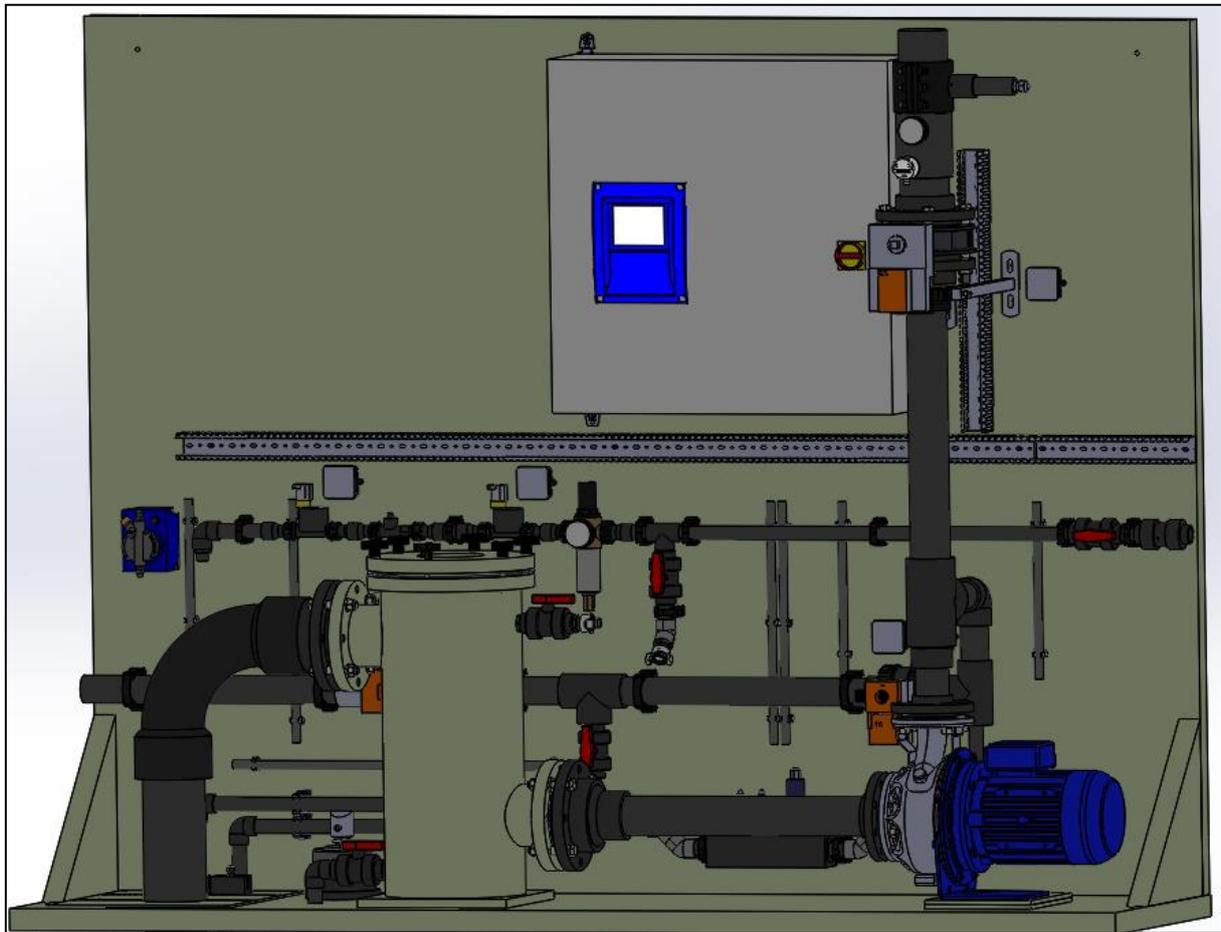


User manual Air Scrubber



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Translation of the original user manual

The air scrubber is available in a chemical and biological version. This user manual is intended for both versions, with the following restrictions:

- **Blue text:** The subject concerned applies to the chemical scrubber only.
- **Green text:** The subject concerned applies to the biological scrubber only.

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1. INTRODUCTION

The purpose of this manual is to explain the safety aspects, the operation, use and maintenance of the Inno⁺ air scrubber (hereinafter in this manual commonly referred to as **Air Scrubber** or **Air Cleaner**).

Please read this manual carefully, paying extra attention to chapter 2 (Safety). It is important that you know exactly how to operate the system and understand all instructions.

The following documents are included with the user manual:

- Electrical circuit diagram;
- Delivery certificate;
- [Material Safety Data Sheets sulphuric acid and anti-foaming agent](#);
- CE declaration;
- Spare part list (available on request);
- Registration log book.

This manual is based on present-day technology. Inno⁺ retains the right to make changes to the documentation and is not obliged to modify any previous versions.

Please carefully store this manual for future use and reference.

In this manual, lists with various options are indicated as follows:

- Option-1
- Option-2
- ...

In this manual, actions to be carried out are indicated as follows:

- Step-1
- Step-2
- ...

The adjacent text boxes are used to emphasize certain parts of the text.

ATTENTION

- Pictures and diagrams in this manual apply to all scrubber construction types.
- The photos and diagrams used in this manual may slightly deviate from the actual situation on non-relevant points.
- All available air scrubber options are described in this manual. Therefore, not all information in this manual may apply to your system.

TIP

Suggestions and recommendations that make it easier or more convenient to carry out certain tasks.

ATTENTION

This remark makes the user aware of potential problems.

CAUTION

Procedures that are not carried out properly can cause damage to the installation or harm the environment.

WARNING

If the procedures are not observed and carried out properly, the user may injure him- or herself or other persons and the installation may be severely damaged.

2. SAFETY

2.1 Introduction

The Air Scrubber is a system with only a few mechanical processes. However, the system does require the use of chemical additives, which involves certain risks.

Therefore persons working near or with the Air Scrubber must always strictly follow the recommendations and working procedures described in this manual.

ATTENTION

Always observe local regulations and statutory provisions regarding personal protection, hygiene and the environment.

2.2 Safety equipment installed

2.2.1 General

The manufacturer has incorporated several safety devices to ensure the Air Scrubber meets statutory guidelines, and to create a safe working environment.

The safety devices are:

- Lockable technical room (in case of modular systems) and electrical box, see § 2.2.2;
- Dual pH meter, see § 2.2.3;
- Safety valve with self-test function, see § 2.2.4;
- Check valve in the clean water supply, see § 2.2.5;
- Drip tray for the acid pump and protection around the sulphuric acid pipe, see § 2.2.6;
- Included safety cabinet with chemical-resistant personal protective equipment, see § 2.4.1.
- Emergency shower, see § 2.2.7.

WARNING

To prevent any personal injuries and minimize the environmental impact, it is essential that all safety functions remain operational and in place!

2.2.2 Lockable technical room

The area with the process and pump control equipment has two doors that can only be opened with a key. Depending on the situation on site, this door can be incorporated into the Air Scrubber or in the building structure.

The technical room must only be opened to replace additives or for maintenance purposes as described in chapter 6. This room must be kept closed and locked during normal operation to prevent any unauthorized people from accessing it.

A separate, lockable cabinet is located behind the doors of the technical room. This cabinet houses all electrical control and circuit elements. It must only be opened in emergency situations, and by qualified electricians only.

WARNING

The technical room must only be opened by or under the supervision and responsibility of staff members who have familiarized themselves with the risks of the fluids used and know to handle these fluids with caution.

WARNING

Work on the electrical system must only be carried out by professional electricians!

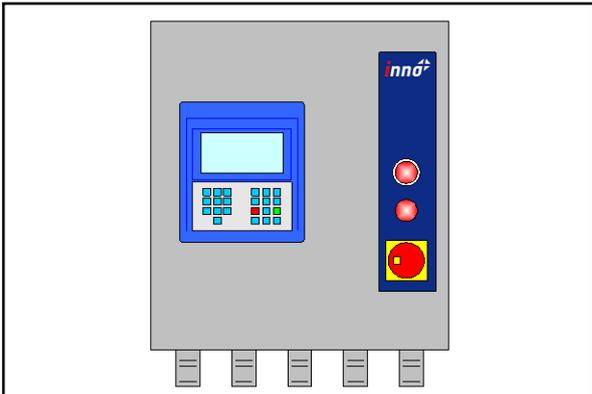


Figure 1: Lockable technical room (left) and electrical box (right)

2.2.3 Dual pH meter

In order to prevent problems that arise as a result of an erroneous pH reading the scrubber is equipped with two pH sensors, which are in operation at the same time. If the control system receives any variant readings from these sensors, an alarm message is generated.

The sensors have a limited life span and must be replaced every year. Inno+ can recalibrate the sensors during servicing.

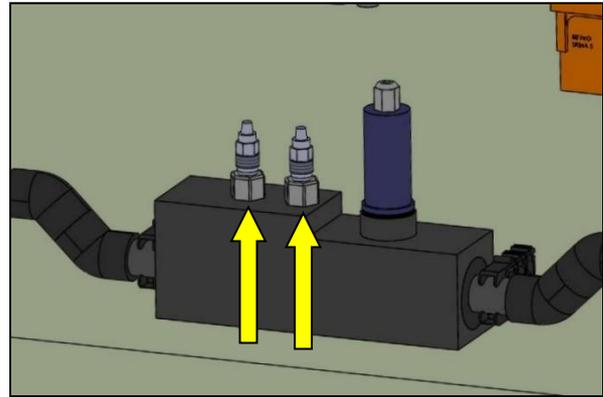


Figure 2: pH sensors

2.2.4 Safety valve with self-test function

The clean water supply circuit is equipped with a safety valve. The reservoir is equipped with an emergency floater.

If the reservoir level control function does not function properly and the water reaches up to the emergency floater, the safety valve closes to disable the water supply. This ensures the reservoir can never overflow.

Every time the reservoir is refilled after a draining phase, the control system carries out a test to check the safety valve. It works as follows:

- The water supply valve is opened and the safety valve is closed.
- No water flow must be measured for a set time (one minute).
- After this testing minute, the safety valve is opened and the Air Scrubber control system continues normal operation.

The emergency floater and safety valve are not controlled by the control computer, but are directly interconnected.

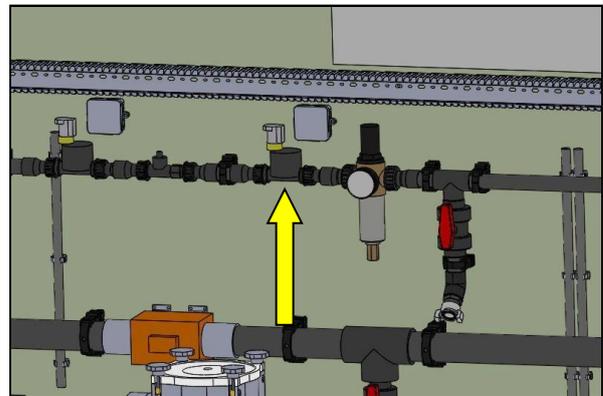


Figure 3: Safety valve

2.2.5 Water supply check valve

The plastic pipeline is equipped with a check valve, located directly behind the clean water supply connection point. The check valve prevents any water from flowing back from the Scrubber to the water supply system.

2.2.6 Protection around the sulphuric acid supply

The line feeding the sulphuric acid from the storage location to the scrubber must of course not be damaged.

As an additional safeguard the pipe has been placed in a sturdy PVC pipe, on which safety symbols have been affixed.

Sulphuric acid pump has been placed in a drip tray. In the drip tray is a switching contact; if a leakage is observed, the pump stops and an alarm is generated.

A metal cover has been mounted around the pump connections. This cover ensures that sulphuric acid can never be sprayed into the environment when there is a leak.

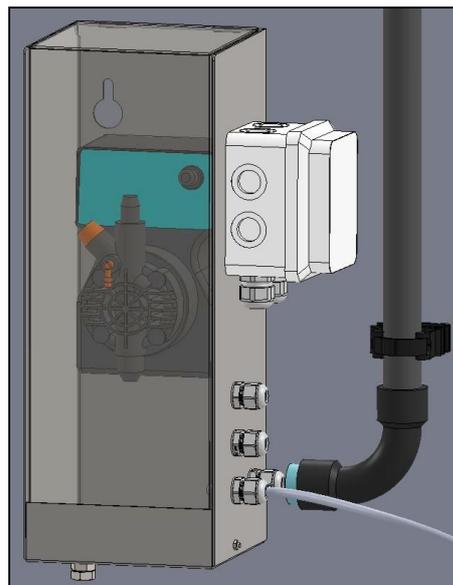


Figure 4: Sulphuric acid pump

2.2.7 Emergency shower and other personal protective equipment

An emergency shower is located in the sulphuric acid storage, in order to be able to immediately flush the injured person in the event of a sulphuric acid accident. Shower is connected to the water supply mains. It is the responsibility of user to ensure that the main valve is always open, and that the line cannot freeze.

In addition, a safety cabinet has been supplied with personal protective equipment that should be worn when working with sulphuric acid. See paragraph 2.4.

In the safety cabinet is a bottle the contents of which can be used to rinse the eyes in case of emergencies.



Figure 5: Emergency shower and safety cabinet

These facilities are available as an option for the biological air scrubber.

2.3 Pictograms

The Air Scrubber has the following pictograms:

WARNING

Replace any damaged or removed stickers as soon as possible!

<p>Dangerous voltage</p> <p><u>Location:</u></p> <ul style="list-style-type: none"> On the exterior of the electrical box in the technical room. 	
<p>Corrosive, causes serious injuries to eyes, skin, airways and gastrointestinal tract</p> <p><u>Location:</u></p> <ul style="list-style-type: none"> Near the storage location of the acid containers; Near the dosing pump for the sulphuric acid; Near the position where the acid is supplied to the reservoir. 	
<p>Text plates indicate which chemicals are present:</p> <ul style="list-style-type: none"> H_2SO_4 = Sulphuric acid 96% <p><u>Location:</u></p> <ul style="list-style-type: none"> Near the storage location of the acid containers; Near the dosing pump for the sulphuric acid; Near the position where the acid is supplied to the reservoir; On the supply pipe between the acid storage and the air scrubber (every metre). 	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>H_2SO_4 (96%)</p> </div>

We recommend adding the pictogram below if the fans are located in the same area as the Air Scrubber, unshielded.

<p>Danger! Rotating fan</p>	
------------------------------------	---

In the following places safety signs have been placed in accordance with Figure 6:

- All accesses to the technical room;
- All accesses to the room where the sulphuric acid has been stored;
- Access to the pressure chamber;
- All accesses to the risk zones of the scrubber, being
 - Area near the package sprinklers;
 - Space under the packages (outflow of cleaning water);
 - Space above the packages (where the purified air leaves the scrubber).



Figure 6: Safety sign for the sulphuric acid space

The sign indicates the following:

- Corrosive fluid.
- Naked flame and smoking prohibited.
- 80 = hazard identification number for sulphuric acid (corrosive substance); this code is particularly important for the transport of chemicals.
- 1830 = UN-number (substance identification number) for sulphuric acid.
- No entry for unauthorised persons: Keep the room closed.

Symbols shown for required personal protective equipment near the acid containers and the acid pump:
 These symbols are also present on the covers of the acid container and filter.



Figure 7: Local regulations for working with sulphuric acid

Symbols present for required personal protective equipment near the supply point of the anti-foaming agent:



Figure 8: Local regulations for working with anti-foaming agent

Existing symbols for compulsory personal protective equipment near the scrubber (near the package sprinklers and under the packages, depending on the local situation):
 This also applies as a warning for risk of slipping.

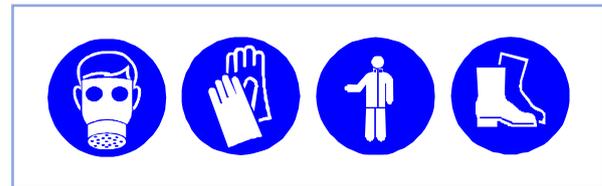


Figure 9: Local regulations at the scrubber

A warning sign as shown in Figure 10 has been placed on the space under the filter packages. This means:

- The space under the filter packages must never be entered when the scrubber is in operation. The packages may be saturated with water, which would make it very heavy (especially in the case of excessive pollution). In exceptional situations, the structure might collapse.
- Turn off the scrubber first, and wait until no more water flows out of the packages.

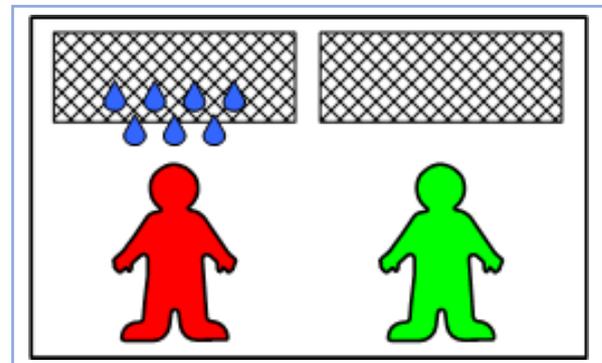


Figure 10: Warning sign near the filter packages

2.4 Recommended personal protective equipment (PPE)

2.4.1 Safety cabinet

The Air Scrubber is delivered with a safety cabinet (Figure 11). In this cabinet you will find the personal protective equipment required for any activities involving sulphuric acid. The cabinet must be placed in a fixed location near the sulphuric acid storage.

WARNING

Regularly check the availability and condition of the PPE. Anyone designated to work with the additives must know how to use the equipment and be familiar with the location of the cabinet.

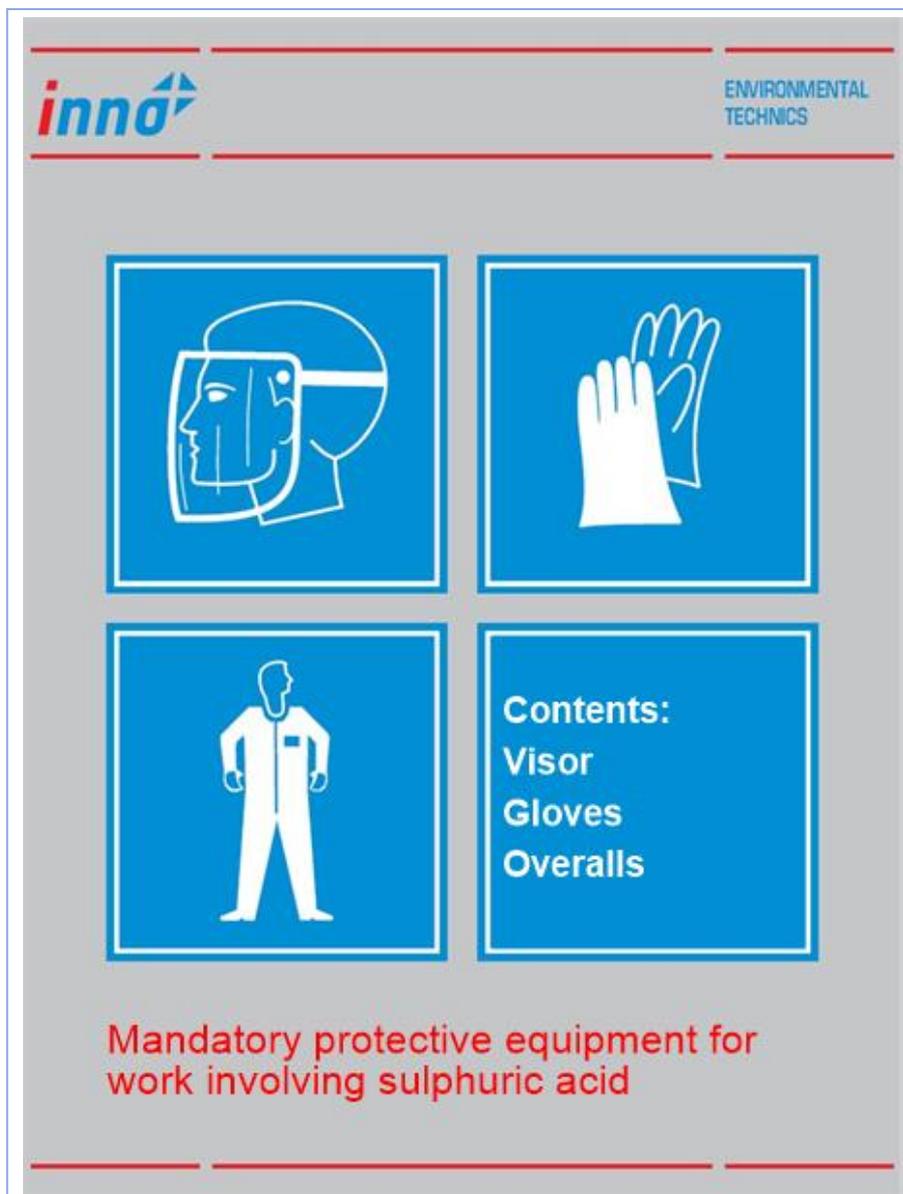


Figure 11: Safety cabinet with personal protective equipment

2.4.2 Personal protective equipment for activities involving sulphuric acid

Following personal protective equipment is recommended for staff responsible for exchanging the acid tanks:

<p>Eye and respiratory tract protection:</p> <ul style="list-style-type: none"> ▪ Face shield or eye protection in combination with respiratory protection. 	
<p>Skin protection:</p> <ul style="list-style-type: none"> ▪ Suitable gloves. Preferably use the gloves from the safety cabinet. 	
<p>Skin protection:</p> <ul style="list-style-type: none"> ▪ Corrosion-resistant protective garments. Preferably use the apron from the safety cabinet. 	

Materials that offer excellent protection against sulphuric acid are:

- Butyl rubber
- Polyethylene
- Tetrafluoroethylene

Less good protection is offered by:

- Neoprene
- PVC
- Viton

Materials that offer poor protection are:

- Natural rubber
- Nitrile rubber
- PVA



WARNING

Do not eat, drink or smoke in the workplace.
 After work: do not remove the gloves. Wash your hands carefully first. Then remove the gloves and wash your bare hands again.

2.4.3 Personal protective equipment for activities anti-foaming agent

Following personal protective equipment is recommended for staff responsible for exchanging the anti-foaming agent containers:

<p>Eye protection:</p> <ul style="list-style-type: none"> ▪ Safety glasses with side shields 	
<p>Skin protection:</p> <ul style="list-style-type: none"> ▪ Suitable gloves against mechanical damage 	
<p>Skin protection:</p> <ul style="list-style-type: none"> ▪ Fluid-resistant clothing 	

WARNING

Do not eat, drink or smoke in the workplace.
Wash hands carefully before any work interruption and after work.

2.4.4 Protective equipment when working near the scrubber

The following personal protective equipment is recommended for staff responsible when checking and cleaning the scrubber: This also applies to all locations where stable air and/or cleaning water (or vapour) may be present, namely (depending on the local situation):

- In the pressure chamber;
- Area near the package sprinklers;
- Space under the packages (outflow of cleaning water);
- Space above the packages (where the purified air leaves the scrubber).

WARNING

Do not eat, drink or smoke in the workplace.
 After work: do not remove the gloves. Wash your hands carefully first. Then remove the gloves and wash your bare hands again.

<p>Protection of the eyes and airways:</p> <ul style="list-style-type: none"> ▪ Visor or eye protection, combined with respiratory protection or ammonia filter (for example FFABEK1P3D). Pay attention to the expiration date of the visor when removing the packaging! 	
<p>Skin protection:</p> <ul style="list-style-type: none"> ▪ Suitable gloves. We recommend using the gloves in the safety cabinet. 	
<p>Skin protection:</p> <ul style="list-style-type: none"> ▪ Non-corrosive protective clothing. We recommend using the clothes in the safety cabinet. 	
<ul style="list-style-type: none"> ▪ Acid resistant boots with non-slip soles. 	

TIP

For ammonia filters applies:
 On the basis of average use (weekly inspection and cleaning), a filter normally has a lifespan of approximately 6 months.

2.5 Safety information Sulphuric acid

For working with sulphuric acid 51%-96% (EC-No. 231-639-5), the following warnings required by law apply:

R35 Causes severe burns.

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S30 Never add water to this product.

S45 In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).

ATTENTION

Always read the information on the packaging and in the safety data sheets supplied by the manufacturer. They include first aid and safe storage precautions.

2.5.1 Action to be taken in the event of a sulphuric acid accident

In the event of inhalation:

- Never inhale sulphuric acid. At perception of smell the exposure limit has already been exceeded!
- Remove victim to fresh air, place in a half-seated position, and provide artificial respiration if necessary. Transport to hospital immediately.

TIP

In addition to this user manual Inno⁺ provides a set of safety data sheets for sulphuric acid.

In case of eye contact:

- Immediately rinse with plenty of water for 15 minutes (remove contact lenses if necessary). Take to ophthalmologist and continue rinsing during transport.

WARNING

Never dilute by adding water to the acid. Always add the acid to the water.

In case of contact with skin:

- First rinse with plenty of water, only then remove the clothing. In case of skin burns, do not pull off the clothing stuck to the skin.
- Then flush again, seek medical advice and transport to hospital if necessary.
- Do not use (chemical) neutralisation agents, cover wounds in a sterile manner.

