

SOIL SCIENCE  
Column leaching tests





## COLUMN TESTS

Mineral by-products, waste and soil material form the bulk of Germany's material flows with potential environmental impact, with approximately 200 million tonnes flowing annually. Before these material can be reused, e.g. in roads and landscaping, they need to be safely recovered.

For this purpose, ecoTech has developed, in collaboration with the Federal Institute for Materials Research and Testing (BAM), an Automated Column Percolation System (ASPA). This new system results from our long-standing cooperation with BAM and can be flexibly combined and adapted to different industry and material-specific requirements and test methods.

Available for purchase from ecoTech are the individual elution columns, semi-automatic elution units or professional, fully automated percolation units, which enable a high sample throughput.

The modular design ensures that you can integrate existing devices from our simpler range when upgrading to a higher-quality system. Just call us if you have any questions.

ecoTech Umwelt-Meßsysteme GmbH



Gefördert durch:



aufgrund eines Beschlusses  
des Deutschen Bundestages

**Note:** The equipment was developed as part of a cooperation between the company ecoTech GmbH and the Federal Institute for Materials Research and Testing (BAM). The work was funded by the Federal Ministry of Economics and Technology as part of the ZIM program (Central Innovation Program for SMEs). Funding Code: KF 2201007MK9 and KF 2325001MK9



## [01] Basic Set | Elution Columns (design patent protected)



### Application

Perform manual column tests in conjunction with existing laboratory equipment such as pumps, water tanks, bottles etc.

### Properties

- Easy installation and column filling
- Three different column sizes available (others on request)
- Concept based on requirements according to DIN 19528: 2009
- Increased pressure resistance thanks to tool-free mountable clamping lock
- Drop weight for uniform compaction of the sample material
- All ecoTech elution columns have a protected registered design

Technical data	Column 50	Column 65	Column 100
Inner diameter glass tube	50 mm	65 mm	100 mm
Outer diameter glass tube	60 mm	75 mm	110 mm
Height glass tube	300 mm	320 mm	440 mm
Volume glass tube	589 ml	1.062 ml	3.456 ml
total height	410 mm	440 mm	610 mm
Material glass tube	Borosilicate glass 3.3		
Material closure	Polyethylene (PE)		



## [02] Erweitertes Set | Elutionseinheit



### Application

Perform semi-automatic column tests

### Impetus

In order to comply with strict DIN specifications, we needed to be very precise in the design, taking into account the many individual components of column test systems. Following a development process that has been ongoing since 2009, we were able to settle on a very narrow selection of components and materials that are DIN compliant. In our experience, each of the components listed below can potentially be a critical source of error. Their thoughtless use therefore easily leads to exceeding DIN tolerance limits, leading to the necessary repetition of the time-consuming elution test.

We offer a set of components that has been developed over extended tests, which simplifies and reproducibly ensures the performance of column elutions:

### Essential components

- High-precision diaphragm metering pump
- Downstream pressure relief valve
- Matched geometry of the pump head
- Arrangement of the pressure holding valve with special holding device
- Factors on the pump inlet:
  - tubing
  - hose length
  - tube dimensions
  - fittings
  - prefilter





## Advantages

- Complete set for the semi-automatic performance of column tests
- Stable and accurate flow even with back pressure through the filled column
- Secure against dry run of pump and water jets
- Intuitive operation and easy calibration
- Components can be integrated later in ASPA

## Set versions

consisting of

Elution Set 435ES.50	Elution Set 435ES.65	Elution Set 435ES.100
<ul style="list-style-type: none"><li>• Elution column, 50 mm (see basic set)</li><li>• high-precision diaphragm dosing pump</li><li>• pressure-retaining valve</li><li>• hoses</li><li>• fittings</li><li>• prefilter</li></ul> additionally required: <ul style="list-style-type: none"><li>• eluent reservoir</li><li>• eluate bottles (available on request)</li></ul>	<ul style="list-style-type: none"><li>• Elution column 65 mm (see basic set), otherwise as above</li></ul>	<ul style="list-style-type: none"><li>• Elution column 100 mm (see basic set), otherwise as above</li></ul>

