

Operation Manual Cartridger® C-670



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Please be sure to read these operating instructions thoroughly before using the **BÜCHI Cartridger™ C-670**. Keep these instructions in the immediate proximity of the device so that it is accessible at all times.

Chapter 2 contains important safety instructions. Their observance is absolutely necessary for safe operation of the device.

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1 Delivery package



Figure 1.1: BÜCHI Cartridger C-670

Description	Order no.
Büchi Cartridger C-670	44500
Included in delivery package	
Cartridger module	
Vacuum tube	17631
Cartridge holder	44530
Protective lid	44505
Test tube	44587
1 Operating instructions:	
German	96945
English	96946
French	96947
Italian	96948
Spanish	96949

Table: Delivery package

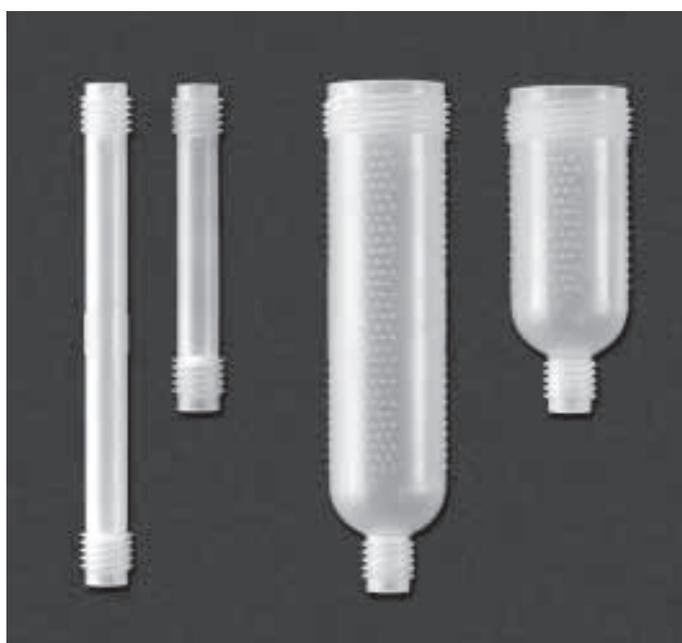


Figure 1.2: Cartridges C-675

2 Safety

The device has been built according to the most up to date technical standards and recognized safety regulations. However, use of the device still presents risks and hazards:

- when the device is not used according to the instructions.
- when the device is operated by inadequately trained personnel

2.1 Symbols



Stop

Information concerning hazards that could result in significant property damage or to life-threatening injuries.



Warning

Information concerning hazards that could result in damage to health or property.



Note

Information pointing out technical requirements. Failure to observe may result in malfunctions, inefficiency and reduced productivity.

2.2 Requirements of the operator

The device may only be used by lab personnel and other persons having an overview, on the basis of training or practical experience, of the hazards involved in the operation of the device.

Personnel lacking this training or persons currently in training require thorough instruction. The operating instructions form the foundation for this purpose.

2.3 Correct usage

The device has been conceived of and constructed as a lab device. Its correct usage is for the packing of Büchi Cartridges C-675 with fluidized separation materials for liquid chromatography with the assistance of a vacuum.

Humidity and oil free compressed air or non-combustible gases such as nitrogen or argon with 1 bar (15 psi) can be used for fluidization. Never use combustible, explosive or reactive gases for fluidization.

We do not recommend operating the Cartridge together with a distillation apparatus for the packing process with vacuum. The very rapid change of the vacuum during the packing process can lead to malfunctions.

2.4 Incorrect usage

Any other usage than that mentioned in the above or any usage not corresponding to the technical data is considered to be incorrect usage. The operator bears exclusive responsibility for any damages resulting from such usage.

2.5 Basic hazards



Basic hazards arise from:

- the evacuated tubes under vacuum conditions
- condensed gases
- fine grained separation materials: the inhalation of fine dust with a particle size of $< 10 \mu\text{m}$ can damage your health. Do not use stationary phases with a high percentile of fine dusts and observe the safety instructions of the stationary phase intended for use. For safety reasons, the Cartridger C-670 should be operated with an exhaust system or a protective mask should be worn when packing cartridges if there is no data sheet for the stationary phase.

