behr
Labor-Technik

CF 2+2 / CF 6

Device for Determining Crude Fiber Content According to EN ISO 6865 Semi-Automatic with User Guidance

Firmware version 1.01

User's Manual

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Please read these operating instructions carefully before starting up your new behrotest® device for determining Crude Fiber Content!

The operating manual gives clear and simple instructions for use of the apparatus.

In the interest of eliminating risk please observe the safety instructions given in this manual! They are marked with a ⚠ symbol.

Additional useful and important information on the functioning of the apparatus is marked by a stripe in the margin.

We wish you every success in your work with the

behrotest® device for determining Crude Fiber Content!

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Safety advice

Danger of electric shock! Make sure that no liquids get into the cable connections or the inside of the equipment.
There are no components inside the appliance which you need to operate. Repairs to electrical equipment must be carried out only by trained specialists. Unplug the mains plug before opening the appliance.

Glass can break and cause injury! In working with glass components, observe all appropriate safety precautions.

Be careful in working with corrosive substances! Follow the safety guidance in the pertinent Safety Data Sheets.

Caution: acetone and petroleum ether are inflammable! Perform all procedures working with organic solvents in the optional defattening unit DG 2+2 / DG 6, not in the CF 2+2 / CF 6. Empty the waste containers regularly; define whether the contents are to be recycled or to be disposed of.

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Appropriate Use

The CF 2+2 / CF 6 is only meant for use with diluted aqueos acids and bases,
not for use with organic solvents (danger of explosion) or with concentrated acids and bases.
Organic solvents or concentrated acids or bases could damage parts of the device.

Contents

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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:

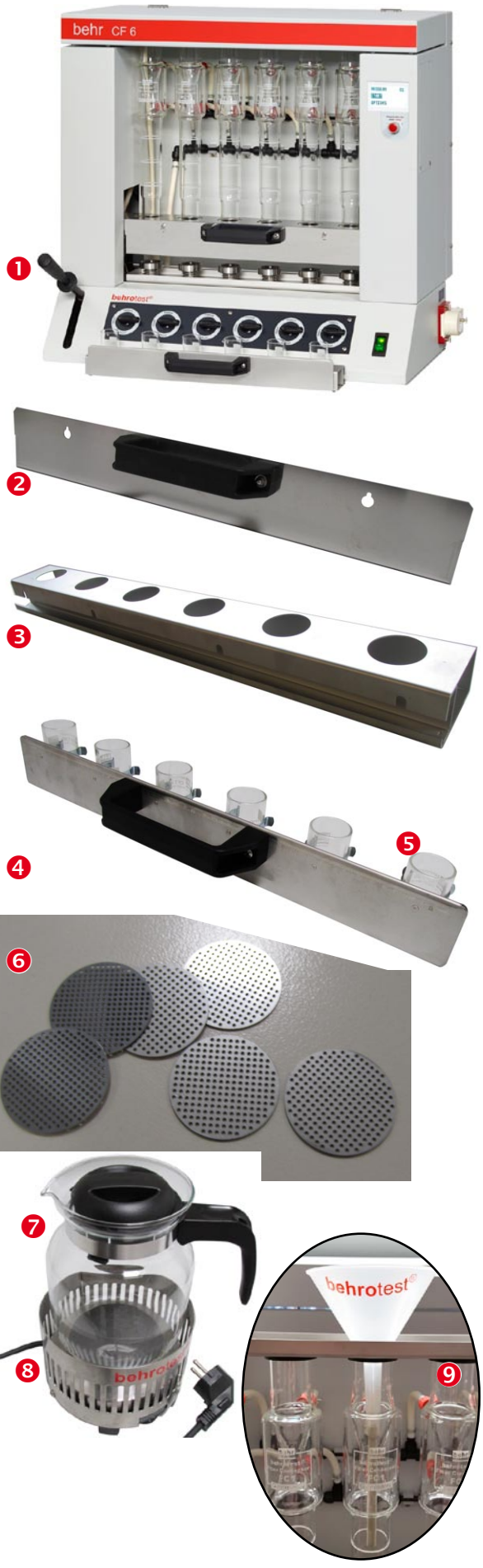
behr Labor-Technik GmbH
Spangerstrasse 8
D-40599 Düsseldorf, Germany
Telephone: (+49 211) 7 48 47 17
Telefax: (+49 211) 7 48 47 48
E-mail: info@behr-labor.com.

Please check the contents against the following list.

Parts list

- ❶ Infrared-heated crude-fibre digestion unit CF 2+2 / CF 6 for 4 or 6 samples, respectively
- ❷ Heat-protection shield for CF 2+2 / CF 6
- ❸ Crucible rack for docking to the CF 2+2 / CF 6
- ❹ Transport gripper to simultaneously take the 4 or 6 crucibles out or insert them
- ❺ 4 or 6 filter crucibles, respectively, packed separately
- ❻ 4 or 6 sieves to be inserted in the suction nozzles
- ❼ 3 jugs,marked for water, acid, and base
- ❽ 2 heating plates
- ❾ Funnel with prolonged outlet for filling in the reagents
- ● Hose set with the cooling-water hoses and the waste-water hose.

In addition, you need a waste-water container and, in case you are using the optional defattening unit, collecting containers for the acetone and petroleum ether.



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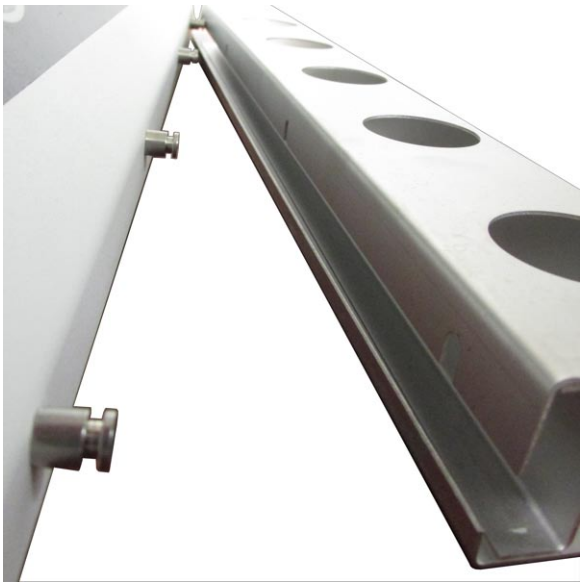
Setting Up And Connecting

Glass can break and cause injury! In working with glass components, observe all appropriate safety precautions.

- Place the infrared crude-fibre unit CF 2+2 / CF 6 on a flat level surface.
- Hang the crucible rack on the hooks in front of the crude-fibre unit.
- Connect the waste-water hose of the crude-fibre unit to the waste-water container (optional).
- Make sure the power switches of the devices and, the case being, of the heating plates are off.
- Connect the infrared crude-fibre unit and, the case being, the defattening unit to mains.

