

# AQpure

Modular water treatment system

Installation and operating instructions



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**GRUNDFOS** 

## English (GB) Installation and operating instructions

### Original installation and operating instructions

These installation and operating instructions describe the Grundfos AQPure water treatment system.

Sections 1-5 give the information necessary to be able to unpack, install and start up the system in a safe way.

Sections 6-12 give important information about the system, as well as information on service, fault finding and disposal of the system.

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#### Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

## 1. General information

### 1.1 Documentation package

The documentation delivered with the AQpure system comprises:

- Installation and operating instructions for AQpure
- Separate manuals for built-in components

The complete documentation package must be available at the installation location at all times.

### 1.2 Target group

These installation and operating instructions are intended for the users and for the operating company. The document contains general instructions that must be observed during installation, commissioning, operation and maintenance of the system. The responsible staff must read these instructions prior to any work on the system.

#### 1.2.1 Qualification and training of staff

The staff responsible for the installation, commissioning, operation and maintenance must be qualified for these tasks. Areas of responsibility, levels of authority and the supervision of the staff must be precisely defined by the operating company. If necessary, the staff must be trained.

#### Operating company

The company or person owning the system is referred to as "operating company" in this document. The operating company has to coordinate the preparation of the installation location. The installation and the commissioning must be done by certified service staff. Once the system is in operation, the operating company has to coordinate the regular maintenance.

#### Users

The staff responsible for operation and basic maintenance of the system is referred to as "users" in this document. The users must be trained on their tasks by the certified service staff during commissioning.

#### Certified service staff

The staff responsible for installation, commissioning, parameterisation and advanced maintenance of the system is referred to as "certified service staff" in this document. These persons must be trained and certified for these tasks by Grundfos.

#### Grundfos service specialists

Grundfos service specialists are Grundfos employees responsible for maintenance and repair of Grundfos products and systems. They possess special knowledge, tools and user rights to perform service and repair tasks that are not allowed to be performed by certified service staff or users.

### 1.2.2 Obligations of the operating company

- Observe the local safety regulations.
- Keep the complete documentation package available at the installation location at all times.
- Coordinate the preparation of the installation location.
  - Provide electrical power.
  - Provide a foundation for mechanical installation.
  - Provide components and installation material outside the scope of delivery (external tank, chemical waste tank, suction line, foot valve, coarse strainer, cables for external wiring, etc.).
  - Provide a pre-treatment installation, if required.
- Ensure that the users are trained on their tasks by the certified service staff during commissioning.
- Provide the stipulated safety equipment and personal protective equipment.
- Arrange regular maintenance.

### 1.2.3 Obligations of the user

- Read this manual thoroughly before putting the system into operation.
- Observe the recognised health and safety regulations as well as the accident prevention regulations.
- Wear protective equipment in accordance with national health and safety regulations when working on the system and handling chemicals.

### 1.2.4 Obligations of the certified service staff

- Read this manual thoroughly before putting the system into operation.
- Observe the recognised health and safety regulations as well as the accident prevention regulations.
- Wear protective equipment in accordance with national health and safety regulations when working on the system and handling chemicals.
- Perform installation and commissioning in accordance with the knowledge and documents received during the training at Grundfos.
- Train the users in performing the user relevant maintenance tasks mentioned in this document.
- Parameterise the system according to on-site requirements during commissioning.
- Fill in the commissioning protocol. Have it signed by the operating company and keep it available for later reference. Hand over a copy to the operating company.
- Set the scheduled maintenance date according to local operating conditions and perform advanced maintenance on request of the operating company.

### 1.3 Symbols used in this document



Warning

If these safety instructions are not observed, it may result in personal injury.



Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.



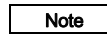
Warning

The surface of the product may be so hot that it may cause burns or personal injury.



Caution



If these safety instructions are not observed, it may result in malfunction or damage to the equipment.



Note

Notes or instructions that make the job easier and ensure safe operation.

### 1.4 Symbols on the system

Symbol	Description
	This symbol indicates a danger of electric shock.
	This symbol indicates a danger of burns or personal injury from hot surface.

All signs and symbols on the system must be observed and maintained legible.

Also observe the manuals for built-in components in the documentation package.

## 1.5 Glossary

Term	Explanation
Air scouring	Special step in the backwash process, where air bubbles are sent through the UF membrane to loosen the fouling.
Concentrate	Concentrate is the part of the water in a cross-flow filtration that is not passing the membrane. Normally, this water is circulating.
Cross-flow	Cross-flow filtration means that a part of the water flows along the feed water side of the membrane.
Dead-end	Dead-end filtration means that the whole water is going through the membrane.
Feed	Feed water is the water entering the membrane for filtration.
Filtrate	Filtrate is the filtered water that has passed the membrane.
Flux rate	The flux rate is the filtrate volume flow per m <sup>2</sup> membrane surface area.
Fouling	Gradual reduction in filtrate flow at constant pressure (or increase in TMP at constant filtrate flow) due to adsorption or deposition of contaminants within or on the membrane. It can be biological, particular, colloidal, organic.
Normalised permeability	As permeability varies in correlation to the water temperature, it needs to be normalised to compare the performance over a certain time period. This is done with the help of a temperature correction factor (mostly 20 °C).
Outside-In	This term describes the flow direction of the water through the membrane. In this case, the feed water flows from the outside of the hollow fibre to the inner side.
Permeability	The permeability is the flux rate in relation to the trans-membrane pressure. With the permeability, the performance of a membrane or a membrane system can be evaluated.
Recovery	The recovery of an ultrafiltration process is the ratio of filtrate flow that can actually be used for consumption to the total raw water flow. The more often a backwash is carried out, the lower the recovery is. If the filtration is done with cross-flow, this amount of water must also be calculated - if it is not circulated.

## 1.6 Abbreviations

Abbreviation	Text	Explanation
BW	Backwash	Cleaning sequence of the UF membrane, where the normal flow direction of the flow is reversed.
CEB	Chemically Enhanced Backwash	Backwash process, where sodium hypochlorite solution is added while the UF membrane is backwashed.
CIP	Clean In Place	An automated process to clean components by recirculation of detergents or rinse solutions.
FF	Forward Flush	Cleaning sequence of the UF membrane, where the normal flow direction is maintained.
GAC	Granulated Activated Carbon	Solid chemical used in the activated carbon filter module (also referred to as GAC filter). Removes odour and taste from the water.
GP	Grundfos Pump	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action.
GRM	Grundfos Remote Management	Remote management system that provides access to information about various Grundfos installations.
HMI	Human Machine Interface	Interface between human interaction and system.
MCB	Miniature Circuit Breaker	An electrical device that protects an electrical circuit from damage caused by overload or short circuit.
MK	Motor valve	A valve that is opened and closed with a motor.
MPV	Multiport Valve	A special valve used for the GAC filter.
NaClO	Sodium hypochlorite	Chemical used in the chlorination module.
PDT	Pressure Decay Test	Test sequence to check the integrity of the UF membrane fibres with air, also referred to as integrity test.
PLC	Programmable Logic Controller	A PLC is a digital computer used for automation of typically industrial electromechanical processes.
POF	Pressure Over Filter	The pressure difference between the inlet and the outlet of a filter.
RCCB	Residual Current Circuit Breaker	An electrical device that disconnects a circuit, if a fault current is detected.
TMP	Trans-Membrane Pressure	The pressure difference between the average pressure on the feed side and the filtrate side of the membrane.
UF	Ultra Filtration	A type of filtration that removes organic molecules, suspended solids, bacteria and partly viruses. The AQPure system includes a hollow fibre UF membrane.
UPS	Uninterruptible Power Supply	A UPS provides the necessary energy for the system to perform safety relevant steps in case of power failure.

## 2. Safety instructions

Non-observance of the safety instructions may have dangerous consequences for the staff, the environment and the system and may result in the loss of any claims for damages.

Should you require further information, please contact Grundfos.

### Caution

Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

### 2.1 Working with chemicals

#### Warning

Danger of personal injury due to contact with chemicals!



Wear the stipulated personal protective equipment (protective clothing, gloves, goggles, etc.) when handling chemicals!

Observe the chemical manufacturer's safety data sheets (MSDS) and safety instructions of the used chemicals!

#### Warning

Danger of personal injury due to contact with chemicals!



If the system is installed in a confined room, ventilation is required.

Spillages must be removed immediately.

The floor around the system must be slip-resistant.

Make sure, that parts in contact with the chemicals are resistant to the chemicals under the specific operating conditions!

### Caution

Should you have questions regarding the material resistance of the system for specific chemicals, please contact Grundfos.

#### 2.1.1 Personal protective equipment

Due to the variety of hazardous chemicals, any information provided in this section is only general. It is the duty of the user to ensure that he has obtained information on all safety precautions relevant to the type of task he is performing, and to ensure that they are adhered to. Grundfos recommends to follow good practice when handling chemicals, and to use personal protective equipment such as ventilated, enclosed goggles, face shields, chemical aprons, boots and gloves. An eye shower may also be advisable.

#### 2.1.2 Sodium hypochlorite solution

If the chlorination module is part of the system, 2 % sodium hypochlorite (NaClO) solution must be used.

#### Warning

Sodium hypochlorite is alkaline and will cause oxidisation and bleaching. It is corrosive and could cause damage to skin or clothing.



Always wear chemical protective clothing and goggles when handling chemicals!

If splashed onto skin, sodium hypochlorite should be washed off with fresh water. All affected clothing has to be removed. If an eye is affected, rinse immediately using an approved eye shower or fresh running water for at least 15 minutes, keeping the eyelid open and rotating the eye. Seek medical treatment immediately. If swallowed, do not induce vomiting. Keep patient warm and quiet and seek immediate medical help. If breathing stops, apply rescue breaths and cardiopulmonary resuscitation as necessary, until medical help arrives.

Warning notices advising users of possible dangers should be prominently displayed wherever sodium hypochlorite is stored, generated or handled.

#### Warning

Treat sodium hypochlorite as an alkali and keep it away from acids, otherwise chlorine gas will be liberated!



A warning notice detailing this must be displayed locally!

#### 2.1.3 Sodium bisulfite solution

At delivery and for long-term storage the membrane is filled with a 1 % sodium bisulfite solution.

Keep ignition sources away from sodium bisulfite storage, handling and transportation equipment. Keep containers closed when not in use. Make sure, that all containers are labelled. Do not expose sodium bisulfite solution to strong acids, as this will liberate sulphur dioxide gas.

Skin contact: Flush skin with running water for a minimum of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention.

In case of minor skin contact, avoid spreading material on unaffected skin. Discard heavily contaminated clothing and shoes in a manner that limits further exposure. Otherwise, wash clothing separately before reuse.

Eye contact: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention.

Inhalation: Move victim to fresh air. Obtain medical attention.

Ingestion: Do not induce vomiting. If victim is alert and not convulsing, rinse mouth and give some water to dilute material. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention.

#### 2.1.4 Granulated Activated Carbon (GAC)

Activated carbon is a strong oxidising agent, which can remove oxygen from air under wet or humid conditions. The material safety data sheets from the chemical supplier must be observed. The material safety data sheets must be available wherever activated carbon is handled.

### 2.2 Working near the AQPure

The sound pressure level of the AQPure system is up to 90 dbA.

### Caution

Wear personal ear protection when working near the AQPure system.

### 2.3 Working with electricity

#### Warning

Death or serious injury

Danger of malfunction or damage to the product.

The AQPure system must be earthed with an earth cable.



Equipotential bonding is installed between all interfaces and metallic parts to prevent build-up of static electricity.

All equipotential bonding and earthing must be reinstalled properly after repair or maintenance.

### 3. Storage and handling



**Warning**  
Wear the stipulated personal protective equipment (protective clothing, gloves, safety boots)!

#### Caution

Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

#### 3.1 Storage

- Observe the permissible ambient conditions. See section: [11.1.2 Ambient conditions](#).
- The storage location must be protected from rain, humidity, condensation, direct sunlight and dust.
- For longer storage the system must be prepared according to section: [10. Taking the system out of operation](#). Observe the special requirements for the UF membrane specified below and in the supplier documents delivered with the system.

##### 3.1.1 UF membrane

Storage in a cool, dry, normally ventilated area protected from direct sunlight with an ambient temperature of 20-35 °C is recommended.

#### Caution

The fibres inside the membrane can be damaged, if the membrane is left empty for more than 2 hours.

Observe the instructions on storage after decommissioning in section: [10. Taking the system out of operation](#).

##### Uninstalled membrane in original packaging

The membrane should be stored horizontally with the ports facing up. To prevent collapse of the packaged membrane, stacking should be limited to four layers. Sealed membranes can be stored up to 1 year at the recommended conditions in the original packaging. Four litres of preservative solution are added, see [2.1.3 Sodium bisulfite solution](#). The UF membrane shelf life is one year from the date of manufacture, without taking additional measures for preservation as long as the instructions on storage conditions are observed.

#### 3.2 Scope of delivery

The system is shipped in several packages:

- Standard UF system with built-in standard components and optional modules
- UF membrane

Depending on the built-in modules the following optional packages are within the scope of delivery:

- Activated carbon filter
- Accessories as ordered

#### Caution

Thoroughly inspect the packaging for damage from transport. If any damage is identified, contact Grundfos.

#### 3.3 Transport

For details on dimensions and weights of packages at first delivery, see section: [11.1.4 Transport dimensions and weights](#).

- Observe the permissible ambient conditions. See section: [11.1.2 Ambient conditions](#).
- The system must be drained completely. Observe the special requirements for the UF membrane specified in the supplier documents delivered with the system.
- The membrane should be transported horizontally.
- Use appropriate lifting and transporting devices.
- Make sure, that the freight does not sustain any point load during the transport.
- Avoid strong impact loads.
- Check and observe the centre of gravity before lifting. The centre of gravity varies depending on the built-in modules.
- If using forklifts, use forks that are long enough to cover the entire depth of the freight.

### 4. Installation

The operating company is responsible for the preparation of the installation location according to the following information and section: [1.2.2 Obligations of the operating company](#).

#### Caution

The installation itself (installation of membrane and GAC filter, hydraulic and electrical connection etc.) must only be done by certified service staff according to the separate service instructions, which are supplied to certified service staff only.



**Warning**  
The installation must meet the local requirements and standards for the installation of machinery equipment.

#### Caution

Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

#### 4.1 Assembly

The system is completely assembled at the factory, and is subjected to a functional test before delivery. Some parts are disassembled for transport. See also section: [3.2 Scope of delivery](#).

The wiring between the control cabinet and the different electrical components is completely established.

##### 4.1.1 Installation with AQtap water dispenser

The AQpure system can be combined with one or more AQtap water dispensers installed downstream the AQpure system.

The connection of AQpure systems with AQtap dispensers is only possible with external tank setup 2. See section: [6.5.1 External tank setup options](#).

The external tank must be installed at an elevated level to ensure the required inlet pressure for the AQtap dispenser installed downstream. See technical data in the AQtap manual.

The UV disinfection is only sufficient, if the AQtap dispenser is placed directly downstream the AQpure system. For longer distances, chlorination of the water is recommended to avoid bacterial growth.

## 4.2 Installation variants

For detailed technical data of the feed pump (e.g. suction lift, minimum inlet pressure), see separate supplier documents delivered with the system.

The raw water connected to the system must meet the specified feed water requirements. See section: [11.1.5 Feed water requirements](#).

### 4.2.1 Installation with direct connection

The system is connected directly to the raw water source (D5). The use of a coarse strainer (D4) is mandatory to prevent dirt from getting into the suction line (D1). A floater (D2) keeps the coarse strainer in a sufficient distance to the surface to prevent suction of dirt and algae into suction line (D1). The foot valve (D3) is installed to avoid draining of the suction line when the system is stopped.

The suction line (D1) must be kept as short as possible.

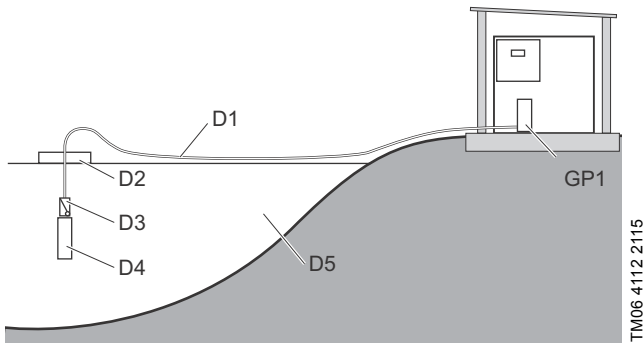


Fig. 1 Installation example for direct connection

Pos.	Description	Pos.	Description
GP1	Feed pump	D3	Foot valve
D1	Suction line	D4	Coarse strainer
D2	Floater	D5	Raw water source

### 4.2.2 Installation with a break tank

A break tank is installed between the raw water source and the system. The tank outlet is equipped with an isolating valve (2) and an inlet strainer (3) with a minimum particle mesh of 300 µm. This type of installation is recommended if pre-treatment of the raw water is necessary or if the distance or difference in height between the raw water source and the AQPure system exceeds the suction capacity (NPSH) of the feed pump (GP1).

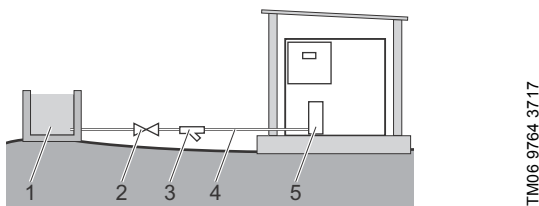


Fig. 2 Example of installation with a break tank

Pos.	Description
1	Break tank
2	Isolating valve
3	Inline strainer
4	Suction line
5	Feed pump

## 4.3 Mechanical installation

### 4.3.1 Installation location

- The installation location must be free of vibrations.
- The installation location must be protected from rain, humidity, condensation, direct sunlight and dust.
- The installation location must be sufficiently illuminated to ensure safe handling of the system.
- The installation location must be a solid building for protection from vandalism and tampering.
- Observe the permissible ambient conditions. See section: [11.1.2 Ambient conditions](#).

### 4.3.2 Foundation and space requirement

For the installation of the system, provide a solid concreted surface, suitable for the weight and dimensions of the system.

Observe the maximum floor load.

#### Caution

The foundation must be based on a sufficiently bearing ground.

Install the system on a horizontal foundation.

Maximum slope: 1:200

Minimum load-bearing capacity [kg]: 1200

Make sure, that the system is always easily accessible for operation and maintenance.

Observe the total dimensions of the system. If the system is equipped with an UV disinfection module, observe the space required for maintenance of this module. For details see section: [11.4 Dimensional drawings](#).



#### 4.4 Hydraulic connections

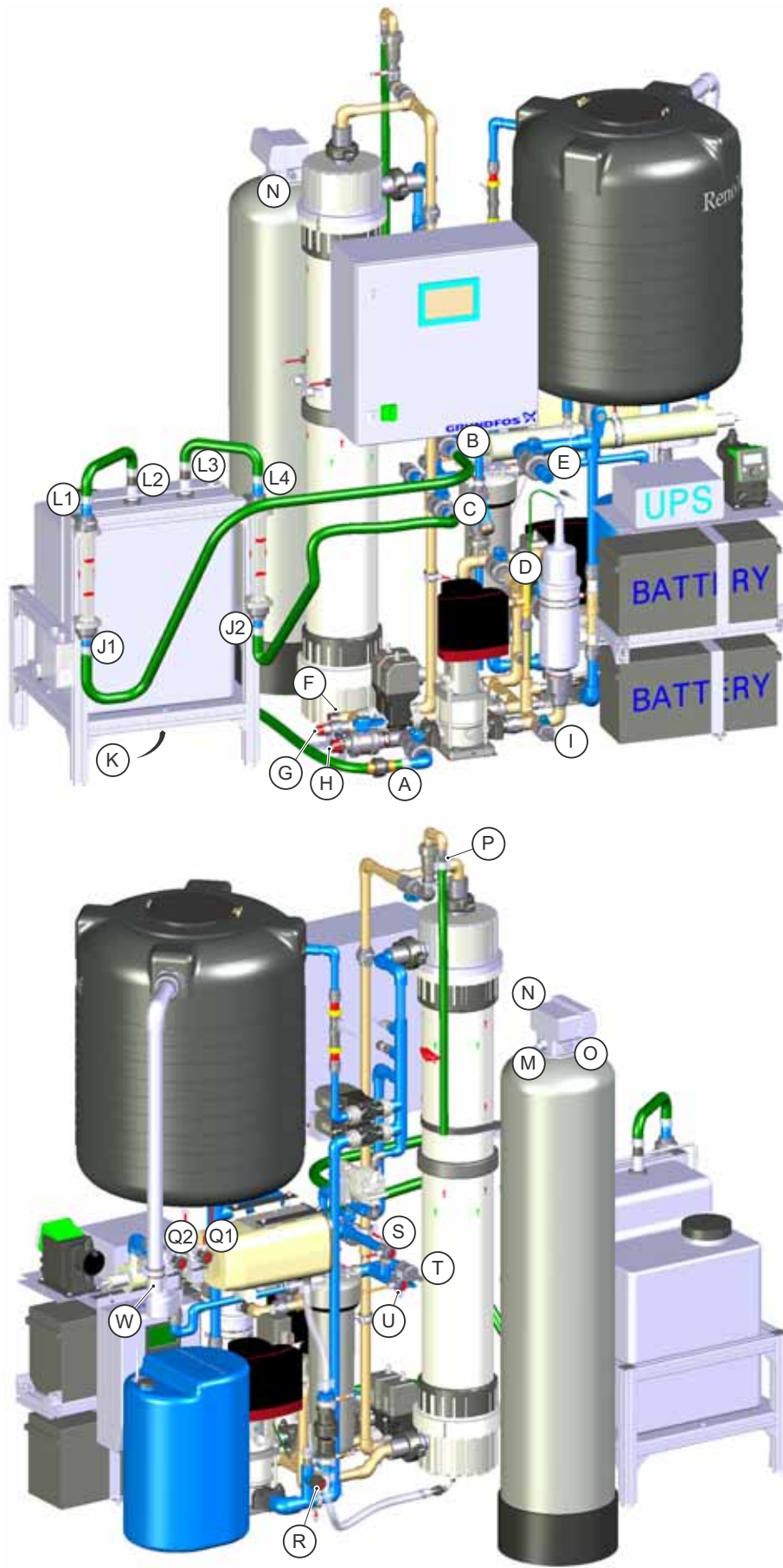


Fig. 3 Hydraulic connections

#### 4.4.1 Hydraulic connection table

This table refers to fig. 3.

