# behrotest<sup>®</sup> K8 / K12 / K20/ K16 / K24 / K40 Digestion Unit





User's Manual

Please read this operating manual carefully before starting use of your new K8 / K12 / K20 / K16 / K24 / K40

### digestion unit!

The manual introduces you to the use of the apparatus with clear and simple guidance.

For reasons of safety in use of the system, please follow all safety warnings carefully. These are designated in the

text by a warning symbol  $\triangle$ .

Additional information, which is useful and important for an understanding of the manner of operation of the apparatus, is denoted by a stripe in the margin.

We wish you success in the use of the

# Safety Advice



Danger of burns! The digestion tubes and the inner zone of the heating block get hot! Never touch the hot glasses or the area of the heating block around the digestion tubes with the bare hands.



### Danger of electric shock!

Always install all cables in such a way that they cannot come into contact with the hot inner zone of the heating block; they could otherwise smoulder through! Always ensure that no liquids can come into contact with cable connections or the interior of the heating block! Always withdraw the mains plug before opening the unit! Repairs on electrical, electronic and mechanical modules of this appliance may be performed only by authorized specialist staff.



Danger of injury in case of breakage of glass! Always adhere to your professional association's regulations when handling glass parts!



Care is required when using and handling acids and alkalis! Danger of corrosive burns and injuries! ! Adhere to the current Hazardous Substances Ordinance!



5911

### Hazard from toxic gases!

During the Kjeldahl digestion, vapours of sulfuric acid (and other toxic gases) are set free. They could harm your health and damage the apparatus and your lab equipment. Always perform digesting operations which can result in evolution of toxic or corrosive vapours using a scrubber system! Place the digester and the scrubber in a fume cupboard.



Never operate the digestion unit in wet, humid or explosion-endangered areas! Maximum air humidity = 80% Maximum temperature = 40° C

# Contents

Safety Advice	3
Scope of supply	5
Correct use of the device	5
Overview of the behr K8 / K12 / K20 / K16 / K24 / K40	6
Setting up	8
Handling	9
Switching the appliance on	11
Using the K8 / K12 / K20 / K16 / K24 / K40	11
The operating unit	11
The Start menu	12
Configuring the K8 / K12 / K20 / K16 / K24 / K40 to meet your needs	12
Creating a temperature program	14
Processing samples	16
Maintenance of your K8/K12/K20/K16/K24/K40	18
Cleaning the Exhaust Collector	18
Keep your Device Working Reliably as Long as Possible	19
Do Not Use Damaged Vessels!	19
Always Use a Scrubber!	19
Don't Leave Any Places Empty!	19
Avoid bumping!	20
Foaming	20
What do I do if?	21
Technical Data	22
Customer Service	22

# Scope of supply

Please check the contents of the pack for completeness and freedom from damage immediately upon receipt.

Claims resulting from damage during transportation which is externally apparent must be lodged immediately with the carrier (i.e., the post/mail service, the railway administration, the freight organization, etc.) - see the label on the packaging.

In case of damage which is not apparent from outside ("concealed transportation damage"), please contact the behr after-sales service immediately upon discovery of the damage. The same applies in the case of any other complaints. Address:

behr Labor-Technik GmbH Spangerstrasse 8 D-40599 Düsseldorf, Germany Telephone: (+49 211) 7 48 47 17 Telefax: (+49 211) 7 48 47 48 e-mail: info@behr-labor.com

Your K8 / K12 / K20 / K16 / K24 / K40 digestion unit is packed in three parts:

- Heating block, ready assembled with mounting rail for sample rack and exhaust collector
- Sample rack
- Exhaust collector, ready assembled, with glass grid and mounting frame

Plus

- 1 set of sample vessels matching to the digestion unit
- Exhauster hose for connection to a behrosog process exhauster system, for example
- Drip pan, to be installed under the exhaust collector.