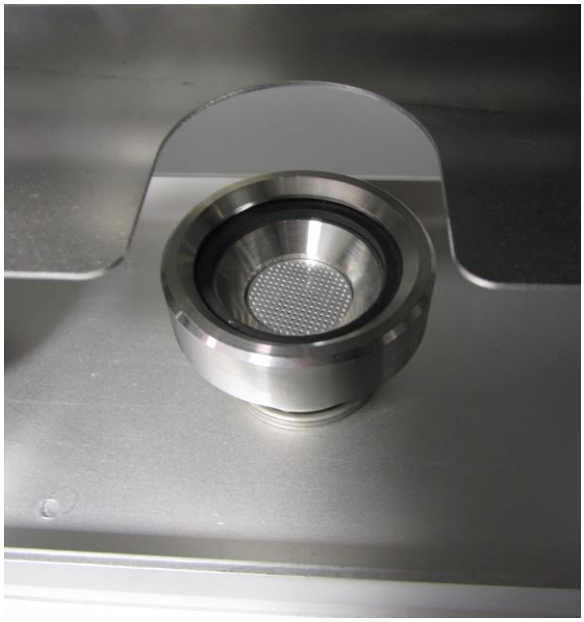


Inserting the sieves

The suction nozzles have stainless-steel sieves laid in, to protect the pump from coarse particles in case a frit should break. On delivery, these sieves come packed separately.

- Using tweezers, lay a sieve in each suction nozzle.

If, later on, you want to change a sieve, take it out of the nozzle with a pin.



Inserting the crucibles in the multi-crucible snapper

On delivery, the filter crucibles and the heat shield come packed separately; insert them in the device now:

- Insert the crucibles in the crucible rack.
- Push the multi-crucible snapper on the crucibles.

Inserting the crucibles in the device

- Release the lock lever by pressing it down a bit and pulling the locking grip towards yourself with your thumb.
- Let the lever come up to the end position; release the locking grip as soon as the lever is out of the lock position.
- Insert the crucibles in the device.
- Push the lock lever down until it engages.Now the crucibles are locked.

Later on, you won't ever grasp the crucibles one by one but insert them in the device using the multi-crucible snapper, and get them out or transfer them to or from the optional defattening unit.

Insert the crucibles in the crucible rack ...

... and press the multi-crucible snapper on the crucibles

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Inserting the heat shield

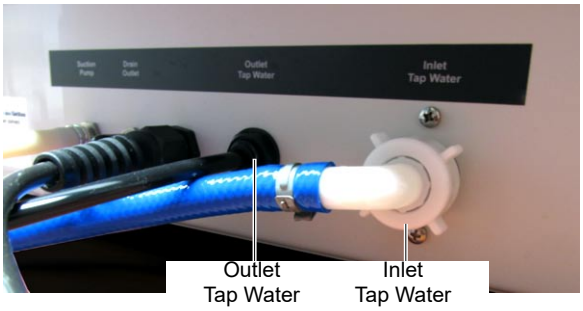
- Hang the heat shield on the hooks on the front of the device.

Cooling-water connections

The cooling-water inlet hose has 3/4" screw connectors on both ends.

- Screw the cooling-water inlet hose to the socket marked "Inlet Tap Water".
- Connect the inlet hose to a water tap.
- Push the cooling-water outlet hose (black polyamide hose) into the socket marked "Outlet Tap Water" as far as it will go and lay it to a sink.
- Open the water tap.

> The CF 2+2 / CF 6 crude-fibre unit can only be operated if cooling water is on. If you try operating it without cooling water, an error message willl appear, and the software cannot be started.



Outlet Tap Water (quick push-in connection)

Outlet hose is a thin polyamide hose; push into the socket as far as it will go

Inlet Tap Water (screw connection)

Inlet hose has screw connections on both ends

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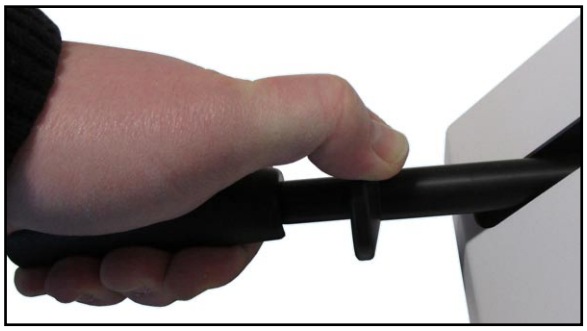
Some Routine Procedures With This Device

Taking Out and Inserting the Crucibles

Crude-Fibre determination with the CF 2+2 / CF 6 is performed with the same filter crucibles for digestion, filtration and incineration. The crucibles are locked under the condensers of the digestion device. In order to insert the crucibles, to take them out or to transfer them from the digestion device to the defattening device and back, there's the multi-crucible snapper. It makes you sure not to mix the samples up. (On delivery, the crucibles came packed separately.)

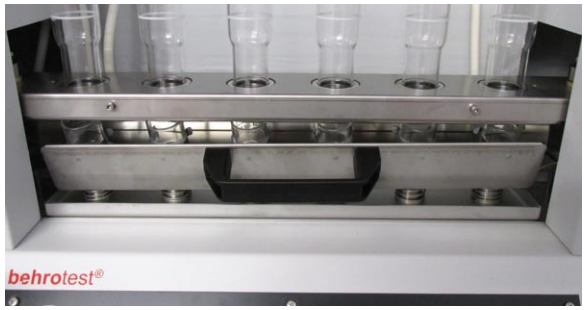


STOP

If you unlock the lock lever without gripping the crucibles before with the multi-crucible snapper, the crucibles will fall out of the device and break. So always grip the crucibles with the multi-crucible snapper, then unlock the lock lever and take the crucibles out simultaneously. Doing it this way, you always have the crucibles in the proper order and are sure not to mix the samples up.

During a digestion, the crucibles are concealed behind the heat shield. In order to take the crucibles out after digestion and filtration, you need first to take the heat shield off.

- Grasping the heat shield with the handle, lift it up a bit so the two "keyholes" will pass over the pins that are holding it.
- Take the heat shield off and lay it aside.



- Now push the multi-crucible snapper on the crucibles that are locked in the device. You will need to press quite firmly until all four or six spring clips have properly locked on the crucibles.
  Now you can unlock the crucibles:
- Release the lock lever by pressing it down a bit and pulling the locking grip towards yourself with your thumb.
- Let the lever come up to the end position; release the locking grip as soon as the lever is out of the lock position.
- With the multi-crucible snapper, take the crucibles out of the device and insert them in the crucible rack in front of the device.

In order to insert the crucibles in the device again, proceed in inverse direction. In the same way insert the crucibles in the optional defattening unit DG 2+2 / DG 6 and back out.

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Filtrating

The samples in the digestion vessels will be differently easy to filtrate, even if they are of the same material - maybe the sample weights are slightly different, or one sample has got more filter aid added than the other.

If you try to filter all these samples simultaneously, the fastest one will already be sucking air while others, may be, have got clogged. So don't do that; filter them one by one. This is the way it is arranged in the software.

- When the program asks you, turn the valve into "Vacuum" position, confirm by pressing the control knob and let the pump drain the content of the vessel. Turn the valve back to "Closed" before opening the next one.

Blowing the frits free

On cooking with acid and then with base, part of the sample material is dissolved. Sometimes the remaining part will consist of very fine particles that will clog the frit on filtrating. In order to get the frits free again, the washing procedures of the program have a part where air is blown through the frit.

In the software, an overall aeration time is given that is meant for all samples together. The display will always show the remaining aeration time.

- Turn the valves, one after the other, cautiously into "Pressure" position and have air blown through the frit.

> If the frits had not been clogged in the first place, blowing might cause part of the sample to be splashed up into the condensers from where it needs to be rinsed back in the next steps. To prevent this, turn the valves cautiously.

