Automated Sample Preparation in Dioxin Analysis

simple - fast
precise – inexpensive
Simple Sample Preparation in Dioxin Analysis through Automation

The Fast and Precise Approach to Get Your Results

Sample preparation is one of the most elaborate and time-consuming process steps within dioxin and PCB analysis. Easy-to-use and at the same time reliable automation makes your work in the laboratory much simpler. The automated DEXTech™ sample preparation system offers many attractive advantages that we are pleased to introduce to you here.

After manual injection of the sample and electrical locking of the columns, the DEXTech™ will undertake the sample preparation for you:

- Applying a pre-installed and evaluated method, precise separation and fractionation of the dioxins and PCBs in up to three groups will be performed. At the end of the process, these are available in purified form for further analytical processing.
- The solvent consumption is significantly reduced as are the incurred costs per sample due to the optimised methodology.

All-inclusive Package

Owing to the easy installation, intuitive operation and the supplied default settings, the DEXTech™ is the ideal system for both, novices in dioxin analysis and for those switching from manual to automated sample preparation.

Equipped with sophisticated concepts, the DEXTech™ offers a convincing solution to laboratories with a high sample throughput: individual, cost-efficient, extremely fast.

Please contact us, we will be happy to advise you!

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The DEXTech™ System Consists of the Following Components:

1. Unit
2. Certified, ready-to-use columns
3. Universal standard method

DEXTech™ is suitable for sample preparation for all types of dioxin and PCB analysis:

- Food and feed samples, such as fish, meat, and fish oil, eggs, vegetable oils and animal feed mixtures,
- environmental samples, such as soil, sewage sludge, sediments,
- biological matrices, such as blood.

Clear Design – Sophisticated Technology

The dioxin system has been designed and constructed for the everyday laboratory use. The structure is simple. Accessibility and visual control of the solvent-carrying tubes, of the valves and pump are cleverly implemented, allowing the user to view all elements at one glance. The device is operated via an integrated touch screen.

Owing to the closed system design, the DEXTech™ does not require an extractor hood, instead, it can be simply placed onto the laboratory bench.

Advantages

- Broad range of application
- No extractor hood required
- Clear and clever design
- Universal default method

Different matrices – one method

The DEXTech™ is supplied with an evaluated method as default setting, allowing its immediate use as soon as it is set up in the laboratory. Regardless of the matrix to be purified, this default method can be universally applied to any sample.

However, modification of the method is also possible. The modified method is then stored in the system as an additional method and can be selected as and when required.
Effective – Easy Operation

Four Column Concept

The DEXTech™ achieves the perfect clean-up and separation of dioxins and PCBs via four column positions that are arranged axially one below another. The ready-to-use columns can be used for all matrices and enable the immediate operation of the device.

Filling, preparation or rinsing of the columns is omitted and thus saves a lot of work. The high-quality packaging made from a special foil with an aluminium barrier layer prevents the absorption of water or the entry of dioxins and PCBs from the environment during transport or storage.

Different Samples – Different Columns

The loading capacity of the Standard column is with 5 g of fat very high, and is essential in order to achieve the low detection limits. Alternatively, for samples with a low fat content of up to 1.5 g or a small matrix load, the SMART columns can be used. These significantly reduce the required amount of solvent as well as the processing time. For environmental samples, a special column with an additional silver nitrate layer is available. Moreover, dummy columns are included in the DEXTech™ standard equipment should a user-modified method only require three columns or if additional rinsing steps are desired.

Just click it

The handling of the columns is very easy. Cut the packing open, remove the column and without further ado click it into the device - „just click it!“ When choosing the SMART column, the adapter is used in the same way - „just click it!“ Then, the patented electrical locking mechanism closes the column making it liquid-tight - no tools required and without screw connections!
Certified Columns for Dioxin and PCB Analysis

The acidic silica gel column (1), which is fitted in the top position in the DEXTech™ system, is the foundation for the high-quality processing of the samples. In this multi-layer column, the individual sorbents are separated by glass fibre filters. Up to 5 g of fat can be degraded by the silica gel, which is impregnated with concentrated sulphuric acid. In addition, water residues are removed from the sample and the sample is then neutralised for the subsequent clean-up.

