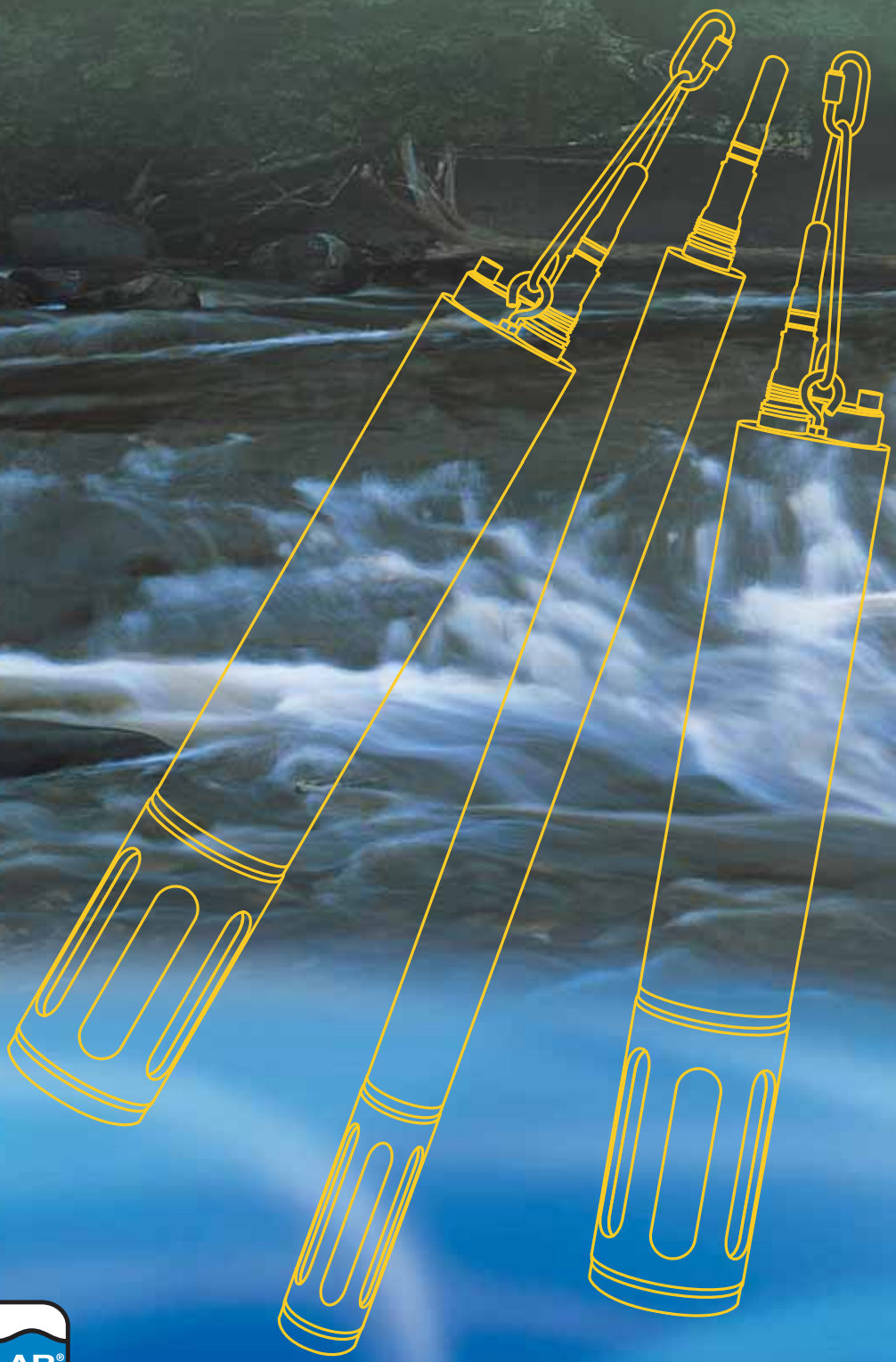
# Series 5 MS 5 / DS 5 / DS 5X

Multiparameter probes for the determination of water quality



HYDROLAB®

# Series 5 Multiparameter Probes

The newest generation, our Series 5 multiparameter probes, were designed specially for measurement of water quality in surface waters, ground water and wastewater areas. The new Series 5 includes three types of probes:


### MiniSonde 5 – MS 5

– Parallel measurement of up to 10 water quality parameters
– 4 additional sensor inputs for specific applications
– Compact and light housing with a 1.75" (44.5 mm) diameter for use in groundwater wells
– Suitable for point-to-point measurement and continuous measurement with data storage