After a few seconds, the frit should be free again.

- Turn the valve back to "Closed" before blowing the next frit free.

The Defattening Unit (optional)

The determination procedure of crude fibre has some steps operating with volatile organic solvents. Before starting the digestion itself, the sample is treated with petroleum ether to remove fat. After the acid digestion step it can be necessary - depending of the nature of the sample - to remove another fraction of fat; in this case the wet sample must be treated with acetone first to remove water. And at the very end, the sample is washed with acetone to make drying easier.

These procedure steps must not be carried out in the CF 2+2 / CF 6 digestion unit. For these steps there is the optional defattening unit DG 2+2 / DG 6. The defattening unit has no condensers and no IR radiator or any other kind of heating, but, instead, it has two separate suction pumps so you can collect acetone and petroleum ether separately and decide if and how they are to be recycled.

The procedure of locking and unlocking the crucibles is the same for the optional defattening unit as for the IR digestion unit.

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Programming the CF 2+2 / CF 6

The operating control unit

Your crude-fibre unit CF 2+2 / CF 6 is programmed and operated easily with a single knob.

The principle remains in all cases the same:

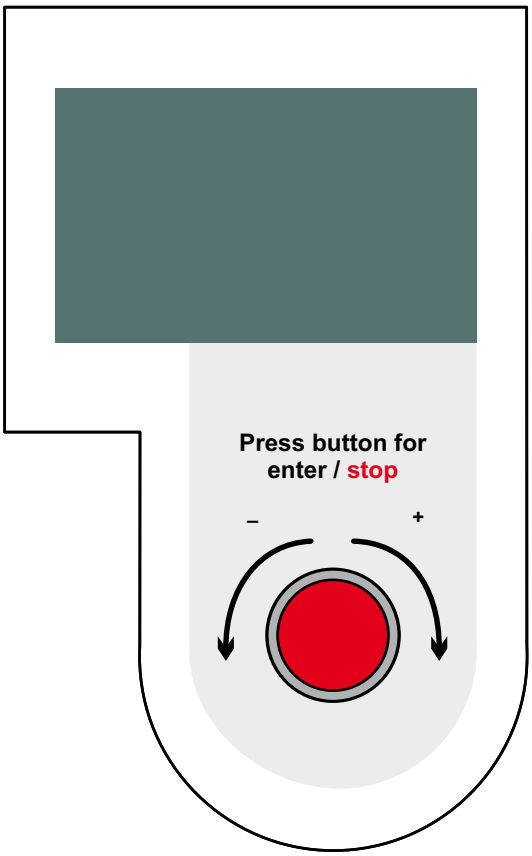
Turning the knob enables you to choose an option. The currently addressable option is recognized by being highlighted with green text on a black background.

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.

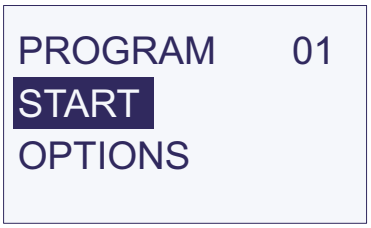
The complete procedure of choosing by turning and implementing by pressing will henceforth simply be called “selecting”.

The following pages will show you how to program and operate your crude-fibre apparatus.



For you being able to switch the device on, the cooling water must be on; otherwise on switching on there will only be an error message.

After switching on and initialization you will see the following display:



This is the **main menu**. From here you come to all other menus and displays.

The option ***START*** is pre-programmed as a default setting.

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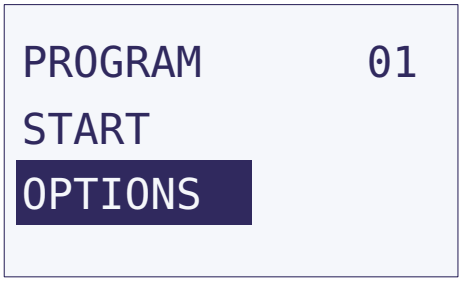
Adapting the CF 2+2 / CF 6 to your requirements

Your crude-fibre digestion apparatus can be adapted to a significant degree to accommodate your personal requirements and those of your work environment.

To do this, first select ***Options*** in the main menu and then select ***Device*** in the sub-menu.

You will find several options.



Choosing the language

Language This enables you to choose the language of the display.

These languages are available:

D = German
GB = English
F = French and
one additional language, which you may have possibly specified in purchasing your behr CF 2+2 / CF 6.

Configuring the level sensor

Container Switches the level sensor for the waste container on or off.

The factory default setting is ***Off***. Switch the setting to ***On***, if you are using a level sensor. If you are not using the canister set, then do not change the factory default setting.

Setting the time

Time Set the time of day using the operating control knob.

Once all settings in this menu have been made in accordance with your requirements, you can proceed to the next menu using **==>>**.

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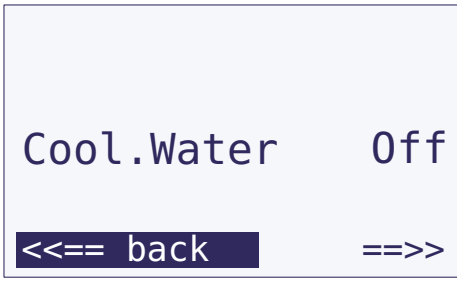
Cooling Water Source Setting

Cool water

The factory default setting is ***Off***. Do not change this setting if you have connected the digestion apparatus to a cold water tap. Cold water will only be drawn from the tap during actual digestion.

Select ***On***, if you are using a circulating water cooler.The cooler will circulate cold water . The cooling water will circulate continuously as long as the crude-fibre digestion apparatus remains switched on.

- ❑ Follow the instructions in the operating manual provided with your circulating water cooler.



Select **==>>** to proceed to the next menu, or **<<==** to return to the previous menu.

Setting the Date

On the third page of the Device Menu you can set the current date. Select and modify the ***Year***, ***Month*** and ***Day*** entries separately.

Select **<<==** to return to the previous menues.

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Working with the CF 2+2 / CF 6

Preparing the Crucibles

Charging the crucibles with filter aid **may** be carried out in the optional defattening unit. To do this, the filter aid is suspended in water and then filtered with the defattening unit.

- Approx. 2 g Celite 545 filter aid are suspended in about 50 ml dist. water.
- In the unit the crucibles are inserted with the multi-crucible snapper and locked by pressing the black lock lever on the left side of the device down. Now the valves are turned each from "Closed" to Acetone / Water position.
- By acting the left green push-button the pump is switched on and the Celite suspension is filtered.
- Then one washes with a little acetone and dries the crucibles about 2 - 3 hours at 130 °C in the drying cupboard. After cooling down in the desiccator, the crucibles are weighed on an analytic balance, and this procedure is repeated up to constant weight.

Suspend Celite® in water to achieve a clear solution

Weighing the Samples In

Depending on the nature of the sample material, add about 1 g of sample into each prepared crucible.

Sample weight: w1

In the formula for calculating the crude fibre content, the sample weight w_1 is a net weight, i. e. just the weight of the sample material without the crucible and the filter aid. But the weights w_2 and w_3 are measured as gross weights, including the crucible and the filter aid. Has someone made a mistake?.
No - on calculating the loss on ignition, $w_2 - w_3$, the weight of the crucible and the filter aid is part both of w_2 and w_3, so it will just cancel out. The loss on ignition resulting from this is thus a net value anyhow.