The removal of lids with the assistance of a commercially available tool is not permitted, with the exception of authorized maintenance and repair personnel. The device may not be operated with damaged glassware.

2.6 Instrument specific hazards

none

2.7 Safety measures



The wearing of personal protective gear such as safety glasses and lab coat is obligatory.

These operating instructions must be available to the operators at the location of the device at all times as a component of the Cartridge C-670. Translations of these operating instructions are available in English, German, French, Italian, Spanish and Japanese.

Modifications

Modification of the device or of its replacement parts or accessories or usage of replacement parts or accessories other than those mentioned in these operating instructions is only allowed with the written permission of BÜCHI Labortechnik AG.

Responsibility of the operator

The operator is responsible for the instruction of his personnel. These operating instructions can be ordered in other languages to this purpose.

The operator must inform the manufacturer immediately of any incidents occurring when using the device that are relevant to matters of safety.

3 Function

The function of the Cartridger is the packing of Büchi Cartridges C-675 with separation materials for liquid chromatography.

3.1 Principle of the packing process

The packing process consists of two phases. In the first phase, the stationary phase is fluidized by the flowing through of gas or compressed air. Silica gel, for example, is thereby homogenized, and the friction of the particles against one another is considerably reduced.

In the second phase the cartridge is packed using vacuum and sealed with two frits.

3.2 Area of usage



The Cartridger is suitable for the dry packing of all Büchi Cartridges C-675. The stationary phases to be packed must be dry and have an identical particle size. Clumped starting material is not suitable.

The permitted grain sizes for packing are between 30 and 200 μm . Smaller particles can not be packed dry. Larger particles are almost never used in chromatography. Silica gel with a grain size of 40-63 μm is most often used in preparative chromatography and is the most suitable.

4 Putting into operation



Inspect for damages after unpacking. It is important that possible transport damage is immediately recognized upon unpacking. It may be necessary to report transport damages to your supplier.

The original packaging should be kept for possible later transport or storage.

4.1 Location

The Cartridger can be used anywhere in the lab. The space should be level, dry and free of vibration. Büchi recommends operation in a clean exhaust system.



Operation in explosion-proof rooms is not permitted. Although the Cartridger is not an electric device, the build-up of a static charge during the packing process is not impossible.



Operation in refrigerated rooms, bathrooms, next to water baths and in storerooms is not recommended. The large surface of the stationary phases and the hygroscopic properties of many stationary phases (e.g. silica gel) can result in contamination and changed chromatographic characteristics.

4.2 Connecting the vacuum tube to the cartridge holder



Figure 4.1: Cartridge holder and Cartridger

The supplied tubes are designed for use with both vacuum and compressed air up to 2bar. Connect the cartridge holder and the Cartridger housing with the shorter tube (see Fig. 4.1).

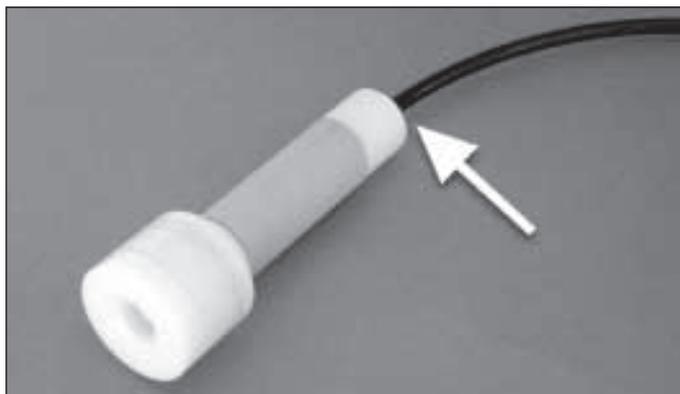


Figure 4.2: Cartridge holder

Now fasten the other end of the tube to the cartridge holder (see Fig. 4.2).

4.3 Connecting the Cartridger to a vacuum source



Figure 4.3: Vacuum Indicator

The Cartridger has two connections on the back side (Figure 4.4). The upper connection is for the vacuum. The vacuum pump should reach a final vacuum of 20mbar and have a suction output greater than 1m³/min. The display panel on the left side (Figure 4.3) is for easily ascertaining whether a sufficient vacuum is present. If the display panel is red, either the vacuum is not sufficient, the Cartridger is not vacuum sealed or the vacuum valve on the front side of the device is open.

