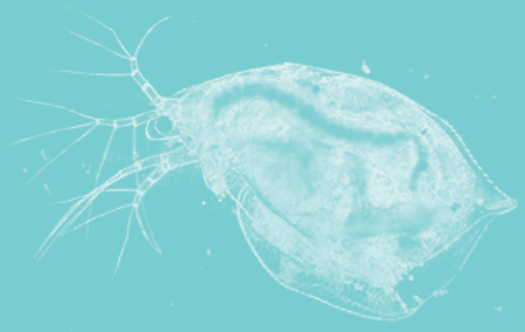
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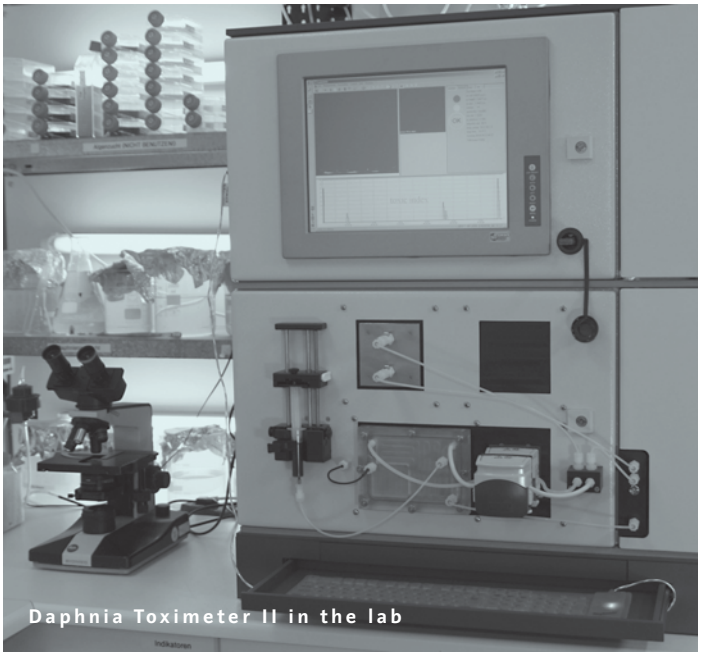
Daphnia Toximeter II



A powerful instrument for water toxicity assessment

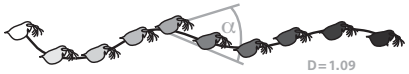
continuous visual analysis of daphnia behaviour

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Daphnia Toximeter II in the lab

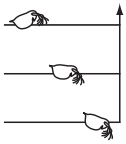
Mobility and analysis of daphnia


Speed: average velocity and distribution



Fractal dimensions: curviness and angle


Distance and grouping


Swimming height


Daphnia growth


Shading: time index and distribution

The bbe Daphnia Toximeter II observes daphnia online

Daphnia are established test organisms to indicate water quality. The bbe Daphnia Toximeter II observes daphnia under the influence of constantly running sample water. bbe developed the 24/7 sensitive method to detect hazardous compounds in water from rivers (source-water protection), plants, distribution systems and production drains to preserve human health and to monitor water. The instrument is also designed as an early warning system to rapidly detect the entire range of dissolved toxic compounds including pesticides, neurotoxins and warfare agents. Thus it is well suited to detect wilful (terrorist attacks) or negligent incidents (spills, accidents). The bbe Daphnia Toximeter II can also be used for long-term monitoring for the “strategic” evaluation of water quality and as a valuable tool in hazard management. The bbe Daphnia Toximeter II has been deployed worldwide now for over 10 years.


Chamber exchange

Measurements

The method of image analysis enables a series of measurement methods and plausibility tests to assess the daphnia behaviour using different criteria.

Speed measurements:
- average speed
- speed distribution

Behaviour observation:
- swimming height
- fractal dimension - measurements for turns and circling movements, curviness

Growth observation:
- determination of daphnia size

Location:
- no. of daphnia
- distribution in chamber

Get to know your water quality using sensitive real-time biomonitoring

Toxicity Index

The concept of the toxicity index is based on the evaluation of certain measurands, such as swimming speed or height, and changes in these measurands. Only if more than two of the measurands simultaneously show unusual results within a fixed period of time does the Daphnia Toximeter II trigger an alarm. Due to a dynamic alarm threshold an increase in daphnia size (growth) does not affect the alarm.

Sensitivity to toxins

Substance	EC_{50} in µg/L	Daphnia Toximeter alarm at µg/L
Aldrin	28	27
Carbaryl	19	22
Chlorpyrifos	344	15
Cyclosarin (GF)	60	10
Cypermethrin	1.2	1
Dichlorvos	170	0.5
Dimethoat	1900	2100
Endosulfan	200 - 900	100
Lindane	800 - 6500	30
Malathion	54	10
Parathionethyl	8.5	10
Sarin	10	6.4
Tabun	30	36
Terbuthylazin	3400	250
Trichlorfon	80	2