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For samples rich in fat: Defattening (Defattening unit optional)

If the sample material has more than 10% fat, the samples need to be defattened.

Caution: acetone and petroleum ether are inflammable! Perform all procedures working with organic solvents in the optional defattening unit DG 2+2 / DG 6, not in the CF 2+2 / CF 6.

- Insert the crucibles containing the samples into the defattening unit DG 2+2 / DG 6.
- Turn all valves in "Closed" position.
- Pour 30 ml petroleum ether 40 - 60 °C into each crucible.
- With the right switch, switch the petroleum-ether suction pump on.
- Now turn the first valve in "Petroleum" position and have the first sample sucked dry.
- Turn this valve back to "Closed", and have the second and all other sample sucked dry, one after the other, in the same way.
- Repeat the defattening procedure twice more: for each step, pour 30 ml petroleum ether in the crucibles, turn the valves, one by one, to "Petroleum" position, have the sample sucked dry and close the valve again.

Decalcifying

If the material contains much carbonate (more than 50 g/kg measured as calcium carbonate), it must be decalcified. The decalcification step can be performed in the DG 2+2 / DG 6 as well. The hydrochloric acid is miscible with acetone, so suck it with the acetone pump into the acetone container.

- If it has not yet been done, insert the crucibles containing the samples in the defattening unit DG 2+2 / DG 6.
- Turn all valves in "Closed" position..
- Pour 30 ml of 0.5-molar hydrochloric acid into each crucible and let it work for one minute.
- Switch the acetone suction pump on with the left switch.
- Now turn, one after another, each of the valves into "Acetone" position and have the content of the crucible sucked dry. Then turn the valve back to "Closed" before opening the next one.
- Repeat the procedure twice more with each sample.

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Acid Digestion

- Heat the amount needed of diluted (0.13 molar) sulfuric acid almost up to boiling temperature on a heating plate. For a series of the CF 2+2 you need 4 x 150 ml = 600 ml, for the CF 6 you need 900 ml.

STOP

Never run a digestion without liquids and add the liquid as soon as the prompt appears. Heating an empty apparatus can make the crucibles burst.

- Insert the crucibles containing the samples in the CF 2+2 / CF 6.
- Switch the CF 2+2 / CF 6 on, and wait for the Start menu to appear.
- Push the control knob. This will start the Crude Fibre software.

The digestion will now run semi-automatically: Heatings and pumps will switch on or off whenever the digestion program needs them to. If an action of yours is required, a message on the display will appear, saying, for example, that now you have to fill the acid in. In this case, follow the instruction and confirm by pushing the control knob. As soon as you have pushed the button, the program will go on.

- Turn all the valves in "Closed" position. Push the control knob for confirmation.

The device will preheat for the preheating time set in the program. Then it will ask for adding the sulfuric acid.

- Insert the filling funnel into the first digestion vessel and fill 150 ml hot 0.13 molar sulfuric acid in. Do the same with the other sample places.

  The prolonged, heat-isolated outlet of the filling funnel allows to fill in the hot acid or base without it cooling down again just from running down through the condenser.
- When you have added the sulfuric acid to all sample vessels, push the control knob.

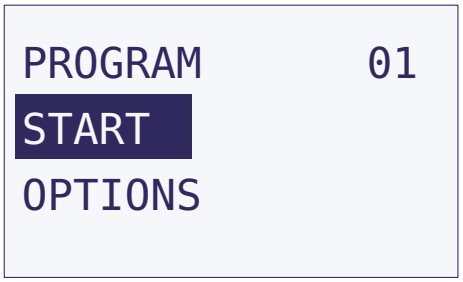
The device will heat the samples for the time given in the program.

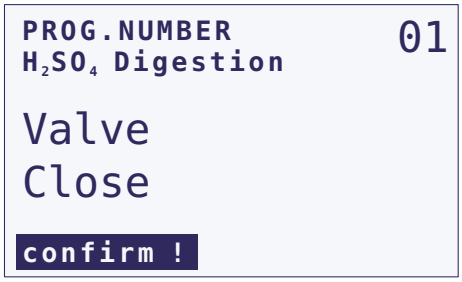
- In the meantime, put the jug with distilled water on the heating plate so it will be ready for the washing steps.

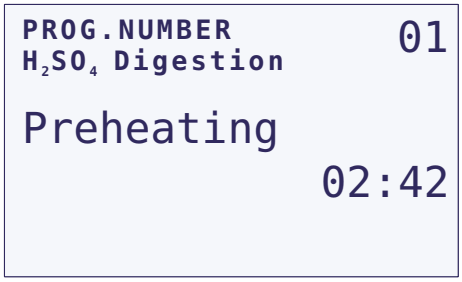
When digestion time is over, an instruction will appear to turn the valves to Vacuum position.

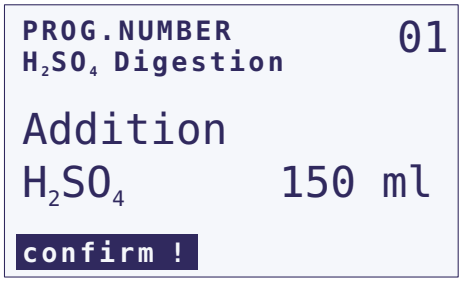
STOP

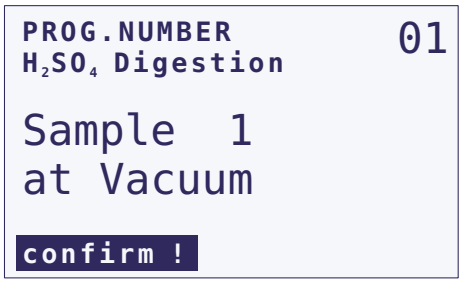
If you try to filter the samples simultaneously, the pump will draw air as soon as the first sample has been sucked dry. Filter the samples one by one in the order the program asks you.











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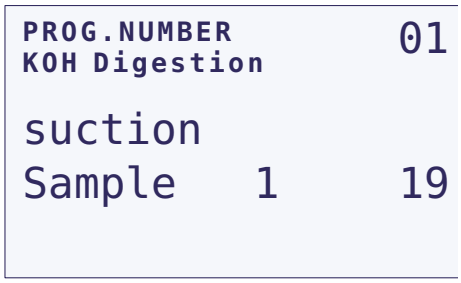
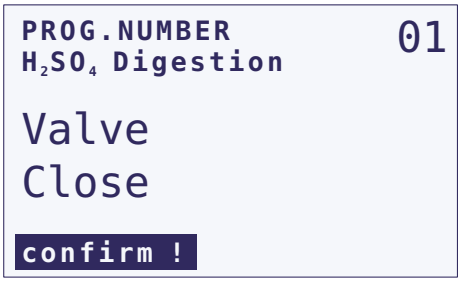
- Turn the first valve to "Vacuum" position and push the control knob.

The suction pump will now run for the time specified. When time is over, a prompt will appear to close the valve. Then the program will ask you to open the next valve and so on until all samples have been drained. For each action you need to push the control knob to confirm it.