### DataSonde 5 – DS 5

– Simultaneous measurement of up to 15 water quality parameters
– 7 additional sensor inputs for specific applications
– Unlimited use of all HYDROLAB sensors
– Suitable for point-to-point measurement and continuous measurement with data storage

### DataSonde 5X – DS 5X

– Simultaneous measurement of up to 15 water quality parameters
– 7 additional sensor inputs for specific applications
– Central brush motor cleans all sensors before each measurement and prevents the buildup of biofilms
– Ideal for long-term use, with a minimum of maintenance required

# Decisive Advantages

– Extremely low maintenance requirement due to the use of newest sensor technology (LDO) for oxygen measurement
– Unique sensor technology to determine chlorophyll a and cyanobacteria
– Versatile, since combined sensor technology enables up to 15 parameters to be detected at a time
– System integration possible through a variety of signal outputs: RS-232, RS-485, SDI-12

– Two year guarantee for the probes, including sensors*
– Autonomous operation through internal datalogger (approx. 120,000 measurements) and with integrated batteries as an option
– Optional suspension hook for suspension lines (automatic operation) or to release tension on underwater cables

*does not apply to consumables, wear parts and ion-selective electrodes

# Data Communication

## “Surveyor” field unit

The Surveyor was specially designed for field use. It is watertight according to IP67 and NEMA 6, weighs only 1 kg and has a switchable illuminated background display.

The Surveyor’s display can display up to 20 parameters at a time. Measured values are updated once per second in online mode, and a graphical display of the parameter selected can be provided as a function of time or of depth.

The expandable datalogger can maintain up to 375,000 measurements in 23 storage files in addition to an AutoLog file. The data can be transferred to the PC via the RS-232 interface for further processing or directly to a printer.

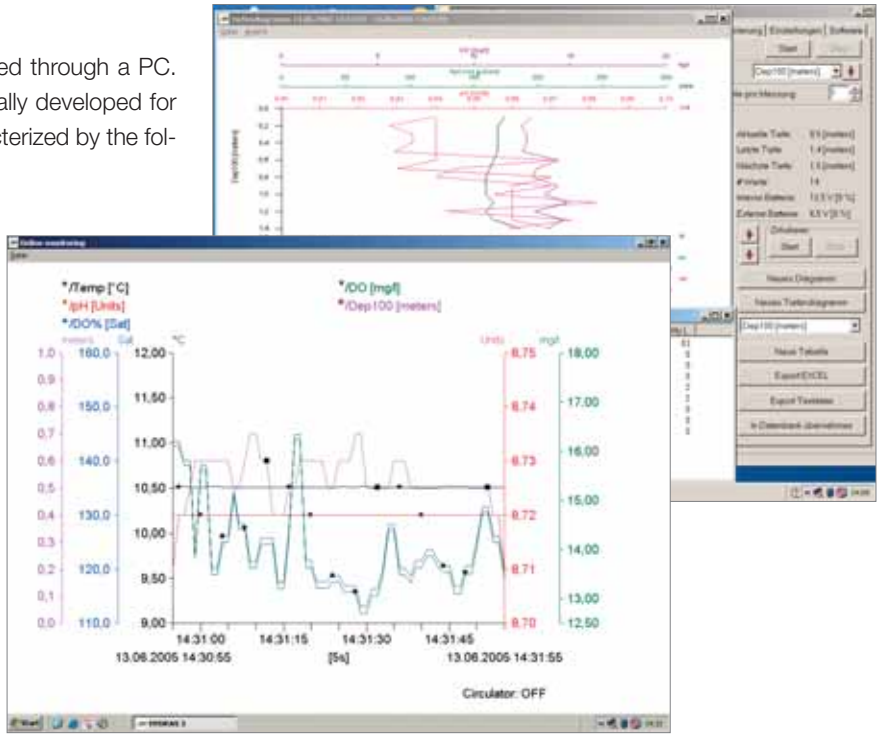
The Surveyor can provide power to the probes as it is performing the measurements, with the average power duration being 12 hours depending on the configuration selected.

The Surveyor can be equipped with GPS if desired, which makes it considerably easier to locate measuring stations. An optional barometric air pressure sensor on the Surveyor makes it easy to correct oxygen measurements. In this case, the barometric air pressure can be simultaneously stored separately along with the selected water quality parameters.