Alternatively, depending on the sample to be processed, the environmental column or the SMART column may be used in this top position.

A Florisil column (2), made of glass, occupies the second position in the system. It binds the dioxins and separates the PCBs from the dioxins.

The carbon column (3) at position three serves the binding and separation of the PCBs. The mono-ortho PCBs are then combined with the ndl-PCBs and fractionated, whereas the non-ortho PCBs will be collected in a separate fraction.

The second carbon column (4) is placed at position four and purifies the eluate from the Florisil column to prevent overlapping and misinterpretation of the dioxins.

Cost Saving through Reuse of Carbon Columns

A significant reduction of costs per sample can be achieved by reuse of the two carbon columns. Using these columns for twenty cycles acquires a cost saving of up to 30% without compromising the sensitivity of the results. Cross contamination is prevented through the well-designed solvent supply management.

Multiple reuse of the columns

Used acidic silica gel columns after a matrix load of 3 g, 1.5 g and 1 g fat
Evaluated, Universal Method for the Optimal Sample Preparation

Perfect Separation of Dioxins and PCBs

The DEXTech™ is equipped with a validated preparation method as default setting, which has been developed specifically for the LCTech dioxin system by the German governmental laboratory, Chemical and Veterinary Analytical Institute Münsterland-Emscher-Lippe (CVUA MEL).

The aim of this method is the separation of dioxins and the three groups of PCBs (indicator PCBs, mono-ortho PCBs, non-ortho-PCBs). This prevents overlapping of the individual PCBs during the chromatographic analysis, such that a false evaluation is prevented from the beginning.

In developing this method, particular attention has been paid to two points:
- **Fast processing**
- **Low solvent consumption**

After only one hour, an optimally prepared sample will be ready for subsequent analysis. This is even faster with the use of SMART columns, which enable sample processing in less than 50 minutes.

At the same time, the DEXTech™ requires amazingly small amounts of solvents using only 400 mL with the Standard column and less than 300 mL with the SMART column.

### Processing Times

<table>
<thead>
<tr>
<th>Column Type</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Column</td>
<td>&lt; 1 h</td>
</tr>
<tr>
<td>SMART Column</td>
<td>&lt; 50 min</td>
</tr>
</tbody>
</table>

Fast processing - low solvent consumption
Flow Scheme: LCTech Four Column Setup

Intermediate concentration steps are not needed using the sample preparation system DEXTech™.

1. n-Hexane
   Sample loading / fraction 1 / ndl PCB

2. Dichloromethane / n-Hexane
   PCDD/F loading to Carbon column

3. Dichloromethane / n-Hexane
   fraction 1 / mono-ortho-PCB

4. Toluene
   fraction 2 / non-ortho-PCB

5. Toluene
   fraction 3 / PCDD/F

Combined

- Mono-ortho-PCB
- Ndl-PCB
- Non-ortho-PCB via backflush
- PCDD/F via backflush

GOLD STANDARD for the Dioxin / PCB Analysis
The Simple Touch

Simple Operation via Touch Screen

The DEXTech™ is operated via a clear and easy-to-use touch screen. In order to prevent damage by liquids during everyday laboratory practice, the touch screen is protected by a special film.

All Data at a Glance

Ongoing process monitoring is possible with the touch screen. By using colour coding, the user recognizes at a glance, which processing step the device is currently undertaking. Upon successful completion of the sample preparation, a beep tone will indicate acoustically the end of the process.

Report Function for Documentation

After completion of the sample processing, the associated sample data will be collected and stored. The device has 30 memory locations for 30 sample preparations. The stored report data can either be saved onto a computer via the report function, or if data storage is not required, it may be overwritten. Using the optional report function, all sample processing data can be transferred to a computer by means of a USB stick and can there be saved as reports.

