



# OPERATION MANUAL

Startup | Operation | Maintenance

**oneAdvanced – KLcontrol**



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**Intended and safe use requires you to heed the instructions and other information in this documentation.**

- Read carefully these instructions before installation, assembly, and startup.
  - Keep these in a safe place for future reference.
- 

Instructions for startup, operation, and maintenance  
Issued for GRAF oneAdvanced wastewater treatment plant  
Control unit KLcontrol.M

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# 1 About these instructions

This Technical Documentation for the wastewater treatment system is divided into several sections. This documentation forms an integral part of the product and must be handed over to the new owner or at the new site. The full Technical Documentation consists of:

- installation instructions for the underground tank
- Assembly instructions for the installation kit
- instructions for startup, operation, and maintenance

All persons coming into direct contact with the plant must have read and understood the contents of this documentation.

This section contains the startup, operating, and maintenance instructions. These are intended for all persons handling the plant, and are prefaced with a description of the plant and its functions as well as details pertaining to its handling safety and potential residual risks. These are followed by details on the available switch and machine cabinets and their positions; a description of the controller and its functions; and instructions for its startup. Concluding these are instructions on how to operate and service the plant and a description of the fault messages, together with troubleshooting instructions. We recommend keeping this section in the vicinity of the plant.

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## 1. About these instructions


### 1.1 Typeface conventions

These instructions make use of the following typeface conventions.

Format	Meaning
<i>Italic text</i>	This refers the reader to other contents in this document, other sections of the instructions for use, or additional information.  Digitised media (e.g. PDFs) present links to the destinations that the user can click or tap directly.
»...«	This reproduces lettering or a label on the product or component.
[...]	This represents a key or switch.

### 1.2 Symbols and signal words

These instructions make use of the following symbols. An overview of the safety symbols and signal words used can be found in *Subsection 2.1.1*.

Symbol	Signal word and meaning
	<b>IMPORTANT / TIP / INFO</b>  This highlights important information, tips, and other particularly useful details

## 2 Safety

Despite all safety precautions, the plant may nevertheless pose some degree of residual risk, particularly when handled incorrectly or negligently. To protect yourself and others from all danger and to prevent damage and pollution as a result of incorrect handling, therefore, please read and follow the safety and other instructions in both this and the other sections making up the instructions for use.



### **WARNING**

**Failure to heed the safety instructions may cause accidents and damage.**

- The consequences can extend to serious, and even fatal injury and harm to health.
  - Read and follow both the safety and the other instructions.
- 

### 2.1 General safety instructions

#### 2.1.1 Safety symbols and signal words

The following safety symbols and signal words are used in these instructions and on the plant's components:



#### **DANGER**

This highlights imminent danger. Failure to observe this will cause death or grievous injury.



#### **WARNING**

This highlights a potentially hazardous situation. Failure to observe this may cause death or grievous injury.



#### **CAUTION**

This highlights a potentially hazardous situation. Failure to observe this may cause slight or minor injury.

#### **IMPORTANT**

This highlights a scenario that may cause pollution to the environment or damage to the product or nearby property.

## 2. Safety



This highlights potential risks from electricity.



This highlights a potential risk of falling.



This highlights potential risks from hot surfaces.



This highlights potential risks from optical radiation.

### 2.1.2 Intended use

The SBR plant has been designed to channel domestic wastewater from private homes. Domestic wastewater contains faeces and other substances found in bath, washing, sink, and mop water such as soap, detergent, and food scraps.

The SBR plant may also be used to channel other wastewater types (e.g. from restaurants, dairies, winemakers, breweries, and other commercial establishments) when this purpose was known at the time of and incorporated in the plant's layout.

### 2.1.3 Incorrect use

The SBR plant may be used only for the purposes described in these instructions. The plant may not be used for industrial wastewater. Under no circumstances may the plant be used to channel biocides, toxic substances, or substances which are not biocompatible: these hinder bacteria important to wastewater cleaning and cause problems in the biological process.

A detailed list of substances that may not be channelled through the plant can be found in *Subsection 6*.



### WARNING

- Failure to use the plant for its intended purpose may cause harm to health, pollution to the environment, and damage to property.
-

### 2.2 Safety instructions for the operator

The operator of the plant is responsible for its correct installation and operation. He is also responsible for ensuring adherence to the safety and other instructions in this section, but also to the laws, standards, rules, and regulations pertaining to the plant's site. These include in particular the health and safety, accident prevention, and environmental protection regulations as well as the inspection and maintenance specifications applying to the plant's site.

To meet official cleaning requirements, it is essential that the plant is operated in accordance with the operating and maintenance instructions.

#### Operator's obligations

In order to maintain the plant's operating safety, the operator must:

- (re)configure and inspect the plant at the prescribed regular intervals and maintain an operating log book (*see Subsection 7.2*)
- commission a specialist to service the plant at the prescribed regular intervals
- Immediately on signs of damage to the controller or wiring, the plant must be shut down and disconnected from the power supply.
- Malfunctions and damage must be remedied immediately or repaired by a specialist
- All safety labels on the plant must be maintained in an easily legible condition at all times.

#### 2.2.1 Personnel qualifications

The operator must make sure that the installation, assembly, inspection, and maintenance personnel are adequately qualified or possess the adequate knowhow for their assigned tasks, and all persons handling the product have received adequate instruction. The requisite qualifications may be subject to additional regulations.

The plant must not be operated by anyone under the influence of alcohol, narcotics, or medication that limits cognitive ability or ability to react.

#### Installation, care, maintenance

Only specialists may perform care and maintenance work on the plant. Specialists are those persons whose professional training and qualifications render them suitable for operating and servicing wastewater treatment systems. Only specialised electricians may be assigned to work on the electrical installations and to connect the plant to its power supply.

### 2.3 General safety measures

- ▶ **Keep tank covers closed at all times. Never leave open tank covers unattended.**
  - Tank covers may be opened for inspection and maintenance purposes only. There is a danger of persons or animals falling into the tank. This may result in serious injury or drowning.
  - Keep unassigned persons, in particular children, away from open tank covers.
  - Closed tank covers must resist all attempts by a child to open them.  
Before closing, make sure that there are no persons or animals in the tank.
- ▶ **Keep switch cabinets closed at all times. Never leave an opened switch cabinet unattended.**
  - Switch cabinets house components that may be hot to the touch. Touching these may cause burning injuries.
  - Unauthorised access to the controller may cause serious malfunctions.
  - Open the switch cabinet only for the purpose of operating or servicing the plant.
  - At the end of the work, close and lock the cabinet.
- ▶ **Operate the controller only when it is in perfect working condition**
  - Any damage, however slight, to the controller's housing or the wiring insulation poses a risk of electric shock.
  - Immediately on signs of damage, shut down the plant, disconnect it from its power supply, and commission a specialist for its repair.
- ▶ **Do not place any receptacles containing liquids on the switch cabinet.**
  - Spilled or discharging liquids may cause short circuits. Fire or electric shock may be the consequence.
- ▶ **Do not transport or deposit any substances hazardous to water near the tank cover.**
- ▶ **Wear personal protective equipment (PPE)**
  - PPE (protective gloves, goggles, safety shoes, etc.) protects the wearer against injury and harm to health.
  - Whenever necessary, wear the prescribed protective equipment.
  - Do not use damaged or defective protective equipment, which must be replaced immediately with fully functional equivalents.

### 2.4 Safety measures for inspection and maintenance

- ▶ **Do not consume any food or drink when operating or working at or on the plant.**
  - Edibles coming into contact with microbes may carry and cause infection.
- ▶ **Shutting down the plant's installations and equipment.**
  - Equipment may start to operate unexpectedly. Damaged wiring poses a risk of electric shock.
  - Before all repair, maintenance, and cleaning work on the plant, shut it down completely, including all of its installations, and secure it against reactivation.
  - Disconnect the electrical installations from their power supplies.
- ▶ **Only specialised electricians may be assigned to work on the electrical installations and to connect the plant to its power supply.**
  - Danger from electric shock.
- ▶ **Handle chemicals properly.**
  - Chemicals can cause poisoning, harm to health, and caustic injuries.
  - Consult their manufacturers' safety data sheets for details.
  - Whenever necessary, wear PPE.
  - Keep chemicals safely away from children and unauthorised access.

#### 2.4.1 Safety measures for work inside the tank

Harmful gases may form inside wastewater treatment systems. The wastewater may carry pathogens and substances harmful to health. The plant's tanks and shafts may be accessed bodily for repair and maintenance work only.

- ▶ **Verify that work in the tank is necessary.**
  - Always examine first whether this work may be performed from outside (e.g. inspections with a remote controlled camera).
- ▶ **Assign a second person to supervise all work.**
  - This second person must remain at the access point. He must remain in constant contact with the person in the tank and be in a position to fetch assistance immediately.
  - Never enter the tank without this second, supervising person.
- ▶ **Empty tank completely**
  - An accident victim can also drown in shallow depths.
  - Never enter a tank, even when it is only partially full.
- ▶ **Provide a supply of healthy air to the tank.**
  - Before being accessed, the tank must first be vented adequately to clear it of any gases.
  - If adequate cross or diagonal venting (chimney effect) cannot be ensured, a supply of air must be provided with equipment.
  - Whenever necessary, measure and monitor constantly the air quality.

## 2. Safety

### ► Increase access safety and provide an escape route

- Use only suitable equipment, e.g. ladder, to access the tank.
- Make sure that the escape route remains unobstructed.

#### 2.4.1.1 In the event of an accident in the tank

### ► If the accident victim is unconscious, do not under any circumstances attempt to climb in to his rescue.




- There is danger of death from asphyxiation or noxious gases.
- Call the emergency services and follow their instructions.
- While you are waiting, vent the tank from outside, using e.g. a fan or similar.

## 3 General

### 3.1 Details about your plant

In case you have any queries while operating the plant, please enter the details of your plant here as follows. Should you encounter a fault, these details will enable our staff to find a remedy faster.

Your plant's specifications can be found on the type plate. This type plate is affixed to the external housing of internal switch cabinets and inside external switch cabinets.

 <b>Wastewater treatment plant</b>			
Plant typ: oneAdvanced		5 PE	
Sludge store	<input type="text"/>	m <sup>3</sup> Approval	<input type="text"/>
Buffer	<input type="text"/>	m <sup>3</sup> Discharge class	C
SB-Reactor	3,45	m <sup>3</sup> Tested	01.12.22
<b>Cabinet</b>		<b>Controller</b>	
<input type="text"/>			
<b>Compressor</b>			
HP 120			
<b>Serial numbers</b>			
<b>Cabinet</b>	<b>Controller</b>	<b>Compressor</b>	
22460586	2225015001	220400126L	
<b>Additional modul</b>			
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<b>El. power</b>		<b>Safety Class</b>	
230 V / 50 HZ 115 W 1~		IP20	
 	Otto Graf GmbH 18	Declaration No. 103	EN-12566-3

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Figure 1: Example oneAdvanced type plate

### 3.2 Layout and functions

The basic wastewater treatment plant consists of the following components:

- one or two tanks
- wastewater treatment installation kit
- control cabinet

The wastewater treatment installations in the tanks are connected to the control cabinet via air hoses laid in the ground.

**In the control cabinet, you will find:**

- a quiet, low-maintenance air compressor
- a valve unit
- a control unit

#### 3.2.1 Layout of oneAdvanced 3–9 PE

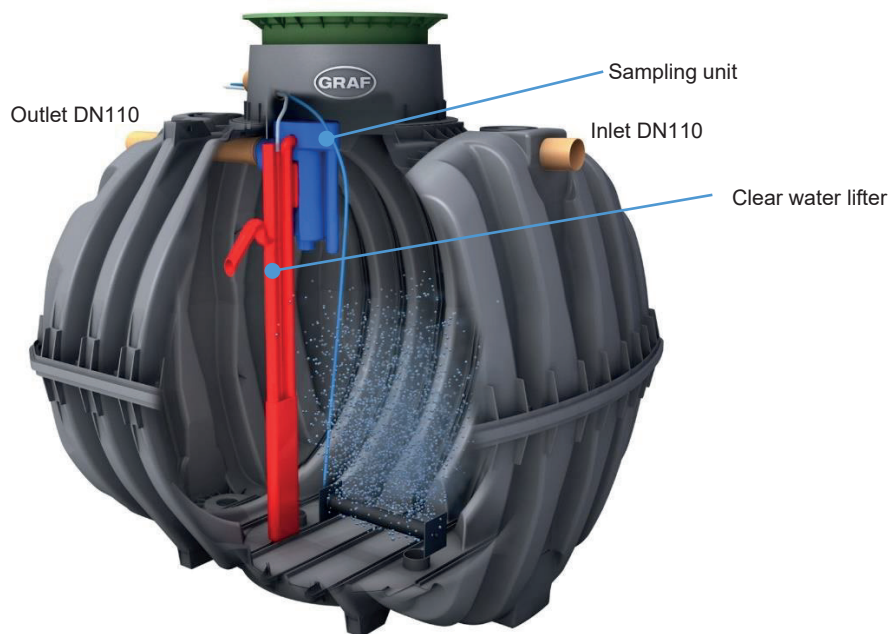


Figure 2: oneAdvanced 3–9 PE in a Carat tank (example)

**The tank houses:**

- a scum guard
- two membrane pipe aerators
- outflow lifter in the form of a mammoth pump with its own air supply
- an integrated water sampling point