4.4 Connecting the Cartridger to a compressed air or gas supply



Figure 4.4: Rear view

The lower connection on the rear side of the device is connected to the compressed air or gas supply. The inlet pressure should be between 1 bar (15psi) and 2 bar (30 psi) and should not exceed this range. In-house compressed air must be free of water and oil in order to prevent contamination of the stationary phase and to avoid changing the water content of the stationary phase.

The use of in-house compressed air should be avoided if there are doubts as to its quality.

All common inert lab gases can be used as an alternative to compressed air (nitrogen, technical air, argon, helium).

5 Operation

5.1 Checking the suction output

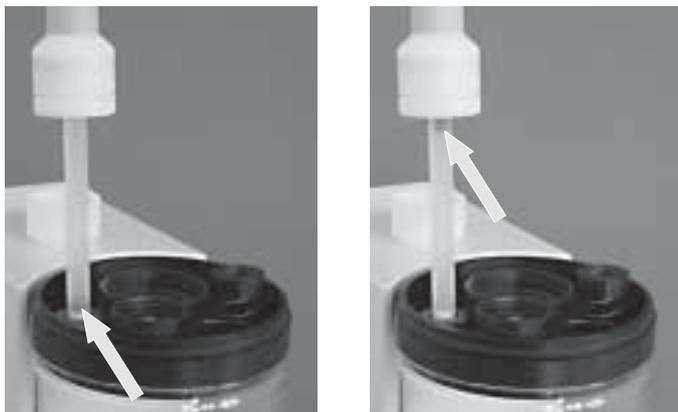


Figure 5.1 a/b: Checking the suction output

Check the suction output of the Cartridge at the cartridge holder prior to each packing process. This is quite easy and fast using the supplied cartridge with the glass ball. Screw in the cartridge and open the vacuum valve. The ball should quickly rise to the top and remain there. Cartridges cannot be packed if it doesn't rise, rises very slowly or falls to the bottom again. Check the vacuum seal of the system, inspect and replace the safety frits if necessary (see 6.2 Replacing the safety frits). If the suction output is adequate following these checks you can now begin to pack cartridges.

5.2 Overview of packing process



Selecting the stationary phase



Preparing the filling process



Filling the stationary phase



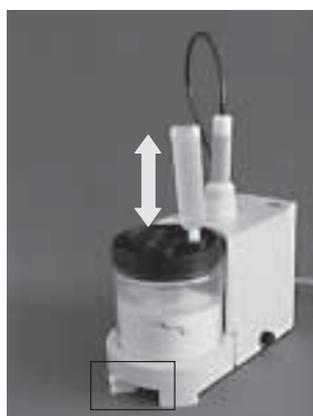
Filling the stationary phase



Fluidization of the stationary phase



Ready for packing



Inserting the first (lower) frit



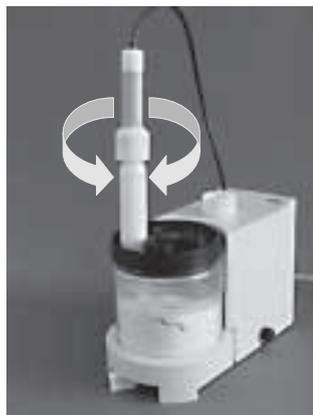
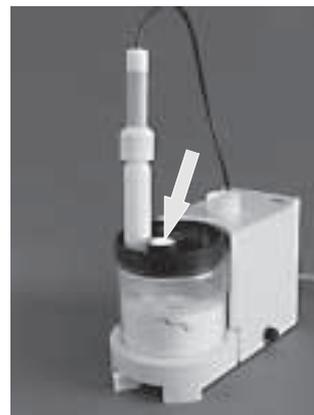
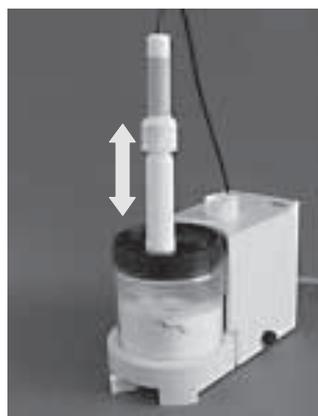
Screwing in the cartridge
Dip into the stationary phase
Close the vacuum valve



Packing the cartridge



Open the vacuum valve

Scratching out excess material
of stationary phaseInserting the second (upper) frit
Vacuum valve still openInserting the second (upper) frit
Vacuum valve still open

Closing the vacuum valve



Removing the packed cartridge



After finishing work

5.2.1 Selecting the stationary phase



The stationary phases to be packed must be dry and must have a very uniform particle size range, e.g. clumped starting material is unsuitable. The permissible particle sizes for packing lie between 30 and 200µm. Modified phases can also be used in this particle size range (C18, C8, C4, ...). Smaller particles cannot be reliably packed.



