

Installation, Operating and Maintenance Instructions

Conductivity Synthesizer

Model SynPur
Type LS 400
LS3400
LS3402

The logo for Draabe, featuring the word "DRAABE" in a bold, stylized, outlined font with a slight shadow effect.

A WMH company

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1. Introduction

1.1 First Things First!

Thank you for choosing the **DRAABE SynPur**.

The SynPur was designed in accordance with the latest level of technology and generally accepted safety standards and regulations. Nevertheless, inappropriate use of the system can result in the risk of injury to the user and/or others, as well as damage to property and equipment.

Therefore, to ensure safe, appropriate, and economical operation of the system, all of the information and particularly the safety-related information in this document should be noted and followed.

For questions that are not addressed or not adequately answered in this document, please contact your local NORTEC representative or our service **+1 613 822 0335**. Our specialists will be happy to assist you.

1.2 About this Technical Document

Limitations

The subject of this Technical Document is the DRAABE SynPur. The system components (e.g. SynPur, mounting rail, etc.) are described only to the extent necessary for proper operation. Since the system offers various upgrading options, this document relates to the basic system. Depending on the application and specified capacity, various system components are available. Because the system serves as the preliminary stage for a DRAABE air humidification system, a higher humidification capacity has a direct influence on the different parts of the system described in this document. Some accessories are not absolutely essential; others are part of the standard configuration. For additional information on accessories and or individualized solutions, please refer to the customer-specific diagram or contact NORTEC.

The information in this Technical Document is limited to the:

- **Installation, initial startup, operation, and maintenance** of the SynPur.

The Technical Document is supplemented by various separate documents (order forms, diagrams, etc.). Where applicable, cross-references to these publications are contained in the Technical Document.

Agreement



This symbol identifies **Safety and Hazard Information** that could lead to personal injury and/or property damage if it is ignored. Safety and Hazard Information is also identified by the term **ATTENTION**.



This symbol identifies important information. This information is also identified by the term **IMPORTANT**.



This symbol is found on the nameplates of all devices. It is intended to remind you to read the Technical Document **before** handling any of the equipment. If anything is still unclear after reading the document, please contact the Technical Customer Support department of the manufacturer **before** handling the equipment in any way.

Definitions

Untreated water:
Drinking water or tap water.

RO water:
Reverse osmosis water (or pure water) is water that has been partially demineralized in the pure water system RO water is also necessary as a preliminary stage for the smooth operation of the SynPur.

DI water:
Fully deionized water contains no minerals. In plants that produce deionized water, this water can be connected to the SynPur.

DM water:
In the Synthesizer cartridge the last minerals are extracted from the RO water. This demineralized water is conditioned in the SynPur with an additive and is suitable for the humidification of „clean rooms,“ etc.

Additive:
The additive is a gas (carbon dioxide) used to condition the DM water to enable humidification with DM water.

Synthesizer cartridge:
The Synthesizer cartridge contains a resin solution formulated especially for DRAABE for the production of DM water.

Document Storage

Please keep this Technical Document readily accessible in a safe place. If the document is ever lost, please contact NORTEC.

Languages

This Technical Document is available multiple languages. Please contact NORTEC with related questions.

2. For Your Safety

2.1 Agreement on Appropriate Use

The SynPur is intended for use **exclusively as a preliminary stage for DRAABE air humidification systems** within the specified operating conditions in non-potentially explosive environments. It is used to condition the feed water (RO or DI water) and deliver a product that is processed further by the downstream air humidification system. Any other use is considered inappropriate and can result in the system becoming a hazard.

The proper use of the system includes **compliance with all of the information contained in these instructions** (particularly the safety information) and strict adherence to the specified operating conditions.

2.2 General Safety Information

- Only **persons** who are familiar with the product and are **adequately trained** for the respective work should install and operate the SynPur. The customer is responsible for ensuring that the technical documentation is supplemented by internal company instructions regarding supervisory and reporting obligations, work organization, employee qualification, etc.
- **Before beginning work** on components of the SynPur, the system should be **shut down** properly according to Chapter 5.2 and secured against accidental restart (controller off, water supply closed, and system depressurized).
- Compliance is required with all local **safety regulations** concerning:
 - The use of mains-supplied **electrical and electronic equipment**.
 - The **design of water and high-pressure systems**.
- All safety regulations concerning the use of pressurized gas containers, especially those filled with carbon dioxide (CO₂), should be obeyed.
- Inadequately maintained air humidification systems can pose a health hazard. Because this system is used as a preliminary stage in an air humidification system, the following rule applies equally to it: **maintenance activities must be performed properly in the specified intervals**.
- If it can be assumed that a **non-hazardous operation is no longer possible**, the SynPur must be **shut down immediately and secured against accidental restart** and NORTEC should be notified. Circumstances in which this could be the case include the following:
 - Components of the system are damaged.
 - The system is no longer functioning properly.
 - Connections or lines are not leak-tight.
- To avoid water damage, materials that are sensitive to water should not be stored directly under the SynPur.
- Aside from the activities described in these instructions, no other interventions are permitted on the Conductivity Synthesizer.
- Only original accessories and replacement parts from NORTEC should be used.



- Changes to the Conductivity Synthesizer are prohibited without written approval from NORTEC.
- After changes are made to the system, NORTEC Customer Service or agents authorized by NORTEC should perform an acceptance inspection before the initial startup.

3. Product Overview

3.1 System variants

The Conductivity Synthesizer system is very flexible. The customer-specific systems are oriented on the humidification demand of the downstream air humidification system. Parts of the system depend on the performance data of the upstream water purification system. Essentially, a distinction is made between Basic System A, Basic System B, and the Conductivity Synthesizer in use with an already existing deionization stage. All variants discussed below have a maximum conditioning capacity of 400 kg/h.

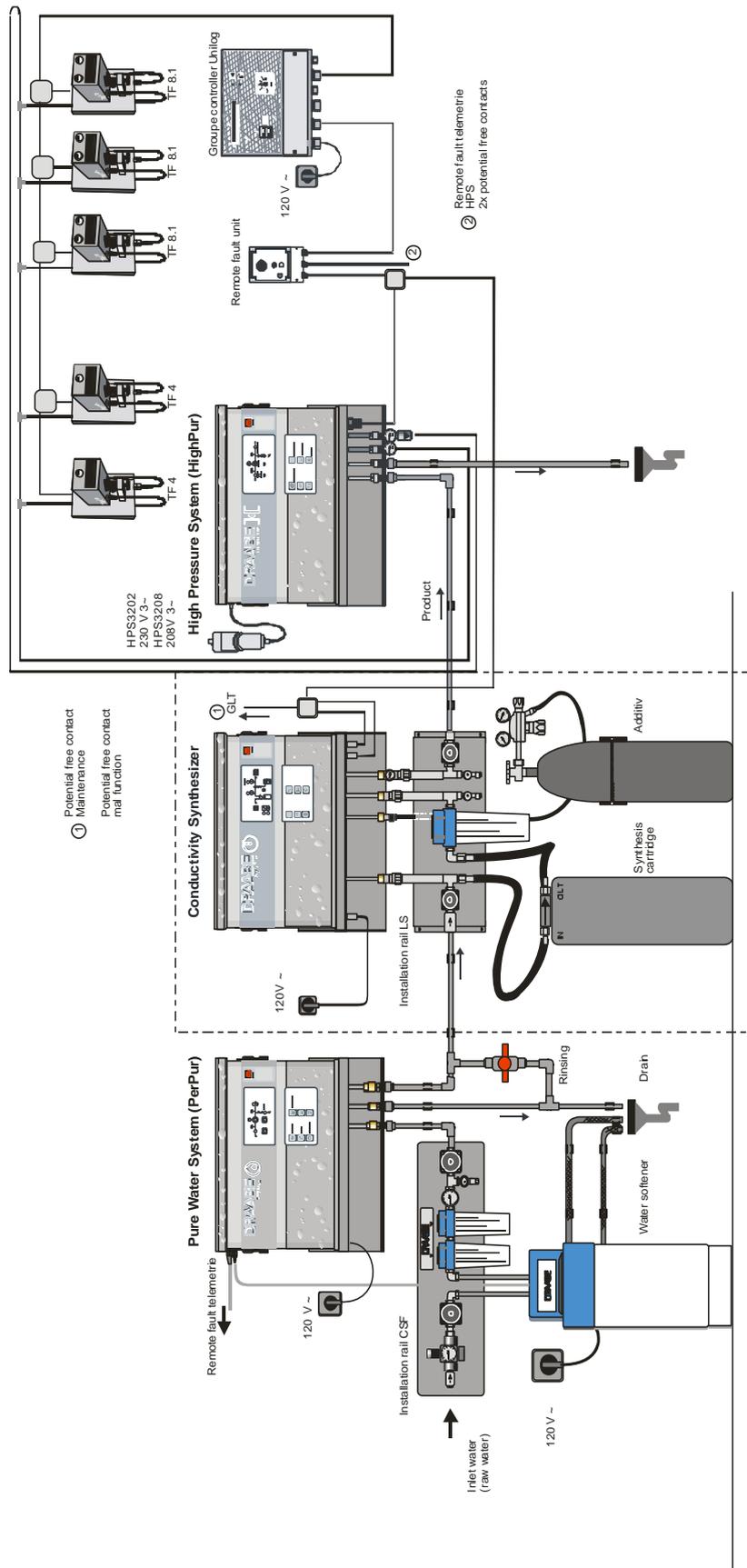


Figure 1: Complete air humidification system

3.1.1 Basic System A

The Basic System A consists of a mounting rail, an SynPur, a Synthesizer cartridge, and the additive. Basic System A is shown in the figure below.