If ingested:

- Rinse out mouth, do not induce vomiting.
- Give two glasses water to drink and immediately transport to hospital.

2.5.2 Cleaning up of spilled sulphuric acid

- Wear prescribed personal protective equipment (see paragraph 2.4.2).
- The spilled product must be dammed up.
- Absorb it in an inert absorbent material (e.g. sand, but not sawdust) or neutralise it with bicarbonate (for example, soda, beware of reactions).
- Remove the reaction product with water.
- Drain away cleaning water to the sewer.
- Label any containers and dispose of them in accordance with local rules.

TIP

Inert = a fluid that does not or barely react with any other fluids.

ATTENTION

See paragraph 3.5 for details on sulphuric acid storage.

2.5.3 Double-walled acid tanks

Only double-walled acid tanks may be applied (ask Inno+ for specifications). These tanks are inspected for safety annually by the manufacturer.

Tanks are equipped with a built-in suction tube, and have chemistry quick couplers for connecting the suction pipe.



Figure 12: Double-walled acid tank

2.6 Anti-foaming agent safety information

Under normal conditions of use anti-foaming agent is not dangerous for humans and the environment. Nevertheless, the following advice applies:

- Avoid contact with the skin.
- Avoid contact with the eyes.
- Do not consume the substance.
- Ensure good ventilation in confined spaces.

First aid measures:

- Skin contact: wash off with soap and water.
- Eye contact: Rinse eyes thoroughly with plenty of water.
- Ingestion: Do not induce vomiting. Drink one or two glasses of water. If necessary, consult a physician.

Environmental precautions:

- Do not drain into surface water or sanitary sewer system.
- In case of fire: remove contaminated extinguishing water separately, do not drain to the sewer.

Cleaning spilled liquid:

- Absorb in inert absorbent material (e.g. sand, acid binder, universal binder, sawdust).
- Shovel into a suitable container for disposal.

TIP

Inert = a fluid that does not or barely react with any other fluids.

Storage details:

- Store in closed packaging in a dry and well-ventilated place.
- Temperature must not be lower than 0°C.

2.7 Noise level

The noise level of the Air Scrubber is well below 70 dB (A). It has been measured on all sides of the cabin at a distance of approx. 1 meter from the exterior.

2.8 Certification

Air scrubber complies with Machinery Directive; the relevant CE declaration is supplied separately.

2.9 Specific use

- The Air Scrubber is designed to remove ammonia-rich air from stables, as described in this manual.
- The Scrubber may only be used if all safety devices are in place and in working order. They are described in § 2.2.
- Before carrying out any work, users must familiarize themselves with the available safety equipment (see § 2.2). The Scrubber must always be used professionally and responsibly.
- Make sure no unnecessary parts, materials or tools are placed on or inside the Scrubber during use.
- Unless otherwise specified: always fully switch off the Scrubber control system when carrying out maintenance, and lock the main switch with a pad lock.
- Keep the working area and technical room clean and make sure there is sufficient lighting.
- Always close the technical room and electrical box and keep them locked during normal use.
- **Store the sulphuric acid in an approved, closed space with adequate ventilation.**
- When cleaning the scrubber always at least 2 persons must be present.
- The Air Scrubber requires regular and responsible maintenance. See the instructions in chapter 6 for more information. If the filter packages become excessively polluted, the water does not drain from the packages sufficiently. The resulting large weight gain may pose a risk to the stability of the structure.
- Keep access roads and stairs clear and dry to prevent freezing and/or slipping.
- Always respond promptly to alerts on the computer. A too low pH value may be hazardous to the health.
- Always use original Inno+ components for maintenance and repair work.
- Observe any local regulations regarding drainage of draining water and water produced during cleaning.
- **Always make sure there is plenty of absorption agent available to clean up any spilt sulphuric acid.**
- If you detect any leakage, consult your manufacturer immediately to discuss what actions must be taken. Clean up any chemical leakages in conformity with the instructions in § 2.5.2 and 2.6.

2.10 Unwise use

- No other chemicals or different chemical concentrations must be used, as prescribed in chapter 9.
- Maintenance of the process water circuits and components in the technical room must only be carried out as described in this manual. Never experiment, but always consult Inno+ if you have any questions, doubts or problems!
- Never climb onto the Scrubber.
- People under the age of 16 are not allowed to operate the Scrubber. People who might reasonably be deemed to be unable to recognize the risks involved in the operation of the Air Scrubber, are not allowed to operate the machine.
- During operation of the Scrubber and/or pressure chamber people must limit their presence near or in the Air Scrubber where possible. Excessive vapours and gases can harm the people in the direct vicinity of the Air Scrubber.
- The technical room and computer settings ensure proper operation and the safety of the Scrubber. Never adjust any of the cleaning or process settings not described in this manual!
- Never add any chemicals to the cleaning water by yourself.
- Never carry out any repairs on or modify the instrumentation or pipelines of the Scrubber. This can disrupt the process and cause dangerous situations. Therefore never repair a leaking sulphuric acid line but refer to Inno+.
- The machine must be earthed properly. Never remove any of the earth connections!
- Mechanical modifications of the Scrubber or pipeline, such as drilling holes, can cause damage to the Scrubber or hazardous chemicals to escape under pressure.
- Never bypass any safety devices such as fuses and never replace them with types that have other specifications.
- Make sure that the emergency shower and safety cabinet are freely accessible.
- [Do not use acid tanks that differ from the regulation in paragraph 2.5.3.](#)

2.11 Other responsibilities of the user

- Following aspects are not covered by the delivery of Inno+. However, as these issues affect the safe use of the scrubber, it is the responsibility of the users to take care of them themselves.
- Technical room must be equipped with mechanical ventilation. Guideline should be that the air in the room must be refreshed 5x per hour.
- All accesses to the technical room must be lockable with a lock.
- User must provide a facility for the collection and/or disposal of cleaning water should the reservoir overflow.
- Drain line of the drain silo must be provided with a valve that can be locked by e.g. a padlock. The large quantity of contaminated water can pose a risk to man and environment should the silo empty unexpectedly and uncontrolled.
- Also, the supply line to the drain silo should be built in such a way that it cannot be damaged by external calamity.
- User must always make sure that there is enough available storage capacity in the drain silo.
- To prevent hazards arising from external calamity, crash protection must be installed around the scrubber construction and the drain silo (where applicable).
- Make sure there is sufficient lighting in all places where maintenance to the scrubber must be carried out, as well as in the technical room.
- Ensure there is sufficient grounding for protection against lightning strike.

2.12 Statutory provisions

Depending on local or national regulations, certain requirements may apply to registration of certain process data.

Control computer is equipped with a number of registration fields and this data can be transferred via the internet to Inno+, or stored on a memory card.

These include:

- Amount of draining water with date information;
- **Amount of added sulphuric acid;**
- Water consumption;
- Development of the pH value and the conductivity value;
- Operating hours;
- Electrical power consumption;
- Pressure drop in the pressure chamber

Every week user must verify whether registration is functioning well. It is described in paragraph 6.3 how to do this.

3. SYSTEM DESCRIPTION

3.1 Air Scrubber: general set-up

The Air Scrubber extracts and cleans air from stables and removes contaminants such as ammonia, bad odours and particulate matter.

In the stable pressure chamber the polluted air is blown through the filter pack of the Scrubber. A large amount of process water is continuously flowing through the filter package, which binds the ammonia. The process water returns to the reservoir and is pumped back to the filter pack.

The air that leaves the scrubber again has been cleaned of the components for a large part; gradation depends on the system's configuration (for example, 70 or 95%).

As soon as the cleaning water has reached a certain conductivity (which indicates the cleaning water no longer has a cleaning ability), the system automatically drains the polluted cleaning water.

Provisions been made to the scrubber for the automatic supply of clean water (and chemicals). The scrubber is also equipped with a control cabinet with computer. The latter has been placed in the technical room. Figure 13 shows the overall system.

The scrubber is easy to operate, but it needs occasional maintenance.

All necessary actions are described in this manual.

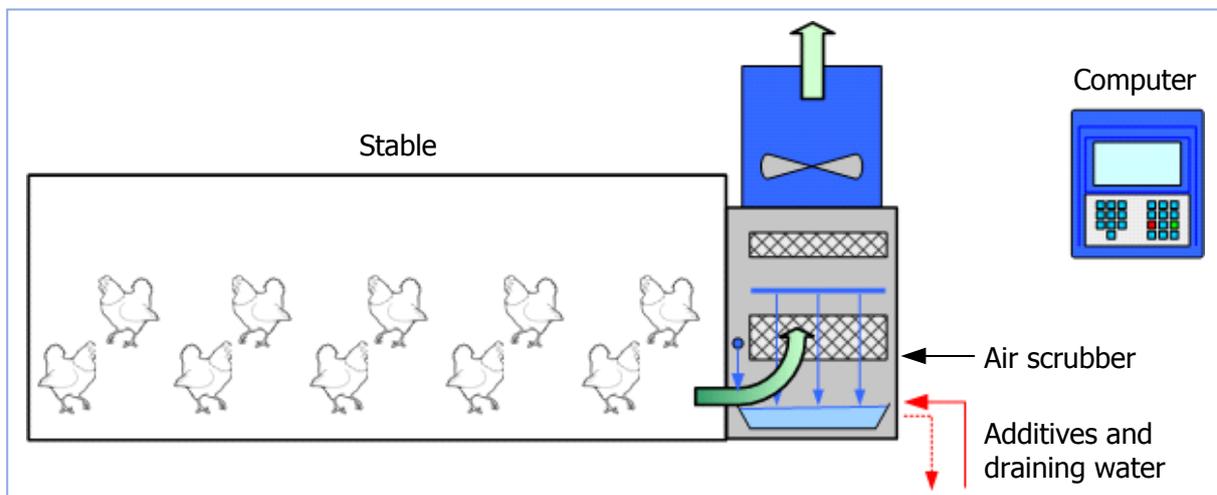


Figure 13: Air Scrubber in a stable system

3.2 Operation

Figure 16 shows the scrubber is divided up into a number of separate rooms:

- **Process area:** This is where the actual cleaning process takes place. It houses the water reservoir and filter packs. The contaminated air inlet is located on the side of the process area. The cleaned air leaves the process area from the top, passing a drip tray.



Figure 14: Filter pack with sprinkler pipes

The drip tray collects any condensed liquid and takes it back to the filter pack and/or cleaning water. The air that is exhausted to the open air outside can have an increased level of air humidity.

Figure 14 and Figure 15 show the top of the filter packs and primary sprinkler.



Figure 15: Primary sprinklers

- **Technical room:** This is where the process is monitored (in the event of chemical scrubbers: at this point the anti-foaming agent is added to the water). So, in this area the circulation pump, the drain pump, the pH meters, conductivity meter and the water valves are located. Also the control cabinet is situated here.
- Storage facility for sulphuric acid tank(s) with dosing pump. See paragraph 3.5;

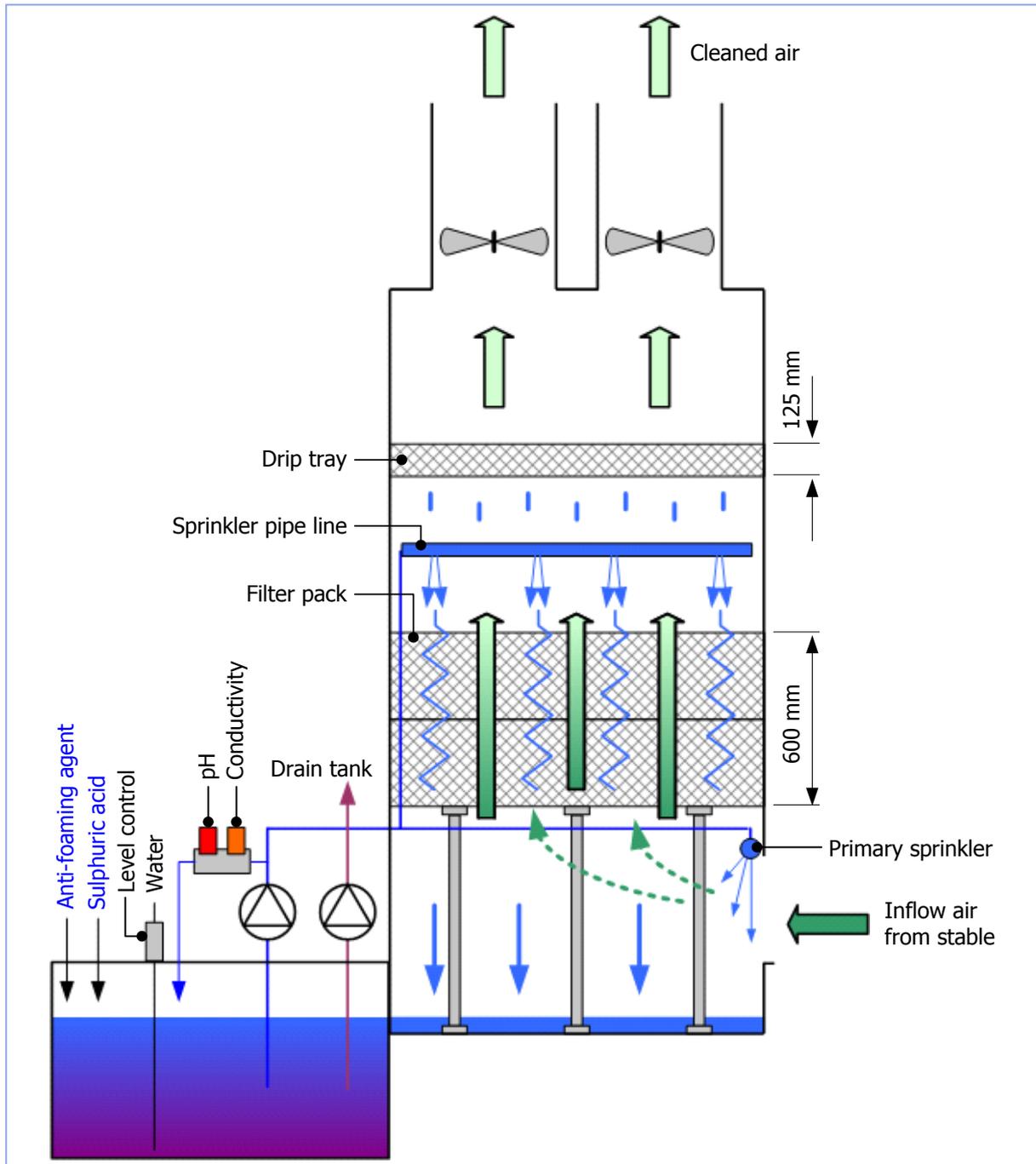


Figure 16: General Air Scrubber structure

3.3 The scrubbing process

Figure 17 shows a schematic overview of the cleaning process.

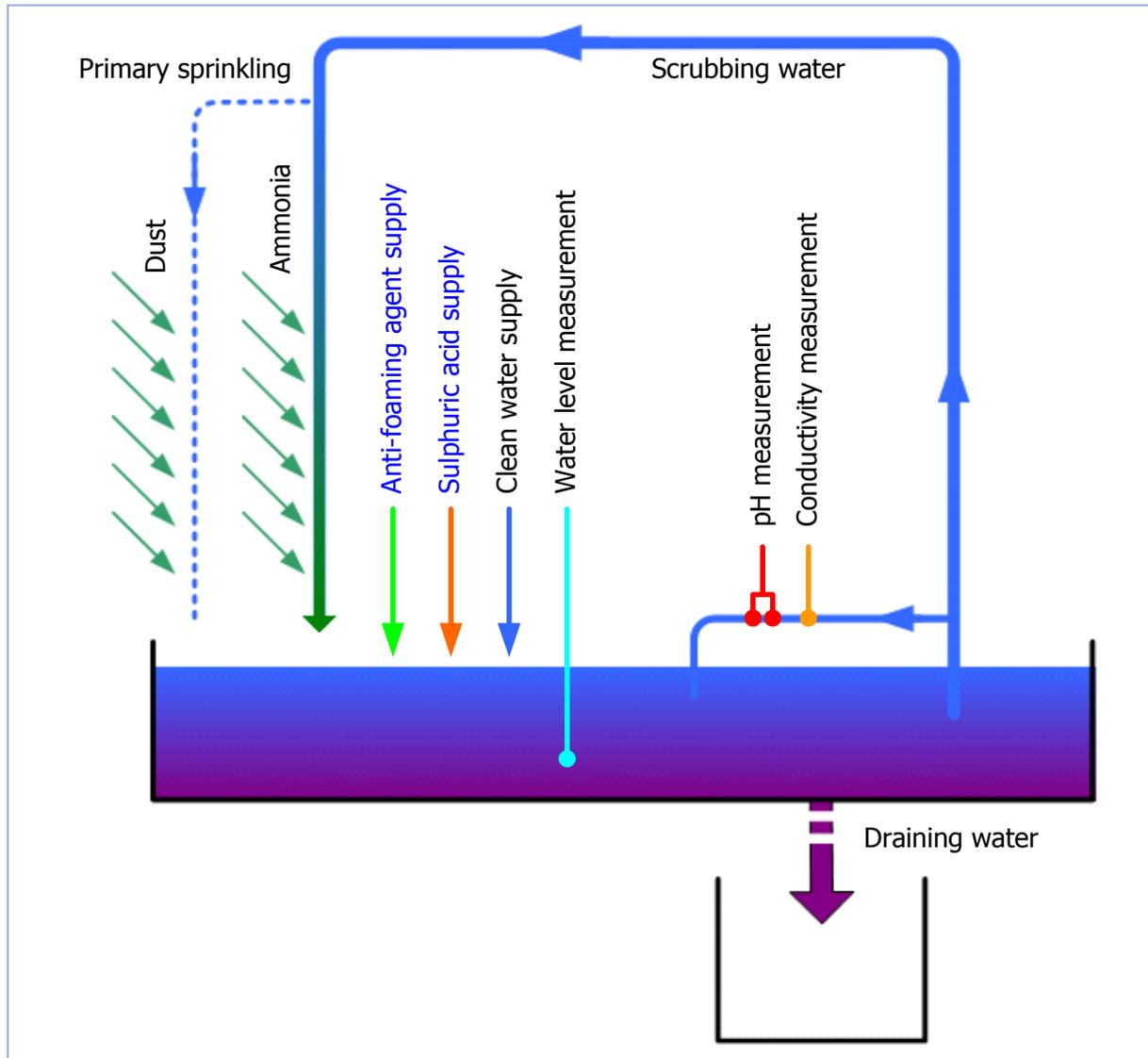


Figure 17: Air Scrubber fluid flows

The Air Scrubber reservoir is filled with tap water.

- In the event of chemical scrubbers the following substances are added to the water:
 - Sulphuric acid, to reduce the acidity (pH value);
 - Anti-foaming agent, to ensure that the washing water will not foam.
- In the event of biological scrubbers no addition takes place.

The cleaning water containing the additives is continuously and regularly sprayed from the reservoir onto the filter packs.

The contaminated stable air flows into the process area where it is humidified by the primary sprinkler. This humidifying process ensures that most of the dust in the air is extracted and collected in the water reservoir.

The air is then blown up from the wet filter pack. The air containing the ammonia comes into contact with the cleaning water. The ammonia is absorbed by the cleaning water, and flows back into the reservoir together with the cleaning water.

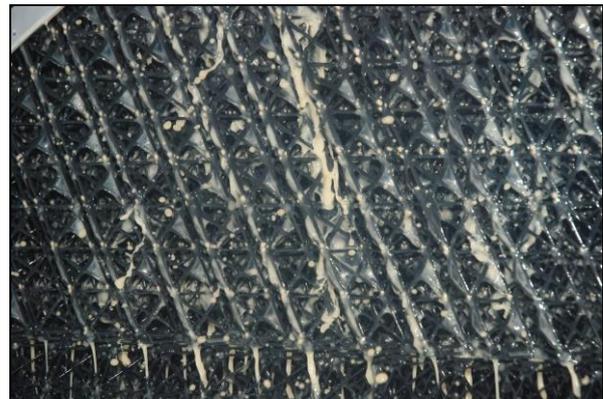


Figure 18: Cleaning water on the filter pack

The longer the system is operational, the more solid substance will arise in the washing water. As soon as so much substance has arisen in the reservoir that good scrubbing is not possible anymore with this water, part of the water will be drained, and the reservoir will be filled with tap water again.

During the draining the cleaning water still present will be pumped around over the packages.

Furthermore, the following applies to chemical scrubbers:

The lower the pH-value of the cleaning water, the better the ammonia is absorbed from the air.

Due to the fact that the concentration of sulphuric acid in the water decreases as a consequence of the ammonia-absorption, it will be increasingly difficult for the cleaning water to clean the air. That is why new sulphuric acid is continuously added to the reservoir. This happens automatically, by means of an acid pump. Prior to the drainage phase the sulphuric acid supply stops, so that the acidity will increase (for example, from 4 to 6). Once the cleaning water is fairly neutral again (pH = 6), the water can actually be drained. This neutralization phase may last up to 3 hours (depending on the system size).

TIP

pH = degree of acidity

Pure water has a pH value of 7 (= neutral).

A pH value below 7 indicates the water is acidic; acidic water has a low degree of acidity.

A pH value above 7 indicates the water is alkaline (basic).

pH values range from 0 (extremely acidic) to 14 (extremely alkaline).

TIP

Key figures for chemical scrubbers:

- pH value during the cleaning process: 3 – 5;
- Conductivity when saturated (start drainage): 170 mS/cm.

Key figures for biological scrubbers:

- pH value during the cleaning process: 6 – 7;
- Conductivity when saturated (start drainage): 20 mS/cm.

Conductivity of clean water is 0 - 1 mS/cm;

The process specifications for the most part are system-dependent and outlined in the Delivery certificate.

Some water evaporates during the regular cleaning process and some of the water is exhausted with the outgoing air. The level control system provides a continuous supply of clean water and keeps the water at the right level.

Figure 19 shows the process cycle of biological scrubbers.

Figure 20 shows the process cycle of chemical scrubbers.

The following measuring systems in the technical room monitor the process:

- pH meter: this controls the acidity of the cleaning water.
- Conductivity meter: this controls the amount of salt in the cleaning water.
- Water level meter: generates data required for maintaining the reservoir level and to stop the draining process.

