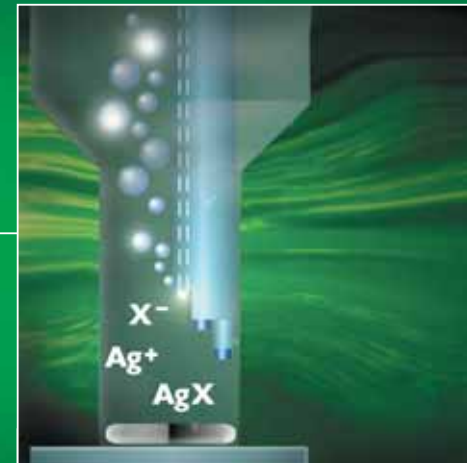


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UNEQUALED FOR FLEXIBILITY



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Subject to changes in design and scope of delivery
as well as further technical development!

AOX/TOX Analyzer
multi X[®] 2000

The New Generation

Easy operation – variable use

An innovative vertical furnace design and “septa-less” gas-lock inlet makes the multi X[®] 2000 the pioneer AOX /TOX analyzer of a new generation. It is ideal for AOX/TOX determination by the batch and column methods, conforming to national and international standards such as EN 1485:1997, ISO 9562:1998, US EPA Method 9020, ASTM D 4744-87.

The automatic sampler, in combination with a variety of sample preparation configurations, allows both fully and semiautomatic AOX/TOX determination.

Switching from column to the batch method or vice versa is quick and easy, allowing for operational flexibility, now and in the future. Configuring the basic unit of this variable system to your specific analytical task is quick and easy, for example, attaching modules for EOX or POX measurement.

Beneficial Features

- Basic unit operates with or without autosampler
- No mechanical lock systems for trouble-free sample introduction
- Integrated autosampler, interchangeable sample trays (25 or 36 position) and combustion tube heads permit swift change-over between the column and batch methods
- Special coulometric cell with solid-state combination electrode
- Optional thermoelectrically-cooled-coulometric cell
- PC Instrument control and data analysis with multiWin[®] software for Windows
- A diagnostic routine continuously monitors system parameters for trouble-free operation
- Optional fully automatic replacement of sulfuric acid in the drying vessel ensures reliable operation and reduces maintenance even when water generation is high
- Add-on modules enable conversion from manual to automatic operation
- Compact, space-saving design

Quick stabilization times, low maintenance, innovative multiWin[®] software, rapid change between methods, and space-saving modular design, combine to give **maximum operating convenience, functional reliability, and certainty** of analytical results.

Measurement: Simple and Reliable

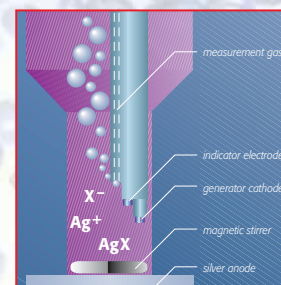
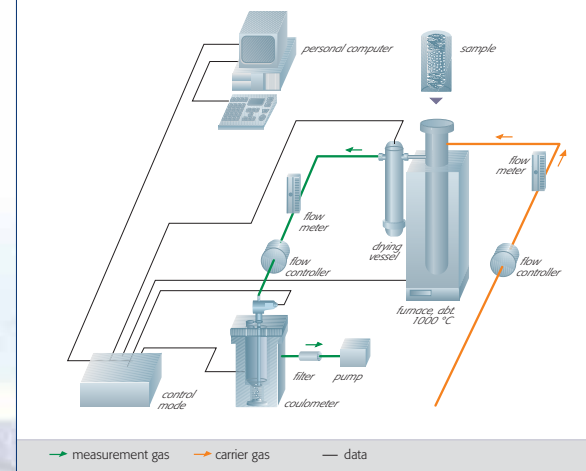


Patented Coulometric Cell - Guarantee for high sensitivity and accurate analyses

The patented measuring cell of the multi X[®] 2000 combines microcoulometric titration with biampometric indication and operates with four different generation current levels. This mechanism guarantees high sensitivity and fast, accurate results – without the likelihood of over titration. Samples with unexpectedly high halide levels pose no problem – they are reliably analyzed as a result of the system's exceptionally large linear dynamic range.

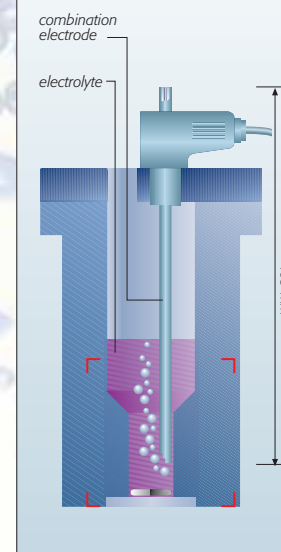
The special electrolyte solution is highly stable and the volumes used may be varied to increase the system's sensitivity.

