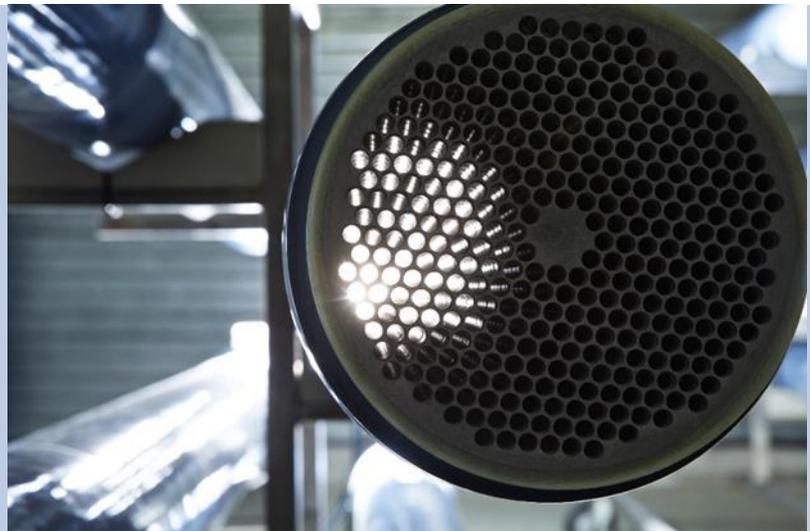


Type T-CUT

ENGLISH

Tubular modules for micro- and ultrafiltration
Rohrmodule für die Mikro- und Ultrafiltration



Operating Instructions
Bedienungsanleitung

We reserve the right to make technical changes without notice.
Technische Änderungen vorbehalten.

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Operating Instructions 1607/02_EU-ML_00769966/Original EN

T-CUT tubular modules for micro- and ultrafiltration

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1 OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the product. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the product.

WARNING!

The operating instructions contain important safety information!
Failure to observe these instructions may result in hazardous situations.
▶ The operating instructions must be read and understood.

1.1 Product-specific Data Sheet

With each product, a product-specific data sheet is included containing information on the product. This information must be noted in addition to the operating instructions.

Should you no longer have the data sheet at your disposal, you can contact us under info@cut-membrane.com

1.2 Symbols

DANGER!

Warns of an immediate danger.
▶ Failure to observe the warning will result in a fatal or serious injury.

WARNING!

Warns of a potentially dangerous situation.
▶ Failure to observe the warning may result in serious injuries or death.

CAUTION!

Warns of a possible danger.
▶ Failure to observe this warning may result in a moderate or minor injury.

NOTE!

Warns of damage to property.
▶ Failure to observe this warning may result in damage to the product or the system.

 Indicates important additional information, tips and recommendations.

 Refers to information in these operating instructions or in other documentation.

▶ Designates instructions for risk prevention.

→ Designates a procedure which you must carry out.

1.3 Definitions of Terms

In these instructions, the term “product” always refers to the T-CUT tubular module.

2 AUTHORIZED USE

Incorrect use of the T-CUT tubular module may be a hazard to people, nearby equipment and the environment.

- ▶ This product is designed to filter substances out of liquid media.
- ▶ The specification data, the operating conditions and conditions of use specified in the contract documents, operating instructions and product-specific data sheet must be observed during use. The designated field of application is specified in Section [“5 Product Information”](#).
- ▶ This product may only be used following detailed consultation with a representative of CUT Membrane Technology.
- ▶ Correct transportation, correct storage and installation and careful use and maintenance are essential for reliable and problem-free operation.
- ▶ Use the product only as intended.

2.1 Restrictions

If exporting the product, observe any restrictions in force.

3 BASIC SAFETY INSTRUCTIONS

These safety instructions do not make allowance for any

- contingencies and events which may arise during assembly, operation, and maintenance of the product.
- local safety regulations - the operator is responsible for observing these regulations, also in relation to the installation personnel.

DANGER!

Risk of poisoning, chemical burns, contamination from escaping medium.

- ▶ Check the product for leak-tightness prior to commencing use.
- ▶ When handling hazardous substances, always take appropriate precautionary measures and wear personal protective equipment in accordance with the requirements of the medium.
- ▶ Before disconnecting lines, the medium must be flushed from the entire system.

Risk of injury from high pressure in the system/product.

- ▶ Before working on the system or product, switch off the pressure and vent/drain the lines and product.

