



Equipment for

# Water Quality Testing

Eijkelkamp Agrisearch Equipment



All it takes for environmental research



# Water Quality Testing

The interaction of various acids, bases and salts determines the **pH**. The pH is important for the selection of plant material, the amount of fertilizer to apply, or the environmental measures to be taken.

**Redox** is short for Reduction-Oxidation potential (also ORP); it is a measure of the capacity of a substance to absorb or release electrons. Together with pH it gives, if measured correctly, a clear indication of which oxidation or reduction processes (e.g. nitrification) are taking place in water and soil.

The **EC** is an indication of the amount of ions dissolved in water. This is an important factor for plant growth and microbiology.

The measurement of **O<sub>2</sub>** refers to the amount of oxygen dissolved in water. The presence of oxygen is not only of crucial importance to the open water biology, but also to below ground remediation processes. It is also the strongest reacting indicator when groundwater sampling can start during the purging process of a monitoring well. To enable correct anaerobe dissolved oxygen and redox measurements next to a well, the use of a flow through cell is essential.

To sample a monitoring well the well must be purged. During purging, old water is removed and replaced by freshly flown in water. To limit the quantity of purge water and to greatly increase sample quality, the technique of low flow sampling (also called micro-purging or low turbidity sampling) is rapidly spreading around the globe. Turbidity greatly increases concentrations of pollutants. Analysis errors of a factor 750 have been proved for some PAH's. This error also counts for many other hydrophobic organics. By low flow purging (max 0.5 l/min; max 0.5 m drawdown, pumped directly with a long tubing from the filter section) a low -near natural- turbidity can be obtained of 0-10 NTU. Then correct levels of organics can be expected.

Both systems of purging require a flow through cell with O<sub>2</sub>, EC and pH probes to obtain correct oxygen values. Turbidity, measured during or after the purging process, validates the sample representativeness and is obligatory for low flow purging. Eijkelkamp Agrisearch Equipment supplies the necessary multimeters and accessories.



## 13.38 Multiparameter probe

This water quality measuring instrument has been developed specifically for the instantaneous determination of water quality values in situ. Suitable for 50 mm (2") and larger diameter wells or open water. The portable and compact design is based upon the proven electric water level meter, with its robust supporting frame and tape drum. The detachable probe is made of high quality stainless steel whilst the 4 cores round cable tape enables precise depth readings to within a centimetre accuracy.

The instrument is operated via an integrated key pad with liquid crystal display. The unit responds to water contact with a tone and an indication on the LCD display. At the touch of a button or after ten seconds (in automatic mode) the tone is cancelled and the LCD shifts through the measured value of the parameters. Any single channel parameter can be locked in for examination in greater detail. The whole operation and other facilities such as off sets (only for pressure) or instructions are conveyed to the operator by the display. Calibration must be done with the unit connected to a PC and with special configuration software.



Parameters	Meetbereik
<b>Water level</b> (pressure sensor)	0...200 m temperature: -5...50 °C
<b>Temperature</b>	-5...50 °C, pressure: 0...50 bar
<b>Conductivity</b> (EC)	0...200 mS, temperature: -5...50 °C pressure: 0...50 bar
<b>Dissolved oxygen (O<sub>2</sub>)</b> (amperometric)	0...40 mg/l, temperature: 0...50 °C pressure: 0...10 bar
<b>pH</b>	0..14, temperature: 0...50 °C pressure: 0...20 bar
<b>Redox</b> (ORP)	-1,200 mV...1,200 mV temperature: 0...50 °C pressure: 0...20 bar
<b>Turbidity</b> (optical)	0...1,000 NTU, temperature: 0...50 °C pressure: 0...20 bar without wiper

### Basic module

The water quality measuring instrument is available in a basic or in a sophisticated module with cable lengths of up to 400 m. The basic module is always supplied with a water level contact sensor and temperature electrode. In addition one extra electrode (e.g. pH, redox, O<sub>2</sub>) or a combined EC+water pressure sensor can be mounted. The probe has a diameter of 40 mm (standard instrument set 13.38.SA).

