

SEDIMENT? SOLVED



CONTENTS

Sediment? Solved.	2
<i>AQUA</i> logger 210TY	3
SSC Converter	5
The Acoustic Profiler	7
<i>AQUA</i> scat 1000 range	9
<i>AQUA</i> scat 1000R	11
<i>AQUA</i> scat 1000S	13
<i>AQUA</i> scat 1000LT	15
<i>AQUA</i> scat 1000L	17
Real Time Systems	19
Designed for you...	20
<i>AQUA</i> scat Selection Guide	22

SEDIMENT? SOLVED

As experts in the field, Aquatec have many years of experience in sediment measurement. Look no further than our equipment for monitoring and logging suspended sediment.



THE STANDALONE TURBIDITY LOGGER AQUAlogger® 210TY

- Turbidity to 2000 FTU
- Flexible sampling
- Optional pressure & temperature
- Wipers to control biofouling
- Suspended sediment concentration conversion

THE ACOUSTIC PROFILER AQUAcat® 1000

- Uses acoustic backscatter method
- Load & mean particle size
- Field & lab models



THE REAL TIME SYSTEM

- Dredge monitoring
- Hydropower intake monitoring
- Water quality monitoring

AQUAlogger® 210TY

THE LOGGER

The AQUAlogger 210 turbidity, temperature and pressure logger is a compact, self contained data logger. The instrument measures turbidity, and optionally temperature and pressure to depths of 4000m. It is suitable for use in freshwater and marine environments. Measuring only 300mm in length with a 60mm diameter, the AQUAlogger 210 is easy to deploy and operate. The internal batteries last up to a year, depending on the sampling regime. The instrument has real time reporting capability as standard and pressure to depth conversion on models with pressure. The AQUAlogger 210 now comes with the SSC Converter to make calculating suspended sediment concentration simple.



THE SENSOR

The AQUAlogger 210TY features a Seapoint turbidity meter:

- Up to 2000 FTU
- 4 switchable sensitivities (set by user or automatically selected by logger for maximum dynamic range)

Gain	Range in FTU (typical values)
100x	25
20x	125
5x	500
1x	2000

Key Features

- Self-contained logger
- To 4000m depth
- Optional temperature and pressure sensors
- Continuous and burst sampling regimes
- 1Hz maximum sampling rate
- Real time reporting capability as standard
- SSC Converter

Applications

The AQUAlogger 210TY is a versatile instrument suitable for a wide variety of applications:

- Oceanographic and environmental assessment / research
- Water quality monitoring for EIA and aquaculture
- Dredge plume monitoring
- Silt monitoring for hydropower plants
- Turbidity monitoring during construction

MODELS

There are three different models available:

Model	Turbidity sensor	Temperature sensor	Pressure sensor
AQUAlogger 210TY	✓		
AQUAlogger 210TYT	✓	✓	
AQUAlogger 210TYPT	✓	✓	✓

Depending on the depth of deployment, one of two types of housing will be used: standard housing to 1000m, stainless steel deep water housing to 4000m.

Biofouling



Wipers are available to reduce the impact of biofouling on the sensor.



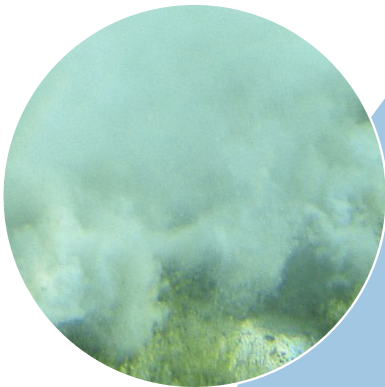
Photo courtesy of Fugro EMU

Auto-gain Function

One of the key features of the AQUAlogger 210TY is the auto-gain function. Once selected, the logger selects the most suitable turbidity range. This is useful when studying environments with significant variability and means key events are captured.

Benefits

- Maximise the resolution in your chosen range.
- Capture high turbidity events against low baseline levels.



About the SSC Converter

The AQUAlogger 210TY now comes with the SSC Converter as standard in the AQUAtalk software package, allowing users to convert their turbidity readings into suspended sediment concentration (SSC) with ease.