### 3. General

#### 3.2.2 Layout of oneAdvanced 10–14 PE

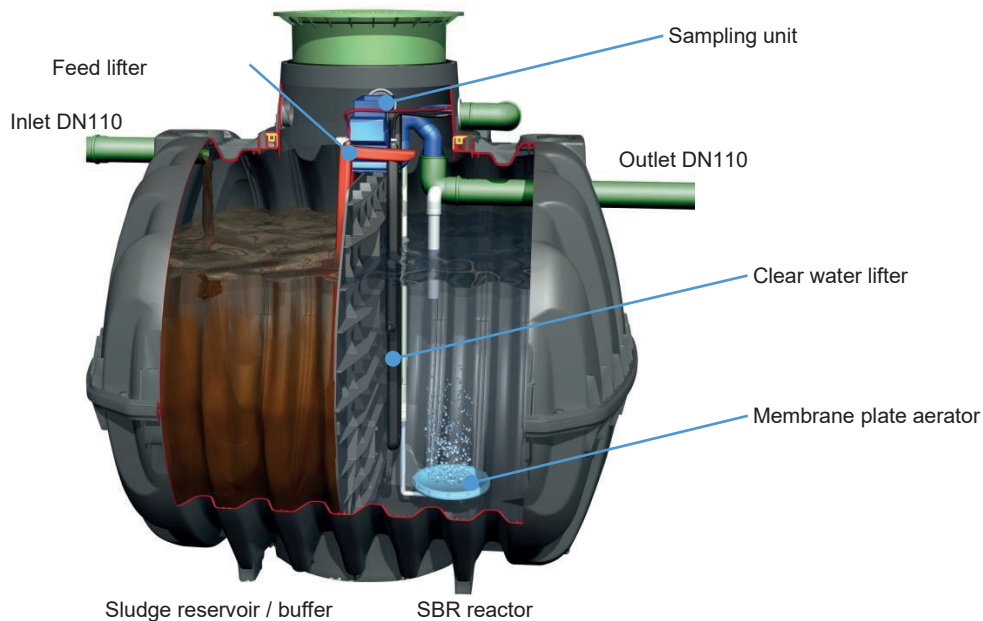


Figure 3: oneAdvanced 10–14 PE in a Carat tank (example)

The tank is split into two areas by a scum guard: a sludge reservoir and buffer in the inlet area and an SBR reactor in the outlet area.

The wastewater treatment installation kit is fitted to the scum guard. This consists of:

**on the sludge reservoir / buffer side:**

- feed lifter in the form of a mammoth pump with its own air supply (marked in red)

**on the SBR reactor side.**

- a stainless steel pipe with membrane plate aerator
- outflow lifter in the form of a mammoth pump with its own air supply (marked in black)
- a secondary sludge lifter in the form of a mammoth pump with its own air supply (marked in white)

**above the scum guard:**

- an integrated water sampling point

### 3. General

#### 3.2.3 3.2.2 Layout of one Advanced 16–1000 PE

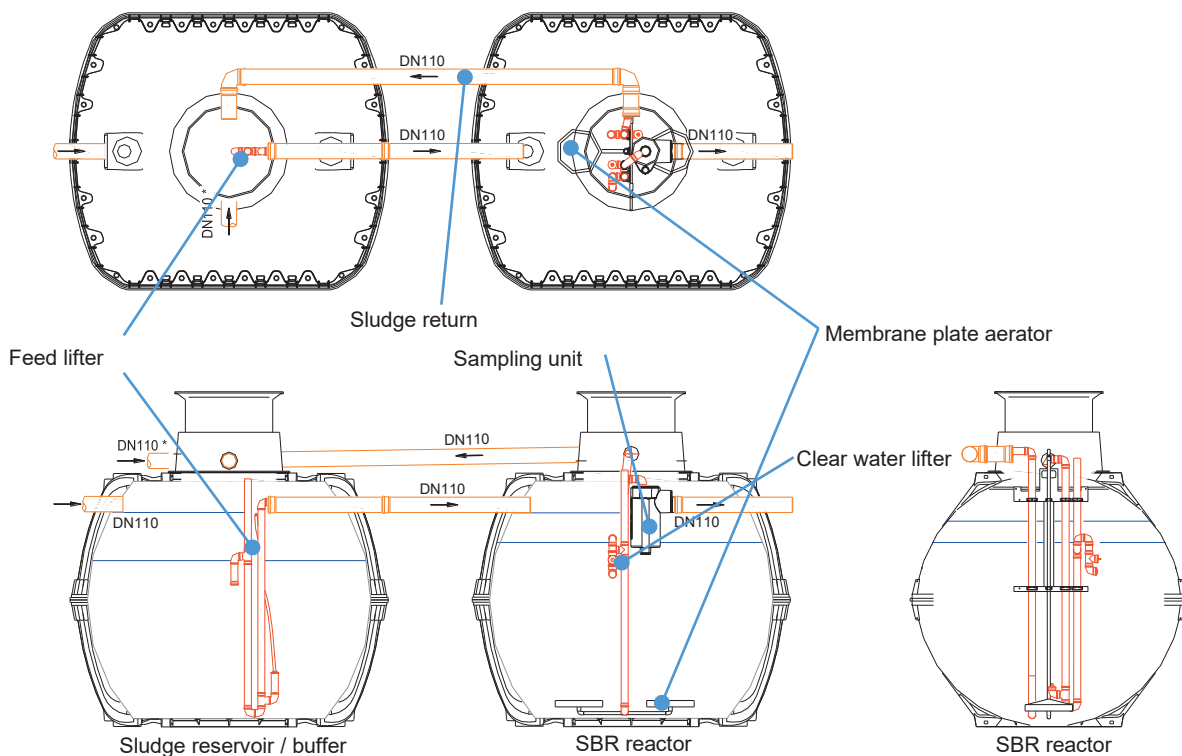


Figure 4: Example multi tank system in two Carat tanks

The wastewater treatment plant is made up of several tanks. The preliminary cleaning tank integrates the sludge reservoir, buffer, and SBR tank. Plants larger than 32 PE consist of multiple preliminary cleaning and SBR tanks.

#### In the sludge reservoir / buffer you will find:

- feed lifter in the form of a mammoth pump with its own air supply (marked in red)

#### In the SBR reactor you will find:

- a stainless steel air distributor system with membrane pipes or aerator plates
- outflow lifter in the form of a mammoth pump with its own air supply (marked in black)
- a secondary sludge lifter in the form of a mammoth pump with its own air supply (marked in white)
- optionally, an integrated water sampling point

### 3.2.4 Function of the SBR plant

**oneAdvanced** is a fully biological wastewater treatment system, which functions on the principle of the SBR process (aeration system in retention process).

This fully biological treatment takes place with aerated sludge. Aerated sludge basically consists of microorganisms that break down the pollutants dissolved in wastewater

Plants larger than 10 PE feature upstream sludge reservoirs with integrated buffer that perform the following functions:

- storage of primary and secondary sludge,
- retention of deposited materials and floating solids,
- storage of supply water,
- compensation of fluctuations in the wastewater supply related to volume and concentration.

The SBR reactor provides the following functions:

- biological cleaning with aerated slurry
- nitrification and denitrification
- phosphate precipitation

The wastewater treatment plant is operated using a microprocessor control, which controls the air compressor and air distribution for the various lifters via magnetic valves / stepped motors.

#### 3.2.4.1 Process flow of oneAdvanced larger than 3–9 PE

The SBR procedure is a series of three steps, undertaken one after another and twice a day.

##### Step 1: Aeration



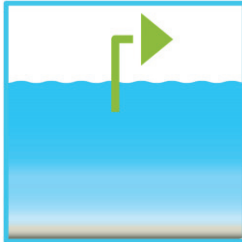
In the first phase, the wastewater is put straight through aerobic treatment for a fixed time. As a result, firstly the microorganisms (aerated sludge) are supplied with the oxygen needed for the breakdown and secondly pressure aeration causes mixing. The system's aeration equipment is supplied with ambient air by a compressor. Aeration is intermittent so that targeted wastewater cleaning is possible. Different ambient conditions can thereby be achieved.

### 3. General



#### Step 2: Settle

There is no aeration in the second phase. The aerated sludge and the remaining settleable solids can now settle with the aid of gravity. A clear water zone forms at the top and a sludge layer at the bottom. Any floating sludge is on top of the clear water zone.



#### Step 3: Clear water extraction

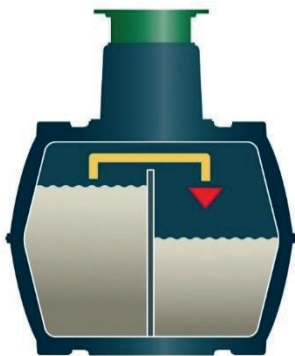
In this phase, the biologically cleaned wastewater (clear water) is drawn out of the SBR stage. It is pumped out by an air lift (or mammoth) pump, which uses compressed air. The air lift pump is designed not to pump out any floating sludge on top of the clear water layer. A minimum water level is maintained in the system without any further components.

Once step 3 is complete, the cleaning process starts again with step 1.

2 cycles are undertaken a day. The maintenance company can individually adapt the switching times.

#### 3.2.4.2 Process flow of one Advanced larger than 10 PE

The process is a series of 5 steps undertaken in turn and repeated several times a day (usually four times).



#### Step 1:

#### Feed

The raw wastewater held in the sludge reservoir is fed to the SBR reactor via an air lift pump. This is arranged such that only water free of solids is pumped. The special design of the lifter guarantees a minimum water level in the sludge reservoir.

Duration: approx 5–20 min

### 3. General

#### Step 2:

#### Aeration

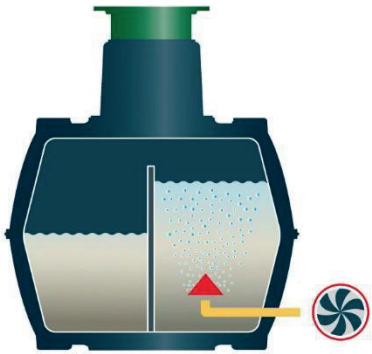
In this step, the wastewater is aerated and mixed. Membrane pipe or plate aerators fitted on the base of the chamber aerate the wastewater.

The plant's aeration equipment is supplied with ambient air by a control cabinet installed separately. An air compressor produces the compressed air needed. Aeration usually takes place intermittently.

with two simultaneous outcomes:

- the microorganisms in the activated sludge are supplied with oxygen, which is needed for their metabolism and therefore for the pollutants to be broken down.
- there is intensive contact between the wastewater and bacteria.

Duration: approx 240 min

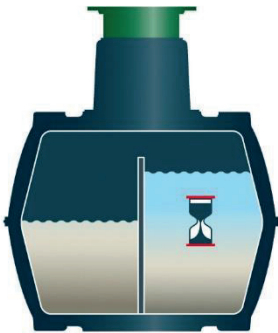


#### Step 3:

#### Sedimentation phase

This step is a rest phase in which no aeration takes place. The activated sludge settles with gravity (sedimentation phase). A clear water zone forms at the top and a sludge layer at the bottom. Any floating sludge is on top of the clear water zone.

Duration: approx 90 min

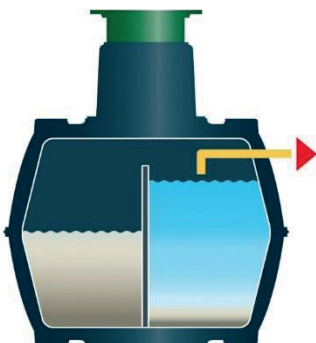


#### Step 4:

#### Clear water extraction

In this phase, the biologically cleaned wastewater (clear water) is drawn out of the SBR stage. It is pumped out by an air lift (or mammoth) pump, which uses compressed air. The air lift pump is designed not to pump out any floating sludge on top of the clear water layer.

Duration: 5–20 min



### 3. General

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**Step 5:****Sludge return**

In this phase, the excess activated sludge at the bottom is pumped by an air lift pump from the SBR reactor chamber to the sludge reservoir chamber, where it is stored.

Duration: 1–2 min

---

At the end of this treatment cycle, the plant pauses for the time remaining until the next cycle start time (about 1–10 minutes). Afterwards, the cleaning process starts again with step 1.

The cycle described above is usually undertaken four times a day. The switching times and number of cycles can be adapted following discussion with the manufacturer. They may only be adapted by an authorised maintenance specialist.

#### **3.2.4.3 Holiday mode**

The operator can switch the plant to holiday mode when he is planning to be away for an extended period. In this event, water is no longer discharged from the plant. Aeration is minimal to maintain the aerated sludge. In addition, a small quantity of wastewater is recirculated (in plants larger than 10 PE) over the sludge and charging lifters inside the plant. This continues to provide nutrients to the aerated sludge.

#### **3.2.4.4 Underload detection**

Alternatively, the plant can be time-controlled to operate depending on its filled level. For this purpose, the controller is fitted as standard with a pressure sensor that can be activated by a specialist on request. This pressure sensor should be activated on new plants only after they have been run in reliably.

This pressure sensor tests the level in the first chamber every six hours (oneAdvanced larger than 10 PE) or in the SBR reactor every twelve hours (oneAdvanced 3-9 PE) or at the nominal start of each cycle. When there is little or no inflow or the level is low, no treatment cycle is initiated. Instead, there is minimum aeration to maintain the aerated sludge. In addition, in oneAdvanced larger than 10 PE, a small quantity of wastewater is recirculated over the sludge and feed lifters inside the plant. This continues to provide nutrients to the aerated sludge. The controller then displays “Cycle pause”. Once the level measured in the first chamber or the SBR reactor respectively, exceeds a certain limit, a normal treatment cycle is initiated.