### Sophisticated module

The sophisticated module is also supplied with a water level contact sensor and temperature electrode, but it has the possibility of plugging in max. 6 sensors (EC, pressure, O<sub>2</sub>, pH, ORP, turbidity). Instead of ORP an ISE electrode in combination with a pH electrode can be fitted. Probe diameter is 48 mm (standard instrument set 13.38.SB).

### Optional data logger function

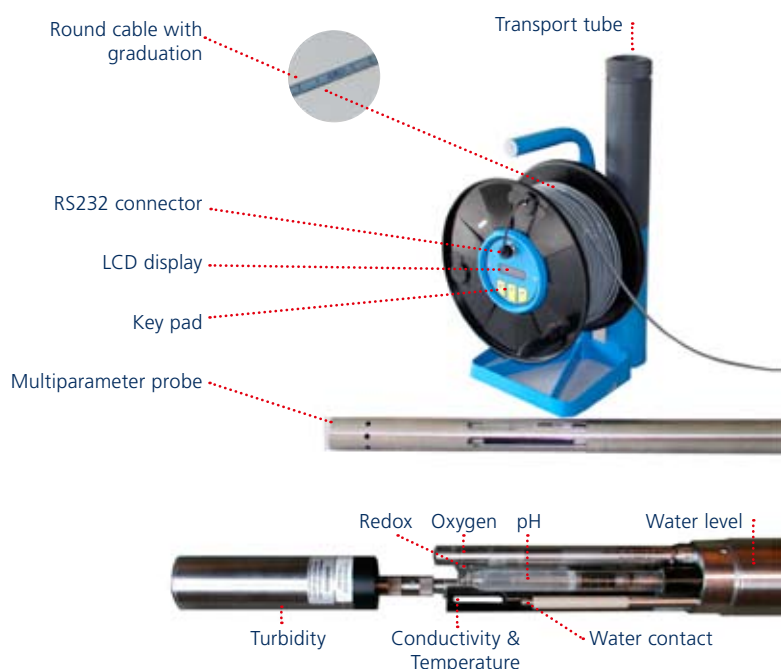
Optionally, the instrument can be equipped with an integrated data logger with storage of up to 70,000 measuring values or manual point storage. It can be operated from a laptop PC or special field palm-tops PDA with RS232 interface.

### Applications:

- Instantaneous determination of ground water quality values in situ
- Suitable for 50 mm (2") diameter wells

### Advantages:

- Additionally plugged in probes can be detached for ease of service or repair
- Robust supporting frame
- System shows low voltage level warning
- When not in logging mode, instrument switches of automatically after 15 minutes



## Technical data

<b>Cable:</b>	4-cores round cable with cm, dm and m graduation
<b>Cable drum:</b>	impact-resistant, temperature stable synthetic material, with aluminium supporting frame
<b>Power supply:</b>	rechargeable batteries (4x 2V) operation period: 8...15 hours depending on cable length and configuration
<b>Cable lengths:</b>	30, 50, 80, 100, 150, 200, 300, 400 m (standard)
<b>Digital indication:</b>	alphanumeric 3 character LC-Display for indication of current value
<b>Sensor body:</b>	non corrosive stainless steel V4a (for ø 40 mm and 48 mm) or PVC (for ø 89 mm)



## 18.54.SA Multiparameter measuring set

An extremely handy and field proof Multiprobe meter that comes with a rugged probe that can be used either in a special flow through cell or lowered from a well protected cable. The meter does not mind getting wet or dirty as the keypad is smooth. Operation is simple: a few seconds after pushing the 'ON' key the meter will show all measured parameters simultaneously. It is absolutely unique that a Multimeter is fitted with a turbidity measuring function (90° scatter method). But it is even more surprising that this turbidity sensor cleans itself by means of a wiper, after pushing the "Measure" key. Only then, a turbidity value (expressed in NTU or FNU) will follow.