## [03] Professional Set | Automated Column Percolation Unit (ASPA)



Automated Column Percolation Unit (ASPA) for the simultaneous performance of four separately controlled elution tests; essential components: 4 columns, 4 pumps, 4 hydraulic distributors, eluate bottles, water tank, control module with monitoring function and network connection; completely housed in a custom-made shelving system with full drawers



## Application

Implementation of fully automatic column tests

## Properties

- Automatic test execution
- Independence of laboratory work times
- Independent fractionation
- Modular construction
- Individual configuration
- High sample throughput
- Standard tests such as DIN 1955, NEN 7373, (DIN) EN 14405 (CEN/TS 14405), CEN/TS 16637-3
- User-specific tests programmable
- Remote monitoring possible

## Components

### Control Module

- Control and monitoring of all processes
- Process display and operation via touchscreen
- Secure autonomous operation (for example, when PC crashes)
- Emergency shutdown if the set pressure is exceeded

### PC software

- Easy entry and management of process data
- Alarm management, operation and incident logging
- Creation of GLP logs following completion of the test

## Columns

- See above under [1] "Basic Set"

## Pump

- See above under [1] "Extendet Set"

## Hydraulic distributor

- Division of fraction under exclusion of air
- No rotating components
- No contact of the eluate with valve components
- Fast replacement of hoses
- Low dead volume

## Collection flask

- Borosilicate glass 3.3 with screw cap
- Cascade connection for large sample volumes
- Eluate transfer under exclusion of air
- Very good chemical resistance

## Storage tank

- Mobile with wheels and handle
- Large capacity (50 l)
- Space-saving storage in the ASPA shelf