When fitted with underload detection, the plant can run independently of the actual hydraulic load, helping to cut operating costs. This mode proves above all practicable when the inlet fluctuates greatly over the course of the week, e.g. when the residents are not regularly at home. Underload detection must be configured by a specialist.

### 3. General

#### **3.2.4.5 Plants with extra nitrogen elimination (discharge class N and D)**

The wastewater treatment plant applies the biological processes of nitrification and denitrification to remove nitrogen content. Plants designed for extra nitrification generate a particularly intensive aeration that provides the optimal living conditions for nitrifying bacteria, which convert the ammonium content of wastewater into nitrate. Plants designed in addition for extra denitrification generate brief aeration pulses that recirculate the water at the suitable time. This serves to stimulate the denitrifying bacteria responsible for converting the nitrate into elementary nitrogen, which discharges as a gas out of the plant.

All GRAF treatment systems can be used for nitrification and denitrification. No additional componentry is needed. Solely the controller's cleaning program must be configured accordingly.

#### **3.2.4.6 Plants with extra phosphate elimination (discharge class D+P, P module)**

Phosphates are precipitated out by means of polyaluminium chloride dosed to the SBR reactor. The phosphate precipitation equipment includes a removable support platform in the tank dome (accessory, art. no. 107362). The precipitant canister is located on this platform. Alternatively, the precipitant canister can be positioned separately near the switch cabinet. There is a dosing pump in the plant's switch cabinet. This dosing pump conveys the precipitant out of the precipitant canister and into the SBR reactor. The precipitant is supplied to the reactor during the feed phase. The amount of precipitant needed can be set on the metering pump. Mixing takes place during the aeration phase. The precipitant forms an insoluble compound with the phosphate, which settles in the tank.

#### **3.2.4.7 Plants with extra hygiene (discharge class D+H)**

The additional module can also be fitted to remove germs from the biologically cleaned water. This disinfection takes place with ultraviolet (UV) light or a dose of chlorine.

#### **3.2.4.8 Plants with additional carbon dosing (C module)**

Carbon can be dosed to the aeration stage to offset any nutrient deficiency. This may become necessary during extreme underload phases or when the wastewater exhibits a suboptimal quality.

### 3. General

In this event, a dosing pump in the switch cabinet conveys automatically a specific quantity of special nutrient solution directly into the aeration basin. This dose can be adjusted at the controller. Carbon dosing serves to maintain the stability of the aerated sludge quantity in the system, even when there is only a sporadic or very low supply of wastewater.

## 3. General

### 3.3 Control and machine cabinet

All the plant's mechanical and electrical components are installed in a switch cabinet. The cabinet for internal installation is made of expanded polypropylene (PP; used for wastewater treatment plants for 3–28 PE) or powder-coated metal (used for wastewater treatment plants for 28 PE or more).

The internal PP switch cabinet can be fitted in a GRAF external switch cabinet M, and in this manner used out of doors as well.

		
<p>Internal PP switch cabinet (no more than 28 PE)</p>	<p>Steel cabinet for indoor installation</p>	<p>External switch cabinet M for internal PP switch cabinet (no more than 28 PE)</p>
		
<p>External switch cabinet L (32–44 PE)</p>	<p>XL metal external cabinet (50–160 PE)</p>	<p>XXL metal external cabinet (from 165 PE)</p>

Figure 5: Available switch cabinets

3.3.1 Technical setup

The main components of the controller are:

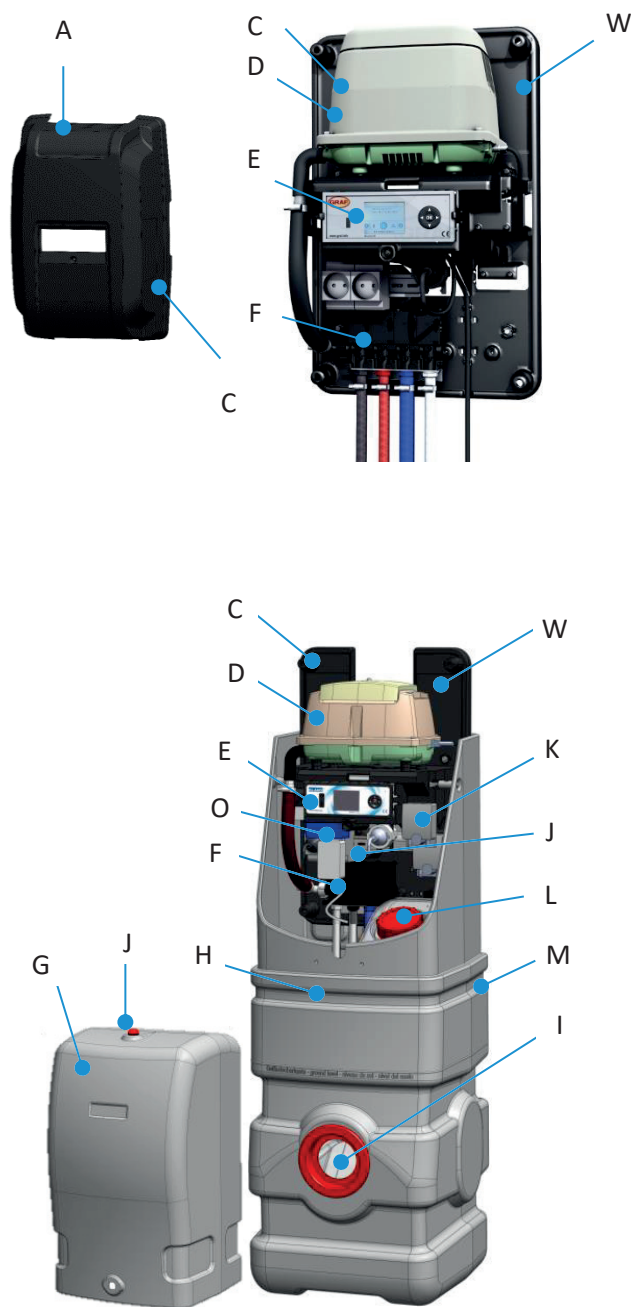


Figure 6: Example layout of an external switch cabinet M

A	Internal cabinet hood
B	Bearer
C	Type plate
D	compressor
E	Control unit
F	Air distributor
G	External cabinet hood
H	External cabinet base section
I	Empty pipe aperture for external cabinet
J	Power strip 230 V
K	Dosing pump (optional)
L	Chemicals tank 37 l (optional)
M	Chemicals tank vent (optional)
N	Warning light
O	Communication module (optional)
P	Empty pipe seal (accessories)
Q	Air hoses (accessories)



Figure 7: Accessories

## 3. General

### 3.3.2 Siting

The control unit must not be fitted or activated in environments with potential explosive atmospheres or in places where there are flammable materials. Sparks in such environments may cause an explosion or fire and this may result in physical injuries or even death.

Ensure that the machine cabinet is not installed above or in the direct vicinity of water vessels. Risk of electric shock if improperly installed.

The switch cabinet must be freely accessible at all times for maintenance work. The ventilation apertures in the switch cabinet must remain unobstructed at all times and may not be covered.

- PP control cabinet: Ventilation apertures on the bottom and top
- Internal control cabinet: Ventilation apertures on the sides
- External control cabinet: Ventilation apertures on the rear

#### Switch cabinets for indoor installation

Switch cabinets for indoor installation must be sited in a dry, well ventilated room, e.g. basement or garage.

#### Switch cabinets for outdoor installation

Switch cabinets for outdoor installation should be sited, whenever possible, away from direct sunlight which would otherwise cause overheating in the summer.

### 3.3.3 Power supply



#### WARNING

##### Hazardous voltage

- Danger from electric shock. An electric shock can cause serious burns and life threatening injury.
- Only specialised electricians may be assigned to work on the electrical installations and to connect the plant to its power supply.

The machine cabinet may be connected only to a correctly installed 230 V socket or earth cable fitted with an upstream 16 A fuse. Additional electrical fixtures on the same fuse may disrupt operation.

The power supply to the switch cabinet must be ensured at all times. If the plant is disconnected from the mains for more than 24 hours, it will be unable to clean the wastewater properly, if at all.

### 3. General

Electrical equipment connected to the mains may be damaged during a storm. We would recommend fitting surge protection in the building to protect against this. The connection cable must be laid such that it does not represent a tripping hazard.

### 4 The wastewater treatment system's control unit

The plant is controlled at the operating unit on the controller's face side. The controller is used to configure the operating parameters, view the operating statuses, query the plant parameters, and program the operating times (this last by a specialist).

The controller presents two access levels with basic and advanced functions and parameters:

- **Operator menu** (not password protected)
- **Service menu for specialists** (password protected)

Use the small wastewater treatment plant only when it is in perfect working condition, only for its intended purpose, and only with all due diligence to safety and risks as set down in the full Technical Documentation. The housing enclosing the controller for wastewater treatment plants may not be opened. Please refer any questions to the manufacturer.



#### IMPORTANT

##### Keep the plant switched ON at all times!

- If the plant is disconnected from the mains for more than 24 hours, it will be unable to clean the wastewater properly, if at all.
  - Switch OFF the plant for maintenance and repair purposes only.
  - Immediately after this work, switch the plant back ON.
-

## 4. The wastewater treatment system's control unit

### 4.1 Operating unit

The operating unit consists of a USB port (A), a display (B), a cursor pad (C), and a status LED (D).

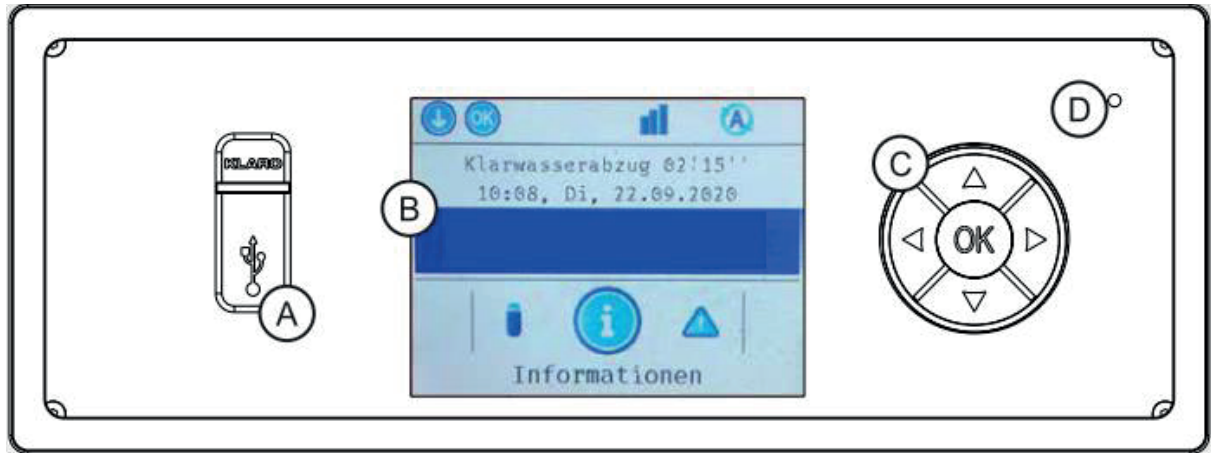


Figure 8: KLcontrol.M operating unit

#### USB port (A)

The USB port accepts a USB stick (see also Subsection 4.4.7 on page 41).

#### Display (B)

Menu navigation is presented on a colour display. The backlight switches OFF after 60 seconds of user inactivity and back ON when the cursor pad (C) is pressed. The display should not be exposed to prolonged direct sunlight.

#### Cursor pad (C)

The cursor pad is used to navigate through the menus and enter parameters. The cursor pad offers five input options:

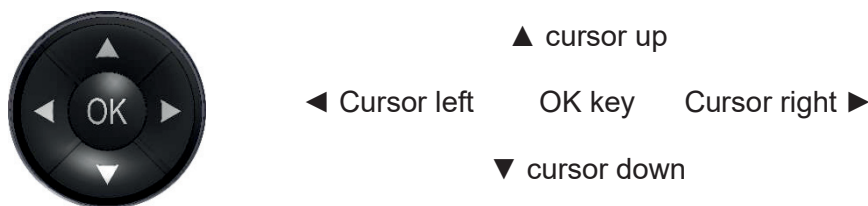


Figure 9: Cursor pad

- [◀] [▶] Left/right cursor keys
  - navigate between menus
  - navigate in config parameters
- [▲] [▼] up/down cursor keys
  - navigate in menus
  - edit config parameters
- [OK] key

## 4. The wastewater treatment system's control unit

- opens menu item
- opens config parameters or view
- confirms settings

### Status LED (D)

This LED indicates the present status as one of the four following colours:

- green: Auto mode. Everything OK.
- blue: manual mode
- yellow: Warning. Clarification cycle continuing.
- red: Fault. Intervention necessary. Clarification cycle suspended.