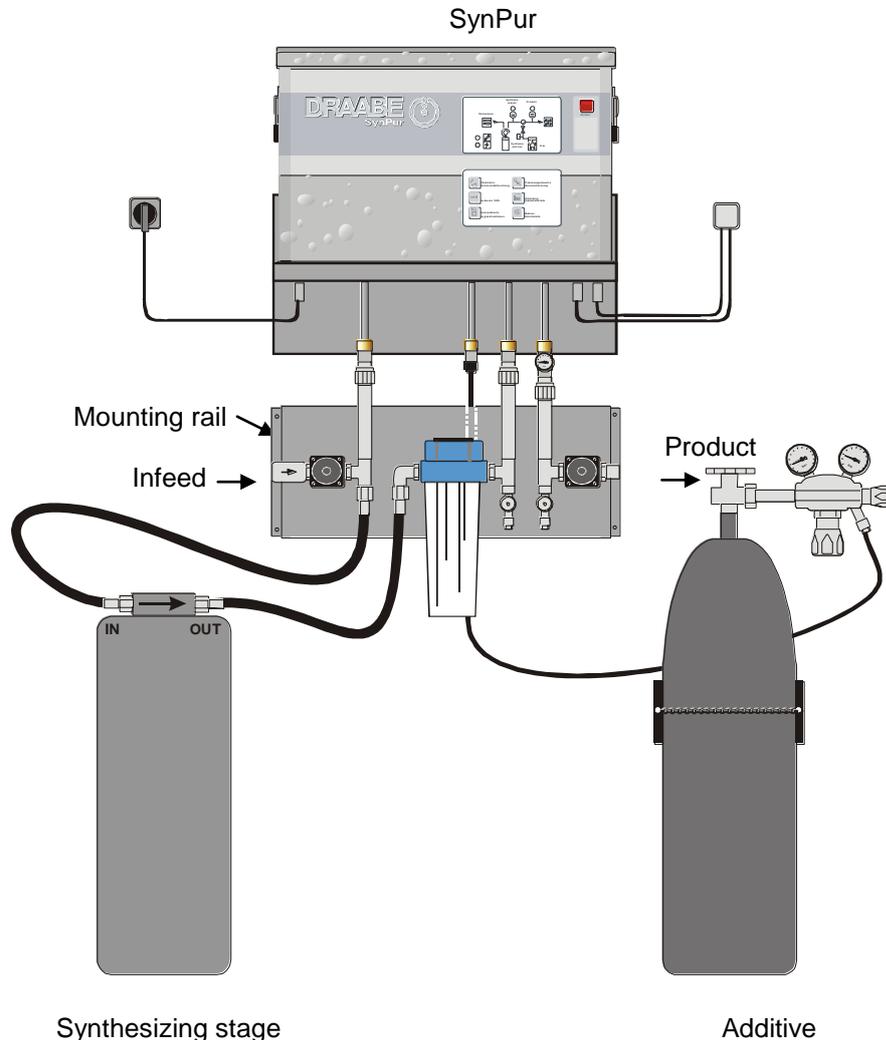


Figure 2: Basic System A

3.1.2 Basic System B

The Basic System B consists of a mounting rail, an SynPur, two to four synthesizer cartridges, and the additive. Basic System B is shown in the figure below. The higher the humidification demand, the faster the resins in the synthesizer cartridges are depleted. To extend the replacement intervals, up to four cartridges can be connected in sequence. As shown in the figure, the mounting rail is connected to the inlet of the first cartridge. The outlet of the first cartridge is connected to the inlet of the second cartridge, etc. The outlet of the last cartridge is connected again to the mounting rail.

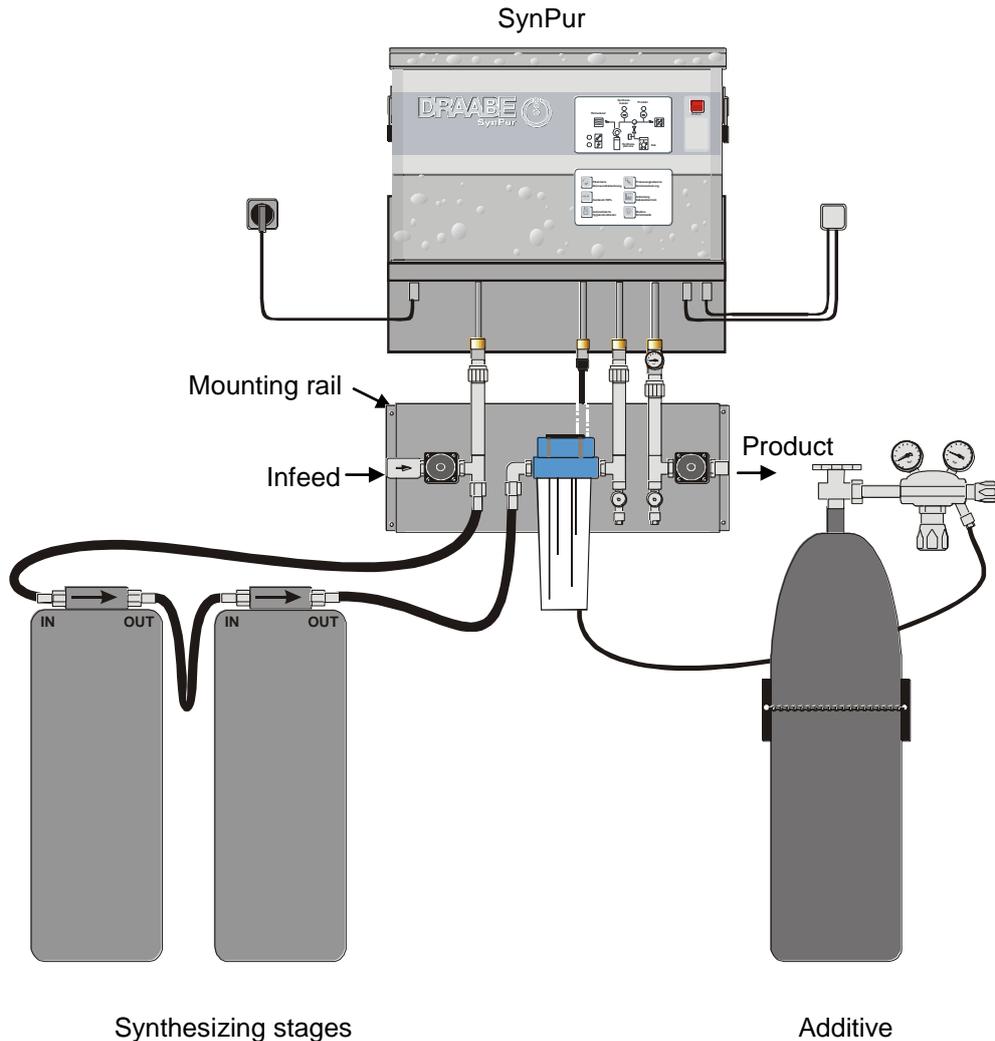


Figure 3: Basic System B with two synthesizing stages

3.1.3 Conductivity Synthesizer with existing full deionization stage

If a full deionization stage already exists in a plant for generating fully deionized water (DI water), the DI water can be connected directly to the mounting rail. The synthesizer cartridges are not required in this case. This system consists of a mounting rail, an SynPur, and the additive. The connection to the synthesizer cartridge should be jumpered on the mounting rail (see Figure 3).

Requirements of the DI water:

- Conductivity < 0.1 μ S
- Constant flow pressure of 2-3 bar (29-43.5 psi)
- Freedom from organic components (< 100 KBE)

Deionized water in untreated form is not suitable for use in a single-component air humidification system. The SynPur conditions the DI water in such a way that it can be used without reservation.

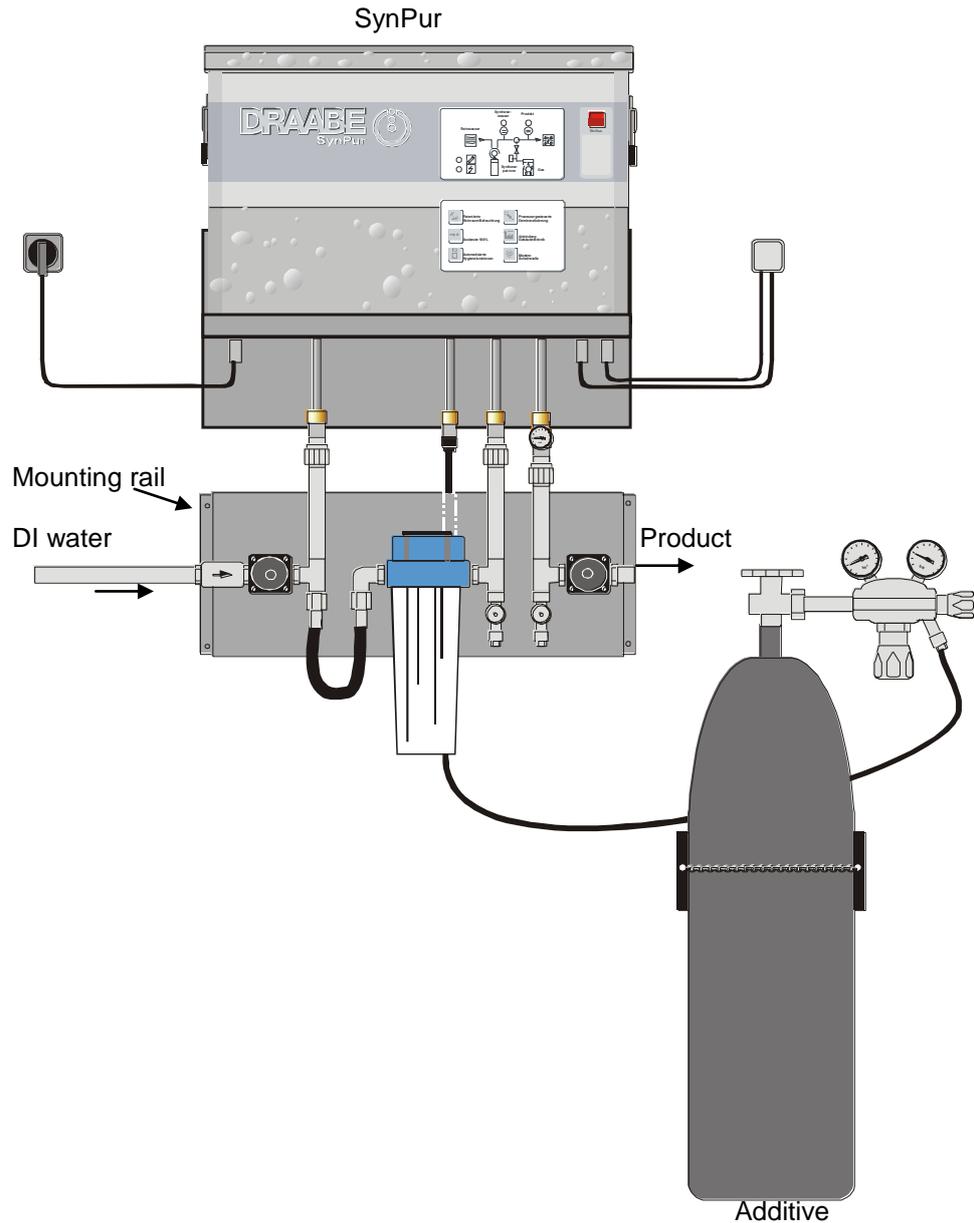


Figure 4: Conductivity Synthesizer with existing DI stage

3.2 System description

The DRAABE Conductivity Synthesizer is a compact conditioning unit that provides maximum convenience and economic efficiency. It regulates the aqueous properties of the product. The infeed water for the downstream air humidification system represents the product. With the DRAABE single-component nozzle systems (such as the TurboFog system) this water is brought to an operating pressure of 85 bar (1232 psi) by means of high-pressure pulsation. At this pressure, special jets deliver the water into the air in the room. The humidity in the room is increased.