General hazardous situations:

To prevent injuries:

- ▶ Ensure that the system cannot be activated unintentionally.
- ▶ Installation and maintenance work may be carried out only by authorized technicians with the appropriate tools.
- ▶ When the filtration process is interrupted, rinse the module immediately with water.
- ▶ After an interruption in the filtration process, ensure that the process is restarted in a controlled manner.
- ▶ The product may be operated only when in perfect condition and in consideration of the operating instructions and product-specific data sheet.
- ▶ The general rules of technology apply to application planning and operation of the product.

To prevent damage to the product:

- ▶ Protect the product from excessive exposure to UV radiation and from frost.
- ▶ Do not allow the product to come into contact with organic solvents. Remove contaminants with water or approved cleaning agents.
- ▶ Protect the product from impacts.
- ▶ Do not back-flush the device.
- ▶ Always keep the interior of the product in a moist state.
- ▶ Do not exceed the maximum pressure drop.
- ▶ The pressure on the permeate side must never be higher than on the feed side.
- ▶ At the maximum permitted temperature, the module must not be operated at pressures higher than those specified in the product-specific data sheet.
- ▶ Do not make any external modifications to the product.
- ▶ It is essential to avoid pressure surges, major underpressures, temperature shocks and pressures greater than in the feed on the permeate side.
- ▶ Pressure surges, sudden increases in the solid content of the feed, heavy cross-flow drops and temperature shocks must absolutely be avoided.
- ▶ Only feed in the media types specified in Section [“7.2.1 Compatible Media”](#) to the media connections. The use of unnamed media is the responsibility of the user.
- ▶ Do not place a physical load on the module (e.g. by placing objects on it or standing on it).
- ▶ Additional information you can find on the specific product data sheet.

 The T-CUT tubular module has been developed with due consideration to recognized safety standards and is consistent with the latest technological developments. Nevertheless, dangerous situations may occur.

4 GENERAL INFORMATION

4.1 Contact Address

Germany

CUT Membrane Technology GmbH

Feldheider Strasse 42

D-40699 Erkrath/Düsseldorf

Tel: +49 (0) 2104 - 176 32 0

Fax: +49 (0) 2104 - 176 32 22

Email: info@cut-membrane.com

International

Contact addresses can be found in the internet at: www.cut-membrane.com

4.2 Warranty

The warranty is only valid if the T-CUT tubular module is used correctly in accordance with the specified usage conditions.

4.3 Information on the Internet

The operating instructions for the T-CUT tubular module can be found on the Internet at:

www.cut-membrane.com

5 PRODUCT INFORMATION

5.1 Intended Use

The intended use of the T-CUT tubular module is to concentrate or filter medium components by separating the solvent in which they are to be found.

The T-CUT tubular module has been designed for media that does not attack the membrane material (refer to product-specific data sheet).



This product may only be used following detailed consultation with a representative of CUT Membrane Technology

We recommend practical testing to support the theoretical basis for successful substance separation. Advance laboratory or pilot reference trials will provide information on the flow rates and purity of the permeate.

5.2 Handling of the Module

5.2.1 Protection against Drying

The module is well packed and supplied with sealed connections. When the module is in storage, there is the risk that the membrane may dry out. This may cause irreversible damage to the membrane and must therefore be absolutely avoided (refer to [“13 Non-use/Module Storage”](#))

5.2.2 Protection against UV

Do not subject the module to long-term exposure to direct sunlight or other UV sources (e.g. UV disinfection lamps).

Store the module in a dark place.

5.2.3 Protection against Frost

Store and use the module in a place protected against frost. If the module freezes, this will damage the membrane and result in brittle fractures.

5.2.4 Protection against Solvents

If the module housing comes into contact with organic solvents or if adhesive rubber tape is used, the housing may break.

To remove soiling from the housing, it should be cleaned with water or ethanol.

5.2.5 Careful Transport

If the module falls or is subjected to other collisions, this may result in fractures in and on the module and on the connectors. Therefore, the module must be transported and handled with care.

6 STRUCTURE AND FILTRATION

The product is designed for the cross-flow mode.

6.1 Design of the tubular Module

T-CUT tubular modules are modules with open flow channels. There are different flow channel widths which usually have a diameter of 5 to 25 mm. Tubular modules are manufactured as a single tube or in bundled configurations and are installed in housings.