## 4.2 Display information and menu navigation

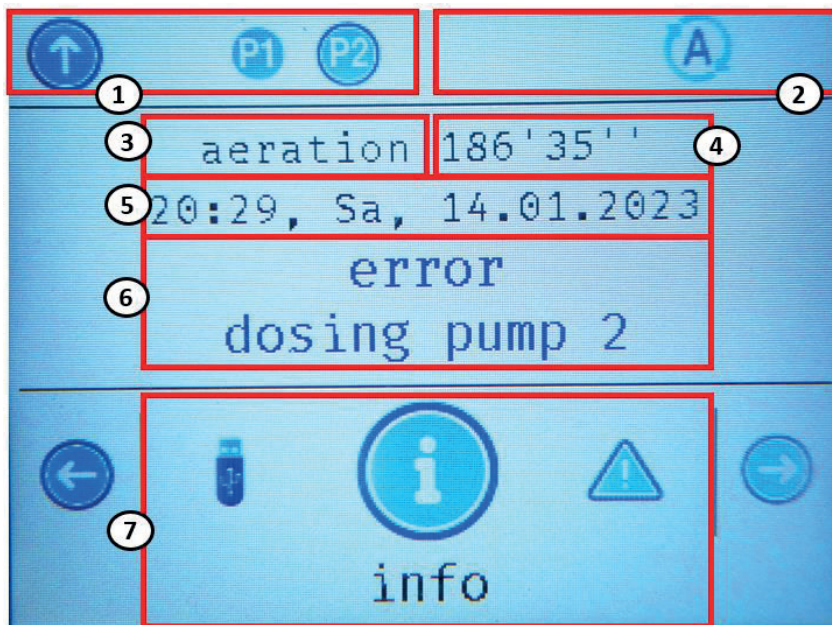











Figure 10: KLcontrol.M graphic display

1. Actions now possible (menu navigation at cursor pad)
2. Status bar (see Subsection 4.2.1 Status bar symbols)
3. Current step of the wastewater treatment plant
4. Remaining runtime of the current step
5. Date and time
6. Event bar (fault, malfunction, info) sorted according to relevance (see Subsection 11.2 on page 98).
7. Menu selection (see Subsection 4.2.2 Menu bar symbols)






## 4. The wastewater treatment system's control unit

### 4.2.1 Status bar symbols



The controller status appears in the status bar. The displayed symbols also serve as navigation aids through the menu structure. The following symbols are provided:

Symbol	Description
	<b>Auto mode:</b> The controller is in auto mode.
	<b>Manual mode:</b> Auto mode has been suspended.
	<b>Pressure sensor 1, pressure sensor 2</b> (icon without boundary): Pressure sensor has been detected and calibrated to factory default.
	<b>Pressure sensor 1, pressure sensor 2</b> (icon with boundary): Pressure sensor has been detected, calibrated on service level, and activated.
	<b>Service level:</b> The service menu has been enabled.
	<b>USB stick:</b> A USB memory has been inserted and detected.
	<b>Wireless module:</b> A wireless module has been connected to KLcontrol. There is no signal.
	<b>Wireless module:</b> A wireless module has been connected to KLcontrol. The link to the remote display is active.
	<b>Communication module:</b> The communication module's link to the WebMonitor has been detected. On detected activity, either the transmit or receive arrow flashes.

### 4.2.2 Menu bar symbols

Symbol	Description
	<b>Information:</b> This presents e.g. total operating hours, controller settings, and sensor measurements.
	<b>Events:</b> This presents information, malfunctions, and errors with time stamps. The max number of messages is 125.
	<b>Mode:</b> Manual mode can be activated here.
	Times/date: This is used to set dates, the clock, and holiday periods.
	Settings: Here the user can choose from 25 languages and enter or edit buzzer and display settings.

#### 4. The wastewater treatment system's control unit

	Service: This is the access area for specialists.
	USB: This is used to update the software, save/load configurations, and save logging data.

### 4.3 Operating the controller

#### 4.3.1 Menu navigation

1. Using the cursor keys [◀] [▶], select the menu you need.
  2. Press [OK] to open the menu.
  3. Using the cursor keys [▼] [▲], select the menu item you need.
  4. Press [OK] to open the submenu.
- Press the left cursor key [◀] to exit the menu.

#### 4.3.2 Editing config parameters

1. Open the submenu with the parameters you want to edit.
2. Using the cursor keys [▼] [▲], edit the parameters you want to change.
3. Press [OK].
  - The results vary depending on the menu:
    - a) the parameter is assigned the new value;
    - b) the parameter adopts a green background: Use the cursor keys [▼] [▲] to select a new value, and confirm with [OK].

#### Date and time settings

1. Open the submenu with the parameters you want to edit.
2. If necessary, use the cursor keys [◀] [▶] to navigate to the place you want to edit in the parameter.
3. Using the cursor keys [▲] [▼], edit the parameter.
4. Press [OK] to save your edit(s).

#### 4.3.3 Auto return to auto

In auto mode, the control unit switches back automatically to auto mode when no keys have been pressed for longer than two minutes. In manual mode, the control unit switches back automatically to auto mode after ten minutes.

#### 4.3.4 Control unit restart (hardware reset)


- Press [OK] and keep this pressed for at least five seconds.
  - The control unit restarts.
  - All settings and stored data are preserved.

See *Subsection 4.7* for further details.

## 4. The wastewater treatment system's control unit

### 4.4 Operator menu


#### 4.4.1 Information menu – show operating hours, settings, sensor values

 <b>Information</b>	
<b>Operating hours tot.</b>	<p>This presents the total operating hours generated by the outputs.</p> <p>Outputs that have not generated operating hours are hidden.</p> <p>The remaining runtime of the UV lamp is given in brackets.</p>
<b>Operating hours this week</b>	<p>This presents the operating hours generated during the week since midnight on Monday.</p>
<b>Operating hours last week</b>	<p>This presents the operating hours generated during the previous week from midnight on Monday to 11:59 pm on Sunday.</p>
<b>Workload</b>	<p>This presents the utilised capacity of the wastewater treatment plant in level-dependent mode (ratio of treatment cycles actually performed to standard possible treatment cycles in percent)</p>
<b>Show all settings</b>	<p>This presents all settings on the service level.</p> <p>These settings cannot be edited.</p>
<b>Version</b>	<p>This presents the firmware version currently in use</p>
<b>Show current + voltage</b>	<p>This presents the measurements returned by the current and voltage sensors.</p> <p>U_eff (~AC):     V    applied mains voltage</p> <p>I_eff (~AC):     mA   current drawn by the 230 V consumers</p> <p>U_out (24 V):    mV   internal voltage for 24 V consumers</p> <p>I_out (24 V):     mA   current drawn by the 24 V consumers</p>

## 4. The wastewater treatment system's control unit

<b>Show sensor values</b>	<p>This presents the measurements returned by the pressure and temperature sensors.</p> <p>Pressure sensor    mbar</p> <p>P1:</p> <p>Pressure sensor    mbar</p> <p>P2:</p> <p>Temperature sensor:    °C</p>
<b>Show switches</b>	<p>This presents the status of switching contacts (e.g. for float switches and contactors)</p> <p>X12.9    ON/OFF</p> <p>X12.11    ON/OFF</p> <p>X20.1    ON/OFF</p>

### 4.4.2 Events menu – show events

 <b>Events</b>	
	<p>View of fault memory.</p> <p>Max 125 events are stored.</p> <p>The latest event is placed at the top of the list.</p>

A new event committed to a full memory overwrites the oldest. The events shown are prefixed with <abbreviation> <date> <clock>. The abbreviations are as follows:

- “H” – information
- “S” – fault
- “F” – error


Pressing [**OK**] shows additional information on the selected event, e.g. the event type (information / fault / error), the full event name, and its date and clock time.

An overview of all events can be found in *Subsection 11.2 on pages 98 ff.*



## 4. The wastewater treatment system's control unit

### 4.4.3 Mode menu

This switches between auto and manual mode.


 <b>Operation</b>	
<b>Mode</b>	Switch between auto and manual mode.  All assigned outputs are listed.  In manual mode, each output can be switched ON and OFF.
<b>Comp. + valve 1–4</b>	Switch compressor in combination with valve 1–4.
<b>Compressor 1</b>	Switch compressor 1 only (without valves).
<b>Valve 1–4</b>	Switch valves 1–4 only (without compressors).
<b>Dosing pump 1–3</b>	Switch dosing pumps 1–3 only.
<b>Cooling fan 1–3</b>	Switch cooling fans 1–3 only.
<b>Warning lamp</b>	Switch external warning lamp only.
<b>Level measuring</b>	Measure level in wastewater treatment plant. Possible only when underload detection has been activated (see <i>Subsection 9.1</i> ).

#### 4.4.3.1 Actuate consumers in manual mode

1. Using the cursor keys [◀] [▶], select the menu  “Mode”, and open it with [OK].
  - The current mode appears in the topmost line of the “Mode” view.
2. When the control unit is in auto mode, again press [OK] to activate manual mode.
  - When manual mode is active, the icon  appears in the symbol bar
  - The status LED lights up blue.
  - The treatment cycle is suspended in the background.
3. Each of the consumers can now be selected with the cursor keys [▼] [▲].
  - Only those consumers are visible that have been activated in the controller.
4. To switch ON or OFF the selected consumer, press [OK].
5. Leave each consumer switched ON for at least five seconds.
  - Monitoring the valves' current consumption may take some time. When the consumers are not left switched ON for long enough, faults may escape detection.

## 4. The wastewater treatment system's control unit

6. To revert to auto mode, select the Mode menu with the cursor keys [▼] [▲] and confirm "Auto" with [OK].

- When auto mode is active, the icon  appears in the symbol bar.
- The status LED lights up green.

When active, manual mode allows users to open other menus, e.g. to read the current draws measured for the operating consumers.

The control unit switches back automatically to auto mode when no keys have been pressed for longer than ten minutes. The treatment cycle is then resumed where it was suspended on the change to manual mode.



### NOTE

When a consumer is switched to manual mode during the sedimentation phase, the control unit restarts the sedimentation phase from the beginning on reverting to auto mode. This ensures that the sludge deposits reliably and the cycle concludes properly with clear water extraction, etc.




### NOTE

A protracted suspension of auto mode may exceed the cycle time, overshooting the start of the next. This next treatment cycle is then lost: The control unit switches to "Cycle pause" mode until the next starting time has been reached.

---

## 4. The wastewater treatment system's control unit

### 4.4.4 Times/date menu – set date, clock, holiday period

 <b>Times/date</b>	
<b>Setting date + clock</b>	This sets the current date and clock time.
<b>Set holiday period</b>	Set the start and end dates of the holiday period.  The holiday period then starts at midnight on the entered starting date and ends at 11:59 pm on the entered end date.
<b>Delete holiday period</b>	Deleting the holiday period.

#### 4.4.4.1 Holiday mode


Holiday mode activates energy saving. Holiday mode does not execute a normal treatment cycle, but provides minimal ventilation to keep the aerated sludge viable. Also, there is no extraction of clear water.

Holiday mode may be activated only when the plant is not supplied with wastewater.

Alternatively, the wastewater treatment plant may simply continue in auto mode. Holiday mode need not be set when the plant is operating in level dependent mode with underload detection. The plant then switches automatically to an energy saving mode when wastewater is no longer being supplied.

## 4. The wastewater treatment system's control unit


### 4.4.5 Settings menu – languages, buzzer, display settings

 Settings			
Language	Select your language for the menus.		
Buzzer	Settings for the acoustic alarm.		
	Buzzer test	ON/OFF	Test acoustic alarm. The buzzer emits an acoustic signal.
	Mains voltage	ON/OFF	Suppress acoustic alarm on power failure.
	Events	ON/OFF	Suppress acoustic alarms on detected events.
Display	Display settings		
	Brightness	0–100%	Backlight brightness.
	Backlight off after	0–30 min	The backlight switches OFF automatically after the set time [min].
	Backlight cursor pad.	OFF/blue/red	The cursor pad can be backlit in the colour blue or red.


## 4. The wastewater treatment system's control unit

### 4.4.6 Service menu – access for specialists

The service level can be enabled when a service code is entered.

When service mode is active, the icon  appears. Service mode lets users toggle between service and operator mode without their having to reenter the code.

“Exit menu” again disables the service level. The service level is disabled automatically when no keys have been pressed for longer than three minutes.

 <b>Service</b> (code required)	
* * * *	Service code
1 3 1 1	Reset function to restart the control unit. All settings and stored data are preserved. See <i>Subsection 4.7</i> for further details.
9 9 9 9	Service calibration for lifter



### IMPORTANT


Unqualified changes to service-level settings may prove detrimental to the plant's correct and reliable operations.

## 4. The wastewater treatment system's control unit

### 4.4.7 USB menu – software update, maintenance manual

The control unit's face side presents a USB port that can take a storage medium. This USB port lets you:

- update software
- save/load a configuration
- save logging data
- save a maintenance manual

 <b>USB</b>	
<b>Software update</b>	This updates the microcontroller's firmware via USB. See <i>Subsection 4.4.7.3</i> for further details.
<b>Cycle settings to USB</b>	Transfer a config file with operating parameters from the control unit to USB memory. See below for further details.
<b>Record events</b>	All controller events are recorded and saved to USB.
<b>Record everything</b>	All controller events and sensor measurements are recorded and saved to USB.
<b>Remove safely</b>	To prevent data loss, make sure before removing the memory that data are no longer being written to or read from it.

#### IMPORTANT

Moisture and dirt may enter the device through an unprotected USB port. For this reason, make sure that after using the face-side USB port it is sealed properly with the rubber cover. Check this rubber cover regularly, and replace immediately when damaged.

#### 4.4.7.1 USB stick requirements:

- FAT32 file system (NTFS not supported)
- Read only OFF
- No partitioning

#### 4.4.7.2 Removing the USB stick safely

To prevent data loss, make sure before removing the memory that data are no longer being written to or read from it.

Execute the menu function "Remove safely" before withdrawing the USB stick.

## 4. The wastewater treatment system's control unit

### 4.4.7.3 Updating the software

The firmware may be updated only as instructed by the manufacturer (see the provided RE-ADME file).

Before updating the microcontroller's firmware, you will first need a USB memory stick containing the manufacturer's original file.

Back up your data before updating. To do so, save the current configuration and the log book to a USB stick.