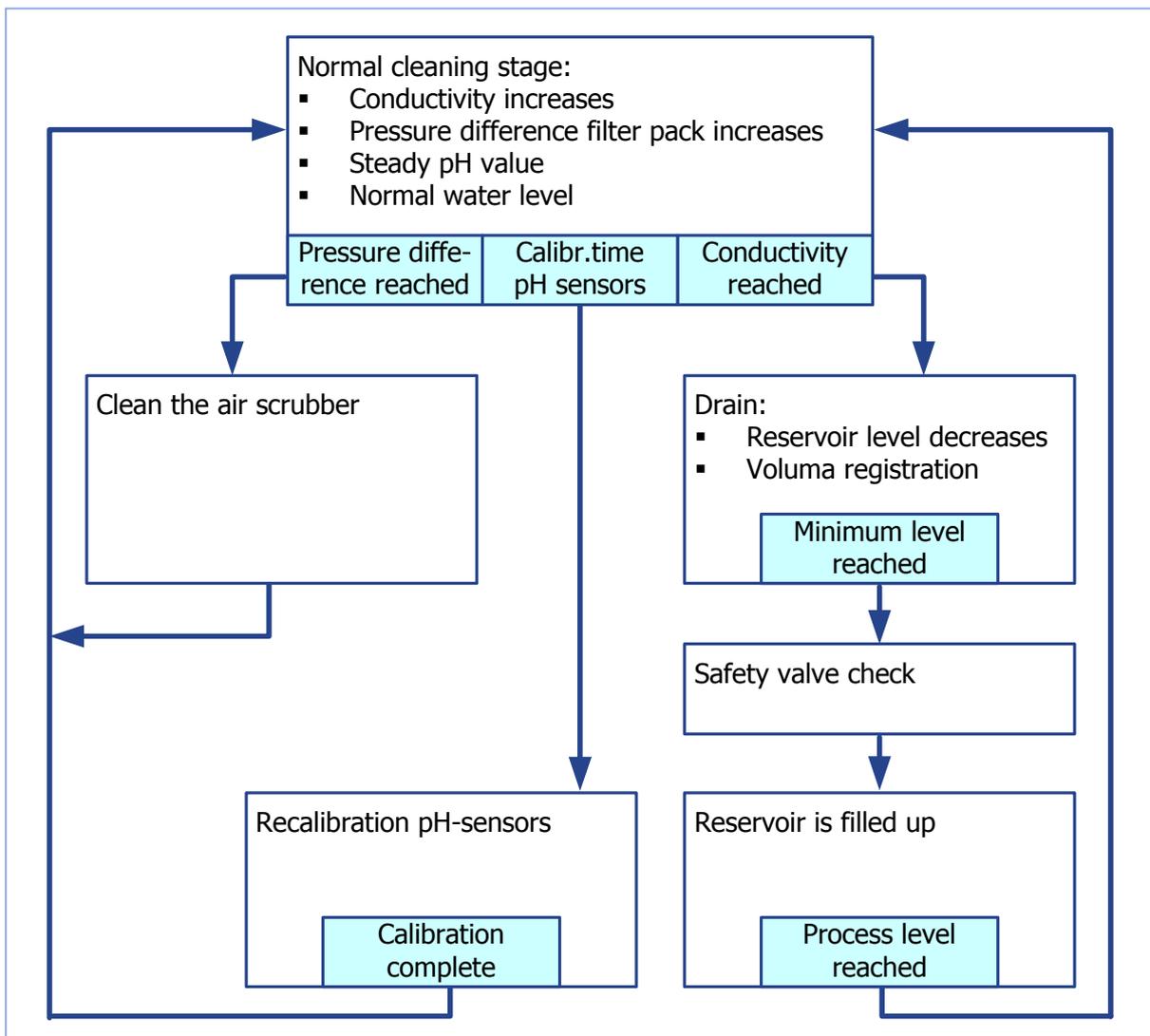


Figure 19: Biological Air Scrubber process flow

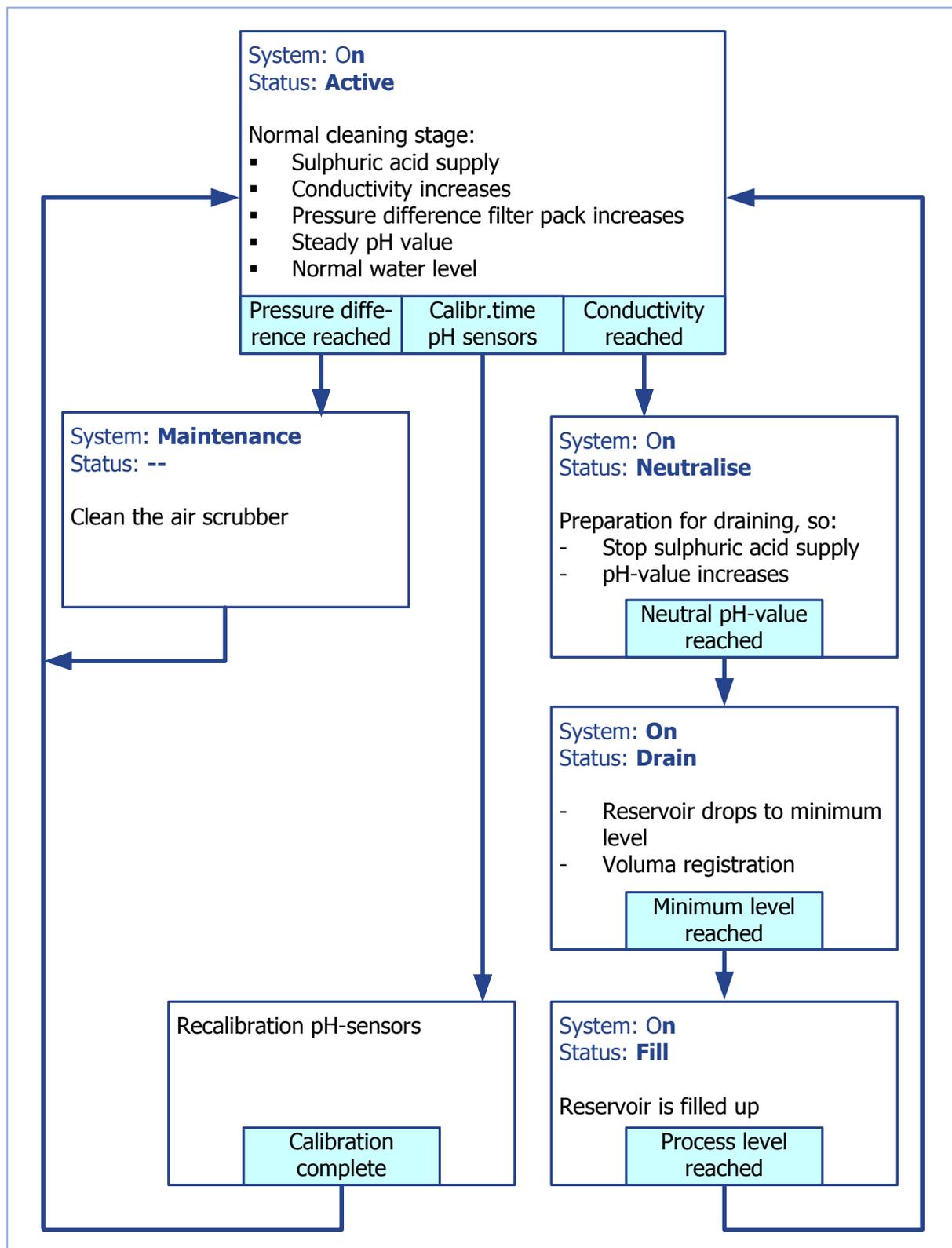


Figure 20: Chemical Air Scrubber process flow

3.4 Instrumentation diagram

Figure 21 shows the control and monitoring equipment for the cleaning water.

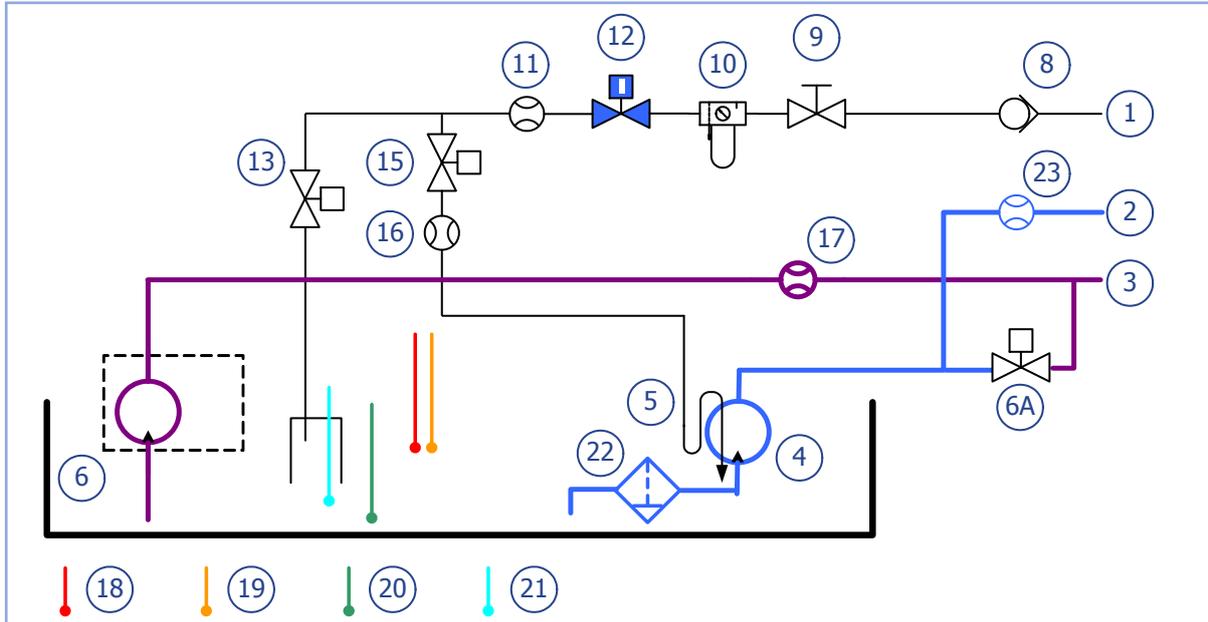


Figure 21: Cleaning water process diagram

- 1 = Tap water supply.
- 2 = Cleaning water, from the circulation pump to the primary sprinklers and package sprinklers.
- 3 = Drain pipe, to drain tank
- 4 = Circulation pump for continuous circulation of cleaning water from the reservoir to the filter packs and primary sprinkler.
- 5 = Shaft rinsing of the circulation pump (pump-dependent).
- 6 = Drain pump or drain valve (6A). As soon as the washing water is heavily polluted, the water is drained to e.g. a drain silo.
- 8 = Check valve; prevents the process water from flowing back to the water supply system (this valve is required by law).
- 9 = Manual valve.
- 10 = Pressure reducing valve with filter and manometer; reduces excessive pipe pressure to a maximum of 3 bar.
- 11 = Water meter, to read out the total water consumption.
- 12 = Safety valve; this valve closes off the water supply (error situation) if the maximum reservoir level is reached.
- 13 = Solenoid valve; (re)fills the reservoir with clean water. The controls keep the water level as constant as possible.
- 15 = Solenoid valve for circulation pump shaft rinsing (pump-dependent).

- 16 = Water meter for shaft rinsing of the circulation pump (pump-dependent).
- 17 = Drain water meter; measures the flow volume and sends the data to the central computer for statutory registration.
- 18 = pH measuring sensor (dual configuration); constantly measures the water's degree of acidity. This sensor has a limited life span (1 or 2 years) and should be replaced periodically.
- 19 = Conductivity sensor; the sensor is connected with the conductivity meter. The cleaning water is drained when a pre-set conductivity level is reached.
- 20 = Emergency floater; when the water level reaches this up to this switch (water level too high, possibly caused by defective controls), the safety valve is deactivated.
- 21 = Water level sensor; constantly measures the water level and sends the data to the control system. The reservoir is then (re)filled with clean tap water.
- 22 = Circulation pump water filter.
- 23 = Flow sensor; indicates if the circulation gets below a certain level, caused by dirty or clogged sprinklers or filter (flow control).
If circulation gets below a certain minimum level, the pump switches off completely (dry-running protection).

Figure 22 shows an example situation.

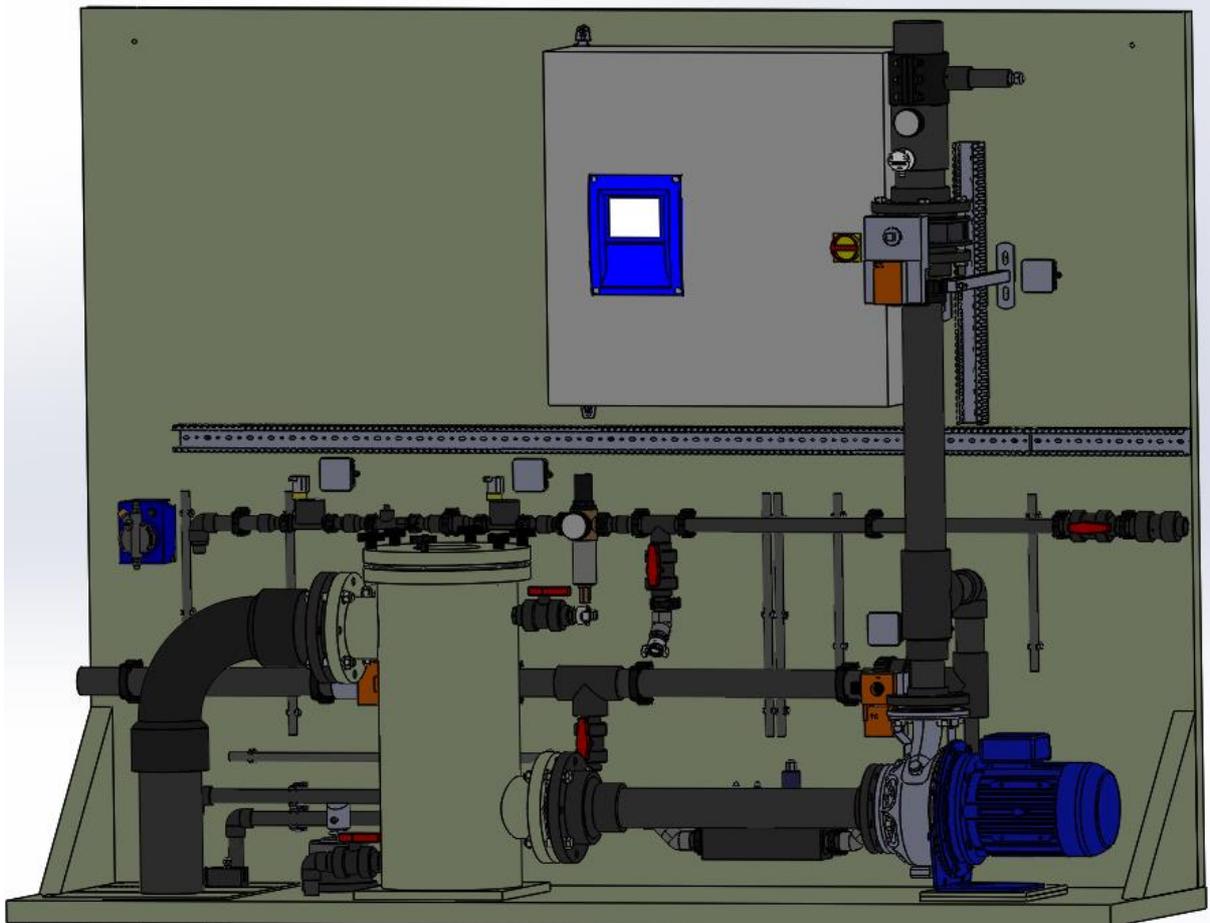


Figure 22: Technical room with process control

Other components in the process room:

Anti-foaming agent tank

This is for example a 5 litre or a 25 kg tank that can be easily exchanged.
Tank does not have level monitoring.

Dosing pump for anti-foaming agent

This pump adds anti-foaming agent to the reservoir on time base. The amount added per pump cycle is set on the pump with a manual button. If desired, pump can be activated extra (manual mode, see paragraph 4.4.2).

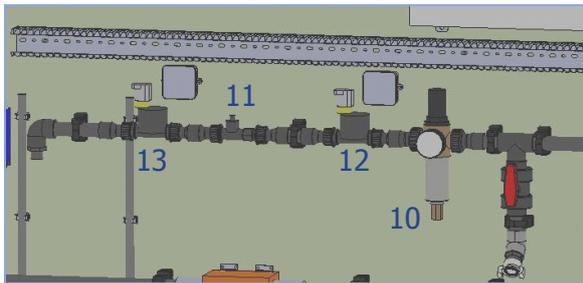
Conductivity meter

Electronic unit to which conductivity sensor has been connected. Unit is connected to control cabinet.

Control cabinet with computer

All electrical and electronic units of the technical room are connected to this cabinet. Computer receives the data from all sensors and actuates the pumps and valves.

Additional illustrations (the numbers correspond with Figure 21):



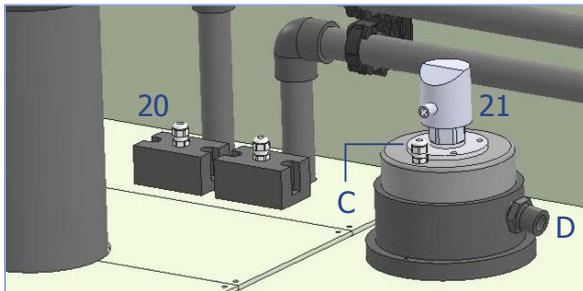
Clean water supply:

10 = Water filter and pressure reducing valve

11 = Water meter

12 = Safety valve

13 = Solenoid valve for water supply



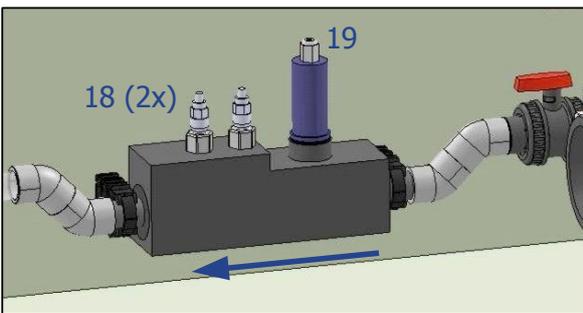
Level measurement and fluid supply:

20 = Emergency floater

21 = Water level sensor

C = Supply point anti-foaming agent

D = Supply point clean water (from solenoid valve 13)



Water quality measurement:

18 = pH sensor (2 pcs)

19 = Conductivity sensor

3.5 Sulphuric acid supply

Figure 23 shows how the sulphuric acid is supplied to the air scrubber, if a system with replacement containers is applied.

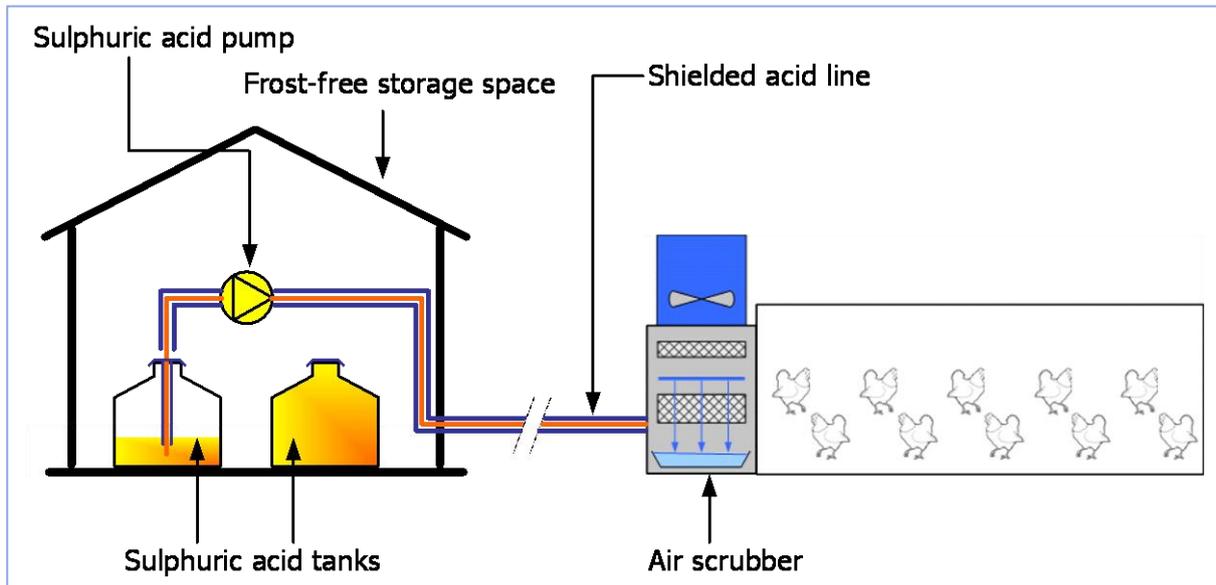


Figure 23: Supply of sulphuric acid

For this the main features are:

- Containers should be lined up in a well ventilated, covered and closed space with acid-resistant and impermeable floor.
- The temperature of the storage space must be at least 5°C.
- Too cold storage can lead to problems when pumping the acid to the scrubber.
- Acid pump is located directly near the tanks; under the pump is a drip tray. In the drip tray is a sensor that sends an alert to the computer in the event of a leakage.
- Acid pump is connected with a connector to a wall socket that is part of the scrubber control. As soon as the main switch of the control is switched off, the acid pump will always immediately switch off too.
- A check valve in the acid tank ensures that the acid cannot flow back from the pipe into the tank.
- Sulphuric acid line ends in the reservoir of the air scrubber; the discharge point is located below water level.

WARNING

Sulphuric acid is highly aggressive. It can cause serious personal injuries and cause serious damage to the environment. Therefore keep the storage space well locked.

WARNING

At all times avoid that water can get into the concentrated acid. As a result, vigorous reactions arise and harmful fumes are released. These problems do not occur when a (little) acid is added to a large amount of water.

ATTENTION

Refer to the instructions of paragraph 2.5.2 for instructions regarding the disposal of spills of sulphuric acid.

- Discharge point is equipped with an injector. This ensures that no water can flow back into the acid line.
- The acid line to the air scrubber can be quite long, and is placed in a solid PVC pipe to prevent mechanical hazards. Symbols have been affixed on the pipe that indicate that this is a sulphuric acid line.

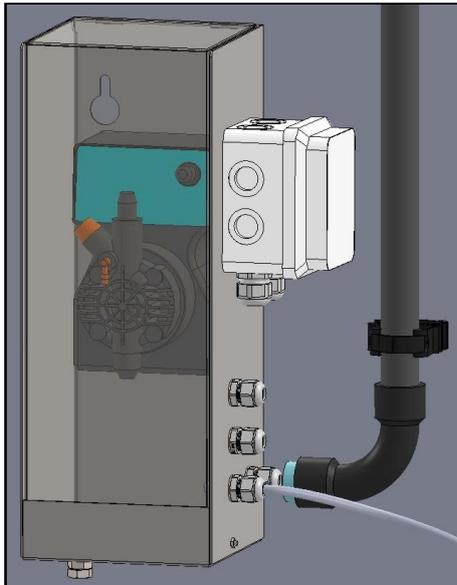


Figure 24: Sulphuric acid pump (left) and sulphuric acid tank (right)



Figure 25: Discharge injector

3.6 Control system

Figure 26 shows the control cabinet, in the technical room:

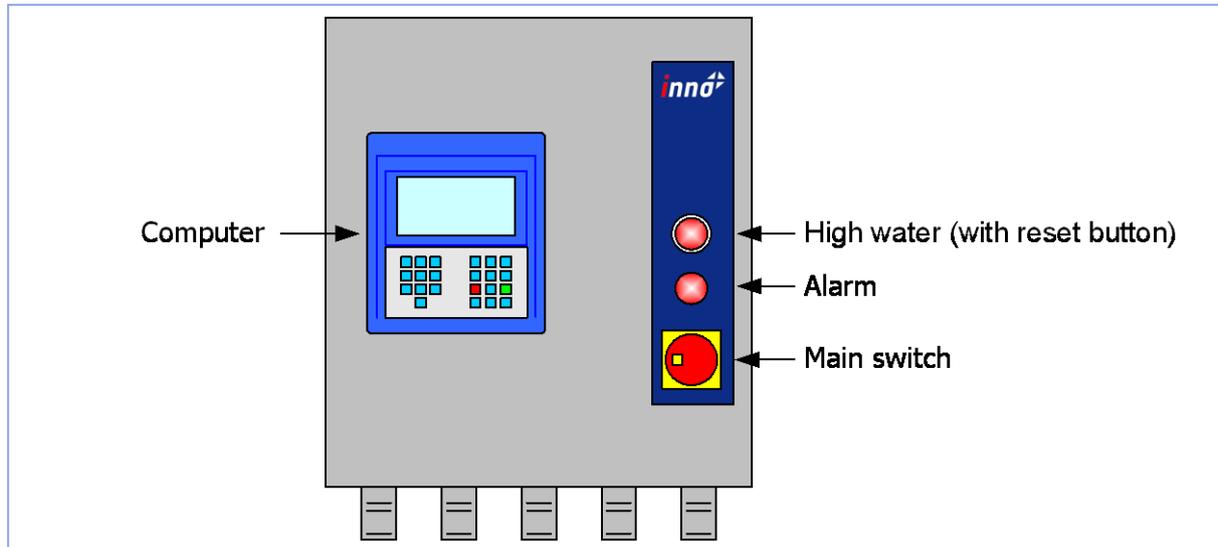


Figure 26: Control cabinet

On the cabinet are the following components:

- Computer: for process settings and process control. Various information can be read out from the monitor. For more information, see chapter 4.
- Main switch for the electrical supply of the entire scrubber. Switch can be locked with a padlock to prevent that the latter is switched on accidentally.
- Lamp **[Alarm]**: The latter is on if there is a malfunction, see chapter 5.
- Push button with lamp **[High water]**: If this light comes on the scrubber is switched off due to high water level. See also paragraph 5.7.

Moreover, among other things, in the cabinet the network interface and the motor protection switches are located.

ATTENTION



The lamp **[Alarm]** works only for alarm groups that are switched **On** (see § 5.2).

4. THE COMPUTER

4.1 Display and buttons

Figure 27 shows the set-up of the air scrubber computer.

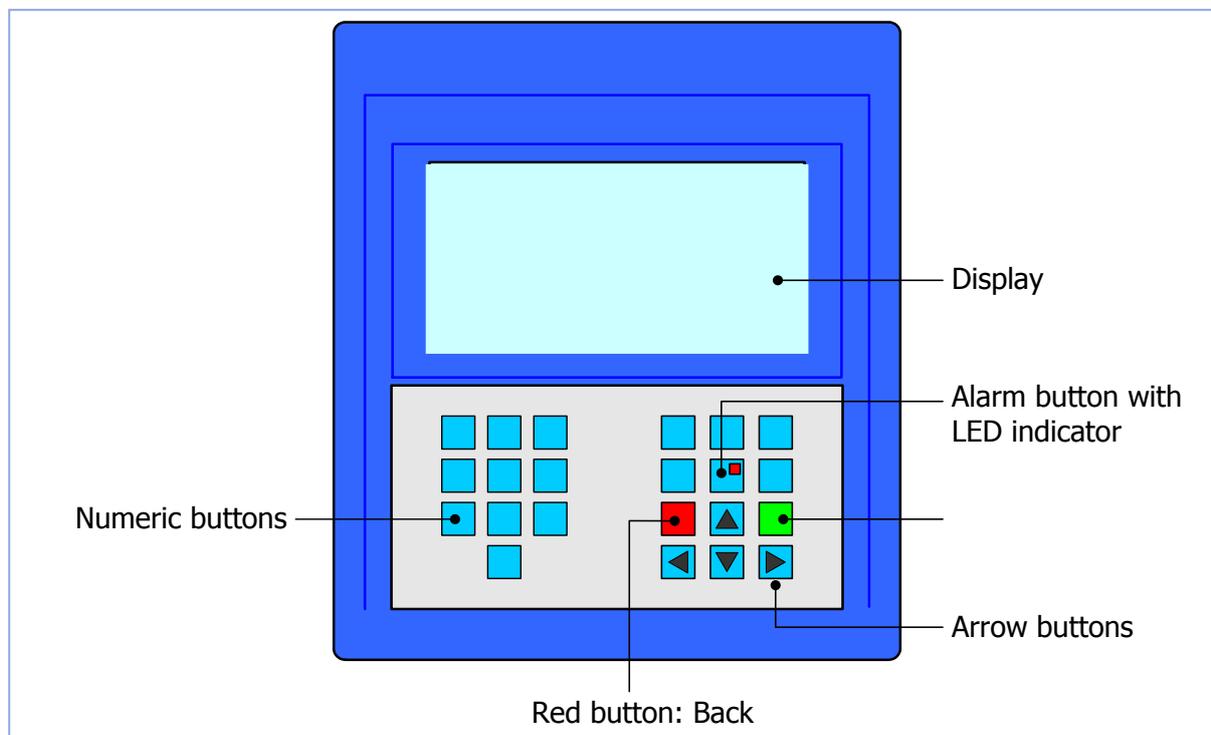


Figure 27: Computer

Use of the components is as follows:

Display

Displays all menus showing the status of the Air Scrubber, any active alarms, etc.