## Correct use of the device

The behrotest® K8 / K12 / K20 / K16 / K24 / K40 digestion unit is used for heating of samples in the appropriate digestion tubes. It is used, in particular, for quantitation of total nitrogen using the Kjeldahl digestion method.

The digestion unit can be heated to 430 ° C. Always ensure that you have selected the temperature program appropriate to your samples. Use the digestion tubes appropriate to this temperature, e.g. behrotest<sup>®</sup> digestion tubes. Only use the appropriate type of digestion tubes (round-bottom tubes).

Please under all circumstances note and adhere to the following items, in order to ensure the greatest possible operating safety and reliability and the longest possible service-life for your digestion unit:

- Always operate the appliance in accordance with the instructions and data contained in this operating manual!
- Modifications to the appliance will result in forfeit of any guarantee claims and can result in serious deficiencies in the unit's operating safety and reliability.
- During te Kjeldahl digestion, solfuric acid vapours (and other aggressive gases) are set free. Always operate the appliance with a scrubber system (e. g. behrosog) and place the appliance and the scrubber in a fume cupboard.
- Never under any circumstances expose the digestion unit to aggressive vapours, such as fumes from acids, alkalis or solvents!

Always operate the behrotest & K8 / K12 / K20 / K16 / K24 / K40 digestion unit under normal laboratory conditions.

# Overview of the K8 / K12 / K20 / K16 / K24 / K40



1.2 Mains switch

1

- 1.3 Heating slots for sample vessels
- 1.4 Aeration slots
- 1.5 Mains plug
- Mounting rail, with: 1.6
- 1.7 Hooks for suspending the sample rack while not in use
- 2 Sample rack Handles 2.1 2.2 Upper guide roller; it also serves for suspending the sample rack on the hooks 1.7
- 2.3 Lower guide roller
- 2.4 Sample vessels



3.5

4

Drip pan

Hooks for suspending the exhaust collector in

the cut-outs 1.8 on the mounting rail

059111

- 2.9 Lower bar of the frame, to hold the hooks (2.8) of the front lid
- © behr Labor-Technik GmbH

### behrotest® K8 / K12 / K20 / K16 / K24 / K40

# Setting up

- Position the heating block on the place provided in the fume cupboard. It should be located to the left of and adjacent to the exhauster system. Leave some room to the left and right; the aeration slots must be free.
- Insert the sample vessels into the sample rack.
- Position the sample rack on the heating block.

- Connect the exhauster hose to the socket on the rear panel of the exhaust collector.
- For the moment suspend the exhaust collector in the cut-outs on the top end of the mounting rail. Check that it is securely engaged.
- Connect the exhauster hose to your process exhauster system.





### Drip pan

After finishing a digestion, insert the drip pan below the exhaust collector. Insert the drip pan on the rail under the bottom of the exhaust collector and shift it in. Lift it up a bit so the hook can engage on the front panel of the exhaust collector. Don't forget removing the drip pan before starting the next digestion.

# Handling

The behrotest<sup>®</sup> K8 / K12 / K20 / K16 / K24 / K40 makes it quick and easy for you to insert your samples into the heating block and to remove them for cooling down. Thus you are always sure that all samples have been treated exactly the same.

Why not get acquainted with the handling right now?

Parking the sample rack

On the middle of the mounting rail in the rear of the heating block you will see two hooks to hang the sample rack on. When lifting the sample rack out of the heating block, run it along the mounting rail, and it will engage in the hooks automatically.

- Grasp the sample rack using the two red handles.
- Lift the rack carefully. Run it along the mounting rail while doing so. Lift the rack upward until you hear it engage.
- Lower the rack carefully onto the hooks, in order to check that it has engaged correctly. If this is not the case, lower it again and repeat the above procedure.

Now the device is in the same position as before the start of a digestion.

Insertig the samples into the heating block

- Grasp the sample rack using the two red handles.
- Position the sample rack on the digestion unit in such a way that the sample vessels locate in the holes in the digestion unit.
- Take the exhaust collector from the top of the mounting rail, and place it on top of the sample rack. The upper parts of the PTFE stoppers will rest on the rims of the sample vessels, and the suction tubes will go into the sample vessels so the fume extractor can remove any vapours coming out of them.







