SEBA HYDROMETRIE

Over 50 years of experience - worldwide service

Discharge Measurements

Discharge Measurements

Dear SEBA customers,

numerous innovations and product improvements have characterised surface water hydrometry in recent years. Especially in the field of mobile and stationary flow measurement, where the innovation engine is running at full speed. In the past 5 years, SEBA Hydrometrie has invested a great deal of commitment and innovation in camera-based flow measurement and now occupies a leading position worldwide in this field.

With the "DischargeKeeper" product series for stationary and mobile flow measurement, completely new avenues can now be explored. In contrast to conventional measuring methods, the camera as "sensor" can be placed at a safe distance from the flowing water. If desired, the measuring operation can even be realised with a self-sufficient solar power supply, so that even the operation in in remote locations without infrastructure is no obstacle.

In addition to the measurement data, HD-quality images are also transmitted, which provide valuable information for flood warning services to assess the situation on site. Since every smartphone is equipped with a high-resolution camera, it makes sense to use it for mobile flow measurements. With the help of the easy-to-use "DischargeApp", an accurate measurement can now be carried out on small rivers or canals in just a few seconds and immediately displayed on the spot.

Another application is the so-called "PostProcessing", whereby flood events can be evaluated afterwards on the basis of short video clips. This adds real value, especially when no other reliable time series are available.

Of course, new technologies or product improvements cannot always be developed. That is why we have strong, long-standing cooperation partners such as Teledyne RDI (San Diego, USA), which offer a wide range of mobile broadband ADCP sensors and measuring boats for mobile flow measurement.

Flow measurement in natural flowing waters is challenging. SEBA offers a valuable wealth of experience and a wide range of products. On this basis, we find the best and most economical solutions for our customers and provide competent and comprehensive advice, both on site and in the field. Our aftersales service also ensures that investments in SEBA measurement technology are sustainable and provide reliable time series in the long term.

As always, we would like to express our special thanks to our loyal SEBA customers and close partners for such productive cooperation during the past years. Your success is also our success!

Your SEBA Hydrometrie

MOBILE SYSTEMS

Application areas:

- Flow measurement from small to large watercourses
- Determination of flow profiles
- Optimisation of turbines at dams
- Design of fish ladders

DischargeApp

Camera-based flow measurement with the smartphone, fast and effortless, suitable for flowing waters and canals up to approx. 20 m wide

- High-tech, low-cost and user-friendly technology for scalable discharge measurements
- Measure water level, surface velocity and discharge with a smartphone in less than a minute
- Setup a measurement station in less than 1 hour
- Calculations are done in the smartphone with the "DischargeApp", no internet connection required
- Error-free data transmission to the cloud
- Intuitive visualization, analysis and management using the DischargeWeb

- **Innovative technology:** Low-cost and high-tech smartphone application providing fast and accurate measurements of water level, surface velocity and volumetric flow rate or discharge.
- **Versatile:** The DischargeApp allows to measure flows in any kind of open channels and streams, like natural rivers, irrigation channel and sewer networks, under different flow conditions.
- **Fast:** A site can be set up in less than 1 hour. Performing a measurement takes less than a minute.
- **Robust measurements:** Every measurement provides the user with the water level, the velocity at the surface of the water and the discharge. The discharge obtained is computed by considering the whole velocity area at the surface of the water body, which strongly contributes to the accuracy of the measurement.
- **Scalable:** Once a station is setup, other users can carry out measurements, which allows to collect more data.
- **Non-intrusive:** The DischargeApp extracts velocity information from the structures at the water surface. It does not rely on any chemical or particle tracers. This also makes this measurement technology safe to use during flood events, during which gauging by entering the water for a gauging would be too dangerous.
- **Proof image:** Every measurement comes with a proof image.
- **Rating curve:** Use the measured water level and discharge data to build site specific rating curves.
- **Error-free transmission:** Data transmission is done automatically, avoiding errors while collecting data.
- **More than a measurement device:** With the help of „DischargeWeb", measuring points and measurement results can be conveniently managed, visualised and shared with other authorised users.