Alarm button with LED indicator

Press this button to open the **Alarm** menu directly.

- LED off: no active alarms, everything is in working order (if the supply voltage is on).
- LED on: A malfunction has occurred. Press this button for further details.
- LED flashes: A malfunction has occurred in an alarm group that was manually deactivated. Press this button for further details.

Enter (green button)

Press this button to activate the cursor line. Use this button to change values, confirm entries or to open submenus.

Arrow buttons

Use these buttons to navigate through the lines and fields of any displayed menu. You can also use these buttons to increase or decrease a value (when you press **[Enter]** to activate the value field in question, the cursor becomes transparent).

Back (red button)

Press this button to return to the previous menu (see the structure in chapter 4). Any activated fields are deactivated when you press this button.

Numeric buttons

Use the numeric buttons to enter your access code, quickly display one of the menu lines shown on the display, etc.

The display shows the information available in the opened menu.

- To jump to a submenu:
 - Use the arrow buttons and then press **[Enter]**, or
 - Enter the number of the line in question.
- Press the red button **[X]** to go back one level.

TIP

If no buttons are pushed for some time, the display reverts to the **Overview** menu.

4.2 Menu structure break-down (chemical scrubber)

Figure 28 shows the menu structure break-down for the Chemical Air Scrubber.

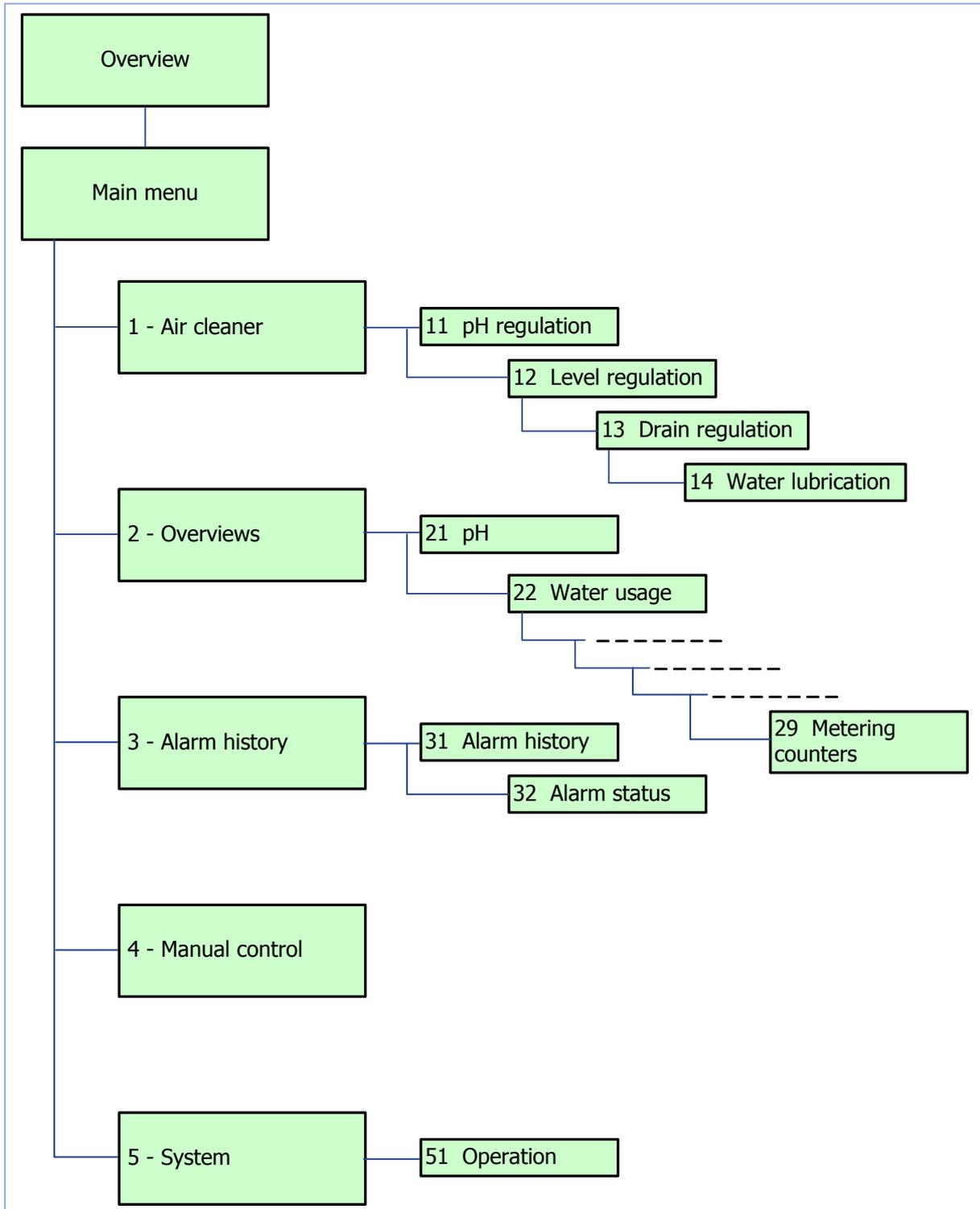


Figure 28: Control computer: menu structure break-down

4.2.1 Overview menu

The standard display menu is the **Overview** menu. It is displayed when no buttons have been pushed in a while, or if the user presses [**X**] several times.

Figure 29 shows this menu.

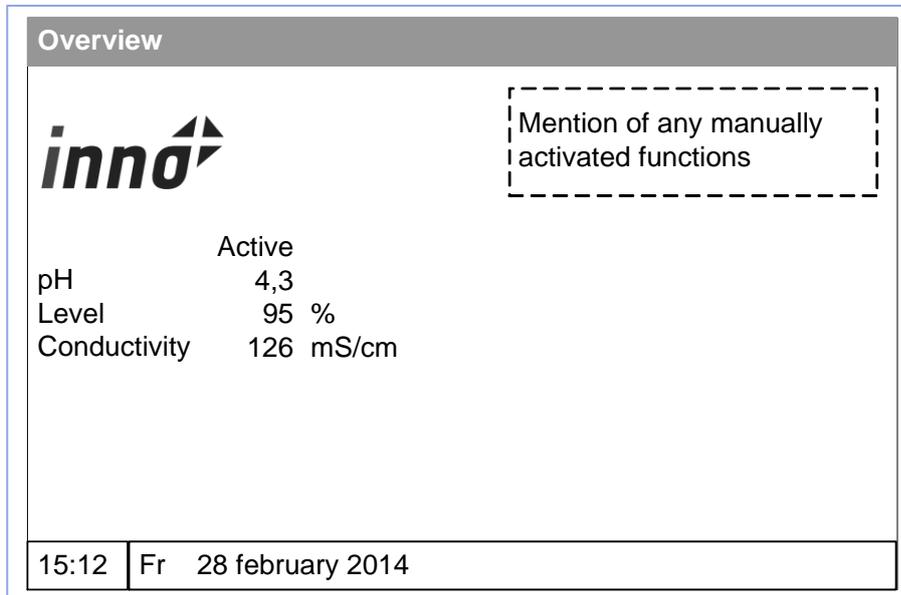


Figure 29: Overview menu

The **Overview** menu shows the following information:

Status

Possible statuses are:

- Active (most common operating status)
- Neutralise
- Drain
- Test safety valve
- Fill

The statuses are passed through automatically, please refer to the explanation in paragraph 3.3.

pH

This shows the current acidity degree of the water in the water tank. Regular values are:

- Status Active: pH initially drops from 7 to approx. 2 to 4, then remains constant;
- Status Neutralise: pH increases to 6.
- Status Drain: pH = 6.
- Status Fill: pH increases to 7.

Level (%)

The reservoir water level. Normal values are:

- Status Active and Neutralise: a control range of 95% - 105%;
- Status Drain: decreases to 0% - 10%.
- Status Fill: increases to about 95% - 105%.

If this value gets well above the control range (approx. 150%) the emergency floater is activated and the safety valve deactivated (alarm situation).

Conductivity (mS/cm)

The current conductivity value; during the cleaning process (status Active), this value increases as a result of salt formation. Normal values are:

- Status Active: increasing value, max. 170;
- Start Neutralise and subsequently Drain on value 170;
- Status Fill: value between 5 and 30.

Pressure difference (Pa)

The pressure difference over the filter pack. The value measured indicates the level of filter pack contamination.

Normal values:

- Status Active: between 0 and approx. 60 to 70 Pa.
- Alarm limit: 80 Pa

Press the [↩] button to enter the **Main menu**.

4.2.2 Main menu

The **Main Menu** does not show actual content data, but is important to make a choice in relation to what one wants to view in detail.

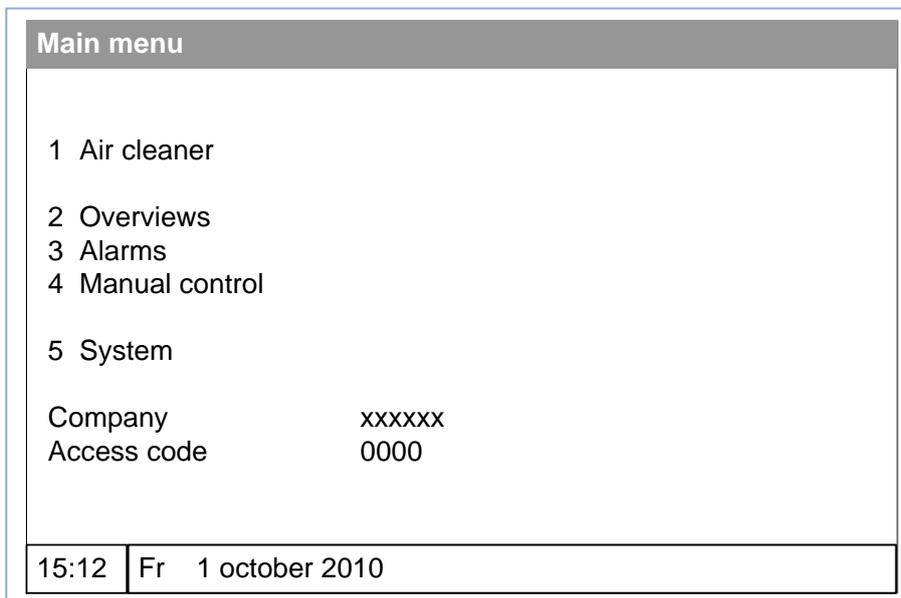


Figure 30: Main menu

The user can access the selected submenu by activating one of the shown menus (with the arrow and [+] buttons or by pressing a number) .

- **Air cleaner:** overall indication of the current status of the Air Scrubber. Also here sub-menus can be opened in order to view the process settings. For more information, see § 4.2.3.
- **Overviews:** In this submenu the user can view various usage data. For more information, please read § 4.2.4.
- See chapter 5 for information on **Alarms**.
- To switch certain functions to **Manual control:** see § 4.4.
- **System** refers to the computer control mode, see § 4.5.
- **Company:** Enter here the code made available by Inno⁺.
- **Access code:** enter your personal access code (only applicable if the code has been registered by the main user, see § 4.6).

TIP

You do not need to enter the company code (and any access code) to open the menus and read out the system status or process values.

However, you cannot change and/or save any settings if you do not enter the company code.

4.2.3 Viewing detailed status data

Via Menu **1 Air cleaner** can be viewed how the scrubber has been set and the statuses of sensors, pumps etc.

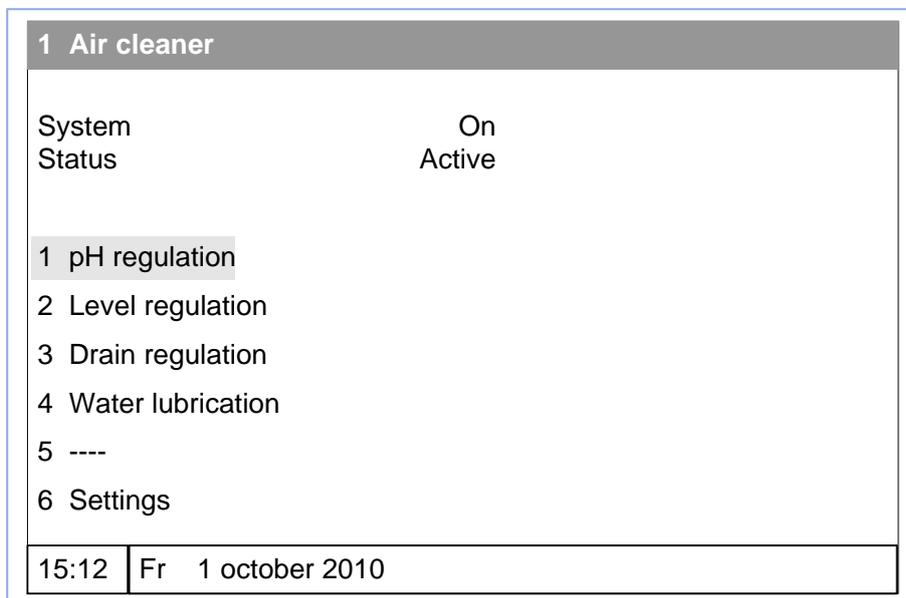


Figure 31: Menu-1 Air cleaner

4.2.3.1 System and status

Air scrubber can be in the following **System situations**:

- **On** = normal operating situation;
- **Off** = everything is stopped, there is no circulation, drain action or chemicals supply;
- **Maintenance** = everything is stopped, there is no circulation, drain action or chemicals supply. Choose this situation when scrubber has been stopped due to maintenance.

System situation must be set manually, read paragraph 4.2.5.

Status depends on the process in the scrubber, and has the following possibilities:

- **Active**: scrubber is in the regular scrubbing phase (and System = **On**);
- **Neutralise**: sulphuric acid supply has stopped, reservoir will soon be drained (and System = **On**);
- **Drain**: water in the reservoir is drained to the drain tank (and System = **On**);

TIP

Off and **Maintenance** are identical situations, but are registered as individual statuses.

TIP

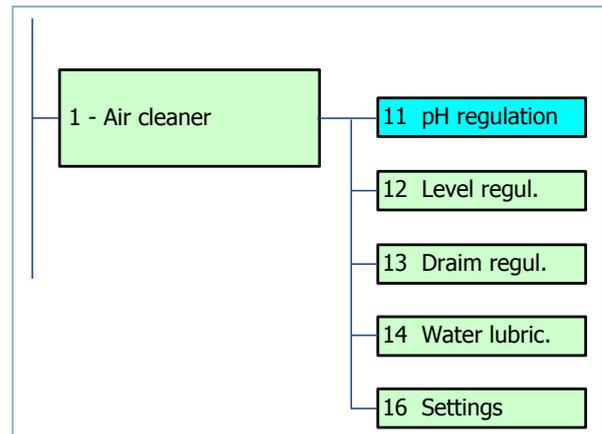
System situations and Statuses are also displayed in the process sequence of Figure 20.

- **Check safety valve:** after the water has been drained the correct operation of the safety valve is checked for a short period of time (and System = **On**);
 - **Fill:** reservoir is filled with clean water after draining (and System = **On**);
- Status** cannot be set manually.

4.2.3.2 Menu-11: pH regulation

Following data are displayed:

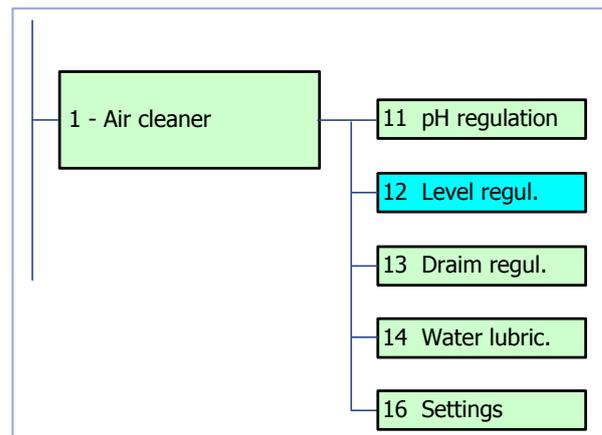
- pH setting: acidity maintained in the reservoir. If the actual value exceeds the set-point value sulphuric acid will be added.
- pH measurement: current acidity.
- Calibration date: calibration date of the two sensors is indicated.
- Start of use: date of insertion of the two pH sensors is indicated.
- Chemicals pump: indicates if sulphuric acid is added at this time or not.



4.2.3.3 Menu-12: Level regulation

Following data are displayed:

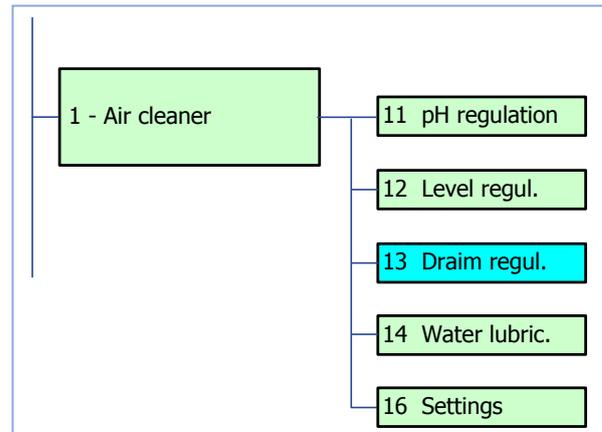
- Level: current water level in the reservoir. Varies between 95 and 105% during normal operation.
- Supply valve: indicates if fresh water is supplied to the scrubber at this time or not.
- Current: if the inlet valve is open, volume of the actual water supply is indicated here (average value: approx. 20 l/min, depending on the local water pressure).



4.2.3.4 Menu-13: Drain regulation

Following data are displayed:

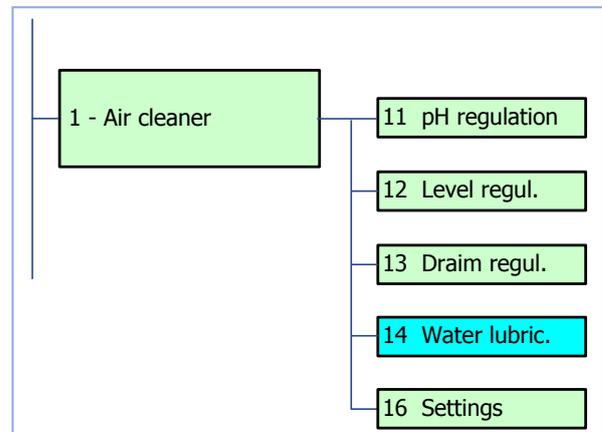
- pH drainage: if during the neutralisation phase pH reaches this value, draining will be started.
- pH measurement: current acidity.
- Conductivity: if during the active phase conductivity has increased to this value, then will be switched over to neutralisation phase (for the purpose of preparing drainage).
- Conductivity measurement: shows the current value for conductivity.
- Drain pump: shows whether the pump is switched on at this time or not (this may take 20 minutes to 3 hours depending on the system size).
- Flow: if the pump is active, actual drain volume is indicated here (average value amounts to 30 l/min).
- Drain Dates: latest 2 dates on which draining took place are shown here.



4.2.3.5 Menu-14: Water lubrication

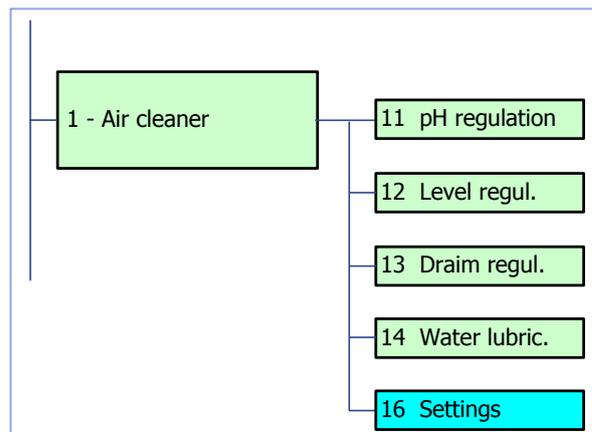
Following data are displayed:

- Shaft lubrication: if drain pump is switched on, its shaft lubrication is automatically activated. This protects the pump shaft against wear and tear. The value shows the actual water quantity of the shaft lubrication (average value: 1 litre per minute).
- Drain pump: indicates if drain pump is switched on at this time or not.
- Shaft flusher: in principle the circulation pump is always running; its shaft is rinsed with water on a regular basis in order to keep it free of salts as well as possible. Value shows the actual water volume of the shaft lubrication (average value: 1 litre per minute).
- Circulation pump: shows if the valve of the shaft rinsing is open at this moment or not.



4.2.3.6 Menu-16: Settings

Via this menu can be set how much anti-foaming agent is added to the cleaning water (duration and interval of dosing pump). It is also possible to calibrate the pH sensors via this menu.



4.2.4 View registration overviews

Via menu **2 Overviews** (see Figure 32) the consumption data and values recorded per main group over longer periods can be viewed:

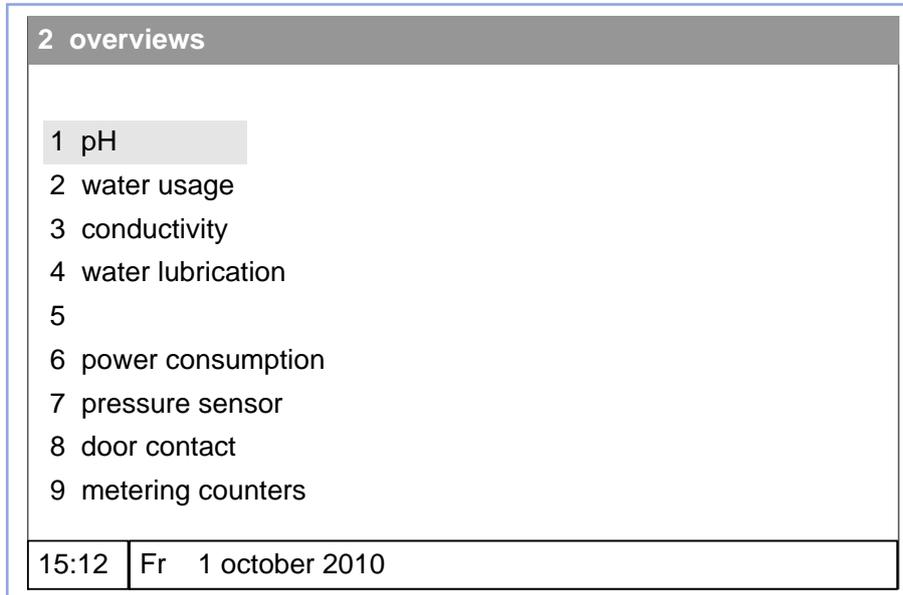


Figure 32: Menu-2 Overviews

In these menus, history of the following data can be viewed:

- pH:
 - Minimum and maximum values measured during the past 24 hours;
 - Minimum and maximum values measured during the past week;
 - Dates on which a new acid container was commissioned, as well as its contents (manual entry);
 - Calculated acid consumption per day.
- Water usage:
 - Daily consumption during the past week in m³.
 - Water consumption per whole week in m³.
- Conductivity:
 - Minimum and maximum values measured during the past 24 hours;
 - Minimum and maximum values measured during the past week;
 - Dates on which was drained (automatically or manually) and the associated number of litres.
- Water lubrication:

- Number of litres of clean water for drain pump lubrication during the past week (per day);
- Number of litres of clean water for rinsing the circulation pump during the past week (per day).
- Power consumption:
 - Electricity consumption during the past week.
 - Electricity consumption per month during the past 8 months as well as the total value during the past year.
- Pressure sensor:
 - Minimum and maximum values measured during the past 24 hours, with the times at which these values occurred;
 - Minimum and maximum values measured during the past week.
 - Minimum and maximum values measured per week (during the past 2 months).
- Door contact:
 - The days and times at which the access door to the pressure chamber was opened and closed.
- Metering counters:
 - Display of total consumption of electricity, shaft rinsing circulation pump, shaft lubrication drain pump, water intake and drainage quantity.
 - Display of the times that the scrubber had system situation **Off**, **On** and **Maintenance**.