Consisting of the components synthesizing stage, additive, mounting rail, and the SynPur, the system is connected between the water purification system and the high-pressure pulsation system (HPS).

The basic design of the system is shown in the figure (see Sections 3.1.1 and 3.1.3).

3.2.1 Functional description of the mounting rail

The mounting rail forms the interface between the water purification system, the Conductivity Synthesizer, and the high-pressure pulsation system (HPS). A check valve (1) prevents backflow of the conditioned water.

The synthesizer cartridge is connected to the mounting rail with quick couplings (3). The shut-off valves (2) enable quick replacement of the cartridge or the filter (e.g. during maintenance activities). From the support console, the circulation of the Conductivity Synthesizer is connected from above (7).

A filter (4) protects the downstream Conductivity Synthesizer from possible impurities in the water. After the filtration the DI water is connected to the Conductivity Synthesizer (9) and the product is returned to the mounting rail (10).

The DI water (5) and the product (6) can be sampled at any time over the sampling taps (5/6).

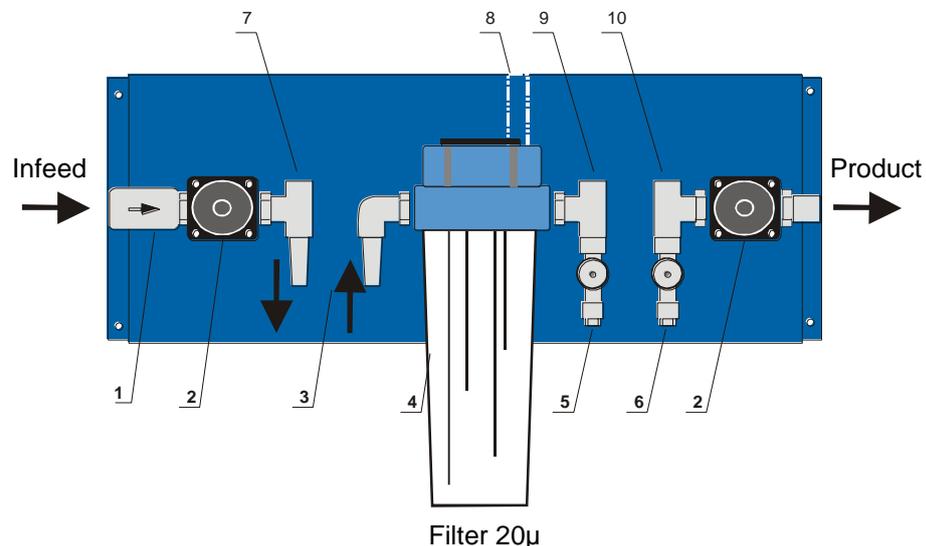


Figure 5: Mounting rail

3.2.2 Functional description of the SynPur

In certain environments (e.g. „clean rooms“, ESD-protected areas, etc.), the water to be atomized must be free of minerals (DI water = fully demineralized water). The SynPur has the task of removing all of the minerals from the already purified water in order to introduce minimum quantities of CO₂. The product is a specially treated (conditioned) water that is fed to the HPS to be atomized.

All internal processes of the SynPur are managed by a programmable logic controller (PLC).

The function of the SynPur is explained below. The display shows the functional status based on a stylized flow diagram and LED's. A detailed description of the display is found in Section 4.3.3.

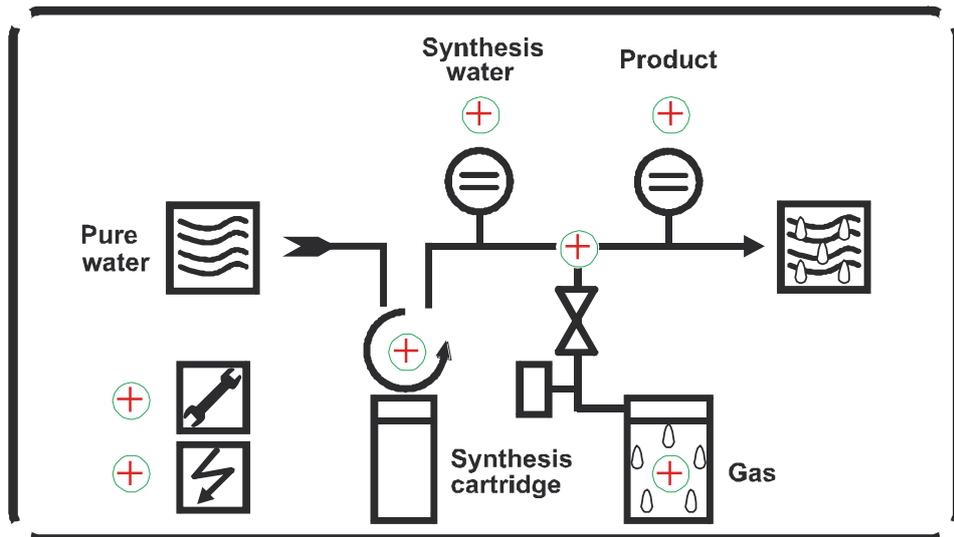


Figure 6: Display of the SynPur

The SynPur is ready for operation when the supply voltage and the water supply (with adequate water pressure) and the additive (with adequate gas pressure) are connected. In addition, the lighted mains switch indicates that the device is turned on.

The infeed pressure switch monitors the pressure of the water supply and shuts the system off if the water supply malfunctions. In this case, the red LED „Fault“ lights up on the display.

Another pressure switch monitors the gas inflow. The LED „Additive“ lights up on the display when gas is present. If the gas supply malfunctions the pressure switch shuts the system off and the red LED „Fault“ lights up on the display. At the same time, the LED „Additive“ turns off. Operation can be resumed after the bottle has been replaced (for more information on replacing the bottle, see Section 6.3).

Because the resins in the synthesizer cartridges are depleted during the process of extracting the minerals, the SynPur continuously monitors the quality of the demineralized water. When a first threshold value is reached, the SynPur outputs a service message indicating that the synthesizer cartridge should be replaced soon.

When the second threshold value is reached, the SynPur outputs a fault message and the system – and therefore also the entire downstream air humidification system – is shut off. To resume operation the synthesizer cartridge must be replaced at this point (for more information on replacing the cartridge, see Section 6.2).

If there is no demand for humidification for an extended period, no product can be accepted. In this case, there is a danger of germination during downtime. To avoid this, the system should be equipped with extensive hygiene functions. The DRAABE BioSafe System ensures a hygienically unobjectionable operation. The SynPur directs the water cyclically from the synthesizer cartridge over a bioreactor that disinfects the synthesizer cartridge, or the water from the cartridge, by means of intensive UV-C radiation (it circulates). The unit responsible for this function is referred to as the circulation.

If the circulation of the SynPur is shut off, the pump pressure and the motor current are monitored as soon as the pump starts to run. The LED „Circulation“ lights up on the display.



ATTENTION: The circulation is a key element in safeguarding the hygiene. A constant supply of power as well as water should be ensured.



ATTENTION: Regular maintenance/inspections are a key element in safeguarding the hygiene. Performance and documentation of these either by the manufacturer or by authorized/trained personnel should be ensured.



ATTENTION: The bioreactor of the circulation should be tested every 6 to 9 months for performance and replaced if necessary. Only the original DRAABE Bioreactor should be used. Deviations from this rule can result in health hazards, as reliable degermination can no longer be ensured.

The SynPur is housed in a small portable container that is placed on the support console. Flexible, self-retracting hoses are used to connect the unit to the support console and to disconnect it from the console when it needs to be replaced.



This container system allows the SynPur to be sent to the manufacturer for a thorough servicing every 6 to 8 months in an exchange system. The container system ensures maximum operating reliability and the quickest possible help in case of a malfunction.

For those who are leasing the Conductivity Synthesizer, the supply of an exchange device, the services performed on the containers, the necessary replacement parts and the standard service are free of charge.

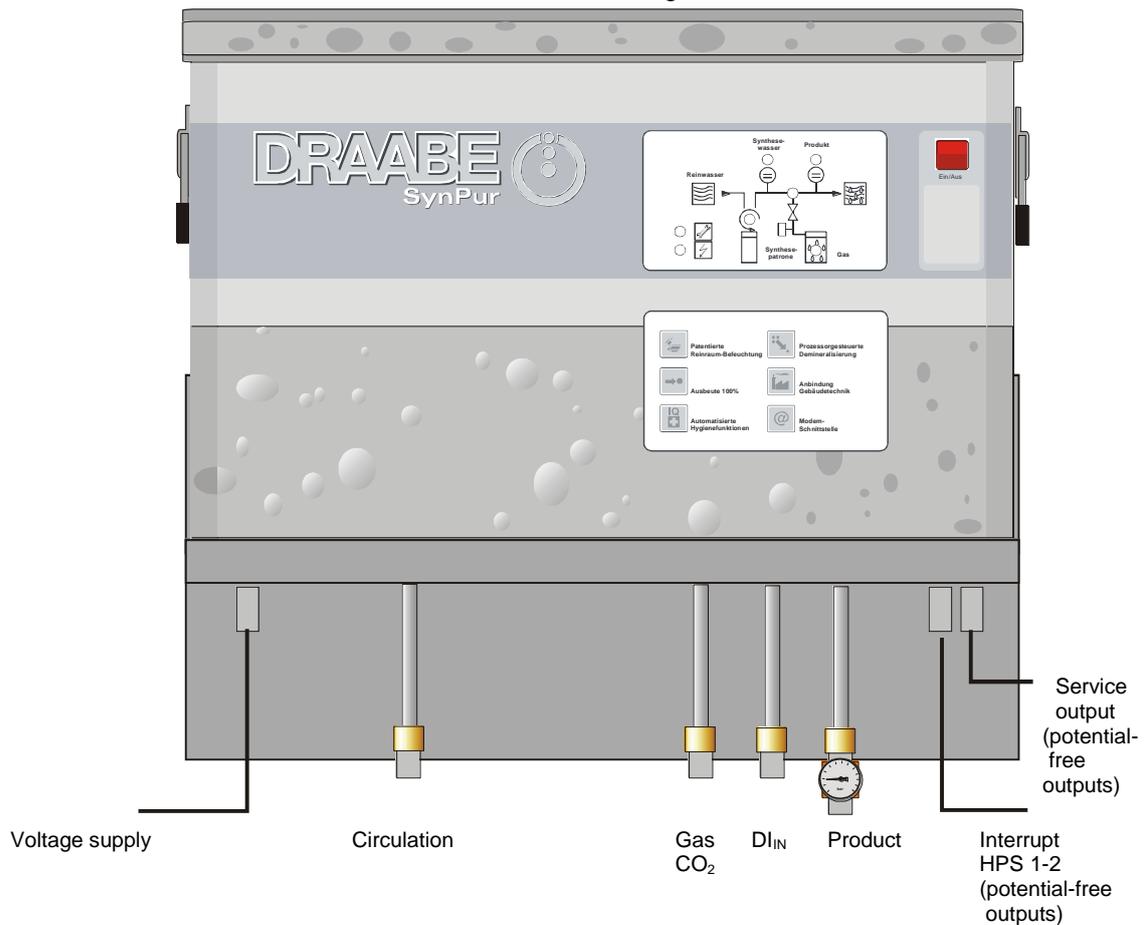


Figure 7: Small container SynPur

3.2.2.1 Display Symbols

The display of the SynPur indicates the functional status based on a stylized flow diagram using LED's.