Complex as this meter may seem, the whole set-up is routine-calibrated in only one liquid. This calibrates the meter on pH, EC, water depth=0, turbidity=0, O<sub>2</sub>=100%. Eleven, selectable parameters can be displayed or logged simultaneously. The KCL 3 Mol reference probe (for pH and redox) can easily be refilled, as is the case with the polarographic O<sub>2</sub> electrode. The 4-pin EC probe cares for a full measuring range and for highest accuracy. Of course relevant parameters can also be calibrated more extensively if this is required. Apart from the parameters already mentioned, a number of derived values is shown as salinity, TDS, water density and temperature.

The Multiparameter probe is equipped with an ultra-sensitive, high precision turbidity sensor with wiper, which has a resolution of 0.01 NTU. Improved stability of the dissolved oxygen sensor has been achieved with a new 3 electrode design for fast response and durable polarographic sensor for easy maintenance. pH and redox/ORP electrodes can be replaced individually to reduce replacement costs. There are various cable lengths available (standard 2, 10 and 30 meter).



### Applications:

- Groundwater monitoring during (low flow) purging of wells with the additional flow through cell
- Routine measurements in open water anywhere or in wells > 4"

### General advantages:

- Wiper in turbidity sensor allows measuring in water that gets less and less turbid (during purging a well)
- Special low volume flow through cell for above-ground use at monitoring wells
- Parameters measured and shown simultaneously
- High range EC measurements with four point probe
- Polarographic O<sub>2</sub> probe requires low maintenance and has highest stability and accuracy
- Field replaceable sensors
- Full data logging capabilities with user definable site specific tags
- Version available with Global Positioning System (GPS) data acquisition and storage



## Technical data

### Control unit features:

- Easy to read high resolution LCD Display, font size can be switched
- One-hand operation smooth keypad that does not mind dirt
- Icon illustrated operation instructions on screen
- On-screen icon displays battery power, USB ► PC and probe unit connectivity
- Single quick-connect connector (cable to control unit)
- Shock resistant cover
- Backlight display
- Splash proof when probe connected, but, as always, after use allow equipment to dry

### Data management:

- Auto hold function freezes average data values
- Diagnostic functions notify the user of errors
- Integral USB connection for data transfer to a PC. USB cable is sold separately and includes software

# 18.50.SA pH/mV/EC/T/Sal/TDS multimeter set

# 18.52.SA pH/mV/EC/T/Sal/TDS/O<sub>2</sub> multimeter set

Portable multimeter sets, especially designed for measurements under difficult field conditions. The meters have a large screen so that the user can see all the important information at a glance during the various activities - all the parameters measured are displayed simultaneously after switching on.

Very concise instructions written especially for field use, enable even inexperienced users to start using the equipment immediately. The user-friendly meters are waterproof to IP67 even with the probes disconnected. A sturdy rubber meter-casing provides extra impact protection. Probes can always stay connected, also when the meter is stored in the case. This speeds up field handling and helps to prevent connectors from oxidizing on the long term. In case of malfunctioning these single probes can easily be removed without losing the ability to go on measuring with the other probes. The rugged large oxygen sensor, galvanic type, is directly ready for use and has a large durable membrane for rapid oxygen exchange. The meter operates correctly, also at freezing temperatures.

The meters are equipped with full Good Laboratory Practice (GLP) features and probes have sturdy and splash proof water protected cable connections. Demanding users may enjoy using the data logging functions and the IR port which enables wireless communication with a PC. All meters are delivered as complete sets, including electrodes, all calibration liquids and spacy transport case. The 18.52.SA multimeter and the 18.56 Flow-through cell Compact, in combination with the separate 13.55 PCCcompact turbidity meter, result in an effective yet very affordable combination of field instrumentation that copes with all needs to (low flow or traditionally) purge groundwater monitoring wells.