##### Hydraulic connections for normal operation:

Pos.	Description	Only systems with module	To be connected to	Fitting	Size	Type
F	Backwash connection from activated carbon filter	Activated carbon filter	M	Double adaptor socket	Thread 1"	Female threaded
G	Backwash outlet		Drain	SS fitting	1"	Male threaded
H	Feed water inlet		Feed water source	SS fitting	5/4"	
I	Feed water sample			Hose adaptor	16 mm	Solvent
M <sup>4)</sup>	Backwash outlet of activated carbon filter	Activated carbon filter	F	Socket	Thread 1"	Female threaded
N <sup>4)</sup>	Water inlet of activated carbon filter	Activated carbon filter	R			
O <sup>4)</sup>	Water outlet of activated carbon filter	Activated carbon filter	U			
P	Deaeration outlet of UF membrane			Hose adaptor	25 mm	Solvent
Q1	Water outlet to external tank	Distribution	External tank inlet	Male-female reducer	Thread 1"	Female threaded
Q2	Clean water outlet	UV disinfection	e.g. AQtap dispenser			
R	Water outlet to activated carbon filter	Activated carbon filter	N	Double adaptor socket	Thread 1"	Female threaded
S	Water inlet from external tank	UV disinfection	External tank outlet	Double adaptor socket	Thread 1"	Female threaded
T	GAC filter water sample	Activated carbon filter		Hose adaptor	16 mm	Solvent
U	Water inlet from activated carbon filter	Activated carbon filter	O	Double adaptor socket	Thread 1"	Female threaded
W	Overflow line connection		External tank inlet <sup>3)</sup>	-	50 mm	-

##### External CIP connections (used only during external CIP performed by certified service staff):

Pos.	Description	Only systems with module	To be connected to	Fitting	Size	Type
A	External CIP connection		K	Hose adaptor	32 mm	Solvent
B	External CIP connection		J1			
C	External CIP connection		J2			
D <sup>1)</sup>	External CIP connection		1000 litre chemical waste tank <sup>2)</sup>			
E	External CIP connection		External tank outlet	Hose adaptor	40 mm	Solvent
J1	External CIP connection	External CIP	B	Hose adaptor	32 mm	Solvent
J2	External CIP connection	External CIP	C			
K	External CIP connection	External CIP	A			
L1	External CIP connection	External CIP	L2			
L2	External CIP connection	External CIP	L1			
L3	External CIP connection	External CIP	L4			
L4	External CIP connection	External CIP	L3			

<sup>1)</sup> Position of connection is slightly different in systems without self-cleaning prefilter module. See fig. 7.

<sup>2)</sup> Not included in external CIP unit, must be provided on site.

<sup>3)</sup> Only with external tank setup 1. Use a hose clamp to connect the hose.

<sup>4)</sup> Hoses for connecting the activated carbon filter are not included, they must be provided on site.

## 5. Commissioning

The system must only be commissioned by certified service staff according to the separate service instructions, which are supplied to certified service staff only.

## 6. Product introduction

### 6.1 Product description

The Grundfos AQPure water treatment system produces potable water by filtering bacteria, viruses and particles from raw source water. The water treatment is based on ultrafiltration (UF) technology.

Standardised modules that are selected according to the specific raw water quality on site can be added to the UF module of the AQPure system.

### 6.2 Applications

#### 6.2.1 Intended use

The purpose of the Grundfos AQPure water treatment system is to produce potable water by filtering bacteria, viruses and particles from certain types of raw source water. The AQPure system provides a reliable and affordable water supply in urban or domestic applications, such as commercial buildings, hotels, industries, and in remote areas, small communities, informal settlements, temporary camps, emergency or disaster areas.

The water entering the system must meet the feed water requirements. See section: [11.1.5 Feed water requirements](#).

#### 6.2.2 Improper use



Warning

Improper use, misuse or misapplication can lead to personal injury and damage to the equipment!

The operational safety of the system is only guaranteed, if it is used in accordance with section: [6.2.1 Intended use](#).

- The system must not be used in potentially explosive areas.
- The system must not be used, if it is damaged.
- The system must not be used after improper repair.
- The system must not be used after unauthorised modification.

## 6.3 Identification

### 6.3.1 Nameplate

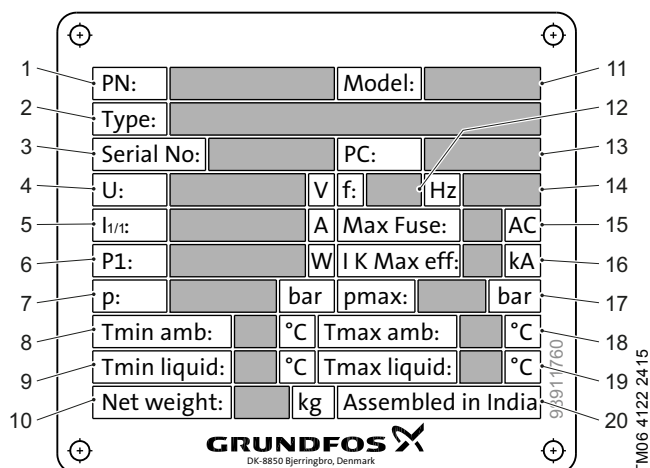


Fig. 4 Nameplate

Pos.	Description
1	Product number
2	Type designation
3	Serial number
4	Voltage
5	Nominal current
6	Nominal power
7	Nominal pressure
8	Min. ambient temperature
9	Min. liquid temperature
10	Weight of the system without water
11	Revision: A, B, C
12	Frequency
13	Production site (e.g. "P1" for India) followed by a four-digit code for year and week of production (e.g. "1523" for year 2015 and week 23)
14	Type of ground connection
15	Fuse rating that should be installed as protection of the system on the power grid
16	Max. short-circuit current
17	Max pressure
18	Max. ambient temperature
19	Max. liquid temperature
20	Country of origin
21	Marks of approval

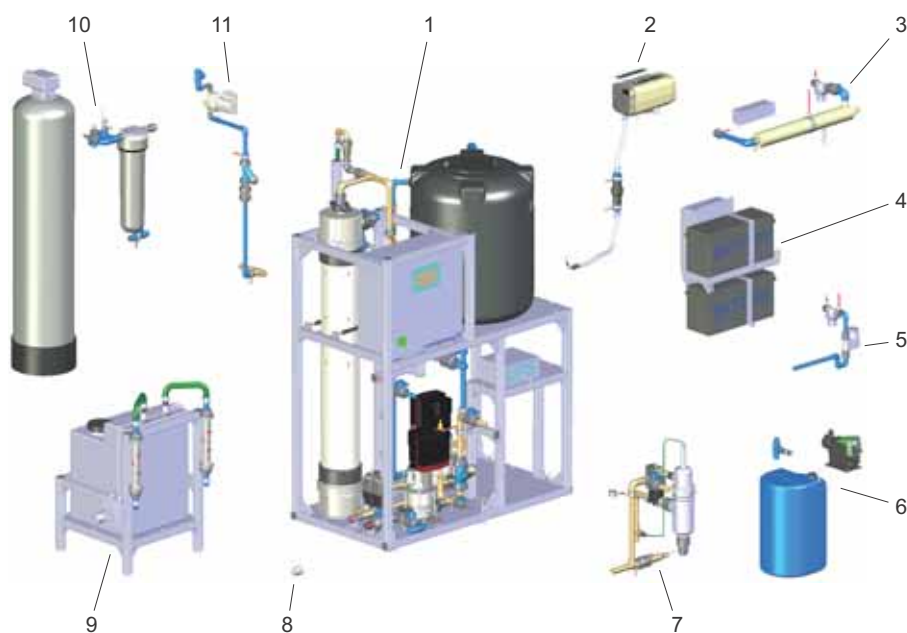
### 6.3.2 Type key

Example: AQP-UF-1-C1-PL-UV-D-SP-RM

	<b>Code</b>	<b>Description</b>
<b>Type</b>	AQP	AQpure
<b>Technology</b>	UF	Ultrafiltration
<b>Number of modules</b>	1	1 module
<b>Main combination</b>	C1	Combination 1
	C2	Combination 2
	C3	Combination 3
	C4	Combination 4
	C5	Combination 5
	C6	Combination 6
	C7	Combination 7
	C8	Combination 8
	C9	Combination 9
	C10	Combination 10
	C11	Combination 11
<b>Optional modules</b>		
<b>Level sensing</b>	PL	Level sensing
	X	No level sensing
<b>UV disinfection</b>	UV	UV disinfection
	X	No UV
<b>Distribution</b>	D	Distribution
	X	No distribution
<b>Solar package</b>	SP	Solar package
	X	No solar package
<b>Remote management</b>	RM	Remote management
	X	No remote management

## 6.4 AQpure modules

The core component of the AQpure system is the standard UF module for ultrafiltration. The standard UF module is included in all possible configurations of an AQpure system. Additionally an AQpure system can comprise a number of modules and accessories. The quality of the raw water intake determines, which modules are required for the water purification process.



**Fig. 5** Overview of AQpure modules

Pos.	Module
1	Standard UF
2	Air scouring
3	UV disinfection
4	Solar package
5	Distribution
6	Chlorination
7	Self-cleaning prefilter
8	Level sensing
9	External CIP (accessory)
10	Activated carbon filter (GAC filter)
11	Internal CIP

TM06 4099 4215

Pos.	Module	Description
1	Standard UF	<p>The standard UF module is included in all possible configurations of an AQpure system. The most basic configuration for an AQpure system comprises only this module. It comprises all components relevant for the ultrafiltration (UF) process and the basic self-cleaning tasks. If no solar package module is used, the system includes an Uninterruptible Power Supply (UPS) to put the system into a safe state in case of power failure.</p> <p>The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one UF membrane</li> <li>• one feed pump</li> <li>• one backwash pump</li> <li>• one internal water tank</li> <li>• four motor valves</li> <li>• three pressure sensors</li> <li>• two flow sensors</li> <li>• one temperature sensor</li> <li>• one UPS (only if no solar package module is used)</li> <li>• one control PLC</li> <li>• one aluminium frame.</li> </ul>
2	Air scouring	<p>An air scouring module can be added to the system. This module serves two different purposes. One is the air scouring which is used to enhance the efficiency of the UF membrane backwash. The air scouring module sends air bubbles through the UF membrane as an additional step of the UF membrane backwash. The air bubbles move from the bottom to the top of the UF membrane. In their movement they help to loosen the fouling of the membrane. See section: <a href="#">6.6.9 Backwash of UF membrane</a>.</p> <p>The other purpose of the air scouring module is to test the integrity of the UF membrane. This is done with a Pressure Decay Test (PDT). During a PDT the UF membrane is pressurised with air. The pressure inside the UF membrane is held and monitored. If the pressure decreases more than expected within a certain period of time, it indicates broken fibres inside the UF membrane. See section: <a href="#">6.6.15 Integrity test</a>.</p> <p>The main component of this module is an air compressor.</p>
3	UV disinfection	<p>A UV disinfection module can be added to the system. The UV light is turned on, when production runtime starts in the morning, and is turned off, when production runtime stops in the evening. For details on production runtime, see section: <a href="#">6.6.5 Production</a>. The UV light is also turned off, if a system alarm is activated.</p> <p>The UV lamp needs 3 minutes to warm up before it reaches the light intensity that has the required disinfection performance. During warm-up time, no tapping of water is possible.</p> <p>A UV light intensity sensor monitors the UV light. The value of the UV intensity is displayed in % at the UV system controller, which is installed at the lower backside of the AQpure control cabinet. Low UV intensity triggers an alarm that stops the system.</p> <p>The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one UV lamp</li> <li>• one UV intensity sensor</li> <li>• one UV sensor controller</li> <li>• one solenoid valve.</li> </ul>
4	Solar package	<p>The AQpure system is powered by single-phase 220-240 VAC power. The power source for the system can either be an external power source provided by the operating company or it can be a solar package module, or a combination of both. The solar package module does not influence the Process and Instrumentation Diagram (PID) of the system. The solar module does however influence the power management of the system. See section: <a href="#">6.7 Power management</a>. The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one breaker box for the PV array connection</li> <li>• one breaker box between batteries and bi-directional inverter</li> <li>• one bi-directional inverter including a solar charger</li> <li>• two batteries.</li> </ul>
5	Distribution	<p>The purpose of the distribution module is to provide the operating company with a precise measurement for the water volume that has been distributed from the system. A distribution module is mandatory, if the activated carbon filter module is part of the system or if the external tank setup 2 is used. See section: <a href="#">6.5.1 External tank setup options</a>. The system must be able to close the distribution during automatic cleaning tasks. The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one water meter</li> <li>• one solenoid valve.</li> </ul>
6	Chlorination	<p>The chlorination module offers the possibility to dose sodium hypochlorite solution into the clean water flow. Furthermore, it provides the possibility to perform Chemically Enhanced Backwashes (CEB), where sodium hypochlorite solution is added while the UF membrane is backwashed. The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one dosing pump</li> <li>• one chemical tank with level switch.</li> </ul>

Pos.	Module	Description
7	Self-cleaning prefilter	<p>It is a requirement that the water flowing through the UF membrane contains only particles smaller than 300 µm. To comply with this requirement, the self-cleaning prefilter module can be chosen to filter the water inlet to the UF membrane. The self-cleaning prefilter module includes a filter with a mesh size of 100 µm. The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one self-cleaning prefilter</li> <li>• one motor valve</li> <li>• one pressure sensor.</li> </ul>
8	Level sensing	<p>An external tank for clean water can be added to the system. The external tank provides a buffer between the system and the consumer. With the external tank the system is able to produce more continuously, because it does not stop each time the internal tank is full. Water can be tapped from the external tank while the system utilises the internal tank for automatic cleaning sequences. The external tank can be installed in two different setups. See section: <a href="#">6.5.1 External tank setup options</a>.</p> <p>The external tank is not supplied by Grundfos but always sourced locally by the operating company to avoid high shipping costs. However the pressure sensor used to determine the water level in the external tank, is supplied by Grundfos. The level sensing module includes only the pressure sensor.</p>
9	External CIP unit (accessory)	<p>If the UF membrane is fouled to an extent where it is no longer possible to clean the membrane with regular backwash and internal CIP, an external CIP has to be performed. During an external CIP strong acids and bases are applied in a closed circuit around the UF membrane and circulated. The mobile external CIP unit is only connected to the system while the external CIP is performed by certified service staff.</p> <p>The external CIP sequence requires the use of feed pump, backwash pump and motor valves. The components of the external CIP unit are controlled manually. A 1000 litre chemical waste tank must be provided on site to collect the waste water from external CIP. The main components of this module are:</p> <ul style="list-style-type: none"> <li>• two flow indicators</li> <li>• one chemical tank</li> <li>• one heater</li> <li>• one circuit breaker box to control the heater</li> <li>• one level switch.</li> </ul>
10	Activated carbon filter (GAC filter)	<p>A Granular Activated Carbon (GAC) filter module can be added to the system. The GAC filter is used to remove colour and certain chemicals, particularly organic chemicals, from the filtered water. The GAC filter is also used to remove chemicals such as chlorine and hydrogen sulfide, that give objectionable odours or tastes to the water. The water from the clean water tank is filtered first through the GAC filter and then through a cartridge filter.</p> <p>A distribution module and the external tank setup 2 are mandatory, if the activated carbon filter module is used. This is because the system must be able to close the distribution during automatic cleaning tasks. See section: <a href="#">6.5.1 External tank setup options</a>.</p> <p>The main components of this module are:</p> <ul style="list-style-type: none"> <li>• one GAC filter</li> <li>• one multiport valve</li> <li>• two pressure sensors</li> <li>• one cartridge filter.</li> </ul>
11	Internal CIP	<p>The internal Clean In Place (CIP) module provides an enhanced cleaning of the UF membrane, which is performed after several membrane backwashes to clean the membrane more efficiently. An internal CIP cleaning is performed once a day at the most.</p> <p>Systems with internal CIP module always include a chlorination module as well, because sodium hypochlorite solution is required for the internal CIP process.</p> <p>During an internal CIP, a closed circuit flowing through the membrane is established. Sodium hypochlorite solution is dosed into the closed circuit and circulated to loosen and dissolve the fouling on the UF membrane. See section: <a href="#">6.6.10 Internal CIP</a>.</p> <p>The main component of this module is a circulation pump.</p>
-	Remote management	<p>The Grundfos Remote Management (GRM) module provides remote monitoring of operational status and performance. Broadcasting of warnings and alarms as well as upload and download of parameterisation files is possible. The main component of this module is the SECOME box (router and VPN connection). A USB modem (3G or higher) must be provided by the customer to access the GRM webpage. The SECOME box also provides a remote control function of the system for troubleshooting or maintenance. See also section: <a href="#">7.7 Grundfos Remote Management (GRM)</a>.</p>

### 6.5 Piping and Instrumentation Diagram (PID)

The following PID shows an AQpure system that comprises all modules. Furthermore, the two possible setups (ETS1 and ETS2) for the installation of an external clean water tank are shown.