All values are valid since the commissioning of the air scrubber (or if a gauge has been replaced) and cannot be set to 0.

4.2.5 Setting the System situation

System situation needs to be manually selected, and that happens in the following manner:

- In the **Main menu**: enter company code and possibly personal access code.
- Go to menu **1 Air cleaner**:

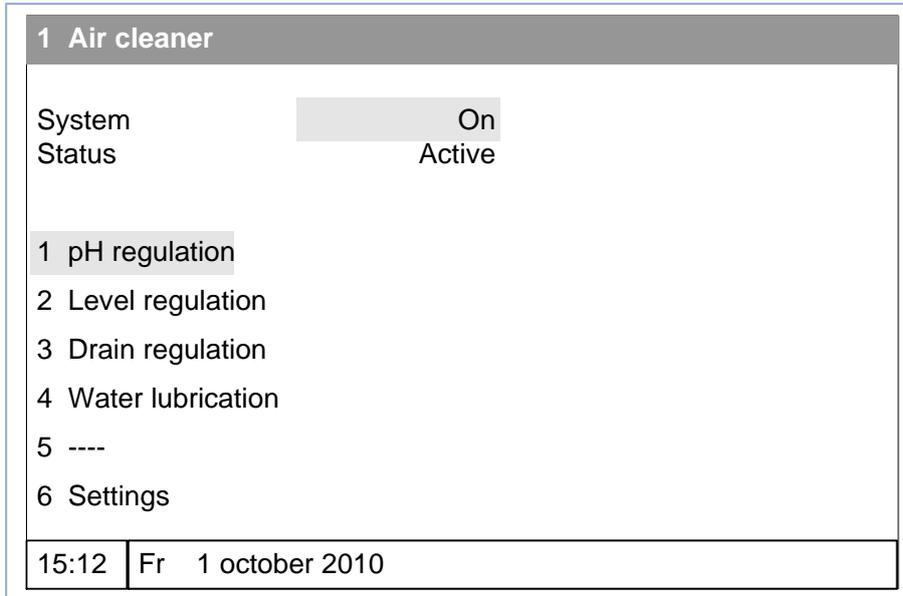


Figure 33: Menu-1 Air cleaner

- Handle [▼] or [▲] to move cursor after **[System]**.
- Press the green button [↵], cursor becomes transparent.
- Handle [▼] or [▲] till **[System]** shows the desired situation.
- Press [↵] to capture this situation.

4.3 Menu structure break-down (biological scrubber)

Figure 34 shows the menu structure break-down for the Biological Air Scrubber.

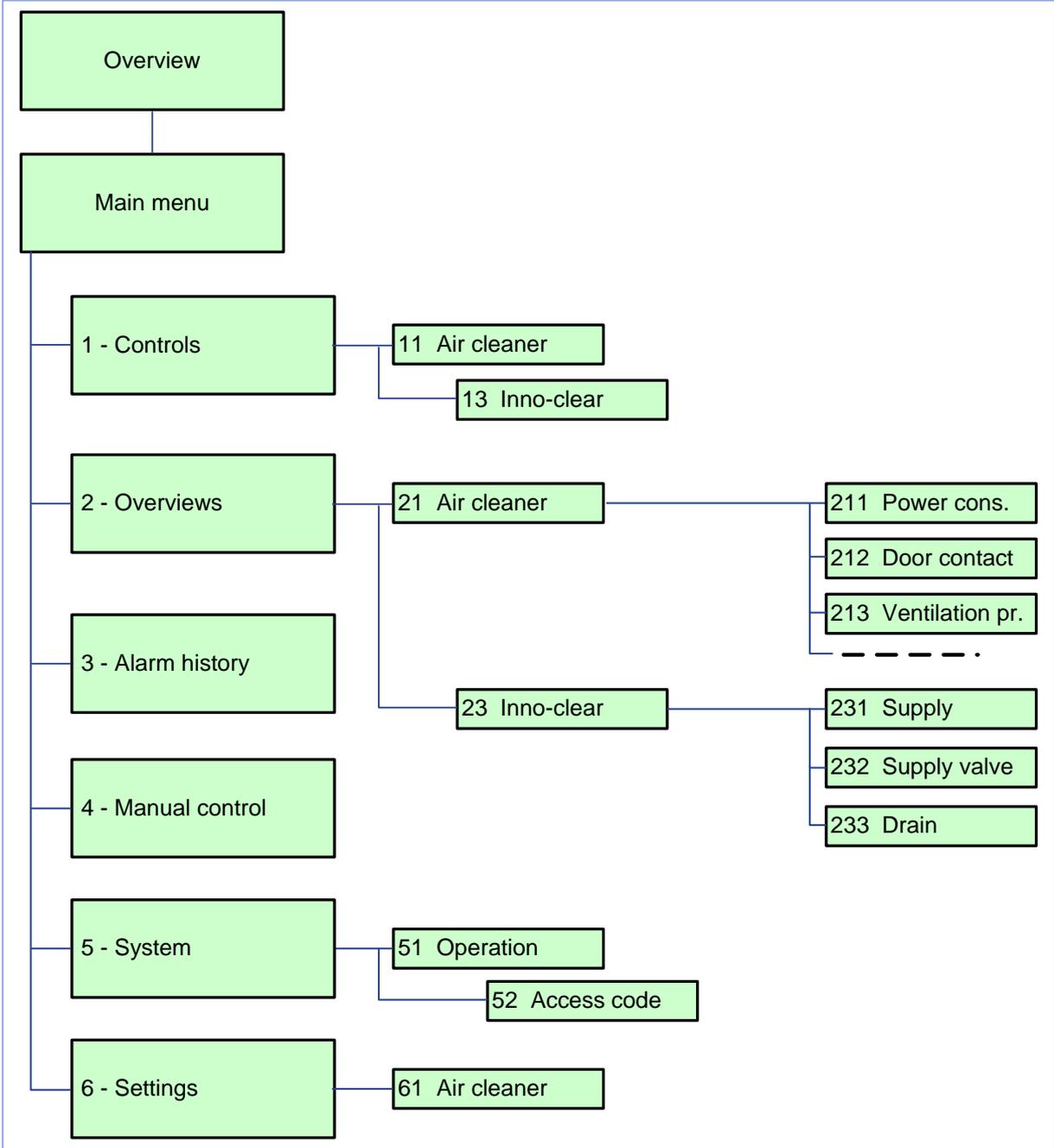


Figure 34: Control computer: menu structure break-down

4.3.1 Overview menu

The standard display menu is the **Overview** menu. It is displayed when no buttons have been pushed in a while, or if the user presses [**X**] several times.

Figure 35 shows this menu.

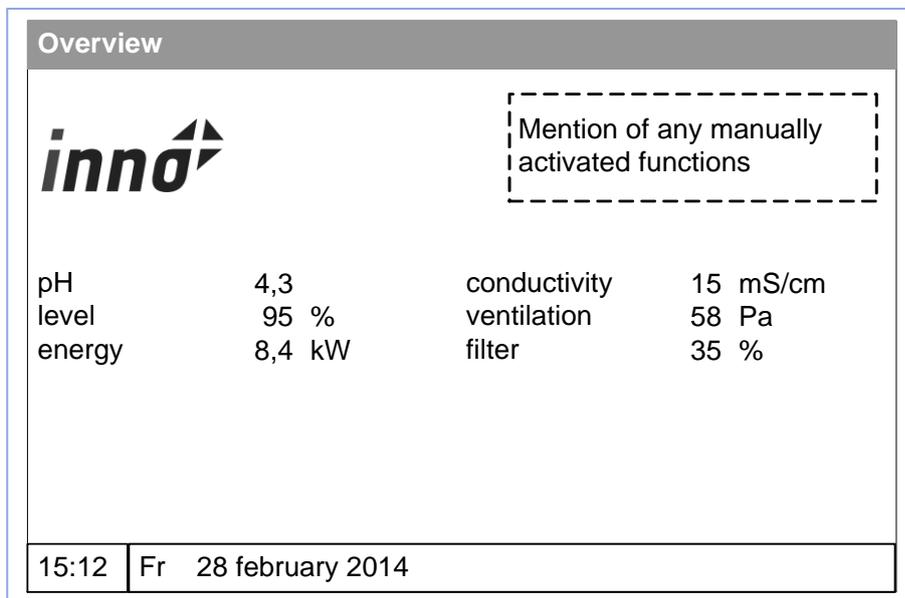


Figure 35: Overview menu

The **Overview** menu shows the following information:

pH

This shows the current acidity degree of the water in the water tank. During operation the pH value will be 6 or 7.

Level (%)

The reservoir water level. Normal values are:

- Cleaning: a control range of 95% - 105%;
- Drain: decreases to 0% - 10%.
- Fill: increases to about 95% - 105%.

If this value gets well above the control range (approx. 150%) the emergency floater is activated and the safety valve deactivated (alarm situation).

Energy [kW]

Current power consumption of all the components in the scrubber (pumps, electrical box, valve coils etc.) together. Value mainly depends on the number of pumps in operation.

Conductivity (mS/cm)

The current conductivity value; during the cleaning process, this value increases as a result of nitrification. Normal values are:

- Cleaning: increasing value, max. 20;
- Start Drain on value 20;
- Fill: Value from 5 if all cleaning water is replaced.

Ventilation (Pa)

The pressure difference over the filter pack. The value measured indicates the level of filter pack contamination.

Normal values:

- Status Active: between 0 and approx. 60 to 70 Pa.
- Alarm limit: 80 Pa

Filter

This is a value for the permeability of the water filter before the circulation pump.

- Clean filter: 100%
- As a result of pollution the percentage drops; at some point, the filter must be cleaned.

Press the [←] button to enter the **Main menu**.

4.3.2 Main menu

The **Main Menu** does not show actual content data, but is important to make a choice in relation to what one wants to view in detail.

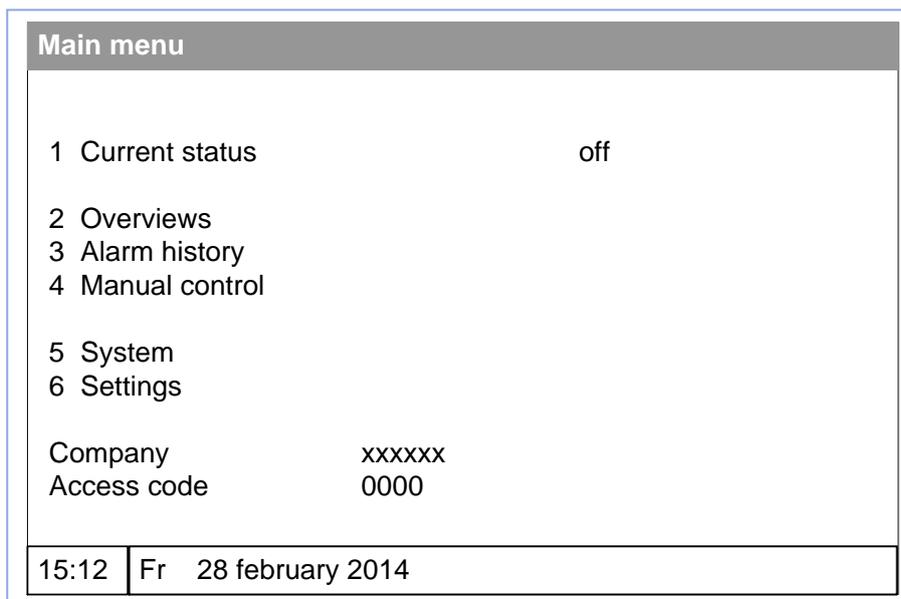


Figure 36: Main menu

The user can access the selected submenu by activating one of the shown menus (with the arrow and [←] buttons or by pressing a number) .

- **Current status:** Gives very briefly the general status of the scrubber (**On**, **Off** or **Maintenance**). By opening the submenu can be seen whether or not the alarm groups are on or off (see chapter 5). It is also possible to see how the processes have been set and the statuses of sensors, pumps etc. See also paragraph 4.3.3.

TIP

Off and **Maintenance** are identical situations, but are registered as individual statuses.

- **Overviews:** In this submenu the user can view various usage data. For more information, please read § 4.3.4.
- See chapter 5 for information on **Alarms**.
- To switch certain functions to **Manual control:** see § 4.4.
- **System** refers to the computer control mode, see § 4.5.
- **Settings:** This submenu allows the user to set the alarm level for the maximum ventilation pressure (= pollution of the filter package) (company code required).
- **Company:** a code needs to be entered here in order to be able to change certain settings. Company code is made available by Inno+.
- **Access code:** enter your personal access code (only applicable if the code has been registered by the main user, see § 4.6).

TIP

You do not need to enter the company code (and any access code) to open the menus and read out the system status or process values. However, you cannot change and/or save any settings if you do not enter the company code.

4.3.3 Viewing detailed status data

- Go to the **Main Menu**.
- Activate line **[1 Current status]**. Menu **1 Settings** is displayed. Alarm status of the main groups (alarm groups) is displayed here (see chapter 5).

1 controls	
Main alarm	On
on after	72:00
1 Air cleaner	On 
2 ----	---
3 Inno-clear	On
4 ----	---
15:12	Fr 28 february 2014

Figure 37: Menu for accessing detailed status data

- Activate one of the displayed lines to view the detailed status of this main group, namely:
 - 1 – Air cleaner, see paragraph 4.3.3.1,
 - 3 – Inno clear (option), see paragraph 4.3.3.2.

4.3.3.1 Submenu 11 Air cleaner

11 air cleaner	
Circulation pump	1
pump status	off
filter status	53 %
Cleaner pH	6,9 6,9
ventilation pressure	30 Pa
water level	95 %
supply flow	3,0 l/min
safety valve	open
supply valve	open
alarm	
15:12	Fr 28 february 2014

Figure 38: Menu-11 Air cleaner data

4.3.3.2 Submenu 13 Inno clear

13 Inno-clear	
State	----
conductivity	15 mS/cm
flow	0,3 l/min
drainage	1220 liter
alarm	
15:12	Fr 28 february 2014

Figure 39: Menu-13 Inno clear data

4.3.4 Overviews with consumption data

- Via menu **2 Overviews** (see Figure 40) the consumption data recorded per main group over longer periods can be viewed, namely:
 - 1 – Air cleaner, see paragraph 4.3.4.1,
 - 3 – Inno clear (option), see paragraph 4.3.4.2.

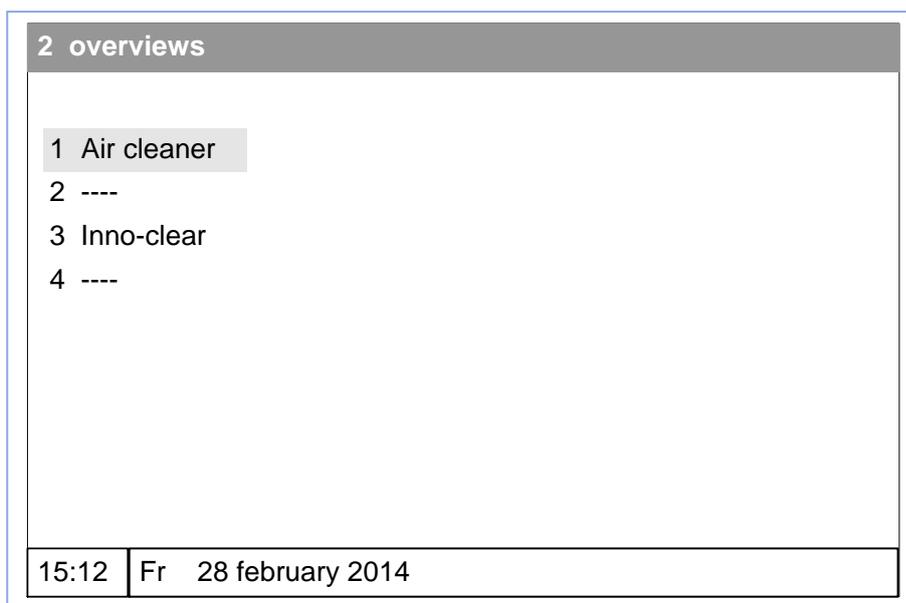
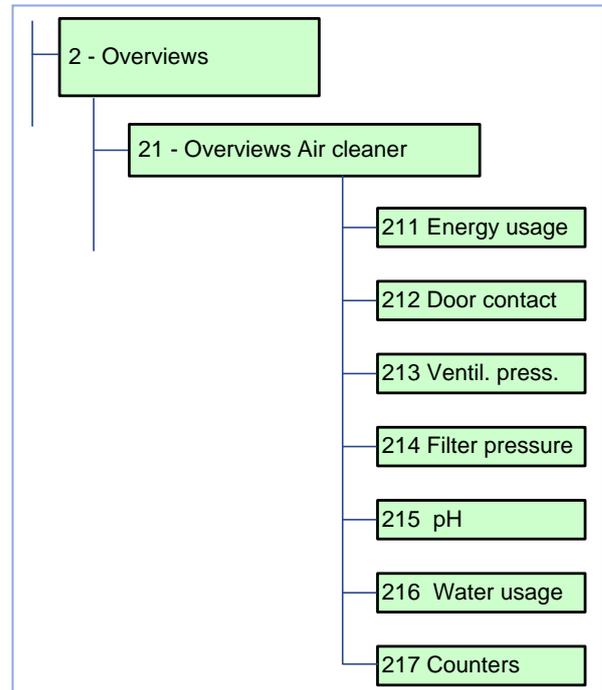


Figure 40: Menu-2 Overviews

4.3.4.1 Submenu-21 Air cleaner

These menus provide the user with long-term data on:

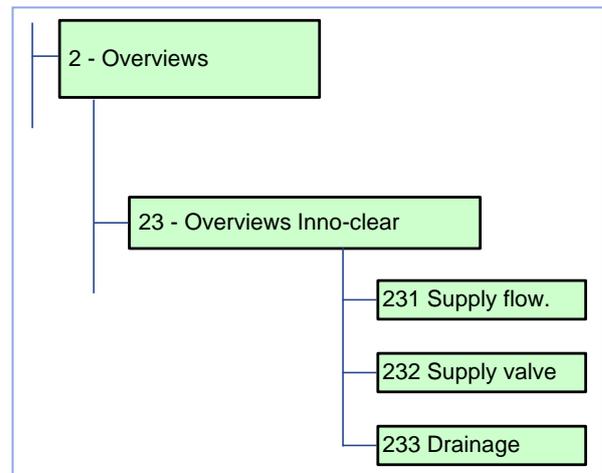
- Energy consumption:
 - Electricity consumption over the past week, and the total value for the past year.
 - Door contact:
 - Dates and times when the pressure chamber access door was opened and closed.
 - Ventilation pressure:
 - Minimum/maximum readings over the last 24 hours;
 - Minimum/maximum readings per day over the past week;
 - Minimum/maximum readings per week.
 - Filter pressure:
 - Minimum/maximum measured pressure drop over the water filter over the last 24 hours;
 - Minimum/maximum readings per day over the past week;
 - Minimum/maximum readings per week.
 - pH:
 - Minimum/maximum readings over the last 24 hours;
 - Minimum/maximum readings per day over the past week;
 - Minimum/maximum readings per week.
 - Water usage:
 - Daily consumption over the past week in m³;
 - Water consumption for the entire week in m³.
 - Metering counters:
 - Total **Maintenance** status duration, **Off** status duration, and **On** status duration.
 - Total energy consumption, water consumption and amount of drained water.
- All readings are recorded from the initial start-up of the Air Scrubber (or the moment a meter is replaced) and cannot be reset to 0.



4.3.4.2 Submenu-23 Innoclear

These menus provide the user with long-term data on:

- Supply flow:
 - Minimum/maximum amount of Innoclear processed over the last 24 hours;
 - Minimum/maximum readings per day over the past week;
 - Minimum/maximum readings per week.
- Supply valve (if applicable):
 - Minimum/maximum amount of cleaning water supplied to the Innoclear sedimentation tank over the last 24 hours;
 - Minimum/maximum readings per day over the past week;
 - Minimum/maximum readings per week.
- Drainage:
 - Conductivity: Minimum/maximum values over the last 24 hours, over the past week, and for the full week.
 - Draining water: The amount of drained water for the full week and for the full month.
 - Draining sessions: The dates of the (automatic or manual) draining sessions and corresponding amount of water (in litres).



4.4 Manual operation

4.4.1 General

Normally all pumps and valves are switched automatically based on measured values. In some cases it is recommended to manually bypass a function, i.e. to activate/deactivate it. From that moment, this function is no longer controlled automatically. Use the computer to control this function.

CAUTION

Manual activation/deactivation of functions can disrupt the Air Scrubber!

4.4.2 Manual function control

To manually activate/deactivate Air Scrubber functions:

- Go to the **Main menu**.
- Enter the company code and any personal access code.
- Navigate to line **[4 Manual control]**.
- Press [▼] to navigate to the right line (the cursor stays in the **[On / Off / Auto]** line).
- Press the green [↵] button. The cursor becomes transparent.
- Press [▼] to activate this setting.
- Press [↵] to confirm this setting.
- Press [X] to leave the menu.

ATTENTION

When one of the functions is manually activated or deactivated, the following text is displayed in the overview menu: **Manual computer** or **Manual extern**.

Figure 41 shows the manual operation menu.

WARNING

Carefully monitor the situation. Do not forget to switch all functions back to **Auto** afterwards!

4 Manual control			
Acid pump	Auto		
Drain pump	Aan		
Anti-foaming pump	Auto		
Water valve	Off		
Shaft flush circ. pump	Auto		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 2px;">15:12</td> <td style="padding: 2px;">Fr 1 october 2010</td> </tr> </table>		15:12	Fr 1 october 2010
15:12	Fr 1 october 2010		

Figure 41: Manual operation menu (example)

4.5 System settings

Open menu **5 System** to view a list of general data, namely:

- **Software details:** version and date of the software installed on the control computer.
- **Time, year, month, and day:** current time settings (only accessible with the main user's access code).

This menu enables you to adjust the parameters used to improve the use and readings of the computer:

- **Menu 51 Operation:** Language selection, display brightness, and backlighting duration.
- **Menu 52 Access code:** Create or change access codes, for more information see § 4.6.

4.6 Using and managing access codes

4.6.1 General

Anyone who wants to make or change any settings with the control computer is required to enter their company code, and must log in using their personal access code.

You can use the computer to create a large number of user access codes, so all people working with the system can have their own code. The personal access codes enable you to see who changed certain settings. There are two user types:

- Main user (owner): manages all codes;
- Sub-users (2 to 31): cannot change any codes.

The main user can change his or her own access code as well as the codes of all sub-users.

TIP

You do not need to enter the company code (or any access code) to open the menus and read out the system status or process values.

However, you cannot change and/or save any settings if you do not enter the company code.

4.6.2 Changing the main user access code

- Go to the **Main menu**.
- Go to [**Access code**] and enter your personal access code.
- Go to line [**5 System**].
- Go to line [**2 Access code**].
- Go to line [**2 Main user**].
- Press the green [↵] button. The cursor becomes transparent.
- Use the numeric buttons to enter the new code.
- Press [↵] to confirm this setting.
- Press [**X**] to leave the menu.

CAUTION

Be sure to remember the code! If you forget the code, you can no longer access certain parts of the system!

4.6.3 Setting/changing sub-user access codes

- Go to the **Main menu**.
- Go to [**Access code**] and enter the code of the main user.
- Go to line [**5 System**].
- Go to line [**2 Access code**].
- Go to line [**1 Users 2-31**].
- Use the [▼] button to navigate to the user in question.
- Press the green [↵] button. The cursor becomes transparent.
- Use the numeric buttons to enter the new code.
- Press [↵] to confirm this setting.
- Press [**X**] to leave the menu.

5. ALARMS

5.1 How to recognize an alarm situation

The air scrubber control system constantly monitors the entire installation to ensure proper operation. If one of the installation's components or controls malfunctions, an alarm is triggered.

In such a situation, depending on the severity of the malfunction/error, the air scrubber will either switch off or remain operational.

The user is notified of any occurring alarms in one of the following ways:

- The red alarm button LED on the computer goes on and stays on. The display shows the meaning of the alarm. For more information, see § 5.2.
- The red light **[Alarm]** goes on.
- Any connected extra alarm devices are activated (flashing light, buzzer).

ATTENTION

A flashing LED inside the alarm button indicates an alarm situation, however, this particular alarm group or the main alarm is inactive.

Therefore, the alarm is only indicated by this flashing button. For more information, please read § 5.2.