### Removing the samples from the heating block

When the digestion is completed, you should take the samples out of the heating block but leave the exhaust collector on the sample rack until the samples have cooled down. So now you need to lift the sample rack along with the exhaust collector out of the heating block and park them.

- Grasp the sample rack using the two red handles.
- Lift the rack carefully, together with the exhaust collector. Run it along the mounting rail while doing so. Lift the rack upward until you hear it engage.
- Lower the rack carefully onto the hooks, in order to check that it has engaged correctly. If this is not the case, lower it again and repeat the above procedure.

Parking the exhaust collector

- Grasp the exhaust collector using the two red handles.
- Remove the exhaust collector from the sample rack and suspend it in the cut-outs at the top end of the mounting rail.

### Front lid on the sample rack



### Danger of burn! The front lid gets hot! o not try to remove the front lid while a digestion is in progress.

The lid on the front side of the sample rack may be taken off. Thus you have the samples in view while digestion is in progress.

For routine digestions you should leave the front lid on. With the front lid on, less heat will escape so you will save energy.

### Removing and remounting the front lid

- Put the sample rack on an even surface.
- For taking the lid off, hold the sample rack down and pull the lid upwards until it can be taken off.
- For putting the lid on, insert it in a way as for the hooks and the fold to engage behind the lower and middle part of the sample rack frame, as indicated.





# Switching the appliance on

Switch the mains switch on the front of the appliance to the "I" position.

The mains switch of the behrotest<sup>®</sup> K8L / K12L / K20L / K16L / K24L / K40L performs two functions. It is used, on the one hand, to switch the unit on and off. There is, in addition, a fuse integrated into the switch.

This fuse functions similarly to a miniature circuitbreaker (m.c.b.) familiar from your household wiring system. It interrupts the electrical circuit if an overcurrent occurs.

Since it is necessary to pretension a spring for this safety function, the mains switch on the digestor requires greater force for switching on than a conventional mains switch.

An initialization message will appear briefly on the display when the unit is switched on. The main menu appears once the initialization routine has been completed:



The device is now ready for operation.

Don't wonder if the start menu appears in German. This is the factory setting; you'll soon see how to change it (see p. 12 / 13).

# Using the K8 / K12 / K20 / K16 / K24 / K40

### The operating unit



You can program and operate your behrotest & K8 / K12 / K20 / K16 / K24 / K40 quite simply using a single button. The principle is the same in all cases:

The principle remains in all cases the same:

Turning the knob enables you to choose an option. The currently addressable option is recognized by being highlighted with light text on a dark background.

The knob may be turned in both directions. In doing this, you will pass all possible options in the display shown and will always again find the desired option on continued turning. Try this for yourself.

The desired option is implemented by pressing on the knob.

The complete procedure of choosing by turning and implementing by pressing will henceforth simply be called "selecting."

### The Start menu



- If a program has been started, or the unit is preheating, the target temperature is displayed here.
  If no program is running, but a starting time has been selected, the starting time is displayed here.
  This box is otherwise blank.
- 2 The temperature currently measured by the temperature sensor is always displayed here.
- 3 "Start" menu item: The temperature program most recently selected starts if this menu item is selected. What program this is is1 indicated at bottom left.
- 4 "Preheat ON/OFF" menu item: the K8 / K12 / K20 will preheat to the starting temperature for the temperature program selected if this menu item is selected. The menu item will then change to "OFF". Select "OFF" in order to switch the heating function off again.
- 5 The program currently selected, and the program step reached, are indicated here.
- 6 **"Continue"** menu item: select this menu item to access other possible settings. You can
  - select another program
  - write a new program
  - configure the unit to your needs

# Configuring the K8 / K12 / K20 / K16 / K24 / K40 to meet your needs

You can, in fact, use your K8 / K12 / K20 / K16 / K24 / K40 for analyses right now. You should, however, take a couple of minutes to perform one or two settings.