### IMPORTANT

**Incorrectly updated firmware can damage the controller.**

- The power supply to the controller may not be disconnected during the update.
  - Do not remove the USB stick during the update.
  - Consult the operating instructions provided by the manufacturer.
- 

The update is complete when the controller reboots. During the update, the screen is OFF.

### 4.4.7.4 Saving/loading a configuration

A config file containing the controller's settings can be saved to a USB stick or loaded into the controller from the same. Data saved to the stick generates the new file "config.txt". If the receiving stick already contains a file of this name, this will be overwritten by the data from the controller.

## 4. The wastewater treatment system's control unit

### 4.4.7.5 Recording

All sensor values are saved every 5 minutes. The Operator menu provides a function to copy these logging data as a CSV file to a USB stick.

There are two logging options:

- **Record everything:** All data from sensors, including pressure and temperature sensors, and all voltages and current measurements, T-steps, remaining times, and occurred events are logged to the USB memory at five-minute intervals.
- **Record events:** Only all occurred events are written to the logging file.

The file name of this log is log.txt. If the USB stick already contains a file with this name, then the names of all successive log files are incremented accordingly as log1.txt, log2.txt, etc.

## 4.5 Function of the power cut detector

The control unit is equipped with a power cut detector, which is powered via an integrated emergency power supply (buffer). Upon delivery, the emergency power supply is flat, but recharges after the controller has been switched ON. In the event of a power cut, the charge of one emergency power supply for power cut signals will last around 12 hours. If the emergency power supply is not required in response to power cuts, it is prevented from discharging by a switching circuit.



### IMPORTANT

**If the plant is disconnected from the mains for more than 24 hours, it will be unable to clean the wastewater properly, if at all.**

---

In the event of mains failure, the time / date setting is powered for around 10 days by an extra buffer. All saved data, such as operating hours and program settings, are retained. If the time and date are not set, weekly operating hours for the units are no longer saved. Error messages occurring in the future are saved with the wrong date

### 4.6 Monitoring the mains voltage

The controller detects failed and excessive mains voltage. It detects an incorrect mains voltage by measuring the input voltage and comparing this with defined limits. The limits defined for an incorrect input voltage are  $< 90 \text{ V}_{\text{eff}}$  and  $> 250 \text{ V}_{\text{eff}}$  respectively.

Brief outages (e.g. during thunderstorms) are ignored within a certain time delay. After this time, the controller disconnects from its power supply.

- **Action – immediately on incorrect mains voltage:**
  - All relevant data are saved to nonvolatile memory
  - All outputs and the backlight are switched OFF as a measure to protect these and to avoid unnecessary draws on the buffer battery.
  - The error is entered in the log book.
  - If the mains voltage returns to its defined range within 5 seconds, the controller resumes the active cycle. A message is entered in the log book.
- **Action – incorrect mains voltage after 5 seconds:**
  - An intermittent beeping is heard, and the LED flashes red in sync. This beeping can be deactivated in the menu “Settings” → “Buzzer” → “Power failure”. In this event, only the LED flashes red.
  - The external warning lamp (if fitted) is not activated.


Once the mains voltage returns to its defined range, the controller is rebooted.

If power has failed for less than 90 minutes, auto mode resumes where it left off. If the power failure equals or exceeds 90 minutes, the clarified water is discharged and then the sludge returned. Afterwards, the controller switches to auto mode.

### 4.7 Hardware reset

If the controller no longer responds, its hardware must be reset.

- To reset the hardware, press and keep pressed [OK] for 5 seconds.
  - The controller powers down and reboots.
  - When the hardware is reset in auto mode, the program resumes where it left off.

The hardware can also be reset in the menu  “Service” (code 1311).

### 5 Initial use

The wastewater treatment plant may be put into operation only when all of its components have been installed and connected to the full extent. Before commissioning, confirm that all electrical connections and air hoses have been fitted correctly and firmly!

#### 5.1 Charging the tanks

- Before switching ON the plant, fill both chambers/tanks to the top with fresh water.

#### 5.2 Switching ON the switch cabinet

- Switch cabinets with main switch: Set the main switch to the position »1«.
- Switch cabinets without main switch: Insert the mains power plug into a socket.

The treatment cycles have been preconfigured to factory defaults and can be edited only by a service specialist. During commissioning, “Cycle pause” and its remaining time appear on the display. After this remaining time, the first clarification cycle is initiated.

#### 5.3 Commissioning wizard

The commissioning wizard appears when not all of the parameters have been set prior to delivery (e.g. current data/time).

The wizard queries the basic settings and offers a brief test run. Each query item can be called with [OK] or skipped with the down cursor [▼].

##### Query points:

- **Language:** Select your language for the menus.
- **Date and clock:** This sets the current date and clock time.
- **Cycle settings:** Check and, if necessary, adjust the settings, e.g. PE number and discharge class. The settings are configured at the factory before shipping.
- **Function test:** All valves and compressors are actuated in turn as a means to test the hydraulic function of the lifters and the aeration in the tank. The time setting can be used to define the wait times after which each of the valves are actuated.

Commissioning is concluded only when the function test has completed. If commissioning is not possible, the plant switches to auto mode after a brief time. Commissioning may be repeated at a later date, when the plant must be restarted in service mode (code 1311). Without this code, only the language, date, and time may be set. Cycle settings can be edited only by specialists after entering a service code.

The commissioning wizard can be skipped/aborted at the left cursor key [◀].

### 5.4 Function tests

- Activate “manual” mode.
  - In manual mode, tests can be performed on the lifters, aeration, and other connected consumers.
  - The ventilation bubbles must be consistent and thorough.
  - The air lift pumps operate only when the tank is sufficiently filled with water.

For further details on these function tests, see *Subsection 4.3 on page 33*.

### 5.5 Startup behaviour

In general, GRAF wastewater treatment plants require only a short startup phase. The startup phase is the time needed until the biotope generated in the wastewater treatment plant has become adequate to deliver and maintain the required discharge values.

The bacteria are carried in the wastewater into the treatment plant. The plant may also be “inoculated” with aerated sludge taken from another treatment system, but normally this is unnecessary.

The startup phase depends on many factors, including e.g. the wastewater quantity and quality, the water temperature, the intended treatment, etc.

If the intended treatment is based solely on carbon removal (discharge class C), the results are obtained after only a few days. Higher requirements (discharge class N, D) can extend this period to a number of weeks until adequate aerated sludge has formed. Specifically, the bacteria responsible for nitrification grow more slowly.

Usually, the startup phase is shorter in summer than winter because the bacteria multiply more readily at higher temperatures.

The startup phase may generate foaming. This characteristic bacterial foaming has a dull, beige-brownish colour. This foam can pile up on the surface of the water, but cannot impair operations.

### 6 Operating instructions

The plant must remain switched ON at all times. The sole exception is during maintenance. If the plant is switched OFF for more than 24 hours, it will be unable to clean the wastewater properly, if at all.

Basically, only substances with the characteristics of domestic wastewater may enter the plant. Biocides, toxic substances or substances which are not biocompatible or biodegradable must not, under any circumstances, enter the plant: these will otherwise cause biological process problems. The following are not permitted:

- rainwater from roofs and yards
- infiltration water (e.g. drainage water)
- liquid or solid residue from animal husbandry
- commercial or agricultural wastewater, unless it is comparable to domestic wastewater
- chemicals, pharmaceuticals, mineral oils, solvents
- cooling water
- solids in the form of food waste, plastics and hygiene articles, coffee filters, bottle tops and other domestic items
- milk and milk products
- water discharged from swimming pools
- large volumes of blood
- large quantities of grease or vegetable oils

If larger volumes of grease or plant-based oils are discharged, we would recommend pre-cleaning the wastewater containing the greases/oils with a grease separator upstream of the wastewater treatment plant.

**Important:** Faeces must not be allowed to enter the grease separator!

The wastewater from commercial kitchens must be pretreated separately in an upstream grease separator. GRAF offers grease separators with nominal sizes up to 15.

#### **General recommendations for cleaning agents:**

- Note the recommended doses on the packaging.
- Heed all warnings on the packaging, e.g. "Harmful to aquatic life with long-lasting effects".
- In most cases, cleaning agents in powder form are more eco friendly than liquids.
- Whenever possible, refrain from using tabs, pods, and toilet fresheners.
- The general rule – "The dose makes the poison" or "It's the quantity that matters"!

The table below contains a list of substances which must not be disposed of in the wastewater treatment plant:

## 6. Operating instructions

substances which should not be disposed of via the sink or toilet:	Why not:	Where then:
Ash	Does not break down	Dustbin
<b>Chemicals</b>	Contaminate the wastewater	Collection points
<b>Disinfectants</b>	Kill bacteria	Do not use
<b>Paints</b>	Contaminate the wastewater	Local collection point
<b>Photochemicals</b>	Contaminate the wastewater	Local collection point
<b>Chip fat</b>	Is deposited in pipes and causes blockages	Dustbin
<b>Adhesive plaster</b>	Blocks the pipes	Dustbin
<b>Cat litter</b>	Blocks the pipes	Dustbin
<b>Cigarette butts</b>	Are deposited in the plant	Dustbin
<b>Condoms</b>	Blockages	Dustbin
<b>Corks</b>	Are deposited in the plant	Dustbin
<b>Varnishes</b>	Contaminate the wastewater	Local collection point
<b>Medicines</b>	Contaminate the wastewater	Collection points, pharmacies
<b>Engine oil</b>	Contaminate the wastewater	Collection points, service stations
<b>Waste containing oil</b>	Contaminate the wastewater	Collection points, service stations
<b>Plant protection agents</b>	Contaminate the wastewater	Local collection point
<b>Paintbrush cleaners</b>	Contaminate the wastewater	Local collection point
<b>Cleaning agents, except chlorine-free products (environmentally sound)</b>	Contaminate the wastewater, corrode piping and seals	Local collection point
<b>Razor blades</b>	Risk of injury to staff in the sewage system and treatment plant	Dustbin
<b>Pipe cleaners</b>	Corrode piping and seals, contaminate the wastewater	Local collection point
<b>Pesticides</b>	Contaminate the wastewater	Local collection point
<b>Panty liners</b>	Cause blockages, non-degradable plastic films blight watercourses	Dustbin
<b>Cooking oil</b>	Cause deposits and pipe blockages	Local collection points
<b>Food waste</b>	Cause blockages, attract rats	Dustbin

## 6. Operating instructions

substances which should not be disposed of via the sink or toilet:	Why not:	Where then:
<b>Wallpaper paste</b>	Causes blockages	Local collection point
<b>Textiles (e.g. nylon tights, cleaning cloths, handkerchiefs etc.)</b>	Block pipes, may paralyse a pump station	Used textiles collection point
<b>Thinner</b>	Contaminates the wastewater	Local collection point
<b>Bird sand, cat litter</b>	Cause deposits and pipe blockages	Dustbin
<b>Cotton buds</b>	Block the plant	Dustbin
<b>Toilet blocks</b>	Contaminate the wastewater	Do not use
<b>Nappies</b>	Block the pipes	Dustbin
<b>Cement water</b>	Is deposited, results in production of concrete	Contact specialist company

### 7 Operation and maintenance

Almost all operating problems will result in the plant's cleaning capacity being impaired. This must be detected in good time and remedied immediately by the operator or a maintenance specialist.

#### Before commencing work

- Prior to all inspection and maintenance work, familiarise yourself with the safety instructions in *Subsection 2*.
- Read and follow the instructions given in the following.



#### WARNING

##### Danger of tripping and falling at open tank covers

- There is a danger of persons or animals falling into the tank. This may result in harm to health, serious injury, or drowning.
  - Secure open tank covers with suitable measures, and never leave them unattended.
  - Keep unassigned persons, in particular children, away from open tank covers.
- 



#### WARNING

##### Danger of poisoning and asphyxiation from harmful gases

- Wastewater treatment plants can pose risks to health and life in the form of poisonous, harmful, and asphyxiating gases.
  - Whenever possible, avoid working inside the tank.
  - When entering the tank, do not fail to observe *Safety measures for work inside the tank* in *Subsection 2.4.1*.
  - Never enter the tank without a second, supervising person at the entrance.
-

## 7. Operation and maintenance

### 7.1 General specifications for maintenance, inspections, and operation

The plant must remain switched ON at all times. The sole exception is during maintenance. If the plant is switched OFF for more than 24 hours, it will be unable to clean the wastewater properly, if at all.

- Switch OFF the plant for maintenance and repair purposes only, and switch it back ON immediately after this work!
- Before all work on the mechanical, electrical, and pneumatic/hydraulic components, first set the main switch to the position »0« or disconnect the controller's mains plug.

### 7.2 Duties of the operator

The operator of a wastewater treatment system is obliged to safeguard its reliable operation and to maintain an operating log book.

This operating log book must list e.g.

- Measured values
- deviations from nominal values
- malfunctions

The water authorities may ask to see this log. Reliable operation requires the operator to conduct the regular inspections listed in the following.

#### 7.2.1 Daily check

- Check that the plant is operating properly.
  - The illuminated inspection LED is green, and there is no acoustic warning:  
The plant is operating properly.
  - The illuminated inspection LED is yellow or red:  
The plant is malfunctioning. Immediately remedy the malfunction, or notify your maintenance partner.

## 7. Operation and maintenance

### 7.2.2 Monthly checks

These monthly inspections must be documented.