The membrane layer of the pipe module is applied on a reinforced carrier material. The product to be filtered flows through the tubular module at a flow rate of approx. 3 m/s. The ultrafiltrate (permeate) flows radially through the membrane and the support layer and reaches a permeate collecting chamber from where it is discharged. The specific cross-flow rate is elementary for operation of the module and must be taken from the specific data sheet.

The major advantage of the tubular modules is their ability to achieve a high concentration without blockages even when media have a high solids content. Tubular module systems do not require any expensive prefiltration which is essential with other systems which have a thinner channel cross-section. Another major advantage of the tubular modules is that they can be cleaned thoroughly.

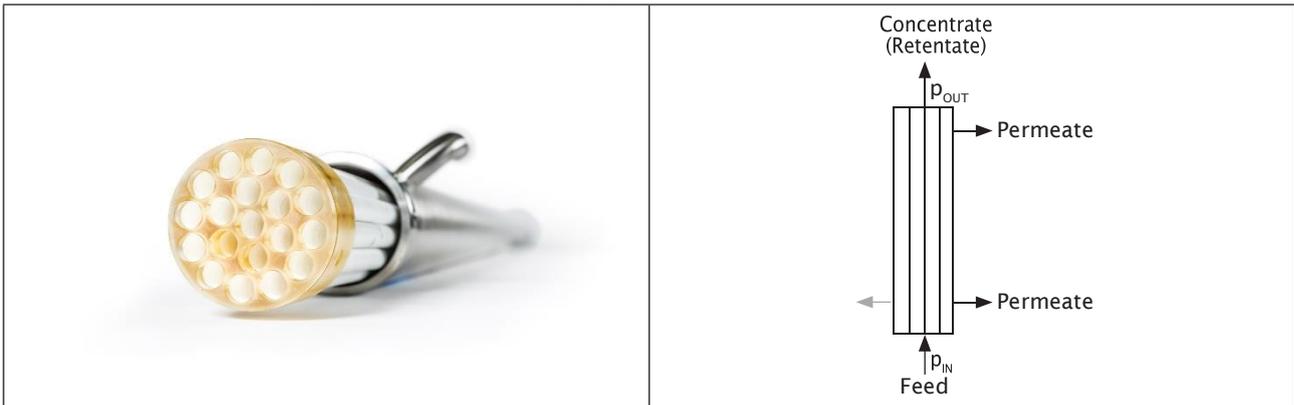


Figure 1: tubular module

6.2 Filtration

T-CUT tubular modules are used exclusively for cross-flow filtration. Unlike so-called dead-end filtration, which usually forms a performance-limiting filter cake, this effect is greatly reduced during cross-flow filtration by the tangential flow control of the liquid to be filtered. Suspended particles or emulsified liquids can be effectively separated by this method.



In the case of the membrane separation method, we recommend practical testing to support the theoretical viewpoints for successful substance separation. Preliminary laboratory and pilot reference trials will provide information on the flow rates and purity of the permeate (filtrate) and therefore on the efficiency of the separation process.

6.2.1 Cross-flow Filtration

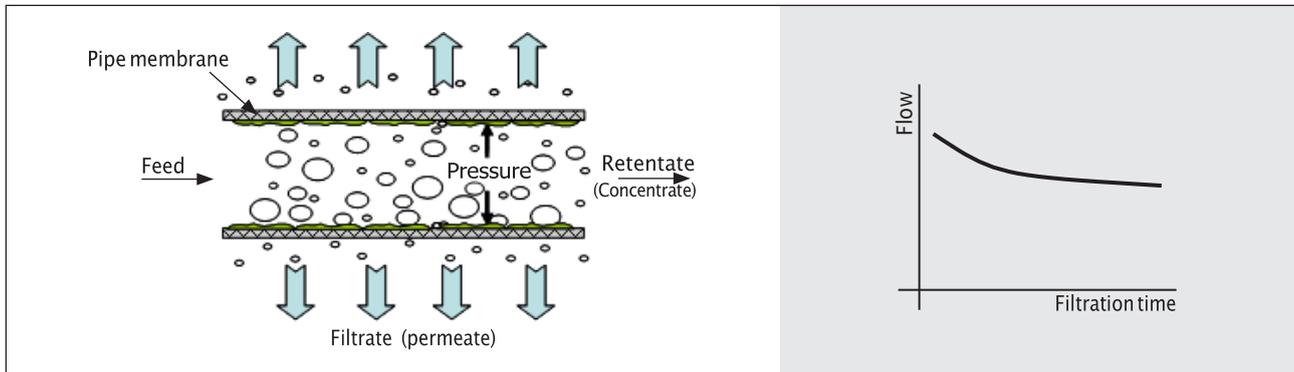


Figure2: Cross-flow filtration

In cross-flow filtration, the product to be filtered flows through the membrane installed in the filter module. The difference in pressure between the membrane tubes which the product crosses and the filtrate void causes part of the fluid to flow as a filtrate (permeate) through the membrane. The remaining part is fed into the circuit as concentrate or retentate.

