar sensor does not have a built-in data logger and must be used with an appropriate computer and data recording software. When used with the SkyHub onboard computer and its software, data from the sensor is recorded in 2 formats:

- CSV files with ready-to use data, including averaged flow velocity;
- SEG-Y files with full-wave data.

Applications

Typical applications of drone-borne water surface velocity radar are:

- hydrological surveys;
- environmental monitoring;
- engineering projects in water supply;
- accurate discharge monitoring in rivers;
- monitoring of flow in irrigation channels.

Application on the drone assumes that to make measurements drone should hover stationary in the point at certain altitude pointing the noise (radar) up or down stream. Recommended time for the measurement in a single point is 30s. The radar averages flow velocity over a few square meters of footprint area that increases with flight height. The optimal measuring height is around 5 meters above the water surface. The signal-to-noise ratio strongly depends on the roughness of the water surface and also on the magnitude of the flow velocity. Faster flows can be measured more reliably than slow flows.

Required components and compatibility

Standard kit includes:

- Geolux RSS-2-AB sensor
- Mountings
- Cable to connect the sensor to [SkyHub](#) onboard computer
- Software for sensor data logging

Kit requires the [SkyHub](#) onboard computer to log the data. It is also strongly recommended to add [True Terrain Following](#) features with radar altimeter to allow precise holding of altitude relative to the water surface.

[SkyHub](#) integration allows the sensor to be used with various drones, including DJI M350/M300 RTK, and Pixhawk-based drones.

Payload data sheet

Payload type	Surface velocity radar
Radar type	K-band 24.125 GHz CW Doppler Radar
Beam angle width	24° vertical, 12° horizontal
Max. detection distance	15 m
Blind zone	-
Measurement resolution	7,3242 mm/s at tilt angle 0°
Measurement repeatability	Error is <1% of the true measured value
Sampling frequency	10 sps
Input voltage	9 – 27 VDC
Power consumption	0.95 W
Max. peak current	< 250 mA
Dimensions	110 mm x 90 mm x 50 mm
Operating temperature range	- 40°C to + 85°C
Interfaces	RS-232, RS-485, CAN
IP rating	IP68
Certificates and compliance	EN 60950-1:2006+A1:2010+A11:2009+A12:2011+A2:2013 EN 62311:2008 Draft EN 301 489-3 V2.1.1:2017 Draft EN 301 489-1 V2.2.0:2017 EN 61000-6-3:2007+A1:2011 EN 61000-6-2:2017 EN 300 440 V2.1.1:2017 EN 60529:2000+A1:2008+A2:2014 FCC Part 15 class B ISED RSS211