Key Features

- The conversion can be applied pre or post deployment.
- Choose one of three methods - Measure, Calculate or Coefficients
- You can select the most appropriate conversion and let the software do the work.
- Keep accurate records of conversions
- Improve the fit by adding samples.

Methods

By using collected in-situ samples or carrying out laboratory analysis, you can select the 'Calculate' or 'Measure' methods and let the software do the work. Alternatively, previous conversion coefficients can be easily applied using the 'Coefficients' method. The transparent process allows you to keep accurate records of conversions and continually add samples to increase the accuracy.

Measure

If you have solutions with known suspended sediment concentrations and need to measure the turbidity, you can use the 'Measure' method. The turbidity of samples can be measured by the logger and their corresponding concentrations added for up to 50 samples. You can then select the most appropriate conversion and apply to existing or future datasets. The software gives the option of saving the conversion for future use, or adding further samples as they become available.

Calculate

If you have carried out previous analyses or want to use in situ data, the 'Calculate' method can be used. Known turbidity values and their corresponding concentrations can be manually added, before selecting a suitable conversion and applying to existing or future datasets. The software gives the option of saving the conversion for future use.

Coefficients

If you have previously carried out a conversion and have the coefficients available, they can be manually entered into the software and applied. The SSC Converter allows you to save a record of your conversion for future use. If you want to use the same conversion again, you can simply input or load the data from the record and apply it to your logger.

SENSOR SPECIFICATIONS

	Turbidity			
Light Source Wavelength	880 nm			
Scattering Angles	15 - 150 degrees			
Measurement Range (typical values)	0-25FTU	0-125FTU	0-500FTU	0-2000FTU
Regression	Linear			Polynomial

	Temperature	Pressure
Sensor type	Thermistor	Piezo-resistive bridge
Ranges	-2 to 30°C standard, other ranges on request	5 bar (~40m), 11 bar (~100m); 51 bar (~500m), 101 bar (~1000m), 201 bar (~2000m), 401 bar (~4000m)
Resolution	better than 0.007°C	better than 0.01% full scale
Accuracy	±0.05°C	typically better than 0.2% full scale*
Time constant	better than 5 seconds to 63% of the change in value	N/A

LOGGER SPECIFICATION

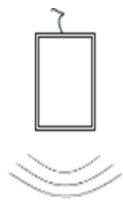
Data storage capacity	Greater than 4 million parameter readings, in non-volatile FLASH
Logging lifetime	Depends on logging parameters - up to 1 year
	Data retention >10 years
Burst sampling	Bursts every 1 - 255 seconds or 1 - 255 minutes
Within-burst rate	From 1 Hz to once every 30 seconds
Burst averaging	Bursts may be averaged to a single data value
Communication	RS232 or RS422 (specify) and USB
Optional extra inputs	2 channels 0-5V external
Optional Controls	External trigger input or output
Battery	3 x 3.6V Custom Lithium 'AA' cell pack
Software	AQUAtalk for Windows for configuration and download
Attachment	Single point attachment through mounting hole or use clamp

*Including non-linearity, hysteresis, zero offset and end value deviation (corresponds to measured error per IEC 61298-2 at room temperature).

THE ACOUSTIC PROFILER

WHAT IS AN ACOUSTIC SUSPENDED SEDIMENT PROFILER?

An acoustic suspended sediment profiler transmits pulses of high frequency sound on multiple transducers operating at different frequencies. It measures the sound scattered by sediment and other suspended materials at discrete spatial intervals. The backscatter is then processed to calculate mean particle size and suspended sediment concentration.