POINT MEASUREMENT METHOD WITH A MEASURING ROD

SEBA Mini Current Meter M1

Inexpensive current meter on the 9 mm rod, ideal for small flowing waters with low water levels and low flow velocity

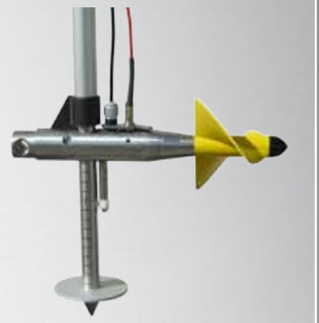
- Hydrological current meter for flow measurement on a Ø 9 mm or Ø 20 mm rod
- Point measuring method (detection of point velocities in measuring verticals)
- Six different aluminum propeller blades for different applications are available
- Connects to Z6 counter or to a notebook or tablet PC HDA-Pro operated with Software Q4 and the „Propeller“ module

Accessories:

- **Propeller:** Ø 30/50, Ø 30/100, Ø 50/50, Ø 50/100, Ø 50/250, Ø 50/500
- **Rods:** Ø 9 mm, 1.5 m in length, 3-piece, adjusting device for the rod Ø 9 mm, Ø 20 mm, 3 m length, 3-piece, special clamp for the Ø 20 mm rod, adjusting device for the wing rod of Ø 20 mm, flow direction float for M1 propeller
- **Connection cable:** 4 m (standard), 10 m or as specified (option)
- **Operating Unit:** Counting device Z6
- **Evaluation software:** Software Q4, “current meter“ module

SEBA Universal Current Meter F1

Universally deployable, robust current meter on 20 mm rod or on sinker weight (in connection with cableway system or single winch), suitable for small and large rivers with velocities of up to max. 5 m/s



- Robust, hydrological current meter for flow measurement on a Ø 20 mm rod or on a sinker weight (suspended universal current meter F1)
- Point measuring method (detection point velocities in measuring verticals)
- Suitable for measurements in watercourses with low to high flow rates
- Different propeller available for different applications
- Connects to Z6 counter or to a notebook or tablet PC HDA-Pro, operated with Software Q4 and “Propeller“ module

Accessories:

- **Propeller:** Anodised aluminum Ø 80/125, Ø 80/250, Ø 80/500, Ø 125/125, Ø 125/250, Ø 125/500, Ø 125/1000; glass fiber-reinforced polyamide Ø 80/300, Ø 125/300
- **Rods:** Ø 20 mm, 3 m length, 3-piece, relocation device for rod Ø 20 mm, special clamp for the Ø 20 mm rod, stabilizer tailpiece for universal current meter F1, canvas bag with a shoulder strap
- **Winch:** SEBA single winch type SEWII
- **Sinker weight:** Adapter for 25 kg/50 kg/100 kg, floating control 1 m, 1.4 m
- **Connection cable:** 4 m (standard), 10 m or as specified (option)
- **Operating Unit:** Counting device Z6
- **Transport case:** impact-resistant instrument cases, plastic
- **Evaluation software:** Software Q4, “current meter“ module

SEBA FlowSens

Magnetic inductive flow velocity sensor on a 20 mm rod, ideal for small and medium-sized watercourses with different flow conditions as well as heavy vegetation growth in the measuring cross-section. Measurement from as low as 5 cm (FlowFlat).

