behr
Labor-Technik

The behr range

Hot extraction according to Randall for faster extraction

EN

semi-automatic

www.behr-labor.com

Quality made in Germany

Hot extraction according to Randall

extraction process

Extraction processes (more precisely: solid-liquid extraction process) are used to separate soluble components from a solid sample.

Examples:

- Determining the fat content in foods
- Determining an impurity (e.g. PCB, abandoned armaments) in soil samples
- Examining the components of natural substances.

Even brewing coffee is an extraction process. However, in the laboratory the focus is on completely dissolving the examined components from the sample under defined conditions and in a not unnecessarily diluted form. In the laboratory, solvents such as ligroin or hexane are used as extraction agents.

The objective of all extraction processes is to dissolve as much of the soluble components as possible with a specific amount of solvent. This is achieved by constantly vaporising the solvent and allowing it to drip into the sample from a reflux condenser. In contrast to a coffee machine, the same solvent is constantly sent back to the sample. The extracted component accumulates in the distillation flask.

Hot extraction according to Randall

The hot extraction process according to Randall consists of three steps:

- Boiling
- Rinsing
- and Recovery.

Boiling

In the first step, the extraction thimble with the sample is located in the vessel with the boiling extraction agent - similar to a tea bag in a cup of hot water. Most of the substance to be extracted should dissolve in this step and is distributed in the solvent. The top part of the apparatus simply acts as a reflux condenser; the condensate drips into the extraction thimble and helps to dissolve the substance.

Rinsing

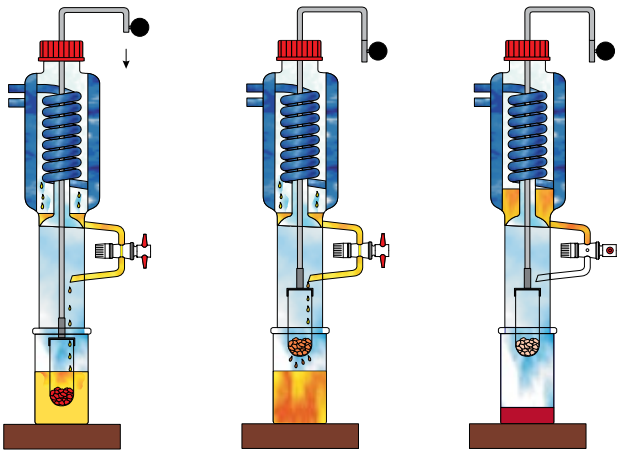
In the second step, the extraction thimble is lifted out of the pool. Extract may still adhere to the thimble; and some of the substance that has not yet dissolved may still be located in the sample. The condensate from the condenser flushes the remaining extract and progressively dissolves the previously undissolved portion. If the dissolved extract is to be subjected to further processing, the extraction is now complete. Otherwise, the solvent is removed in the third step.

Recovery

Connect the recirculating tap to the condenser for evaporation. The condensate collects in the lower part of the condenser; it can be reused for the next extraction. Thanks to the the short path to the apparatus, the sample can be evaporated until it is almost dry. Benefits of the hot extraction process include

- A compact apparatus with short process paths,
- Low solvent requirement,
- Short extraction period - typically about an hour.

Due to the short extraction period, hot extraction is also gentle on the extract. There are now also an increasing number of analysis processes that use hot extraction.



Introduction

from sample preparation to extraction

Only necessary on high fat content and bound fat

Hydrolysis principle

This acid digestion process dissolves both “free fats” as well as “bound fats” from the overall fat content.

The fat is frequently naturally enclosed in the cell matrix of the food or fodder or chemically bound. In these cases, a hydrolysis step before extraction completely releases the fat. Determination of total fat content according to Weibull and Stoldt.

The user filters the hydrolysate of the separated sample by using a glass sample tube filled with sand or Celite.

The user then rinses the fatty filter residue with water in order to remove the acid.

HY 6

Sample preparation

After drying, the filter residue is finally extracted.

This is done by applying one of the following method:

Hot extraction according to Randall

ES 6

Extraction

Hydrolysis

Sample preparation for the extraction

The Weibull-Stoldt method

The quantitative determination of the fat content of food is performed by extraction with a solvent. The "free fat" is determined by direct extraction. The "total fat content" includes both the "free fat" and the "bound fats" that are dissolved by acid digestion (hydrolysis).

HY 6

AST 6

TST 6

GT

HYR

State-of-the-art equipment

behrotest® hydrolysis unit for acid digestion

HY 6 is an apparatus equipped with manual energy control for 6 sample positions with highly uniform and rapid heating provided by the built-in high-quality quartz infrared emitters. Full heating power is reached within 1 minute, which eliminates the need for preheating.