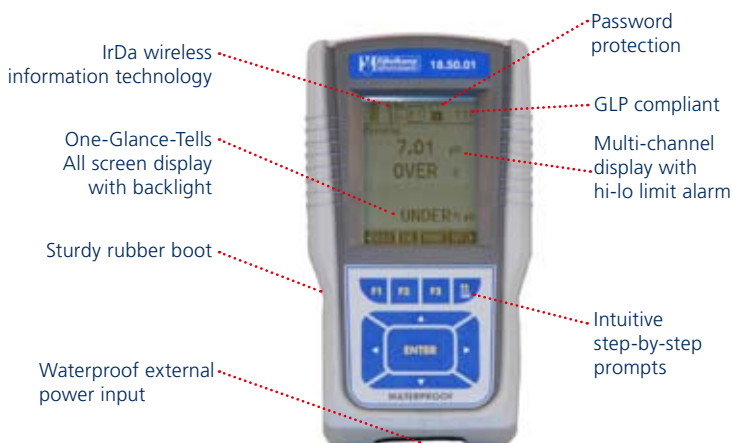
## Applications 18.50.SA:

- Field and laboratory measurements of acidity (standard), Electrical Conductivity (and derivatives) (standard) with a two-ring EC electrode with integrated temperature sensor (TDS according to EN27888, ISO7888, salinity@15°C according to PSS/IOT). Furthermore it is possible to connect optional probes for redox and ion-selective measurements.

## Applications 18.52.SA:

- As 18.50.SA, but as a result of the 4 ring EC/T electrode (standard), more accurate conductivity measurements in a wider measuring range (far beyond sea water)
- 18.52.SA also measures dissolved oxygen in water with automatic air pressure and salinity compensation (standard)

(18.52.SB as 18.52.SA but with necessities to also measure redox with a combination type redox electrode (for water and wetted soil). Including glass fibre brush for Platinum treatment and calibration liquid. The same redox necessities can also be used with the 18.50 meter.)



## Advantages:

- Setup menu already pre-set for simple and direct use in the field;
- Quick guide allows direct use by non-professional users too (6 languages En, Du, Ge, Fr, Sp, Pt)
- All parameters can be measured and shown simultaneously (except for pH with redox)
- Air pressure and salinity are automatically compensated during O<sub>2</sub> measurement
- Read-out of TDS salt content in accordance with ISO-EN standard 27888, which is compulsory in the EU
- Data logging and wireless data transfer is possible



## 18.55 Flow-through cell

The flow-through cell consists of a transparent chamber through which water flows upwards in a constant stream. The electrodes measure in water that has not yet come into contact with air. Various single or combined electrodes can be placed in the flow-through cell which is easy to disassemble and clean. It can handle a maximum of 3 l/m and has an own volume of 1.2 litres.

### Applications:

- To facilitate and improve the accuracy of in-line measurement of pH, redox, EC, T, O<sub>2</sub>, etc.

### Advantages:

- Makes measuring pH/EC/O<sub>2</sub>/Redox measurements simple
- Works with practically all electrodes
- The principle enables 0% O<sub>2</sub> measurements
- Easy to clean, sand is not a problem
- Simple and durable; can withstand field conditions
- Protects electrodes during use, less handling, no wet hands



## 18.56 Flow-through cell Compact



This flow through cell has been designed to limit the quantity of water flowing through the cell and therefore increase the speed. This greatly increases the reaction speed of all parameters measured. This makes the cell particularly fit for low flow/low turbidity sampling. Even at a very low flow a drop of oxygen level, signalling that fresh anoxic groundwater is entering the cell, will be noted immediately. This speeds up the purging and sampling process significantly.