Functional diagram of multi X[®] 2000



The coulometric cell is compact and robust. A thermoelectrically-cooled cell is available as an option, with a working temperature below ambient. This provides excellent long-term stability in overnight measurements and in severe climates and ensures a favorable signal-to-noise ratio and low drift.

Sectional view of a coulometer cell



The silver anode of the coulometric cell is situated on the bottom of the cell, and employs a magnetic stirrer for automatic cleaning during operation. This simplifies handling and maintenance of the coulometer.

The solid-state combination electrode, which integrates both the generator cathode and indicator electrodes, needs neither diaphragms nor salt bridges and is essentially maintenance-free and immediately ready for operation.

The cell can also be used as a stand-alone measuring instrument, e.g. for fast chloride determination prior to AOX/TOX analysis, or for separate chloride, bromide or iodide determination. Coulometric sulfur determination is possible as well.



Universal Sample Preparation

The autosampler for all sample preparation steps

The multi X® 2000 can be equipped with a software-controlled autosampler, which automatically transfers the sample tubes from a sample preparation unit to the instrument – up to 36 in the column method, up to 25 in the batch method.

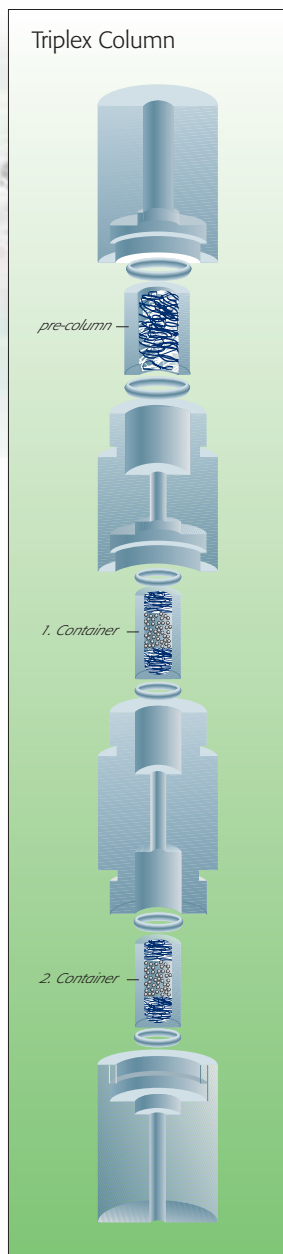


Fig.: software-controlled autosampler

Conversion from batch to column method is accomplished by simply changing the sample tray. Electronically-monitored gas flows and magnetic switches ensure safe operation.

The autosampler is provided with a cover, which prevents cross-contamination, environmental influences and makes purging with an inert gas unnecessary.

For special applications, such as the sewage sludge method, the autosampler can be coupled with a pneumatic pre-combustion lock. The pre-combustion time can be set via the multiWin® software, depending on sample requirements.



Method flexibility: Sample Preparation

For sample preparation, i.e. adsorption onto activated carbon, you can choose between the column and batch methods. This allows the analytical procedure to be easily adapted to your sample matrix.

Measure carbon doses conveniently and without contamination with the specially designed dispenser.



Fig.: Dosing dispenser

The column method – a closed system

With this method, analysis of the loaded carbon takes place in a combined adsorption and combustion container.

Once adsorption has taken place, the carbon is not ejected from the container. The carbon remains in the same container and is transferred directly to the combustion zone, eliminating the possibility of contamination from the environment. The use of a triplex pre-column, which acts as a filter, allows the analysis of particle-containing samples, without problems.

Automation not Limited



Automatic Adsorption Systems

Diverse automatic adsorption systems for sample preparation related to the column method of AOX/TOX analysis make quick and easy work of AOX/TOX determination.

AP 2P Adsorption Pump

Designed for the preparation of samples for AOX/TOX analyses by the column method, this automatic adsorption module handles two samples simultaneously. Both sample and rinsing volumes are selectable from 10 and 225 mL. Sample volume, rinsing volume and flow rate are controlled electronically.

The programmed run includes aspiration of sample and the nitrate rinsing solution. The risk of carry-over, especially in the pre-concentration of saline solutions, is efficiently prevented by automatic multiple rinsing.

Functions of the adsorption module may be monitored on the LCD display. Completion of the adsorption process is visually indicated on the display and by an audible signal.



Fig.: Adsorption Pump AP 2P



Fig.: APV 26 Adsorption System

The batch method – for water, sewage sludge and sediments

The batch method is especially suitable for aqueous samples with high particle content, as well as for AOX/TOX determination in sewage sludge and sediment.

Adsorption takes place while the sample is shaken, as a batch, with activated carbon, followed by vacuum filtration with either a polycarbonate membrane filter or quartz wool. The carbon is then introduced into the multi X® 2000 for AOX/TOX determination, either manually or with an autosampler.

For automating the batch method, a combined adsorption and pressure filtration unit – the DF 3U – is available. After adsorption, this unit can transfer three samples at a time to filter containers, using pressurized gas. The containers are then manually or automatically introduced into the multi X® 2000 for AOX/TOX determination. The DF 3U device can also be used for the column method.