More heavily contaminated water is frequently treated using the cross-flow operation. In comparison with dead-end operation, a higher volume flow is fed into the module here. The main part of the water which is fed in washes over the membrane (cross-flow) and is recirculated. The resulting flow and turbulence reduces the formation of a covering layer and ensures a consistent permeate output.

6.2.2 Trans-membrane Pressure

The trans-membrane pressure is identified by the pressure loss over the module.

Drop in pressure through the module: $\Delta p = p_{IN} - p_{OUT}$

Trans-membrane pressure:
$$p_{TMP} = \frac{p_{IN} + p_{OUT}}{2} - p_{Perm}$$

The permeate flow increases with the trans-membrane pressure.

Please note that while high trans-membrane pressures produce a thicker and denser covering layer, the permeate flow increases only slightly and membrane fouling may result in a decline in the permeate flow in the long term.

Therefore, while moderate trans-membrane pressures mean that there are no peak permeate flow rates at the start phase of filtration, this will pay off in the form of high and stable permeate flow rates in the long term.

6.2.3 Cross-flow Rates

Higher cross-flow rates will limit the thickness of the developing covering layer and enable the flow rate of the permeate to be kept high.

The standard flow rate (cross-flow rate) per module can be found in the specific data sheet. The cross-flow rate of approx. 3 m/s is usually indicated here. The optimum flow rates for membrane applications will vary and are dependent on the composition of the fluid to be filtered.

7 TECHNICAL DATA

7.1 Product Data

Please refer to the product-specific data sheet for the product data.

7.2 Operating and Usage Conditions

In order to monitor the flow rate and pressure for the membrane application, the system must be fitted with control valves for cross-flow, pressure control etc.

When planning and constructing a membrane system, ensure that the module is not exposed to any external mechanical loads. By using flexible supply lines, vibrations and thermal material expansion of the tubulars and the module can be absorbed without damaging the module (in particular the connections).

NOTE!

- The operating conditions (cross-flow and trans-membrane pressure) are dependent on the specific filtration application and should be optimized by means of laboratory or pilot tests!
- The limit values for pressure and temperature must not be exceeded.
- The ambient temperature must not exceed the medium temperature and must not give rise to frost.

Please refer to the product-specific data sheet for further information on operating and usage conditions.

7.2.1 Compatible Media

Aqueous media (within certain pH and temperature ranges – please refer to product-specific data sheet for precise information).

When using media not specified in the product-specific data sheets, please consult a representative of CUT Membrane Technology beforehand. The use of unnamed media without such prior consultation is the responsibility of the user.

8 INSTALLATION

8.1 Safety Instructions



DANGER!

Risk of poisoning, chemical burns, contamination from escaping medium.

- ▶ Check the product for leak-tightness prior to commencing use.
- ▶ When handling hazardous substances, always take appropriate precautionary measures and wear personal protective equipment in accordance with the requirements of the medium.
- ▶ Before disconnecting lines, the medium must be flushed from the entire system.

Risk of injury from high pressure in the system/product.

- ▶ Before working on the system or product, switch off the pressure and vent/drain the lines.



WARNING!

Risk of injury from improper installation.

- ▶ Installation may be carried out by authorized technicians only and with the appropriate tools.

Risk of injury from unintentional activation of the system and uncontrolled restart.

- ▶ Secure system against unintentional activation.
- ▶ Following installation, ensure a controlled restart.

8.2 Before Installation

→ Only remove the module from its packaging immediately before installing it in the system. Once removed from the packaging, the module must be treated with particular care.

→ Examine the module for any external physical damage.

→ Clean the system and pipelines to ensure that soiling and oily substances cannot be flushed into the module from the system.

New modules are supplied dry or filled with a preservative fluid. If the module is filled with preservative fluid, please drain the module first immediately before installing it.

Dispose of the preservative fluid in accordance with the applicable waste disposal and environmental protection regulations.