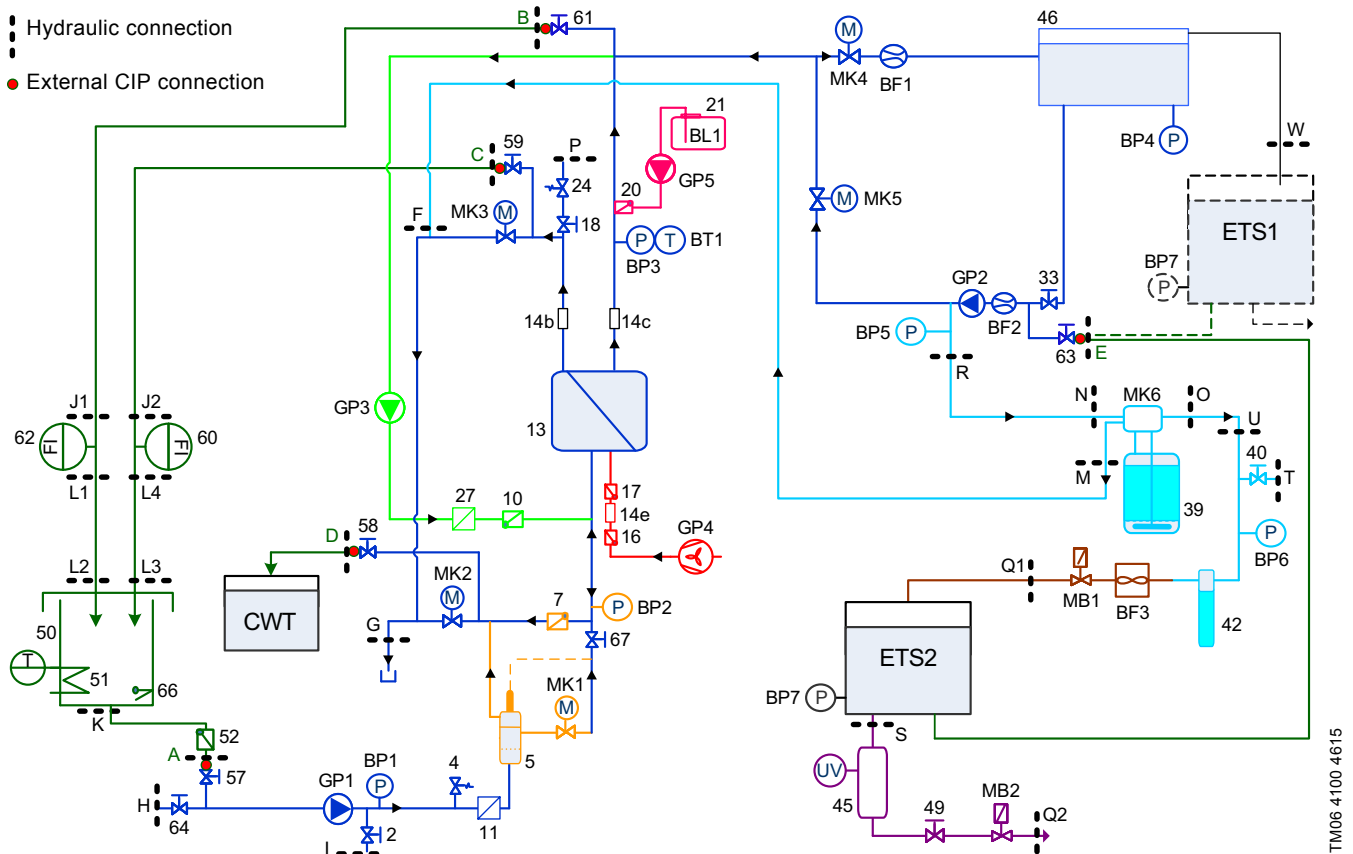


Fig. 6 PID of an AQpure system with all modules

Pos.	Description	Pos.	Description	Pos.	Description
<b>Standard UF module:</b>		<b>Air scouring module:</b>		<b>External CIP unit:</b>	
BF1	Flow sensor	GP4	Compressor	50	Chemical tank
BF2	Flow sensor	14e	Transparent hose	51	Heater
BP1	Pressure sensor	16, 17	Non-return valve	52	Non-return valve
BP3	Pressure sensor	<b>UV disinfection module:</b>		60, 62	Flow indicator
BP4	Pressure sensor	MB2	Solenoid valve	66	Float switch
BT1	Temperature sensor	45	UV disinfection system with sensor	<b>Activated carbon filter module:</b>	
GP1	Feed pump	49	Manual valve	BP5	Pressure sensor
GP2	Backwash pump	<b>Distribution module:</b>		BP6	Pressure sensor
MK2	Motor valve	BF3	Water meter	MK6	Multiport valve
MK3	Motor valve	MB1	Solenoid valve	39	Carbon filter vessel
MK4	Motor valve	<b>Chlorination module:</b>		40	Manual valve
MK5	Motor valve	BL1	Level sensor	42	Cartridge filter
2	Manual valve	GP5	Dosing pump	<b>Internal CIP module:</b>	
4	Pressure relief valve	20	Injection unit	GP3	Circulation pump
11	Strainer	21	Chemical tank	10	Non-return valve
13	UF membrane	<b>Self-cleaning prefilter module:</b>		27	Strainer
14b	Sight glass	BP2	Pressure sensor	<b>Other:</b>	
14c	Sight glass	MK1	Motor valve	CWT	Chemical waste tank
18	Manual valve	5	Self-cleaning prefilter	ETS1	External tank, setup 1
24	Air release valve	7	Non-return valve	ETS2	External tank, setup 2
33	Manual valve	<b>Level sensing module:</b>			
46	Internal tank	BP7	Pressure sensor		
57, 58	Manual valve	<b>Note:</b>			
59, 61	Manual valve	Pos. (11) and (67) are only available in systems without self-cleaning prefilter module.			
63, 64	Manual valve	Details on connections (A-W) can be found in section: <a href="#">4.4 Hydraulic connections</a> .			
67	Manual valve				



### 6.5.1 External tank setup options

This section refers to [fig. 6](#).

There are two different setups for the external tank installation.

#### Setup 1 with external tank (ETS1)

In setup 1, the water flows from the internal tank (46) through the overflow pipe to the external tank (ETS1) based on gravity or on an external pump that is controlled by the operating company. Once the *Production* task has filled the internal tank (46), the water flows from the top of the internal tank (46) to the top of the external tank (ETS1).

If a level sensing module is part of the system, the level in the external tank (ETS1) is measured and the *Production* task is stopped, when the external tank (ETS1) is full. Otherwise the *Production* task is stopped at the end of the production runtime or for internal cleaning tasks.

The distribution module and the activated carbon filter module cannot be used with setup 1.

The UV disinfection module can only be used:

- if an external pump controlled and provided by the operating company is installed to achieve the required inlet pressure for the UV module.
- if the external tank is installed at a level that provides sufficient inlet pressure for the UV disinfection module.

#### Setup 2 with external tank (ETS2)

In setup 2, the backwash pump (GP2) is used to pump the water from the internal tank (46) to the external tank (ETS2). The process is controlled by the task *Filling of the external tank*. See section: [6.6.6 Filling of the external tank](#).

The distribution module and the level sensing module are mandatory for setup 2.

6.5.2 Location of PID components

AQpure standard UF module

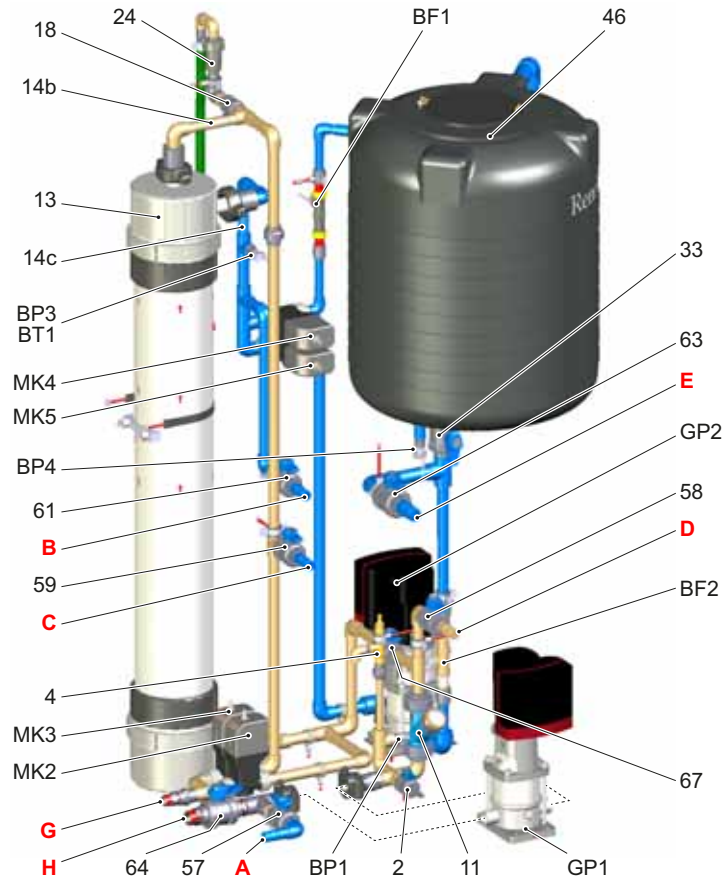


Fig. 7 AQpure standard UF module

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Pos.	Description
<b>Standard UF module:</b>	
BF1	Flow sensor
BF2	Flow sensor
BP1	Pressure sensor
BP3	Pressure sensor
BP4	Pressure sensor
BT1	Temperature sensor
GP1	Feed pump
GP2	Backwash pump
MK2	Motor valve
MK3	Motor valve
MK4	Motor valve
MK5	Motor valve
2	Manual valve
4	Pressure relief valve
11	Strainer
13	UF membrane

Pos.	Description
14b	Sight glass
14c	Sight glass
18	Manual valve
24	Air release valve
33	Manual valve
46	Internal tank backwash
57	Manual valve
58	Manual valve
59	Manual valve
61	Manual valve
63	Manual valve
64	Manual valve
67	Manual valve
<b>Other:</b>	
A, B, C, D, E	External CIP connection
G	Backwash outlet
H	Feed water inlet

**Note** Pos. (11) and (67) are only available in systems without self-cleaning prefilter module.

AQpure standard UF module with self-cleaning prefilter module

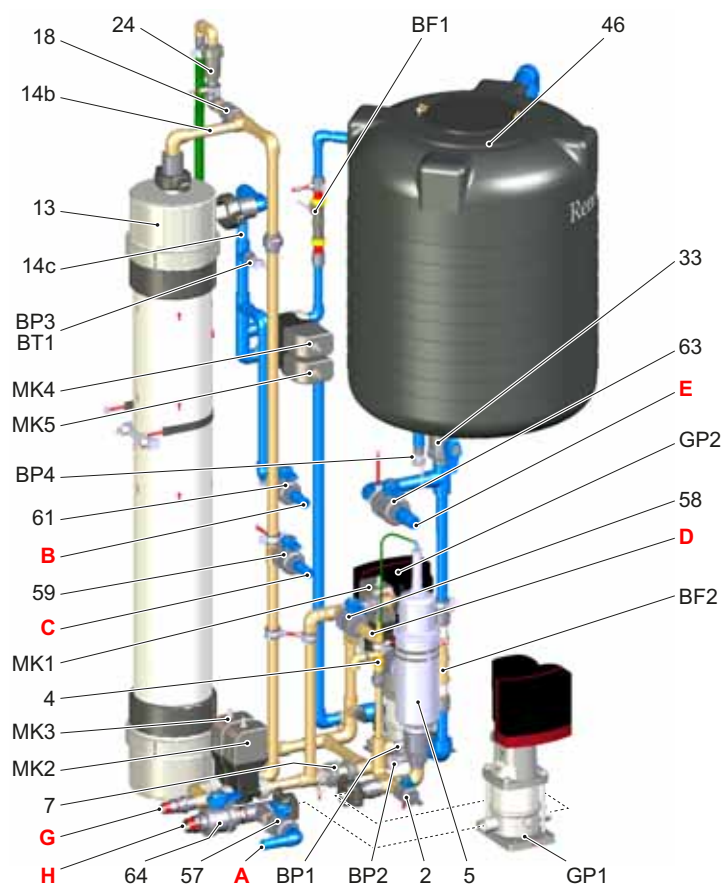


Fig. 8 AQpure standard UF module with self-cleaning prefilter module

Pos.	Description
<b>Standard UF module:</b>	
BF1	Flow sensor
BF2	Flow sensor
BP1	Pressure sensor
BP3	Pressure sensor
BP4	Pressure sensor
BT1	Temperature sensor
GP1	Feed pump
GP2	Backwash pump
MK2	Motor valve
MK3	Motor valve
MK4	Motor valve
MK5	Motor valve
2	Manual valve
4	Pressure relief valve
13	UF membrane
14b	Sight glass
14c	Sight glass
18	Manual valve

Pos.	Description
24	Air release valve
33	Manual valve
46	Internal tank backwash
57	Manual valve
58	Manual valve
59	Manual valve
61	Manual valve
63	Manual valve
64	Manual valve
<b>Self-cleaning prefilter module:</b>	
BP2	Pressure sensor
MK1	Motor valve
5	Self-cleaning prefilter
7	Non-return valve
<b>Other:</b>	
A, B, C, D, E	External CIP connection
G	Backwash outlet
H	Feed water inlet

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AQpure optional modules (without solar package module)

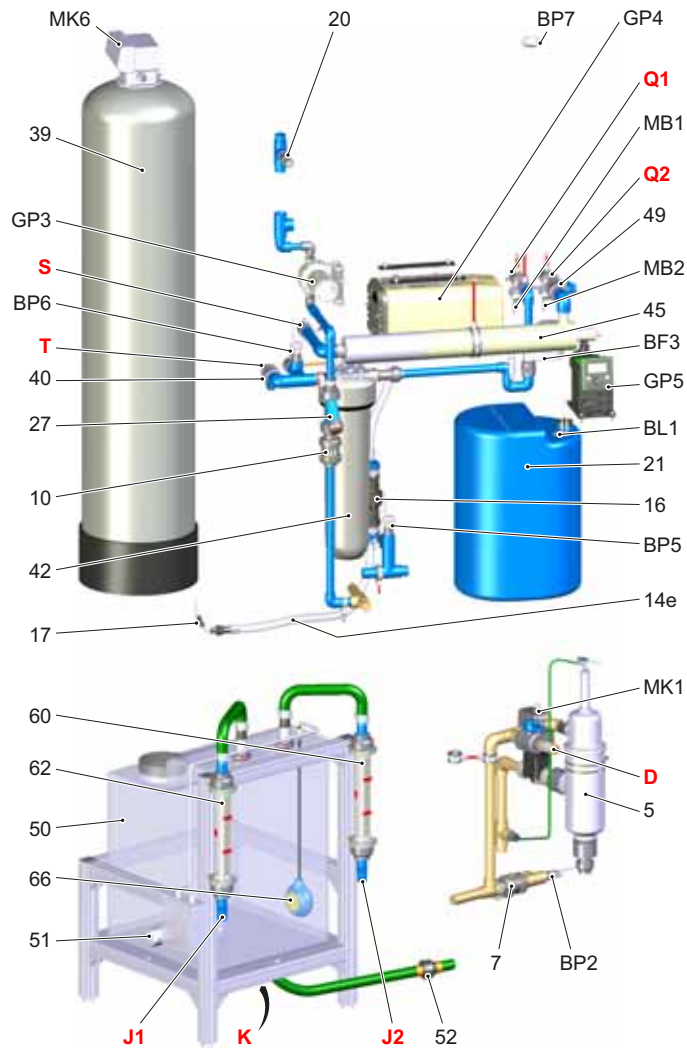


Fig. 9 AQpure optional modules (without solar package and remote management module)

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Pos.	Description
<b>Air scouring module:</b>	
GP4	Compressor
14e	Transparent hose
16	Non-return valve
17	Non-return valve
<b>UV disinfection module:</b>	
MB2	Solenoid valve
45	UV disinfection system with sensor
49	Manual valve
<b>Distribution module:</b>	
BF3	Water meter
MB1	Solenoid valve
<b>Chlorination module:</b>	
BL1	Level sensor
GP5	Dosing pump
20	Injection unit
21	Chemical tank
<b>Self-cleaning prefilter module:</b>	
BP2	Pressure sensor
MK1	Motor valve
5	Self-cleaning prefilter
7	Non-return valve
<b>Level sensing module:</b>	
BP7	Pressure sensor

Pos.	Description
<b>External CIP unit:</b>	
50	Chemical tank
51	Heater
52	Non-return valve
60	Flow indicator
62	Flow indicator
66	Float switch
<b>Activated carbon filter module:</b>	
BP5	Pressure sensor
BP6	Pressure sensor
MK6	Multiport valve
39	Carbon filter vessel
40	Manual valve
42	Cartridge filter
<b>Internal CIP module:</b>	
GP3	Circulation pump
10	Non-return valve
27	Strainer
<b>Other:</b>	
D, J1, J2, K	External CIP connection
Q1	Water outlet to external tank
Q2	Clean water outlet
S	Water inlet from external tank
T	GAC filter water sample

## 6.6 Process description

### 6.6.1 Tasks

The system performs a number of different tasks. The following tasks are automatically performed by the system, when automatic mode is active:

Task	See section
<a href="#">Production</a>	<a href="#">6.6.5</a>
<a href="#">Filling of the external tank</a>	<a href="#">6.6.6</a>
<a href="#">Tapping UV light</a>	<a href="#">6.6.7</a>
<a href="#">Backwash of self-cleaning prefilter</a>	<a href="#">6.6.8</a>
<a href="#">Backwash of UF membrane</a>	<a href="#">6.6.9</a>
<a href="#">Internal CIP</a>	<a href="#">6.6.10</a>
<a href="#">Backwash of GAC filter</a>	<a href="#">6.6.11</a>
<a href="#">Low power control</a>	<a href="#">6.6.12</a>
<a href="#">PLC reboot</a>	<a href="#">6.6.13</a>

In semi-automatic mode all tasks performed in automatic mode (except [Low power control](#) and [PLC reboot](#)) as well as the following tasks can be activated by the certified service staff:

Task	See section
<a href="#">External CIP</a>	<a href="#">6.6.14</a>
<a href="#">Integrity test</a>	<a href="#">6.6.15</a>

Several of the tasks utilise the same components and are therefore in conflict with one another. Two conflicting tasks cannot be active at the same time.

In semi-automatic mode the system can be switched to manual control. In manual control all components of the system can be controlled individually.

**Caution** Manual control is protected with a special password and must only be used by Grundfos service specialists.

### 6.6.2 Production runtime

The task [Production](#) is only running within a specified period of time each day. This period of time is referred to as "production runtime". The production runtime is site dependent and is in general determined by the consumer patterns and the power management setup. Production runtime will typically be during the day when water consumption is largest and when solar power is available. Outside the production runtime the system is in an idle state or it is performing self-cleaning tasks.

The production runtime is a system parameter.

### 6.6.3 Procedures for start and end of day

When the system enters production runtime (start of day) or leaves production runtime (end of day), a number of tasks is executed in a specific order. Other tasks are not activated before or in between.

#### Start of day

At start of day the following tasks are executed in listed order:

- [Backwash of GAC filter](#)
- [Backwash of GAC filter](#)

Please note that the system deliberately performs the same task twice. Once the tasks have been performed, the system starts the [Production](#) task and from this point activates tasks as specified in section: [6.6.1 Tasks](#).

#### End of day

At end of day the following tasks are executed in listed order:

- [Backwash of GAC filter](#)
- [Backwash of UF membrane](#) or [Internal CIP](#)
  - The [Internal CIP](#) is followed by [Backwash of self-cleaning prefilter](#).

### 6.6.4 System parameters

For safe and faultless functioning of the system a number of parameters is required. A general parameterisation is done during the Factory Acceptance Test (FAT) in the factory. The parameterisation is adapted according to local conditions and customer requirements during commissioning on site.

### 6.6.5 Production

This section refers to [figs. 6-8](#).

The task [Production](#) controls the filtration flow through the system from feed water inlet valve (64) to the internal tank (46).

#### Activation

The following criteria must be fulfilled before the task is started:

- The time of day must be within the specified "production runtime".
- Power must be available.
- None of the following tasks must be active:
  - [Backwash of UF membrane](#)
  - [Backwash of self-cleaning prefilter](#)
  - [Internal CIP](#)
  - [External CIP](#)
  - [Integrity test](#)
- The internal tank (46) must not be full (applicable only if external tank (ETS2) is used).
- The external tank (ETS1 or ETS2) must not be full.
- No active alarms.

If the system is switched into semi-automatic mode, the task is automatically stopped. Once the system is switched back to automatic mode, the task is automatically activated again.

The task can be active along with:

- [Filling of the external tank](#)
- [Tapping UV light](#)

#### Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

- The feed pump (GP1) is stopped. If present, the dosing pump (GP5) is stopped as well.
- All motor valves (MK) are closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

#### Production startup

When the task [Production](#) is activated, the pressure sensor upstream the UF membrane is examined first. If the pressure is below a defined critical value, it is likely that the UF membrane has been drained. In this case the feed pump (GP1) is operated with increased speed, until the UF membrane is filled again. During the filling of the UF membrane the air inside the membrane escapes from air release valve (24).

#### Production flow

The system has an adaptive control algorithm for the production flow setpoint. The production flow setpoint is automatically reduced in steps down to a pre-defined minimum value. This increases the time period between the external CIP executions. After an external CIP has been performed, the production flow setpoint is set back to the pre-defined maximum value.

The adaptive control algorithm for the production flow setpoint can be disabled by setting the minimum flow and maximum flow parameters to the same value. Observe section: [6.6.4 System parameters](#).

### Setup 1 with external tank (ETS1)

In setup 1 the flow from the internal tank (46) through the overflow pipe to the external tank (ETS1) is based either on gravity or an external pump that is controlled by the operating company and not by the AQPure system. Once the *Production* task has filled the internal tank (46), the water flows from the top of the internal tank (46) to the top of the external tank (ETS1).

If a level sensing module is part of the system, the level in the external tank (ETS1) is measured and the *Production* task is stopped, when the external tank (ETS1) is full. Otherwise the *Production* task is only stopped at the end of production runtime or for internal cleaning tasks. A parameter must be set according to the availability of the level sensing module.

See also section: [6.5.1 External tank setup options](#).

### Chlorination

If the chlorination module (fig. 5, pos. 6) is part of the system, sodium hypochlorite solution can be added to the water. The sodium hypochlorite reduces the bacteria growth in the system after the injection point, e.g. in the internal water tank. The sodium hypochlorite solution is dosed with dosing pump (GP5) according to the flow measured by flow sensor (BF1). The sodium hypochlorite dosing amount is adjustable. Observe section: [6.6.4 System parameters](#).

### 6.6.6 Filling of the external tank

**This section refers to figs. 6-8.**

This task is only relevant, if external tank (ETS2) is used (setup 2), otherwise see section: [6.6.5 Production](#). The task controls the water flow from the internal tank (46) to the external tank (ETS2) utilising backwash pump (GP2). If the level sensing module (fig. 5, pos. 8) is part of the system, the level in the external tank is measured by pressure sensor (BP7).

#### Activation

The following criteria must be fulfilled before the task is started:

- The water in the internal tank (46) must not be reserved for other pending tasks.
- The UV system (45) must be active.
- The internal tank (46) must not be empty.
- The external tank (ETS2) must not be full.
- The time of day must be within the specified production runtime.
- The following tasks are conflicting and must be inactive:
  - [Backwash of self-cleaning prefilter](#)
  - [Backwash of UF membrane](#)
  - [Backwash of GAC filter](#)
  - [Internal CIP](#)
- No active alarms.

#### Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. The backwash pump (GP2) is stopped.
2. If a distribution module is part of the system, solenoid valve (MB1) is closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

### 6.6.7 Tapping UV light

**This section refers to figs. 6-8.**

This task controls the flow from the external tank (ETS1 or ETS2) through the UV disinfection system (45) and out of the system to the water tapping device (e.g. AQtap dispenser). If the system does not include an UV disinfection module, the task is disabled and has no function.

#### Activation

The following criteria must be fulfilled before the task is started:

- If a level sensing module is available, the external tank (ETS1 or ETS2) must not be empty. Otherwise the internal tank (46) must not be empty.
- The UV light bulb must be warmed up.
- No active alarms.

If the system is switched into semi-automatic mode, the task is stopped. Once the system is switched back to automatic mode, the task is automatically activated again.

#### Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. UV light (45) is deactivated.
2. Solenoid valve (MB2) is closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

#### UV light

The UV light is switched on automatically, when production runtime starts in the morning. It is switched off, when production runtime ends and if an alarm is activated.

To reach a sufficient disinfection performance, the UV light requires a certain warm-up time, usually 3 minutes. During this time no tapping of water is possible. The warm-up time is not adjustable.

### 6.6.8 Backwash of self-cleaning prefilter

**This section refers to figs. 6-8.**

This task controls the frequent automatic backwash (BW) of the self-cleaning prefilter (5). The purpose of this task is to remove fouling from the prefilter.

#### Activation

The task can be activated by different criteria:

- Activation after: [Backwash of UF membrane](#).
- Activation after: [Internal CIP](#).
- Activation, if the pressure over the prefilter (POF) exceeds a predefined limit (e.g. 0.35 bar).
- Activation after long idle time.
- Manual activation, when the system is in semi-automatic mode.

Furthermore, the following criteria must be met:

- The tasks [Production](#), [Backwash of UF membrane](#) and [Backwash of GAC filter](#) must be inactive. If [Production](#) is active, it is stopped.
- No active alarms.

#### Supervision

The system monitors the volume of water passing the prefilter between two backwashes. An alarm is triggered, if a predefined minimum volume is not achieved.

Furthermore, the system monitors the time required for the backwash of the prefilter. If the time exceeds a predefined value, an alarm is triggered.

See section: [7.5.1 List of warnings and alarms](#).

## Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. Feed pump (GP1) is stopped.
2. Motor valve (MK2) is opened.
3. When the pressure at sensor (BP1) falls below a predefined value, all motor valves (MK) are closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu. If the system is in automatic mode and the alarm is reset, the task is repeated.

### 6.6.9 Backwash of UF membrane

This section refers to figs. 6-8.

A backwash (BW) is performed to remove fouling on the surface and in the pores of the UF membrane (13). There are several backwash types:

Backwash type	Included backwash steps:				
	Air scouring	Draining	Backwash UF	Backwash UF with sodium hypochlorite	Forward flushing
1			X		X
2	X		X		X
3		X	X		X
4	X	X	X		X
5			X		
6				X	
7	X	X		X	X
8	X	X		X	

In general, a backwash consists of the following steps, which are carried out in listed order:

1. Air scouring
2. Draining
3. Backwash of the bottom of the UF membrane
4. Backwash of the top of the UF membrane
5. Forward flushing of the UF membrane

The backwash types 6, 7 and 8 are also referred to as Chemically Enhanced Backwash (CEB), because sodium hypochlorite solution is added to the backwash flow. For these backwash types a chlorination module is required.

#### Activation

The task can be activated by different criteria:

- Activation each time a predefined volume of water has passed UF membrane (13).
- Activation after long idle time.
- Activation at the end of production runtime. See also section: [6.6.3 Procedures for start and end of day](#).
- Manual activation, when the system is in semi-automatic mode.

For each of these criteria a different backwash type can be predefined at the system. Observe section: [6.6.4 System parameters](#).

Furthermore, the following criteria must be met:

- All conflicting tasks must be inactive. If *Production* is active, it is stopped.
- There must be enough water in the internal tank (46).
  - If there is not enough water in the internal tank, the system starts *Production* until enough water is prepared and then activates the task.
- No active alarms.

## Backwash at the end of production runtime

The backwash at the end of production runtime is performed to make sure, that fouling is removed from the UF membrane, and that the UF membrane is filled with clean water while the system is in a passive state. Typically type 5 backwash is chosen. If a backwash type including forward flushing is chosen, feed water is flushed along the outside of the membrane fibres as the last step. The feed water increases the fouling in the membrane while the system is passive, which is undesirable. Backwash at the end of production runtime should never include forward flushing.

### Adaptive activation volume

Once a BW has been activated, the counter for the water that has run through the membrane and the counter for the idle time are reset. The volume of water that must run through the membrane before a BW is activated is automatically changed by the system to optimise the performance. The system changes the water volume, if the Trans-Membrane Pressure (TMP) value for the UF membrane increases too fast.

## Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. Pumps (GP1) and (GP2) are stopped. If present, the dosing pump (GP5) is stopped as well.
2. Compressor (GP4) is stopped.
3. All motor valves (MK) are closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu. If the system is in automatic mode and the alarm is reset, the task is repeated.

### 6.6.10 Internal CIP

This section refers to fig.: 6-9.

This task is only relevant, if an internal CIP module and a chlorination module are part of the system.

The *Internal CIP* task is an enhanced variant of the *Backwash of UF membrane* task and removes fouling in the UF membrane.

*Internal CIP* is less frequently activated and more time-consuming. *Internal CIP* establishes a closed loop with sodium hypochlorite solution around the UF membrane. The system circulates the sodium hypochlorite solution through the UF membrane to dissolve the fouling. The *Internal CIP* task consists of the following steps, which are carried out in listed order:

1. Draining
2. Backwash of the bottom of the UF membrane
3. Backwash of the top of the UF membrane together with enabled circulation pump (GP3).
4. Sodium hypochlorite solution is added to the water
5. The chlorinated solution is circulated in a closed loop around the UF membrane. The circulation is interrupted cyclically for soaking.
6. Dilution where the sodium hypochlorite solution is mixed with feed water.
7. Backwash type 1.

## Activation

The task can be activated by different criteria:

- Manual activation, when the system is in semi-automatic mode.
- Activation by internal CIP flag.
- Activation by increase in TMP value. If the TMP value has increased more than a predefined value since the last internal CIP, a new internal CIP is activated.
- Periodic activation. The automatic activation must be carried out with a minimum periodic interval, e.g. once every 14 days. The time interval in days is a predefined parameter.

Activation by internal CIP flag occurs, when the backwash water volume has reached its minimum limit and the internal CIP flag is set. *Internal CIP* must be carried out at the first possible opportunity, which is always at the end of production runtime.

*Internal CIP* is also activated, when the TMP value of the UF membrane has increased more than a predefined value since the last internal CIP.

Periodic activation can also occur, if an internal CIP has not been activated within the last YY days (e.g. 14 days). It is not desired to have the internal CIP activated too often. The frequency limit (max one internal CIP every 7 days) is determined by a predefined parameter. If the frequency limit is reached, the feed pump flow is reduced to mitigate the fast fouling. If a minimum flow is reached, the system requires an external CIP and stops.

Furthermore, the following criteria must be met:

- All other tasks must be inactive.
- Manual control must not be active.
- There must be enough water in the internal tank (46).
  - If there is not enough water in the internal tank, the system starts *Production* until enough water is prepared and then activates the task.
- The chemical tank (21) must not be empty.
- The battery capacity must be above 25 % (only relevant, if the solar package module is included).
- No active alarms.

## Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. Pumps (GP1), (GP2), (GP3) and (GP5) are stopped.
2. All motor valves (MK) are closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

### 6.6.11 Backwash of GAC filter

This section refers to fig.: 6-9.

The GAC filter (39) is backwashed daily to remove fouling.

## Activation

The task can be activated by different criteria:

- Activation at start or end of production runtime.
- Activation as a result of high Pressure Over Filter (POF) value for GAC filter (39).
- Manual activation, when the system is in semi-automatic mode.

Furthermore, the following criteria must be met:

- All tasks must be inactive, except *Production*.
- Manual control must not be active.
- There must be enough water in the internal tank (46).
- No active alarms.

The *Production* task runs while the *Backwash of GAC filter* task is ongoing to ensure a sufficient water level in the internal tank.

Usually the *Backwash of GAC filter* is activated by start and end of production runtime. See section: 6.6.3 *Procedures for start and end of day*.

## Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. Feed pump (GP1) and backwash pump (GP2) are stopped. If present, the dosing pump (GP5) is stopped as well.
2. All motor valves (MK) are closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

### 6.6.12 Low power control

This task controls the system in case of power failure.

#### AQpure system with solar package module

*Low power control* is activated in case of a power failure. If the active task is *Production*, *Filling of the external tank* or *Tapping UV light*, *Low power control* halts the active task. If another task is active, *Low power control* allows to execute the active task only. It blocks the possibility to execute any other task.

*Low power control* remains active, until the battery voltage reaches 75 %. If production on external power is allowed, *Low power control* is deactivated as soon as external power is available.

#### AQpure system with UPS

*Low power control* is activated as soon as the external power is not available. Once *Low power control* is active, other active tasks are halted and the possibility to execute any other task is blocked. All pumps, motor valves and solenoid valves are in OFF state. *Low power control* is deactivated as soon as external power is available.

### 6.6.13 PLC reboot

If there is no active task, *PLC reboot* is executed automatically at midnight. *PLC reboot* is done only if the Reboot request flag is set by the GRMInterface.

The Reboot request flag is set after a software update has been performed by the GRMInterface.

See also section: 7.7 *Grundfos Remote Management (GRM)*.



### 6.6.14 External CIP



#### Warning

Danger of personal injury due to contact with chemicals!

External CIP must only be carried out by certified service staff. For further information about external CIP see the Service Instructions.

**This section refers to fig.: 6-9.**

The purpose of the external Clean In Place (CIP) task is similar to the internal CIP task to remove fouling from the UF membrane and to recover its hydraulic properties. The external CIP is used, when the internal CIP is not efficient anymore. An external CIP task must be performed when the interval between internal CIP tasks has reached the minimum value and the production flow is reduced to the minimum flow. The task must only be performed by certified service staff. The external CIP task requires additional equipment that must be connected to the system. The additional equipment is comprised in the external CIP unit package. A 1000 litre chemical waste tank (not included in the external CIP unit package) must be provided on site.

The mobile external CIP unit uses the feed pump (GP1) and the backwash pump (GP2) during the external CIP.

For the external CIP task an air compressor for air scouring is required. If the system is not equipped with an air scouring module, an external compressor must be connected to the air hose installed at the bottom of the membrane.

The external CIP task consists of the following steps, which are carried out in listed order:

1. Perform UF membrane backwash to fill the system with clean water.
2. Connect external CIP system and chemical waste tank (CWT).
3. Filling of chemical tank (50) with clean water (1st time).
4. Flushing the feed line.
5. Circulation and heating of clean water along UF membrane (13).
6. Pouring chemicals manually into chemical tank (50).
7. Circulation of chemicals along and through UF membrane (13).
8. Soaking.
9. Emptying of chemical tank (50) to chemical waste tank (CWT), (1st time).
10. Backwash of chemicals inside the membrane to chemical waste tank (CWT).
11. Filling of chemical tank (50) with clean water (2nd time).
12. Outside flush along UF membrane (13), (1st time).
13. Emptying of chemical tank (50) to chemical waste tank (CWT), (2nd time).
14. Filling of chemical tank (50) with clean water (3rd time).
15. Outside flush along UF membrane (13), (2nd time).
16. Emptying of chemical tank (50) to chemical waste tank (CWT), (3rd time).
17. Backwash to refill the system with clean water.
18. When last chemical is used, perform integrity test. See section: [6.6.15 Integrity test](#).
19. End of task

### Activation

The external CIP can only be activated manually when the following criteria are met:

- System must be in semi-automatic mode.
- All other tasks must be inactive.
- Manual control must not be active.
- No active alarms.

If the system is not equipped with an air scouring module, an external air compressor must be connected before the external CIP can be started. A non-return valve must be installed between the membrane and the external compressor to avoid ingress of water into the compressor. The non-return valve must be installed as close as possible to the membrane.

### Alarm handling

If an alarm is activated while the task is active, the following sequence is activated:

1. Feed pump (GP1) and backwash pump (GP2) are stopped.
2. All motor valves (MK) are closed.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

### 6.6.15 Integrity test

**This section refers to fig.: 6-9.**

The purpose of the integrity test, also referred to as pressure decay test (PDT), is to test the UF membrane for broken or damaged fibres. The task must only be performed by certified service staff. The integrity test requires an air compressor that is connected to the system. If the air scouring module is part of the system, the air compressor (GP4) is utilised for the integrity test.

If the system is not equipped with an air scouring module, an external compressor must be connected to the air hose installed at the bottom of the membrane.

During the integrity test, pressure is built up in the UF membrane by the air compressor. A pressure drop within a certain period of time indicates broken or damaged fibres.

The integrity test task consists of the following steps, which are carried out in listed order:

1. Filling up of internal tank to have enough water to perform UF backwash at the end of the integrity test.
2. Draining of UF membrane.
3. Pressurisation of UF membrane with air up to 1 bar.
4. Waiting 10 minutes to monitor the pressure drop.
5. If the pressure drop is below the value of parameter "IntegrityPressureDropMax":  
Fibres are intact. No leaks.
6. If the pressure drop is above the value of parameter "IntegrityPressureDropMax":  
Failure. At least one fibre is broken.
7. Depressurisation of UF membrane.
8. UF backwash to refill the system with clean water. The UF backwash type is defined by parameter "UfBwVolumeType".
9. End of Integrity test.

**Activation**

The integrity tests can only be activated manually when the following criteria are met:

- System must be in semi-automatic mode.
- There must be enough water in the internal tank (46). The water is required for a UF backwash, which is performed after the integrity test.
  - If there is not enough water in the internal tank, the system starts *Production* until enough water is prepared and then activates the task.
- Manual control must not be active.
- All other tasks must be inactive.
- No active alarms.

**Alarm handling**

If an alarm is activated while the task is active, the following sequence is activated:

1. Motor valve (MK2) is opened and stays open to release pressure.

The system remains stopped, until the problem is remedied and the [Reset] button is pressed at the HMI. Alternatively, certified service staff can reset the alarm in the service menu.

**6.7 Power management**

The operating company is responsible for the preparation of the installation location according to sections *1.2.2 Obligations of the operating company* and *4. Installation*.

**Caution** The installation itself (installation of membrane and GAC filter, hydraulic and electrical connection etc.) must only be done by certified service staff according to the separate service instructions, which are supplied to certified service staff only.

The AQpure system is either equipped with the solar package module or with an UPS (Uninterruptible Power Supply).

**6.7.1 AQpure system with solar package module**

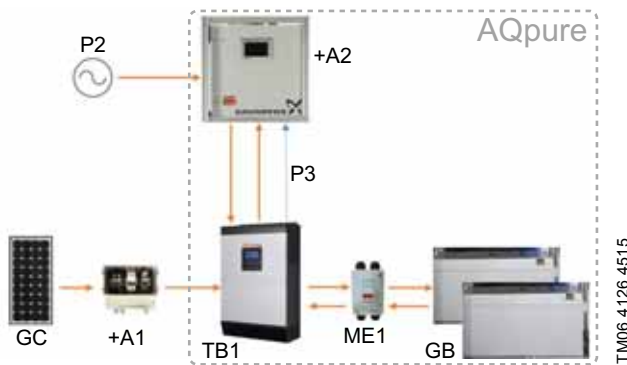


Fig. 10 AQpure system with solar package module

Pos.	Description	Pos.	Description
P2	External AC power supply	+A1	Solar panel junction box
+A2	Control cabinet	TB1	Bi-directional inverter
P3	Auxiliary contact	ME1	Isolator
GC	Solar panels	GB	Batteries

The external AC power supply (P2) is connected to the control cabinet (+A2). The control cabinet (+A2) is connected to the inverter (TB1). The inverter (TB1) charges the batteries (GB) either by external AC power supply (P2) coming from control cabinet (+A2), or by DC power supply from solar panels (GC). The inverter has two operation modes:

Operation mode	Description
Line mode	In line mode, the batteries (GB) are charged by external AC power supply (P2).
Solar mode	In solar mode, the batteries are charged by the DC power supply from solar panels (GC).

If both power sources are available, the AC power supply (P2) is prioritised.

The output of the inverter (TB1) is 230 VAC. If no external AC power supply (P2) and no DC power supply (GC) is available, the inverter uses the batteries (GB) to provide power to control cabinet (+A2). If the battery voltage falls below 24.0 VDC, the low-battery auxiliary contact (P3) provides a low-battery signal to the controller. When receiving this signal, if production task is running, the system is stopped instantly. If any other task is running, the task is finished before the system is stopped.

**Power failure**

A power failure can happen in both solar runtime and external power runtime. In case of solar runtime, power failure can happen due to the following reasons:

- Batteries have been discharged one time (low-battery signal active) and external power is not available.
- Batteries have been discharged one time (low-battery signal active), external power is available and production on external power is disabled.
- Batteries have been discharged twice in a day and external power is not available.
- Batteries have been discharged twice in a day, external power is available and production on external power is disabled.

In case of external power runtime, power failure can happen due to the following reasons:

- External power is not available and batteries have been discharged twice in a day.
- External power is not available and batteries have been discharged one time (low-battery signal active).
- External power is not available and external power has been lost twice in external power runtime.
- External power is available, external power has been lost twice in external power runtime and production on external power is disabled.

As soon as there is a power failure, the system tries to go into idle mode.

If the currently active tasks are either *Production, Filling of the external tank* or *Tapping UV light*, the system executes the following steps:

1. The currently active tasks are halted. The system blocks the activation of any other task.
2. All pumps are stopped.
3. All solenoid valves are closed.
4. All motor valves are closed.
5. The UV controller is switched off.
6. The system remains in idle state, until the conditions to run the halted tasks are met again.
  - In idle state, all electrical devices are in ON state. The power backup is provided by the batteries. If the system remains in idle state for a longer period, the voltage of the batteries becomes critically low. At critically low voltage of batteries, the bi-directional inverter is tripped and all electrical devices go into OFF state.

If the currently active task is either *Backwash of self-cleaning prefilter, Backwash of GAC filter, Backwash of UF membrane* or *Internal CIP*, the system executes the following steps:

1. The system completes the active task. The system blocks the activation of any other task.
2. Once the active task is completed, all pumps are stopped.
3. All solenoid valves are closed.
4. All motor valves are closed.
5. The UV controller is switched off.
6. The system remains in idle state, until the conditions to run task *Production* are met again.
  - In idle state, all electrical devices are in ON state. The power backup is provided by the batteries. If the system remains in idle state for a longer period, the voltage of the batteries becomes critically low. At critically low voltage of batteries, the bi-directional inverter is tripped and all electrical devices go into OFF state.

### 6.7.2 AQpure system with UPS



Fig. 11 AQpure system with UPS

Pos.	Description	Pos.	Description
P2	External AC power supply	UPS1	UPS
+A2	Control cabinet		

The external AC power supply (P2) is connected to the control cabinet (+A2). The control cabinet (+A2) is connected to the UPS (UPS1). The UPS is charged by the external AC power supply coming from control cabinet (+A2).

The capacity of the UPS is 800 VA. Depending on the state of charge, the UPS provides 170 VAC to 230 VAC to the control cabinet. This voltage is used to provide power to the 24 VDC power supply device, IO 351b (Genibus pump control module) and the 12 VDC adaptor of the multiport valve for the GAC filter module.

Systems with UPS only produce water while the external AC power supply (P2) is available. If the external AC power supply is interrupted, the system stops all tasks instantly and closes all motor valves, using the power supplied by the UPS. The PLC stays in idle state. When the external AC power supply is available again, the system starts automatically.

#### Power failure

In systems with UPS a power failure happens, if external power is not available.

As soon as there is a power failure, the system executes the following steps:

1. No matter which task is active, the system halts the active task(s) and blocks the activation of any other task.
2. All pumps are stopped.
3. All solenoid valves are closed.
4. All motor valves are closed.
5. The UV controller is switched off.
6. The system remains in idle state, until the conditions to run the halted tasks are met again.

In idle state, only PLC, GAC multiport valve and IO 351b stay in ON state. All other electrical devices are in OFF state. The power backup is provided by the UPS. If the system remains in idle state for a longer period, the UPS power becomes critically low. At critically low power, the UPS is tripped and PLC, GAC multiport valve and IO 351b go into OFF state.