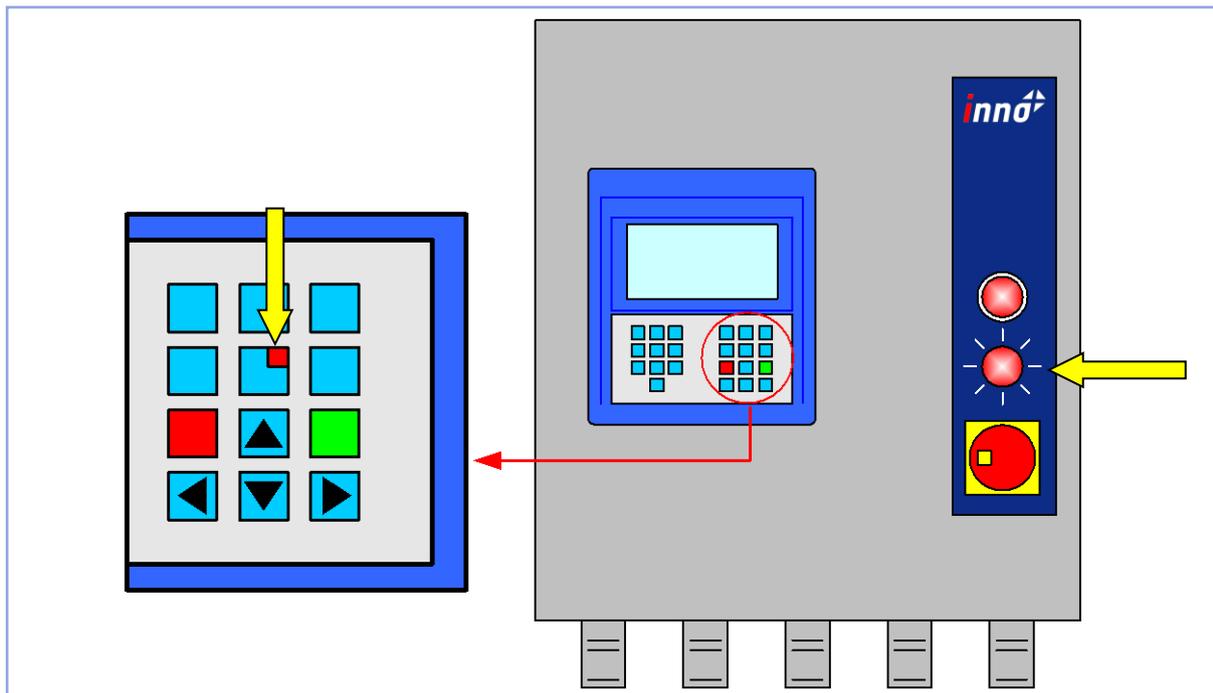


Figure 42: Alarm messages

§ 5.4 explains the individual alarms and alarm types and lists the required user actions.

All alarms are stored in the control system's memory. Old alarms are automatically deleted when the computer's memory reaches its storage limit.

See § 5.6 for information on how to view the alarm history.

5.2 Activating and deactivating alarms

The system has several alarm groups. They are active by default. This means:

- **Alarm group on:** any occurring errors in this alarm group are registered immediately and the red light goes on. In certain circumstances one of the pumps is deactivated or one of the supply valves is closed.
- **Alarm group off:** any occurring error situations in this alarm group are ignored. The entire system remains operational and the user is not notified about any error situations (apart from the flashing LED on the control computer).

All alarm groups are part of the **Main alarm**. The main alarm can be activated and deactivated as well. Therefore:

- **Main alarm on:** the system monitors the individual alarm groups; if they are all active, all occurring alarms are reported.
- **Main alarm off:** no alarms are reported.

Press the **[Alarm]** button to display the **Alarm Status**. The menu shows the alarm groups and corresponding status (on or off), see Figure 43.

If the **Main alarm** is off, the system indicates when it will be reactivated automatically. It goes without saying that the main alarm can always be activated manually.

ATTENTION

If the main alarm is deactivated, it is automatically re-activated after 3 days.

ATTENTION

A flashing LED in the alarm button indicates an alarm situation; however the main alarm or alarm group in question is inactive.

32 alarm status	
Main alarm	On on after 72:00
1 pH regulation	On
2 Level regulation	On 
3 Drain regulation	On
4 Water lubrication	OFF 
5 ----	
6 Pumps	OFF
7 Ventilation pressure	On
15:12 Fr 1 october 2010	

Figure 43: General alarm status (example)

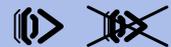
The example in Figure 43 shows the following:

- Alarm groups 1, 3 and 7 are active, but there are no errors.
- Alarm group 2 is active and an error has been detected (horn symbol). A general alarm message is generated.
- Alarm group 4 is not active, yet an error has occurred. The user is only made aware of the error by the flashing button on the computer.
- Alarm group 6 is off, there is no failure either.

To activate and deactivate the main alarm and individual alarm groups:

- In the **Main menu**: enter the company code and any personal access code.
- Press the **[Alarm]** button.
- Press **[▼]** to proceed to the desired row (the cursor stays in the **[On / Off]** row).
- To change a setting: press the green **[←]** button in the row in question. The cursor becomes transparent.
- Press **[▼]** to activate this setting.
- Press **[←]** again.
- Leave the menu by pressing **[X]**.

TIP



- The horn symbol indicates an active alarm in this alarm group.
- A crossed-out horn symbol indicates that this particular alarm group is off (however, an alarm is currently active).

5.3 Viewing an alarm

If an alarm occurs, view the computer to see the details:

- Press the **[Alarm]** button to display the **Alarm Status**. The activated alarm group now has an extra horn symbol.
- Press the corresponding numeric key to view this group's status.

The bottom row on the screen now shows an alarm description. Above it, you can see the current status of the individual components.

Figure 44.

ATTENTION

Remember to type in the company code first!

- Reset the alarm as described in § 5.5.

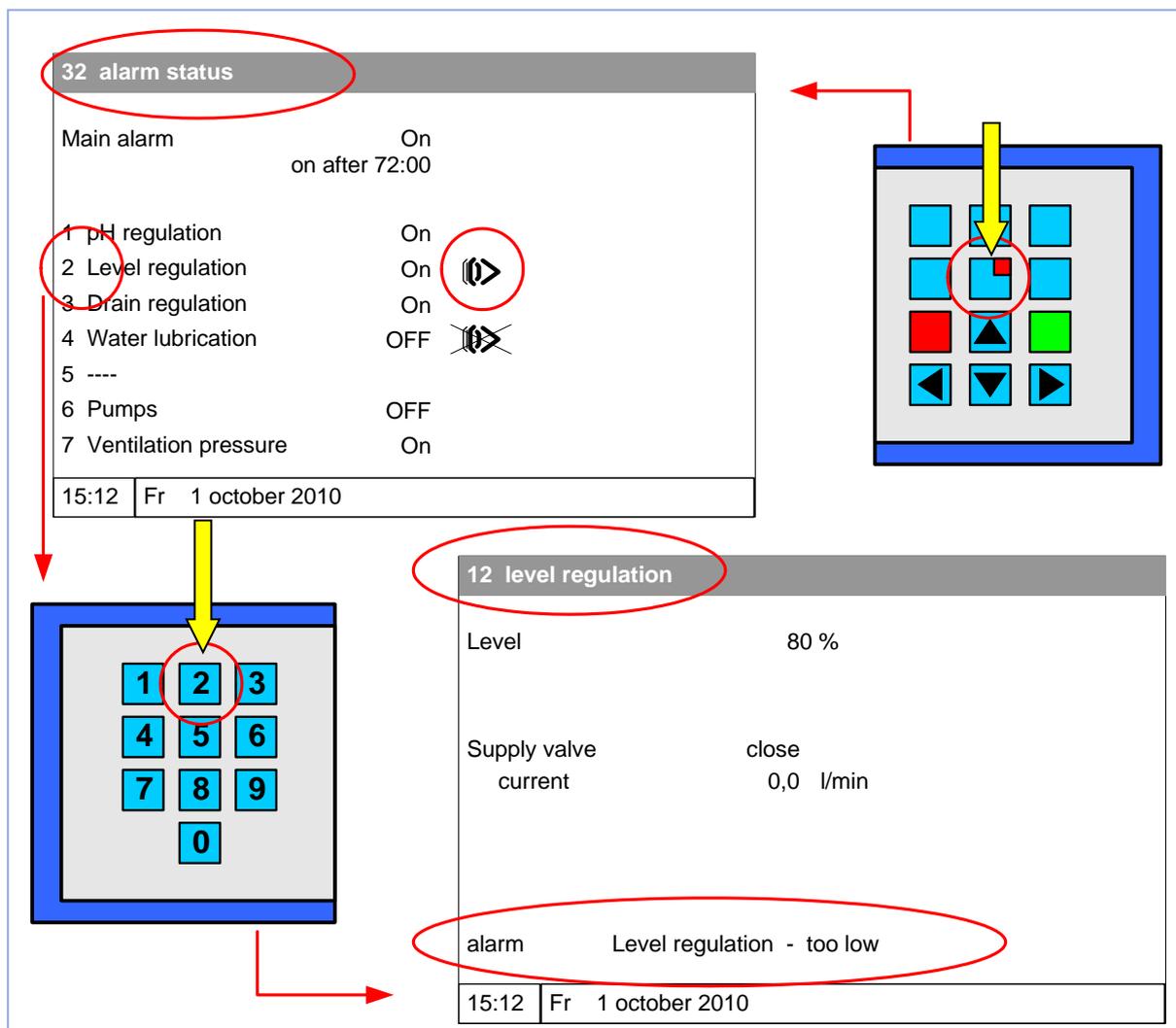


Figure 44: Viewing an alarm

5.4 List of potential alarms

The computer may report any of the below alarms. The list is in alphabetical order.

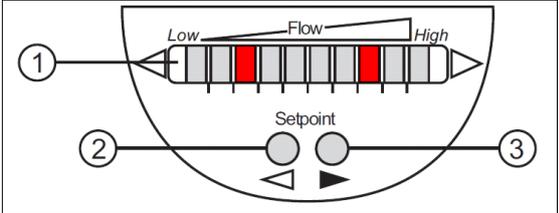
H: Alarms that require manual resetting (see § 5.5). All other alarms are deleted automatically once the problem causing the alarm is solved.

Message code and meaning	H	Consequence and required action
<p>Ventilation pressure - sensor Measured pressure difference over the filter package is out of the working range of the sensors.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ One of the two pressure sensors is faulty or not connected properly. 		<ul style="list-style-type: none"> ➤ Consult Inno⁺.
<p>Ventilation pressure - too high Measured pressure difference over the filter package is above the alarm limit (80 Pa).</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ Package is seriously polluted so that the air can no longer get through. 		<ul style="list-style-type: none"> ➤ Clean the filter package as soon as possible, see paragraph 6.6.
<p>pH-regulation – runtime Acid pump has been on for too long without interruption, without the cleaning water reaching correct pH.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Sulphuric acid container is empty. ▪ There is air in the acid line. ▪ Valve of the by-pass is closed, because of which the cleaning water cannot get to the pH-sensor. ▪ Acid pump is broken. ▪ This is a problem with the pH sensors. 	■	<ul style="list-style-type: none"> ➤ Check the acid container; replace if necessary. ➤ Vent the line (see end of paragraph 6.4.2). ➤ If there is a valve in the bypass, make sure that it is at least 10% open. ➤ If the problem is still not solved, please contact Inno⁺.
<p>pH regulation deviation The values indicated by both pH sensors are too far apart.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ One of both sensors is probably defective. 		<ul style="list-style-type: none"> ➤ Please consult Inno⁺ to recalibrate or replace the pH sensor.

Message code and meaning	H	Consequence and required action
<p>pH regulation - leakage Liquid has been found in the drip tray under the acid pump.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Tube connection not correct; ▪ Pump is defective. 		<ul style="list-style-type: none"> ➤ Clean the drip tray (read paragraph 2.5.2). ➤ Have the tube connections repaired by Inno+. ➤ At pump leakage: consult Inno+.
<p>pH regulation level too low The pH level stays below the set value for too long.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ The bypass flow valve is closed: the cleaning water cannot reach the pH sensor. ▪ The controls do not function properly. 		<ul style="list-style-type: none"> ➤ Open the bypass flow valve by 10%. ➤ If this does not solve the problem, please consult Inno+.
<p>pH regulation level too high The pH level stays above the set value for too long.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ The bypass flow valve is closed: the cleaning water cannot reach the pH sensor. ▪ The controls do not function properly. 		<ul style="list-style-type: none"> ➤ Open the bypass flow valve by 10%. ➤ If this does not solve the problem, please consult Inno+.
<p>Level control - valve During status Control safety valve is found that there is water flow.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ Safety valve is leaking. 	■	<ul style="list-style-type: none"> ➤ Consult Inno+.
<p>Level regulator - siphon The reservoir (master) level became so high that the emergency floater was activated, causing the safety valve to close.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ A large supply of external water (rain water, melt water, cleaning water). ▪ The water supply valve is defective; it stays open. ▪ The water level sensor is defective. ▪ The emergency floater is polluted. 	■	<p>The system does not take any more water. The circulation pumps function normally.</p> <ul style="list-style-type: none"> ➤ If external water has entered the reservoir, the reservoir must be partially drained. ➤ If the problem cannot be solved or if the problem keeps recurring, please contact Inno+.

Message code and meaning	H	Consequence and required action
<p>Level regulation - sensor The electric signal of the level sensor (radar) is out of range.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ The sensor is defective or a wire break has occurred. 		<ul style="list-style-type: none"> ➤ Contact Inno⁺.
<p>Level regulation - too high Water level in the tank rose above the maximum control limit.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ A large supply of external water (rain water, melt water, cleaning water). ▪ The water supply valve is defective; it stays open. ▪ The water level sensor is defective. 		<p>System does not take in water anymore and stops the acid supply. The circulation pumps function normally.</p> <ul style="list-style-type: none"> ➤ If external water has entered the reservoir, the reservoir must be partially drained. ➤ If the problem cannot be solved or if the problem keeps recurring, please contact Inno⁺.
<p>Level regulation - too low There is too little water in the reservoir.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Too much water evaporation / loss, yet no / insufficient water refilled. ▪ A large leak in the system. 		<ul style="list-style-type: none"> ➤ Make sure the main valve is open. ➤ If you are unable to solve the problem by opening the main valve, please contact Inno⁺.
<p>Level regulation - leak Water passes the closed water valve.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ (small) leak in the water valve. 	<ul style="list-style-type: none"> ■ 	<p>If this alarm occurs only sporadically it does not constitute a problem.</p> <ul style="list-style-type: none"> ➤ If this alarm occurs frequently, please contact Inno⁺.
<p>Level regulation – min.flow Insufficient water supply flow during filling.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ The water supply filter is clogged. ▪ The main valve is closed. ▪ Insufficient capacity water supply system. ▪ Water meter defective. ▪ Water supply valve defective. 	<ul style="list-style-type: none"> ■ 	<ul style="list-style-type: none"> ➤ Check the main valve and water supply system. ➤ Check and clean the water filter (see § 6.5). ➤ If the problem cannot be solved or if the problem keeps recurring, please contact Inno⁺.
<p>Air cleaner Circ.pump running dry Water level in the reservoir is too low, pump cannot suck water anymore.</p>		<ul style="list-style-type: none"> ➤ Check the main valve and water supply system. ➤ Contact Inno⁺.
<p>Air cleaner Circ.pump switched off Water level in the reservoir is too low. Even after restart pump can still not suck water.</p>	<ul style="list-style-type: none"> ■ 	<ul style="list-style-type: none"> ➤ Check the main valve and water supply system. ➤ Contact Inno⁺.

Message code and meaning	H	Consequence and required action
<p>Drainage runtime It takes too much time for the pump to drain the reservoir (4 hours).</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Drain pump defective or switched off thermally. ▪ Drain pump or system clogged. ▪ Level sensor defective. 	<ul style="list-style-type: none"> ▪ 	<p>Pump switches off, reservoir is not filled. Circulation pump will keep running, but cleaning water is already maximally polluted. It also has a neutral pH value, so that there is not enough ammonia absorption.</p> <p>➤ Please contact Inno+.</p>
<p>Drain regulation - sensor The electric signal of the conductivity sensor is not within range.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ The sensor is defective or a wire break has occurred. 		<p>➤ Please contact Inno+.</p>
<p>Drain regulation – min.flow The drain pump is active, but the measured flow is too low.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Drain pump defective or switched off thermally. ▪ Drain pump or system clogged. ▪ Level sensor defective. ▪ Drain flow meter defective. 	<ul style="list-style-type: none"> ▪ 	<p>➤ Please contact Inno+.</p>
<p>Water lubrication - min. flow Relevant pump has too little water flow for flushing the shaft.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Supply valve water lubrication failure. ▪ Water meter water lubrication failure. ▪ Supply fitting on pump is clogged. 	<ul style="list-style-type: none"> ▪ 	<ul style="list-style-type: none"> ▪ For the circulation pump(s) applies: pump also stays switched on in case of too little water lubrication. ▪ For drain pump applies: this pump switches off in case of too little water lubrication, to prevent damage. <p>➤ Consult Inno+.</p>
<p>Water lubrication - leak During a certain period of time a certain amount of water flowed through with valve closed.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> ▪ (Small) leakage in the water lubrication valve. 		<p>If this alarm occurs very occasionally, it does not indicate a problem.</p> <p>➤ If the problem occurs more frequently, please contact Inno+.</p>

Message code and meaning	H	Consequence and required action
<p>Pumps thermal</p> <p>One of the circulation pumps has overloaded and was switched off thermally. The motor protection switch in the technical room has switched off.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Pump damaged or seized up. ▪ Motor switch defective or configured incorrectly. 		<ul style="list-style-type: none"> ➤ Consult Inno+.
<p>Dry running protection</p> <p>Circulation pump delivers too little flow and is therefore deactivated.</p> <p>On the flow sensor two red LEDs have turned red.</p>  <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> ▪ Valve in the pressure line is closed; ▪ Reservoir is empty; ▪ Filter for the circulation pump is polluted; ▪ Sprinklers are clogged. 	<ul style="list-style-type: none"> ■ 	<ul style="list-style-type: none"> ➤ Turn the valve open, see paragraph 6.5.3; ➤ Check water level and inlet valve (manual valve); ➤ Clean filter, see section 6.5.3; ➤ Clean sprinklers, see paragraph 6.4.1.

5.5 Resetting the alarm manually

Some problems that generate an alarm are solved automatically overtime and then disappear from the menu. Other alarms must be reset manually. All potential alarms are explained in detail in the summary table in § 5.4.

To reset the alarms:

- In the **Main menu**: enter the company code and any personal access code.
- Press the **[Alarm]** button.
- Go to the **[On / Off]** column in the corresponding alarm row.
- Press the green **[←]** button. The cursor becomes transparent.
- Press **[▼]** to switch **off** the alarm group.
- Press **[←]**.
- Press **[←]** again. The cursor becomes transparent again.
- Press **[▼]** to switch **on** the alarm group.
- Press **[←]**.
- After 2 seconds, the alarm message is removed from the list (if the problem causing the alarm has been solved).

ATTENTION

Several alarms can occur at the same time. Therefore, once you have solved a problem that caused an alarm, another alarm message may appear on the screen.

5.6 Viewing the alarm history

You can view the 25 most recent alarms on the computer. To view the alarm history:

- Go to the **Main menu**.
- Go to row **[Alarms]**.
- Go to row **[Alarm history]**.
- The **[Latest alarms]** menu is shown. Any registered alarms are displayed in blocks, showing 2 alarms per page.
- Use the **[▼]** and **[▲]** buttons to view the other alarms.

Alarm 1 is the most recent alarm.

5.7 Too high water level alarm

If the emergency float is activated because the water level is too high, then the scrubber switches off (only the circulation pump remains active).

Also the light **[High water]** on the control cabinet turns on.

Handle this situation as follows:

- Examine the cause of the fault and solve it.
- Press **[Reset]** on the control cabinet.
- Switch the system **On** (from menu **1 Air cleaner**).

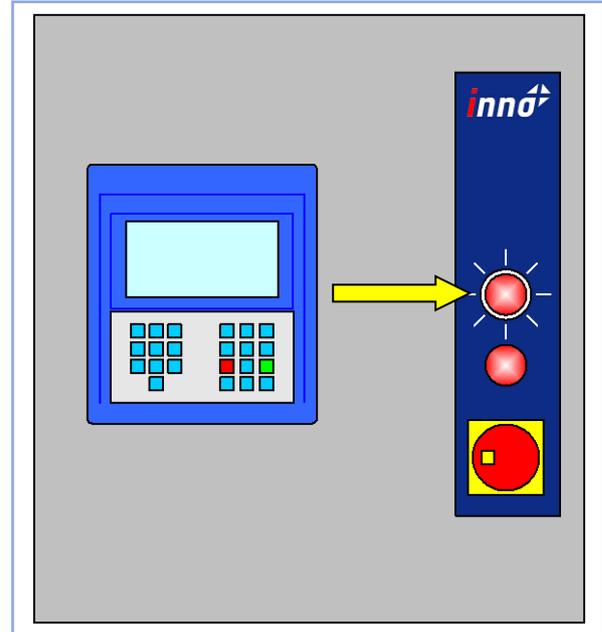


Figure 45: Too high water level alarm

6. MAINTENANCE AND PREVENTIVE MONITORING

6.1 Safety

Unless otherwise indicated: take into account the following when performing maintenance:

- Take any unused additives/residue to a depot for chemical waste, in conformity with local regulations.
- Any spilt additives must be removed immediately with special granules, as specified in § 2.5 and 2.6. Remove the used granules in accordance with local regulations.
- Keep in mind that fans are located in the direct vicinity of the Air Scrubber!

WARNING

Always wear the personal protective equipment specified in each section of this manual.

WARNING

Never flush sulphuric acid with water! If relatively little water is added to sulphuric acid this causes violent reactions!

6.2 Maintenance overview

Maintenance aspect	See	Weekly	Monthly	Annually
Check data registration	§ 6.3	■		
General inspection Air Scrubber (filter packs and sprinklers)	§ 6.4.1	■		
Check sulphuric acid	§ 6.4.2	■		
Check anti-foaming agent	§ 6.4.3	■		
Inspection safety equipment	§ 6.4.4	■		
Cleaning: technical room	§ 6.5.1		■	
Cleaning sensors	§ 6.5.2		■	
Cleaning: circulation pump filters	§ 6.5.3		■	
Other checks	§ 6.5.4		■	
Air Scrubber, full cleaning session	§ 6.6			■
Major overhaul by Inno+ (as per maintenance contract, if any)	---			■

6.3 Weekly control of data registration

A certain number of data of the scrubber is recorded every hour. User is obliged to check weekly if that functions correctly.

There are 2 registration systems available:

- System-A: Registration via the internet. Read more at paragraph 6.3.1.
- System-B: Registration on a Wlogger with SD card. Read more at paragraph 6.3.2.

6.3.1 Control data registration for internet-version

ATTENTION

Microsoft Internet Explorer may cause problems.

Mozilla Firefox has proven to work best. If you do not have it, you can freely download it on your PC (check europe.mozilla.org).

- On your PC: launch Mozilla Firefox.
- In the address line enter the internet address.
- Click **[Enter]**. A login menu will be displayed.
- Type the user name and password.
- Click **[Login]**.

Now you are on Inno+'s data server, and can view an overview of the data Inno+ has received from your scrubber computer.

On the next page is an example. It may take a few minutes for the whole list to be displayed.

- Check if today's or yesterday's date is in the list.
- If that is the case, then the registration functions properly.
- Close the menu.

ATTENTION

You received the following information from Inno+:

- Internet address;
- Username;
- Password.

User name and password are case-sensitive.




Figure 46: To access the registration data



Figure 47: Registration data on the server of Inno+ (example)

If you wish to save the recorded data yourself (for example, if a governmental body requests this), follow the instructions below:

- Carry out the operations of paragraph 6.3.1, so that your data will become visible.
 - Click the date field (A in Figure 47). A pop-up will appear, see Figure 48.
 - Enter start date (upper line) of the period for which you wish to have the data.
 - Enter end date (lower line).
 - Click [➡].
 - Click [Chart], above the table (B in Figure 47). A chart will appear regarding the set period (Figure 49).
-
- In the list (to the right of the chart) check the boxes of the data to be displayed in the chart.
 - If necessary, click [Table] (B) to return to the table of Figure 47.