The cell's dead volume (without probes) is about 250 ml. The narrow diameter cares for a sufficiently high upward speed for accurate measurements on all parameters. There are only three parts to clean and easy one-knob disassembling is possible. It fits any probe between 4 mm and 26 mm and there are connectors for various sizes of sample tubing. Smart flip-up legs make transport easy and field installation quick and effective. Although low flow purging is done at flows < 500 ml/min, the cell can easily handle up to 2000 ml/min without leakage. At higher flows, a part of the flow can be passed away from the cell with a simple T-piece in the tubing that leads to the cell.

### Applications:

- To allow accurate, anaerobe mobile in-line measurements of water quality parameters like pH, redox, EC, T, O<sub>2</sub>, etc.
- At monitoring wells to speed up the purging process, particularly in combination with the low flow purging method
- To supply the necessary flow speed to the O<sub>2</sub> probe and therefore increase accuracy
- If wanted (pH in certain cases) a measurement in stagnant water is possible by simply blocking the entering water flow

### Advantages:

As 18.55 but in addition:

- Perfect for low flow / low turbidity sampling < 500 ml/min (but can handle 2000 ml/min)
- Faster response on all parameters even at low flow rates
- Rapid filling
- Flip-up legs make cell easy to set up and transport

## 18.40 Nitrachek reflectometer

The Nitrachek reflectometer is a pocket-sized digital measuring instrument for the rapid, simple determination of the nitrate content of water or a watery sample originating from soil or plants. The method is based on reading nitrate test strips. After a test strip has been held in the test solution, it is placed in the optical read-out device. The instrument has a memory that will hold a maximum of 20 measurements, including the date and time.

### Applications:

- For the rapid, simple determination of the nitrate content in water in the field; does not require transport

### Advantages:

- Works very accurately if used properly
- Can also be used for diluted plant extracts, substrates or compost
- Soil material can be mixed with water or a watery KCl or CaCl<sub>2</sub> solution



## 13.55 PC-compact turbidimeter



The PCcompact has been designed as a compact, easy-to-use instrument for the fast, accurate determination of the turbidity of a liquid. A light emitting diode (LED) is used as a light source with a photo detector positioned to detect light scattered by a sample at 90° to the incident beam. The PCcompact is supplied as a fully functional unit in a handy case complete with accessories and calibration standards.

### Applications:

- For testing water samples e.g. during dredging activities or groundwater sampling
- Suitable for use both in the field and the laboratory

### Advantages:

- Compact, battery powered and user-friendly
- Four calibration solutions are included in the set
- Measurement according to ISO 7027
- Switches off automatically
- Splash-proof keyboard

## 18.41 RQ-flex reflectometer

Various anions and cations can be measured using the portable RQ-flex reflectometer. The measuring system consists of various analytical strips for different parameters and the reflectometer itself. The latter has an internal memory for a maximum of 50 measurements of 10 parameters. Analytical strips are available for a large number of parameters such as ammonium, nitrate, iron, copper, phosphate and potassium. They are supplied separately from the meter. Every batch of strips is supplied with a calibration film, to be read by the bar-code reader of the meter. This increases measuring accuracy and prevents a user calibration.

### Applications:

- For use in water and watery extracts of substrates, compost, soil or plant tissue.

### Advantages:

- High-precision as a result of the double optics and charge-specific calibration of the test strips
- Mobile as a result of its small dimensions and battery power supply
- No waste or environmental problems (the test strips are biodegradable)



## Training courses on water quality testing equipment

Do you want to be trained in how to use the equipment for water quality testing?

Then you should contact Eijkelkamp Training & Consultancy; an independent organization that has its premises at the Eijkelkamp Agrisearch Equipment building in Giesbeek, the Netherlands. Eijkelkamp Training & Consultancy offers (tailor made) courses that can take place in Giesbeek as well as in your home country.

For more information please send an email to [etc@eijkelkamp.com](mailto:etc@eijkelkamp.com) or call +31 313 880 262.