8.3 Installation in a Filtration System

NOTE!

Risk of material breaking.

- ▶ Attach and connect the module in such a way that vibrations from the system cannot be transferred to the module.

The module must be attached on the frame of the filtration system by a holder (e.g. 2 clamps). It is not adequate to attach the module by the connections only.

- Check the seals to ensure that they are clean. Only use clean seals.
- Loosely connect the feed inlet first, then the concentrate outlet, and finally the permeate outlets of the pipe.
- Ensure that the seals are not displaced when establishing the connections.
- Check that none of the connections is subject to mechanical stresses.
- Check that the seals are seated correctly.
- Alternately tighten the connections.

NOTE!

Damage to the connections.

- ▶ Do not use force to tighten the connections! Use of excessive force in tightening may cause fractures in the connections.

9 PREPARATION FOR USE

These instructions are limited to the correct treatment of the T-CUT tubular module. Please refer to the operating instructions of the filtration system to prepare the filtration system for use safely and securely.

9.1 Safety Instructions

DANGER!

Risk of poisoning, chemical burns, contamination from escaping medium.

- ▶ When handling hazardous substances, always take appropriate precautionary measures and wear personal protective equipment in accordance with the requirements of the medium.
- ▶ Before disconnecting lines, the medium must be flushed from the entire system.

Risk of injury from improper operation.

Improper operation may result in injuries as well as damage to the product and the surrounding area.

- ▶ Before start-up, ensure that the operating personnel are familiar with and completely understand the contents of the operating instructions.
- ▶ Observe the safety instructions and intended use.
- ▶ Only adequately trained personnel may start up the equipment/the product.



Compared to pumps and pipelines, the membrane in the filtration system is a relatively sensitive component. Therefore, every effort should be made when planning and operating the system to avoid pressure surges, sudden increases in the solid content of the feed, heavy cross-flow drops and temperature shocks. Pressure surges and vibrations in particular may damage the module and impair its performance.

NOTE!

Damage to the Module.

- ▶ Basically the pressure on the permeate site must not exceed the pressure on the feed site of the module.
- ▶ For detailed information, please check the related product data sheet.
- ▶ Media with non-permissible pH values or other products that would attack the membrane must not be used (please refer to the data sheet for compatible media – alternatively, contact a representative of CUT Membrane Technology).
- ▶ Do not exceed the maximum pressure drop.
- ▶ At the maximum permitted temperature, the module may only be operated at permitted pressure values (please refer to product-specific data sheet).
- ▶ We recommend keeping the pressure at the module outlet to at least 0.5 bar. The filtration system must be designed so that negative pressure cannot arise in the feed chamber.
- ▶ The limit values for pressure and cross-flow rate must not be exceeded.
- ▶ Quickly opening the valves may cause pressure surges, damaging the module.

9.2 Prior to Preparation for Use

When starting up for the first time, briefly rinse the modules with water. Then rinse for 15 minutes with a NaOH solution (pH 9-10) or an approved alkaline cleaner to flush the remaining preservative fluid out of the module. Then rinse again with water. Afterwards, the water flow can be determined or it can be changed directly for filtration.

Irrespective of whether the system is used for rinsing, filtering or cleaning, please proceed as described below in "9.3 Filtration".



CAUTION!

Mildly toxic preservative fluid.

▶ Avoid contact with eyes and skin.



The water used for flushing purposes must satisfy certain purity requirements. These are product-specific and must be inquired about.

Any concentrate and permeate generated during rinsing will be rejected. Please observe any applicable national environmental regulations.

9.2.1 Determining the Water Flow Rate

The water flow rate is the maximum achievable permeate flow rate for a certain trans-membrane pressure value. As no separation of substances takes place at the membrane, no covering layer will develop and the permeate flow rate is determined solely by the hydrodynamic properties of the membrane.

The effectiveness of cleaning the membrane can be defined by measuring the water flow rate before and after cleaning and then comparing both measurements.

The use of demineralized water, pre-filtered to 10 µm, is recommended for determining the water flow rate.

Please consult a representative of CUT Membrane Technology if you wish to use tap water.

The Water flow rate is calculated with the amount of permeate (in L/h) divided by the active membrane area. The membrane area is noted in the product data sheet.



To avoid pressure surges, we recommend operating the module for around 2 minutes at low pressure before gradually increasing the pressure to the recommended values (refer to product-specific data sheet).