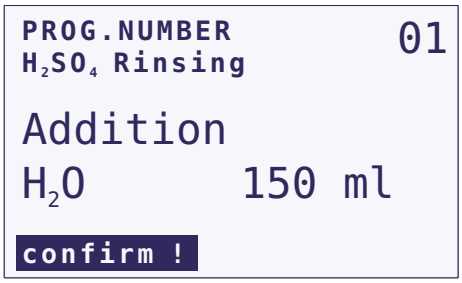


Blowing free and rinsing

- A prompt will appear demanding addition of water. Insert the filling funnel and fill the prescribed amount of water in, for one vessel after the other.

- When you are through with this, push the control knob. The aeration pump will start running.

- An instruction will appear to turn the valves to ***Pressure***. **Aeration time** (in seconds) displayed on the screen is counted **for all samples together**. Cautiously turn each valve in turns to Pressure for a few seconds, and back again.



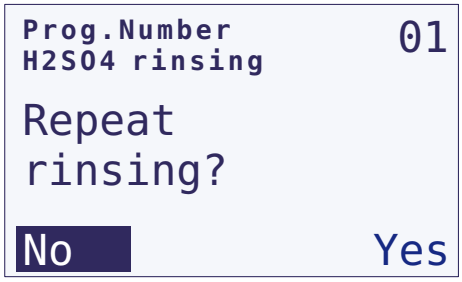
If the frits had not been clogged in the first place, blowing might cause part of the sample to be splashed up into the condensers from where it needs to be rinsed back in the next steps. To prevent this, turn the valves cautiously.

When aeration time is over, the prompt will appear to turn valve 1 to Vacuum.

- Turn the first valve to "Vacuum" position and push the control knob.

The suction pump will run for the time specified, just as before. The samples will be filtered one after another, and each time the software will prompt you to switch the valves and push the control knob.

Rinsing will be repeated the number of times set in the program (the preset is 3 times). After this, the program will ask if you want to repeat rinsing. If you answer ***Yes***, the rinsing process will repeat itself. If you answer ***No***, the program will go to the next step.

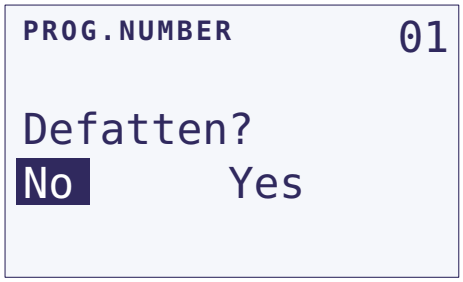


Intermediary step: second defattening

Caution: acetone and petroleum ether are inflammable! Perform all procedures working with organic solvents in the optional defattening unit DG 2+2 / DG 6, not in the CF 2+2 / CF 6.

With samples that contain very much fat, it may be necessary to defatten once more before the alkaline digestion. Since the material is wet now, the water is first supplanted with acetone before defattening with petroleum ether.

- Insert the crucibles containing the samples into the defattening unit DG 2+2 / DG 6.
- Turn all valves in "Closed" position.
- Pour 30 ml acetone into each crucible.
- With the left switch, switch the acetone suction pump on.
- Now turn the first valve in "Acetone" position and have the first sample sucked dry.
- Turn this valve back to "Closed", and have the second and all other sample sucked dry, one after the other, in the same way.
- Switch the acetone suction pump off and the petroleum ether suction pump on instead.
- Pour 30 ml petroleum ether 40 - 60 °C into each crucible.
- With the right switch, switch the petroleum-ether suction pump on.
- Now turn the first valve in "Petroleum" position and have the first sample sucked dry.
- Turn this valve back to "Closed", and have the second and all other sample sucked dry, one after the other, in the same way.
- Repeat the defattening procedure twice more: for each step, pour 30 ml petroleum ether in the crucibles, turn the valves, one by one, to "Petroleum" position, have the sample sucked dry and close the valve again.



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Alkaline Digestion

- Heat the amount of diluted (0.23-molar) potassium hydroxide solution on the heating plate almost up to boiling. For a series of the CF 2+2 you need 4 x 150 ml = 600 ml, for the CF 6 you need 900 ml.
- Insert the crucibles containing the samples in the CF 2+2 / CF 6.
- Turn the valves in "Closed" position and push the control knob to confirm.

The device will now demand addition of the potassium hydroxide solution.

- Insert the filling funnel into the first digestion vessel and fill 150 ml hot 0.23 molar potassium hydroxide in. Do the same with the other sample places.

The prolonged, heat-isolated outlet of the filling funnel allows to fill in the hot acid or base without it cooling down again just from running down through the condenser.

- When you have added the potassium hydroxide to all sample vessels, push the control knob.

The samples will now be heated for the time set in the program.

- In the meantime, put the jug with distilled water on the heating plate so it will be ready for the washing steps.

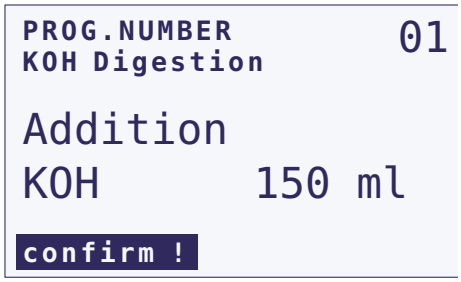
When digestion time is over, an instruction will appear to turn the valves to Vacuum position.

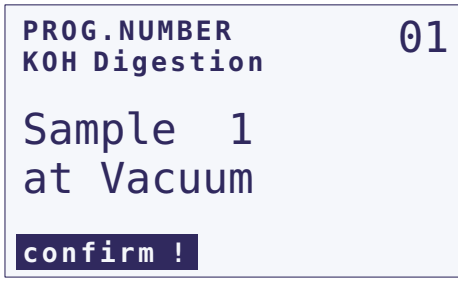
If you try to filter the samples simultaneously, the pump will draw air as soon as the first sample has been sucked dry. Filter the samples one by one as the program demands.

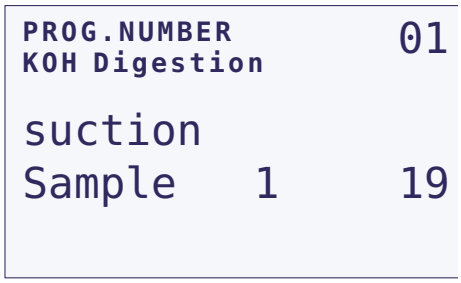
- Turn the first valve to "Vacuum" position and push the control knob.

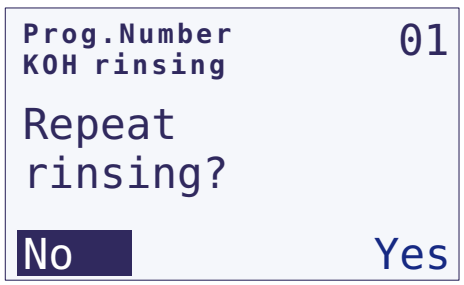
The suction pump will now run for the suction time set just as before. The samples will be drained one by one, and the program will ask each time to switch the valves and to pushg the control knob.

After this the samples will be rinsed with water just the same as after the acid digestion. Rinsing will be repeated as often as specified in the program. After the last rinsing the program will ask if you want to repeat rinsing. If you answer ***Yes***, the rinsing process will repeat itself. If you answer ***No***, the program will go to the next step.









Drying and Weighing

Caution: acetone and petroleum ether are inflammable! Perform all procedures working with organic solvents in the optional defattening unit DG 2+2 / DG 6, not in the CF 2+2 / CF 6.