Transducer transmits sound in MHz region equal in length to the bin

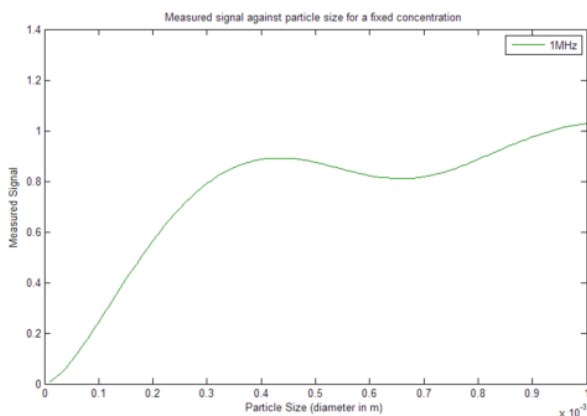


Sound waves travel through water



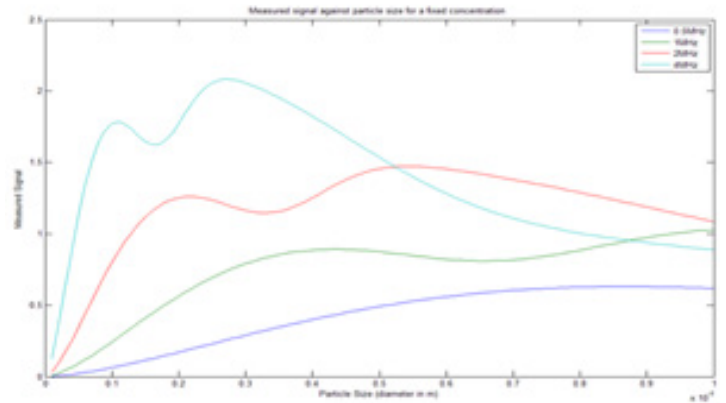
Sediment in water scatters sound, which is picked up by transducer. Different size sediment scatters sound more or less depending on frequency of sound.

WHY USE MULTIPLE FREQUENCIES?



Using a single frequency, the measured signal varies with particle size. Physical samples are required.

With multiple frequencies, the size dependent response to different frequencies can be used to determine particle size. The concentration can then be calculated using the particle size.



BENEFITS OF USING ACOUSTICS

- Low maintenance
- Good immunity to biofouling
- Provides profiles of up to 10m
- Suitable for unattended operation
- Non intrusive
- Flexible sampling



WHY CHOOSE ACOUSTICS OVER OPTICAL INSTRUMENTS?

The AQUAscat has greater sensitivity to coarser, sandy suspensions compared to optical instruments such as the AQUAlogger 210TY, which are more sensitive to fine, muddy material. Neither instrument directly establishes sediment concentration because the backscatter is also a function of grain size and shape. However, the use of multiple frequencies allows good estimates of mean particle size to be made. Calibrations may be carried out in laboratory conditions using samples of actual seabed material from a deployment site.

Optical instruments give a reading at a single point, whereas the AQUAscat instrument gives a profile of up to 10m.

AQUAscat® 1000

The AQUAscat 1000 represents a new generation of high frequency acoustic instrumentation. It has applications in sediment transport studies, including measurement of suspended sediment profiles, precision altimetry, dredge plumes and turbulence.

The AQUAscat transmits pulses of high frequency sound on up to four transducers, each of which may operate at a different frequency. It measures the sound scattered by sediment or other suspended materials at discrete spatial intervals programmable from 2½ millimetres to 4 centimetres. For altimetry, this may span a few tens of centimetres; for monitoring sediment suspension profiles, a total range of around 1- 2 metres is typical; while dredge plume estimation may extend to 10 metres.

OVERVIEW

- Acoustic suspended sediment profilers
- Multiple frequencies to estimate mean grain size and give suspended sediment concentration
- Profiles of <1m up to 10m
- Lab and field models
- Size inversion typically feasible for sediment with a radius of 20 to 500µm
- Concentrations of 0.01g/l to 20g/l over 1m
- Optional turbidity probe

APPLICATIONS

- Sediment transport studies
- Dredge plume monitoring
- Environmental/oceanographic monitoring
- Sediment research



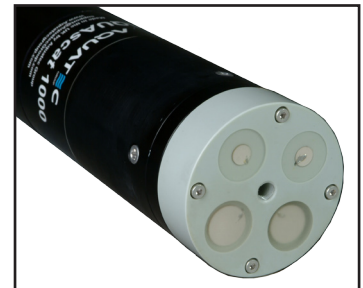


RESEARCH AQUAscat® 1000R

The AQUAscat 1000R research model is supplied with 3 cabled transducers, and a temperature and pressure sensor as standard. An additional transducer can be purchased. The standard instrument can be used to 1000m depth, with custom instruments available for greater depths.

SURVEY AQUAscat® 1000S

The AQUAscat 1000S survey model is supplied with 4 fixed transducers, and a temperature and pressure sensor as standard. The standard instrument can be used to 1000m depth, with custom instruments available for greater depths.