APV 26 Adsorption System

With the APV 26 adsorption system, up to 26 samples can be pre-concentrated for AOX/TOX determination by the column method, according to DIN EN 1485. The samples are treated sequentially, so that the first samples are available for analyses immediately after pre-concentration. Controlled either by handheld or by the PC that controls the multi X® 2000, the adsorption system can operate unattended overnight.

The specifications of the APV 26 Adsorption System encompass every possible need. The main features include:

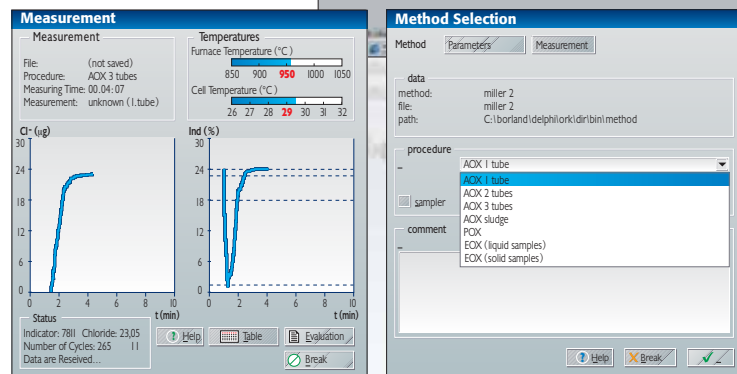
- Variable sample volume to 200 mL
- Pre-selectable rinsing volume
- Stirring of the current sample
- Possibility to use duplex and triplex columns (for manufacturers of other AOX/TOX equipment besides the multi X® 2000)
- Uncomplicated, convenient operation



Data extraction the easy way with the multiWin® software

The innovative control and data analysis software, multiWin®, adds convenience and dependability to your operation of the multi X® 2000. Working in the Windows environment, this software monitors all system parameters and acquires measurement data and titration curves, in accordance with GLP.

Sample ID	Method	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5	Parameter 6	Parameter 7	Parameter 8
Sample 1	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 2	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 3	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 4	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 5	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 6	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 7	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 8	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 9	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sample 10	AOX	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0



By presenting the measurement processes as graphs, multiWin® makes analysis transparent and allows data and results to be assessed with precision and accuracy.

With multiWin® you can select and control all AOX/TOX analysis methods (column or batch method, sewage sludge analysis) as well as EOX and POX determinations through your PC.

Multi-tasking in your lab

Multi-tasking allows sample analysis and sample preparation with the automatic APV 26 pre-concentration module to run simultaneously.

The sample tables of the APV 26 can be downloaded to the multi X® 2000 as a sampler file. This reduces the volume of work and avoids transcription errors. During an analysis, job-specific methods and sampler tables can be compiled and saved. It is also possible to edit and analyze previously acquired data during a measurement.

These capabilities will make your daily routine more efficient. An online help menu and the possibility to use a commercial barcode reader for compiling sample lists also contribute to make multiWin® a software package that satisfies the most exacting requirements.



AOX/TOX analyses in waters with high chloride content – the easy way

A major concern in the determination of AOX/TOX in highly saline waters is the need for substantial dilutions in order to reduce the inorganic chloride concentration to a level below 1g/L. When diluting to these levels, there is a risk of diluting the organic chloride concentration below the detection limits of AOX/TOX technology.



A solution for all sample types

The multi X® 2000 can be upgraded with additional modules for the EOX and POX determination in order to meet any requirement in the field of AOX/TOX analysis.

Optional EOX module

An optional EOX-i module is available for the determination of (E)extractable (O)rganic (X)halogens. Solvent extracts from liquid and solid samples can be directly injected into the combustion module of the multi X® 2000, combusted and subjected to coulometric detection. The halide content is representative of the sample's EOX content.



Fig.: Routine analysis made easy

Optional POX module

An optional POX module is available for the determination of (P)urgeable (O)rganic (X)halogens in liquid samples. The gaseous constituents are purged from the sample, transferred to the combustion module of the multi X® 2000, combusted and subjected to coulometric detection. The halide content is representative of the sample's POX content. Sampling is done by a calibrated procedure.

This matrix problem can now be solved with a modified sample preparation technique allowing reliable AOX/TOX determinations without excessive dilution.

The sample preparation technique, based on DIN EN 1485 Adsorption to activated carbon, is preceded by a solid-phase extraction (SPE). This preparation technique is described in DIN 38409-22.

The AP 2P and APV 26 sample preparation systems are suitable for both conventional pre-concentration, conforming to DIN EN 1485, and for clean-up and adsorption by the SPE-AOX/TOX technique, according to DIN 38409-22. Adapters are available for each sample preparation system.

The SPE-AOX/TOX determination can be applied to water samples of any kind containing more than 10 µg/L of dissolved organic chlorine, bromine and/or iodine.