Do not use phases containing fine dust particles that can penetrate the lungs (particle size <10µm). These can endanger your health.

Use DC plates to test which stationary phases are best suited for your separation. Modified silica gels can also be packed with the Cartridge (C18, C8, C4, NH2...).

5.2.2 Filling the stationary phase



Figure 5.1: Glass vessel with level indicator

Remove the black function lid and slowly empty your stationary phase into the glass container. Please be sure not to overfill the vessel (see the marking on the glass).

5.2.3 Fluidization of the stationary phase

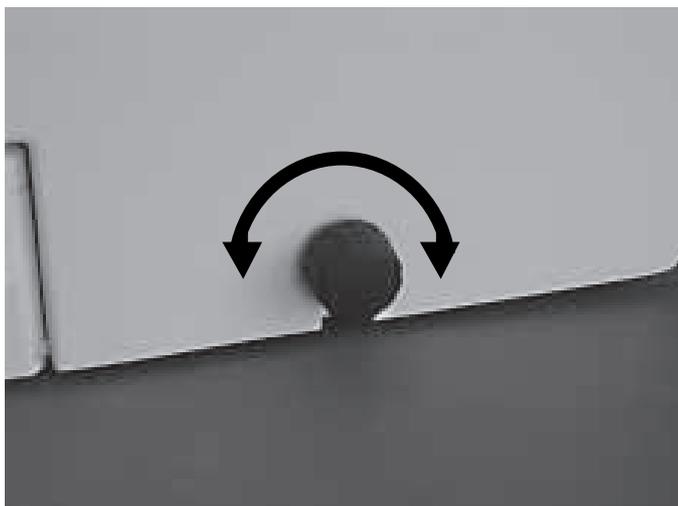


Figure 5.1: Needle valve for fine regulation of gas flow

The fluidization is based on a flow of gas (or air) through the stationary phase. A frit is integrated into the bottom of the glass vessel. The optimal gas flow is dependent upon the grain size of the silica gel and can be set very precisely on the right side using a needle valve. Be sure to close the needle valve completely when using the Cartridge for the first time. Fill the glass vessel and open the air supply to the Cartridge. Next, slowly open the needle valve until the first air bubbles appear on the surface of the gel. Inspect the fluidization with a spatula. It should be possible to move the spatula through the fluidized gel without resistance. However, the gel shouldn't bubble, meaning that the gel should have an even, calm surface.

Once the needle valve has been set, it need no longer be adjusted as long as the admission pressure and the stationary phase remain the same. At the end of the packing process you need only shut off the main gas flow. Please turn on the gas supply slowly prior to the next packing procedure.

5.2.4 Inserting the first (lower) frit

Lay the first frit with a diameter of 12mm level in the recession of the insertion device and insert the frit into the cartridge. The insertion device is conceived of in such a way that the frit is inserted in the correct insertion depth.

If you forget the first frit, the Cartridger is protected from contamination by a safety frit in the cartridge holder. In such a case always be sure to replace the safety frit prior to continuing packing (see 6.2 Replacing the safety frit).

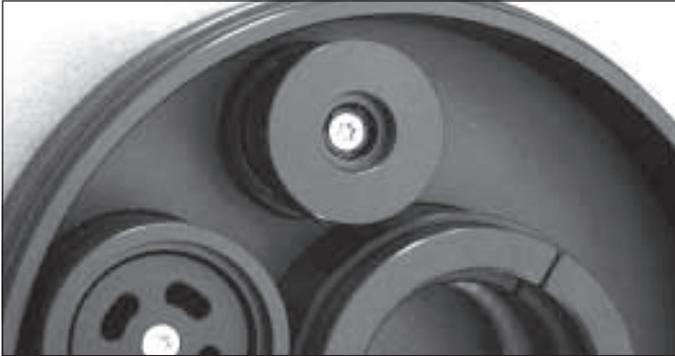


Figure 5.3: Insertion device

5.2.5 Screwing in the cartridge



Now screw the cartridge with the side of the frit into the cartridge holder until the stop. Movement of the frit is prevented by the stop. For short cartridges of 75 mm length use the elongation.