- Portable measuring instrument with a magnetic inductive flow sensor for mobile flow measurement on a Ø 20 mm rod
- Point measuring method (detection of point velocities in measuring verticals)
- Battery-powered handheld terminal with a large LCD and operated by keypad
- FlowFlat sensor for use from 5 cm water level (optional)

Accessories:

Evaluation software:

- Software Q4

Sensor carrier:

- Ø 20 mm wing rod with relocation device

MOVING BOOT METHOD WITH TELEDYNE RDI ADCP BROADBAND SENSORS

Teledyne RD Instruments StreamPro ADCP

High-performance mini broadband ADCP sensor for small and medium flowing waters

- 2 MHz broadband ADCP sensor incl. instrument carrier
- Profile range: 0.1 m to 6 m
- Flow velocity up to 2 m/s with standard instrument carrier
  Option: up to 3.5 m/s with Trimaran Riverboat SP
- Fast and precise flow determination
- Wireless communication via Bluetooth transmission to tablet PC or notebook

Accessories:

Operating device:
- HDA-Pro (field-compatible Windows tablet)

Operating and evaluation software:
- WinRiver II

Equipment carrier:
- Riverboat SP (trimaran) up to 3.5 m/s
- Q-Boat 1200 (electric drive with remote control)

Teledyne RD Instruments RiverPro ADCP

Universally deployable broadband ADCP sensor for the use in small to large rivers

- 1200 MHz broadband ADCP sensor with 5 beams (4 x 1200 kHz ultrasonic transducer and 1 x 600 kHz vertical beam) incl. foldable trimaran
- Profile range: 0.12 m to 25 m
- Flow velocity up to 5 m/s (standard)
- Integrated GPS for georeferencing
- Modularly expandable with DGPS, RTK and echo sounder
- Broadband measurement mode with automatic and manual cell size adjustment and sensor parameterisation
- Wireless communication via Bluetooth transmission, optionally with radio modem, to tablet PC or notebook

Accessories:

Operating device:
- HDA-Pro (field-compatible Windows tablet)

Operating and evaluation software:
- WinRiver II

Equipment carrier:
- High-Speed Riverboat up to 6 m/s
- Q-Boat 1250 (motor driven with remote control) up to 2.3 m/s
- Q-Boat 1800 (motor driven with remote control) up to 5 m/s

Other:
- 2-channel radio modem
- DGPS

Teledyne RD Instruments RiverRay ADCP

High-performance broadband ADCP sensor for rivers with high sediment loads as well as for special applications requiring a particularly large measuring range.

- 600 kHz broadband ADCP sensor with phase-controlled sensor field incl. foldable trimaran
- Profile range: 0.4 m to 60 m
- Flow velocity up to 5 m/s (standard)
- Integrated GPS for georeferencing
- Modularly expandable with DGPS, RTK and echo sounder
- Broadband measurement mode with automatic and manual cell size adjustment and sensor parameterisation
- Wireless communication via Bluetooth transmission, optionally with radio modem, to tablet PC or notebook

Accessories:

Operating device:
- HDA-Pro (field-compatible Windows tablet)

Operating and evaluation software:
- WinRiver II

Equipment carrier:
- High-Speed Riverboat up to 6 m/s
- Q-Boat 1250 (motor driven with remote control) up to 2.3 m/s
- Q-Boat 1800 (motor driven with remote control) up to 5 m/s

Other:
- 2-channel radio modem
- DGPS

EQUIPMENT CARRIER FROM TELEDYNE RDI FOR ADCP SENSORS

Riverboat SP

Teledyne Oceanscience Riverboat SP

Trimaran for StreamPro for flow speeds up to 3.6 m/s

- Robust, stable instrument equipment rack for ADCP measurements with the TRDI StreamPro (with or without compass upgrade)
- Best suited for flow up to 3.6 m/s

- Robust and streamlined equipment carrier (trimaran)
- Best suited for flowing waters up to 3.6 m/s
- Simple handling and convenient transport to the measuring site
- Quick setting up and dismantling

High-Speed Riverboat

Teledyne Oceanscience High-Speed Riverboat

Stable, streamlined trimaran for RiverPro and RiverRay for flow speeds up to 6 m/s