LITE AQUAscat® 1000LT

The AQUAscat 1000LT lite model is supplied with 2 fixed transducers. The instrument can be used to 200m depth, making it ideal for shallow water deployment.

LABORATORY AQUAscat® 1000L

The AQUAscat 1000L laboratory model is supplied with 3 cabled transducers, with the option to purchase an additional transducer. The instrument housing is designed for bench use - only the transducers can be submerged.



AQUAscat® 1000R

RESEARCH

For the most flexible sediment research, the AQUAscat 1000R has 4 cabled transducers, allowing researchers and scientists to choose between 7 frequencies (300 kHz, 500 kHz, 1 MHz, 2 MHz, 2.5 MHz, 4 MHz and 5 MHz). With cabled transducers, the instrument can transmit and receive sound in any direction. The AQUAscat 1000R has an internal battery, and can be connected to an external battery pack for long-term, unattended research. The instrument has integrated temperature and depth sensors. With an optional turbidity sensor, researchers and scientists can obtain both turbidity and suspended sediment concentration.



Key Features

- Uses acoustic backscatter method
- Up to 4 different frequencies
- Cabled transducers for flexible deployment

Applications

- Sediment transport studies
- Dredge plume monitoring

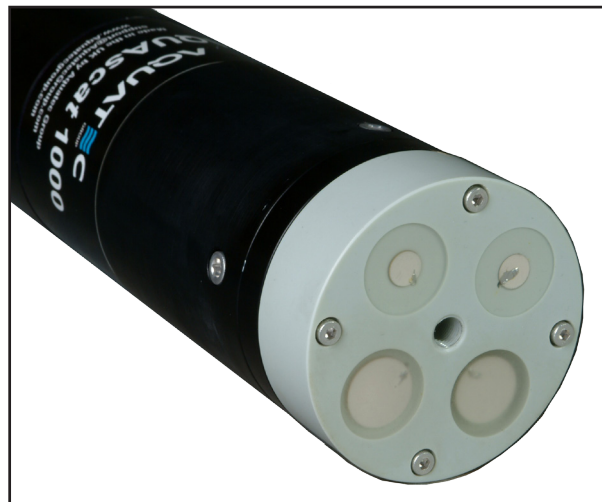
SPECIFICATION

Sediment range	Sensitive to a wide range of grain sizes Size inversion typically feasible for 20 µm to 500 µm radius Typically 0.01 g/l to 20 g/l over 1 m, or more over shorter range
Frequencies	Up to 4 frequencies, from 500 kHz to 5 MHz
Transducers	Typically Ø10-25mm ceramic discs (beam width according to frequency), with other optional configurations.
Transducer arrangement	Individual cabled transducers
Gain	Software controlled transmitter and receiver gain adjustment
Range	150 cm (typical), up to 10 m at frequencies below 2MHz depending on options.
Transmitted signal	1 W rms typical transmit CW pulse, pulse length to match cell size.
Transmission rate	128 Hz max pulse rate for each frequency (i.e. 512 pulses per second for four), subject to acoustic range limits. Minimum rate 1 Hz for calibration.
Data averaging	Cell ensembles averaged over time by powers of 2 up to 64 before storage
Range cells	256 cells. 2.5 mm, 5 mm, 10 mm, 20 mm and 40 mm at 1500 m/s speed of sound. Start/end range set by software
Burst duration	Defined by number of profiles requested
Burst trigger	Either external hardware trigger when required or internal software trigger at regular intervals
Burst interval	Internally generated from once every minute to once every 255 minutes, user definable start time of first burst.
Trigger output	A digital output allows triggering of external instruments
Power requirement	8 V to 24 V dc. Typically 1 W when logging, and with standby of typically 1 mW when not logging.
Battery packs	Internal alkaline battery pack gives up to 10 days typical deployment. External battery packs available according to deployment needs.
Additional sensors	Built-in temperature and pressure, optional turbidity
Disk storage	Compact Flash (proprietary format). 8 GB standard.
Data comms	RS232 up to 115 kbaud; USB 1.1 typically 2-3 Mbaud
Housing options	1000m rated aluminium alloy housing. Greater depths available as custom instruments.