These settings can, of course, also be made or modified at a later time.

This screen will appear when the unit is switched on:



Turn the operating button until the ==>> menu item is indicated and then press the button. The following menu will appear:

PROGRAMM	01
GERAET	
<<== zurück	

Select the Geraet (Device) menu item. You will then move to a menu consisting of two pages.

Select the required entry by turning the operating button if you wish to change a setting. Press the button to select the entry and set the required value by turning the button. Store the value by pressing the operating button again.

# First page: Language and time Select language



Three languages are permanently programmed in the K8 / K12 / K20 / K16 / K24 / K40 : D (German), GB (English), F (French). A fourth language can be added as an option.

German is the default (ex-works) language. A different language can be selected using this menu.

Select the Sprache (Language) menu item. The entry for the language will now appear on a dark background. Turn the operating button until the required language appears, and then press the button.

From this point on, all menus and messages will appear in the language you have selected.

### Setting the time

You should also set the time while you are on this page. The time is required to permit use of the K8 / K12 / K20's Autostart function.

Select the *Time* menu item. The first digit of the hours will then appear marked.



You can now enter the digits for the time one after the other. Turn the operating button until the correct digit appears, and then press it.



If an illogical value is entered, such as "26" for the hours or "61" for minutes, for example, the unit will reject the value and instead jump back to the first digit of the setting.

Use ==>> to move to the next page of this menu.

### Second page: Autostart settings



The Autostart settings can be selected on this page. You can, for example, set the unit to preheat at a specified time or to start a temperature program at a specified time.

Autostart	The following possibilities can be selected here:	
Off - the K8/K12/K20/K16/K24/K only start to heat when a program is ted or <b>On</b> is selected in the Start me <b>On</b> - the K8/K12/K20/K16/K24/K4 preheat to the starting temperature of most recently selected program as a as it is switched on at the mains swi		
	(p. 7, 2.3).	
	<b>Prg</b> - the K8/K12/K20/K16/K24/K40 will start the most recently selected temperature program at the <b>Start time</b> .	
	<i>Tme</i> - the K8/K12/K20/K16/K24/K40 will start to preheat to the starting tempe- rature of the most recently selected tem- perature program at the <i>Start time</i> .	
Start time	Starting time for <b>Prg</b> and <b>Tme</b> .	

 The value can be set digit-by-digit, as described before.

<<==	back.

Selecting <<== repeatedly returns the unit to the Start menu.

### Creating a temperature program

The K8 / K12 / K20 / K16 / K24 / K40 can be used to write up to ten different temperature programs.

A program can have up to 10 program steps.

- When writing a program, always note its purpose and the settings selected.
- Select ==>> in the Start menu and select *Program* in the menu which then appears.

You are now on the first page of the Program menu.



Select the entry box for the Program No.



- Select the required Program No. You should select 01 if you have not yet written any other program.
- Then select ==>>.

You will now see for every program step a page, on which you can enter the settings for this step.

Program	01/05
TEMPERATURE	350
TIME	12 <u>0</u>
FUNCTION	Т
<<==	==>>

The Program No. and the Program Step No. which you are currently editing are shown in the top line. Program 07/05, for example, indicates the fifth step in Program No. 07.

This screen page will change its appearance depending on the Function you select.

There are the following possibilities:

Function T: Temperature step



In this function, the unit heats up to the specified *Temperature* as quickly as possible (if it is not already preheated) and then maintains this temperature. The entire procedure (heating-up and maintaining, together) lasts the stated *Time* in minutes.

You can enter *Temperature* and *Time* digit-bydigit. The unit will not accept an impermissible temperature and will instead jump back to the first digit of the entry box.

# Function C/M: Heating rate (degrees Celsius per Minute)

Program	02/07
TEMPERATURE	350
TIME	120
FUNCTION	C/M
<<==	==>>

In this function, the unit heats up uniformly to the specified *Temperature* (in degrees Celsius) in the specified *Time* (in minutes). It thus operates on a temperature gradient.