## 7. Operation

### 7.1 Display and control elements

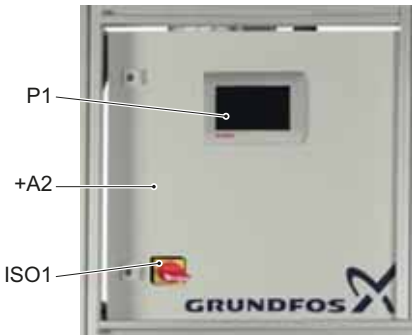


Fig. 12 Display and control elements

TM06 4134 4515

Pos.	Description	See section
P1	HMI touchscreen	<a href="#">7.4 User HMI</a>
+A2	Control cabinet	
ISO1	Main breaker	<a href="#">7.2 Main breaker</a>

### 7.2 Main breaker

The main breaker (ISO1) is a two-way electrical device. It will be either in ON position or in OFF position. It is used to switch on and off the system.

See also section: [6.7 Power management](#).

#### 7.2.1 OFF position

When the main breaker (ISO1) is in OFF position, the external AC power supply (P2) to the inverter (TB1) and the AC output from the inverter to the control cabinet (+A2) are isolated. In case a UPS is used, the external AC power supply (P2) to the UPS and the AC output from the UPS to the control cabinet (+A2) are isolated. As a result, all electrical components are in OFF state.

**Caution** The main breaker should be switched to the OFF position in case of emergency and before performing electrical maintenance of the system.

**Note** The DC power supply between solar panels (GC), inverter (TB1) and batteries (GB) remains unaffected, when the main breaker is switched ON or OFF.

#### 7.2.2 ON position

Switch the main breaker (ISO1) to the ON position. This will power up the system. The PLC has a booting time of 10 seconds. Subsequently the HMI application starts. If a GRM module is installed, the GRM interface application starts as well. The GRM interface application is always running in the background of the HMI application.

**Note** Wait at least 2 minutes before operating the system from the HMI. See fig. 12, pos. P1.

### 7.3 Operational modes

The AQpure water treatment system has two operational modes:

- Automatic mode
- Semi-automatic mode

These two operational modes are mutually exclusive. The system can either be in automatic mode or in semi-automatic mode. The system stores the active operational mode as persistent data. If the system is in semi-automatic mode and the power to the PLC is toggled, the system starts up in semi-automatic mode and vice versa. The two operational modes are described in the following sections.

#### 7.3.1 Automatic mode

The automatic mode is activated, when the system is started via the [Start] button at the HMI. In automatic mode the system runs autonomously without human intervention. A supervision function monitors the system and detects failures. See section: [7.5 Warnings and alarms](#).

#### 7.3.2 Semi-automatic mode

The semi-automatic mode is activated, when the system is stopped via the [Stop] button at the HMI. In this mode the user can perform maintenance tasks, which do not require to switch off the power supply before execution. See section: [8. Maintenance](#).

#### Service menu

**Caution** Only certified service staff is allowed to enter the service menu.

After login to the service menu with the service password, individual tasks can be started via the HMI.

Supervisions that monitor and protect the system against maloperation remain active in semi-automatic mode, unless manual control has been activated.

## 7.4 User HMI

When the PLC is powered up, the HMI application starts up automatically with a delay of 10 seconds. During the launch of the application, a startup screen with the Grundfos logo is displayed. After startup the user screen is displayed.

The user screen comprises several elements:



Fig. 13 User screen

Pos.	Description	Function
B1	[Service] button	Opens the service menu screen
B2	[Start/Stop/Reset] button	Used to start/stop the system and to reset alarms
S1	Main page content	Shows the status of the modules
S2	Grundfos Eye GRM	Shows the status of the system
S3	Shows the status of GRM connectivity status symbol	

The function of each element is described in the following subsections.

### 7.4.1 [Service] button

When the service button is pressed, the service menu screen pops up:



Fig. 14 Service menu screen

Pos.	Description
B3	Closes the service menu screen.
B4	Activates the sleep function. See section: <a href="#">7.4.2 Sleep function</a> .
B5	Login button for certified service staff to log in to the service menu.
S4	If the user is not able to rectify the cause of an alarm, certified service staff must be called.
S5	Shows the last five tasks performed by the system
S6	Shows the active alarm / warning codes of the system

### 7.4.2 Sleep function

The sleep function must be used, when the system is stopped for longer time periods e.g. for external maintenance or holiday. See also section: [10. Taking the system out of operation](#).

Depending on the installed modules, different internal cleaning sequences are automatically performed before the system stops and switches into semi-automatic mode.

The cleaning sequence consists of up to three steps:

1. [Backwash of GAC filter](#)
2. [Backwash of UF membrane](#)
3. [Backwash of self-cleaning prefilter](#)

If a module is not installed, the respective sequence is skipped. While the cleaning sequence is running, button (B4) is flashing green. When the sequence is completed, the button stays green. The system remains in semi-automatic mode, until the user presses the [Start] button again.

### 7.4.3 Grundfos Eye

The Grundfos Eye shows the current status of the system:

Grundfos Eye status	Description
	If the system is idle without alarm and warning, the Grundfos Eye is idle in green colour.
	If the system is running without any warning or alarm, the Grundfos Eye is rotating in green colour.
	If the system is idle with warning, the Grundfos Eye is idle in yellow colour.
	If the system is running with any warning and without alarm, the Grundfos Eye is rotating in yellow colour.
	If the system is in alarm state, the Grundfos Eye is flashing in red colour.

### 7.4.4 [Start/Stop/Reset] button

The system can only be stopped, if no internal cleaning task is running.

If an internal cleaning task is running and the [Stop] button is pressed, a message is displayed, telling the user that the system cannot be stopped at the moment. To stop the system, wait until the internal cleaning task is completed and press the [Stop] button again.

**Note**

Button	Active system status	Description
	Stopped	Start the production. Once the production is started, "Start" label will change into "Stop" label.
	Running	Stop the production. Once the production is stopped, "Stop" label will change into "Start" label.
	Stopped	If the system is in alarm state, press this button to reset the alarm after its cause was remedied. If the same alarm occurs and is reset 3 times in a row, it is no longer possible for the user to reset it. Certified service staff must be called in this case to reset the alarm.

### 7.4.5 Warning and troubleshooting

The user has to perform the maintenance of the four modules shown in the user screen. A warning is displayed for these modules as an intimation for the user, that maintenance is required.

If a warning is activated for any of the four modules, e.g. low level in chlorine tank, the HMI shows the status as shown in fig. 15.

If the Grundfos Eye is in warning state and there is no warning indication on any of the four modules, press the [Service] button to see the warning code. Call certified service staff for further instructions. See also section: [7.5 Warnings and alarms](#).



Fig. 15 Warning indication - low level in chlorine tank

For detailed instructions on performance of maintenance tasks see section: [8. Maintenance](#).

A warning is an intimation to the user to perform the respective maintenance task as soon as possible, to avoid a stop of the system caused by the subsequent alarm.

**Note**

The system does not stop due to active warnings.

### 7.4.6 Alarm and troubleshooting

The user has to perform the maintenance of the four modules shown on the user screen. If an alarm is activated for any of the four modules, e.g. UV intensity sensor failure, the system stops and the HMI shows the status as shown in fig. 16.

If the Grundfos Eye is in alarm state and there is no alarm indication on any of the four modules, press the [Service] button to see the warning code. Call certified service staff for further instructions. See also section: [7.5 Warnings and alarms](#).



Fig. 16 Alarm indication - UV intensity sensor failure

Once the alarm is activated for any of the four modules, the user has to perform the maintenance of the respective module at highest priority.

Alarms can be reset using the [Reset] button at the HMI after its cause was remedied.

If the same alarm occurs and is reset 3 times in a row, it is no longer possible for the user to reset it.

**Note**

Certified service staff must be called in this case to reset the alarm. The alarm can be reset via the alarm submenu in the service menu.

Perform the required maintenance of the highlighted module before pressing the [Reset] button to avoid this situation.

If the user is appropriately trained to perform the maintenance of the four modules, he should follow the instructions on maintenance. See section: [8. Maintenance](#). Otherwise the user has to call certified service staff using the service number mentioned in the service menu screen.

In addition to the instructions on maintenance given in this document, the user can retrieve shortened instructions directly at the HMI:

1. Press the particular module button, which is highlighted in red colour.
2. A pop-up screen appears as shown in fig. 17.
3. Follow the instructions step by step pressing the [ > ] and [ < ] buttons in the pop-up screen.
4. Once the maintenance is completed, the user can press the [Reset] button and start the system again.



Fig. 17 Instructions on performance of maintenance

The maintenance instructions of the HMI are shortened.

**Caution**

Maintenance must only be performed in accordance with the complete instructions given in this document!

## 7.5 Warnings and alarms

A supervision function monitors the system and detects failures. The failures are categorised into warnings and alarms. See also section: [7.4.3 Grundfos Eye](#).

Type	Indication	System behaviour
Warning	The Grundfos Eye in the display turns yellow	System keeps running
Alarm	The Grundfos Eye in the display turns red	System stops and waits for acknowledgement signal from the user or the certified service staff before it starts again

The supervision function is always active when the system is in automatic mode. When the system is in semi-automatic mode, the supervision function is only active while manual control is disabled. In manual control, the supervision only covers the alarms 105, 106, 107, 108, because they are the most important alarms for the protection of the UF membrane.

### 7.5.1 List of warnings and alarms

Type	Code	Description	Remedy
Alarms	100	Sensor signal is missing from pressure sensor BP1	Call certified service staff
Alarms	101	Sensor signal is missing from pressure sensor BP3	Call certified service staff
Alarms	102	Sensor signal is missing from pressure sensor BP4	Call certified service staff
Alarms	103	Flow signal is missing from flow sensor BF1 during production	Call certified service staff
Alarms	104	Flow signal is missing from flow sensor BF2 while BW pump active	Call certified service staff
Alarms	105	Pressure on inlet of UF membrane is too high	Call certified service staff
Alarms	106	Pressure on outlet of UF membrane is too high	Call certified service staff
Alarms	107	TMP (inlet to outlet) for UF membrane is too high	Call certified service staff
Alarms	108	TMP (outlet to inlet) for UF membrane is too high	Call certified service staff
Alarms	109	Water temperature is too low	Call certified service staff
Alarms	110	Water temperature is too high	Call certified service staff
Alarms	111	Sensor signal is missing from pressure sensor BP7	Call certified service staff
Alarms	112	System requires external CIP	Call certified service staff
Alarms	113	Internal tank alarm limit without overflow	Call certified service staff
Alarms	114	Sensor signal is missing from pressure sensor BP2	Call certified service staff
Alarms	115	Pressure on inlet of prefilter (5) is too high	Call certified service staff
Alarms	116	Internal tank alarm limit with overflow	Call certified service staff
Alarms	117	POF for prefilter (5) is above alarm limit	See section: <a href="#">8.11 Self-cleaning prefilter</a>
Alarms	118	Prefilter (5) backwash timeout	Call certified service staff
Alarms	119	Time between prefilter (5) backwash activations is too short	Call certified service staff
Alarms	120	System reboot failure	Call certified service staff
Alarms	121	Chemical tank (21) is empty	See section: <a href="#">8.12 Chemical tank</a>
Alarms	122	Sensor signal is missing from pressure sensor BP5	Call certified service staff
Alarms	123	Sensor signal is missing from pressure sensor BP6	Call certified service staff
Alarms	124	Pressure on inlet of GAC filter (39) is too high	Call certified service staff
Alarms	126	POF for cartridge filter (42) is above alarm limit	See section: <a href="#">8.14 Cartridge filter</a>
Alarms	127	UV light intensity failure	See section: <a href="#">8.13 UV disinfection module</a>
Alarms	128	Pump (GP5) - Main network communication fault	Call certified service staff
Alarms	129	Pump (GP5) - Diaphragm break - dosing pump	Call certified service staff
Alarms	130	Pump (GP5) - Cable breakdown on analogue	Call certified service staff
Alarms	131	Pump (GP5) - Blocked motor/pump	Call certified service staff
Alarms	132	Pump (GP5) - Empty tank (dry running)	See section: <a href="#">8.12 Chemical tank</a>
Alarms	133	Pump (GP5) - External box communication fault	Call certified service staff
Alarms	134	Pump (GP5) - Over pressure	Call certified service staff
Alarms	135	Pump (GP5) - Mean pressure too low (under pressure)	Call certified service staff
Alarms	136	Pump (GP1) - Current: overcurrent	Call certified service staff
Alarms	137	Pump (GP1) - Current: blocked motor/pump	Call certified service staff

The failure codes of active warnings and alarms are displayed after pressing the [Service] button at the HMI.

Some failures can be fixed by the user by performing the respective maintenance task. See section: [7.5.1 List of warnings and alarms](#). Shortened instructions on these maintenance tasks are presented at the HMI after pressing the picture of the respective component. See also section: [7.4 User HMI](#).

All other failures may only be fixed by certified service staff. Before calling the certified service staff, note down the active failure codes displayed in the service menu.

Warnings are automatically reset by the system once the cause is remedied.

Alarms can be reset using the [Reset] button at the HMI.

#### Note

If the same alarm occurs and is reset 3 times in a row, it is no longer possible for the user to reset it. Certified service staff must be called in this case to reset the alarm.

In addition to warnings caused by failures, the system shows warnings caused by the scheduled maintenance date. See section: [8.1.1 Scheduled maintenance date](#).

Type	Code	Description	Remedy
Alarms	138	Pump (GP1) - Current: overload	Call certified service staff
Alarms	139	Pump (GP1) - Over temperature: motor temperature	Call certified service staff
Alarms	140	Pump (GP1) - Over temperature: temperature, control electronics	Call certified service staff
Alarms	141	Pump (GP1) - Over temperature: thermo relay 2 in motor	Call certified service staff
Alarms	142	Pump (GP1) - Voltage: overvoltage	Call certified service staff
Alarms	143	Pump (GP1) - Voltage: undervoltage	Call certified service staff
Alarms	144	Pump (GP1) - Voltage: inrush fault	Call certified service staff
Alarms	145	Pump (GP1) - Hardware shutdown: hardware fault	Call certified service staff
Alarms	146	Pump (GP1) - External: external fault signal	Call certified service staff
Alarms	147	Pump (GP1) - Other: too many restarts	Call certified service staff
Alarms	148	Pump (GP1) - Other: communication fault	Call certified service staff
Alarms	149	Pump (GP1) - Other: turbine operation, impellers forced backwards	Call certified service staff
Alarms	150	Pump (GP1) - Other: internal communication fault	Call certified service staff
Alarms	151	Pump (GP1) - Other: verification error, FE parameter area (EEPROM)	Call certified service staff
Alarms	152	Pump (GP1) - Other: freq. converter parameter verification error (EEPROM)	Call certified service staff
Alarms	153	Pump (GP1) - Other: -	Call certified service staff
Alarms/ Warnings	154	Pump (GP1) - Motor drive end (DE) bearing temp. alarm or warning Limit	Call certified service staff
Alarms/ Warnings	155	Pump (GP1) - Motor non drive end (DE) bearing temp	Call certified service staff
Alarms	156	Pump (GP1) - Sensor signal fault: motor drive protection function measurement fault	Call certified service staff
Alarms	157	Pump (GP1) - Dry running	Call certified service staff
Alarms	158	Pump (GP2) - Current: overcurrent	Call certified service staff
Alarms	159	Pump (GP2) - Current: blocked motor/pump	Call certified service staff
Alarms	160	Pump (GP2) - Current: overload	Call certified service staff
Alarms	161	Pump (GP2) - Over temperature: motor temperature	Call certified service staff
Alarms	162	Pump (GP2) - Over temperature: temperature, control electronics	Call certified service staff
Alarms	163	Pump (GP2) - Over temperature: thermo relay 2 in motor	Call certified service staff
Alarms	164	Pump (GP2) - Voltage: overvoltage	Call certified service staff
Alarms	165	Pump (GP2) - Voltage: undervoltage	Call certified service staff
Alarms	166	Pump (GP2) - Voltage: inrush fault	Call certified service staff
Alarms	167	Pump (GP2) - Hardware shutdown: hardware fault	Call certified service staff
Alarms	168	Pump (GP2) - External: external fault signal	Call certified service staff
Alarms	169	Pump (GP2) - Other: too many restarts	Call certified service staff
Alarms	170	Pump (GP2) - Other: communication fault	Call certified service staff
Alarms	171	Pump (GP2) - Other: turbine operation, impellers forced backwards	Call certified service staff
Alarms	172	Pump (GP2) - Other: internal communication fault	Call certified service staff
Alarms	173	Pump (GP2) - Other: verification error, FE parameter area(EEPROM)	Call certified service staff
Alarms	174	Pump (GP2) - Other: freq. converter parameter verification error (EEPROM)	Call certified service staff
Alarms	175	Pump (GP2) - Other: -	Call certified service staff
Alarms/ Warnings	176	Pump (GP2) - Motor drive end (DE) bearing temp. alarm or warning Limit	Call certified service staff
Alarms/ Warnings	177	Pump (GP2) - Motor non drive end (DE) bearing temp	Call certified service staff
Alarms	178	Pump (GP2) - Sensor signal fault: motor drive protection function measurement fault	Call certified service staff
Alarms	179	Pump (GP2) - Dry running	Call certified service staff
Alarms	180	Internal CIP - membrane is not filled with water.	Call certified service staff
Alarms	181	Pump (GP3) not working.	Call certified service staff
Alarms	182	MK4 malfunctioning during UF BW.	Call certified service staff
Alarms	183	MK4 malfunctioning during Internal CIP.	Call certified service staff
Alarms	184	MK6 valve - Feedback signal missing.	Call certified service staff
Alarms	185	MK6 valve - Timeout for feedback signal.	Call certified service staff
Alarms	186	MB1 malfunctioning during UF BW.	Call certified service staff
Alarms	187	MB1 malfunctioning during Internal CIP.	Call certified service staff
Warnings	200	Pump (GP5) - Power in fault	Call certified service staff



Type	Code	Description	Remedy
Warnings	201	Pump (GP5) - Time for service is exceed	Call certified service staff
Warnings	202	Pump (GP5) - Capacity too low	Call certified service staff
Warnings	203	Pump (GP5) - Soon time for service	Call certified service staff
Warnings	204	Pump (GP5) - Gas in pump head deaerating problem	Call certified service staff
Warnings	205	Pump (GP5) - Pressure valve leakage	Call certified service staff
Warnings	206	Pump (GP5) - Suction valve leakage	Call certified service staff
Warnings	207	Pump (GP5) - Deaeration valve defective	Call certified service staff
Warnings	208	Pump (GP5) - Cable break on flow meter	Call certified service staff
Warnings	209	Pump (GP5) - Low level in tank	See section: <a href="#">8.12 Chemical tank</a>
Warnings	210	Pump (GP5) - Cavitation	Call certified service staff
Warnings	211	Pump (GP5) - Mean pressure too low (under pressure)	Call certified service staff
Warnings	212	IO351B - Warning	Call certified service staff
Warnings	213	IO351B - EEPROM error	Call certified service staff
Warnings	214	IO351B - Analog sensor 1 signal fault	Call certified service staff
Warnings	215	IO351B - Analog sensor 1 signal fault and EEPROM error	Call certified service staff
Warnings	216	IO351B - Analog sensor 2 signal fault	Call certified service staff
Warnings	217	IO351B - Analog sensor 2 signal fault and EEPROM error	Call certified service staff
Warnings	218	IO351B - Analog sensor 1 and 2 signal fault	Call certified service staff
Warnings	219	IO351B - Analog sensor 1 and 2 signal fault and EEPROM error	Call certified service staff
Warnings	220	Pump (GP1) - Reference/Sensor fault: general sensor fault/feedback sensor fault	Call certified service staff
Warnings	221	Pump (GP1) - Other: twin pump communication fault	Call certified service staff
Warnings	222	Pump (GP1) - Other: memory access error	Call certified service staff
Warnings	223	Pump (GP1) - Other: real time clock error	Call certified service staff
Warnings	224	Pump (GP1) - Limit 1 exceeded	Call certified service staff
Warnings	225	Pump (GP1) - Limit 2 exceeded	Call certified service staff
Warnings	226	Pump (GP1) - Sensor signal fault: sensor supply fault, 5 V	Call certified service staff
Warnings	227	Pump (GP1) - Sensor signal fault: sensor supply fault, 24 V	Call certified service staff
Warnings	228	Pump (GP1) - Sensor signal fault: signal fault, liqtee sensor	Call certified service staff
Warnings	229	Pump (GP1) - Sensor signal fault: signal fault AI1	Call certified service staff
Warnings	230	Pump (GP1) - Sensor signal fault: signal fault AI2	Call certified service staff
Warnings	231	Pump (GP1) - Sensor signal fault: signal fault AI3	Call certified service staff
Warnings	232	Pump (GP1) - Sensor signal fault: sensor 2 signal fault	Call certified service staff
Warnings	233	Pump (GP1) - Sensor signal fault: temperature 1 signal fault	Call certified service staff
Warnings	234	Pump (GP1) - Sensor signal fault: temperature 2 signal fault	Call certified service staff
Warnings	235	Pump (GP1) - Lubricate: motor bearings need lubrication	Call certified service staff
Warnings	236	Pump (GP1) - Change bearings: motor bearings need change	Call certified service staff
Warnings	237	Pump (GP1) - Change varistor(s): motor varistor(s) need change	Call certified service staff
Warnings	238	Pump (GP1) - Application: soft pressure build up time out	Call certified service staff
Warnings	239	Pump (GP2) - Reference/Sensor fault: general sensor fault/feedback sensor fault	Call certified service staff
Warnings	240	Pump (GP2) - Other: twin pump communication fault	Call certified service staff
Warnings	241	Pump (GP2) - Other: memory access error	Call certified service staff
Warnings	242	Pump (GP2) - Other: real time clock error	Call certified service staff
Warnings	243	Pump (GP2) - Limit 1 exceeded	Call certified service staff
Warnings	244	Pump (GP2) - Limit 2 exceeded	Call certified service staff
Warnings	245	Pump (GP2) - Sensor signal fault: sensor supply fault, 5 V	Call certified service staff
Warnings	246	Pump (GP2) - Sensor signal fault: sensor supply fault, 24 V	Call certified service staff
Warnings	247	Pump (GP2) - Sensor signal fault: signal fault, liqtee sensor	Call certified service staff
Warnings	248	Pump (GP2) - Sensor signal fault: signal fault AI1	Call certified service staff
Warnings	249	Pump (GP2) - Sensor signal fault: signal fault AI2	Call certified service staff
Warnings	250	Pump (GP2) - Sensor signal fault: signal fault AI3	Call certified service staff
Warnings	251	Pump (GP2) - Sensor signal fault: sensor 2 signal fault	Call certified service staff
Warnings	252	Pump (GP2) - Sensor signal fault: temperature 1 signal fault	Call certified service staff
Warnings	253	Pump (GP2) - Sensor signal fault: temperature 2 signal fault	Call certified service staff
Warnings	254	Pump (GP2) - Lubricate: motor bearings need lubrication	Call certified service staff
Warnings	255	Pump (GP2) - Change bearings: motor bearings need change	Call certified service staff
Warnings	256	Pump (GP2) - Change varistor(s): motor varistor(s) need change	Call certified service staff

Type	Code	Description	Remedy
Warnings	257	Pump (GP2) - Application: soft pressure build up time out	Call certified service staff
Warnings	270	Pump (GP1) flow has been reduced	Call certified service staff
Warnings	271	POF for prefilter (5) is above warning limit	See section: <a href="#">8.11 Self-cleaning prefilter</a>
Warnings	272	Low level in chemical tank (21)	See section: <a href="#">8.12 Chemical tank</a>
Warnings	273	POF for cartridge filter (42) is above warning limit	See section: <a href="#">8.14 Cartridge filter</a>
Warnings	274	Service Schedule Type 1 warning - Soon time for service.	Call certified service staff
Warnings	275	Service Schedule Type 2 warning - Service due date expired.	Call certified service staff

## 7.6 Manual valves

All manual valves of the system are labelled with an individual number. The numbers on the valves correspond to the respective numbers of the valves in the PID. See fig.: [6-9](#).