5.2.6 Packing the cartridge



Submerge the cartridge into the fluidized gel. Open the valve on the front side of the cartridge. The cartridge is filled all at once. Leave the valve open and carefully withdraw the cartridge from the glass vessel.

Adherent gel is cleaned from the cartridge by the brushes in the lid. You should thereby directly clean off the gel projecting beyond the length of the cartridge.

See also video of cartridge packing at the Buchi synthesis homepage <http://synthesis.buchi.com>

Figure 5.6: Submerged cartridge with vacuum valve

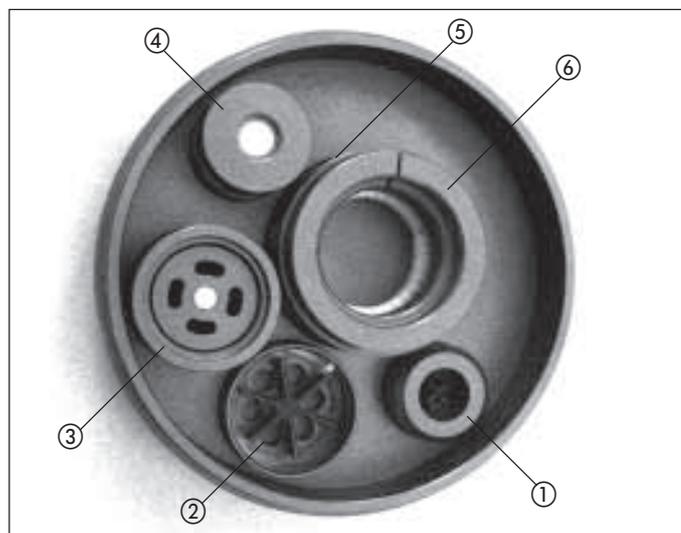


Figure 5.7: Tools

5.2.7 Inserting the second (upper) frit

Before inserting the second frit you must first use the appropriate tool (knife ① or ②) in the lid to free the column start of gel. The scraper knives have a stop that determines the depth. Now insert the appropriate frit with 12 mm or 40 mm into the insertion tool and insert the second frit.

- | | |
|---|----------------------------|
| ① | Knife Ø 12 mm |
| ② | Knife Ø 40 mm |
| ③ | Punch Ø 40 mm |
| ④ | Punch Ø 12 mm |
| ⑤ | Brush set Ø 40 mm complete |
| ⑥ | Stop sleeve |

5.2.8 Removing the packed cartridge

Close the vacuum valve and unscrew the cartridge from the cartridge holder. Finished. You can now use the cartridge for chromatography.

Avoid jarring or blows. These can damage the column bed, which unavoidably leads to worse separation performance.

5.3 Storing the cartridges

Büchi recommends packing the cartridges immediately prior to use. If you intend to store supplies of filled cartridges, be sure that the cartridge ends are properly sealed and that they are stored protected from jarring and vibration. Most gels are hygroscopic and have a bonding affinity with volatile chemicals. Both effects have a negative influence on the separation performance.

5.4 Changing the stationary phase

When changing the stationary phase it is particularly important to thoroughly clean the glass vessel and the lid. This is best undertaken with a vacuum cleaner and a dry, lint-free cloth. Never use solvents or water!

5.5 After finishing work

At the end of the packing process, shut off the vacuum source and the gas supply. Where longer interruptions are intended (app. 2 weeks, depending upon the ambient conditions), we recommend transferring the remaining gel into a vessel that can be tightly sealed and using this for storage purposes.

The glass vessel can also be separated from the Cartridge. For daily usage it is usually sufficient to tightly press on the white plastic lid.



Figure 5.8: Removal of the glass vessel

6 Maintenance

6.1 Cleaning the device



No special cleaning is normally required when the device is used correctly.