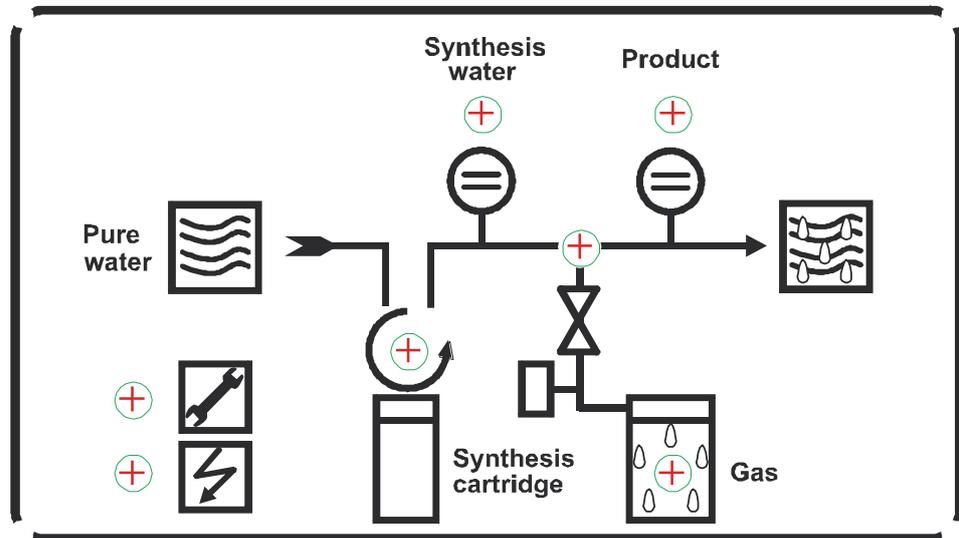


Figure 8: Display SynPur

The individual LED's and their symbols are described below:

Infeed water



This symbol indicates the infeed water (RO water) fed to the SynPur.

Product



This symbol stands for the product that is forwarded to the HPS for atomization after synthesis.

Service



The LED Service lights up in connection with the LED DI. This means that the synthesizing resins are almost depleted and the synthesizer cartridge should be replaced.

Fault



If the LED Fault lights up the air humidification is automatically interrupted and only resumed after the fault has been corrected. Only the circulation is kept on to prevent germination of the water.

Possible causes of a fault are:

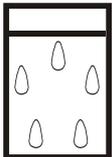
- Infeed water pressure is too low
- Additive pressure is too low
- Outlet pressure of the circulation is too high
- Motor protection of the circulation was triggered
- Conductivity of the demineralized water is too high
- Product quality is not O.K. (conductivity too high)
- Product quality is not O.K. (conductivity too low)

Circulation



In extended downtimes germination of the water takes place, which can be harmful to health and can damage the equipment. To counteract this, the SynPur is equipped with a circulation. Regardless of whether humidification is active or not, this circulation is turned on every 8 hours for approx. 15 minutes and ensures degermination of the synthesizer cartridge. During this period the LED „Circulation, is lit.

Additive



In normal operating mode the LED „Additive“ is lit and indicates that adequate CO₂ is still present. If a drop in the gas pressure occurs (e.g. when the CO₂ bottle is empty), the light goes out and a collective fault message is output.

Operation



This LED is lit when the SynPur is in operating mode. If no acceptance occurs, the light goes out.

DI



The LED „DI“ is lit when the DI water is above the specified threshold value. In conjunction with the LED „Service,“ this means that the conductivity of the DI water is slightly increased and the synthesizer cartridge should be replaced soon. If the conductivity of the DI water exceeds the second threshold value, the LED's „DI“ and „Fault“ are lit. To prevent precipitation of minerals, the air humidification system is shut off simultaneously. The synthesizer cartridge must be replaced before operation can be resumed (for more information on replacement see Section 6.2).



OUT

The LED „OUT“ is lit when the conductivity of the product is too high or too low. Because this condition can lead to problems, the air humidification system is also shut off at the same time.

Mains switch

The mains switch is used to turn the system on or off.

3.3 Functional description of the Synthesizer cartridge

The Synthesizer cartridge contains a regenerative resin mixture specially formulated for DRAABE. The resin solution extracts the minerals from the purified water based on the principle of ion exchange. During this process, the DI resins are depleted and must be replaced for regeneration (for further information on replacement, see Section 6.2).

The synthesizer cartridge is connected to the mounting rail with quick-couplings. It is important during connection to ensure that the cartridge is connected properly. The inlet and outlet are marked „IN“ and „OUT“ on the cartridge. The infeed is connected with the inlet („IN“) of the cartridge. The outlet („OUT“) is connected to the filter.

For increased humidification capacity up to four synthesizer cartridges can be connected sequentially and thus a longer service life achieved. As shown in the figure below, the inlet („IN“) of the first is connected by a hose with quick-couplings to the inlet of the mounting rail. The outlet („OUT“) of the first cartridge is connected in turn with quick-couplings to the inlet („IN“) of the second cartridge, etc. The last synthesizer cartridge is connected again to the mounting rail.

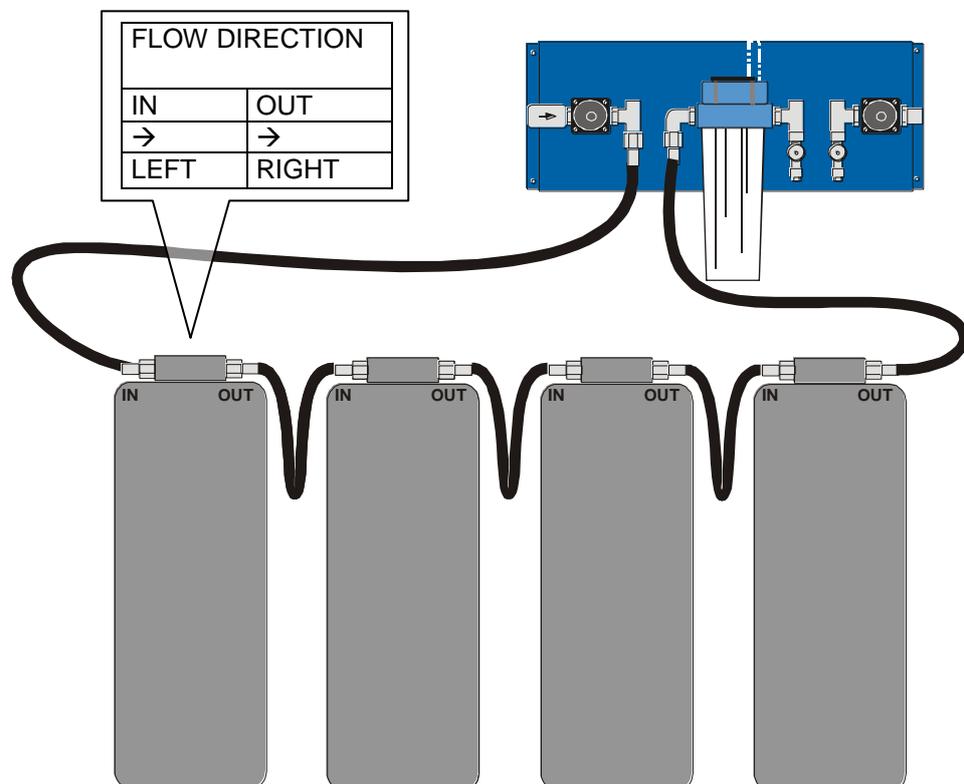


Figure 9: Sequential connection of synthesizer cartridges

The 20 μ filter removes the last impurities from the demineralized water and thus protects the downstream equipment from possible damage.

To measure the conductivity, DM water can be extracted over the sampling tap. To do this, hold a clean container under the tap and rotate it in counter-clockwise direction. Flush the container out first with DM water to remove any impurities that could lead to measuring errors. Then extract approximately ¼ l of DM water and close the sampling tap by rotating it in clockwise direction until it stops. With a calibrated conductivity gauge the conductivity of the DM water can now be determined. The value should be < 0.5 μ S. When the values are around 1 μ S, the synthesizer cartridge should be replaced soon.



ATTENTION:

Values > 2-3 μ S are definitely too high! In this case, NORTEC Customer Service should be notified!

For help selecting a suitable conductivity gauge, please contact our Customer Service department. Our specialists will be happy to assist you.

3.4 Functional description of the additive

The CO₂ bottle is connected to the SynPur over a hose. For this connection the hose should be routed through the cable sleeve of the mounting rail (see diagram in Section 4.2, Point 7) and connected to the support console. The SynPur feeds CO₂ to the demineralized water.

The gas fitting should be connected to the CO₂ bottle and the valve on the bottle opened. The bottle pressure is indicated on the left pressure gage of the gas fitting. The pressure of 6 bar (87psi) can be adjusted over the pressure reducer (can be read on the right pressure gage). The valve can then be opened on the gas fitting.

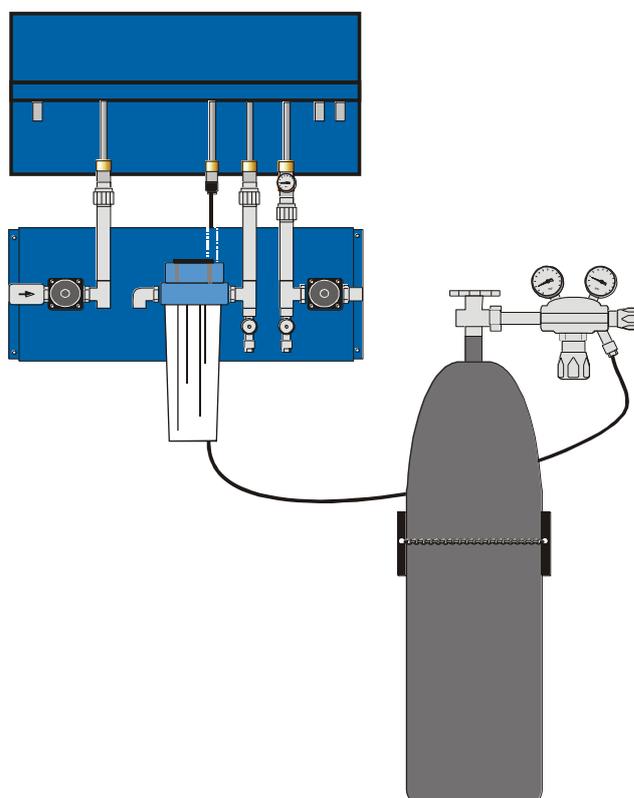


Figure 10: Connection of the additive

To measure the conductivity, the product can be extracted over the sampling tap. To do this, hold a clean container under the tap and rotate it in counter-clockwise direction. Flush the container out first with product to remove any impurities that could lead to measuring errors. Then extract approximately ¼ l of product and close the sampling tap by rotating it in clockwise direction until it stops. With a calibrated conductivity gauge the conductivity of the product can now be determined. The value should be > 5 µS.