## 7.7 Grundfos Remote Management (GRM)

An AQpure system can include a remote management module. If this module is included, the system is able to send and receive data from Grundfos Remote Management (GRM). The GRM module features the following functions:

- Send Key Performance Indicator (KPI) values
- Send status data
- Send warning and alarm data
- Send log files
- Send and receive parameter and configuration files
- Receive and install a new software version

The following sections give a brief overview of the functions. Detailed information on GRM can be found in the separate GRM manuals.

## 8. Maintenance

### 8.1 Maintenance intervals

The preventive maintenance intervals recommended in this section are for average operating conditions. The maintenance tasks must be performed more frequently where the operating conditions are unfavourable, for example extreme water demand, unexpected changes in the raw water quality (contamination, rain season, etc.). During commissioning, the certified service staff has to train the users in the different basic maintenance tasks. The certified service staff has to determine the recommended maintenance intervals for the specific system based on the environmental conditions.

#### 8.1.1 Scheduled maintenance date

The certified service staff sets a scheduled maintenance date in the service menu of the HMI after commissioning and after each advanced maintenance. Grundfos provides a maintenance tool supporting the certified service staff in finding the right interval for the individual conditions.

The system displays a daily warning at the HMI a few days before the set maintenance date reminding the user to contact certified service staff for performance of advanced maintenance. The number of days can be set individually by the certified service staff via the parameter file. Once the set maintenance date is reached or exceeded, a daily warning is displayed with a frequency of a few hours reminding the user that advanced maintenance is due.

Details can be found in the separate HMI manual, which is supplied to certified service staff only.

### 8.2 Safety instructions and requirements

Warning

Cleaning and maintenance must only be carried out by authorised and qualified staff.

Wear the stipulated personal protective equipment (protective clothing, gloves, goggles, etc.)!

Observe the chemical manufacturer's safety data sheets (MSDS) and safety instructions of the used chemicals!

Safety installations, which have been disabled during maintenance, must be enabled again immediately after maintenance.



Warning

Danger of electric shock!

Water or any other liquids on electrical components can lead to personal injury from electric shock. Furthermore, damage to the equipment can be caused due to short circuits.

Keep all electrical components dry!

Cover electrical components during maintenance with a water-tight foil!



**Caution**

Before reassembling make sure, that all parts are clean, dry and undamaged!

Warning

Death or serious injury

Danger of malfunction or damage to the product.

The AQpure system must be earthed with an earth cable.

Equipotential bonding is installed between all interfaces and metallic parts to prevent build-up of static electricity.

All equipotential bonding and earthing must be reinstalled properly after repair or maintenance.



### 8.3 Basic maintenance schedule

The basic preventive maintenance activities expected to be carried out by the user are described in the following table, in order to keep the system free from troubles and to avoid unexpected breakdowns.

The position references in the table refer to the PID. See fig.: 6.

Interval	Module	Task	See section
Daily	Whole AQpure system	Perform a visual inspection. Check the presence of warnings or alarms, water leaks, abnormal noise or vibrations.	
		Visually inspect strainers (11) and (27). Clean, if necessary.	<a href="#">8.10</a>
	Whole AQpure system	Clean the strainers (11) and (27).	<a href="#">8.10</a>
	Air scouring	Check that there is no water in the transparent hose (14e).	<a href="#">Fig. 9</a>
	Solar package	Clean the solar panels in order to obtain the maximum efficiency.	
Weekly	Chlorination	Check sodium hypochlorite solution level and conditions in chemical tank (21). Refill chemical tank (21), if necessary.	<a href="#">8.12</a>
	Whole AQpure system	If necessary, clean all system surfaces with a dry and clean cloth.	<a href="#">8.8</a>
		Check the feed water supply.	<a href="#">8.9</a>
	UV disinfection	<p>Check the UV intensity value displayed at the UV controller. The UV controller can be found at the lower back side of the AQpure control cabinet. Actions should be taken according to the displayed value:</p> <ul style="list-style-type: none"> <li>• &gt; 65 %: No action required.</li> <li>• 65-50 %: Clean the quartz sleeve and the sensor of UV system (45) soon.</li> <li>• &lt; 50 %: An alarm is displayed and the system is stopped. Clean the quartz sleeve and the sensor of UV system (45).</li> </ul>	<a href="#">8.13</a>

## 8.4 Advanced maintenance schedule (only certified service staff)

The position references in the table refer to the PID. See fig.: 6.



### Warning

Danger of personal injury or damage to the equipment!

The following tasks must only be performed by certified service staff. This staff must have received proper training from Grundfos before any work on the system.

### Note

After maintenance, the certified service staff is responsible for setting the new scheduled maintenance date in the service menu at the HMI. Details can be found in the separate HMI manual, which is supplied to certified service staff only.

Interval	Component	Task
Every 6 months	Whole AQPure system	Inspection of general installation conditions. Log statistics, alarm history, check system for functionality, leaks, abnormal conditions.
	Feed pump (GP1) / Backwash pump (GP2)	Inspect shaft seal, tighten pump connections, tighten electrical connections on terminal box.
	Pressure relief valve (4)	Check that no leak is present.
	Motor valves (MK1 to MK5)	Check functionality of valves.
	Filters (11), (27)	Replace filter screens.
	UF membrane (13)	Perform integrity test.
	Control cabinet	Retighten electrical connections. Clean mat of cooling filter.
	Internal CIP	General check of circulation pump (GP3). Retighten mechanical and electrical connections.
	Air scouring	General check of air compressor (GP4). Retighten mechanical and electrical connections.
	GAC filter (39)	Replace activated carbon (GAC) in filter vessel (39) and check filter cartridge in cartridge filter (42). Inspect strainers and riser pipe for damages or clogging. Test functionality of multiport valve (MK6).
Every 12 months	UV disinfection (45)	Clean UV sleeve and sensor of UV system (45). Check intensity value. Check functionality of solenoid valve (MB2).
	Chlorination	Check level sensor (BL1) and suction line. Check that no sediments are in chemical tank (21). Check that the sodium hypochlorite solution meets the specifications. Calibrate dosing pump (GP5), and retighten dosing head screws.
	Prefilter (5)	Replace filter screen (5.13). See fig.: 20.
	Air scouring	Replace intake filter of compressor (GP4).
	GAC filter (39)	Replace filter cartridge in cartridge filter (42).
Every 24 months	UV disinfection (45)	Replace UV lamp of UV system (45). Perform sensor cleaning. Reset intensity value to 100 %.
	Solar package	Tighten electrical connections, measure voltage of batteries.
	Whole AQPure system	Perform External CIP to remove sediments and other particles.
	Feed pump (GP1) / Backwash pump (GP2)	Replace shaft seal, wear kit, gaskets and motor bearings.
	Prefilter (5)	Replace non-return valve (7). Replace cylinder (5.1) and elbow fitting (5.2). See fig.: 19.
Every 60 months	Internal CIP	Replace non-return valve (10).
	Air scouring	Replace non-return valves (16), (17).
	Chlorination	Replace diaphragm and valves of dosing pump (GP5).
	External CIP unit	Replace non-return valve (52).
	UF membrane (13)	Replace membrane element.
Every 60 months	Internal CIP	Replace pump head of circulation pump (GP3).
	Air scouring	Replace intake vanes of compressor (GP4).
	Solar power	Replace batteries.

## 8.5 Lubricants

For drinking water applications, food-safe grease must be used.

Danger of damage to the UF membrane!

Ingress of oil or grease will damage the UF membrane irreversibly.

**Caution**

Make sure, that no oil or grease gets into the feed water.

## 8.6 Cleaning agents

### 8.6.1 Safety instructions

Warning

Danger of personal injury due to contact with chemicals!



Wear the stipulated personal protective equipment (protective clothing, gloves, goggles, etc.) when handling chemicals!

Observe the chemical manufacturer's safety data sheets (MSDS) and safety instructions of the used chemicals!

### 8.6.2 Sodium hypochlorite solution

Read section: [8.6.1 Safety instructions](#).

During maintenance, for manual cleaning of some components 0.05 % sodium hypochlorite solution is required. Use a clean bucket for mixing. Put on chemically resistant gloves and tight-fitting protective goggles.

The required sodium hypochlorite solution can be mixed as follows:

- Mix 1 part of a 2 % sodium hypochlorite solution with 30 parts of clean potable water.
- Mix 1 part of a 10 % sodium hypochlorite solution with 190 parts of clean potable water.
- Mix 1 part of a 15 % sodium hypochlorite solution with 290 parts of clean potable water.

The result is a solution of 0.05 % sodium hypochlorite, that can be used for cleaning.

### 8.6.3 Household vinegar

Read section: [8.6.1 Safety instructions](#).

This cleaning agent can be used to remove scale, e.g. for UV sleeve cleaning. Observe the safety instructions from the supplier of the cleaning agent.

### 8.6.4 Citric acid

Read section: [8.6.1 Safety instructions](#).

This cleaning agent can be used to remove scale, e.g. for UV sleeve cleaning. Observe the safety instructions from the supplier of the cleaning agent.

### 8.6.5 IPA (Iso Propyl Alcohol)

Read section: [8.6.1 Safety instructions](#).

This cleaning agent can be used to remove scale, e.g. for UV sleeve cleaning. Observe the safety instructions from the supplier of the cleaning agent.

## 8.7 Service kits

### 8.7.1 Standard UF module

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, filter screen 40 mm, mesh 50*</b>				
Filter screen	2	7	11	99025202*
<b>Kit, maintenance feed pump / backwash pump</b>				
Wear part kit	2			
Shaft seal kit	2	7	GP1	99025243
O-ring kit	2		GP2	
Motor bearing kit	2			
<b>Kit, UF membrane</b>				
Complete UF membrane with air hose assembly	1	7	13	99025244

\* Only for systems without self-cleaning prefilter module

### 8.7.2 Self-cleaning prefilter

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, prefilter screen</b>				
Filter screen	1	20	5.13	99025245
Kit gasket/O-ring	1		-	
<b>Kit, prefilter cylinder</b>				
Cylinder	1	20	5.1	99025246
Fitting	1		-	

### 8.7.3 Air scouring module

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, intake filter of air compressor</b>				
Intake filter	2	9	GP4	99025247
<b>Kit, compressor vanes</b>				
Vanes	4	9	GP4	99025248
<b>Kit, non-return valves</b>				
NRV 1 1/2" PP	1	9	16	99025249
Push-in NRV 8 mm	1		17	

### 8.7.4 Chlorination module

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, valves / diaphragm</b>				
Discharge valve	1			
Suction valve	1	9	GP5	97751497
Diaphragm	1			
Dosing head screws	1			

### 8.7.5 Internal CIP module

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, filter screen 25 mm, mesh 50</b>				
Filter screen	2	9	27	99025250
<b>Kit, circulation pump head</b>				
Circulation pump head	1	9	GP3	99025251

### 8.7.6 Activated carbon filter module

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, cartridge filter maintenance</b>				
O-ring	1		42.1	99025252
Filter cartridge	1	27	42.2	
Centring ring	1		42.3	

### 8.7.7 UV disinfection module

Description	Qty.	Fig.	Pos.	Product number
<b>Kit, UV lamp</b>				
UV lamp	1	23	45.4	99025253

### 8.8 Cleaning the system



#### Warning

Danger of electric shock!

Water or other liquids on electrical components can lead to personal injury from electric shock. Damage to the equipment can be caused by short circuits.

Keep all electrical components dry!

Never use water or any other liquid to clean electrical components or electrical lines of the system!

If necessary, clean all system surfaces with a dry and clean cloth.

### 8.9 Checking the feed water supply

If the system is connected to an upstream break tank, check that:

- the suction line is not leaking.
  - If air is in the suction line, check that the non-return valve at the outlet of the break tank is installed correctly and does not leak.
- there is sufficient water in the break tank.
- the manual valve at the outlet of the break tank is open.

If the system is connected directly to the raw water source, check that:

- the coarse strainer upstream the foot valve at the suction point is not blocked by dirt.
- the suction line is not leaking.

### 8.10 Strainers

This section refers to fig.: 6-9.

The strainer (11) is only present in systems without self-cleaning prefilter module to ensure, that no particles larger than 300 µm enter the UF membrane. It needs to be cleaned frequently, depending on the feed water quality.

The strainer (27) is only present in systems with internal CIP module. It ensures that no particles loosened during internal CIP are flushed into the UF membrane.

#### Position of the component

See fig. 7, pos. 11 and fig. 9, pos. 27.

#### 8.10.1 Safety instructions

##### Warning

Danger of personal injury due to contact with chemicals!



Wear the stipulated personal protective equipment (protective clothing, gloves, goggles, etc.) when handling chemicals!

Observe the chemical manufacturer's safety data sheets (MSDS) and safety instructions of the used chemicals!

Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

##### Caution

#### 8.10.2 Preparations

The following tools are required for this maintenance task:

- bucket with sodium hypochlorite solution
- empty bucket
- nylon brush
- chemically resistant gloves
- tight-fitting protective goggles
- water-tight foil

#### 8.10.3 Strainer components

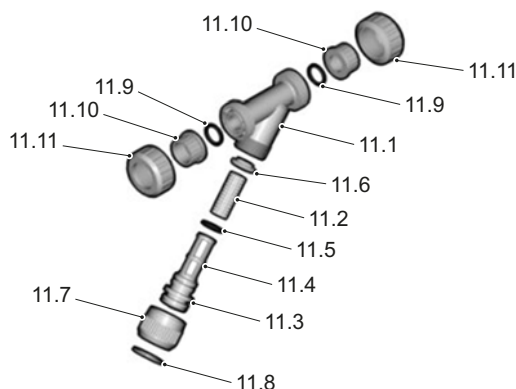


Fig. 18 Strainer components

Pos.	Description	Pos.	Description
11.1	Body	11.7	Lock nut
11.2	Screen	11.8	Split ring
11.3	Bonnet	11.9	Seal ring
11.4	Screen housing	11.10	End connector
11.5	O-ring	11.11	Union nut
11.6	Retaining ring		

#### 8.10.4 Maintenance of strainer (11)

Read section: [8.10.1 Safety instructions](#).

1. Stop the system by pressing the [Stop] button on the HMI.



Warning

Danger from running system!

Make sure, that the Grundfos Eye has stopped rotating before starting any work on the system components or lines!

2. Put on chemically resistant gloves and tight-fitting protective goggles.
3. Prepare a bucket with a 0.05 % sodium hypochlorite solution.  
See section: [8.6.2 Sodium hypochlorite solution](#).

The following steps refer to fig.: 7.

4. Close manual valves (64) and (67).
5. Place an empty bucket underneath manual valve (2).
6. Open manual valve (2) to drain strainer (11) until the water level in the strainer reaches the lower union nut.
  - If necessary, slightly open manual valve (58) until the strainer is drained.
  - The strainer body is transparent, so the water level can be checked visually during draining.
  - Do not drain too much water to avoid draining the feed pump. A drained feed pump requires the whole system to be deaerated by certified service staff.

The following steps refer to fig.: 18.

7. Unscrew lock nut (11.7) and remove it together with inner strainer parts (11.2), (11.3), (11.4), (11.5), (11.6).
8. Remove retaining ring (11.6).
9. Remove screen (11.2).
10. Remove split ring (11.8) carefully, as it can easily break.
11. Remove lock nut (11.7) from bonnet (11.3).
12. If body (11.1) is dirty, open both union nuts (11.11) and remove the body from the system to clean it.
  - Be careful not to loose or damage the seal rings (11.9).
13. Clean all parts of the strainer thoroughly. See section: [8.6 Cleaning agents](#).
  - To remove organics, use a brush and a 0.05 % sodium hypochlorite solution.
  - To remove scaling, use household vinegar or citric acid.
  - If screen (11.2) is damaged, replace it by a new one.
14. Check the O-ring (11.5) at bonnet (11.3) for wear or damage. Replace it, if necessary.
15. Reassemble the strainer and reinstall it into the system in reversed order.
16. To restart the system, press the [Start] button on the HMI.

#### 8.10.5 Maintenance of strainer (27)

Read section: [8.10.1 Safety instructions](#).

1. Stop the system by pressing the [Stop] button on the HMI.



Warning

Danger from running system!

Make sure, that the Grundfos Eye has stopped rotating before starting any work on the system components or lines!

2. Put on chemically resistant gloves and tight-fitting protective goggles.
3. Prepare a bucket with a 0.05 % sodium hypochlorite solution.  
See section: [8.6.2 Sodium hypochlorite solution](#).

The following steps refer to fig.: 7.

4. Close manual valve (64).
5. Place an empty bucket underneath strainer (27).
6. Cover all electrical components around and below the working area with water-tight foil, so that no water can ingress and damage those components.

The following steps refer to fig.: 18.

7. Unscrew lock nut (11.7) and remove it together with inner strainer parts (11.2), (11.3), (11.4), (11.5), (11.6).
8. Remove retaining ring (11.6).
9. Remove screen (11.2).
10. Remove split ring (11.8) carefully, as it can easily break.
11. Remove lock nut (11.7) from bonnet (11.3).
12. If body (11.1) is dirty, open both union nuts (11.11) and remove the body from the system to clean it.
  - Be careful not to loose or damage the seal rings (11.9).
13. Clean all parts of the strainer thoroughly. See section: [8.6 Cleaning agents](#).
  - To remove organics, use a brush and a 0.05 % sodium hypochlorite solution.
  - To remove scaling, use household vinegar or citric acid.
  - If screen (11.2) is damaged, replace it by a new one.
14. Check the O-ring (11.5) at bonnet (11.3) for wear or damage. Replace it, if necessary.
15. Reassemble the strainer and reinstall it into the system in reversed order.
16. To restart the system press the [Start] button on the HMI.



## 8.11 Self-cleaning prefilter

### Note

This section is only relevant, if the AQPure system is equipped with a self-cleaning prefilter module. See fig. 5, pos. 7.

The self-cleaning prefilter removes particles larger than 100 µm from the feed water. It is automatically backwashed, but requires manual maintenance after a certain period of time.

The system indicates the requirement for this maintenance task with a warning or an alarm. See section: [7.5 Warnings and alarms](#).

### Position of the component

See fig. 8, pos. 5.

#### 8.11.1 Safety instructions

##### Warning

Danger of personal injury due to contact with chemicals!



Wear the stipulated personal protective equipment (protective clothing, gloves, goggles, etc.) when handling chemicals!

Observe the chemical manufacturer's safety data sheets (MSDS) and safety instructions of the used chemicals!