- Visually check for any sludge leaks, clouding, or discoloration in the discharge
- Visual check for clogged supply and discharge routes
- Read operating hours counter for air compressor (total operating hours), aeration (valve 2), sludge return (valve 4), and if necessary any other units (when fitted), and note in operating log.
- Check the control cabinet's air filter
  - Check and, if necessary, clean or replace the filter for venting the control cabinet (ventilation grille on left and right in housing wall of internal cabinet or on rear of external cabinet).
  - To clean or replace the grille, first remove it by hand from the cabinet's outside. The filter mat is not secured in the ventilation shaft and can be shaken and/or blown out. The time at which the air compressor filter is to be cleaned or replaced depends on the extent of contamination caused by the atmospheric conditions of the application. Follow the service documents provided by the compressor manufacturer to check or replace the filter on the compressor.



Figure 11: Opening the ventilation grille 15 x 15 cm



Figure 12: Opening the ventilation grille 32 x 32 cm

- Check the UV module (if fitted).
  - See the operating instructions for the UV module
- Check the P module (if fitted).
  - Check that the dosing pump is operating properly.
  - Check the level in the precipitant container.
- Check the Infiltration (if fitted).

## 7. Operation and maintenance

- Implement preventive measures immediately you detect any signs of failure, e.g. wet surfaces or wastewater backflow in the infeed section.
- Remove regularly any buildup in the distributor units and open infiltration areas.

### 7.2.3 Yearly checks

- Determine the consumption of mains water, and enter this in the operating log book.

## 7.3 Care and maintenance by a maintenance specialist only.

A specialist must be commissioned to service the plant at least every six months. This is reduced to at least every four months on plants with discharge classes +P and +H. To this end, the plant owner should take out a maintenance contract with a qualified specialist. A maintenance contract may also be stipulated by law.

### 7.3.1 Maintenance work

- Inspect the operating log book for correct operation (nominal/actual comparison)
- Check the air filter of the air compressor and the supply/exhaust air openings on the control cabinet
- Air compressor maintenance according to details provided by manufacturer (see *Subsection 16*)
- Check that all essential, mechanical, and electrical installations are operating properly, e.g. aerator, lifts, control unit, valves, alarm equipment, and battery in power cut detector
- Only for plants larger than 10 PE: Check level of sludge in the sludge reservoir. If necessary, the operator must arrange for the sludge to be removed (see also instructions in *Subsection 7.5*).
- Carry out general cleaning work, e.g. to remove deposits
- Check the structural condition of the plant
- Check sufficient aeration and ventilation
- Analysis of the aeration basin:
  - Oxygen concentration ( $O_2/l > 2 \text{ mg}$ ); if necessary, adjust compressor operating times
  - For oneAdvanced 3–9 PE (one-tank systems with scum guard)  
Sludge volume  $SV_{30} (< 700 \text{ ml/l})$ ; sludge volume  $> 700 \text{ ml/l}$  must be removed
  - For oneAdvanced larger than 10 PE (with preliminary cleaning / sludge reservoir):  
Sludge volume  $SV_{30} (< 400 \text{ ml/l})$ ; if  $> 400 \text{ ml/l}$ , increase the duration of sludge removal following consultation with the manufacturer
  - Check that there is an even aeration pattern (bubbling)
- Sampling from discharge and analysis of the following values:

## 7. Operation and maintenance

- temperature of wastewater
- substances that can settle
- pH
- odour
- Colour
- depth of visibility
- BOD5 (every other maintenance)
- COD value
- NH<sub>4</sub>-N (if required)
- Nanorg (if required)
- P (if required)

The maintenance work undertaken, any damage found, repairs undertaken and other information should be summarised in a maintenance report by the maintenance company. A suitable template is provided in the Annex. Anything established during the analyses should also be documented in this report. The plant operator should be given the maintenance report so that it can be passed to the responsible authorities if demanded. The maintenance report should be attached to the operating manual. Please keep the operating log in a place where it can be easily accessed.

Plant failures resulting from insufficient maintenance (e.g. of the compressor) will not be covered by free replacement under warranty.

### 7.4 Sludge measurements

#### 7.4.1 Sludge measurements on oneAdvanced 3–9 PE (one-tank systems)

In oneAdvanced 3–9 PE there is only aerated sludge. Sludge removal is recommended when sludge volume **exceeds 70%**.

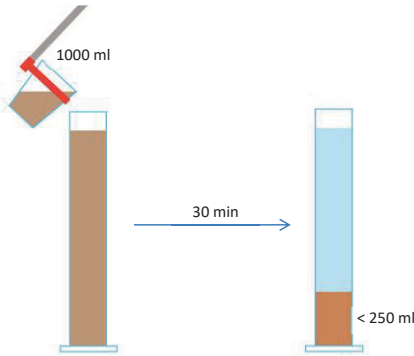
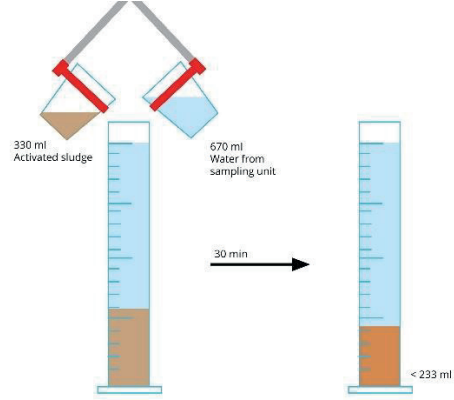


A measurement cylinder is used to quantify the sludge (SV30 test). The measurements must proceed as follows:

##### Preparations:

The ventilation for the aeration basis must be active or switched ON in manual mode. Once the aeration basin has been adequately mixed, a scoop can be used to take a sludge sample.

## 7. Operation and maintenance

The measurement cylinders should be placed in a location free of vibrations and shielded from direct sunlight. easyOne plants generally operate with higher sludge contents, so there must be two sets of measurements here:

Double quantification with two measurement cylinders: 1 x undiluted, 1 x diluted	
	
Fill with sludge sample to the 1000 ml mark	Fill with sludge to the 330 ml mark only, then to the 1000 ml mark with water discharged from the sample
After 30 min, read and round off to the nearest 10 ml/l	
<p>&lt; 250 ml/l: Note value</p> <p>&gt; 250 ml/l: Reject measurement, dilute</p>	<p>&lt; 250 ml/l: Multiply value by 3, write down result</p> <p>&gt; 250 ml/l: Result "&gt; 750 ml/l" Write down</p>
<p>Measures:</p> <p>&lt; 250 ml/l: none/OK</p>	<p>Measures:</p> <p>&lt; 700 ml/l: none/OK</p> <p>&gt; 700 ml/l: Have sludge removed, increase aeration</p>
Example:	
<p>Measured result, undiluted: 750 ml/l</p> <p>➔ Reject</p> 	<p>Measured result, diluted: 190 ml/l</p> <p>➔ <math>190 \times 3 = 570</math></p> <p>➔ Result: 570 ml/l</p> 

## 7. Operation and maintenance

### 7.4.2 Sludge measurements on oneAdvanced larger than 10 PE (with preliminary cleaning / sludge reservoir)

There are various types of sludge in oneAdvanced wastewater treatment plants. Only the sludge in the preliminary cleaning need be removed. A distinction is drawn between floating and bottom sludge. Some plants present a distinct layer of floating sludge, others none at all. The bottom sludge is measured with a plunging siphon or level sensor, and the thickness estimated.

Sludge must be removed when bottom and floating sludge together have verifiably filled 50% of the total capacity.

Systems in Carat tanks do not exhibit a linear relationship between fill level and capacity. The following table lists the sludge removal levels.

Carat tank	50% Total volume [cm]
3,750L	66
4,800L	80
6,500L	94

Table 1: Sludge removal levels based on 50% rule

### 7.5 Sludge must be removed by a specialist only

Over the course of time, sludge starts accumulating in the wastewater treatment plant. On reaching certain limits, this sludge must be removed. When sludge must be removed is decided during maintenance.

Basically:

- Sludge is removed when necessary.
- Sludge must be removed by a specialist following the pertinent, applicable regulations.
- The sludge removal must be confirmed, and this confirmation handed over to the operator.
- Failure to remove sludge promptly will pose an additional stress on the biotope. Adequate cleaning performance is then no longer ensured.
- Needs-based sludge removal is determined by the sludge levels measured during maintenance. Sludge must be removed in compliance with the local provisions.

#### When the sludge is being removed:

- All preliminary cleaning tanks must be emptied.
- The inlet, overflows, outlet, and vents must be kept clear of floating sludge.
- After they have been emptied and freed of sludge, the tanks must be refilled immediately with water if there is to be no adverse effects on the downstream biological cleaning stage.

## 7. Operation and maintenance

### **Special measure for oneAdvanced 3–9 PE (single-tank systems with scum guard)**

- 10 cm of water-sludge mixture should remain in the plant for maintaining the effectiveness of biological cleaning. Make sure there is no damage to the installations (membrane pipe aerators!)

Procedure:

1. Switch ON aeration in manual mode, and leave to mix briefly
2. Extract to a remaining water level of 10 cm.

### 8 Service menu for authorised specialist

Configuring the parameters in the Service menu requires specific knowhow.




#### NOTE


**The Service menu is intended for specialists only and is code protected.**

- Do not attempt to edit any of the settings here. This may otherwise prove detrimental to the plant's correct and reliable operation.

#### 8.1 Menu overview

 <b>Service</b>	
<b>Cycle settings</b>	Treatment system, PE, discharge class, starting times T-settings Output assignments Valve size Restart cycle
<b>Pressure sensor</b>	Level measuring Pressure monitoring
<b>Information</b>	Reset operating hours Delete events
<b>Temperature sensor</b>	Define temperature thresholds
<b>Current measurements</b>	Define maximum/minimum currents for alarms
<b>Maintenance</b>	Organise maintenance
<b>Modules</b>	Configure dosing installations Configure UV module
<b>Contactor monitoring</b>	Compressor monitoring by means of external motor circuit breakers
<b>Exit menu</b>	Exit and disable service level

### 8.2 Cycle settings

 Service » Cycle settings	
Treatment process settings	Generate table based on process, PE number, and discharge class. The tables can afterwards be viewed and edited in the “T-settings” menu.
	<b>Process</b>  There are a number of SBR processes to choose from, as well as “Continuous systems” like e.g. fixed or fluidised beds. SBR 4V: oneAdvanced larger than 10 PE, 4 valves, 4 cycles/day SBR One 3V: 3 valves, 2 cycles/day SBR One 2V: oneAdvanced no larger than 90 PE, 2 valves, 2 cycles/day SBR MAX 4V KLARO MAX large-scale plants, 4 valves SBR MAX 3V KLARO MAX large-scale plants, 3 valves Flow 2V Continuous systems, 2 valves, day/night cycle Flow 1V Continuous systems, 1 valve, day/night cycle
	<b>System</b>  Trade name of wastewater treatment system. The selection does not affect the cycle parameters.
	<b>PE number</b>  The PE number affects above all the lifters’ runtime and allows continuous adjustment. The plant size is set prior to shipping (see type plate). The PE can be adjusted to the number of residents.
	<b>Discharge class</b>  The selection of discharge class also configures the nitrification and denitrification processes. C Carbon removal. Target parameters: BSB <sub>5</sub> , CSB, AFS N Nitrification. Target parameters: BSB <sub>5</sub> , CSB, AFS, NH <sub>4</sub> N D Denitrification. Target parameters: BSB <sub>5</sub> , CSB, AFS, NH <sub>4</sub> N, N <sub>tot</sub> D+ Denitrification. Target parameters: BSB <sub>5</sub> , CSB, AFS, NH <sub>4</sub> -N, N <sub>tot</sub> (program with interim charging)

## 8. Service menu for authorised specialist

<b>Start times</b>	<p>Editing the cycle start times. Each process comes with its own start time defaults. The number of cycles can be edited in the “T-settings” submenu.</p> <p>NOTE The edited start time is adopted only when ALL start times are confirmed with <b>[OK]</b>.</p>
<b>Valve size</b>	The size of the fitted step motor valves is selected to ensure that the right stroke is executed. These values are ½", 1", and 2".
<b>Restart cycle</b>	After editing the cycle settings, you should afterwards restart the cycle. The current treatment cycle is aborted, and the control unit switches to “Cycle pause” until the next start time is reached. Otherwise, the current cycle is ended with the old settings and then the next cycle with the new ones.
<b>Assigning outputs</b>	The electric components/consumers can be assigned here a control unit output. Preassigned functions and outputs appear, which can be selected and edited. Additional consumers added later must be assigned to the corresponding output if they too are to be addressed by the control unit. See <i>Subsection 8.2.2</i> for an overview of the functions and outputs.
<b>T-settings</b>	For viewing and editing each of the T-settings (work steps) and the number of treatment cycles. See <i>Subsection 8.2.1.1</i> for further details.

### 8.2.1 Overview of processes, systems, and discharge classes

There are a total of 7 cleaning processes with up to 4 discharge classes each to choose from.

	1	2	3	4	5	6	7
<b>Process</b>	<b>SBR 4V</b>	<b>SBR One 3V</b>	<b>SBR One 2V</b>	<b>SBR MAX 4V</b>	<b>SBR MAX 3V</b>	<b>Flow 2V</b>	<b>Flow 1V</b>
<b>System</b>	<b>KLARO</b>	<b>KLARO One</b>	<b>KLARO One</b>	<b>KLARO MAX</b>	<b>KLARO MAX</b>	<b>Logo</b>	<b>Moving bed</b>
	<b>Klaro Easy</b>	<b>easyOne</b>	<b>easyOne</b>	-	con-tainer.blue	<b>Fixed bed</b>	<b>Fixed bed</b>
	<b>EPro</b>	<b>one Advanced</b>	<b>one Advanced</b>	-	-	<b>Fluid-ised bed</b>	<b>Fluid-ised bed</b>
	<b>Graf prof</b>	<b>one2clean</b>	<b>one2clean</b>	-	-	-	-
	<b>one Advanced</b>	-	<b>EClean</b>	-	-	-	-
	<b>Demo</b>	<b>Demo</b>	<b>Demo</b>	<b>Demo</b>	<b>Demo</b>	<b>Demo</b>	<b>Demo</b>
<b>Dis-charge class</b>	<b>C/N/D/D+</b>	<b>C/N/D</b>	<b>C/N/D</b>	<b>C/N/D</b>	<b>C/N/D</b>	<b>C/N</b>	<b>C/N</b>

These instructions describe exclusively oneAdvanced plants with two (2V, oneAdvanced 3–9 PE) and four valves (4V, oneAdvanced larger than 10 PE). These must therefore be selected.