AQUAscat® 1000S

SURVEY

For simple deployment and operation, the AQUAscat 1000S has 4 integrated transducers (frequencies of 500 kHz, 1 MHz, 2 MHz and 4 MHz). The integrated transducers make deployment simple, and allows operators to save time in the field. The AQUAscat 1000S has an internal battery, and can be connected to an external battery pack for long-term, unattended research. The instrument has integrated temperature and depth sensors. With an optional turbidity sensor, researchers and scientists can obtain both turbidity and suspended sediment concentration.



Key Features

- Uses acoustic backscatter method
- 4 different frequencies
- Fixed transducers for repeat deployments

Applications

- Sediment transport studies
- Dredge plume monitoring

SPECIFICATION

Sediment range	Sensitive to a wide range of grain sizes Size inversion typically feasible for 20 µm to 500 µm radius Typically 0.01 g/l to 20 g/l over 1 m, or more over shorter range
Frequencies	4 frequencies - 500 kHz, 1MHz, 2MHz, 4MHz
Transducers	Ø10-25mm ceramic discs (beam width according to frequency)
Transducer arrangement	4 fixed transducers
Gain	Software controlled transmitter and receiver gain adjustment
Range	150 cm (typical), up to 10 m at frequencies below 2MHz depending on options.
Transmitted signal	1 W rms typical transmit CW pulse, pulse length to match cell size.
Transmission rate	128 Hz max pulse rate for each frequency (i.e. 512 pulses per second for four), subject to acoustic range limits. Minimum rate 1 Hz for calibration.
Data averaging	Cell ensembles averaged over time by powers of 2 up to 64 before storage
Range cells	256 cells. 2.5 mm, 5 mm, 10 mm, 20 mm and 40 mm at 1500 m/s speed of sound. Start/end range set by software
Burst duration	Defined by number of profiles requested.
Burst trigger	Either external hardware trigger when required or internal software trigger at regular intervals
Burst interval	Internally generated from once every minute to once every 255 minutes, user definable start time of first burst.
Trigger output	A digital output allows triggering of external instruments
Power requirement	8 V to 24 V dc. Typically 1 W when logging, and with standby of typically 1 mW when not logging.
Battery packs	Internal alkaline battery pack gives up to 10 days typical deployment. External battery packs available according to deployment needs.
Additional sensors	Built-in temperature and pressure, optional turbidity
Disk storage	Compact Flash (proprietary format). 8 GB standard
Data comms	RS232 up to 115 kbaud; USB 1.1 typically 2-3 Mbaud
Housing options	1000m rated aluminium alloy housing. Greater depths available as custom instruments.

AQUAscat® 1000LT

LITE

Measuring suspended sediment concentration has never been easier with the AQUAscat 1000LT acoustic profiler. The latest addition to the well-established AQUAscat range combines cutting edge technology with economic design to give the best value solution for scientists and surveyors. The AQUAscat 1000LT has 2 integrated transducers (frequencies of 1 MHz and 4 MHz), and observe profiles of 2.5m. The self-contained design and rechargeable battery make it easy to deploy and maintain. Suitable for use to 200m, the new AQUAscat can be deployed in rivers, lakes, estuaries and coastal regions.

NEW



Key Features

- Uses acoustic backscatter method
- 2 different frequencies
- Fixed transducers for repeat deployments