- Insert the crucibles containing the samples into the defattening unit DG 2+2 / DG 6.
- Turn all valves in "Closed" position.
- Pour 30 ml acetone into each crucible.
- With the left switch, switch the acetone suction pump on.
- Now turn the first valve in "Acetone" position and have the first sample sucked dry.
- Turn this valve back to "Closed", and have the second and all other sample sucked dry, one after the other, in the same way.
- Repeat this acetone rinsing twice more with each sample.
- Put the crucibles on incineration dishes and dry them for 2 hours in the drying cupboard.

While drying and incinerating, parts might chip off the filter crucibles, and that would distort your analysis result. So place the crucibles on incineration dishes for drying and incinerating and weigh them with the dishes.

- Weigh the crucibles with 0.1 mg accuracy.

Incinerating and Weighing

- Place the crucibles with the incinerating dishes in the muffle furnace and incinerate at 500 °C (±25 °C).

Do not use a higher temperature - otherwise the frits would sinter and get useless.

- Place the crucibles with the incinerating dishes in a desiccator to let them cool down.
- Weigh the crucibles with the incinerating dish with an accuracy of 0.1 mg.
- Incinerate once more, let the crucibles cool down and weigh again till the weight remains constant for 2 mg at most.

Blank

Use one of the four or six sample places to do a blank. For the blank, just apply approximately the same amount of filter aid and treat it with the same reagents as the samples. The blank must not exceed 2 mg.

Evaluation

Sample weight: w_1
Weight after drying: w_2
Weight after incinerating: w_3
(in grams each)

Then the Crude Fibre content results as the loss on incineration as a fraction of the sample weight::

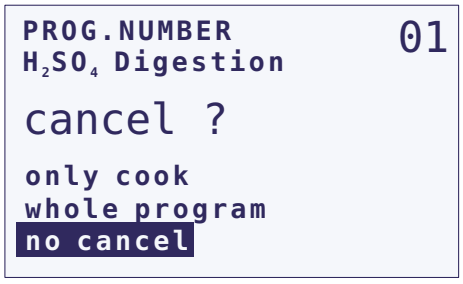
$$w_f = (w_2 - w_3) / w_1$$

In order to get the result expressed in g / kg, enter the values in the numerator, w_2 and w_3, in milligrams or - which is the same - divide the result by 1000.
The result should be given in full g/kg.

Aborting Digestion

During the pre-heating and cooking phases, you can interrupt or abort the program.

On pushing the control knob during the pre-heating or cooking phase, a prompt will apppear to ask if you just want to shortcut this heating process or to abort the entire program. The preset is ***No cancel.***.



If you select ***Only cook*** or ***Whole program***, the program will ask, to be sure, if you really want to abort.

If you have decided to abort the ***whole program***, there will be a final rinsing step; then the program will be aborted.

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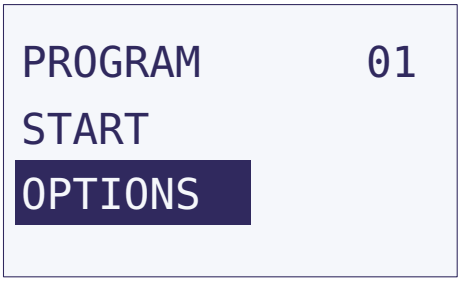
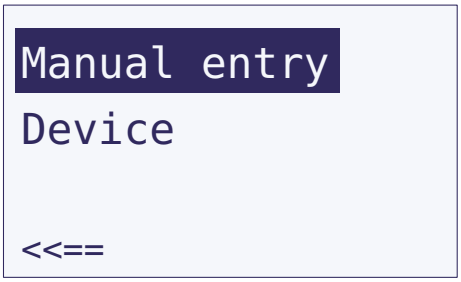
Manual Entry

In case time for draining or for aerating has not been enough, you can do an extra draining or aeration by manual entry. Also you can use this feature to remove remainders of liquid when digestion is done, or blow the frits free on this occasion.

To continue suction or aeration after the program is through, select ***Options*** in the start menu and then ***Manual entry***.





This will get you to the ***Manual Entry*** menu. There you can switch the aerating pump or the suction pump on by hand.

- Turn the valve of the sampe place you want to drain or aerate manually, to ***Pressure*** or ***Vacuum***, depending on the function you want.

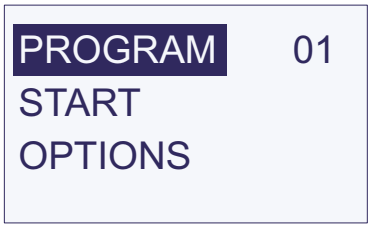
- Select the function you need, ***Aerate*** or ***Drain***.
- Push the operating knob. Now the operating state of the function is highlighted; it is still ***Off***.
- Now turn the operating knob. The aerating pump or suction pump will start running. In order to stop it, press the operating knob again.

Of course it is possible to have both the suction pump and the aeration pump running at the same time; but this will cause unnecessary wear and tear of the pump hoses. Switch each pump off before using the other one, and be sure to switch them off before leaving this menu item.

Modifying the Program

The CF 2+2 / CF 6 allows you to create different crude-fibre programs. This enables you to define the appropriate reagents and digestion parameters for different samples.

When defining a program, make a note of its purpose and the settings you made.



Turn the operating control knob clockwise or counterclockwise until the menu item ***Program*** is highlighted. Then press the knob once. You will now see the following display:

You can now select which of the programs of the device you wish to enter or modify. Simply turn the operating control knob until ***Prog.Number*** appears in green on a black background. If you now press the knob once, you will be able to dial to another number. Turning the knob clockwise advances the display to the higher numbers, while turning counterclockwise brings you to the lower numbers. At both ends of the number range, continued turning of the knob will bring you to the other end of the range, specifically

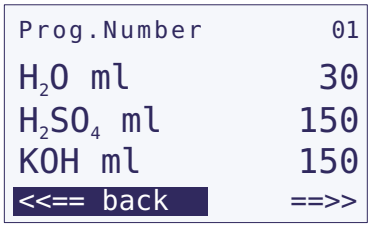
turning clockwise beyond 10 will bring you back to 00
turning counterclockwise from 00 will bring you to 10.

By pressing on the operating control knob you will then enter the programming options of the selected program number.

If you are working with the device for the first time, then leave the program number selection on 01.

By turning the operating control knob and pressing, select the option **==>>**.

You will now see the following menu displayed:

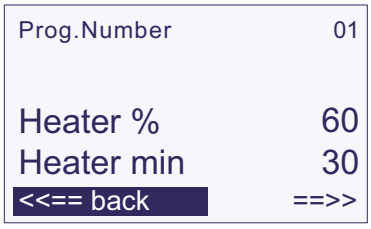


Read the menu items as follows:

Prog.Number 01	You can modify the settings of program no. 01
H_2O ml ***H_2SO_4 ml*** ***KOH ml***	The quantities of reagents to be added in the individual working steps (for H_2O, the quantity for each rinsing cycle). The software will just display these values and ask for confirmation - it is up to you to add the reagents
<<==	back
==>>	further

If you wish to change an entry, simply turn the operating control knob to highlight the value of interest and press the knob to access the entry value. Then dial the desired value by turning the operating control knob and enter it in memory storage by pressing the knob again.