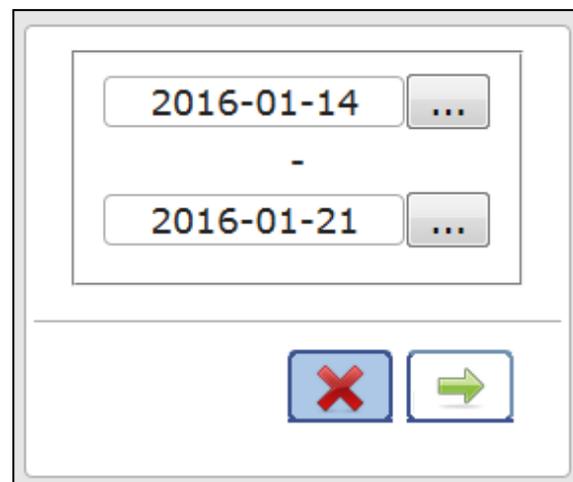


Figure 48: Set period

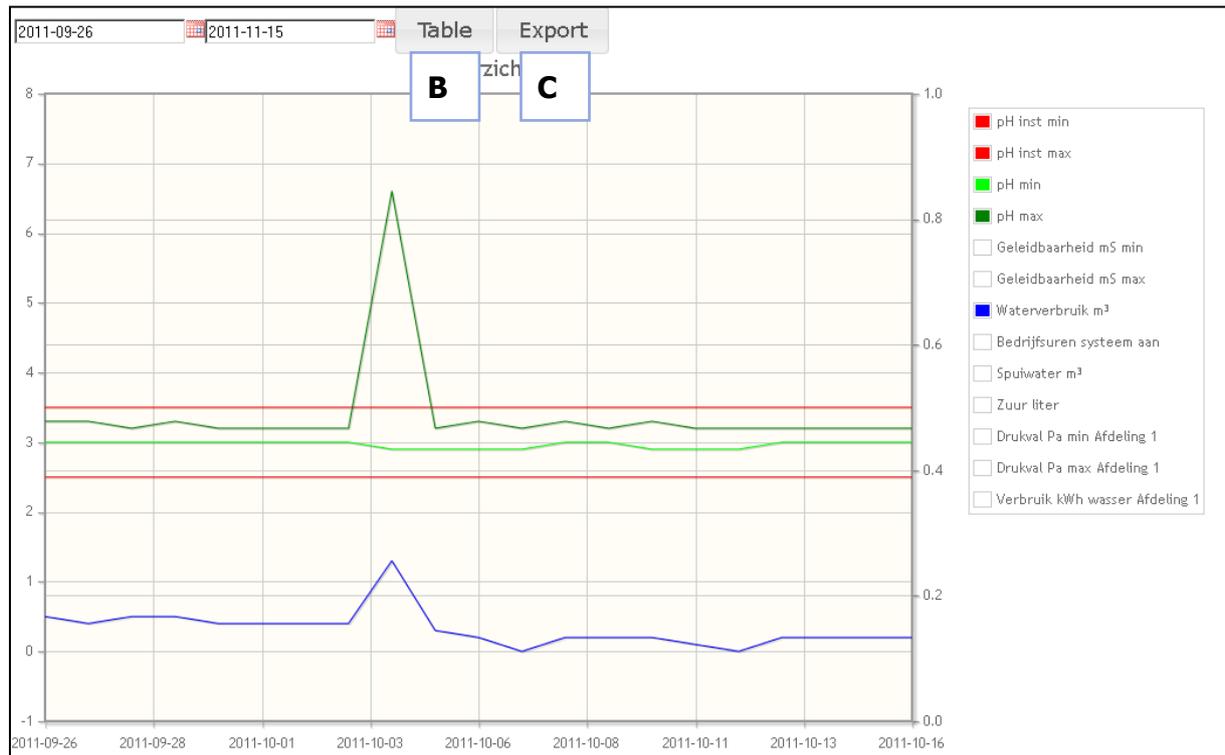


Figure 49: Example chart

To save the data: Click **[Export]** (C). A menu is displayed with the following selection:

- Open in Excel. Click this option and click **[OK]**. Microsoft Excel opens and shows the data in the spreadsheet. Save the file if desired.
- Save file. Click this option and click **[OK]**. The data is saved as *.csv file in the download folder on your PC (or choose a different location).

ATTENTION

Opening in Excel is of course only possible if Excel has been installed on your PC.

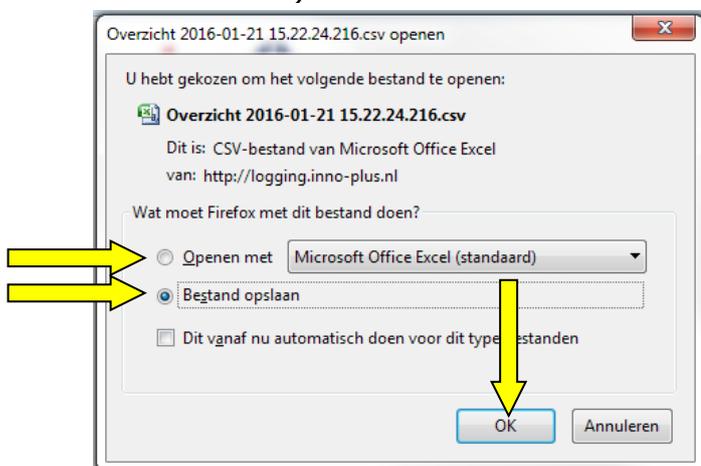


Figure 50: Export data to your own PC

6.3.2 Control data registration for W-logger

The Wlogger has been mounted in a separate box, in or near the control cabinet.

- Check whether logger's green light is on.
- If not, find out why registration does not take place. Possible causes are:
 - Supply voltage is not enabled;
 - Automatic circuit breaker failed;
 - No SD card is present, or it has not been pushed far enough into the PLC;
 - SD card is not right.

LET OP

If the green light is not on, then nothing can be recorded.
Contact Inno+ if the registration can be restored!

Every month a new Excel file will automatically be created on the SD card.

Check if that functions properly, as follows:

- Open the logger cabinet.
- Press gently on the SD card, so that it comes up.
- Take the SD card out of PLC.
- Close logger cabinet.
- Place SD card in a computer running Microsoft Excel.
- Open the most recent file (see Figure 52 for an example).
- Check if past week's data have been added per day (pH, conductivity, drainage quantity, clean water supply, power consumption and pressure drop over the packages).



Figure 51: Wlogger with SD card

ID	PLC MAC ID	Datum	Tijd	pH1	Geleidbaarheid 1 (mS)	Spuiwater 1 (m3)	Waterverbruik 1 (m3)	Electrisch vermogen 1 (kWh)	Drukval waspakket 1 (Pa)
13511	00:30:DE:02:74:48	08-05-2015	08:33:55	6.1	219	0.017	0.011	0.020	1
13510	00:30:DE:02:74:48	08-05-2015	08:33:45	6.1	219	0.017	0.010	0.018	1
13509	00:30:DE:02:74:48	08-05-2015	08:33:35	6.1	219	0.017	0.009	0.016	1
13508	00:30:DE:02:74:48	08-05-2015	08:33:25	6.1	219	0.017	0.008	0.015	1
13507	00:30:DE:02:74:48	08-05-2015	08:33:15	6.1	219	0.017	0.008	0.013	1
13506	00:30:DE:02:74:48	08-05-2015	08:33:05	6.1	219	0.017	0.007	0.011	1
13505	00:30:DE:02:74:48	08-05-2015	08:32:55	6.1	219	0.009	0.006	0.010	1
13504	00:30:DE:02:74:48	08-05-2015	08:32:45	6.1	219	0.009	0.005	0.009	1
13503	00:30:DE:02:74:48	08-05-2015	08:32:35	6.1	219	0.009	0.004	0.006	1
13502	00:30:DE:02:74:48	08-05-2015	08:32:25	6.1	219	0.009	0.003	0.005	1
13501	00:30:DE:02:74:48	08-05-2015	08:32:15	6.1	219	0.009	0.002	0.004	1

Figure 52: Example of a registration file

If you wish to save the recorded data yourself (for example, if a governmental body requests this), this can be done in the following ways:

- Save the file as pdf;
- Print the file;
- Make a copy of the Excel file for your own network.

Make Datalogger ready for use again:

- Take the SD card out of the computer and put it back into the Wlogger.
- Push the SD card in, so that it stays flush in the card reader.
- Close logger cabinet.
- Check if logger's green light is on.

ATTENTION

- Make a copy of the stored data for your own administration at least 1x per month.
- In the PLC of the logger the data for the past 12 months is kept.
- If the data on the SD card get lost or changed, they will automatically be re-stored as soon as the card is placed into the logger again.

6.4 Weekly inspection and maintenance of the scrubber

6.4.1 Viewing the overall status and quick cleaning

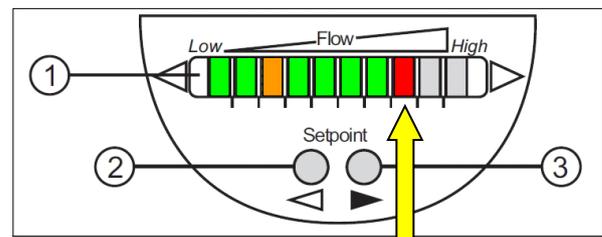


Figure 53: Air Scrubber inflow section clean or extremely contaminated

Check both the inflow and outflow section of the Air Scrubber. Check the following:

- Is there excessive foaming in the cleaning water?
- Can you see any slime and/or dust deposits on the packs?
- Is the water evenly distributed over the packs?
- Are water distribution bins blocked, which makes the water gush over it?
- Check the package sprinklers and primary sprinklers. Are they clogged?
- Check the water reservoir for excessive contamination; particles larger than 5 mm must be removed (they can damage the pumps).
- Check the flow sensor. If there is a red LED, then there is less circulation. Clean the filter and sprinklers.

To ensure the Air Scrubber is kept in good condition, it is vital that you regularly clean it superficially, once a week for example. Be sure to wash off any caked dirt sticking to the packs. You can carry out this cleaning procedure while the system is operational. It improves the cleaning quality, increases the life span, and improves the working environment. It also prevents many malfunctions and faults. Make a note of your findings on the weekly registration list.



ATTENTION!

Monitor the overall status of the Air Scrubber approximately 2x a day, at first. After a while, you may want to decide to monitor only 1x a week, based on your own experiences and insights.

Clean the scrubber superficially as follows:

CAUTION

- Never use a high-pressure cleaner or a steam cleaner; this can damage the packages. Always use a maximum water pressure of approx. 10 bar.
- Do not step on the pipes.

WARNING

- Always wear the personal protective equipment described in § 2.4.4.
- A 2nd person must be present, to come to the rescue if the 1st person should become unwell. The 2nd person must not get under the packages during the operations, and must be able to call for external aid really fast.

Preparation:

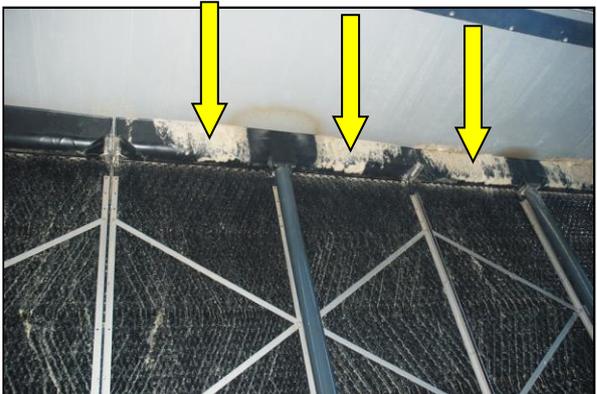
No.	Description	Photo
<p>1.</p>	<ul style="list-style-type: none"> ➤ Enter in the Main menu the company code and possibly personal access code. ➤ Go to menu 4 - Manual control. ➤ Switch water valve Off, so that the reservoir will no longer be filled up automatically. ➤ Switch drain pump On to drain the reservoir. ➤ Switch drain pump off as soon as the reservoir is empty. 	
<p>2.</p>	<ul style="list-style-type: none"> ➤ Switch the scrubber Off (see paragraph 6.7.1). ➤ Also switch main switch off and make sure nobody else can switch the switch on again. 	
<p>3.</p>	<p>➤ Wait until all water has drained from the packages.</p> <p style="text-align: center;"><u>WARNING:</u></p> <p>Never go under the packages when the scrubber is still in operation or when there is still water dripping from it!</p>	

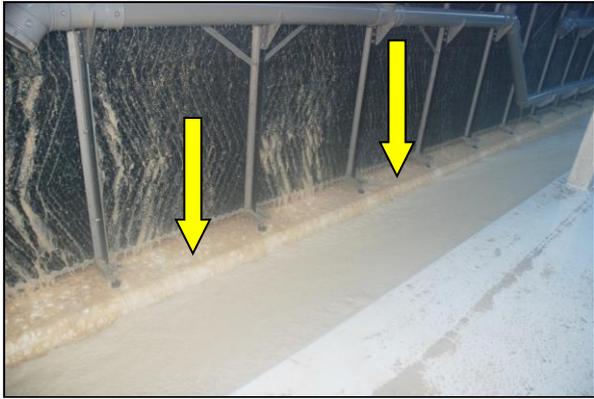
Systems with horizontal cleaning packages:

No.	Description	Photo
1.	<ul style="list-style-type: none"> ➤ We recommend using a water connection with Geka coupling, if available. 	
2.	<p>Top:</p> <ul style="list-style-type: none"> ➤ Clean the filter packs with a steady spout. ➤ Hose down all sprinklers. <p>Caution: Use plenty of water at a low pressure. Keep at a safe distance from the packages. The packs can break if they are hit too hard.</p>	
3.	<p>Bottom:</p> <ul style="list-style-type: none"> ➤ Spray away any dirt from the filter packs. ➤ Here, too, use plenty of water and only use low pressure. 	

No.	Description	Photo																								
4.	<ul style="list-style-type: none"> ➤ Carefully clean the primary sprinklers. 																									
5.	<ul style="list-style-type: none"> ➤ Hose away any excessive dirt from the floor underneath the packs. ➤ Separate hard, coarse dirt from the water. 																									
6.	<p>All this extra rinse water increases the reservoir water level. An alarm is generated if it reaches the maximum level.</p> <ul style="list-style-type: none"> ➤ Manually drain the water to restore the reservoir level and remove the contaminated water. ➤ Go to menu 4 - Manual control, start the drain pump and open the drain valve. ➤ Do not forget to deactivate the drain pump and close the valve afterwards. <p>Attention: all dirt and solid bits must be drained from the system.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th colspan="4" style="text-align: left; padding: 2px;">4 Manual control</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">supply valve</td> <td style="padding: 2px;">Auto</td> <td style="padding: 2px;">Safety valve</td> <td style="padding: 2px;">Auto</td> </tr> <tr> <td style="padding: 2px;">circ. pump 1</td> <td style="padding: 2px; background-color: #cccccc;">Auto</td> <td></td> <td></td> </tr> <tr> <td style="padding: 2px;">drain valve</td> <td style="padding: 2px;">Auto</td> <td></td> <td></td> </tr> <tr> <td style="padding: 2px;">inno-clear</td> <td style="padding: 2px;">Auto</td> <td style="padding: 2px;">Eimo-food</td> <td style="padding: 2px;">Auto</td> </tr> <tr> <td colspan="4" style="padding: 2px;">15:12 Fr 28 february 2014</td> </tr> </tbody> </table>	4 Manual control				supply valve	Auto	Safety valve	Auto	circ. pump 1	Auto			drain valve	Auto			inno-clear	Auto	Eimo-food	Auto	15:12 Fr 28 february 2014			
4 Manual control																										
supply valve	Auto	Safety valve	Auto																							
circ. pump 1	Auto																									
drain valve	Auto																									
inno-clear	Auto	Eimo-food	Auto																							
15:12 Fr 28 february 2014																										

Systems with vertical cleaning packages:

No.	Description	Photo
1.	<ul style="list-style-type: none"> ➤ It is preferable to use the Geka coupling water connection, which is standard provided by Inno+ (for module systems). 	
2.	<p>Pressure chamber side:</p> <ul style="list-style-type: none"> ➤ Hose off the rough pollution from the filter packages. ➤ Hose away the excessive debris from the floor. 	
3.	<p>Outflow side:</p> <ul style="list-style-type: none"> ➤ Hose the dirt off the water distribution basins. 	
4.	<ul style="list-style-type: none"> ➤ Hose off stuck debris from the filter packages. 	

No.	Description	Photo																								
<p>5.</p> <ul style="list-style-type: none"> ➤ Hose away any excessive dirt from the floor underneath the packs. ➤ Separate hard, coarse dirt from the water. 																										
<p>6.</p> <p>All this extra rinse water increases the reservoir water level. An alarm is generated if it reaches the maximum level.</p> <ul style="list-style-type: none"> ➤ Manually drain the water to restore the reservoir level and remove the contaminated water. ➤ Go to menu 4 - Manual control, start the drain pump and open the drain valve. ➤ Do not forget to deactivate the drain pump and close the valve afterwards. <p>Attention: all dirt and solid bits must be drained from the system.</p>		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th colspan="4" data-bbox="831 725 1420 757">4 Manual control</th> </tr> </thead> <tbody> <tr> <td data-bbox="831 779 986 806">supply valve</td> <td data-bbox="1007 779 1054 806">Auto</td> <td data-bbox="1158 779 1267 806">Safety valve</td> <td data-bbox="1331 779 1378 806">Auto</td> </tr> <tr> <td data-bbox="831 813 943 840">circ. pump 1</td> <td data-bbox="1007 813 1054 840">Auto</td> <td></td> <td></td> </tr> <tr> <td data-bbox="831 846 932 873">drain valve</td> <td data-bbox="1007 846 1054 873">Auto</td> <td></td> <td></td> </tr> <tr> <td data-bbox="831 909 927 936">inno-clear</td> <td data-bbox="1007 909 1054 936">Auto</td> <td data-bbox="1158 909 1251 936">Eimo-food</td> <td data-bbox="1331 909 1378 936">Auto</td> </tr> <tr> <td colspan="4" data-bbox="831 1081 1420 1108">15:12 Fr 28 february 2014</td> </tr> </tbody> </table>	4 Manual control				supply valve	Auto	Safety valve	Auto	circ. pump 1	Auto			drain valve	Auto			inno-clear	Auto	Eimo-food	Auto	15:12 Fr 28 february 2014			
4 Manual control																										
supply valve	Auto	Safety valve	Auto																							
circ. pump 1	Auto																									
drain valve	Auto																									
inno-clear	Auto	Eimo-food	Auto																							
15:12 Fr 28 february 2014																										

6.4.2 Inspection/replacing sulphuric acid

Replace an empty sulphuric acid tank in accordance with the following procedure.

WARNING

Sulphuric acid container must be located at least 2 metres from the emergency shower. Namely, then no water droplets from the shower can get to the acid. On the floor there must be markings to this end.

WARNING

Wear prescribed personal protective equipment (see paragraph 2.4.2):

- Face shield combination with respiratory protection;
- Suitable gloves;
- Corrosion-resistant clothing.

ATTENTION

Refer to paragraph 2.5.2 for instructions regarding the disposal of spills of sulphuric acid.

No.	Description	Photo
1.	<ul style="list-style-type: none"> ➤ Place a new container as close as possible to the empty container. ➤ Container must be flat on the floor, so not on a pallet or any other platform! 	
2.	<ul style="list-style-type: none"> ➤ If present, remove the protective caps from the couplings. ➤ Disconnect the quick couplers from the empty container. ➤ Connect hoses to the new container. 	

No.	Description	Photo																								
<p>3.</p>	<ul style="list-style-type: none"> ➤ Remove the cover from the acid pump. ➤ Visually check for sulphuric acid in the drip tray underneath the pump. ➤ Replace the cover. <p>If there is a leakage:</p> <ul style="list-style-type: none"> ➤ Read paragraph 2.5.2 for cleaning up of the sulphuric acid. ➤ Contact Inno+ to have the leakage repaired. 																									
<p>4.</p>	<p>Control computer:</p> <ul style="list-style-type: none"> ➤ Go to Main menu and enter company code and possibly personal access code. ➤ Go to menu 215 – Acid usage. ➤ In the top line enter under kg the net acid weight of the new container. 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: left; background-color: #cccccc;">215 acid usage</th> </tr> <tr> <th style="text-align: left;">Date</th> <th style="text-align: left;">Time</th> <th style="text-align: left;">Kg</th> <th style="text-align: left;">Kg / day</th> </tr> </thead> <tbody> <tr> <td>27-01-2011</td> <td>13:47</td> <td style="background-color: #cccccc;">800</td> <td>-----</td> </tr> <tr> <td>18-11-2010</td> <td>08:30</td> <td>800</td> <td>21</td> </tr> <tr> <td>04-10-2010</td> <td>12:00</td> <td>800</td> <td>18</td> </tr> <tr> <td>25-08-2010</td> <td>16:50</td> <td>600</td> <td>0</td> </tr> </tbody> </table> <p style="font-size: small; margin-top: 5px;">15:12 Th 27 January 2011</p>	215 acid usage				Date	Time	Kg	Kg / day	27-01-2011	13:47	800	-----	18-11-2010	08:30	800	21	04-10-2010	12:00	800	18	25-08-2010	16:50	600	0
215 acid usage																										
Date	Time	Kg	Kg / day																							
27-01-2011	13:47	800	-----																							
18-11-2010	08:30	800	21																							
04-10-2010	12:00	800	18																							
25-08-2010	16:50	600	0																							

WARNING

It is important to replace the cover. If there is a leak or a fault in the pump, this cover blocks any splashes.

6.4.3 Replacing anti-foaming agent

Replace an empty tank of anti-foaming agent in accordance with the following procedure.

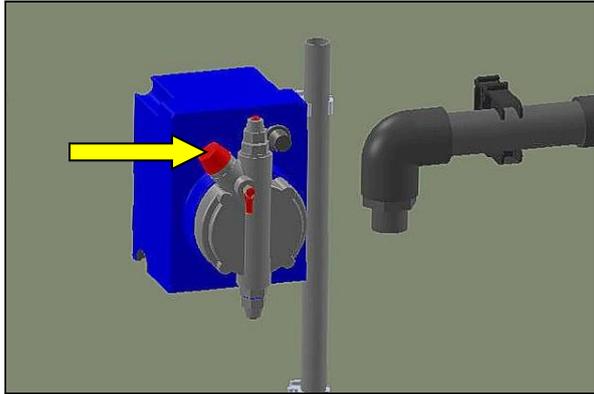
WARNING

Wear prescribed personal protective equipment (see paragraph 2.4.3):

- Safety glasses with side shields;
- Suitable gloves;
- Corrosion-resistant clothing.

ATTENTION

Refer to paragraph 2.6 for instructions regarding the disposal of spills of sulphuric acid.

No.	Description	Photo
<p>1.</p>	<ul style="list-style-type: none"> ➤ Place a new container as close as possible to the empty container. ➤ Unscrew the cap of the new container. ➤ Replace the suction hose from the empty container into the full container. 	
<p>2.</p>	<p>If the hose drained completely, it may be that the pump cannot suck from the container anymore. Then do the following:</p> <ul style="list-style-type: none"> ➤ Turn open the knob. ➤ Via manual control switch on the anti-foaming pump. ➤ Wait till the pump head is filled with liquid. The liquid passes through the other hose back into the container. ➤ Close the knob again. ➤ Switch the pump back to Auto. 	

6.4.4 Safety equipment inspection

No.	Description	Photo
<p>1.</p>	<ul style="list-style-type: none"> ➤ Check the proper operation of the emergency shower. ➤ Make sure that the supply valve is open! 	
<p>2.</p>	<ul style="list-style-type: none"> ➤ If available: Check the contents of the safety cabinet. 	

6.5 Monthly maintenance

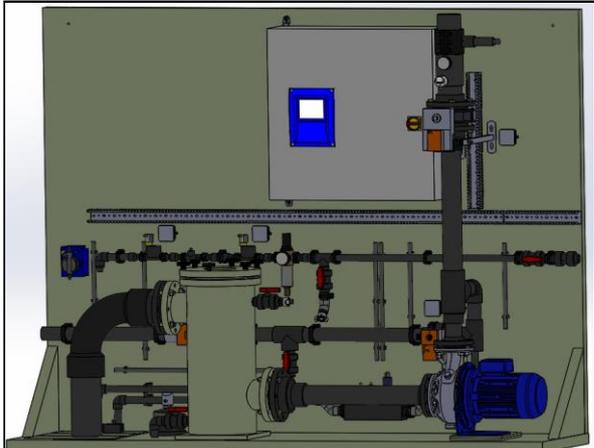
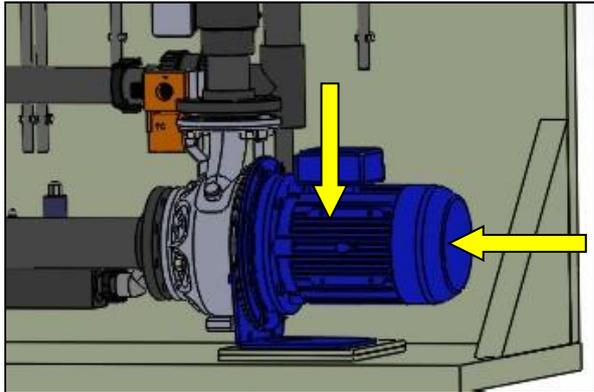
6.5.1 Cleaning the technical room

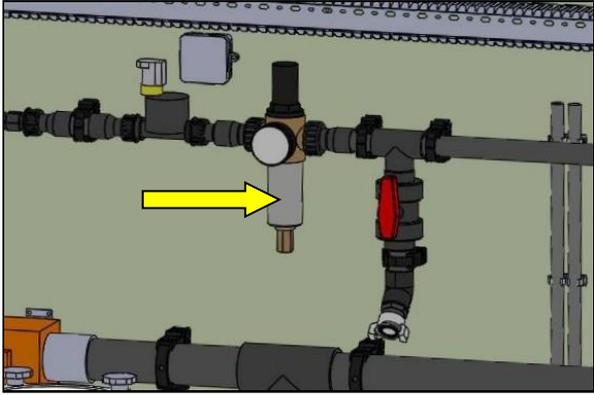
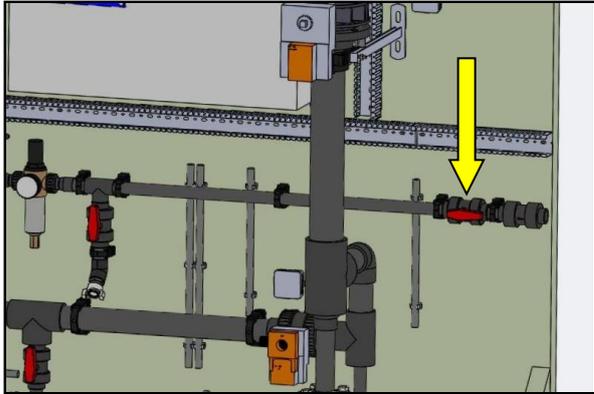
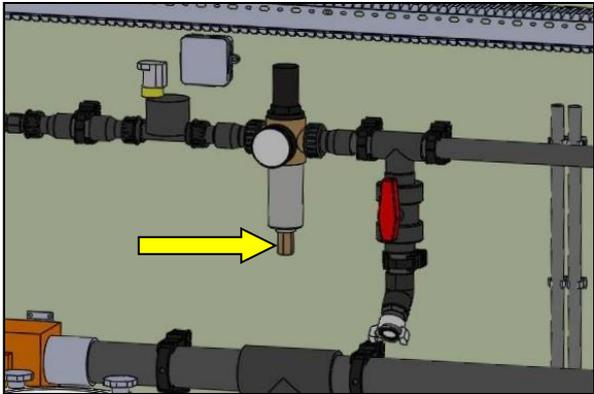
WARNING

Keep both feet firmly on the ground. Remember, the frames and pipes are wet. They can be very slippery!