- Robust and stable equipment rack for various ADCP sensors (StreamPro, RiverPro and RiverRay)
- The state-of-the-art trimaran hull design cuts through surface waves, strongly resists overturning, and maintains instrument orientation in high flows conditions.
- Modularly expandable with DGPS and depth sounder

- Robust and stable equipment rack for gathering ADCP-data at water velocities over 6 m/s.
- Easy handling and an effortless transportation to and from the measuring site, easy setting up and dismantling.
- High-Speed Riverboat offers enough space to accommodate the ADCP sensor (optional StreamPro, RiverPro and RiverRay) and other components, such as a DGPS and depth sounder.

Q-Boat 1250

Teledyne Oceanscience Q-Boat 1250

Motor-driven trimaran for StreamPro, RiverPro and RiverRay for flow speeds up to max. 2.3 m/s

- Motorised, cost-efficient equipment carrier with remote control for various ADCP sensors (StreamPro, RiverPro und RiverRay)
- Collapsible sliding crossbar and lightweight for easy handling and convenient transportation to and from the deployment site
- Modularly expandable with DGPS

- **Versatile applications:** Bridges or cableway systems are not always available for ADCP measurements. The motorised Q-Boat 1250 with remote control function bridges this gap and places the survey team in the position to carry out highly efficient flow measurements at almost any location.
- **Easy handling:** The lightweight and collapsible sliding crossbar boat enables an easy handling and an effortless transportation to and from the measuring site.
- **Measuring without risk:** Work safety first! Manned monitoring boat trips, represent a high risk of injury and death. The Q-Boat 1250 represents an interesting option here and allows flow measurements even and especially under critical conditions.
- **Optimised:** The Q-Boat 1250 offers enough space to accommodate the ADCP sensor (optional StreamPro, RiverPro, RiverRay) and other components, such as a GPS smart antenna.

Q-Boat 1800

Teledyne Oceanscience Q-Boat 1800

Motor-driven high-speed boat for RiverPro and RiverRay for flow speeds up to max. 5 m/s

- Robust, motor-driven, unsinkable equipment carrier with radio remote control
- Modular expandable with DGPS (e.g. Trimble), radio modem and echo sounder

- **Versatile applications:** Bridges or cableway systems are not always available for ADCP measurements. The motorised Q-Boat with remote control function bridges this gap and places the survey team in the position to carry out highly efficient flow measurements at almost any location.
- **High-Performance:** Two high-performance electric motors and power batteries ensure a long service life even at high water since the Q-Boat does not run out of steam quickly even with high flow velocities.
- **Measuring without risk:** Work safety first! Manned monitoring boat trips, represent a high risk of injury and death. The Q-Boat constitutes an interesting option here and allows flow measurements even and especially under critical conditions.
- **Optimised:** The Q-Boat offers enough space to accommodate the ADCP sensor (optional RioPro, RiverPro, RiverRay) and other components, such as GPS, wireless modem, camera and sonar.

STATIONARY SYSTEMS

Application areas:

- Natural watercourses (streams, rivers, wadis)
- Waterways
- Irrigation canals

DischargeKeeper

Camera-based measuring method, ideal for medium to large rivers, can also be used under turbulent flow conditions and for recording extreme events. Self-sufficient measuring operation with solar power possible

- Camera-based measurement of water level, surface velocity and discharge
- Versatile camera mounting positions
- Non-intrusive system, reliably measuring during flood events
- Remote transmission of measurement data and proof images
- Real-time, in-situ discharge measurements and alarms