Applications

- Sediment transport studies
- Dredge monitoring
- Water quality monitoring

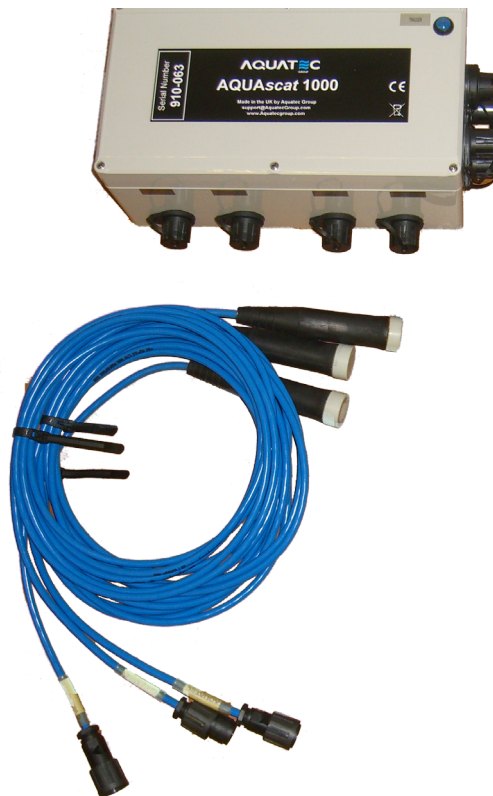
SPECIFICATION

Sediment range	Sensitive to a wide range of grain sizes Size inversion typically feasible for 20 µm to 500 µm radius Typically 0.01 g/l to 20 g/l over 1 m, or more over shorter range
Frequencies	2 frequencies - 1 MHz, 4 MHz
Transducers	Ø10-20mm ceramic discs (beam width according to frequency)
Transducer arrangement	2 fixed transducers
Gain	Software controlled transmitter and receiver gain adjustment
Range	150 cm (typical) at 4 MHz, 255 cm at 1 MHz
Transmitted signal	1 W rms typical transmit CW pulse, pulse length to match cell size.
Transmission rate	128 Hz max pulse rate for each frequency (i.e. 256 pulses per second for two), subject to acoustic range limits. Minimum rate 1 Hz for calibration.
Data averaging	Cell ensembles averaged over time by powers of 2 up to 64 before storage
Range cells	256 cells, 10 mm (at 1500 m/s speed of sound)
Burst duration	Defined by number of profiles requested.
Burst trigger	Either external hardware trigger when required or internal software trigger at regular intervals
Burst interval	Internally generated from once every minute to once every 255 minutes, user definable start time of first burst.
Trigger output	A digital output allows triggering of external instruments
Power requirement	8 V to 24 V dc. Typically 1 W when logging, and with standby of typically 1 mW when not logging.
Battery packs	Internal rechargeable Nickel Metal Hydride battery pack gives up to 5 days typical burst deployment. External battery packs available according to deployment needs.
Additional sensors	Built-in temperature and pressure
Disk storage	Compact Flash (proprietary format). 8 GB standard.
Data comms	USB 1.1 typically 2-3 Mbaud
Housing options	200 m rated acetal housing.

AQUAscat® 1000L

LABORATORY

For research in the laboratory, the AQUAscat 1000L is the ideal solution. The instrument is supplied with 3 cabled transducers providing flexibility in operation, as it can transmit and receive sound in any direction. Researchers and scientists can choose between 6 frequencies (500 kHz, 1 MHz, 2 MHz, 2.5 MHz, 4 MHz and 5 MHz). With an optional turbidity sensor, researchers and scientists can obtain both turbidity and suspended sediment concentration.



Key Features

- Uses acoustic backscatter method
- Up to 4 different frequencies
- Cabled transducers for flexible experiments

Applications

- Flume tanks
- Laboratory based transport studies

SPECIFICATION

Sediment range	Sensitive to a wide range of grain sizes Size inversion typically feasible for 20 µm to 500 µm radius Typically 0.01 g/l to 20 g/l over 1 m, or more over shorter range
Frequencies	Up to 4 frequencies, from 500 kHz to 5 MHz
Transducers	Typically Ø10-25mm ceramic discs (beam width according to frequency), with other optional configurations.
Transducer arrangement	Individual cabled transducers
Gain	Software controlled transmitter and receiver gain adjustment
Range	150 cm (typical), up to 10 m below 2MHz depending on options.
Transmitted signal	1 W rms typical transmit CW pulse, pulse length to match cell size.
Transmission rate	128 Hz max pulse rate for each frequency (i.e. 512 pulses per second for four), subject to acoustic range limits. Minimum rate 1 Hz for calibration.
Data averaging	Cell ensembles averaged over time by powers of 2 up to 64 before storage
Range cells	256 cells, 10 mm standard (at 1500 m/s speed of sound). Options for 2.5 mm, 5 mm, 20 mm and 40 mm. Start/end range set by software
Burst duration	Defined by number of profiles requested.
Burst trigger	Either external hardware trigger when required or internal software trigger at regular intervals
Burst interval	Internally generated from once every minute to once every 255 minutes, user definable start time of first burst.
Trigger output	A digital output allows triggering of external instruments
Power requirement	12V power supply
Additional sensors	Cabled temperature, pressure, turbidity
Disk storage	Compact Flash (proprietary format). 8 GB standard.
Data comms	RS232 up to 115 kbaud; USB 1.1 typically 2-3 Mbaud
Housing options	Plastic IP68 weatherproof instrument case

REAL TIME SYSTEMS



**DREDGE
MONITORING**



**WATER
QUALITY**



HYDROPOWER

Based on the established AQUAlogger 210TY turbidity logger, Aquatec can provide real time monitoring systems tailored to your project, for applications in dredge monitoring, water quality and hydropower.