With the behrotest® **quick-engagement system**, the individual sample vessels can be quickly and easily inserted into the IR heating system and brought out. Each sample vessel can then be filtered off and flushed in parallel or individually.

The HY 6 hydrolysis-filtration unit as basic unit consists of:

- Quick digestion system with manual energy control and direct heating of the samples
- Round bottom digestion vessel 250 ml
- Glass crucible, porosity 1
- Suction tubes
- Suction bridge with PTFE plug and one suction connection with threaded fitting
- Celite 545, 1 kg
- Quartz sand, 2 kg

Optional: For continuous vacuum during acid hydrolysis and subsequent filtration please use our optional behrotest® suction units.

Type	Item description	Item no.
HY 6	for 6 sample places	B00734467

Technical data HY 6

Number of sample positions	6
Dimensions (W x D x H)	54 x 37 x 63 cm
Weight	20 kg
Nominal voltage	230 V~, 50/60 Hz
Nominal power	1500 W
Energy adjustment range	0 - 100 %

Accessories

Type	Item description	VPE	Item no.
AST 6	Stand for round-bottom digestion vessels SR3i		B00734893
TST 6	Stand for glass crucibles		B00734894
HYR	Tube holder for the glass crucibles		B00707740
GT	Glass crucible		B00734888
SR3i	Round bottom digestion vessel		B00217959
ASR	Suction tubes		B00734889
ASB 6	Suction bridge with PTFE plug and one suction connection with threaded fitting		B00734890
CEL	Celite 545	1 kg	B00734882
QSH	Quartz sand	2 kg	B00734883

Classical apparatus

behrotest® hydrolysis unit for acid digestion

Hydrolysis-digestion apparatus with 4 or 6 sample positions.

Complete with:

- 600 ml beaker
- Water-cooled condenser with cool water distribution
- Condenser stand with drip tray
- Heating positions individually infinitely adjustable
- Main power switch with pilot light

Fully assembled complete device with all the necessary accessories.

EXR 4

behrotest® hydrolysis unit for acid digestion

Type	Product description	Art. No.
EXR 4	Hydrolysis unit, 4 sample positions	B00218446
EXR 6	Hydrolysis unit, 6 sample positions	B00218448

FU 4

behrotest® filtration unit

Complete with:

- Filtration attachment, 400 ml, threaded
- PP funnel, threaded
- Sieve plate with 2 seals
- Stainless steel frame

SIMVAC

Filtration unit for hydrolysis

Type	Product description	Art. No.
FU 4	Filtration unit for hydrolysis with 4 positions	B00441135
FU 6	Filtration unit for hydrolysis with 6 positions	B00441144

Suited for attachment to a water jetstream pump/ vacuum pump:

Type	Product description	Art. No.
SIMVAC	behrotest® suction unit with water jet pump, collection bottle 2 l and tubes	B00217922
AFR 2	behrotest® suction unit with diaphragm vacuum pump, collection bottle 2 L and tubes	B00734891

AFR 2

behrotest® semi-automatic equipment

for hot extraction according to Randall

The semi-automatic extraction systems ES 2+2 / ES 6 save time and costs by a fast extraction.
The hot extraction system following Randall is several times faster than the conventional Soxhlet extraction.

ES 6

TGE 6

TGE 4

FF 30

Good to know:

For particularly high fat contents and bound fats we recommend the compatible HY6 hydrolysis unit for total fat determination

Multi-position extraction units:

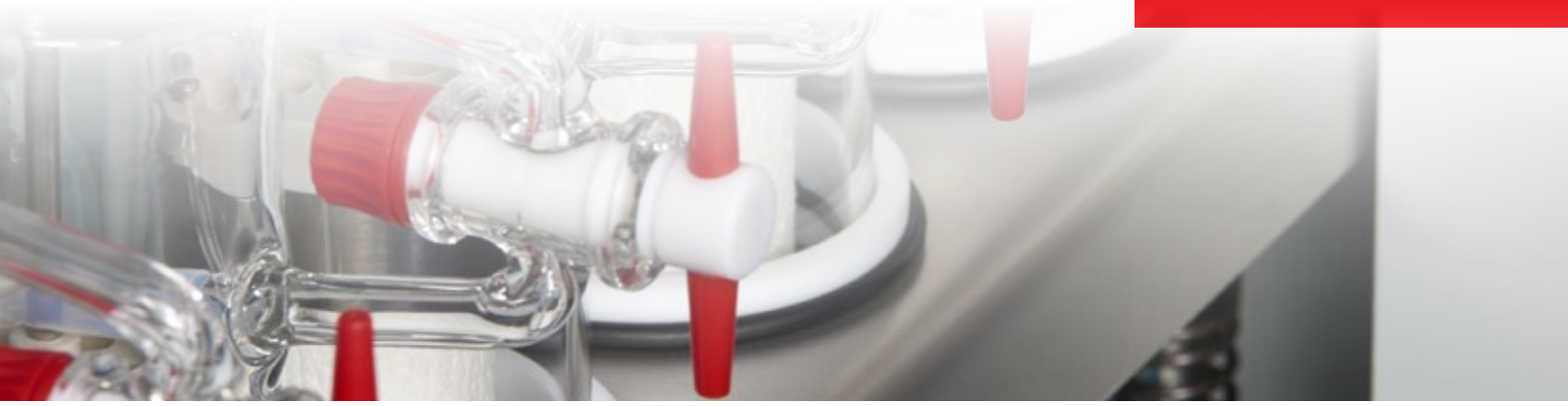
- Step-by-step user-friendly instructions on the display
- One heating program for all sample positions, but separate heating for each sample position
- Cooling water manifold ensures uniform cooling at all sample locations
- Low solvent losses due to the specially designed behrotest® coolers
- 31 freely configurable programs for your individual extraction applications
- behr one-button operation for particularly fast and easy programming
- Audible and visual error messages
- Integrated overtemperature protection
- Resource-saving cooling water saving program

Semi-automatic hot extraction apparatus according to Randall

Type	Item description	Item no.
ES 2+2	for 4 sample places with 100 ml extraction tubes	B00704623
ES 6	for 6 sample places with 100 ml extraction tubes	B00704624

Technical data

	ES 2+2	ES 6
Number of sample positions	4	6
Dimensions (W x D x H)	56 x 52 x 67 cm	72 x 52 x 67 cm
Weight	42 kg	50 kg
Nominal voltage	230 V~, 50/60 Hz	
Nominal power	1000 W	1500 W
Display	LCD	
Solution volume	60 ml; max 75 ml	
Solvent recovery	Up to 90 %	
Reproducibility	± 1%	
Temperature range	From 20 to 260 °C	
Time setting range	1 – 999 min, digitally adjustable	
Programs	31	
Water consumption	2 l/min	



Accessories

Type	Product description	VPE	Art. No.
FF 30	behrotest® beaker for extraction		B00687525
MCR	Clamping ring, magnetic		B00707723
EX 75 HS	Extraction sleeve suitable for FF30	Pack of 25	B00600441
SIST 100	behrotest® boiling stones	100 g	B00217914
TGE 4	Heat shield/support frame for 4 extraction beakers		B00734885
TGE 6	Heat shield / support frame for 6 extraction beakers		B00734886
DEH	behrotest® PTFE lid, white		B00707719
VSL	Viton sealing ring		B00734892
BSL	Butyl sealing ring		B00734878
PSL	PTFE sealing ring		B00734879
HST 6	Stand for 6 extraction sleeves		B00734880
ESG 6	Desiccator stand for 6 extraction cups		B00734881
WAN	PTFE weighing rack		B00734884
EXK 300	behrotest® Desiccator, borosilicate glass 3.3, with plastic knob and porcelain plate (DN 300)		B00711550
SG 500	behrotest® Silica gel with self-indicating (orange gel), 1-3 mm	500 g	B00726297
SG 1000	behrotest® Silica gel with self-indicating (orange gel), 1-3 mm	1000 g	B00726298
HHR	Hot Hand		B00738628

EXK 300

ESG 6

SG 1000

WAN plus MCR und EX 75 HS

EX 100 HS

HST 6

This may also interest you

Extraction units for extracting liquids

Determination of the nitrogen content according to Kjedahl:

- Infrared digestion devices with manual operation and also programmable
- Block digestion unit, also with fully-automatic lift
- Steam distillation units for (almost) any requirement
- Titration devices

The complete range for the CSB titration method:

- Dosing units for sulphuric acid, manual and also programmable
- Digestion units with fully-automatic time/temperature profile for standardised CSB determination
- Titrators, manual and fully-automatic, also as dosing-titrating combination

Further determinations

- Crude fiber
- Determination of fibers
- Cyanide
- Heavy metal digestion systems

Made in Germany

ISO 9001 BUREAU VERITAS Certification

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Subject to technical changes and errors.

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