## OTT Hydras 3 LT

The multiparameter probes can be fully operated through a PC. The OTT Hydras 3 LT user software was specially developed for these water quality measurements and is characterized by the following features:

– Precise calibration of all sensors through simple input via mouse click
– Concise display of online measured values in the form of a depth profile, time graph, and tabular
– Simple and fast setup of memory files in the probe
– Expanded memory options in online monitoring mode (for example, stability controls)
– Data export (for example as an Excel file, text file, or according to OTT Hydras 3)
– Database for online values



# Areas of Use

## Spot Measurements

In order to collect instantaneous values at groundwater measurement sites, from 2" (MS 5), or in surface waters on the spot, the probes are connected to the following readout devices via a pluggable underwater cable:
– the Surveyor, a robust and water tight field unit
– a notebook containing the Hydras 3 LT user software

The following power options are available:
– internal batteries (8 x 1.5 V C batteries)
– powered via the Surveyor
– powered with an adapter cable via a shoulder battery pack (7.2 Ah)
– powered with an adapter cable via the cigarette lighter of a car

The update intervals for the measured values can be arbitrarily selected between 1 second and 24 hours.

To store the measured values, you can use:
– the probe itself
– the Surveyor
– a notebook

The probes can store up to 120,000 measurements; the Surveyor can store up to 375,000 measurements. A measurement includes all measured values at the time of the measurement. The measurement data stored on the spot can then be transferred to a PC for evaluation.

## Depth Profile Measurements

In order to make depth profile measurements, the probes are ideally connected to a notebook via a pluggable underwater cable. For cable lengths of >50 m, we recommend our cable drum with sliding contacts.

With Hydras 3 LT, all selected parameters can be displayed in the depth profile graphically at selected depth intervals. In addition, the tabular view can be inserted here in parallel.

The measured values are first stored in the working memory of the Hydras 3 LT user software and can then be exported for further processing.

## Stationary Measurement Station / Buoy

For stationary applications with remote transfer, the probes are connected to an external datalogger (e. g. OTT LogoSens 2 Station Manager) with a pluggable cable (max. length 100 m).

Optional external data logger locations include:
– a cover housing with a wall or pipe fixture
– a measurement hut
– the internal cylinder of our “Water Station 1” buoy

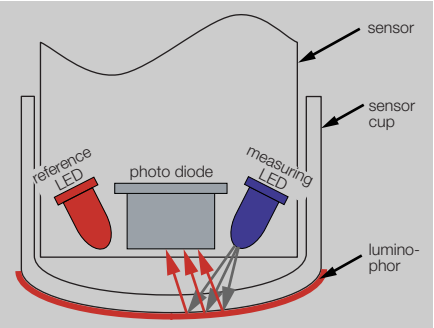
The connection to the OTT LogoSens 2 Station Manager enables remote data transfer via analog, ISDN, GSM or radio modem as well as via satellite, so that the measured values can be called up from the office, for example. In addition, you can define alarm limits for the individual parameters and verbal announcements can be set up. The power options extend from local power to battery power to solar power. The probe should be placed in the water such that it can be maintained and calibrated easily, such as the arrangement set up for “OTT Water Station 1”, for example.

# Newest Sensor Technology

## Measurement of Dissolved Oxygen using LDO technology

The new sensor uses luminescence technology (LDO) to measure the dissolved oxygen. No membrane is needed in this case, which enables calibrations to last for up to a year without drift.

The LDO measurement method is based on an optical measurement principle, whereas the traditional measurement methods are galvanic and polarographic. The measurement is done using an oxygen sensitive layer (the luminescence layer), which is excited by a blue light-emitting diode.




The excited luminophor radiates red light back with a time delay in a more or less short period of time (depending on the oxygen concentration). The classically determined decay time is a measure of the oxygen concentration. With a red LED, the sensor electronics undergoes a continuous “null” adjustment.

The advantages of the LDO method compared to usual electrochemical methods are:
– Less calibration work
– Never have to change out membranes and electrolytes again: simplest of handling
– No oncoming flow necessary: reliable measurement values
– Electrodes not destroyed by $H_2S$
– More precise measurement values than with electrochemical methods
– Longest shelf lives due to the high reactivity of the luminophor

## Cyanobacteria Measurement

New guidelines in monitoring the water quality of drinking water and bathing water, as well as the potential health risks of greater occurrences of cyanobacteria during so-called “algal bloom” periods have resulted in new requirements for the monitoring of cyanobacteria.

The new fluorometric sensor of Series 5 measures the concentration of the cyanobacteria contained in the water. This sensor utilizes the light absorption of substances contained in the cyanobacteria, such as phycocyanin (blue color: fresh water) or phycoerythrin (red color: salt water).