The housing can be wiped off with a damp cloth. Fine dust from the gel can also be vacuumed.

6.1.1 Replacing the safety frit

The safety frit in the cartridge holder should be inspected from time to time and be replaced as necessary. Use the small cartridge with the glass ball to test the permeability of the frit.

If after opening the vacuum valve the ball rises quickly upwards and remains there, the suction output is optimum and the safety frit need not be exchanged.

To exchange the frit you need only unscrew the holder, replace the frit and screw it tight again. Never try to blow out an already used safety frit with compressed air or to clean it „chemically“ or in an ultrasonic bath.

Incorrect operation of the Cartridge without a safety frit shortens the useful life of the vacuum valve and the vacuum pump. Such usage makes any guarantee claim null and void.

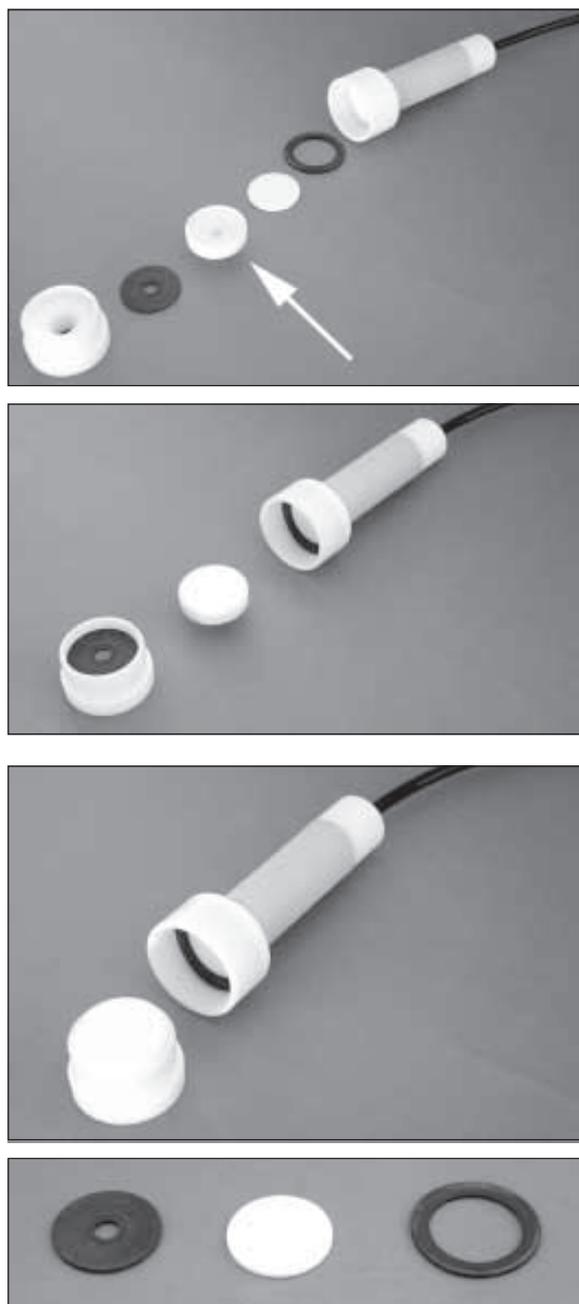


Figure 6.1: Procedure for replacing the safety frit

6.2 Customer service

Only authorised service personnel can perform work on or in the apparatus. These persons have a comprehensive technical training and knowledge about hazards, resulting when safety stipulations are not complied with. BÜCHI Customer Service Office have apparatus specific Service Manual, which can only be obtained by authorised personnel.

The addresses of the official BÜCHI Customer Service offices are given on the last cover page of these operating instructions. Please direct technical questions and application problems to these offices in case of malfunction.