CAUTION

- Do not use a high pressure scrubber, steam scrubber or water hose.
- Keep the control cabinet locked at all times.
- Keep all electrical components and motors dry.
- Do not step on the pipes.

No.	Description	Photo
1.	<ul style="list-style-type: none"> ➤ Clean the technical room using a damp cloth and a soft brush. ➤ Dry any wet components immediately. ➤ Clean up any spilt chemicals in accordance with the safety precautions stated in chapter 2. ➤ Check the pipe system for any leakage. Leaks must only be repaired by qualified staff. 	
2.	<ul style="list-style-type: none"> ➤ Check the ribs and intake grille of the pump motors for any excessive dust. Wipe them clean with a brush. 	

No.	Description	Photo
3.	<ul style="list-style-type: none"> ➤ Check the water filter for contamination. ➤ If the element is dirty, clean it as follows: 	
3.a	<ul style="list-style-type: none"> ➤ Close the mains (position-9 in the process diagram, see Figure 21). 	
3.b	<ul style="list-style-type: none"> ➤ Hold a bucket underneath the water filter. ➤ Open the valve underneath the water filter to release the residual pressure (see arrow). ➤ Use the included synthetic spanner to loosen the filter breaker. ➤ Clean the element with a fine brush and warm water. ➤ Place back the element and mount the filter cup. ➤ Close the valve underneath the water filter. ➤ Open the mains. (see step 3a). 	

6.5.2 Cleaning the sensors

No.	Description	Photo
<p>1.</p>	<ul style="list-style-type: none"> ➤ In menu 1 - Air cleaner set the system to Maintenance. 	<p>The screenshot shows a menu titled '1 air cleaner'. Under 'System Status', the 'Maintenance' option is highlighted with a grey background and a yellow arrow pointing to it. Below this, there is a list of options: '1 pH-regulation', '2 Level regulation', '3 Drain regulation', '4 Water lubrication', '5 ----', and '6 Settings'. At the bottom, the time '15:12' and date 'Fr 1 october 2010' are displayed.</p>
<p>2.a</p>	<p>pH sensors:</p> <ul style="list-style-type: none"> ➤ Loosen the swivel. 	<p>A 3D diagram of a manifold with two pH sensors. A yellow arrow points to the swivel joint of the leftmost sensor, indicating the point where it should be loosened.</p>
<p>2.b</p>	<ul style="list-style-type: none"> ➤ Remove the sensors. ➤ Clean them with a damp cloth. <p>Careful! pH sensors are made of glass, and are fragile!</p>	<p>A 3D diagram of the same manifold as in 2.a. Two red arrows point upwards from the top of each pH sensor, indicating the direction to pull them out of the manifold.</p>

No.	Description	Photo
<p>2.c</p>	<ul style="list-style-type: none"> ➤ Place back the sensors, carefully. ➤ Tighten the swivel (hand-tight). ➤ Careful! pH sensors are made of glass, and are fragile! 	
<p>3.a</p>	<p>Conductivity sensor:</p> <ul style="list-style-type: none"> ➤ Loosen the large swivel nut. ➤ Remove the sensor. ➤ There is a gasket between the positioning block and sensor; do not lose it! 	
<p>3.b</p>	<ul style="list-style-type: none"> ➤ Carefully clean the sensor using a damp cloth. ➤ Put the gasket around the sensor. 	
<p>3.c</p>	<ul style="list-style-type: none"> ➤ Place back the sensor, keeping in mind the right order: <ul style="list-style-type: none"> ▪ Remember the flow direction; in this photo it is indicated with a red arrow. ▪ Position the sensor in such a way that the channel in the sensor tip matches the flow direction. ▪ Align the metal part of the sensor (yellow arrow) with the in-flow side. 	

No.	Description	Photo
<p>3.d</p> <ul style="list-style-type: none"> ➤ Carefully place back the sensor. ➤ Tighten the swivel (hand-tight). 		
<p>4.</p> <ul style="list-style-type: none"> ➤ Set the system to On (see paragraph 6.7.2). 		

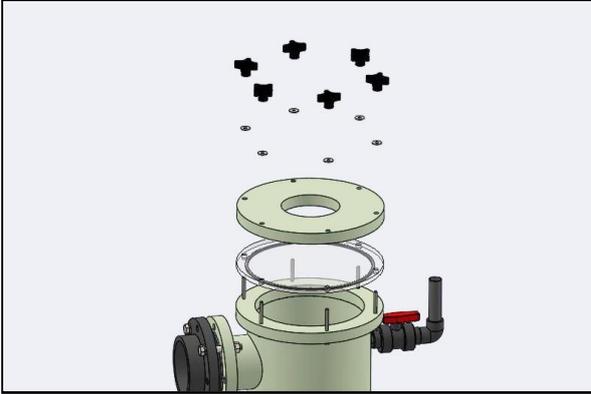
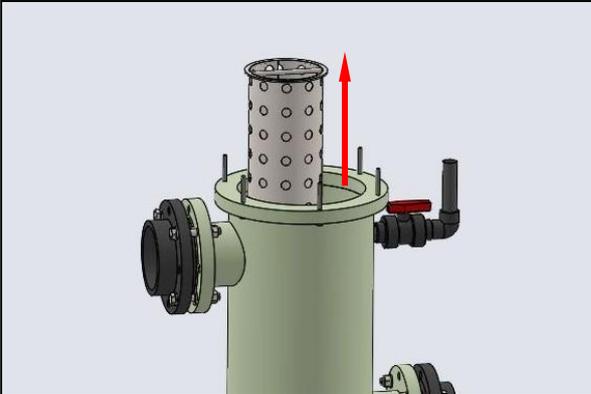
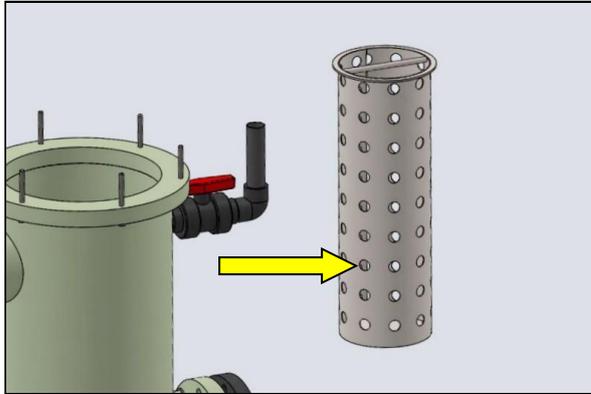
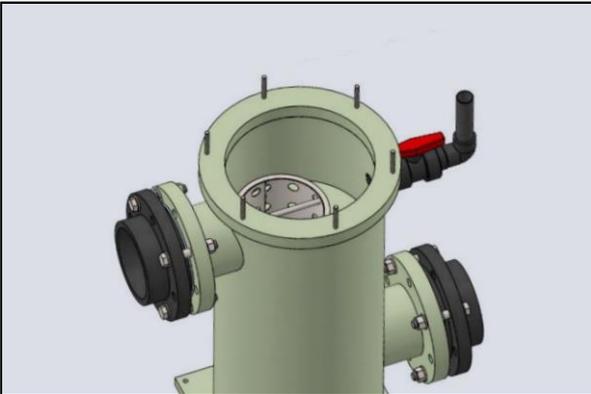
6.5.3 Cleaning the circulation pump filters

WARNING

Wear prescribed personal protective equipment:

- Face shield;
- Suitable gloves;
- Corrosion-resistant clothing.

No.	Description	Photo
<p>1.</p>	<ul style="list-style-type: none"> ➤ In menu 1 - Air cleaner set the system to Maintenance. The electric valve in the pressure line after the pump will close. ➤ If there is no electric valve, then close the manual valve. 	<p>1 air cleaner</p> <p>System Status</p> <p style="text-align: center;">Maintenance</p> <p>1 pH-regulation 2 Level regulation 3 Drain regulation 4 Water lubrication 5 --- 6 Settings</p> <p>15:12 Fr 1 october 2010</p>
<p>2.</p>	<ul style="list-style-type: none"> ➤ Open the lower drain valve, the water in the filter casing can flow back into the reservoir now. 	
<p>3.</p>	<ul style="list-style-type: none"> ➤ Gradually open the upper venting valve. ➤ Close both valves once the water has fallen to the top of the filter basket. 	

No.	Description	Photo
4.	<ul style="list-style-type: none"> ➤ Unscrew the screw buttons. ➤ Remove the flange and the cover. 	
5.	<ul style="list-style-type: none"> ➤ Pull the filter basket from the filter casing. 	
6.	<ul style="list-style-type: none"> ➤ Carefully clean the filter basket. 	
7.	<ul style="list-style-type: none"> ➤ Place the filter basket back into the filter casing. ➤ Carefully clean the top of the filter casing. ➤ If the filter casing drained, fill it with water. 	

No.	Description	Photo
8.	<ul style="list-style-type: none"> ➤ Make sure that the O-ring fits tightly into the slot of the lid. ➤ Put the lid back onto the filter casing, with the O-ring facing the floor. 	
9.	<ul style="list-style-type: none"> ➤ Place the flange on the cover. ➤ Put the lock rings over the wire ends. ➤ Mount the screw buttons. 	
10.	<ul style="list-style-type: none"> ➤ If present: open the manual valve in the pressure line. ➤ Switch the scrubber On (see paragraph 6.7.2). ➤ It may take some time before it switches on again. 	

6.5.4 Other checks

- Check all the piping for leaks:
 - Cleaning water lines;
 - Drain line;
 - Sulphuric acid line;
 - Anti-foaming line.
- Check if all symbols are still present. Replace it if required.

6.6 Annual maintenance: full cleaning session

In the following situations, the scrubber needs to be cleaned completely, and the system must be switched off:

- As soon as alarm message **Ventilation pressure too high** appears;
- At least once a year.

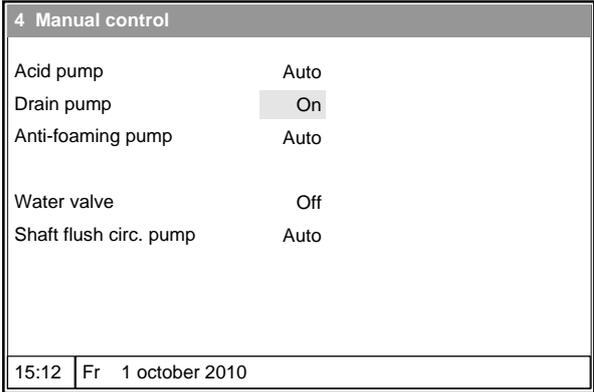
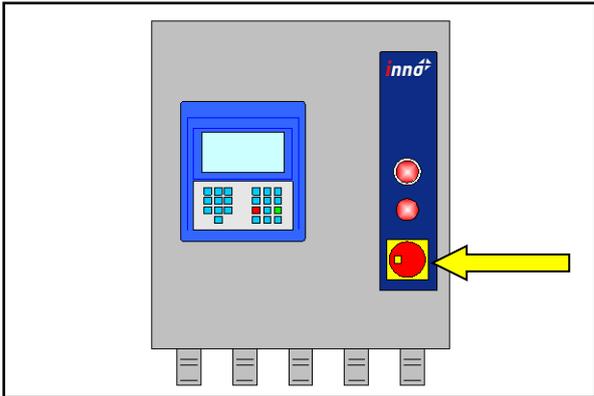
ATTENTION

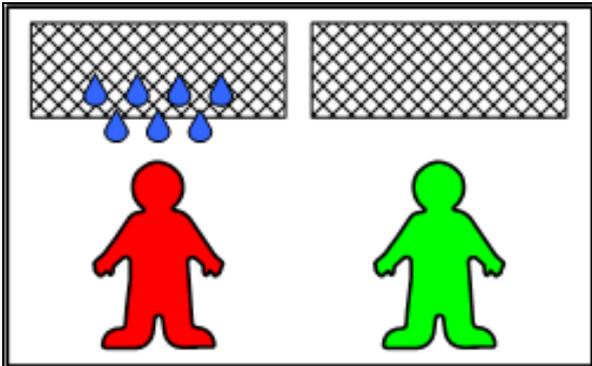
The Air Scrubber must be properly cleaned before Inno+ can service the system.

WARNING

- Wear/use the required personal protective equipment/gear (see § 2.4.4).
- Do not use high-pressure or steam cleaners; this leads to damage to the packages. Sustain a maximum water pressure of about 10 bar.
- Don't stand on lines.

The actions are somewhat depending on the local situation, the following general points are important:

No.	Description	Photo
1.	<ul style="list-style-type: none"> ➤ Enter in the Main menu the company code and possibly personal access code. ➤ Go to menu 4 - Manual control. ➤ Switch water valve Off, so that the reservoir will no longer be filled up automatically. ➤ Switch drain pump On to drain the reservoir. ➤ Switch drain pump off as soon as the reservoir is empty. 	
2.	<ul style="list-style-type: none"> ➤ Switch the scrubber Off (see paragraph 6.7.1). ➤ Also switch main switch off and make sure nobody else can switch the switch on again. 	

No.	Description	Photo
<p>3.</p> <p>➤ Wait until all water has drained from the packages.</p> <p style="text-align: center;"><u>WARNING:</u></p> <p>Never go under the packages when the scrubber is still in operation or when there is still water dripping from it!</p>		

General work activities:

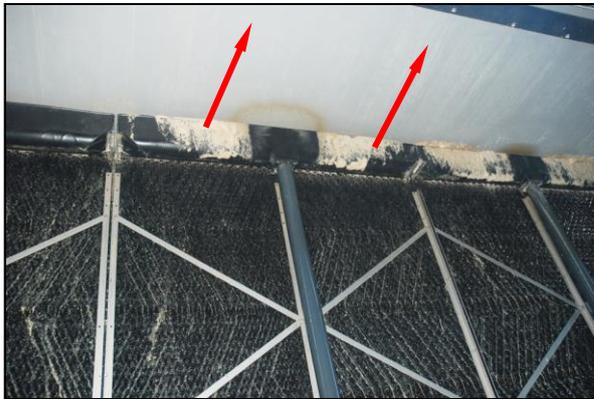
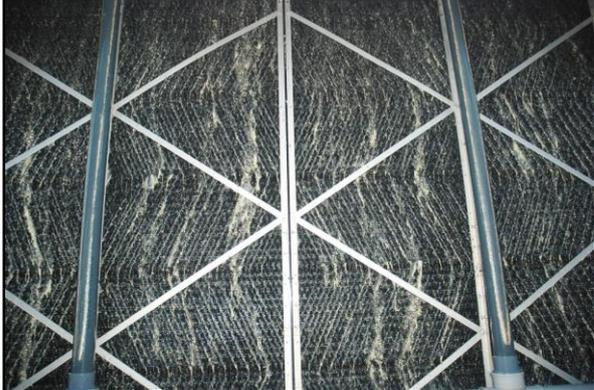
- Clean the packages completely. They may need to be removed from the scrubber for this operation.
- Completely clean the bottom of the scrubber or the central well.
- Clean any and all lines and sprinklers.

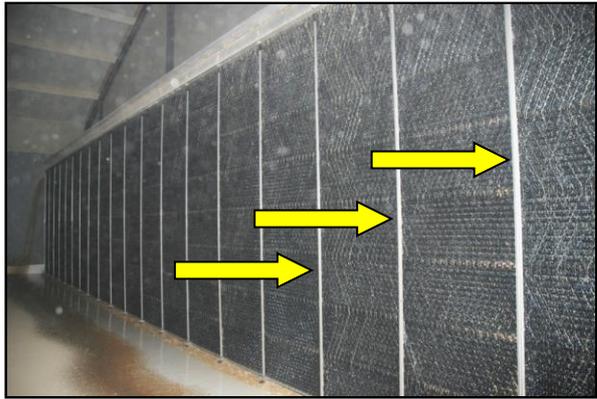
WARNING

A 2nd person must be present, to come to the rescue if the 1st person should become unwell. The 2nd person must not get under the packages during the operations, and must be able to call for external aid really fast.

Additional instructions for wall systems:

No.	Description	Photo
<p>1.</p> <p>➤ It is preferable to use the Geka coupling water connection, which is standard provided by Inno⁺.</p>		
<p>2.</p> <p>➤ Make yourself a proper standing facility.</p> <p>➤ Where deemed necessary: Disconnect the piping partly from the scrubber frame.</p>		

No.	Description	Photo
3.	<ul style="list-style-type: none"> ➤ Pull the pipe out of the connecting point of the water distribution basin (there are multiple versions). ➤ Turn the pipe to the side (if applicable). 	
4.	<ul style="list-style-type: none"> ➤ Slide the water basin from the scrubber (in the picture the pipe is still connected to the basin). 	
5.	<ul style="list-style-type: none"> ➤ Clean the water distribution basins thoroughly. ➤ Make sure that all channels and out-flow holes are properly open. 	
6.	<ul style="list-style-type: none"> ➤ Hose down the filter packages from both sides as well as possible. 	

No.	Description	Photo
7.	<p>In the case of thick packages or persistent pollution the packages can be cleaned well enough when they are still in the scrubber. In that case, take them out of the scrubber:</p> <ul style="list-style-type: none"> ➤ Remove the retaining strips at pressure chamber side. ➤ Take the packages from the scrubber; make sure they don't get damaged! 	
8.	<ul style="list-style-type: none"> ➤ Clean the packages separately. 	
9.	<ul style="list-style-type: none"> ➤ Hose down the floor, the walls and the reservoir as well as possible. ➤ Switch drain pump on to drain everything. ➤ Place a submersible pump in the well. ➤ Use it to pump the final dirt to the drain tank. 	

Rebuild the entire scrubber to its original state. Please note the fibre direction at re-stacking the filter packages:

- Per water basin there are two stacks of fibre packages next to each other.
- Fibres of the upper row packages should be sloping down outward.
- Fibres of the 2nd row of packages should be sloping down inward.
- The underlying packages sloping outward again, and so on.

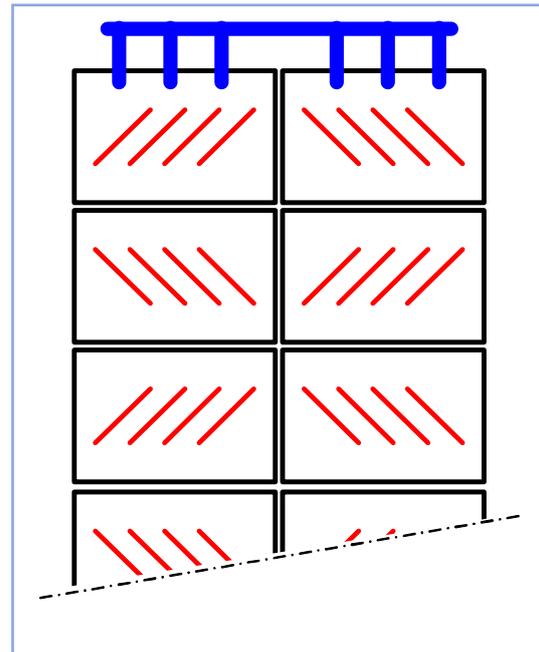


Figure 54: Fibre direction of the filter packages

6.7 Air Scrubber activation/deactivation

If you need to deactivate the Air Scrubber (for a major overhaul for example), follow the instructions in § 6.7.1 and 6.7.2.

6.7.1 Deactivating the Air Scrubber

- Go to the **Main menu**.
- Go to **System / Current status**.
- Press [▶] to place the cursor in the right column (**On**).
- Press the green [←] button. The cursor becomes transparent.
- Press [▼] until the display shows the word **Off**.
- Press [←] again to confirm the new status.

6.7.2 Activating the Air Scrubber

- Turn on the main switch.
- Go to the **Main menu**.
- Go to **System / Current status**.
- Press [▶] to place the cursor in the right column (**Off**).
- Press the green [←] button. The cursor becomes transparent.
- Press [▼] until the display shows the word **On**.
- Press [←] again to confirm the new status.

6.8 Required measures for planned long-term standstill

If the Air Scrubber is not going to be used for a long period of time (several weeks at least), we recommend taking the following precautions to prevent any sensor damage and dirt accumulation.

Proceed as follows:

- Switch the system to status **OFF**.
- Thoroughly clean the entire installation, as described in paragraph 6.6.
- Clean the conductivity sensor and pH sensors (see § 6.5.2).
- Fill the system with clean water.
- Let the circulation pumps run for several hours to clean the system.
- Deactivate the main switch in the technical room.

7. DISPOSAL AND RECYCLING

If the Air Scrubber is not going to be used any more and must be disassembled, take into account the following pointers:

- Clean the Air Scrubber as indicated in § 6.6.
- Dispose of the tanks with additives in accordance with local regulations.
- Disconnect the mains supply and make sure it cannot be activated accidentally.
- Disassemble the pumps, measuring equipment, and any other accessories.
- **Dismount acid lines and hoses. Empty and clean them properly, so that no acid can flow out of them later on. First read paragraph 2.5 for more information.**
- Work from top to bottom when disassembling the Air Scrubber. Use proper aids and tools to do this and work safely!
- All components must be disposed of in accordance with local regulations, and preferably be taken to a recycling company.

WARNING

Prior to disassembly:

Designate a person that is responsible for the operation and safety.

This person must ensure that measures are taken to prevent the risk of falling.

The person must also ensure that no one gets under the cleaning packages without reason.

8. WARRANTY AND LIABILITY

In accordance with the order Inno+ provides a warranty for the installation for components and labour. The warranty is only valid if the Air Scrubber is kept in top condition in accordance with the guidelines in this manual. Operational activities must always be carried out by skilled and qualified personnel.

Wearing and non-durable parts are not covered by the warranty.

Inno+ cannot be held liable for any unsafe situations, accidents or damage as a result of:

- Any damage or loss, of any nature, suffered by the user or any third parties, resulting from or in connection with the use or inability to use the Air Scrubber and/or documentation.
- Ignoring warnings or regulations stated on the Air Scrubber or in this documentation.
- The use of this Air Scrubber for purposes or situations other than those indicated in this documentation.
- Any modifications made to the Air Scrubber, that have not been agreed upon in writing by Inno+.
- The use of unoriginal and/or deviating additives / chemicals.
- Required periodical maintenance not carried out in time. For example: the packs gather considerable weight if they are not cleaned properly. The extra weight can damage the system structure.
- Water and/or chemical damage to the technical room, buildings or animals as a result of leakage or spilt fluids that were not cleaned immediately.
- Damage to the environment (buildings and crops) as a result of a malfunctioning Air Scrubber.
- Maintenance, settings, and/or repairs carried out by unskilled, unqualified people.
- Disassembled, by-passed or deactivated safety equipment/precautions.
- Lightning strikes.

9. TECHNICAL SPECIFICATIONS

The Air Scrubber has the following specifications:

Main dimensions	System-dependent
Framework material	Stainless steel / PP / PE
Supply voltage	3 x 400 V / 50 Hz + Zero + Pe
Max. energy consumption	See delivery certificate
Water consumption	See delivery certificate
pH value inside the Air Scrubber	2 – 7 (dependant on process status)
Cleaning capacity	See delivery certificate
Sulphuric acid to be used (H ₂ SO ₄)	Concentration 96 - 98%
Consumption of sulphuric acid (H ₂ SO ₄)	See delivery certificate
Anti-foaming agent to be used	Anti-foam Inno ⁺
Storage anti-foaming agent	T > 0°C
Storage sulphuric acid	T > 5°C
Network interface for data registration	Moxa modem or Wlogger