ATTENTION:

Values < 1µS are definitely too low! In this case, NORTEC Customer Service should be notified!

For help selecting a suitable conductivity gauge, please contact our Customer Service department. Our specialists will be happy to assist you.

4. Installation

4.1 Safety information concerning installation

- Only **trained specialty personnel** (plumbing and electrical fitters) should perform the assembly and installation work. The party commissioning the installation is responsible for ensuring that the respective personnel are qualified.
- All local regulations and guidelines pertaining to electrical and water installation work must be noted and followed.
- The information and specifications in this section concerning placement of the system components, assembly, and electrical installation must be noted and followed.

4.2 General placement and assembly information

Fundamentally the placement of a system is determined during the planning and defined in the system documentation. In any case, the following placement information should be noted and followed:

- The installation should be performed according to generally accepted engineering rules and practices and the connection specifications of the local utility companies.
- Before the start of the installation, the completeness and intact condition of the delivery should be inspected based on the delivery note.
- The structure (wall, column, ceiling construction, etc.) that the equipment or system components will be mounted must have adequate load capacity and be suitable for mounting.
- The system components should be mounted in such a way that sufficient space is available for service and operation.
- No unauthorized conversions or modifications should be made to the equipment.
- Additional fittings (e.g. valves, etc.) that are not referenced in the assembly diagram should not be installed within the DRAABE system.

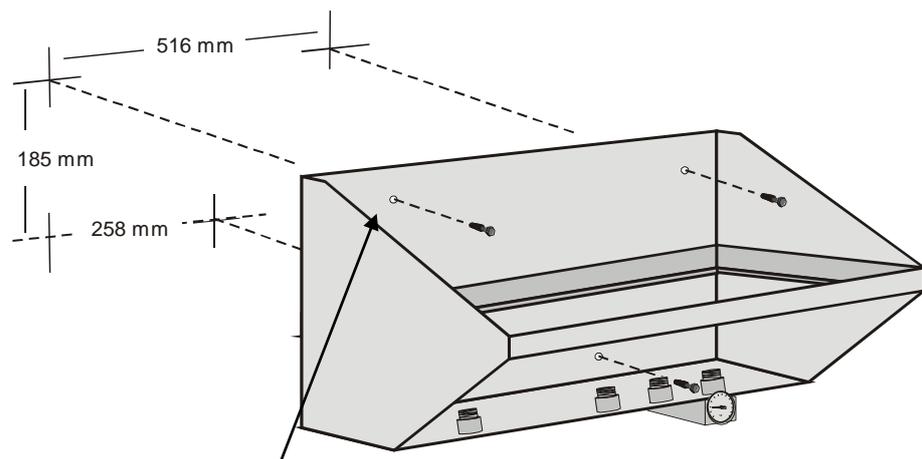
- These assembly instructions relate only to individual systems. For the customer systems, the manufacturer delivers individual system diagrams. In addition, instruction on the assemblies will also be provided. Assembly instructions, diagrams, and the instruction are binding for the design.
- The material specification must be followed.

4.2.1 Support console SynPur

- If possible the equipment should be installed in an operating area that is accessible only to a limited group of people.
- The ambient temperature must be +10°C and +30°C year-round.
- The assembly location should be selected such that direct exposure of the equipment to heat or sunshine is not possible.

IMPORTANT:

The equipment should be mounted on a good bearing wall surface (with a load capacity of 50 kg).



Through holes 8 mm

Figure 11: Hole pattern, support console

There should be an overhead clearance of 50 cm across the entire width of the support console, and 20 cm on the left and right side of the console. The bottom edge of the console should be 1.2 m from the floor.



ATTENTION:

To prevent damage from potential leaks, no electrically conductive parts or goods should be mounted/placed under the support console.

4.2.2 Mounting rail

- The assembly site should be selected in such a way that the mounting rail is always accessible.
- Direct exposure to heat or sunlight should be avoided.

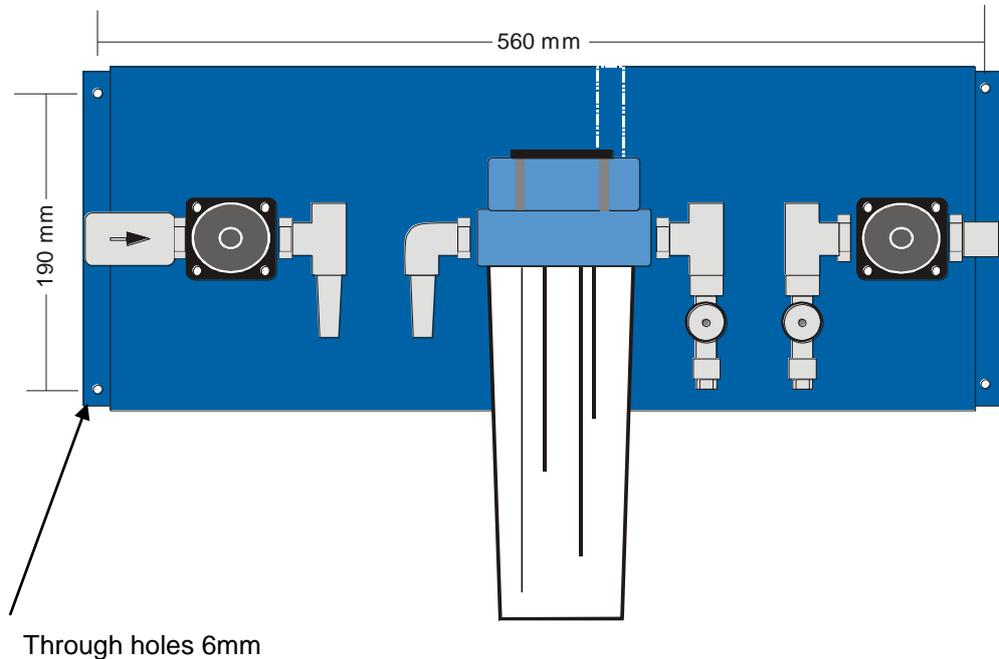


Figure 12: Hole pattern, mounting rail



ATTENTION:

To prevent damage from potential leaks, no electrically conductive parts or goods should be mounted/placed under the support console.

4.2.3 CO₂ bottle

Carbon dioxide is not a hazardous gas as defined by the Hazardous Substances Act (GefStoffV), but it can present a hazard for humans and the environment if used improperly. In addition to the safety measures described in this document general safety rules and practices for working with gases should be followed.



ATTENTION:

Adequate ventilation must be provided since carbon dioxide in high concentrations can result in unconsciousness and death by asphyxiation.



ATTENTION:

The bottle should be secured against falling over. The bottle is under high pressure. If the bottle does fall over leaks can result, which can lead to personal injury or equipment damage.

- The bottle must be placed on a solid, level surface.
- If large quantities emerge from the bottle, direct contact can result in cold burn/frostbite injuries.
- The bottle is under pressure. Direct exposure to heat or sunshine should be avoided, as the bottle could otherwise burst.

- Fittings and hose should be inspected for leak-tightness.

4.3 Electrical installation

This document does not cover the installation of the voltage supply. However, requirements for this are addressed. The installation of the electrical components of the SynPur and the location of the voltage supply are shown.



ATTENTION: The design of the electrical installation, including the voltage supply, must conform to local safety regulations and standards.

IMPORTANT for the electrical installation:

- The cable ends must have appropriate end splices.
- Fuse protection should be provided in the specified values.
- The installation must be performed exclusively according to the diagrams referenced in this document.
- During the installation the voltage supply must be turned off and secured against accidental activation.

4.3.1 SynPur

The voltage supply is created over a wall receptacle and the connecting cable belonging to the delivery (equipped with a standard 3-pin plug with grounding connections).

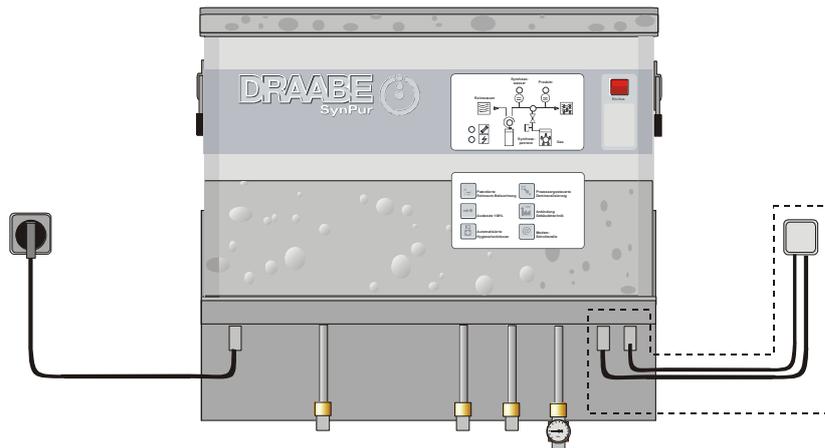


Figure 13: Electrical installation SynPur

Voltage supply SynPur 3400	: 230 V AC, $\pm 10\%$, single-phase
Voltage supply SynPur 3402	: 120 V AC, $\pm 10\%$, single-phase
Fuse protection	: 10A, time-lag
Conductors	: L1, N, PE
Cable cross section	: 1.5 mm ² (AWG 16)

Included in the further scope of delivery of the SynPur are two pre-assembled control cables (consisting of a 7-pin plug (for connection to the HPS) and a 3 m long cable, as well as a 4-pin receptacle (service/fault outputs) and a 3 m long cable) and a junction box.

4.3.1.1 Linking of fault and service outputs

The SynPur has a potential-free fault and service output. Both can be connected to the building control system (GLT) in order to use the data for control or information purposes.