BÜCHI Customer Service is equipped to supply the following services:

- replacement part service
- repair service
- maintenance service
- technical consultation
- Service contracts

7 Taking out of operation

7.1 Storage/transport

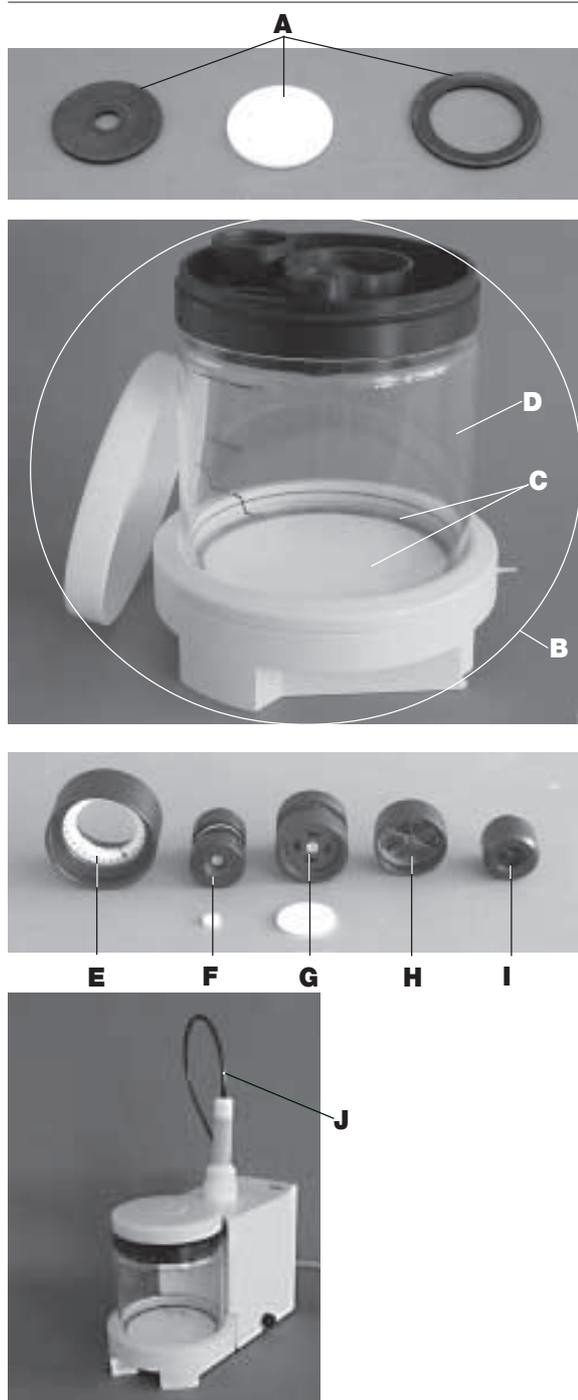
The device should be thoroughly cleaned. Chemical residue must be removed without exception and the glass parts washed. The device should be stored and transported in its original packaging.

7.2 Disposal

We have provided a list of the materials used in the Appendix, Chapter 9, in order to enable the disposal of the device in an environmentally-friendly manner. In this way it can be ensured that the parts are separated and can be reused. Please observe valid regional and local laws.

8 Replacement parts and accessories

Only Büchi original accessories and replacement parts guarantee safe usage and functionality of the device. The use of replacement parts and accessories other than those from Büchi is only allowed with the permission of the manufacturer. The replacement parts catalog may only be used in connection with the corresponding chapters 5 and 7 of the operating instructions for assembly or disassembly purposes. Perusal by and transfer to third parties as well as production according to this handbook is not permitted. Büchi Labortechnik AG maintains the copyright.



8.1 Replacement parts and accessories

Description	Order no.
A 1 Safety frit set	44802
B 1 Fluidization vessel cpl. with tools	44800
C 1 Bottom frit and seal set	44801
D 1 Glass part of Fluidization vessel	44559
E 1 Brush set Ø 40 mm complete	44555
F 1 Stamp Ø 12 mm	44545
G 1 Stamp Ø 40 mm	44550
H 1 Knife Ø 40 mm	44540
I 1 Knife Ø 12 mm	44537
J 1 Pneumatic tube 5 m	44803
See next page for K - P	
K 1 O-Ring for brush Ø 63 x 2,5 mm	44551
L 1 O-Ring Ø 38 x 2,5 mm	44538
M 1 O-Ring Ø 28 x 2,5 mm	44535
N 1 O-Ring string Ø 176 mm	44532
O 1 O-Ring string Ø 184 mm	44533
P 1 Elongation	44598
1 Operating instructions:	
German	96945
English	96946
French	96947
Italian	96948
Spanish	96949