The temperature gradients which can in fact be operated depend on the type and heat output of the digester, and also on the heat capacity of the samples.

Perform a trial run and find out for yourself, using the temperature display, whether the temperature plots set can actually be achieved.

### Function E: End

This function is used to inform the K8 / K12 / K20 / K16 / K24 / K40 that the temperature program ends here.

Every program memory slot consists of ten slots for program steps. The K8 / K12 / K20 / K16 / K24 / K40 works through these ten program steps in sequence if it does not previously encounter an End step.

The last program step of every program must therefore be an End step. An End step is only not needed if the program actually has the maximum of ten steps.

A program can thus be written as follows:

- For the first step, enter the required function and the corresponding values.
- Select ==>>. This then leads to the next program step.
- Continue this procedure to program all the required steps.
- Select <<== if you wish to check or modify the program step entered. Use ==>> to move forward again.
- Remember to enter End (Function E) as the final step. An End step is only not needed if the program has ten steps.
- Press <<== repeatedly to return to the Start menu.</p>

Which program settings are most useful for you will depend on your digester, the digestion method and the nature of the samples.

### **Processing samples**

Switch the K8 / K12 / K20 / K16 / K24 / K40 on (mains switch on the rear panel of the unit, Page 7, 2.3).



If you have selected *Prg* or *Tme* for the Autostart functions, the starting time will be shown at the top left; the target temperature will be shown in this position if the unit is preheating.

### Select program

The most recently selected program is displayed in the bottom line of the Start menu. Select a different program if this is not the program you require now:

Select continue ==>>





- Select the required *Program No.*
- Return to the Start menu by selecting <<== repeatedly.

### Preheating the digester



Danger of burns! The inner zone of the heating block gets hot! Never touch the hot glasses or the area of the heating block around the mounting holes with the bare hands.

If necessary, preheat the digester to the starting temperature.

022	°C
START	ΟΝ
Prog 01/01	==>>

Select the **ON** menu item in the Start menu.

The device will now start to preheat to the starting temperature of the program selected.

165	022	°C
	START	OFF
Prog 01	/01	==>>

The temperature to which the device will preheat is now shown at the top left of the display, and the temperature reached at the center.

Select **OFF** if you wish to abort preheating.

Inserting the samples, starting the program



Danger of burns! The inner zone of the heating block gets hot! Never touch the hot glasses or the area of the heating block around the mounting holes with the bare hands. Use the sample rack to insert the samples.



- If the drip pan has been inserted, take it out. To do this, lift the front side of the drip pan up a bit so you can pull the hook over the panel of the exhaust collector.
- Position the sample rack bearing the samples on the digestion unit in such a way that the sample vessels locate in the holes in the digestion unit.
- Put the exhaust collector in position and switch the exhauster system on.
- Select the Start menu item in the Start menu.



The selected target temperature will now appear at top left on the display, with the currently measured temperature next to it;

The time for this program step and total remaining time are shown in the next line down.

The program step which is currently being run is shown at the bottom.



The K8 / K12 / K20 / K16 / K24 / K40 does not react to any operation of the operating button while a program is running. The program cannot be interrupted by actuating the operating button. This is intended to prevent any inadvertent interruption or manipulation of a program while it is running.

Please use the mains switch (Page 7, 2.3) at the bottom on the front side if you should need to abort a digestion.

A signal is heard, and the heating system switches off, when the program has been completed.

Finishing digestion and taking out the samples



Danger of burns! The inner zone of the heating block and the sample vessels get hot!

Never touch the hot glasses or the area of the heating block around the mounting holes with the bare hands. Always remove the samples from the heating block using the sample rack and allow them to cool as described here.



Caution the heating block and the tubes get 400 °C hot. If the sample vessels are left in the heating block cooling down, they may get jammed or even cracked due to the different expansion coefficients. Do not leave the sample vessels in the block after digestion; proceed as described here.