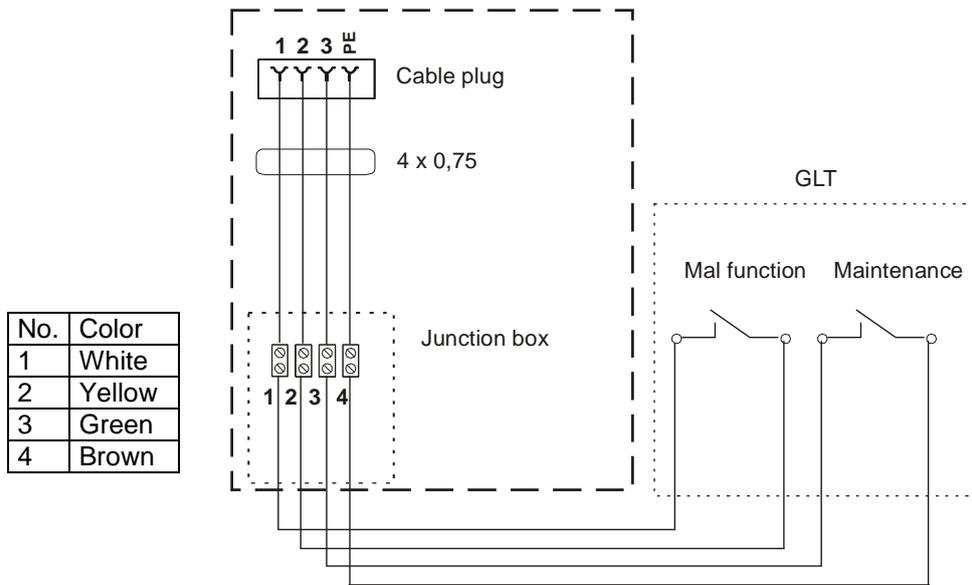


Figure 14: Linking to the GLT

Requirements of the GLT: The GLT must only supply two inputs for processing the data.

Type of cable: LIYY 4x 0.75 mm² (AWG 18)

Contact rating 250 V AC, 2A

4.3.1.2 Linking to the HPS

The SynPur is connected to the HPS over the 7-pin connector. In case of a fault condition, the HPS is interrupted or turned off. The FWA of the HPS or the air humidification remains on.

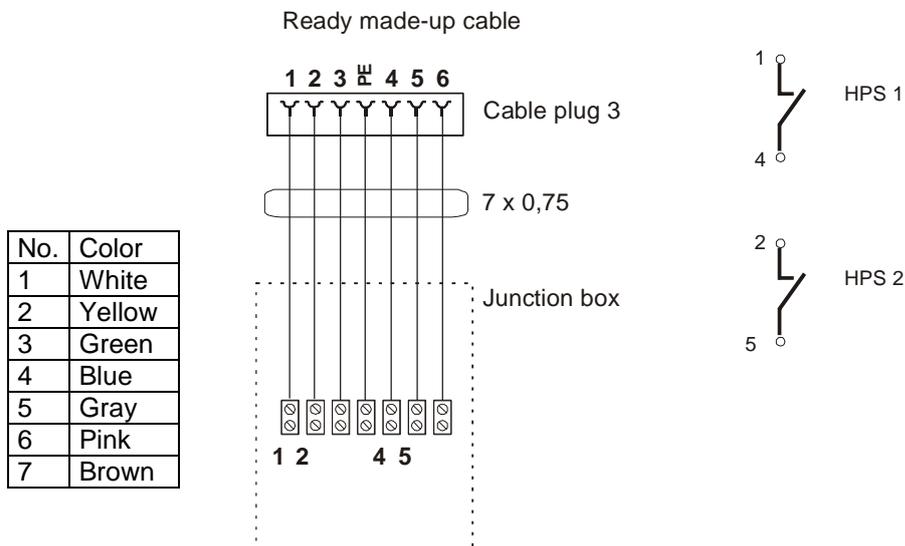


figure 15: Linking to the HPS

4.3.1.3 Linking to the remote fault reporting system

The SynPur can be connected to the remote fault reporting system as an option. The figure below shows the connection of an HPS to the SynPur and the remote fault reporting system.

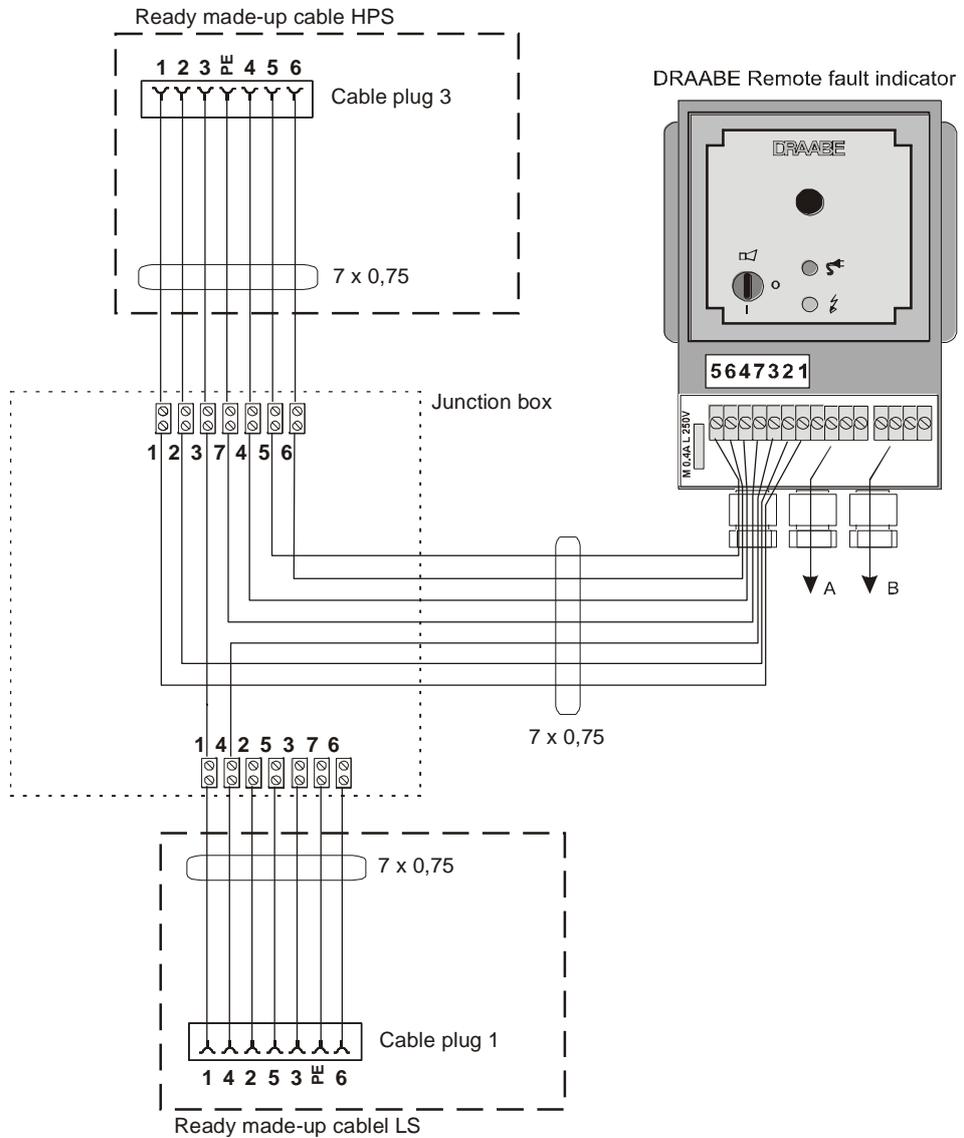


Figure 16: Linking to the remote fault reporting system

A second HPS can also be linked as shown in the figure above, but connected to terminal 2 and 5 of male connector 1.

4.4 Material specification

4.4.1 Electrical components

Electrical cables

Purpose: From the SynPur to the HPS
Designation: LIYY 7x 0.75 mm² (color or number code), AWG 18
Capacity:

Purpose: From the SynPur to the GLT
Designation: LIYY 4x0.75 mm² (color or number code), AWG 18
Capacity:

Standard plug with grounding connections (wall-mounted)

Purpose: Conductivity Synthesizer, SynPur
Techn. data:
LS3400: 230 VAC, 16 A, L1, N, PE
LS3402: 120 VAC, 16 A, L1, N, PE

4.4.2 Additive

Designation: Carbon dioxide, CO₂
Purity: 99.5%
Type of gas: Technical gas

4.4.3 Pressure reducer

Designation: Is fixed directly at the CO₂-bottle

Techn. Daten:

- Back pressure 8 bar (116 psi)
- Operating pressure 6 bar (87 psi)
- The safety valve must be adjusted at 10-12 bar (145-174 psi).
- The output, connection to console, must have a ¼" thread (male).

5. Operation

The system should not be operated by the Operator or personnel authorized by the Operator until NORTEC Customer Service or its authorized agents have performed an acceptance inspection of the initial startup. In addition, the Operator must have received instruction on the operation of the system from DRAABE. After the initial startup and instruction on operation, it is the responsibility of the Operator to ensure that only trained personnel operate the system. This is one of the terms of the warranty from NORTEC.

5.1 Start-up in daily operations

Depending on whether the system was partially or completely shut down, it should be restarted in reverse order (see also the **replacement instructions** for the individual devices). As a general rule, the following applies:

SynPur:

- First produce the water supply
- Then produce the power supply
- Then turn on the mains switch (set to position „I“).

Synthesizing stage:

- First reconnect the lines
- Then produce the water supply

CO₂ gas:

- First connect the gas lines
- Then open the valves and set to 6 bar (87 psi).

5.2 Shutdown in daily operations

To perform maintenance, to replace defective components or components that are to be serviced, or in case of a system fault, it may be necessary to shut the system down. Conditions requiring a shutdown are described in detail in Section 8.



ATTENTION: When the system is shut down, it must always be secured against accidental restart (water and power supply, depending on the type of shutdown). Employees should be informed of the shutdown.

Complete shutdown: In a complete shutdown, system components or even the entire system is disconnected from the power supply and the water supply is shut off.

SynPur: Turn mains switch off (set to position „0“).
If a wall receptacle with switch is present, turn this switch off too (set to position „0“). If none exists, then disconnect the plug. Shut off the water supply and close the CO₂ bottle.



ATTENTION: During extended downtimes (longer than 24 hours) there is the danger of germination (circulation not active). Please always notify NORTEC Customer Service before shutting the system down completely.

Partial shutdown: In a partial shutdown, only a startup of the system should be prevented during a replacement.

SynPur: Disconnect the 7-pin connector under the SynPur. The HPS can no longer start up. Shut off the water supply (if the SynPur is to be replaced).

Synthesizing stage: Shut off the water supply. The SynPur will go into an admission pressure fault condition.

Additive: Close the CO₂ bottle. The SynPur will go into an additive pressure fault condition.