- **Simple installation:** The weatherproof IP-camera and the sensor controlled infrared beamer can be mounted easily on e.g. a river gauging station, a mast, concrete constructions or a bridge. The process unit can be housed in a monitoring station or in a protective enclosure. Complicated and expensive installations in the water are no longer required.
- **No flow tracers required:** A special feature of the measuring system is that no flow tracers need to be added for the flow velocity detection. The DischargeKeeper operates on visible moving surface structures, although naturally occurring floating objects on the water surface (e.g. leaves) enhance the measurement signal.
- **Representative measurement:** Unlike other non-intrusive sensor types (such as radar), the DischargeKeeper delivers a flow rate measurement (profiling) on the entire surface of the image section. This provides a representative and spatially resolved flow velocity detection.
- **Non-intrusive:** The optical measuring system DischargeKeeper does not come into contact with the measured medium. A damage of the equipment as a result of siltation, vegetation growth etc. is not possible. Therefore the technology is practically maintenance free.
- **On-site evaluation:** All DischargeKeeper measurement parameters (water level, velocity profile, and discharge) are collected and processed locally on the measuring site, almost instantaneously.
- **Smart:** DischargeKeeper informs immediately by SMS and/or e-mail when system critical levels (e.g. in case of low battery voltage or sensor drift) are reached or when definable thresholds are exceeded or fallen below.
- **Autonomy:** With the „SmartPowerModule“, the DischargeKeeper can be operated completely independent from the mains with a solar panel.
- **Robust, precise:** The DischargeKeeper can also be used under a wide variety of environmental, weather, and lighting conditions.
- **More than just a sensor:** The DischargeKeeper provides both, the required measurement values and proof in the form of HD quality images from the measuring site. In case of any doubt, the parameters, such as the water level can be verified using the actual image information. Time-consuming site visits to the measuring site can be reduced or even avoided.

Can be combined with:

Data Logger:

- NetLogCom

Sensors for water level measurement:

- Pressure probe DS(T) 22
- Radar SEBAPuls
- Pneumatic system PS
- PS-Light-2
- LevelSense

ChannelMaster

Broadband ADCP sensors for different watercourse cross-sections from 1 m to 300 m width, integrated water level sensor (ultrasound). Horizontal mounting of the sensor in the water body at the edge of the bank.

- All-in-one ADCP system for high-resolution and precise velocity profiling from 1 m to 300 m ranges including an integrated ultrasonic vertical beam and a redundant pressure sensor for stage measurement
- Water level, flow velocity and discharge output via RS232 interface (SDI-12 protocol) for connection to an external data logger (e.g. SEBA-NetLogCom)
- User-friendly software for site configuration (input of the cross-section, correction factors,… etc.)
- Robust and flexible bracket for easy installation and alignment of the ChannelMaster is optionally available with additional protection fixture
- Comparatively low installation effort and expenditure, since the ChannelMaster is installed on only one side of the river/channel.

Can be combined with:

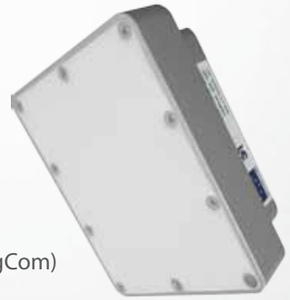
Data Logger:
- NetLogCom

Sensors for water level measurement:
- Pressure probe DS(T) 22
- Radar SEBAPuls
- Pneumatic system PS
- PS-Light-2
- LevelSense

SEBA v-Radar/Q-Radar

Non-contact measuring method with radar doppler technology for small to medium measuring cross-sections, mounting on bridges or mast booms directly above the water cross-section.

- Available as stand-alone flow velocity sensor (v-Radar) or in a robust compact housing (Q-Radar) made of stainless steel together with SEBAPuls radar sensor for water level measurement
- Flow velocity v-Radar: 0.02 m/s to 15 m/s
- Water level: 0-15 m (SEBAPuls 15) or 0-35 m (SEBAPuls 35)
- Low energy consumption, self-sufficient operation with solar panels or exchangeable batteries possible
- SDI-12 interface for direct connection to SEBA data loggers (e.g. UnilogCom, NetLogCom)
- Practically maintenance-free



Can be combined with:

Data Logger:
- NetLogCom
- UnilogCom

Sensors for water level measurement:
- Radar SEBAPuls

SEBA LogCom-Q/UniLogCom-Q Ultrasound doppler

Cost-effective, battery-operated ultrasonic doppler measuring system ideal for small, defined measuring cross-sections (e.g. circular or rectangular profiles) consisting of data logger, cellular modem and combi-sensor for flow velocity and water level measurement. The doppler sensor can be mounted either vertically on the bottom or horizontally, e.g. for a rectangular watercourse profile.