Hooks on which the sample rack can be suspended are located on the mounting rail on the rear side of the digestion unit. The rack will engage automatically in the hooks if it is run along the rail during raising.

- Grasp the sample rack using the two red handles.
- Lift the rack carefully, together with the exhaust collector. Run it along the mounting rail while doing so. Lift the rack upward until you hear it engage.
- Lower the rack carefully onto the hooks, in order to check that it has engaged correctly. If this is not the case, lower it again and repeat the above procedure.
- Leave the exhaust collector on the sample rack until the samples have cooled down.
- Once the samples have cooled, switch the exhauster system off.
- Remove the exhaust collector from the sample rack and suspend it in the cut-outs at the top end of the mounting rail.



Insert the drip pan on the rail under the bottom of the exhaust collector and shift it in. Lift it up a bit so the hook can engage on the front panel of the exhaust collector. Don't forget removing the drip pan before starting the next digestion.

The sample rack can now be removed for further processing of the samples.

# Maintenance of your K8/K12/K20/K16/K24/K40



Danger of electric shock! Always ensure that no liquids can come into contact with cable connections or the interior of the unit. Never attempt to open the unit! Repairs to electrical equipment may be performed only by specialist electricians.

### Checking the Temperature

All behr Kjeldahl heating blocks have a boring (2 mm ø) in the center of the aluminium block. You can insert the temperature sensor of an electronic thermometer there to check the temperatur. Check if the temperature measured corresponds to the temperature display of the heating block.

Remove the temperature sensor again before starting a digestion.

### Cleaning the Exhaust Collector



Danger of injury in case of breakage of glass! Always adhere to your professional association's regulations when handling glass elements!



Caution: there may be sulphuric acid in the exhaust collector! It might burn you. Adhere to the current Hazardous Substances Ordinance!

If, during a digestion, the exhaust collector has been contaminated by sample components, you can easily clean it.

- Cautiously lay the exhaust collector upside down, with the nozzles pointing upwards.
- Rinse the nozzles with distilled water.
- If need be, gently apply a small bottle brush or a pipecleaner to clean the nozzles.

If necessary, you can dismantle the PTFE sealings from the nozzles for cleaning.

- Grasp the sealing at the sides, and at the same time cautiously press against the nozzle with your thumbs.
- Gently wiggling withdraw the sealing from the nozzle.

After cleaning the sealings, put them on the nozzles again by reversing this procedure.





# Changing Tubes of the Exhaust Collector

If a glass part of the exhaust collector has broken, you need not replace the exhaust collector as a whole. The iner parts of the exhaust collector consist of

- the suction vessels that reach into the sample vessels with their long tubes (carrying the PTFEstoppers on their ends); with
- Short Viton tube cuttings they are connected to the
- collecting tube. And on the nozzle of this collecting tube there is the
- Suction hose that connects the exhaust collector to the scrubber.



Danger of injury in case of breakage of glass! Always adhere to your professional association's regulations when handling glass parts!

Opening the Housing of the Exhaust Collector

- Undo the four screws on the rear panel of the housing.
- Undo the four screws on the roof of the housing.
- Take the panel off that forms the rear and the roof of the housing.

On top of the suction vessels you see the two crossbars that are fixing them. They had held the roof panel by the four screws that you have just unscrewed. They are themselves fastened to the intermediate bottom by four long screws.

- Unscrew the long screws that hold the crossbars to the intermediate bottom.
- Take these two crossbars off the suction vessels.

The suction vessels, with their long suction nozzles, go through borings of an intermediate bottom. In order to take them out you must first take the PTFE stoppers off the suction nozzles.









0591

### Taking Off the PTFE Stoppers

- Cautiously turn the exhaust collector bottom up so that the suction nozzles are pointing upwards.
- From the suction vessels you want to replace, pull the PTFE stoppers off.
- Turn the exhaust collector to the normal position again.