### Caution

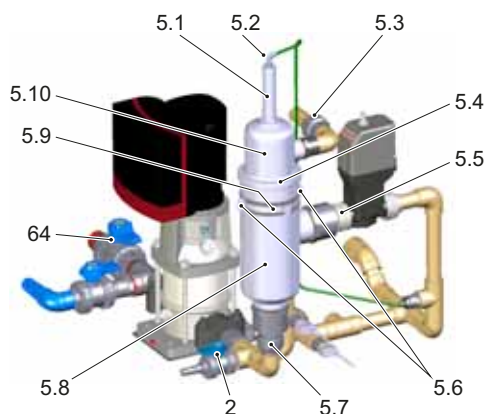
Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

#### 8.11.2 Preparations

The following tools are required for this maintenance task:

- nylon brush
- high-pressure cleaner
- empty bucket
- bucket with sodium hypochlorite solution
- chemically resistant gloves
- tight-fitting protective goggles
- water-tight foil

#### 8.11.3 Prefilter overview



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Fig. 19 Prefilter overview

Pos.	Description	Pos.	Description
2	Manual valve	5.6	Screws
5.1	Cylinder	5.7	Union nut
5.2	Elbow fitting	5.8	Bottom housing
5.3	Union nut	5.9	Support clamp
5.4	Clamp	5.10	Top housing
5.5	Union nut	64	Manual valve

#### 8.11.4 Maintenance of prefilter

Read section: [8.11.1 Safety instructions](#).

The following steps refer to fig.: 19-20.

1. Unless the system is already stopped due to an active alarm, stop the system by pressing the [Stop] button on the HMI.



##### Warning

Danger from running system!

Make sure, that the Grundfos Eye has stopped rotating before starting any work on the system components or lines!

2. Put on chemically resistant gloves and tight-fitting protective goggles.
  3. Prepare a bucket with a 0.05 % sodium hypochlorite solution. See section: [8.6.2 Sodium hypochlorite solution](#). In case of strong inorganic fouling, HCl (ph value 2) or citric acid can be used alternatively.
  4. Close valve (64).
  5. Cover all electrical components around and below the working area with water-tight foil, so that no water can ingress and damage those components.
  6. Disconnect the hose from elbow fitting (5.2).
    - Seal the hose with the provided push-in fitting. Otherwise the whole membrane will drain.
    - The elbow fitting is a special fitting that cannot be replaced by a standard fitting.
  7. Place an empty bucket underneath manual valve (2).
  8. Open valve (2) for approximately 20 seconds to empty the top part of the prefilter.
    - Do not drain too much water to avoid draining the feed pump. A drained feed pump requires the whole system to be deaerated by certified service staff.
  9. Loosen clamp (5.4).
  10. Unscrew union nut (5.3).
    - Be careful not to loose or damage the O-rings.
  11. Remove top housing (5.10) together with cylinder (5.1).
  12. Carefully pull cyclone system (5.11) out of bottom housing (5.8).
- If the bottom housing is dirty, proceed with the following steps. Otherwise proceed with step 17.
13. Slowly open manual valve (2) until the water level inside the bottom housing (5.8) reaches union nut (5.7).
    - Do not drain too much water to avoid draining the feed pump. A drained feed pump requires the whole system to be deaerated by certified service staff.
  14. Remove screws (5.6) of support clamp (5.9).
  15. Unscrew union nuts (5.7) and (5.5).
    - Be careful not to loose or damage the O-rings.
  16. Remove bottom housing (5.8) from the system.

## Cleaning

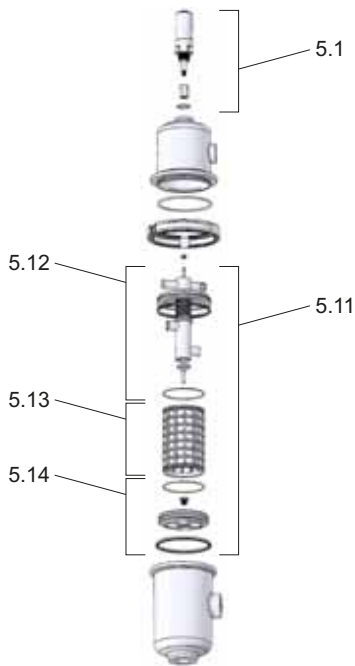


Fig. 20 Components of the prefilter

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Pos.	Description	Pos.	Description
5.1	Cylinder	5.13	Screen
5.11	Cyclone system	5.14	Bottom part
5.12	Top part		

17. Remove top part (5.12) from cyclone system (5.11).
18. Remove screen (5.13) from bottom part (5.14).
19. Check cylinder (5.1) for signs of wear or damage. Clean or replace it, if necessary.
20. Clean the prefilter parts as follows:
  - Use 0.05 % sodium hypochlorite solution as cleaning agent in the following steps. In case of strong inorganic fouling, HCl (ph value 2) or citric acid can be used alternatively.
  - Use the fingers and the nylon brush or a tooth brush and the selected cleaning agent to clean all gaskets, O-rings and plastic parts.

## Warning

**Danger of personal injury from high-pressure jet!**  
 The high-pressure jet of the high-pressure cleaner can pierce skin, damage eyes and burst ear drums.  
 Do not point the high-pressure jet at people or animals!

Wear protective gloves and goggles!

- Clean the entire screen surface with the high-pressure cleaner, first from the inside to the outside, then from the outside to the inside.
- Clean the inside and the outside of bottom housing (5.8) and top housing (5.10) with the selected cleaning agent and with the high-pressure cleaner.
- Clean the elbow fitting (5.2) with the selected cleaning agent and the nylon brush. If necessary, soak it in the solution for some time to loosen the fouling. Make sure, that the small strainer integrated in the elbow fitting is undamaged, free and clean. Replace elbow fitting (5.2), if necessary.

21. When all parts are cleaned, dip the housing parts (5.8), (5.10) and all parts of (5.11) into a bucket filled with the selected cleaning agent.
  - All parts must be immersed completely in the sodium hypochlorite solution.
  - Let the parts soak for about 15 minutes.
22. Take the parts out of the bucket and rinse them thoroughly with clean water using the high-pressure cleaner.
23. Clean the cylinder rod. Make sure, that it moves freely.
24. Reassemble the prefilter in reversed order.
  - Make sure, that all gaskets and O-rings are placed correctly.
25. Reinstall the prefilter in the system in reversed order.
  - Make sure, that cyclone system (5.11) is fully inserted into bottom housing (5.8), as shown in the figure below.



Fig. 21 Inserting the cyclone system

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26. Remove the water-tight foil without getting any water on electrical components.
27. If the alarm of the maintained component is active, press the [Reset] button on the HMI to restart the system. Otherwise press the [Start] button to restart the system.

## 8.12 Chemical tank

### Note

This section is only relevant, if the AQPure system is equipped with a chlorination module. See fig. 5, pos. 6.

The chlorination module includes a sensor in the chemical tank. The sensor detects when the volume in the tank has reached a low level and when it is empty. The sensor signal is used to avoid dry running of the dosing pump.

The system indicates the requirement for this maintenance task with a warning or an alarm. See section: [7.5 Warnings and alarms](#).

### Position of the component

See fig. 9, pos. 21.

#### 8.12.1 Safety instructions

##### Warning

Danger of personal injury due to contact with chemicals!



Wear the stipulated personal protective equipment (protective clothing, gloves, goggles, etc.) when handling chemicals!

Observe the chemical manufacturer's safety data sheets (MSDS) and safety instructions of the used chemicals!

#### Chemical degradation of chlorine

The chemical degradation of chlorine in a sodium hypochlorite solution is accelerated by the following factors:

- high concentration of solution
- high ambient temperature
- UV light, if stored in transparent tanks

Chemical degradation of chlorine can lead to insufficient disinfection performance of the sodium hypochlorite solution!

Dilute the concentrated sodium hypochlorite solution as soon as possible to the required concentration. This reduces the risk of chemical degradation significantly.

### Caution

Store the solution protected from UV light. Choose a storage location with low ambient temperature.

#### 8.12.2 Preparations

The following tools are required for this maintenance task:

- clean funnel
- clean bucket or canister
- piece of cloth
- chemically resistant gloves
- tight-fitting protective goggles
- screwdriver
- wrench

#### 8.12.3 Preparing the sodium hypochlorite solution

Read section: [8.12.1 Safety instructions](#).

### Caution

Softened water must be used for dilution. Otherwise calcium carbonate can precipitate from the diluted solution, which can cause damage to the dosing pump and valves.

1. Put on chemically resistant gloves and tight-fitting protective goggles.
2. Use a clean bucket for mixing.
3. The required sodium hypochlorite solution can be mixed as follows:
  - Mix 1 part of a 10 % sodium hypochlorite solution with 4 parts of clean and softened potable water.
  - Mix 1 part of a 15 % sodium hypochlorite solution with 6.5 parts of clean and softened potable water.

The result is a solution of 2 % sodium hypochlorite, that can be filled into the chemical tank of the chlorination module.

#### 8.12.4 Refilling the chemical tank

Read section: [8.12.1 Safety instructions](#).

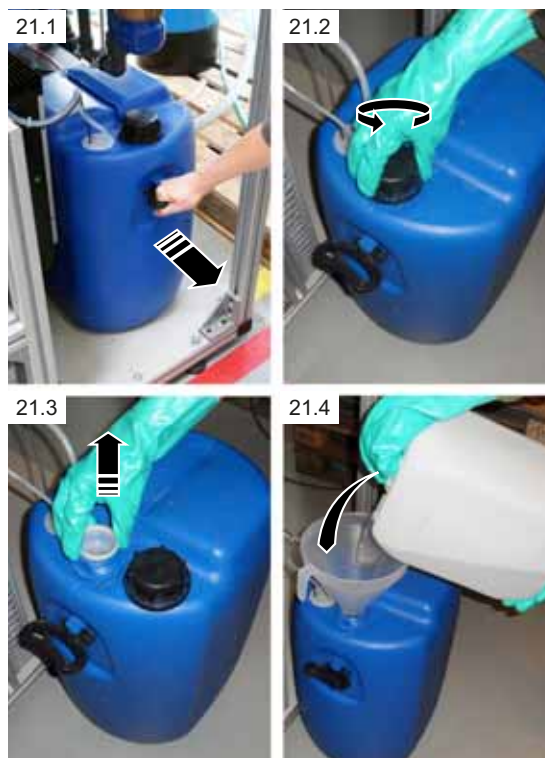


Fig. 22 Filling the chemical tank

1. Unless the system is already stopped due to an active alarm, stop the system by pressing the [Stop] button on the HMI.



##### Warning

Danger from running system!

Make sure, that the Grundfos Eye has stopped rotating before starting any work on the system components or lines!

2. Put on chemically resistant gloves and tight-fitting protective goggles.
3. Carefully pull the chemical tank out of the system without tensioning the connected lines, until it is easily accessible for filling. See detail (21.1).
4. Remove the screw cap. See detail (21.2).
5. Remove the sealing cap. See detail (21.3). If necessary, use the screwdriver carefully to lift the strainer.
6. Put the funnel into the tank and fill in the right chemical. See detail (21.4).
7. When the tank is full, assemble in reversed order.
8. If the alarm of the maintained component is active, press the [Reset] button on the HMI to restart the system. Otherwise press the [Start] button to restart the system.

## 8.13 UV disinfection module

**Note** This section is only relevant, if the AQPure system is equipped with an UV disinfection module. See fig. 5, pos. 3.

Some components of the UV disinfection module can get dirty or worn, and need cleaning or replacement after a certain time. The system monitors the UV light intensity and displays an alarm, if the UV light intensity is too low. The current value of the UV light intensity in % can be read at the UV controller, which is installed at the lower back side of the AQPure control cabinet.

Reasons for low UV intensity can be:

- a defective UV lamp
- a worn UV lamp
- a dirty sleeve
- a dirty sensor
- water quality deviation (e.g. damaged UF membrane or problems with activated carbon filter module)
- a combination of above reasons

### Position of the component

See fig. 9, pos. 45.

#### 8.13.1 Safety instructions

##### Warning

Danger of personal injury from high-intensity ultraviolet light!



The UV light emitted by the UV lamp can cause serious burns to unprotected eyes and skin. Never look directly at an illuminated UV lamp.

Before any service work on the UV disinfection module, switch off the power supply.

Never operate the UV system while the UV lamp is outside of the UV reactor.

Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

##### Caution

#### 8.13.2 Preparations

The following tools are required for this maintenance task:

- screwdriver
- small adjustable wrench or key
- mild acid solution, such as 10 % citric acid, or household cleaner, such as vinegar (isopropyl alcohol, can be used as well)
- several clean cloth
- water-tight foil

#### 8.13.3 Overview UV system

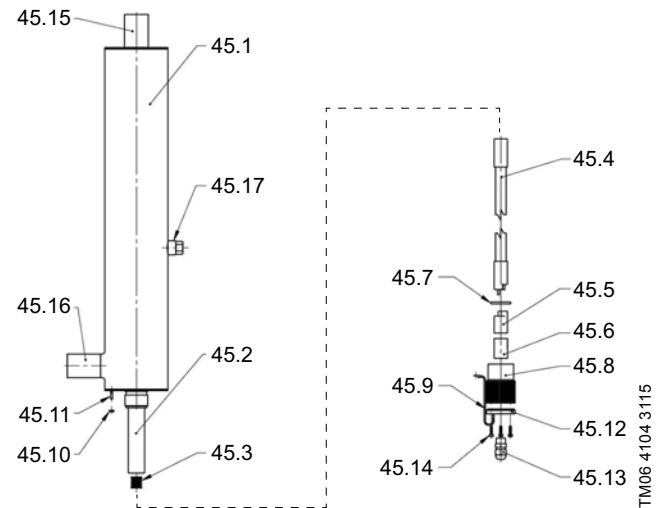


Fig. 23 Components of the UV disinfection device

Pos.	Description	Pos.	Description
45.1	UV reactor	45.10	Earthing nut and washer
45.2	Quartz sleeve	45.11	Earthing stud
45.3	Lamp centring spring	45.12	End cover
45.4	UV lamp	45.13	Cable gland
45.5	Lamp connector	45.14	Screws
45.6	Lamp locator	45.15	Reactor inlet
45.7	Quartz sealing O-ring	45.16	Reactor outlet
45.8	Quartz compression nut	45.17	UV sensor connection
45.9	Earthing wire		

#### 8.13.4 Replacing the UV lamp

Read section: [8.13.1 Safety instructions](#).

To replace the lamp, there is no need to drain the water from the reactor chamber.

##### Dismantling

The following steps refer to fig.: 23-24.

1. Unless the system is already stopped due to an active alarm, stop the system by pressing the [Stop] button on the HMI.

##### Warning



Danger from running system!

Make sure, that the Grundfos Eye has stopped rotating before starting any work on the system components or lines!

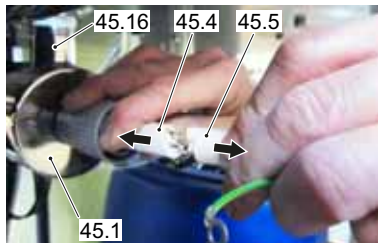
2. Switch off the power supply by turning the main breaker to the OFF position.
3. Remove earthing nut and washer (45.10) and disconnect the earthing wire (45.9) from the earthing stud (45.11) on the reactor.
4. Unscrew screws (45.14) from end cover (45.12).

**Warning****Risk of burns!**

Depending on when the power supply was switched off, the UV lamp might still be very hot.

Wear protective gloves, if necessary.

5. Gently pull out the lamp harness, until you can see the lamp (45.4).
  - Be careful not to touch the glass of the lamp with the fingers. Wipe off any fingerprints with alcohol and a soft cloth.



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**Fig. 24** Disconnecting the UV lamp

6. Separate the lamp (45.4) from the connector (45.5) by pulling them apart.
  - Do not try to twist the connector, as it can break.
7. Carefully remove lamp (45.4) from reactor (45.1) taking special care not to angle the lamp while pulling it out.
  - If the lamp is angled, pressure is applied to the inside of the quartz sleeve (45.2), which can damage the quartz sleeve.
  - Note that the centring spring (45.3) remains in the quartz sleeve. For lamp replacement, the spring can be left in the sleeve.

This concludes the dismantling of the lamp. The lamp can now be replaced.

For cleaning or replacement of the quartz sleeve, go on according to section: [8.13.5 Cleaning or replacing the quartz sleeve and the sensor](#).

**Reassembling**

To install the new lamp, go through the following steps.

1. Be careful not to touch the glass of the lamp with the fingers. Wipe off any fingerprints with alcohol and a soft cloth.
2. Before inserting lamp (45.4) into quartz sleeve (45.2) of UV reactor (45.1) make sure, that the lamp centring spring (45.3) is inside the quartz sleeve.
3. Insert lamp (45.4) into quartz sleeve (45.2) with the pins on the connection side.
  - Leave about 5 cm of the lamp protruding from the quartz sleeve.
4. Connect lamp connector (45.5) to lamp (45.4).
  - Make sure, that the connector is fully seated on the pins.
5. Screw end cover (45.12) back onto the quartz compression nut (45.8) with screws (45.14).
6. Connect earthing wire (45.9) to earthing stud (45.11) at UV reactor (45.1) with earthing nut and washer (45.10).
7. To restart the system:
  - Switch on the power supply by turning the main breaker to the ON position.
  - If the alarm of the maintained component is active, press the [Reset] button on the HMI to restart the system. Otherwise press the [Start] button to restart the system.

**Note**

It takes 4 minutes after startup until water can be tapped from the system, because the UV lamp needs to warm up again.

**8.13.5 Cleaning or replacing the quartz sleeve and the sensor****Dismantling**

The following steps refer to [fig.: 9](#).

1. If the lamp is not yet removed, remove the lamp as described in the dismantling steps of section [8.13.4 Replacing the UV lamp](#) and carefully set it aside on a clean cloth.
2. Shut off the upstream water supply that feeds water into the UV reactor by closing the manual valve at the external tank outlet.

Danger of insufficient UV disinfection performance  
Manual valve (49) is adjusted by certified service staff during commissioning. Do not change the adjustment of this valve.

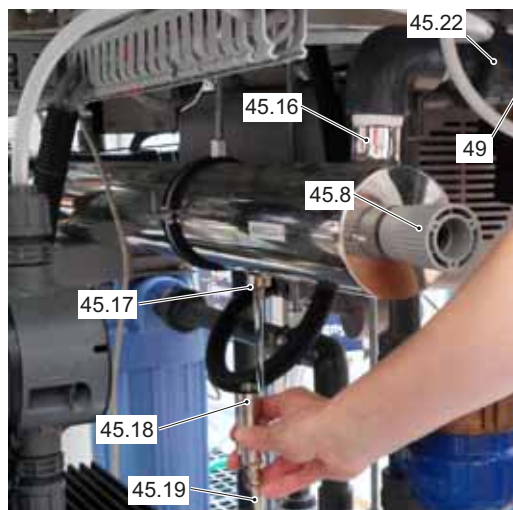
**Caution**

Otherwise certified service staff needs to re-adjust the valve.

3. If the system is equipped with a chlorination module, move the chemical tank (21) out of the system, so that you can place a bucket under the UV sensor connection.

The following steps refer to [fig.: 23-25](#).

4. Place an empty bucket under sensor connection (45.17).
5. Cable (45.19) is wrapped up in loops that are fixed with a cable tie. Remove the cable tie.
  - The cable tie must be removed because the cable is twisted, when the sensor (45.18) is unscrewed. It is not necessary to disconnect the cable from the control box.
6. Cover all electrical components around and below the working area with water-tight foil, so that no water can ingress and damage those components.
7. Unscrew sensor (45.18) counter-clockwise.
8. To aerate the UV reactor, slightly loosen union nut (45.22) at manual valve (49) and wait, until the UV reactor is drained completely into the bucket. Then carefully tighten it again.
  - Be careful not to change the adjustment of manual valve (49).



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**Fig. 25** Dismantling the quartz sleeve

9. Unscrew quartz compressing nut (45.8) counter-clockwise from UV reactor (45.1).
10. Remove quartz sealing O-ring (45.7).
11. Carefully pull quartz sleeve (45.2) out of UV reactor (45.1).
  - Make sure, that the sleeve is not at an angle as otherwise pressure will be applied on the sides of the sleeve and against the reactor chamber, which can damage the sleeve.
  - In case the sleeve gets stuck, gently try rotating it while pulling it out.
12. Remove centring spring (45.3) from the quartz sleeve.

## Cleaning

Do not use an abrasive cleaner!

**Caution** Scratching of the sensor window or sleeve will void any manufacturer's warranty on this item.

13. Put on chemically resistant gloves and tight-fitting protective goggles.
14. For cleaning, use a mild acid solution, such as 10 % citric acid, or a household cleaner, such as vinegar. For strong fouling use IPA (IsoPropyl Alcohol). See section: [8.6 Cleaning agents](#).
15. Clean the quartz sleeve with a soft cloth or replace it by a new one.
16. Clean the quartz window of sensor (45.18) with a lint-free cotton swab.