Test substances in static tests and in the bbe Daphnia Toximeter

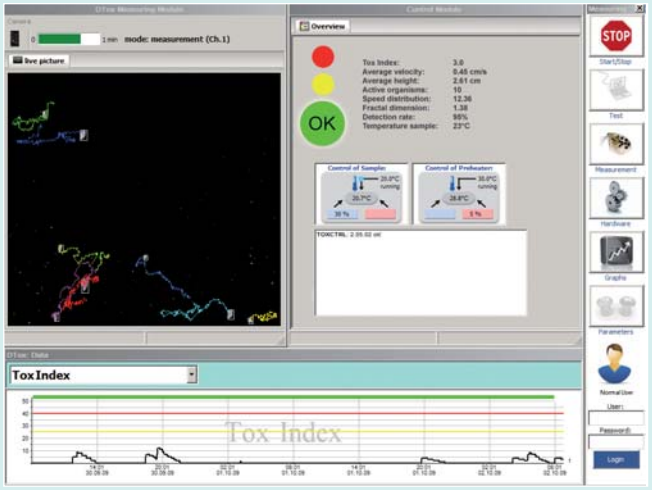
Operation

Sample water (0.5-2 l/h) continuously runs through the measuring chamber containing the daphnia. The live images obtained using a CCD-camera are evaluated online with an integrated PC in order to analyse changes in behaviour. If the change is statistically significant, an alarm is triggered. Depending on the physical properties of the water flow, the incoming water maybe subject to sample preparation. The integrated preparation unit filters the sample water, mesh 2 - 40 µm, and treats the sample with ultrasound. Particles from the filter are suspended and removed by this procedure. An excess of waterflow washes away the suspended matter and keeps the water preparation clean. Additionally the water is heated with a heating cartridge to an appropriate temperature to remove dissolved air.
Remote access software enables direct control of the Daphnia Toximeter II via remote PC and telephone lines. Readout, operational check and parameter adjustment can be performed by the user or by bbe as part of our support service.

Software

The bbe alarm software is used to record and analyse the data. The most important features are

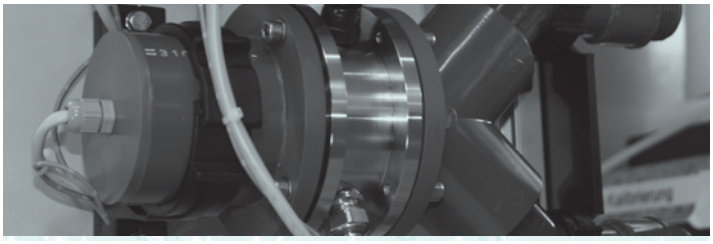
- determination of different behavioural patterns
- alarm analysis
- saving of data and parameters
- graphic display of all measurement values
- online display
- drift correction
- parameterisation of the measurements
- data export to Excel or text files
- print function



Live picture and trace image screen

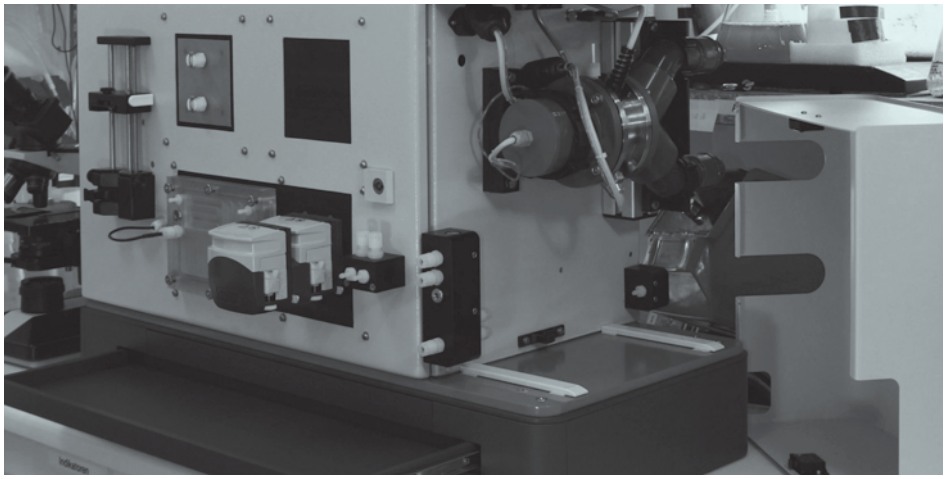


Short response time to toxin impact



Applications

- drinking water supply
- dam monitoring
- waterway analysis and assessment
- general environmental monitoring
- intake assessment
- toxicological evaluation
- limnological work
- research and education



Daphnia Toximeter II with drip pan, pumpheads and filter unit

Features

- 1- or 2-chamber systems with up to 10 daphnia each
- sample preparation: ultrasonic filter unit
- automatic daphnia feeding with ready prepared algae food
- compact housing: IP54 security protection class
- separate compartment for flow-through cell and electrical components







- modern touchscreen PC, 15" monitor, Windows XP, flexible USB keyboard
- alarm evaluation with bbe alarm database software
- hardware diagnostic
- remote control via software (optional)

Specifications

Daphnia Toximeter

Measurement procedure	video image analysis
Housing material	varnished steel plate
Weight	60 kg
Dimensions (H x W x D)	880 x 800 x 500 mm
Protection class	IP54
Mains supply	230/110 V 60/50 Hz
Power consumption	600 W
Sample temperature	0 - 30 °C
Water requirement	200 l/h
Maintenance interval	≥ 7 days
Sample inflow	free inflow/tube pump
Hardware	touchscreen PC, 15" monitor
Outputs	modem, LAN, analog output 4-20 mA (2 X), relay output (2 X), RS232, USB

Subject to alteration!

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