Once all entry values have been entered according to your wishes, select **==>>** and press the operating control knob to bring up the following program menu.



Explanation:

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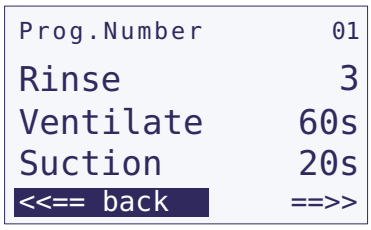
Prog.Number 01	You can modify the settings of program no. 01
Heater %	Heating power of the IR radiator in % of full power
Heater min	Heating time in minutes each for the acid and alkaline digestions
<<==	back
==>>	further

If you wish to change an entry, simply turn the operating control knob to highlight the value of interest and press the knob to access the entry value. Then dial the desired value by turning the operating control knob and enter it in memory storage by pressing the knob again.

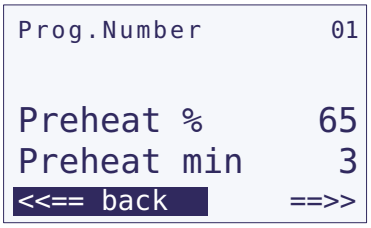
Once all entry values have been entered according to your wishes, select **==>>** and press the operating control knob to bring up the following program menu.



Read the menu items as follows:

Rinse	Number of rinsing cycles with hot water. The quantity of water that will be asked for each time has been specified on the first menu page.
Ventilate	Total run-time of the aeration pump. During this time interval all aeration valves have to be opened and closed again.
Suction	Run-time of the suction pump for each sample.
<<==	back
==>>	further

Once all entry values have been entered according to your wishes, select **==>>** and press the operating control knob to bring up the following program menu.

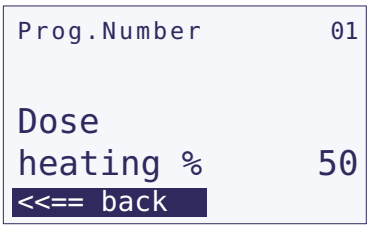


Read the menu items as follows:

Preheat %	Heating power of the IR radiator for preheating. ***Never set higher than 65%.***
Preheat min	Time in minutes for preheating. ***Never set longer than 3 minutes.***
<<==	back
==>>	further

Too heavy preheating can make the crucibles burst. Set preheating power no higher than 65% and preheating time no longer than 3 minutes.

Once all entry values have been entered according to your wishes, select **==>>** and press the operating control knob to bring up the following program menu.



Read the menu items as follows:

Dose heating %	Heating power of the IR radiator while waiting for addition of reagents. ***Never set higher than 50%.***
<<==	back

Too heavy heating during addition of reagents can make the crucibles burst. Set dose heating power no higher than 50%.

If you wish to change an entry, simply turn the operating control knob to highlight the value of interest and press the knob to access the entry value. Then dial the desired value by turning the operating control knob and enter it in memory storage by pressing the knob again.

You have now completed program no. 01.

Select **<<==**. By repeatedly pressing **<<==** you will return to the main menu.

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Maintenance and Care

Danger of electric shock! Repairs to electrical equipment must be carried out only by trained specialists. Unplug the mains plug before opening the appliance.

Solvent Containers

From the defattening steps and from rinsing before weighing there are rests of acetone and petroleum ether 40-60°, possibly containing fat from the samples. The acetone is mingled with water, the petroleum ether with acetone. Regularly empty the solvent containers, define if the residues are to be recycled, and dispose of any residues in accordance with regulations.

Peristaltic pumps

The pump hose is a wear-and-tear part. Check regularly if sufficient wall thickness is left for safe operation. Change the hose before it gets rubbed through.

- Loosen the upper knurled nut and lift the retaining pin upwards out of the groove.
- Pull the cover of the pump head off. You need to tilt it a little, then pull it downwards.
- Replace the tubing (complete with end nipples) as required.

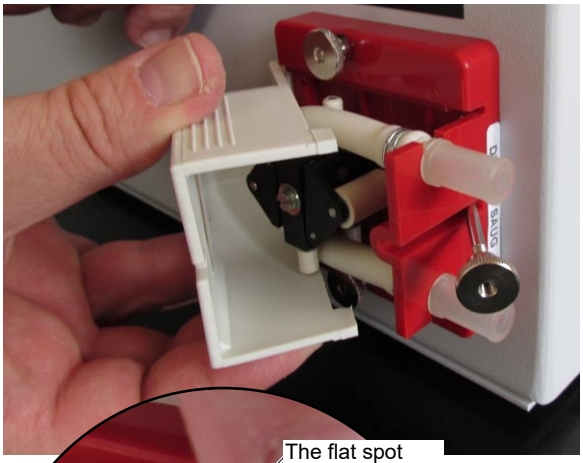
Now the pump hose and rotor are lying open before your eyes. Check if the pump hose is still intact or if you need to replace it.

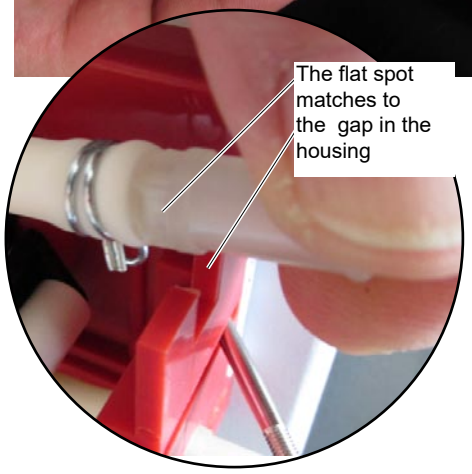
In order to change the pump hose:

- Pull the connector pieces of the old hose out of the cut-outs of the pump housing (see detail photo).
- Pull the hoses: the discharge hose and the hose connecting the pump to the filters, off the connector pieces of the pump.

The new pump hose comes assembled ready-for-use with the connector pieces.

- Put the connecting hose leading to the filters to the suction-sided connector piece of the new pump hose.
- Connect the discharge hose to the pressure-sided connector piece.
- Lay the new pump hose around the pump rotor.
- Close the housing again, turn the screw upwards again and tighten it a little.





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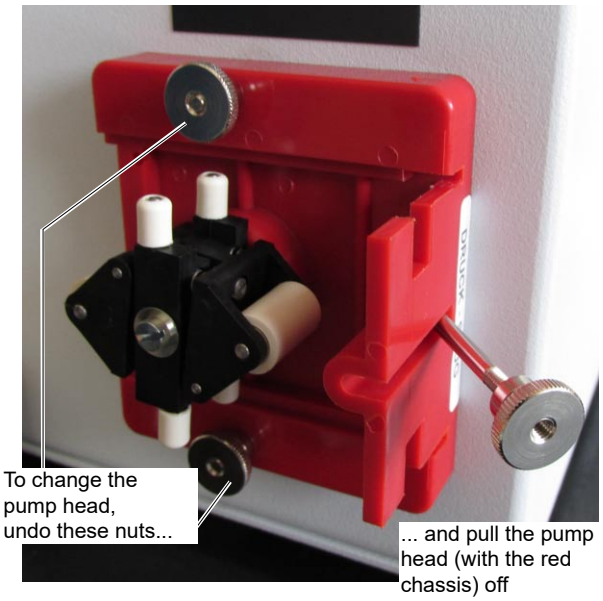
Changing the pump head

If need be, you can change the pump head too (after taking off the pump hose).