Why Choose a Real Time System?

- Integrate additional parameters such as temperature, pressure, pH, DO, chlorophyll and PAR.
- If biofouling is likely to be an issue, automatic wipers can be included in the system.
- We provide complete systems designed for your application including buoys, seabed frames or solar powered shore based river stations.
- Optional alarms with email or SMS notification.
- Each system comes with our bespoke AQUAtalk software, with modifications made upon request.
- Data access can be via a dedicated shore station or remote access via a secure website.
- Installation and commissioning services can be added if additional support is needed
- Training can be provided onsite or remotely.

DESIGNED FOR YOU...

APPLICATION AND NEED

Every real time monitoring project is different, with different aims and end requirements for data. Aquatec will find the best solution to achieve your goal, whether it be complying with dredging regulations, carrying out oceanographic research or undertaking environmental monitoring.

Your experience starts with an initial consultation with one of our systems experts, who will discuss your requirements in detail.

SENSORS

Aquatec can integrate a wide range of sensors, including those listed below:

Water Quality

- Turbidity, Temperature
- Pressure, Depth
- Chlorophyll, CDOM, PAR
- Salinity, DO, pH, Redox

Hydrodynamics

- Waves, Tide,
- Water level, Currents

If you require a sensor that is not listed, let us know and we will aim to source one for you.

DEPLOYMENT METHODS

Deployment options include:

- Moorings
- Seabed frame
- From a vessel
- Attached to a structure



DATA TRANSMISSION

We will assist you in determining the most suitable method of transmitting the data from your measurement point to where you need it.

Subsea

- Cable, Acoustic modems, Optical modems

Wireless

- Mobile network, Radio, Satellite
- WiFi, Bluetooth



POWER OPTIONS

Aquatec can design a system suited to your deployment length and sampling regime. Power options include the following:

- Batteries (primary or rechargeable)
- Solar
- Wind
- External power

DATA ACCESS AND OPERATIONAL FUNCTIONALITY

Aquatec provide a complete solution including bespoke software and optional PCs. Operational functionality includes the addition of alarms and access to data via the web.



AQUAscat® SELECTION GUIDE



AQUAscat® 1000R
Research



AQUAscat® 1000S
Survey



AQUAscat® 1000LT
Lite



AQUAscat® 1000L
Laboratory

Sediment range

Size inversion feasibility (radius)	20µm - 500µm	20µm - 500µm	20µm - 500µm	20µm - 500µm
Typical concentrations	0.01g/l - 20g/l over 1m	0.01g/l - 20g/l over 1m	0.01g/l - 20g/l over 1m	0.01g/l - 20g/l over 1m

Transducers

	Up to 4 cabled transducers	4 fixed transducers	2 fixed transducers	Up to 4 cabled transducers
300 kHz	✓			
500 kHz	✓	✓		✓
1 MHz	✓	✓	✓	✓
2 MHz	✓	✓		✓
2.5 MHz	✓			✓
4 MHz	✓	✓	✓	✓
5 MHz	✓			✓

Features (*can be upgraded to AQUAscat 1000R specification)

Housing	Aluminium alloy housing rated 1000m	Aluminium alloy housing rated 1000m	Acetal housing rated 200m	Waterproof Bench Housing
Integral pressure and temperature sensors	✓	✓	✓	
Optional cabled turbidity sensor	✓	✓		✓
Memory	8GB	8GB	8GB	8GB
Range cells	256	256	256	256
Bin size	2.5, 5, 10, 20, 40mm	2.5, 5, 10, 20, 40mm	10mm	10mm*

Application

Field work	✓	✓	✓	
Laboratory work				✓
Flume tanks				✓

CONTACT US

t +44 (0)1256 416010 (UK) **t** 1-281-220-6035 (USA)

e inquiry@aquatecgroup.com **www.aquatecgroup.com**