The multiparameter probes of Series 5 make it possible to continuously measure the concentration of cyanobacteria and thus provide the possibility of early alarm when critical values are exceeded.

Checking sensor calibration is very simple; it is done through an optical calibration reference, called a “secondary reference”. To adjust this optical reference, a first reference value is established through a comparison measurement of a water sample in the laboratory. To carry out regular checks of the first calibration, just place the secondary reference on the sensor head and measure against the adjusted set point of the reference.

## Measurement of Chlorophyll a

The new chlorophyll a sensor of Series 5 is characterized especially by the following features:
– small physical size
– wide concentration measurement range (0.03 to 500 µg/l)
– high selectivity
– measurement is independent of turbidity

The high measurement precision is attained by filtering out surrounding light right away in the measurement process. Any measurement errors due to heavy turbidity are eliminated by using extremely small measurement volumes and high quality optical filters. Compared with the classical determination of chlorophyll a in the laboratory, the sensor allows a considerably faster measurement while at the same time being continuously “in-vivo”. The calibration is done in a very simple manner with a secondary reference.

# Sensor Overview

## Dissolved Oxygen

– Extremely high precision through the use of the optical LDO measurement method (Luminescent Dissolved Oxygen)
– Calibrations last up to 1 year
– Easy to maintain since no membranes are used
– Clark Cell is available as an alternative

## Conductivity

– The open cell allows reliable measurements even under the most serious environmental conditions: Sediment drops down and air bubbles rise
– Salt content, electrical resistance and TDS can be individually maintained as calculated values

## pH

– The reference electrode can be refilled quickly and easily independent of the pH sensor
– The pH sensor doesn't have to be replaced when the reference electrode is empty

## Self-Cleaning Turbidity Sensor

– The self-cleaning system can be adjusted according to environmental conditions and can execute up to 10 cleaning cycles prior to every measurement
– A measurement range of 3000 NTU permits turbidity measurement even during heavy rain or other events
– Also available: 4-beam turbidity and standard turbidity

## Ion-Selective Electrodes

– Available for the measurement of ammonium, nitrate or chloride

## Chlorophyll a

– Very compact size, specially developed for use in HYDROLAB probes
– Very precise, selective measurement through electronic filtering of ambient light and by using high quality optical components

## Cyanobacteria

– Real-time measurement recognizes potential algal bloom early on before it becomes a problem
– Very compact size, specially developed for use in HYDROLAB probes
– Very precise, selective measurement of phycocyanin and phycoerythrin through electronic filtering of ambient light and by using high quality optical components

## Depth

– Optimized for depths of up to 10 m, 25 m, 100 m or 200 m

## ORP

– Uses a simple platinum strip that either discharges electrons or absorbs them, so as to observe chemical reactions, determine ion activity or to determine oxidizing or reducing properties of a solution.

## TDG (total dissolved gases)

– Real-time measurement indicates if water is supersaturated with atmospheric gases, which can lead to gill illnesses

## Rhodamine WT

– Ultra-compact size specially developed for use in HYDROLAB probes
– Very precise measurement of rhodamine WT through electronic filtering of ambient light and by using high quality optical components

## Ambient light

– Real-time measurement of the intensity of sunlight, which influences the photosynthesis of plants.

## Temperature

– Provides reference data for DO, conductivity and pH sensors and for the nutrient-measuring sensors
– Is contained in every probe