- Powerful 32-bit multi-channel data logger with 16 MB ring memory for approx. 1,120,000 measured values
- Integrated 4G modem (transmission options: retrieval via mobile data, FTP push, TCP push, SMS push, SMS alarm, event push)
- Impact-resistant aluminium protective housing with threaded connection (type LogCom-Q) for level pipes from Ø 4“. Alternatively: compact plastic housing for wall mounting for installation in protective housings or control cabinets
- LC display with three multi-function keys for displaying current measured values and system status (option: backlit LC display)
- 1.04 MHz pulse doppler sensor for recording flow velocity profiles in max. 18 cells
- Integrated ultrasonic sensor for precise water level measurement (0.1 % FS) up to 1.3 m
- Connection options for further sensors (e.g. SEBA pressure probe DS 22)

Can be combined with:

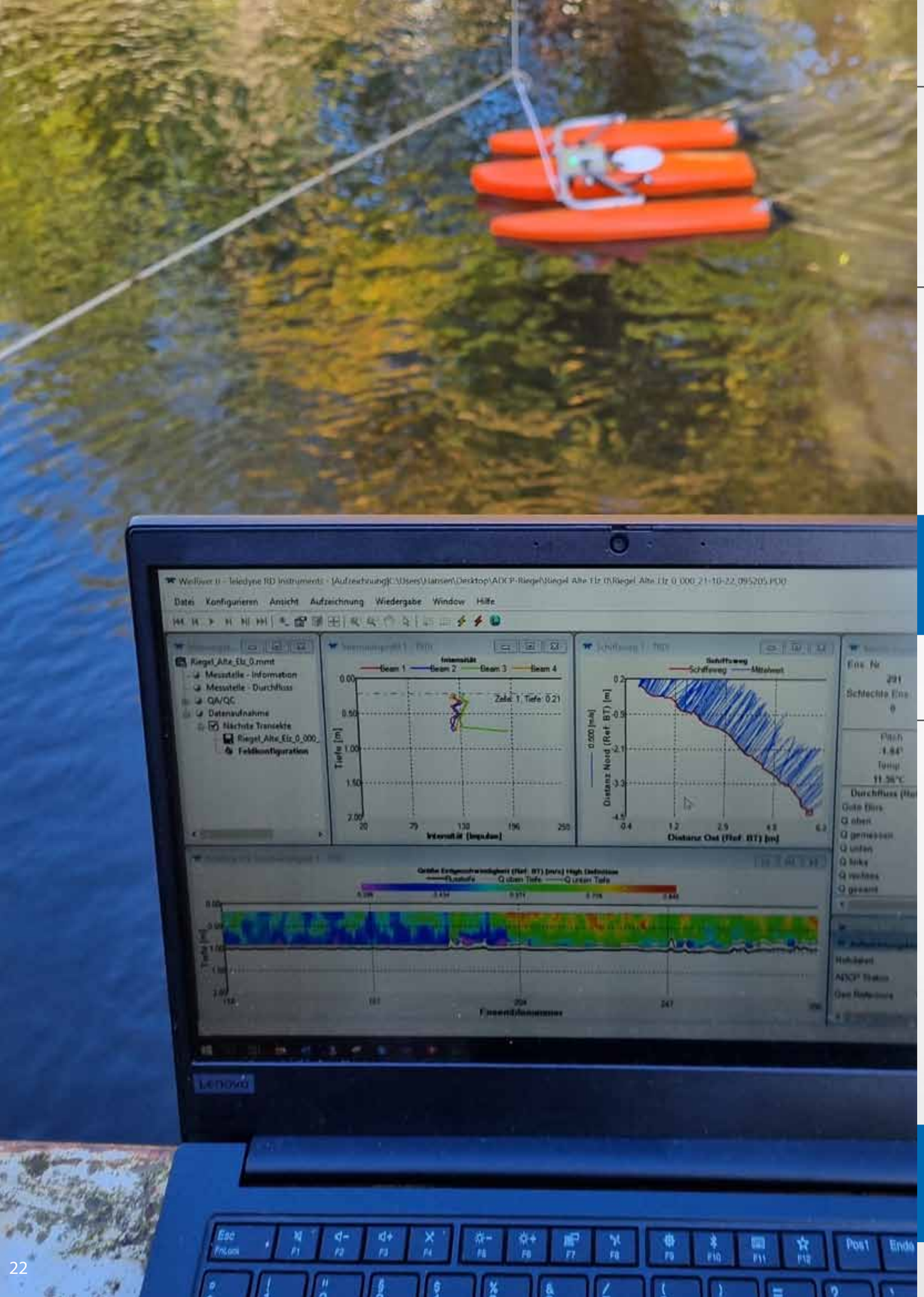
Operating devices:
- SEBA HDA-Pro *(field-ready Windows tablet)*