## 8. Service menu for authorised specialist

### 8.2.1.1 Table layouts

The table is divided into work steps, e.g. feed, and runtime calculations. Also the number of cleaning cycles per day can be edited.

All work steps are made up of 3 T-steps. The first T-step of a work step is the total duration of the work step. The two following T-steps specify the activation and deactivation periods within this work step.

Example work step for aeration: T7 = 240 min is the total duration of aeration. Within these 240 minutes, aeration alternates between ON for 6 min (T8) and OFF for 4 min (T9).

Functions	Example values for 5 PE SBR 2V Flow class D	Example values for 14 PE SBR 4V Discharge class C
Feed	X31,	X31, X16.V1
T 1 $\Sigma$	0.00 min	13.11 min
T 2 ON	0.00 min	13.11 min
T 3 OFF	0.00 min	0.00 min
Denitrification	X31, X16.V1	X31, X16.V2
T 4 $\Sigma$	90.00 min	0.00 min
T 5 OFF	18.00 min	0.00 min
T 6 ON	1.00 min	0.00 min
Aeration	X31, X16.V1	X31, X16.V2
T 7 $\Sigma$	480.00 min	232.70 min
T 8 ON	15.00 min	10.00 min
T 9 OFF	5.00 min	10.00 min
Sedimentation	X31, -	X31, -
T 10 $\Sigma$	120.00 min	90.00 min
T 11 ON	0.00 min	0.00 min
T 12 OFF	120.00 min	90.00 min
Clear water extraction	X31, X16.V2	X31, X16.V3
T 13 $\Sigma$	9.36 min	13.11 min
T 14 ON	9.36 min	13.11 min
T 15 OFF	0.00 min	0.00 min
Sludge return	X31, -	X31, X16.V4
T 16 $\Sigma$	0.00 min	1.00 min
T 17 ON	0.00 min	1.00 min
T 18 OFF	0.00 min	0.00 min
Cycle pause	X31, X16.V1	X31, X16.V2
T 19 OFF	30.00 min	15.00 min
T 20 ON	4.00 min	2.00 min
Holiday	X31, X16.V1	X31, X16.V2
T 21 ON	4.00 min	2.00 min
T 22 OFF	30.00 min	15.00 min
Cycle time	699.36 min	349.93 min
Aeration time	12.13 h/d	8.00 h/d
Total runtime	12.44 h/d	9.81 h/d
Cycles per day	2 1/d	4 1/d

Table 2: Layout of cycle tables

#### NOTE

When settings have been edited in the “Table selection” menu and the menu exited with the left cursor key [◀], the message “Please wait ...” appears briefly. The edited settings are saved, and the new table can then be viewed in the “T-settings” menu. A restart is not necessary.

## 8. Service menu for authorised specialist

### NOTE

Each cycle phase and each work step also shows the outputs used. Example: “Charging: X31, X16.V1” signals that, for charging purposes, output X31 for the compressor and X16.V1 for valve 1 are being addressed. Edits are possible in the menu “Assign outputs”.

### NOTE

The T-settings may be edited in steps of one minute. Steps of 0.10 min are also possible for subminute durations. The setting 0.00 min means that the T step is not activated.

## 8. Service menu for authorised specialist

### 8.2.2 Outputs

Prior to shipping, the output functions and assignments have been provided with the defaults listed in the following table. Additional components must be connected accordingly if the switch cabinet wiring is to continue complying with the circuit diagrams (clarity).

Function	KLcontrol.M	Note
Valve 1	X16.1	Standard assignments for transport processes with pneumatic lifter via <b>step motor valves</b> . Alternatives also include solenoid valves (see <i>Subsection 9.7</i> ) or submersible pumps (see <i>Subsection 9.5</i> ).
Valve 2	X16.2	
Valve 3	X16.3	
Valve 4	X16.4	
Function	KLcontrol.M	Note
Compressor 1	X31	If only one compressor, always select "Compressor 1"
Compressor 2	X32	Runs in parallel to compressor 1. For monitoring, check the current threshold settings.
UV module	X33	
Cooling fan 1	X34	Cooling fan 230 V
Cooling fan 2	X35	Cooling fan 230 V
Pump	X32	For submersible pump, e.g. for secondary buffer. Operating parameters via "reserve module"
Dosing pump 1	X12.7	C module
Dosing pump 2	X12.1	P module
Dosing pump 3	X12.5	Chlorination module
Warning lamp	X12.5	External warning lamp 24 V
Cooling fan 3	X12.3	Cooling fan 24 V
Output 24 V	...	Reserve

Multiple outputs must be interpreted as "either or". Each output can be used once only.

#### NOTE

A compressor is assigned as standard to the valves. After confirming your selection, you are prompted with "Deactivate compressor Yes/No". If pneumatic lifters are to operate, press [◀] "No". If submersible pumps are to operate, press [▶] "Yes". For the use of submersible pumps, see also *Subsection 9.5* on page 91.

## 8. Service menu for authorised specialist

### 8.2.3 Inputs


The KLcontrol.M control unit presents three inputs. These are not managed in the menu “Assign outputs”.

Function	KLcontrol.M	Note
Float switches	X12.9	For their use as “canister empty” monitors, see <i>Subsection 9.3</i> ; as flooding alarms, see <i>Subsection 8.2.4</i> )...
Float switches	X12.11	
Contactor monitoring	X20	See <i>Subsection 8.2.10</i> .

## 8. Service menu for authorised specialist

### 8.2.4 Pressure sensor

The control units are fitted with two pressure sensors that can be used to measure the level and/or for monitoring the operating pressure. Before use, a specialist must first perform an on-site calibration ("service calibration"). The functions and their execution are described in *Subsections 9.1 and 9.2*.

 <b>Service » Pressure sensor</b>	
<b>Level measuring</b>	Setting the parameters for level-dependent operations. The sensor must be service-calibrated (see <i>Subsection 9.1.3</i> ).
	<b>Cycle start from</b>  0–999 cm  Enter the level above which a cycle is to be started.  A value of 0 cm deactivates level measurements, and the plant operations are time-controlled. The factory default is 0 cm.
	<b>Overflow alarm from</b>  0–999 cm  Level above which an alarm sounds. Meaningful is e.g. the distance between the tank base and the emergency overflow, or just under.  The setting "0 cm" deactivates the fault message "Max level". It is not necessary for the overflow alarm to be activated for the plant to function correctly.
	<b>Recirculation</b>  0–999 s  This selects the duration of the recirculation or the sludge lifter's runtime. We recommend 120 s.

## 8. Service menu for authorised specialist

<b>Operating pressure monitoring</b>	This lets you configure the parameters for pressure monitoring (see <i>Subsection 9.2</i> ).
	<b>Activate</b> Yes/No
	<b>Measured values</b> This reads out the measurements, together with their time stamps, stored for compressor 1, valve 1–4. Saved measurements can be deleted; this does not affect the values from the teach-in phase.
	<b>Limit values</b> This reads out the limit values for compressor 1, valve 1–4 detected during the teach-in phase. If this teach-in phase is still active, the limit values are 0.
	<b>Reset</b> Restart of the teach-in phase.
<b>Lifter calibration</b>	<b>oneAdvanced 3–9 PE (one-tank systems)</b> This starts the service calibration for level measurements via the membrane pipe aerator. Same calibration process as with code 8 8 8 8 (see <i>Subsection 9.1.4</i> ). <b>oneAdvanced larger than 10 PE (with preliminary cleaning / sludge reservoir)</b> The service calibration for level measurements via the charging lifter are also started with the service code 9 9 9 9 (see <i>Subsection 9.1.4</i> ).


## 8. Service menu for authorised specialist

<b>Flooding alarm 2</b>	<p>Level monitoring in any tank by means of a float switch.</p> <p>Exceeding the threshold outputs the fault message S.32 "Flooding 2".</p> <p>This alarm can be delayed and temporarily suppressed.</p>
	<p><b>Input</b></p> <p>Define the input for the sensor: X12.9 / X12.11</p> <p>The float switch must be an NO switch.</p> <p>Max conductor cross section 1.5 mm<sup>2</sup> (see circuit diagram for connections).</p>
	<p><b>Alarm delay</b></p> <p>0–999 min</p> <p>This defines a waiting time in the event of false alarms as a result of fluctuating water levels. The alarm is not sounded until the sensor continues signalling after this time has expired.</p>
	<p><b>Alarm mute</b></p> <p>0–99 h</p> <p>This suppresses the flooding alarm for the set time.</p> <p>Before it can be suppressed, the alarm must first be acknowledged (by the operator). After expiry of the suppression time, the alarm is again sounded when the sensor continues signalling. The operator then has time to remedy the overflow and yet is still alerted when the problem persists.</p>

## 8. Service menu for authorised specialist

### 8.2.5 Information


This also lets users manage the operating hours counters and event messages.

 <b>Service » Information</b>	
<b>Show wkl. operating hours</b>	This presents for each output the weekly operating hours for the last 53 weeks. Outputs that have not generated operating hours are hidden.
<b>Delete wkl. operating hours</b>	This deletes the weekly operating hours.
<b>Delete all operating hours</b>	This deletes all operating hour totals.
<b>Delete events</b>	This deletes all events (info messages, malfunctions, errors) in the log book.

## 8. Service menu for authorised specialist

### 8.2.6 Temperature sensor

The control unit is fitted with a temperature sensor that measures continuously the temperature inside the switch cabinet. The currently measured temperature can be viewed on the operator level in the menu “Information” » “Show sensor values”.

 <b>Service » Temperature sensor</b>	
<b>Temp 1: Fan ON</b>	<p>ON temperature of the cooling fan (when fitted).</p> <p>0–100 °C</p> <p>We recommend 35 °C. The fan switches OFF when the temperature drops below the threshold by 5 °C.</p>
<b>Temp 2: Tmax</b>	<p>Warning of overheating.</p> <p>0–100 °C</p> <p>We recommend 45 °C.</p> <p>When the set temperature is reached, the message H.7 “Temp 2 max” appears.</p>
<b>Temp 3: Compressor OFF</b>	<p>Emergency shutdown.</p> <p>0–100 °C</p> <p>We recommend 55 °C. When the set temperature is reached, all current outputs are switched OFF, with the exception of the cooling fan, to protect components against overheating. Power is reinstated when the temperature drops below the set threshold by 5 °C.</p>

## 8. Service menu for authorised specialist


### 8.2.7 Current limits

The control unit's outputs are monitored on the basis of current measurements. The control unit has been provided with minimum and maximum defaults prior to shipping. Threshold violations cause a fault message to appear. The values can be changed manually when necessary. To deactivate the current monitor for an output, set its maximum value to 0.

An output is assigned unambiguously only when this is the only one (24 V or 230 V) active during measurements. If more than one output is active, an error message assumes a general nature.

### 8.2.8 Maintenance


This menu can be used to organise maintenance schedules and intervals.

 <b>Service » Maintenance</b>	
<b>Set service date</b>	Set any date for a maintenance job.  The info message "H.1: Maintenance needed" appears on the display as a reminder to the operator.
<b>Maintenance interval</b>	Set regular maintenance (e.g. every six months)  0–12 months  The next date is calculated automatically and appears as a service message on this day.
<b>Maintenance interval</b>	Setting a maintenance interval causes the next maintenance date to appear automatically after this interval, also in an optional box.
<b>Service completed</b>	The maintenance performed on this date must be confirmed by the service personnel. This confirmation is entered in the log book.

## 8. Service menu for authorised specialist

### 8.2.9 Modules

This menu can be used to steer and monitor additional modules.

 <b>Service » Modules</b>	
<b>C module</b>	<p>Additional dosing from an external carbon source.</p> <p>Setting the operating parameters for dosing pumps. In addition, level monitoring can be activated for the canister (see <i>Subsection 9.3.4 on page 87</i>).</p>
<b>P module</b>	<p>Setting the simultaneous phosphate precipitation in the SBR reactor.</p> <p>Setting the operating parameters for the dosing pumps. In addition, level monitoring can be activated for the canister (see <i>Subsection 9.3.3 on page 84</i>).</p>
<b>Chlorination module</b>	<p>Setting a tertiary cleaning stage for the disinfection of wastewater with a chloride solution.</p> <p>Setting the operating parameters for one or more dosing pumps. In addition, monitoring can be activated for the canister (see <i>Subsection 9.3.5 on page 88</i>).</p>
<b>UV module</b>	<p>Setting a tertiary cleaning stage for the disinfection of wastewater with UVC.</p> <p>Setting the operating parameters for a UV emitter, either with a pump (time controlled) or with a float switch (level controlled).</p> <p>The emitter's maximum service life can be set. After the service life, a message appears prompting the replacement of the emitter (see <i>Subsection 9.4 on page 90</i>).</p>

## 8. Service menu for authorised specialist

<b>Redundancy module</b>	Two compressors can be operated in parallel or in turn (on a cyclic or daily basis). If a compressor fails, an event message “Compressor X fault” appears. The plant then continues running with the other compressor.
	<b>Activate</b> OFF/Cyclic/Daily  OFF    No alternating operation. Both compressors run in parallel.  Cy-    The compressors alternate each time a new cycle cl    starts.  Daily    On a daily basis: The compressors alternate each time a new cycle starts on a new day.
	<b>Output X31, –</b>  This shows for inspection purposes the outputs addressed for the compressors.
<b>Reserve module</b>	This sets the start T-step and the runtime for the “Pump” function. This function is suitable e.g. for operating a submersible pump in a secondary buffer (see <i>Subsection 9.5</i> ).