9.3 Filtration

→ Ensure that the permeate can flow out at zero pressure (open permeate valve(s)!).

When using centrifugal pumps for the feed:

→ Close the feed valve

→ Open the concentrate outlet valve

When using displacement pumps for the feed:

→ Leave the feed valve slightly open

→ Open the concentrate outlet valve

With either type of pump:

→ Switch on pump. Select low frequency for speed-controlled pump.

→ Open feed valve deliberately slowly to avoid pressure surges when deaerating the system.

 The limit values for pressure and cross-flow rate must not be exceeded.

- Ensure that the entire system (in particular the permeate areas of the modules) is deaerated.
- Gradually increase the cross-flow rate and rinsing water pressure by carefully opening the feed valve further.
- Adjust the trans-membrane pressure by carefully and gradually closing the valve on the concentrate outlet (pressure sustaining valve).
- Check connections of the module for leaks. If leaks are determined, stop the operation and take countermeasures (if the seal is correctly positioned, it is usually adequate to tighten the clamps hand-tight).

NOTE!

Damage to the connections.

▶ If the surfaces of the seals on the connector and supply line are not flat on top of one another, do not use excessive force to tighten the connecting elements to ensure leak-tightness. Using excessive force may cause the connections to break.

- After rinsing, drain the system and start filtration.

 There is usually the option of measuring the pressure drop through the module and the cross-flow rate of the module from the system.

If the cross-flow rate of the module cannot be measured, the operating point is simply adjusted by slowly increasing the pressure drop to its recommended value.

In any case, the concentrate outlet valve (pressure sustaining valve) must be closed enough for the concentrate pressure on the module outlet to always be greater than 0.5 bar.

The cross-flow rate specified in the data sheets for the recommended pressure drop applies to water (temperature 25 °C, viscosity 1 mPas). Please note that the maximum permissible pressure drop with feed solutions of a higher viscosity is reached with a considerably lower cross-flow rate.

 Please consult a representative of CUT Membrane Technology if you have questions surrounding the preparation of the module for use.

10 CLEANING AND MAINTENANCE

Fouling of the membrane surface may result in a decline in the flow rate of the permeate. In most cases, the coatings can be removed from the membrane and the permeate flow rate can be for the most part restored.

The cleaning procedure must take into consideration the type of fouling and the resilience of the module type in question.



The ideal cleaning method should be determined by means of pre-trials. As an alternative to commercial cleaning agents, the pH value can also be modified during the cleaning phase with the use of bases or acids.

Only use the cleaning agents recommended by us in Section "[12 Recommended auxiliary materials](#)". Please contact our technical support service before using cleaning agents not listed in these operating instructions.

Cleaning is generally conducted under the stress limits of the module. Therefore, each cleaning activity reduces the life of the module.

10.1 Cleaning Methods

10.1.1 Cleaning by Water Circulation

- Flush residual process solution out of the pipelines and the module by rinsing with DI water and convey out of the system via the concentrate outlet.
- Switch off feed pump, drain system.
- Fill feed tank with DI water.
- Switch valves in the system so that concentrate and permeate are fed back into the feed tank (cleaning mode).
- Leave water to circulate in the system for approx. 20 min. An increased cross-flow rate and temperature will improve the cleaning effect. However, the maximum permitted values for module inlet pressure and temperature must not be exceeded.
- Drain the system.

If cleaning with water does not produce the expected results, the system can then be chemically cleaned.

10.1.2 Chemical Cleaning

The system can be chemically cleaned depending on the rawwater quality. Chemical cleaning is always implemented under cross-flow conditions.

Different chemicals, such as acids, alkalis, oxidizing agents, enzymes or surfactants, are added to the cleaning circuit.

The option of cross-flow cleaning prevents a gradual blockage of the membrane.

10.1.3 Soaking with Chemicals

In the ultrafiltration of water with high concentrations of organic material, regular soaking with chemicals may be required in addition to rinsing.

The module is filled with a chemical solution. Permeate with 100–250 ppm chlorine is used for this (in alkaline cleaning fluid only!), acid up to pH 2 or alkali up to pH 11. The solution remains in the module for 5 to 15 minutes and is then flushed out (static cleaning).

10.2 Water for Flushing and Diluting/Dilution

Water used for flushing and diluting/dilution is subject to certain requirements that must be met:

- free of particles
- low hardness
- partially deionized

10.3 Maintenance

No maintenance is necessary. The product may need to be cleaned in accordance with [“10.1 Cleaning Methods”](#).