ATTENTION: During extended downtimes (longer than 24 hours) there is the danger of germination (circulation not active). Please always notify NORTEC Customer Service before shutting the system down completely.

5.3 Checks/regular service

Regular service

SynPurPur: Aside from the inspections described here, the container is subject to regular service. The **operational safety** as well as the **hygienically clean function** depend on regular service. The manufacturer recommends a service cycle of 6 to 8 months. Service must be performed by the manufacturer. Only the manufacturer has special test equipment at his disposal, has the required knowledge to perform the necessary work and enters into a commitment towards the user by performing the service.



Note to purchasers (byer) of SynPur: For the duration of the 24-month warranty period, the user is obliged to comply with the above mentioned service cycle. Failure to comply may render the warranty null and void. Should a functional defect of the SYNPUR occur during the 24-month warranty period, warranty claims will only be accepted by Draabe, if the described service intervals for the SYNPUR have been complied with, i.e., if regular service has not been performed on the SYNPUR at max. time intervals of 8 months, the warranty of the SYNPUR will be rendered null and void.

Transport costs are the responsibility of the user. Service costs must be paid by the user (the user receives a report of service work performed as well as a guarantee for exchanged parts). For the time of service work (2-3 weeks) the user will receive a rental unit. The cost of the rental unit is included in the service costs.

Regular service is also recommended after the expiry of the warranty period.



Note to lessees (rental) of SynPur: The manufacturer is responsible for the above mentioned service cycle. Transport costs for the return from the user to the manufacturer are charged the responsibility of the user. Service costs are included in the lease.

Whenever inspections reveal something suspicious or any case of incorrect functioning, the DRAABE customer service are to be notified at once! Inspection work may only be carried out by properly instructed persons. The operator (customer) is responsible for checking that the inspectors are suitable for the task and are instructed properly.

Checks

If any discrepancies or malfunctions are noted during the inspections, NORTEC Customer Service should be notified immediately! Only trained personnel should perform inspections. The Operator is responsible for ensuring that the personnel is qualified and properly trained.

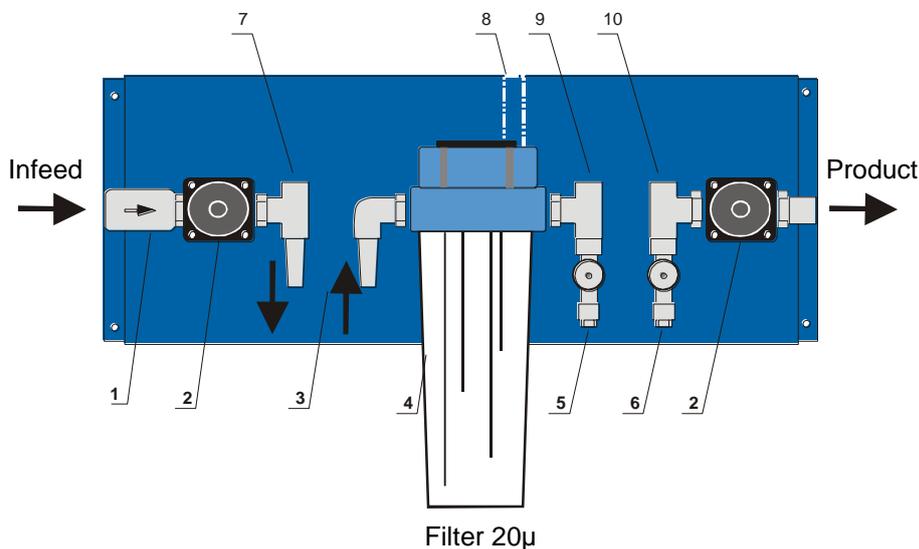


Figure 17: installation rail

SynPur:

Inspection of the product: Extract 3L of product from the sampling tap (6) and check the quality of the product with a calibrated conductivity tester. It is important to use a clean bucket to make no measuring mistakes. The value has to be in the range 7 – 22 micro Siemens. If the measured value is out of the range, please contact the NORTEC service department.

Cycle: Every 2 weeks

Synthesizer cartridge:

Inspection of the DM water: Extract 3L of DM water from the sampling tap (5) and check the quality of the water with a calibrated conductivity tester. It is important to use a clean bucket to make no measuring mistakes. The value has to be in the range 0 – 1 micro Siemens. If the measured value is out of the range, it could be the synthesizer cartridge has to be exchanged.

Cycle: Every 2 weeks

Filter (4):

For each regular servicing of the SynPur the filter of the installation rail must be replaced. These are delivered with the exchange container.

CO₂ Bottle:

The bottle must be secured against falling over. Check whether everything is correct and save.

Inspection of the bottle pressure. The bottle pressure and the outlet pressure can be inspected on the bottle pressure reducer. The outlet pressure should be between 6 and 6.5 bar (87-95psi). If the pressure is too low please try to adjust the pressure to the needed value. If this is not possible, it could be that the pressure reducer is broken or the gas bottle is empty.

Cycle:	Every 2 weeks
---------------	----------------------

6. Replacing components

Please notify NORTEC Service if you find a fault in the system.

If there is a question please call **+1 613 822 0335**.

Only qualified and trained personnel should perform the replacement. The Operator is responsible for ensuring that the personnel are qualified and trained and that the work is performed in accordance with the specifications from NORTEC, in particular with the specifications contained in this document.



ATTENTION:

- Inform everyone in the area that work is to be performed on the SynPur.
- Secure the system against accidental startup.
- Notify everyone in the area that during this time the air humidification system will not be operating.

6.1 SynPur

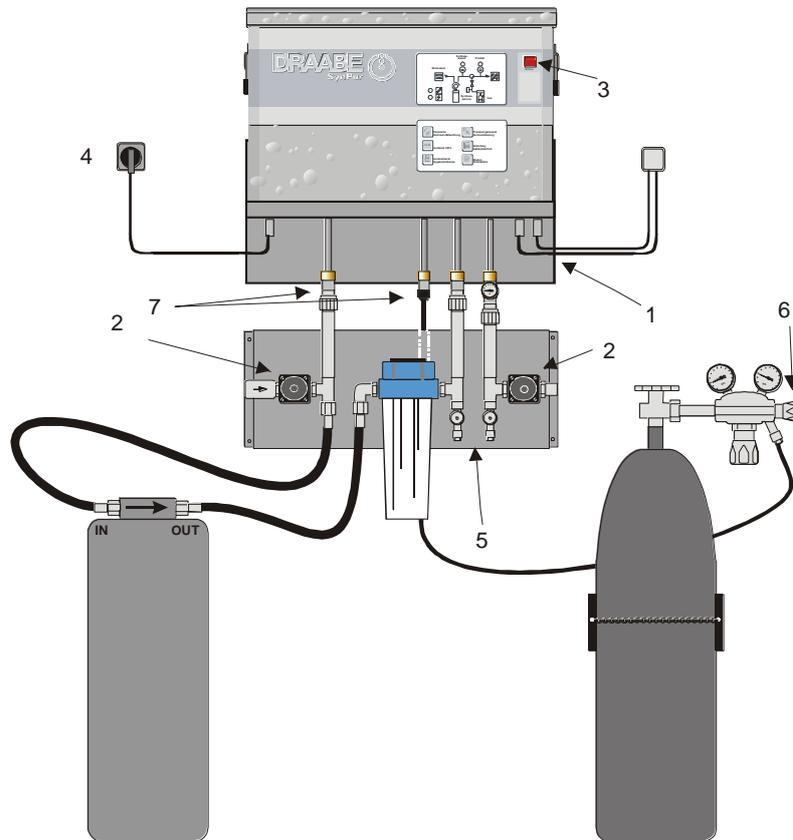
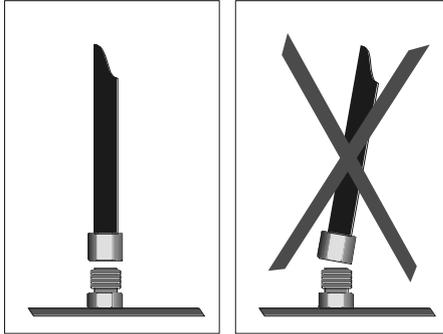


Figure 18: Replacing the SynPur

- Turn off the mains switch (3) and disconnect the plug (4).
- Remove the two plugs (1) from the device by loosening the knurled ring on the plug.
- Shut off the water supply (2) on the mounting rail.
- Open the shutoff valve (5). Wait until the system is completely depressurized. The pressure is indicated on the pressure gage.
- Close the shutoff valve on the CO₂ bottle (6).
- Release the self-retracting hoses (7) (14/17 open-jawed wrench) and allow to slide into the container.
- Remove the SynPur from the support console and set the new device in place.
- Connect the new device in reverse order.



ATTENTION: When removing and reattaching the hoses, ensure that the hoses are set on straight.



ATTENTION: After the system has been restarted it should be checked for leak-tightness. Inspect the system occasionally over the next two days.

6.2 Synthesizer cartridge

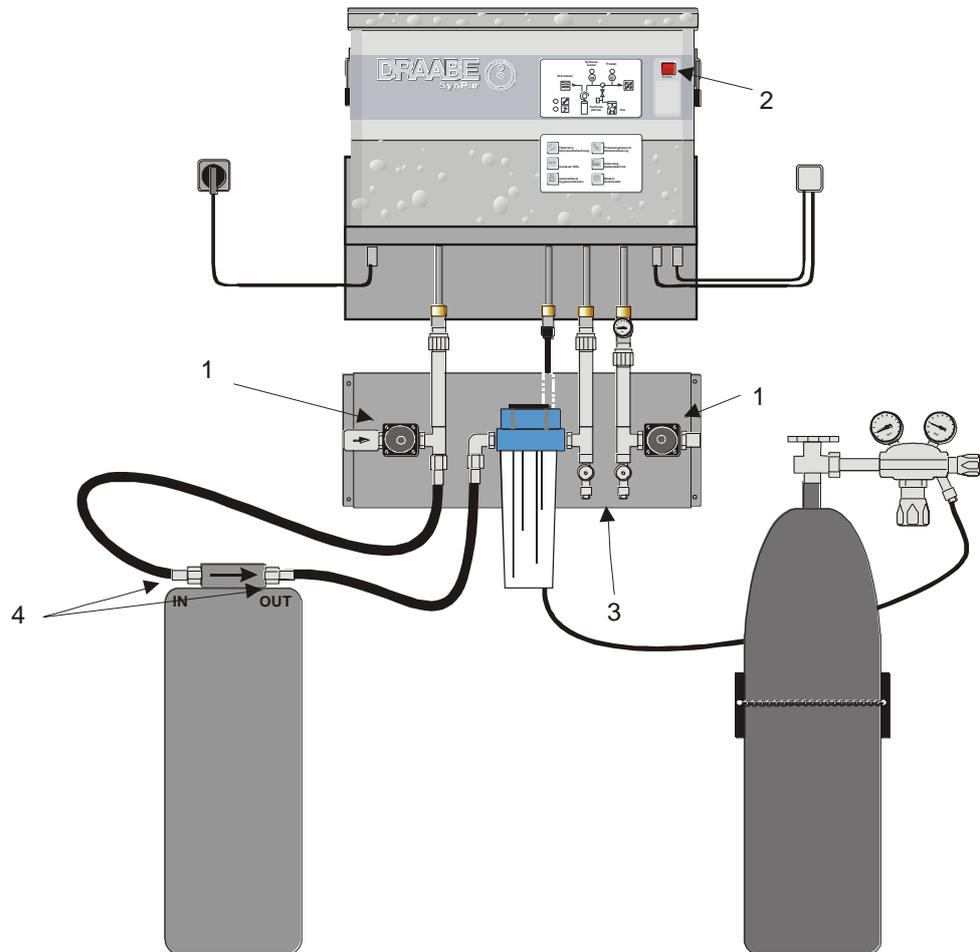


Figure 19: Replacing the synthesizer stage

- Close the shutoff valves (1) on the mounting rail.
- Turn off the mains switch (2) of the SynPur.
- Open the shutoff valves (3). Wait until the system is completely depressurized. The pressure is indicated on the pressure gage.
- Remove the lines (4) on the synthesizer cartridge.
- Connect the new synthesizer cartridge in reverse order.