SEBA operating software:
- SEBAConfigPC *(Windows)*

SEBA evaluation software:
- DEMASvis

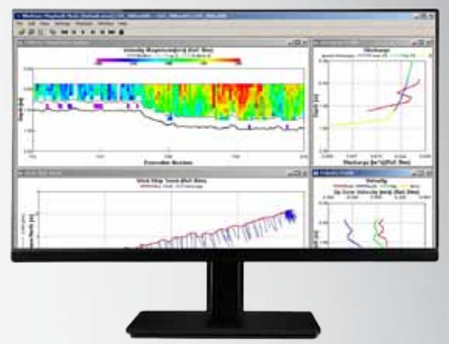
SEBA archiving software:
- DEMASdb

SEBA Web portal:
- SEBA-Hydrocenter



SOFTWARE

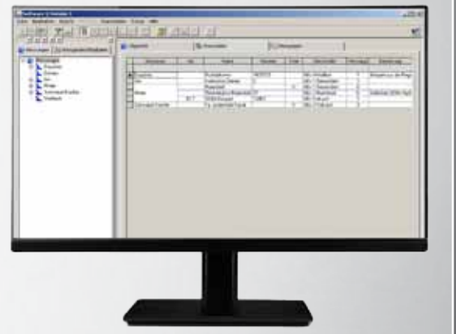
Teledyne RD Instruments WinRiver II



- Operating and configuration software for ADCP-products of Teledyne RD Instruments (StreamPro, RiverPro, RioGrande, RiverRay)
- Available in several languages
- Data collection and analysis of speed / flow profiles in real time - configuration via “Measurement Wizard“
- Modes to customise the ADCP measuring device

The WinRiver II software is used for recording and analysing of velocity and flow measurements using mobile ADCP systems. The configuration of the measurement system is done via “Measurement Wizard“. In addition to measuring-point-specific settings, different modes can be selected to adapt the measuring instrument to different water conditions.

SEBA Software Q4



- Standard software (Windows) of the German Federal Institute of Hydrology (Bundesanstalt für Gewässerkunde, BfG) and the Water and Shipping Authorities for Evaluation of Mobile Flow Measurement in accordance with ISO748 and Gauging Regulations, Annex D
- Relational database management system (SQL interface, easy data search and data backup, redundancy-free storage)
- Data management for measuring instruments (e.g. Mini Current Meter M1, Universal Current Meter F1) and calibration equations
- Creation of measurement reports
- Supported measurement methods: single-point measurement, two-point measurement and multi-point measurement
- Modularly expandable (module “Pro“, module “Current Meter“ etc.)
- Modes for individual adaptation of the ADCP

The APP allows the acquisition, management and analysis of flow rates using Windows. The technical basis of the program is provided by the gauging regulation, Annex D. The determination of the flow rate (Q) must be executed applying the surface speed method, which is customary in the hydrological practice. Considering the device-specific parameters, the total flow can be evaluated immediately after the data acquisition.