## Reassembling

17. Insert centring spring (45.3) into quartz sleeve (45.2).
18. Carefully slide quartz sleeve (45.2) into reactor (45.1) until it is locked into place in the internal quartz holder.
  - Make sure, that the sleeve is not at an angle as otherwise pressure will be applied on the sides of the sleeve and against the reactor chamber, which can damage the sleeve.
  - In case the sleeve gets stuck, gently try rotating it while pushing it in.
19. Screw in sensor (45.18) into sensor connection (45.17) and carefully tighten it by hand to achieve a water-tight seal.
  - Make sure, that the O-ring at the sensor is placed correctly.
20. Push the quartz sealing O-ring (45.7) onto the sleeve and move it against the quartz sleeve socket.
21. Reinstall quartz compression nut (45.8). This nut should be tightened by hand.
22. Wrap up cable (45.19) in loops and fix it with a cable tie.
23. Remove the bucket under sensor connection (45.17).
24. If the system is equipped with a chlorination module, move the chemical tank (fig. 9, pos. 21) back into its original position.
25. Make sure, that there is some clean water in the external tank providing a positive pressure at the UV reactor inlet.
26. Slowly open the manual valve at the external tank outlet.
  - Check, if any water leaks from the UV reactor. In case of a leakage, carefully try to retighten the connections. If this does not help, check the O-rings.
27. To deaerate the UV reactor, slightly loosen union nut (45.22) at manual valve (49) and wait until water comes out. Then carefully tighten it again.
  - Be careful not to change the adjustment of manual valve (49).

Danger of damage to the UV lamp due to overheating

The UV reactor must be deaerated before the system is switched on again. Otherwise the UV lamp can get damaged by overheating.

**Caution**

If the UV reactor is not sufficiently deaerated, switch off the UV lamp during startup until the UV reactor is completely filled with water. See section:

[8.13.6 Switching on/off the UV lamp](#).

28. Remove the water-tight foil without getting any water on electrical components.
29. Reinstall the lamp and restart the system according to the reassembling steps in section: [8.13.4 Replacing the UV lamp](#).

## 8.13.6 Switching on/off the UV lamp



Fig. 26 UV controller

1. To switch off the UV lamp, press the power button (45.20) at the UV controller on the back of the AQpure control cabinet for 2 seconds.
2. The UV lamp switches off and the display (45.21) shows "P-OFF".
  - To switch on the lamp, press power button (45.20) again for 2 seconds.

## 8.14 Cartridge filter

### Note

This section is only relevant, if the AQPure system is equipped with an activated carbon filter module. See fig. 5, pos. 10.

The cartridge filter ensures that no residual particles remain in the water (e.g. from the upstream GAC filter). It needs to be replaced after a certain period of time depending on the feed water quality. See section: [8.3 Basic maintenance schedule](#). The system indicates the requirement for this maintenance task with a warning or an alarm. See section: [7.5 Warnings and alarms](#).

### Position of the component

See fig. 9, pos. 42.

### 8.14.1 Filter cartridge specification

The filter cartridge must comply with the following specification:

Pore size	[ $\mu\text{m}$ ]	5
Material		PP
Type		meltblown
Diameter external		114 / 4.5
Diameter internal	[mm / inch]	26 / 1
Length		508 / 20

### 8.14.2 Preparations

The following tools are required for this maintenance task:

- filter housing key (optional)
- flat container
- cloth
- nylon brush
- water-tight foil

### 8.14.3 Cartridge filter overview



Fig. 27 Cartridge filter maintenance

Pos.	Description	Pos.	Description
42.1	O-ring	42.5	Top part
42.2	Filter cartridge	42.6	Deaeration valve
42.3	Centring ring	42.7	Filter housing
42.4	Filter housing key	42.8	Centring nipple

### 8.14.4 Maintenance of cartridge filter

1. Unless the system is already stopped due to an active alarm, stop the system by pressing the [Stop] button on the HMI.



### Warning

Danger from running system!

Make sure, that the Grundfos Eye has stopped rotating before starting any work on the system components or lines!

The following steps refer to fig.: [6-9](#).

2. Once the system is stopped, solenoid valve (43) is closed automatically.
3. Cover all electrical components around and below the working area with water-tight foil, so that no water can ingress and damage those components.
4. Place a flat container under the cartridge filter.
5. Close manual valve (33).

The following steps refer to fig.: [27](#).

6. Place a cloth on deaeration valve (42.6) and carefully press it down to depressurise the filter. Some pressurised water may come out.
7. Use filter housing key (42.4) or your hands to loosen the filter housing (42.7).
8. Remove filter cartridge (42.2) from filter housing (42.7).
9. Pour the water from filter housing (42.7) into the flat container or a suitable drain.
10. Put on chemically resistant gloves and tight-fitting protective goggles.
11. Clean filter housing (42.7) and top part (42.5) with clean potable water and a nylon brush.
  - If necessary, a 0.05 % sodium hypochlorite solution can be used for cleaning. Observe section: [8.6 Cleaning agents](#).
12. Centring ring (42.3) is delivered together with the new filter cartridge.
13. Place centring ring (42.3) on the new filter cartridge as shown in the figure.
14. Put new filter cartridge (42.2) into filter housing (42.7).
  - Make sure, that filter cartridge (42.2) is placed exactly centred in filter housing (42.7).
  - Cartridge (42.2) must be slipped onto centring nipple (42.8) at the bottom of filter housing.
15. Replace O-ring (42.1).
16. Check, that O-ring (42.1) is placed correctly in the filter housing.
17. Screw filter housing (42.7) with new filter cartridge back into top part (42.5).
  - Make sure, that the filter cartridge is exactly centred. Only a centred cartridge ensures proper filtering.
  - Tighten the filter housing carefully using filter housing key (42.4) or your hands.

The following steps refer to fig.: [6-9](#).

18. Slowly open manual valve (33).
  - Check, if water leaks from the filter. In case of leakage, carefully try to retighten the filter housing. If this does not help, close manual valve (33) again and check the O-ring.
19. Remove the water-tight foil and the flat container without getting any water on electrical components.
20. If the alarm of the maintained component is active, press the [Reset] button on the HMI to restart the system. Otherwise press the [Start] button to restart the system.

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## 9. Repair

The system must only be repaired by certified service staff according to the separate service instructions, which are supplied to certified service staff only.

## 10. Taking the system out of operation

To stop the system only for a few hours (e.g. for maintenance), use the [Stop] button on the HMI. No further action is required in this case.

For long-term storage observe, that the UF membrane requires special treatment and conditions. See section: [3.1 Storage](#).

For storage times and storage conditions different to the ones described below, contact certified service staff.

**Caution** Observe the separate supplier documents for the components. All supplier documents are part of the documentation package delivered with the system.

Observe the permissible ambient conditions. See section: [11.1.2 Ambient conditions](#).

### 10.1 Short-term decommissioning up to 4 days

#### 10.1.1 Storage with installed membrane

1. Stop the system by pressing the [Stop] button on the HMI.
  - If the system cannot be stopped, e.g. due to ongoing cleaning tasks, wait until these tasks are completed and stop the system again.
2. Press the [Service] button to enter the service menu.
3. Press the [Sleep] button. See section: [7.4.2 Sleep function](#).

### 10.2 Long-term decommissioning for more than 4 days

#### 10.2.1 Storage of an operable system up to 7 days

1. Operate the system for 45-60 minutes per day during storage to protect the equipment from bacterial fouling.

### 10.3 Restarting the system

#### 10.3.1 Restarting the system (users)

If the system was decommissioned according to sections [10.1.1 Storage with installed membrane](#) or [10.2.1 Storage of an operable system up to 7 days](#), press the [Start] button. The system starts production in automatic mode again.

Otherwise only certified service staff must restart the system.

## 11. Technical data

**Caution** The values stated in the technical data must be adhered to.

For detailed data of the system components see the separate supplier documents. All supplier documents are part of the documentation package delivered with the system.

### 11.1 AQpure system

#### 11.1.1 General data

Water production	[m <sup>3</sup> /h]	0.5 - 2
Max. production runtime per day	[h]	22
Max. water inlet pressure of system*		1.5 bar at 1 m <sup>3</sup> /h
Permissible water inlet pressure of UV disinfection module (min./max.)	[bar]	0.1 / 3.0
Max. operating pressure	[bar]	3
Permissible water inlet temperature (min./max.)	[°C]	+5 / +40
Weight empty (excluding consumables):		
• AQpure system with standard UF module only	[kg]	400
• AQpure system with all modules	[kg]	615
Weight filled (including consumables):		
• AQpure system with standard UF module only	[kg]	750
• AQpure system with all modules	[kg]	1165
• Sound pressure level	[dB(A)]	90

\* For minimum water inlet pressure, see separate manual of the feed pump (GP1).

#### 11.1.2 Ambient conditions

Permissible ambient temperatures (min./max.)		
Transport*	[°C]	-5 / +50
Storage*	[°C]	-5 / +50
Operation	[°C]	+1 / +45
Max. relative humidity (non-condensing)	[%]	95
Max. altitude above sea level	[m]	2000

\* System must be drained. Observe special requirements of the UF membrane. See section: [3. Storage and handling](#).

Direct sunlight can cause damage.

**Caution** Exposition to direct sunlight can cause changes in colour as well as material deformations and cracks. Do not expose the system to direct sunlight!

Freezing and boiling liquids can cause damage.

**Caution** Observe the freezing and boiling points of the used liquids. The freezing and boiling point of a liquid varies depending on the pressure.

**Caution** Because of the embrittlement of plastics at low temperatures, the transport must not be done if the temperature falls below the specified value for transport, otherwise plastic parts can be damaged.



### 11.1.3 Electrical data

Power supply	200-240 V 1-phase, 50/60 Hz
Max. power consumption	1500 W
Enclosure class	IP41
Electrical safety class	I
Control interface (HMI)	PLC-based 7" touchscreen
Control strategy	Long service intervals - Parametric to be very flexible

**Caution** Observe the wiring diagram and the separate electrical installation and operating instructions, which are supplied to certified service staff only.

### 11.1.4 Transport dimensions and weights

Description	Packing box dimensions [mm]			Weight [kg]
	Length	Width	Height	
AQpure system with standard UF module only	1660	1030	2240	429
AQpure system with all modules	1740	1135	2240	612
External CIP unit	840	850	1215	93
UF membrane	2000	355	550	75
GAC filter	2000	500	565	67

### 11.1.5 Feed water requirements

The values in this section define the feed water quality requirements for the AQpure system. Coarse pollutants bigger than 300 µm and abrasive particles must be removed from the water entering the system. The customer is responsible for the relevant pre-treatment of the water.

Before entering the UF treatment process, the water quality must comply with the values stated in the table below. Otherwise the warranty of the system is voided.

**Note** If the parameters are above the maximum recommended values, the performance and capacity of the system might be affected.

Parameter	Unit	Desirable	Maximum recommended
Turbidity	NTU	<50	300
TSS	mg/L	<20	100
TOC	mg/L	<10	40
COD <sub>Mn</sub>	mg/L	<20	60
Oil & grease	mg/L	0	<2
Particle size	micron	<150	300
pH continuous	-	6-9	2-11
pH cleaning	-	1-12	1-12

### 11.2 UF membrane

Membrane type	Hollow fibre, dead-end, outside-in	
Membrane material	PVDF	
Membrane pore size	[µm]	0.03
pH range	2-11	
Max. TMP	[bar]	2.1
Max. air scouring flow	[m <sup>3</sup> /h]	12
Max. backwash pressure	[bar]	2.5
Max. sodium hypochlorite (NaClO)	[mg/l]	2
Recommended transport and storage temperature	[°C]	20-35

### 11.3 Activated carbon filter module

Particle size of GAC	[mesh]	12-40
Minimum iodine value of GAC	950	
Amount of GAC in filter vessel (min./max.)	[l]	90 / 100
Total filter vessel volume	[l]	154

#### 11.3.1 Filter cartridge for cartridge filter

Pore size	[µm]	5
Material	PP	
Type	meltblown	
Diameter external	114 / 4.5	
Diameter internal	[mm / inch]	26 / 1
Length	508 / 20	

11.4 Dimensional drawings

11.4.1 AQpure system

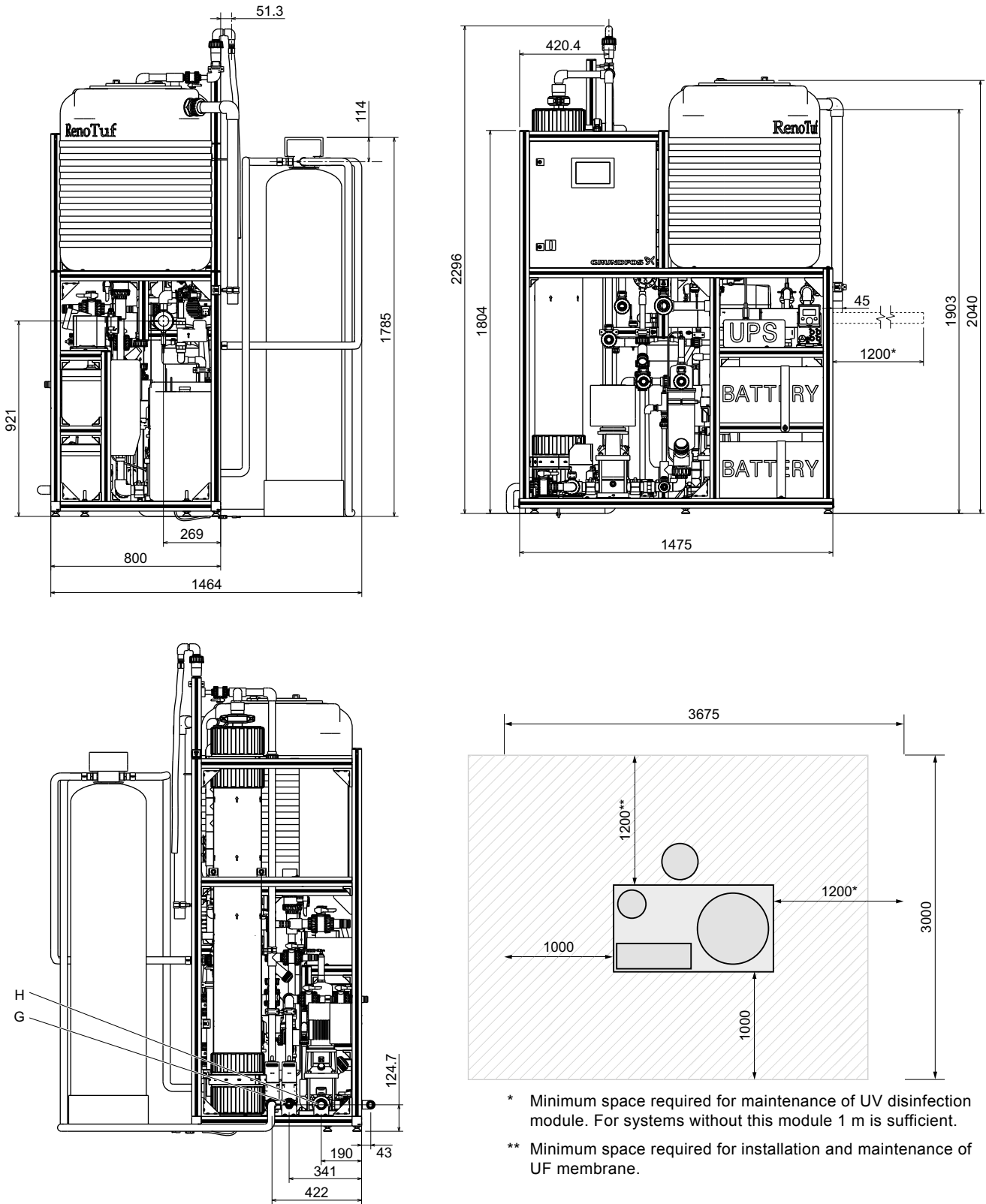


Fig. 28 Dimensions of AQpure system, connections and space requirement. Dimensions in mm

Pos.	Description
H	Raw water inlet
G	Backwash outlet

- \* Minimum space required for maintenance of UV disinfection module. For systems without this module 1 m is sufficient.
- \*\* Minimum space required for installation and maintenance of UF membrane.

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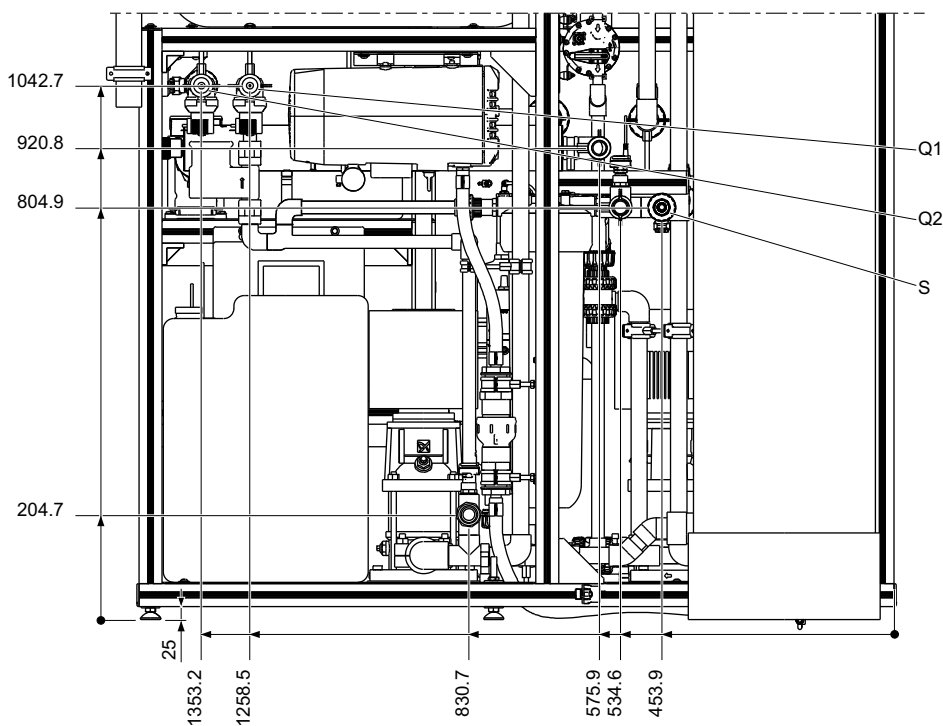
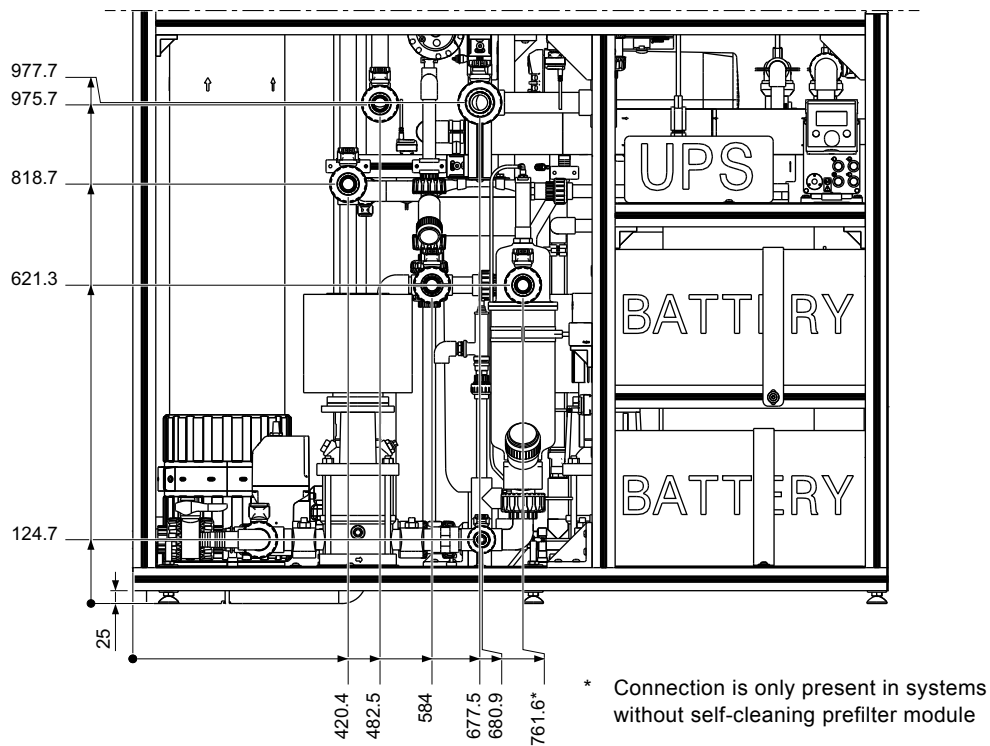


Fig. 29 AQpure system and connections. Dimensions in mm

Pos.	Description
Q1	Clean water outlet (distribution module)
Q2	Clean water outlet (UV module)
S	External tank inlet water (UV module)

## 12. Disposing of the system

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

### 12.1 Disposing of chemicals

Dispose of chemicals according to the local environmental protection regulations.



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