### Changing the Glassware

- On the suction vessel you want to replace, pry the upper hose clip open with broad pliers and push the hose clip downwards on the hose.
- Cautiously pull the suction vessel out of the viton hose cutting.

In case you want to replace the collecting tube, you need to take out all the suction vessels this way.

- Insert the new suction vessel into the intermediate bottom and push the nozzle into the viton hose cutting.
- Secure the joint of the hose cutting and the new suction vessel by pushing the hose clip to the upper position again.
- If need be, shift the collecting tube and the suction vessels connected to it in such a way that the nozzles go centered through the borings of the intermediate bottom.
- Lay the crossbars on top of the suction vessels again and screw them to the intermediate bottom with the long screws.
- Screw the roof panel onto the crossbars again.
- Screw the back panel tight too.
- Turn the exhaust collector bottom up again and push the PTFE stoppers on the nozzles.









# Keep your Device Working Reliably as Long as Possible

The Kjeldahl digestion produces a highly aggressive mixture of sulfuric acid vapour, sulfur dioxide and organic vapours. This gas mixture will, with time, corrode even stainless steel surfaces and make them look shabby.

If acid drips in the aluminium heating block, it will eat away the aluminium and transform it into bloomings of aluminium oxide. The sample vessels won't match into the block any more (or they cannot be taken out any more) or they are no longer heated properly.

### Do Not Use Damaged Vessels!

Before preparing the samples, check the sample vessels. Do not use vessels that have a fissure; they might burst when heated.

### Always Use a Scrubber!

The exhaust gases coming out of a Kjeldahl digestion are corrosive; moreover they are poisonous, and they will also damage your lab equipment. So always use a scrubber system, as e.g. the behrosog 3. Fill the gas washing flasks according to the user's manual (the first one with water, the second one with diluted NaOH). Connect the suction hose to the outlet nozzle in the rear of the exhaust collector.

Make sure to insert the exhaust collector properly on the sample vessels. The suction nozzles must reach into the vessels; the uppermost disk on the nozzles will rest on the rim of the vessel. Adjust the suction flow rate in such a way that the white fumes are sucked off but no vacuum will arise.

### Don't Leave Any Places Empty!

The suction air current will always go the way of least resistance. So if you leave some sample places empty, if there is no sample vessel under the suction nozzle, the scrubber will aspirate most of its air from there. The caustic vapours coming out of the samples are not removed; instead, they will creep over the rim of the vessel. Caustic condensate may drip down from there, damaging the heating block and the sample rack. If worst comes to worst, drops may come into the gap between the vessel and the boring in the heating block, evaporating explosively and cracking the vessel. So always insert samples on all sample places; at least, insert empty sample vessels.



Samples in all places: Waste gas will be removed smoothly



Some places left free: Scrubber will draw air, gas will accumulate and come out sideways



059111

### Avoid bumping!

With liquid samples, bumping may occur so that liquid will splash out of the sample. With liquid samples, add some boiling chips. Boiling chips do not contain nitrogen. Nevertheless, treat the blank in the same way as the samples.

When digesting liquids like water or milk, the water contained in them must be evaporated before digeschion really starts. During this time, heating must be adjusted in such a way that the sample is boiling steadily but does not boil over.

### Foaming

Some kinds of samples will develop a foam when reacting with concentrated sulfuric acid, which will rise up in the vessels, creep over the rims or even rise into the suction nozzles. Textbooks have various advices what to do against foam – but it will depend on the kind of sample which technique will work.

- Heating slowly so the foam won't rise so fast, maybe even preparing the sample in the evening and letting it rest overnight before starting the digestion. That will sometimes work, but it won't always work. Some sample materials will start reacting with the sulfuric acid in the cold, and the longer it takes the sample to reach digestion temperature, the higher the foam will rise.
- In these cases it is better to have the sample come to digestion temperature as quick as possible so the foam will collapse soon. Which means: preheat the block and prepare the sample immediately before starting the digestion.
- An anti-foam agent can neutralize the foaming components of the sample. Add some drops of paraffine oil or silicone oil to the sample. Make sure to treat the blank in the same way as the samples.
  - If you have an infrared digestion device (e.g. behr InKjel) too, the easiest way to digest high-protein samples will be the infrared digestion. In an infrared digestion, the samples reach digestion temperature very quickly so the foam will collapse soon.