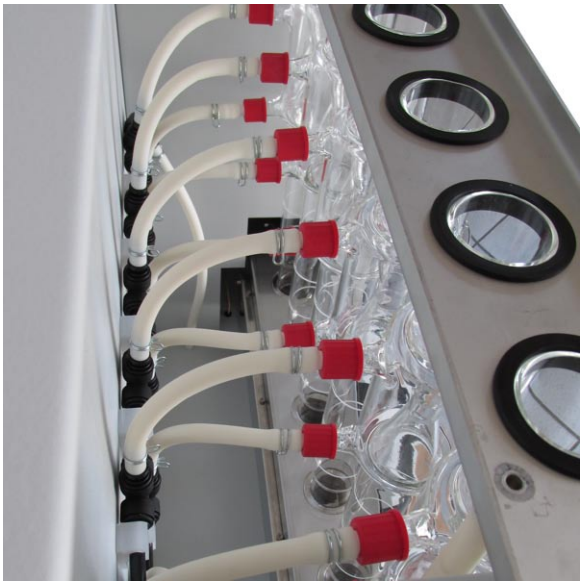
- Unscrew the two knurled nuts on the left and right side of the pump head....
- and pull off the entire pump head (the red chassis) towards yourself.



Taking out or changing condensers, changing gasket rings

The condensers are held on the upside by the crossbeam under the roof of the device.

- Disconnect the hose connections of the condensers you want to change or check.
- Open the roof of the device, just the same way as you would do to fill in chemicals for a digestion.



- Loosen the locking sleeve just far enough so you can pull it off the rail.
- Cautiously take off the crossbeam.

- Take the condensers out of the mountings, upwards.

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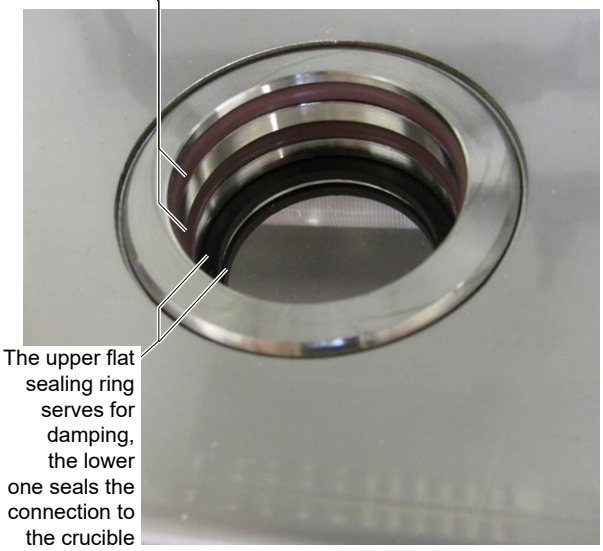
On this occasion, check the gasket rings sealing the connection of condensers and crucibles.

At the lower end of the condensers there are two flat sealing rings. The lower one is to seal the connection of the condenser and the crucible; the upper one serves as a damping element to prevent the condenser from hitting the metal rim.

Further up from there, there are two O-rings that are holding the condenser.

Especially the lowermost of the flat sealing rings has to withstand the chemicals and the filter aid so it can get leaky with time.

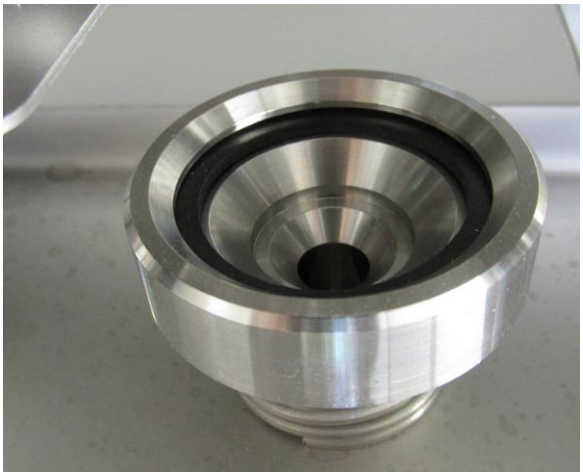
In order to change the sealing rings, lever them out of the notch with a narrow screwdriver.



Sealing ring in the crucible mounting

The flat sealing ring in the crucible mounting is the same one as the two on the lower side of the condenser. Check here as well as with the others if any filter aid has got jammed on the sealing ring, and if need be change it.

The maintenance sets for the CF 2+2 and CF 6 come with these flat sealing rings and O-rings.



Spare Parts and Accessories

Article	Art.-Nr.
behrotest® glass jug 1.25 l for water	B 0066 1511
behrotest® glass jug 1.25 l for base solution	B 0066 1509
behrotest® glass jug 1.25 l for acid solution	B 0066 1510
behrotest® heating unit with controller	B 0021 7695
behrotest® Plastic funnel, prolonged	B 0064 9871
behrotest® Multi-Crucible-Snapper 4fold for CF 2+2 / DG 2+2	B 0064 5430
behrotest® Multi-Crucible-Snapper 6fold for CF 6 / DG 6	B 0064 5422
behrotest® Sieves Set for CF 2+2	B 0064 5428
behrotest® Sieves Set for CF 6	B 0064 5427
Verprene hose 8 x 2 mm, 2 m	B 0023 2053
Y connector, material PP, 7 - 9 mm	B 0066 1508
Water connection hose including connections	B 0062 4744
Suction hose	B 0066 1528
Discharge connecting hose	B 0022 7280
Cooling water discharge hose	B 0022 7281
behrotest® crucible rack for 4 filter crucibles	B 0044 1175
behrotest® crucible rack for 6 filter crucibles	B 0031 4330
behrotest® filter crucible 30 ml for crude fibre unit, 6 pcs.	B 0065 8875
Incineration dish, porcelaine	B 0012 0461
Pump hose for the peristaltic pumps for CF, with connector pieces	B 0066 8980
Pump head for the peristaltic pumps	B 0049 1177
behrotest® Reflux condenser CFK1	B 0066 0004
IR radiator for CF 2+2, service kit for mounting	B 0066 2081
IR radiator for CF 6, service kit for mounting	B 0044 0880
Float switch, for 20-liter container with opening 49 mm inner ø	B 0023 3060
Container 20 l, opening 49 mm inner ø	B 0017 7003
behrotest® maintenance set for CF 2+2	B 0066 2072
behrotest® maintenance for CF 6	B 0066 1512
Flat sealing rings for CF 2+2 / CF 6, 10 pcs.	B 0052 1028
O-ring, Viton, 34 x 3 mm, for CF 2+2 / CF 6, 10 pcs.	B 0052 1059

Consumables

Filter aid Celite®, 1 kg	B 0006 4727

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Technical Data

Dimensions W x H x D approx. mm - Digestion unit CF 2+2 / CF 6 - De-fattening unit	CF 2+2 600 x 670 x 570 650 x 300 x 570	CF 6 750 x 670 x 570 800 x 300 x 570
Weight approx. kg - Digestion unit CF 2+2 / CF 6 - De-fattening unit	 46 21	 54 23
Nominal voltage	230 V ~ / 50 Hz	
Power consumption max. VA - Digestion unit CF 2+2 / CF 6 - De-fattening unit	 1000 200	 1400 200

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Support

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