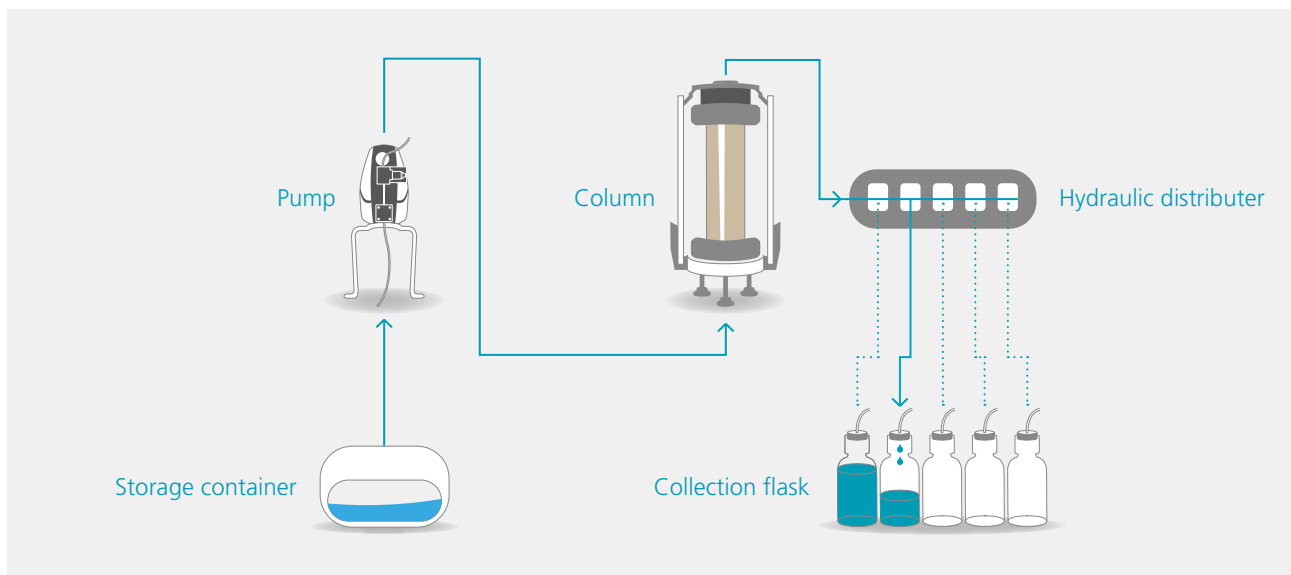
## Shelving

- Space saving and ergonomic
- Full drawers
- Modular and expandable

## Case weight

- Defined weight and drop height
- Uniformly sealed
- Easy to use

## Process flow during a percolation





## Overview

	Basic Set Elution columns	Extended Set Elution unit	Professional Set ASPA
Simple execution of column tests	✓	✓	✓
Accurate and consistent flow rates during test run	✗	✓	✓
Different saturation and test flow rates possible	✗	✗	✓
Fractionation	✗	✗	✓
Pressure monitoring	✗	✗	✓
Logging	✗	✗	✓
Automatic performance of column tests	✗	✗	✓

## References



Bundesanstalt für  
Materialforschung  
und -prüfung

Federal Institute for Materials Research/Testing  
(Bundesanstalt für Materialforschung/-Prüfung (BAM))  
Laboratory IV.31 | Dr. Ute Kalbe  
Unter den Eichen 87 | 12205 Berlin | GERMANY



bfg Bundesanstalt für  
Gewässerkunde

Federal Institute of Hydrology  
(Bundesanstalt für Gewässerkunde (BfG))  
Referat G2 - Aquatic Chemistry | Dr. Lars Düster  
Am Mainzer Tor 1 | 56068 Koblenz | GERMANY



INSTITUT FÜR  
BAUSTOFF  
FORSCHUNG

FEHS

FEHS - Institute for Building Material Research e.V.  
Dr. Ruth Bialucha  
Bliersheimer Straße 62 | 47229 Duisburg  
GERMANY



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

The University of Queensland  
Sustainable Minerals Institute  
Professor Thomas Baumgartl  
St. Lucia, 4072, QLD | AUSTRALIA

## 35 years of ecoTech – Innovation and Competence

For 35 years we have developed, produced and supplied measuring and monitoring systems for water – soil – air.



### HYDROLOGY

- Multiparameter-Sondes YSI EXO
- Handheld meters YSI ProPlus, ProDSS
- Profiler, vertical water column measurements
- Single-Parameter data logger
- Level Logger
- Radar sensor, non-contact discharge measurement
- Buoys
- Monitoring stations



### METEOROLOGY

- Stationary weather monitoring systems
- Mobile weather stations
- Sensors for wind, radiation, temperature, relative humidity and precipitation
- Data logger with up to 48 channels
- Data logger for long-distance data transmission



### SOIL SCIENCE

- pH and redox monitoring in field and laboratory
- Tensiomark™ – Matric potential and temperature
- Hydra probe – Soil water content, temperature and EC
- pF laboratory station & add-on modules for pF curves
- Suction plates and suction cups
- ASPA – Automated column percolation test device
- Laboratory lysimeter and laboratory soil columns
- Soil profile tape measure



### ECOLOGY

- Arboreal photo-electors
- Ground photo-electors
- Air and water photo-electors
- automatic extractors according to MacFadyen/Kempson
- Vacuum insect collector ecoVac
- Accessories



All current products can be found online at [www.ecotech-bonn.de](http://www.ecotech-bonn.de)

ecoTech Umwelt-Meßsysteme GmbH  
Klara-M.-Faßbinder-Straße 1A | 53121 Bonn | Germany

Tel. +49 (0) 228 85 044 7700  
Fax +49 (0) 228 85 044 7709

[ecoTech@ecoTech-Bonn.de](mailto:ecoTech@ecoTech-Bonn.de)  
[www.ecotech-bonn.de](http://www.ecotech-bonn.de)