Advantages

- Simple operation via touch screen
- Acoustic signal indicates completion of process
- Process monitoring with “traffic light system”
- Report function

Convenient operation via touch pad
The DEXTech™ measures only 550 x 725 x 570 mm (W x H x D). With this compact footprint, several units may be placed side by side on a lab bench to facilitate a high sample throughput. Since each unit is controlled by its own PLC system, each sample preparation can be started and operated individually.

**No Cross-Contamination**

Cross-contamination is reliably avoided as a consequence of the superior solvent management. Components that have been in contact with the sample are either exchanged (columns) or constantly rinsed during processing (sample loop and valves). The feed pump itself has no contact with the sample at any time, since the injection takes place as partial filling into the sample loop. Hence, not only cross-contamination but also soiling and wear and tear of the feed pump is prevented.

Due to the special design of the high quality valves, which have been tested in numerous analytical devices, the smallest amount of solvent is already sufficient to reliably prevent cross-contamination. Clogging of the valves is impossible even with a high matrix load of the sample.

**Separate Solvent Disposal**

DEXTech™ is equipped with separate connections for the disposal lines that allow for separate collection of halogenated and non-halogenated solvents, if required.

**Perfect Options**

For optimum operation in everyday laboratory practice, an optional fraction rack and waste disposal rack are available. Thereby, the fraction flasks can be hooked into the device, keeping them stable and saving space. Upon removal of the fraction flasks, the lids together with the fitted fraction tubes can be placed into the waste disposal rack. Any liquid potentially dripping out of the tubes or when the device is rinsed is directly fed into the waste.

Comparison of typical DEXTech™ blank values influenced by environmental conditions with blank values obtained directly after sample preparation of highly contaminated fly ash. This type of matrix is particularly suitable for testing for cross-contamination due to its high PCDD / F and PCB levels. It can be seen that the system does not carry any cross-contamination (Data: Helmholtz Zentrum Munich, German Research Center for Environmental Health).
Safety First

User safety was a key aspect in the development of the LCTech Dioxin System. For this reason, the DEXTech™ is equipped with a variety of security features:

- DEXTech™ braces the columns and starts sample processing only if the front door of the device is shut.
- The device operates entirely in the low voltage range.
- At the end of the processing procedure, compressed air or nitrogen may be applied to the columns to prevent dripping upon their removal.
- The pressure sensor stops the process as soon as the permissible, freely adjustable pressure is exceeded.
- The leakage sensor detects leaks and is mounted below a drip tray, which can be easily removed and cleaned.
- Optional solvent sensors indicate the absence of solvents.
- An optional waste control detects the filling level of the waste container.

As soon as one of the safety sensors detects a problem, the unit switches itself off. After correcting the fault, sample processing will continue from that point at which the process had been interrupted.

Your safety is important to us!
The DEXTech™ system performed very successfully in the 2013 "Feed Fat" ring trial. Equally, the results obtained by the European Reference Laboratory for sample preparation of Sepiolite extracts in the 2014 ring trial have been very convincing.

A comparison of two independent government laboratories in Germany illustrates the excellent agreement of the DEXTech™ processed samples and the consensus value.

The processing of various matrices in different laboratories is also a testimony to the robustness of the DEXTech™ system.

**Figure 1:** Comparison of PCDD/F-congeners and their Sum-TEQ including PCB-TEQ of two laboratories (CVUA MEL, LGL Oberschleißheim) with assigned values from proficiency test of EURL.

**Figure 2:** Comparison of PCB-congeners, their sum-TEQ and ICES-6 of two laboratories (CVUA, MEL and LGL, Oberschleißheim) with assigned values from the proficiency test of the EURL.

* concentration of these compounds 10 times higher; ** concentration of these compounds 100 times higher
Different matrices – one method

No cross-contamination

Just click it

Fast processing - low solvent consumption

Convenient operation via touch pad

Multiple reuse of the columns

Your safety is important to us!

The information contained in this brochure is based on our current knowledge and has been carefully checked. However, since we continually work on the further development of our products, please accept texts, pictures and numbers on these pages as non-binding and exemplary only.