If the permeate flow rate and separation characteristics can no longer be restored by cleaning the module, the product has reached the end of its service life.

To order new T-CUT tubular modules, please contact a representative of CUT Membrane Technology.

11 DISASSEMBLY



DANGER!

Risk of poisoning, chemical burns, contamination from escaping medium.

- ▶ When handling hazardous substances, always take appropriate precautionary measures and wear personal protective equipment in accordance with the requirements of the medium.
- ▶ Before disconnecting lines, the medium must be flushed from the entire system.

Risk of injury from high pressure in the system/product.

- ▶ Before working on the system or product, switch off the pressure and vent/drain the lines.

Risk of injury from improper disassembly.

Improper disassembly may result in injuries as well as damage to the product and the area around it.

- ▶ Before removal, ensure that the operating personnel are familiar with and completely understand the contents of the operating instructions.
- ▶ Observe the safety instructions and intended use.
- ▶ Only adequately trained personnel may remove the product.



If the T-CUT tubular module is to be used further after removal, certain conditions must be adhered to regarding storage (refer to "13 Non-use/Module Storage").

Procedure:

- Completely drain the system.
- Flush out the rest of the feed solution with water (normal cold tap water) until the concentrate is clear.
- Flush the entire system for 20 minutes using warm water. Any concentrate or permeate generated is to be disposed of.
- Completely drain the system.
- Disconnect the connections.
- Remove the product.



Please consult a representative of CUT Membrane Technology if you have any questions.

12 RECOMMENDED AUXILIARY MATERIALS

We recommend the use of the following substances for the installation, disinfection and cleaning of the T-CUT tubular module.

Use	Product	Manufacturer
Lubricant	Glycerin anhydrous	
Disinfectant	Sodium metabisulfite 1.0%	
Cleaning agent	NaOH NaOCl HNO ₃	CUT Membrane Technology GmbH www.cut-membrane.com

13 NON-USE/MODULE STORAGE

13.1 Unused Products

NOTE!

Incorrect storage may damage the product.

- ▶ Store product horizontally in a dark and frost-protected room.
- ▶ Storage temperature 5 ... 30 °C.
- ▶ Never store the module with open connections – if the membrane dries out, the module will be irreversibly damaged.
- ▶ Use only DI water to make preservative solutions.

The T-CUT tubular module is well packed and supplied with sealed connections. Please store the unused module in this sealed bag, unopened.

13.2 Used Products

Used membranes must be kept moist at all times. To inhibit bacterial growth during periods of non-use or module storage, moist membranes should be rinsed using suitable disinfectants (refer to [“12 Recommended auxiliary materials”](#)).

We recommend storing the module inside the system.

13.2.1 Short-term Storage

Non-use up to 24 hours

→ No measures required.

Non-use between 24 hours and 7 days

→ Carefully rinse the module with disinfectant (please refer to [“12 Recommended auxiliary materials”](#)).

→ Perform a filtration once a day using clean water, permeate or cleaning agent.

13.2.2 Long-term Storage

Non-use between 7 day and 12 months

→ Clean the module prior to disinfection (refer to [“10.1 Cleaning Methods”](#)).

→ Fill module with preservative solution 1.0% sodium bisulfite (NaHSO₃) or

Causing a brief and slight cross-flow through the modules will ensure that the permeate chamber is completely filled with preservative solution.

→ Leave the solution in the module and replace it every 14 days.

Clean the module prior to disinfection (refer to [“10.1 Cleaning Methods”](#)).

14 RETURNING A MODULE

Please contact a representative of CUT Membrane Technology before sending back a module.

Prepare the module as if you were preparing it for long-term storage ([“13.2.2 Long-term Storage”](#)). Send the module well-packed to CUT Membrane Technology with an enclosed written statement of the faults identified.

15 PACKAGING AND TRANSPORT

NOTE!

Transport damage.

Inadequately protected products may be damaged during transportation.

- ▶ Protect the product against light, moisture and dirt in shock-resistant packaging during transportation.
- ▶ Prevent the temperature from exceeding or dropping below the permitted storage temperature.
- ▶ Storage temperature 5 ... 30 °C.

Damage to the environment caused by parts of the product contaminated with media.

- ▶ Dispose of the product and packaging in an environmentally friendly manner.
- ▶ Observe applicable waste disposal and environmental regulations.

www.cut-membrane.com