Table: Replacement parts and accessories

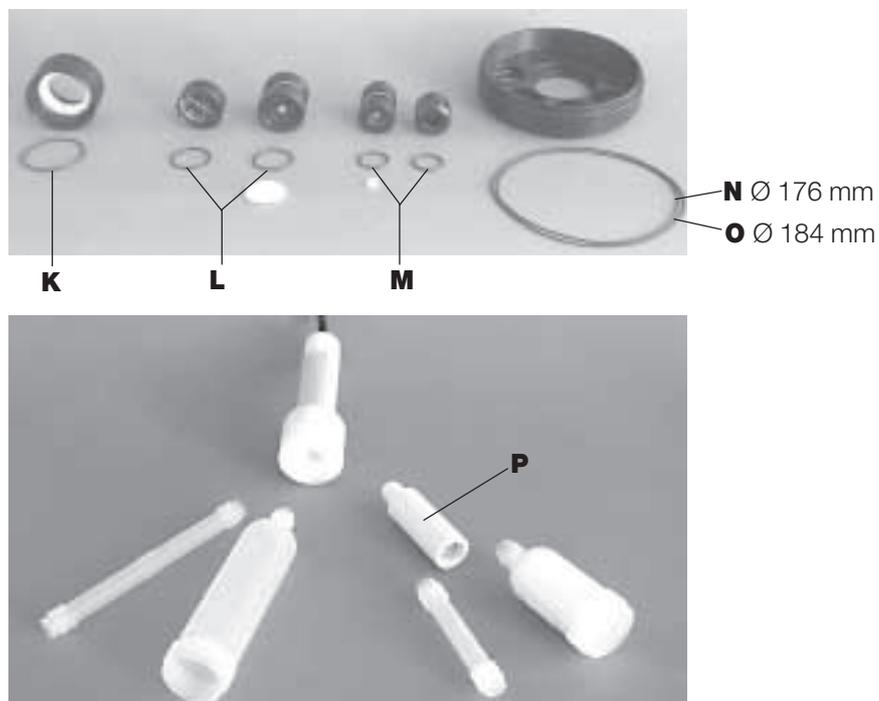


Figure 8.1: Empty Cartridges C-675

8.2 Empty Cartridges

High transparent, chemical resistant polypropylene cartridges including porous HD-polyethylene frits for packing with the Büchi Cartridge™ C-670.

Cartridge inner diameter (ID)	12 mm	12 mm	40 mm	40 mm
Cartridge length	75 mm	150 mm	75 mm	150 mm
Used for sample range	up to 200 mg	up to 400 mg	up to 1 g	up to 5 g
Resulting packing weight with Si60 (40-63 µm)	4 g	8 g	40 g	90 g
cartridges incl. frits	50	50	50	50
Order No.	44880	44881	44882	44883

Table: Büchi Cartridges C-675

9 Appendix

9.1 Technical data

BÜCHI Cartridge™ C-670

Device dimensions (W x H x D)	220 x 315 x 450 mm
Weight (empty)	7.5 kg
Power consumption	none
Voltage	none
Compatible cartridge sizes	all Büchi Cartridges C-675
Prerequisites	Gas/air and vacuum → oil-free and dry Vacuum source: Vacuum flow $\geq 1 \text{ m}^3/\text{h}$ Vacuum $\leq 20 \text{ mbar}$
Tube connections	ID 6 mm for pressurized gas/air and vacuum

Table: Technical data

9.2 Materials used

Description	Materials	Material code
Housing	PUR	
Glass parts	Borosilicate glass 3.3	
Plastic parts	POM	
Frits	HD-PE	
Seals	NBR	

Table: Materials used

9.3 Declaration of conformity

We **BÜCHI** Labortechnik AG
Postfach, CH-9230 Flawil
Switzerland

declares, as exclusively responsible party, that the product:

BÜCHI Cartridger™ C-670

with which this declaration is concerned, conforms to the following norms:

EN 292-1:1991

Safety of machines; basic concepts, general principles of design
Part 1: Basic terminology, methodology

EN 292-2:1991 + A1:1995

Safety of machines – basic concepts, general principles of design
Part 2: Technical basic principles and specifications

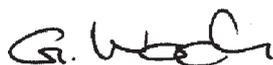
According to the determinations of the EU guideline:

89/392/EEC (Machine guideline)

Flawil, 11.06.2003

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