ATTENTION: When exchanging the synthesizer cartridges, ensure that the inputs and outputs are connected as described in Section 3.3.



ATTENTION: After the system has been restarted it should be checked for leak-tightness. Inspect the system occasionally over the next two days.

The Operator should send the exchanged synthesizer cartridge to NORTEC for regeneration:

Please notify NORTEC Service if you find a fault in the system.

If there is a question please call +1 613 822 0335.

The Operator is responsible for the costs of regeneration.

When the synthesizer cartridge is received, a regenerated cartridge will be sent to the Operator immediately.

6.3 CO₂ Bottle

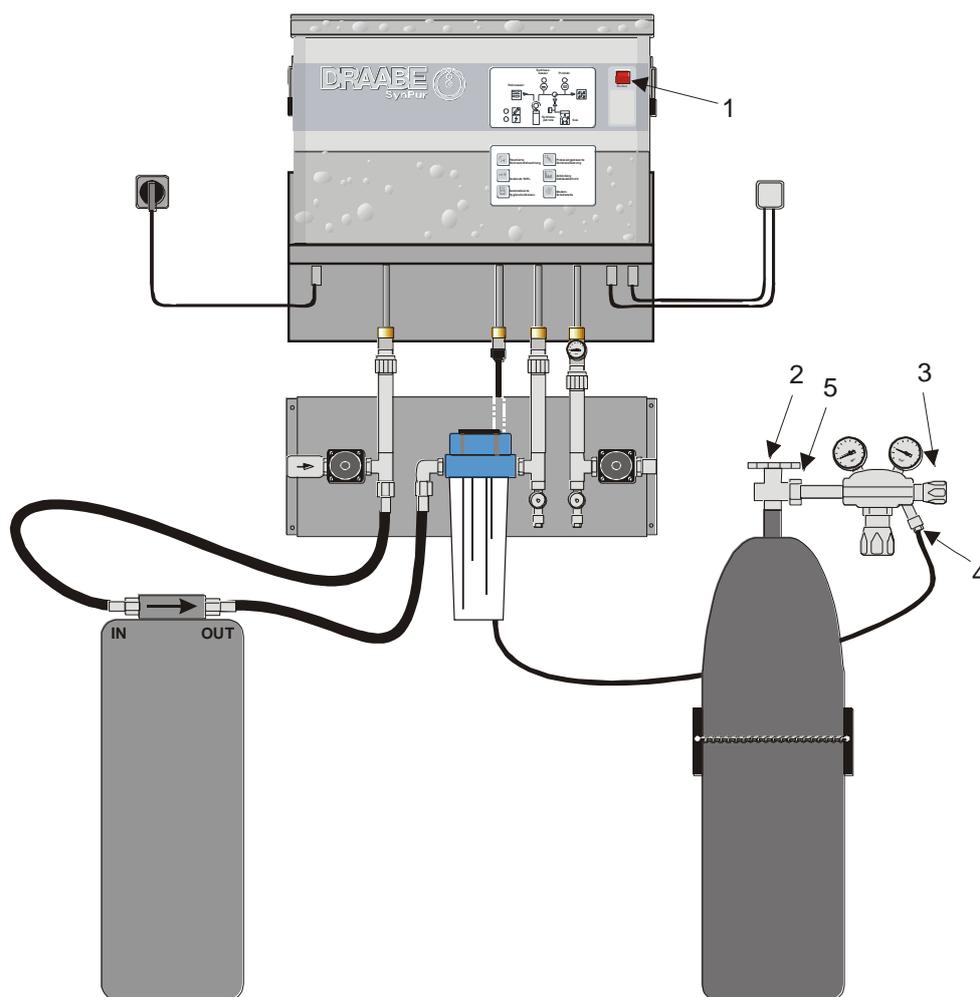


Figure 20: Replacing the CO₂ bottle

- Turn off the mains switch (1) of the SynPur.
- Rotate primary shutoff valve on the bottle (2) in clockwise direction.
- Close the valve (3) on the CO₂ bottle by rotating it in clockwise direction.
- Disconnect the hose (4) on the bottle.
- Disconnect the bottle pressure reducer (5).
- Connect the new CO₂ bottle in reverse order.



ATTENTION: After the system has been restarted it should be checked for leak-tightness. Inspect the system occasionally over the next two days.

7. Technical Data

7.1 Conductivity synthesizer SynPur

	LS3400	LS3402
Capacity	400 kg/h	
Dimensions	600 x 400 x 400 mm	
Weight	approx. 40 kg	
Operating voltage	230VAC, 50-60 Hz, ±10%	120VAC, 50-60 Hz, ±10%
Power draw	90W	
Installation category	II	
Pollution degree	2	
Use	Only in enclosed areas	
Height above sea level	2000 m	
Ambient temperature	7-35°C	
Ambient moisture	Max. 80%, condensation should be avoided	

7.2 Synthesizing stage

Dimensions	234 x 904 mm
Total volume	33.4 l
Fill quantity	25 l
Compressive strength	Max. 10 bar (145psi)
Ambient temperature	5-50°C

7.3 CO₂ bottle

7.3.1.1 Gas

Gas:	Carbon dioxide CO ₂
Trade name (Linde):	Model 370
Purity:	99.5% (not suitable for medicinal purposes)
Aggregate state:	Gaseous

7.3.1.2 Pressure reducer

Back pressure:	8 bar (116psi)
Operating pressure:	6 bar (87psi)
Safety valve:	10-12 bar (145-174psi)
Pressure gage (working pressure)	16 bar (232psi) (max. setting 10 bar, 145psi)

8. Appendix

8.1 Spare parts

Item	Article No.	Designation
1	129008	Filter
2	126035	Quick-couplings, hose-side
3	126034	Quick couplings, cartridge-side
4	126033	Hose

8.2 Replacement parts

Item	Article No.	Designation
1	001279	Synthesizer cartridge

8.3 Accessories

Item	Article No.	Designation
1	126040	Bottle pressure reducer

8.4 Fresenius Test Certificate

Test certificate

Test report

Order no. 479652
Client no. 5464400

Dr. Ansgar Ferner/Th
Tel. +49 6128/744-266, Fax -203
ansgar.ferner@institut-fresenius.de

Test objects:

Product description: Air humidification system
Model: PUR

Appliances tested :

DRAABE pure water system PerPur, SynPur
DRAABE high pressure system HighPur
DRAABE air humidification system Turbo Fog (TF4, TF16, TF32)
DI Flex (ED/HT), BS

Consumer Testing Services
Meat & Food-Management systems

SGS INSTITUT FRESENIUS GmbH
Im Maisel 14
65232Tausenstein

Test period:

The DRAABE appliances that are listed as "tested appliances" were microbiologically tested by us in 2005 over a period of 6 months. Microbiological check studies are carried out on the system at regular intervals to also confirm the results in the long term.

Test conditions and requirements:

The system must permanently prove that it permanently functions hygienically as part of this study. In this process the test conditions assume the "worst case". This is the case if:

- the entire system is in standby mode
- no air humidification is demanded
- the room air does not require any conditioning in terms of the humidity (% air humidity)

The hygiene levels must ensure the maintenance of the following requirements during the entire test period (3% humidification EIN). Procedures were not employed which cause the additional discharge of chemicals /biocides in the room air.

The system was contaminated with a germ compound three times in the course of the test. The system configuration corresponded to the maximum extension level of the DRAABE system (see above). The results shall be stated by means of a detailed analysis report.

Contents of the analysis report:

Materials tested, description of the test, test bacteria, contamination interval, germ pollution, individual results, composition and quantity of the germ compound (for the contamination process).

Results:

The DRAABE system tested by us completely fulfils the aforementioned requirements. As a result the requirements for the awarding of the INSTITUT FRESENIUS quality seal have been fulfilled. The DRAABE system that was tested works perfectly in terms of the hygiene levels and fulfils the present demands (as at: December 2005) of BG Druck und Papierverarbeitung, Wiesbaden.

The following total germ levels were not exceeded:

Admission water air humidification 150KBE*/ml
Humidifier water 150KBE*/ml

***germ forming units**

The evaluation of the test result is based on the data of a system operating in accordance with the operating instructions drafted by DRAABE and their service intervals.

Tausenstein, December 2005

SGS INSTITUT FRESENIUS GmbH

Dr. Ansgar Ferner Franz-Josef Schäfer
Created: 21.12.2006
Changed: 21.03.2007
Printed: 02.03.2009

8.5 Statement of Conformity

STATEMENT OF CONFORMITY

Type of Device: Conductivity Synthesizer



Model SynPur

With this EC Statement of Conformity, DRAABE Industrietechnik GmbH hereby certifies that the devices that it manufactures and markets conform with the applicable EU Directives as well as the safety requirements of the EC Directive 89/336/EEG for harmonization of the legal regulations of the member countries concerning electromagnetic compatibility. The operating and assembly instructions included with the devices must be obeyed, and the device must be used exclusively for the intended purpose. The operating voltage of the device is 230V AC.

To assure agreement the following Directives or Standards were referenced:

- **EN 50081-1** (1992)
- **EN 50082-2** (1995)

Issued by:

Manufacturer:

DRAABE Industrietechnik GmbH

Schnackenburgallee 18
D-22525 Hamburg
+49 40 853277-0
www.DRAABE.de

A WMH company

Distributor:

NORTEC Air Conditioning Industries Inc.

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+1 613 822 0335
www.humidity.com