

Technical Specifications

Container Dimensions

Length: ~3.0m
Width: ~2.4m
Height: ~2.5m
Weight: ~1200kg

Pump Capacity

Typical capacity: 12l/min
(can be adapted to the size of the sensor tank)

Data Acquisition (GENI 2000)

32-bit microprocessor
Flash disk data storage
Low power consumption
Real time operating system
Flexible data acquisition software

Sensors Inputs

Almost all sensors on the market today can be interfaced directly to the data acquisition unit:

- 14 differential analog voltage inputs, $\pm 5V$ range and 16-bit resolution. Eight of these inputs can be switched to current inputs (4-20mA)
- 4 analog resistance inputs (thermistors and PT-100)
- 1 analog voltage input, 14V range (battery control)
- 12 serial interface RS-232 ports
- 2 RS-232 ports with full modem signals
- 1 RS-422 port
- 1 RS-485 port
- 1 frequency input. Optional other digital interfaces, e.g. serial grey code, parallel greycodes
- 16 digital in/out (TTL level)

All serial ports are buffered and capable of up to 100kbit/s transfer rates.

Data Transmission System (Alternatives)

- Satellite (Inmarsat-C, Argos, ORBCOMM)
- GSM Telephone
- Radio (UHF/VHF)
- Telephone
- Serial line (proprietary or PPP protocol) over any of

- the serial ports
- Ethernet (TCP/IP)

The links may be used in parallel, in any given combination.

Power Supply

All instrumentation, data acquisition and sensors run on low-voltage (12 and 24V) from batteries providing back-up. When available, the batteries are charged from mains power.

Alternatively the batteries are charged from solar panels placed on the roof of the container.

If necessary, back-up power from a diesel generator can be added.

Basic Water Quality Sensors Specification

Parameter	Range	Accuracy
Temperature	0-50°C	$\pm 0.1^\circ\text{C}$
pH	1-13	± 0.1
Conductivity	0.02 - 800mS/cm	$\pm 2\%$ FS
Oxygen	0-20mg/l	$\pm 0.1\text{mg/l}$
Turbidity	0-750NTU	$\pm 10\%$

Additional Sensors

- Water level (several options)
- Meteorological sensors
- Nitrate
- Metals (Trace Metal Monitor)
- Radioactivity (Radam)
- Organic matter (TOC/COD)

Automatic water samplers and other analysers (phosphorous, ammonia, micro-organisms) can also be interfaced.



Modular, automatic water quality monitoring station

- Continuous, real-time monitoring
- Easy access for service and maintenance
- Automatic cleaning and back-flushing of water intake
- Minimal infrastructure requirements: wireless communication, low voltage power
- Protection against theft, vandalism, heat, frost, sunshine, precipitation and lightning
- Prefabricated, ready to use
- Combined transportation and housing
- Easily extended to meteorological and hydrological applications



The Riverwatch Field Station works by pumping water samples from the river into the field station placed on the riverbank.

It is designed to give high reliability with low maintenance and power consumption, and minimal infrastructure requirements.

The field station includes the following equipment:

- Data Acquisition Unit, including local data storage and Field Station software
- data transmission system
- power supply, including back-up
- pump system, and
- sensors

The sampling regime is completely flexible and determined by the user.

Reliable Monitoring

Reliable water quality monitoring is achieved by a combination of features.

Optimised Design

The sensor tank provides the best hydraulic characteristics for the operation of the sensors. For example, the pH sensor works best when the velocity is low, while the oxygen sensor requires a higher velocity for optimum performance.

Choice of Sensor

Fugro chooses measurement principles that minimise the need for service and calibration. Each sensor has been selected or developed to meet the needs for accuracy, robustness and easy maintenance:

- pH sensor - solid-state reference ensuring low maintenance and long calibration intervals;
- conductivity sensor - four-electrode, potentiometric-type with low sensitivity to fouling;
- dissolved oxygen sensor - galvanic-type sensor suitable for automatic calibration.

Automatic Cleaning

Between each scheduled measurement the water sample is discharged and the sensor tank and sensors flushed prior to induction of each fresh sample. In addition, high-pressure back-flushing of the pump intake is periodically carried out to remove debris.

Automatic Calibration

Calibration of the oxygen sensor is done automatically at user-defined intervals when the sensor unit is emptied between measurements. The galvanic-type sensor acts as a battery giving a voltage proportional to the oxygen content. In addition to not using power, the zero point can not drift (no oxygen always gives zero output) and a one-point calibration when the sensor is in air (at saturation) is sufficient, along with barometric pressure and temperature readings, to calibrate the sensor's voltage output.

Easy Set-up

For maximum protection, all equipment, instruments and sensors are placed in a weatherproof housing on the riverbank, above design flood levels. This 10ft², insulated, steel container serves as both transportation and on-site housing and is supplied fully functional and ready to operate.

The only components that are placed in the river or water body are hoses for water intake and outlet (including floats and anchors) and the sensors for physical parameters, like water level and water temperature, that need to be in the water body to ensure accurate measurements. The antenna for communication is the only other component placed outside the container.

The steel walls, roof and doors include rigid locks to ensure that the equipment is well protected against theft and vandalism. The insulated walls and roof protect the instrumentation from heat, frost, sunshine and precipitation. The steel container acts like a Faraday cage and, combined with lightning conductor on the

roof and earth grounding, ensures very good protection against lightning.