# Sensor Specifications

| Sensors | Measurement Range | Precision | Resolution |
|---|---|---|---|
| **Dissolved oxygen (Luminescence) LDO** | 0 … 60 mg/l*<br>*exceeds max. natural concentration | ±0.1 mg/l for values ≤ 8 mg/l<br>±0.2 mg/l for values > 8 mg/l and ≤ 20 mg/l<br>±10 % of meas. value for values > 20mg/ | 0.01 mg/l |
| **Dissolved oxygen (Clark cell)** | 0 … 50 mg/l | ±0.2 mg/l for values ≤ 20 mg/l<br>±0.6 mg/l for values > 20 mg/l | 0.01 mg/l |
| **Conductivity sensor** | 0 … 100 mS/cm | ±(0.5 % of meas. value + 0.001 mS/cm) | |
| **Salinity** | 0 … 70 ppt | ±0.2 ppt | 0.01 ppt |
| **pH sensor** | 0 … 14 pH units | ±0.2 units | 0.01 units |
| **Turbidity sensor, self cleaning** | 0 … 3000 NTU | ±1 % for values <100 NTU<br>±3 % for values ≥100 and <400 NTU<br>±5 % for values ≥ 400 and ≤ 3000 NTU | ≤ 400 NTU: 0.1 NTU<br>> 400 NTU: 1 NTU |
| **Turbidity sensor, 4 beam** | 0 … 1000 NTU | ±(0.5 % of meas. value + 1 NTU) | ≤100 NTU: 0.1 NTU<br>>100 NTU: 1 NTU |
| **Depth sensor** | 0 … 10 m (reference pressure)<br>0 … 25 m<br>0 … 100 m<br>0 … 200 m | ±0.003 m<br>±0.05 m<br>±0.05 m<br>±0.1 m | 0.001 m<br>0.01 m<br>0.01 m<br>0.1 m |
| **Chlorophyll a** | Dynamic measurement range<br>Low sensitivity: 0.03 … 500 µg/l<br>Med. sensitivity: 0.03 … 50 µg/l<br>High sensitivity: 0.03 … 5 µg/l | ±3 % for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor | 0.01 µg/l |
| **Cyanobacteria** | Dynamic measurement range<br>Low sensitivity: 150 … 2,000,000 cells/ml<br>Med. sensitivity: 150 … 200,000 cells/ml<br>High sensitivity: 150 … 20,000 cells/ml | ±3 % for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor | 20 cells/ml |
| **Ion-selective electrodes**<br>Ammonium*<br>Nitrate*<br>Chloride*<br>*maximum depth: 15 m | <br>0 … 100 mg/l-N<br>0 … 100 mg/l-N<br>0.5 … 18,000 mg/l | <br>±5 % of meas. value; at least ±2 mg/l-N<br>±5 % of meas. value; at least ±2 mg/l-N<br>±5 % of meas. value; at least ±2 mg/l | <br>0.01 mg/l-N<br>0.01 mg/l-N<br>4 digits |
| **TDG** | 533 … 1.866 mbar | ±1.9 mbar | 1.3 mbar |
| **ORP** | -999 … 999 mV | ±20 mV | 1 mV |
| **Rhodamine WT** | Dynamic measurement range<br>Low sensitivity: 0.04 … 1000 ppb<br>Med. sensitivity: 0.04 … 100 ppb<br>High sensitivity: 0.04 … 10 ppb | ±3 for % signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor | 0.01 ppb |
| **Ambient light** | 0 … 10,000 µmol $s^{-1}m^{-2}$ | ±5 % of meas. value | 1 µmol $s^{-1}m^{-2}$ |
| **Temperature** | –5 … +50 °C | ±0.1 °C | 0.01 °C |

# Technical Data

## Multiparameter Probes

| | |
|---|---|
| **Power supply** | 12 V DC external or with integrated battery pack |
| **MS 5** | 8 AA cells |
| **DS 5** | 8 C cells |
| **DS 5X** | 8 C cells |
| **Data storage** | Integrated data memory for approx. 120,000 measurements |
| **Probe material** | Robust, impact resistant plastic housing, IP 68 |
| **Dimensions (Ø x L); Weight** | |
| **MS 5** | without batteries: 44 mm x 533 mm; 1.0 kg<br>with batteries: 44 mm x 749 mm; 1.3 kg |
| **DS 5 / DS 5 X** | 89 mm x 584 mm; 3.4 kg |
| **Temperature range** | -5 °C … +50 °C |
| **Accessories** | – with integrated temperature sensor<br>– RS-232/SDI-12/RS-485 interface<br>– Sensor measurement cap<br>– Calibration and storage cap<br>– Basic maintenance set for the probe and selected sensors |
| **Language** | English, optional French or Spanish |
| **Maximum depth** | 200 m |

## Surveyor

| | |
|---|---|
| **Dimensions (L x W x H); Weight** | 280 mm x 100 mm x 40 mm; 1.0 kg |
| **Temperature range** | –5 °C … +50 °C |
| **Display language** | English |
| | |
| **Optional:** | |
| **Data storage** | Integrated data memory for approx. 375,000 measurements |
| **Global Positioning System (GPS)** | |
| **Antenna included** | |
| **Precision** | ±25 m CEP (50 %) (when receiving from at least 3 satellites) |
| **Resolution** | 0.1" |
| **Air pressure sensor** | |
| **Measuring range** | 667 … 1,133 mbar |
| **Precision** | ± 13.3 mbar |
| **Resolution** | 0.13 mbar |

**OTT** – Your partner for:

- Water level measurement in ground and surface water
- Discharge measurement
- Precipitation measurement
- Water quality measurement
- Data management and communication
- HydroService: consulting, training, installation and maintenance

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