### After Digestion: Take the Samples Out

During digestion, the block and the sample vessels will get more than 400 °C hot. If you let the vessels cool down in the digestion block, it can happen that they get jammed or even crushed, due to different thermal expansion coefficients of aluminium and glass.

Take the sample rack out of the block right after digestion and hang it on the hooks. The scrubber must still be left working.



For liquid samples, use boiling chips



– 22 –

# What do I do if ...?

The behr Kjeldahl heating block has an internal fault scanning system. This is capable of detecting five different error situations. "Error" will then appear on a red background, together with a Code No., on the display. An alarm signal (bleep tones) is also heard. The numbers have the following meanings:

Code	Meaning	Remedy
002	The temperature sensor is not detected.	Notify the behr after-sales service.
003	Short-circuit on the temperature sensor.	
010	The thermal cut-out on the heating block has tripped.	Switch the device off and allow the heating block to cool for a while. Make sure the % function has not inadvertently been selected in your temperature program. Reset the termal cut-out before switching on again (see below).
	The heating system or the triac control system of the digester unit is defective.	Notify the behr after-sales service.
011	The device heats without stopping.	
100	General error.	

Resetting the thermal cut-out:

You find the thermal cut-out in the rear of the device. In the boring above the power socket there is a small green lever. Press this lever downwards with a screw driver. It will engage with a click. If it doesn't, the cause of the malfunction is elsewhere; notify the behr after-sales service.

If it is not possible to switch the appliance on at all (the display remains dark), it is possible that a mains fuse has tripped. Switch the appliance off and on again after a few minutes. Notify the behr after-sales service if it is still not possible to switch the appliance on or if the problem occurs repeatedly.

### If the thermal cut-out keeps tripping:

It must be possible to heat the block to 430 °C. If the thermal cut-out keeps tripping before reaching digestion temperature, please notify the behr after-sales service.



## **Technical Data**

230 V~, 50 Hz
up to 430 °C, digitally adjustable
0 to 999 minutes, digitally adjustable
10
LCD

# **Spare Parts**

Article	ArtNr.
Round-bottom digestion vessel 250 ml, for K8, K12, K20	B 0021 7959
PTFE stopper N, for K8L, K12L, K20L	B 0023 0803
Round-bottom digestion vessel 100 ml, for K16, K24, K40	B 0021 7960
PTFE stopper M, for K16, K24, K40	B 0050 0481
Suction vessel 2-fold, for K8	B 0023 1854
Suction vessel 3-fold, for K12	B 0023 1855
Suction vessel 4-fold, for K20	B 0023 1857
Suction vessel 4-fold, for K16, K24	B 0044 0884
Suction vessel 5-fold, for K40	B 0044 0882
Collecting tube for exhaust collector, for K8, K12	B 0023 1853
Collecting tube for exhaust collector, for K20	B 0023 1856
Collecting tube for exhaust collector, for K16	B 0044 0886
Collecting tube for exhaust collector, for K24	B 0044 0885
Collecting tube for exhaust collector, for K40	B 0044 0883
Suction hose, Viton <sup>®</sup> , 1 m	B 0022 4985
Hose clip for the suction hose	B 0023 3672
Viton hose cutting for exhaust collector	B 0012 4089
Hose clip for the exhaust collector	B 0023 3673

## **Customer Service**

behr Labor-Technik GmbH Spangerstraße 8 D-40599 Düsseldorf Phone Customer service: (+49 211) 7 48 47 31 Spare parts: (+49 211) 7 48 47 17 Telefax: (+49 211) 7 48 47 48 E-mail: info@behr-labor.com