Compact & Lightweight Bathymetric Depth Finder for Surveying Tasks

- Laser rangefinder for bathymetric applications
- Surveying system with integrated IMU, GNSS, and data storage unit
- Optimized for UAV-borne operation
- Ideally suited for generating profiles of inland waterbodies
- Optionally equipped with up to two external cameras
- Active pitch compensation
- Essential performance improvements in adverse conditions by predetection averaging
- Highly accurate, reliable and informative bathymetric data resulting from RIEGL's proprietary hydrographic waveform processing

The *RIEGL* BDF-1 is a laser range finder specifically designed for bathymetric surveying tasks. The compact and lightweight device is ideally suited for generating profiles of inland waterbodies when operated from a UAV. The topo-bathymetric depth finder comprises of a tilt compensator, an IMU/GNSS unit with antenna, a control unit, and up to two external digital cameras.

The BDF-1 laser depth finder sends out laser pulses at a rate of 4 kHz. The echo signal for each laser pulse is digitized and recorded for the entire range gate of 50 m. This means that predetection averaging of the waveforms can be performed in post processing, increasing the depth performance. The averaging rate can be chosen after the flight on basis of the measurement conditions. Subsequently the waveforms are processed by *RIEGL's* new and patented hydrographic full waveform processing algorithm based on exponential decomposition. Finally data sets with high accuracy, high range resolution, and hydrography-specific attributes are provided which support point classification.

The BDF-1 is designed to be operated from low altitudes at moderate flight speed, as in surveying missions carried out by UAV. With a measurement rate of 4 kHz the distance of the measurements on the ground is in the range between 1 cm and 10 cm, depending on the flight speed and averaging rate.

An innovative optical design allows the device to be classified as Class 2M Laser Product which can be considered safe for the unaided eye.

Typical applications include

- Generation of River Profiles
- Repeated Survey of Water Reservoirs
- Canal Surveying
- Landscaping
- Surveys for Planning and Hydraulic Engineering Work

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Unmanned Laser Scanning

RIEGL BDF-1 Measuring Principle



The drawings above illustrate the measurement principle of the BDF-1 when operated from a UAV: The UAV performs a meanderlike flight path over an inland water body (river, channel, or lake) while the BDF-1 is measuring downward. In case the optional tilt compensator is used, the measuring angle is user-defined and stabilized. Profiles of the water surface (blue dots), ground (green dots) as well as the surrounding landscape (red dots) are generated this way. The multi-target capability of the rangefinder is not only employed for separating the water surface from the ground but also for vegetation penetration.

RIEGL VUX-SYS Scan Data and RIEGL BDF-1 Profiles



Riverine zone surveying is a typical application of the *RIEGL* BDF-1:

The image above shows a colorized 3D point cloud acquired with a VUX-1UAV combined with profiles acquired by the BDF-1. Both devices were mounted on the RiCOPTER. The combined dataset provides comprehensive information about the topography of the river and its surroundings. The locations of the detailed river profiles are selected according to hydrographic viewpoints. They can be used to assess water transportation, roughness, and clarity.

Dimensional Drawings RIEGL BDF-1



rear view



laser on indicators (2x)







4x M6x1 - 6H threads, depth 14mm

all dimensions in mm

Configurations RIEGL BDF-1

vertical setup for static measurements



horizontal setup with beam folding mirror including tilt compensation for UAV-borne surveying







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