OPERATING DEVICES

Z6 counting device

Compact, easy-to-operate counter for universal current meters with large LC display for indication of propeller pulses and flow velocity (option)

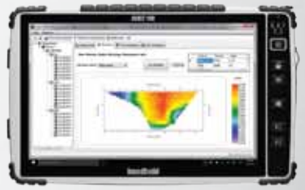
- Robust, compact counting device for counting propeller pulses
- Time preset and/or pulse preselect (optional)
- Display of flow rate (optional)
- 5-digit LCD
- Automatic battery monitoring

- Counting device for the SEBA universal current meter M1 and F1 as well as the Ott wing (type C2, C31)
- Connection possibility to SEBA single winch type SEWII and SEBA double winch SDW-ES and to mechanical and electrical OTT winches

SEBA Z6

SEBA HDA-Pro

Field-ready Windows tablet with large 10“ display for operating SEBA loggers and/or ADCP measuring boats



- Robust 10.1“ tablet PC with Windows 10 Operating System
- Protection class IP65
- 1 x RS232 interface, 2 x USB, VGA, LAN, MicroSD Slot, Loudspeaker
- Integrated GPS, 5 megapixel camera, Bluetooth®, WWAN (Optional)

WINDOWS

- **Robust, shockproof, handy:** The HDA-Pro with a 10.1“ display is a multi-function tablet PC for use in rough environments and therefore it is a multi-purpose device.
- **Powerful and innovative:** The HDA-Pro scores with its fast Intel Quad-core processor and large 10.1“ wide-screen LED (1366x768 pixels) with ambient light sensor that automatically adjusts the backlighting to the surrounding light conditions.
- **Smart:** The HDA-Pro is the ideal assistant for numerous measuring tasks. Parameterisation and adjustment of data loggers and data read-out via USB / Bluetooth® with SEBA operating software ConfigPC. Implementation of ADCP measurements with software WinRiver II or HydroProfiler, current meter measurements with Software Q4, data visualisation and evaluation with DEMASvis and much more.

HDA-Pro

Service

The SEBA all-round service for your SEBA measurement technology:
Reliable, professional and tailored precisely to your needs and requirements!

Installation and commissioning
- Professional installation and commissioning
- Software installation and setup
- Commissioning and turnkey handover

Provision of time series in the cloud
- Setup and hosting of monitoring wells (online/offline) in the SEBA-Hydrocenter or on SEBA's FTP server for secure data handling and downloads

Support of measurement projects
- Provision of SEBA data loggers (e.g. for pump tests) from our rental pool
- Installation and parameterisation of the measurement technology according to customer specifications
- Support of the measurement technology on site
- Data readout and dismantling at the end of the project
- Data evaluation with DEMASvis in the form of hydrographs and tables

Implementation of training courses for measurement technology and software
- In-house directly at your location, on-site at the monitoring station or as your company event with us in Bavaria

From maintenance to the SEBA carefree package
- Services tailored to your needs - from basic to all-inclusive
- System check, battery replacement, adjustment and calibration
- Remote monitoring and plausibility checks
- Troubleshooting via remote maintenance
- Troubleshooting at the measuring point
- Provision of time series in the SEBA-Hydrocenter
- Customised offers according to your requirements

Telephone support
- Commissioning of online stations with remote parameterisation
- Support during initial setup and commissioning of measurement technology and software
- Support with troubleshooting and error correction

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