The equipment is organised in several cabinets, with wet components separated from the electronics, and power supply separated from signal output. The instrumentation head is prefabricated and ready to use after connecting power mains and hoses to the river. The containers are equipped with light. Electrical heating or air condition can be added on request.

Pumping

The station typically comprises a floating intake or submerged intake with a submersible pump, mounted in a frame anchored on the river bed or attached to a structure such as a bridge.

Fugro offers several pump types, depending on the height difference between the river and instrumentation head. If this is less than 3m, a suction pump placed inside the housing is used. Alternatively, a pneumatic

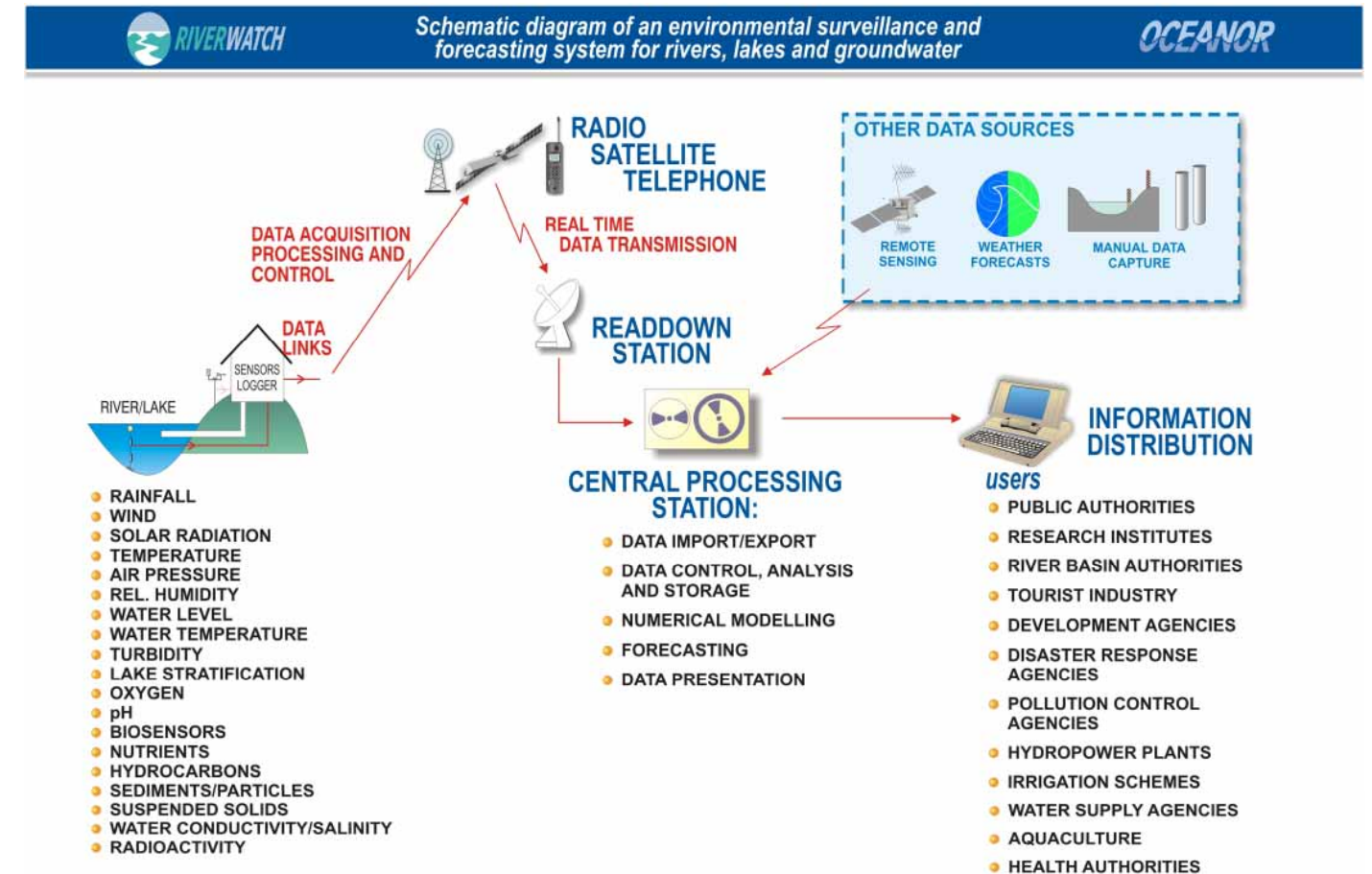
pump system, with a combined vacuum pump and compressor inside the container supplying air to the pump body in the river, is used.

Data Acquisition

The system is built around Fugro's own data acquisition unit, GENI 2000, which can be interfaced to a number of telemetry, water quality, water level and meteorological sensor options to provide the necessary regularity, reliability, accuracy and resolution requirements.

Basic Water Quality Sensors

Parameter	Group
Water temperature	physical condition
pH	acidic matter (acid, base)
Conductivity	dissolved matter (salt, ions)
Dissolved oxygen	dissolved gases (effect of organic mat-
Turbidity	particles (inorganic, and organic)



Riverwatch Field Stations can form part of an integrated environmental surveillance and forecasting system