## 8. Service menu for authorised specialist

### 8.2.10 Contactor monitoring

If higher performance consumers are required, these can also be supplied via a contactor. The increased load is then no longer borne by the controller. This contactor can be monitored via the input at the connector X20.

Activating contactor monitoring deactivates automatically the current monitor for the consumer's original output, irrespectively of the current measuring limits set in the Service menu.

The contactor is monitored with a defined debouncing time. Also contactors activated with 24 V can be used.

 <b>Service » Contactor monitoring</b>	
<b>Output</b>	Select the consumer you wish to monitor (e.g. "Compressor 1").
<b>Input X20.1</b>	This presents the input X20.1 provided for contactor monitoring

### 8.2.11 Exit menu

Execute this function to exit and disable the service menu. To open the service menu, you will need to reenter a service code.

If no key has been pressed for three minutes, the service menu is disabled automatically.

## 9 Additional controller functions

### 9.1 Underload detection

Underload detection is deactivated by default. When the plant is started up, it runs in automatic mode regardless of the volume of wastewater flowing in.

#### Note

We recommend activating this function after a run-in phase of 3 months at the earliest!

KLcontrol.S and KLcontrol.M control units are fitted with a pressure sensor as standard and this can be used to establish the level in the first chamber (oneAdvanced larger than 10 PE) or in the SBR reactor (oneAdvanced 3-9 PE) respectively. This function is used to save energy when the flow of wastewater is low.

### IMPORTANT

#### Incorrect settings will cause malfunction

- Incorrect calibration of the plant could cause it to operate constantly in economy mode (with cycle pause). Correct cleaning of wastewater is not then possible.
- Calibration and level-dependent operation must be activated by a maintenance fitter or expert only.

#### 9.1.1 Function

##### 9.1.1.1 Functions of oneAdvanced 3–9 PE

The water level is measured at adjustable intervals at the start of a cleaning cycle by means of the pressure in the membrane aerator. If the level in the tank exceeds a previously set level ("Level measurement" in service level), the system starts a cleaning cycle. If the set level is not reached, the system automatically goes into cycle pause for the set interval. Only enough oxygen to maintain the biological components is then pumped into the system. The water level continues to be measured during the cycle pause at set intervals. Should sufficient wastewater have again flowed into the system after a certain time, the control unit switches to the normal cleaning cycle once the set level is reached.

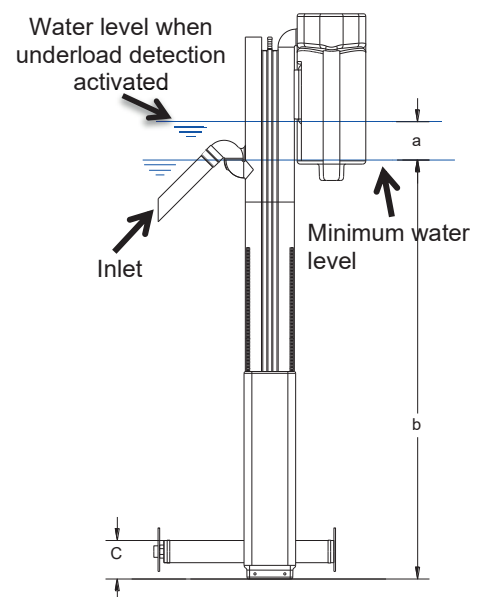


Figure 13: Clear water lifter, levels in SBR reactor

## 9. Additional controller functions

### 9.1.1.2 Functions of oneAdvanced larger than 10 PE

The water level is measured using the pressure in the feed lifter during the feed phase. If the water level in the sludge reservoir/buffer (first chamber) exceeds a preset level ("Level measuring setting"), the plant starts a cleaning cycle. If the level is not reached, the plant goes into cycle pause for 6 hours. The SBR reactor is then aerated only sporadically to maintain the bacterial biotope. If the preset water level is not reached in the first chamber after 4 consecutive measurements, the plant pumps water from the reactor into the first chamber via the excess sludge lifter.

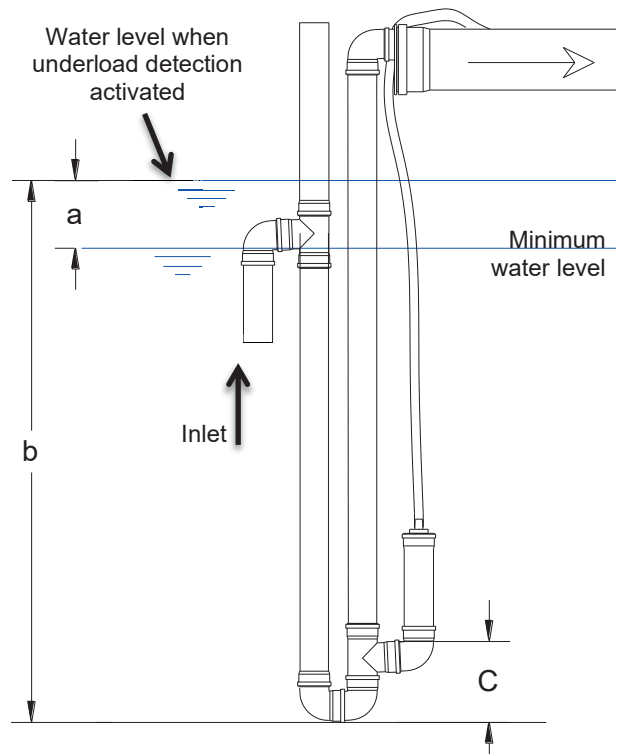


Figure 14: Charging lifter, levels in preliminary cleaning

After pumping back, the plant measures the water level again. After a certain time, new feed is therefore supplied to the reactor even with little or no wastewater supply. The normal cleaning line can therefore be kept for long periods even in the event of absence or underload.

### 9.1.2 Cleaning cycle queries

The number of cleaning cycles undertaken can be queried using the "Information" item under the "Utilised capacity" menu. This indicates the cleaning cycles actually undertaken with the cycles performed in automatic mode as a ratio and as a percentage (25% to 100% utilisation).

## 9. Additional controller functions

### 9.1.3 Calibrating level measuring

Calibrating adjusts the offset for the level's characteristic curve. This involves adjusting the measurements to the height of the air lifter or membrane pipe aerator. Level measuring always makes use of pressure sensor 1.

Calibration can be accessed in the Service menu under "Pressure sensor" or following the entry of the password "8888" (3–9 PE) or "9999" (from 10 PE) for the Service menu.

Before and during calibration, the water level must be measured from the tank base.

#### Calibration functions

The controller guides the user through the calibration and displays the remaining time and the current pressure. The controller performs 3 measurements. Afterwards, the measured water level must be entered (in cm).

In the event of an implausible input, the value can be reentered or the calibration aborted. If the entry corresponds to the calculated value, the calibration can be saved. The displayed offset is the distance between the tank base and the lifter's or membrane pipe aerator's blow-in point.

### 9.1.4 Starting level measuring

The first chamber (sludge reservoir/buffer), where the feed lifter is located (oneAdvanced larger than 10 PE) or the SBR reactor where the membrane aerator is located (oneAdvanced 3-9 PE) respectively, must be filled with water up to the height at which a cleaning cycle is to be triggered. This level depends on the geometry of the tank and the number of connected inhabitants (PE). The recommended buffer heights *a* (see *Figure 14, p 76*) above the minimum water level are specified for the various configurations in the table below.


#### Recommended settings for the buffer height:

Type													
PE	3	5	7	9	10	14	10	16	22	28	32	44	50
Type	2700 l	3750 l	4800 l	6500 l	4800 l	6500 l	2 x 2700 l	2 x 3750 l	2 x 4800 l	2 x 6500 l	4 x 3750 l	4 x 4800 l	4 x 6500 l
b [cm]	100	118	140	165	122	142	100	113	126	146	113	126	146

## 9. Additional controller functions

### 1. step: Calibrate pressure sensor


It is absolutely essential that the sensor is calibrated for starting up underload detection. Please carefully work through the following points in order.

<b>Measure level</b>	Use a dipstick to measure the level from the bottom of the tank to the water level, and note this.  oneAdvanced 3–9 PE: Measure in the SBR reactor oneAdvanced larger than 12 PE: Measure in preliminary cleaning
<b>Enter service code:</b> * * * *	Open the menu  “Service”, press [OK], and enter for the calibration the following code:  oneAdvanced 3–9 PE: 8 8 8 8 oneAdvanced larger than 10 PE: 9 9 9 9
<b>Calibrate</b> ◀ No      Yes ▶	Using the cursor keys [◀] [▶], select “Calibrate Yes”, and confirm with [OK] to start calibration.
<b>Measurement underway</b>	3 measurement processes are undertaken automatically.
<b>000 cm</b> <b>Current level</b>	Enter the level you have measured, and confirm this with [OK]. Measuring the level:  On plants from 10 PE, measurements must be taken in the first chamber or tank.
<b>Save</b> ◀ No      Yes ▶ <b>Offset XX cm</b>	This offset is the distance $c$ between the tank base and the lifter's blow-in point (for lifter calibration). Using the cursor keys [◀] [▶], select “Save Yes” to end calibration.

## 9. Additional controller functions

### 2. step: Set controller parameters

Setting the level from which a treatment cycle is started is absolutely essential for this level function. Please carefully work through the following points in order:

<b>Service</b> <b>Enter code:</b> * * * *	Open the menu  "Service", press [OK], and, when prompted, enter the general service code.
<b>Pressure sensor »</b> <b>Level measure-</b> <b>ment</b>	Using the cursor key [▼], select "Pressure sensor", and confirm with [OK]. In the menu "Pressure sensor" now appearing, press [OK] to open "Level measuring".
<b>Cycle start from</b> <b>000 cm</b>	Press [OK] to open the menu "Cycle start from". Using the cursor keys [▲] [▼], enter the water level <i>b</i> above which a treatment cycle is to be started (see table above). Confirm your entry with [OK].
<b>Overflow alarm</b> <b>from 000 cm</b>	<p><b>NOTE</b> It is not essential for the overflow warning message to be activated for the plant to function correctly. If 000 cm is saved, this warning message remains deactivated.</p> <p>To activate, measure the height between the base of the tank and bottom edge of the emergency overflow in the discharge. Confirm your entry with [OK].</p> <p>→ Saving the value 000 cm deactivates the overflow warning message.</p>
<b>Recirculation</b> <b>120 s</b> <b>(from 10 PE)</b>	Press [OK] to open the menu "Recirculation". Using the cursor keys [▲] [▼], enter the value 120 s, and confirm this with [OK]. The necessary settings are now complete. Press [◀] to exit the menu.

### 3. step: Function check

Level measuring can now be undertaken in manual mode for checking purposes. This requires level measuring to be activated with [OK]. The control unit automatically takes a measurement. Once the process is complete, the measured value appears.

## 9. Additional controller functions

### 9.1.5 Deactivating the level measurement

To deactivate the level measurement and again run the cycles dependent on time, proceed as described under “*Step 2: Set control unit parameters*” in *Subsection 9.1.4*, and set the water level b to 0 cm. The set recirculation can remain at 120 seconds.

### 9.1.6 Safety and fault messages

If the sensor measures a value below 40 cm, the following message appears on the display: “Fault: Min. level”. If this happens, the plant reverts to the normal time-controlled mode. This is either triggered by too low a water level ( $\leq 40$  cm) in the measuring chamber or a leak in the pressure or measurement line. In this event, we recommend contacting your maintenance company.

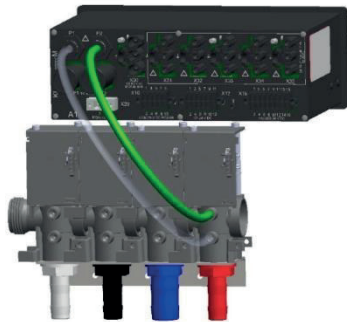
If the sensor measures a value greater than “Warning overflow”, this message appears on the display. If this happens, the plant reverts to the normal time-controlled mode. The cause is either too high a wastewater supply or a clogged clear water lifter. In this event, we recommend contacting the maintenance company.

### 9.2 Compressed air monitoring

This function lets you monitor the operating pressure in the air distributor for all valves. A pressure measured outside of the normal range causes a warning to appear. The causes of too low a pressure can be a leak or e.g. a pressure hose detached or detaching from the compressor. Too high a pressure may indicate crushed air hoses or problems with the membrane aerators.

#### 9.2.1 Technical requirements

The KLcontrol.M control unit uses automatically pressure sensor 2. This necessitates an additional compressed air line between pressure sensor 2 and the top connector on valve 1.



KLcontrol.M with connection P2

#### 9.2.2 Settings

Compressed air monitoring is decoupled from the actual cycle process. Monitored are compressor 1, valve 1, valve 2, valve 3, and valve 4. Compressed air monitoring switches to one of two states: teach-in phase and monitoring phase:

#### 9.2.3 Teach-in phase

In the teach-in phase, each monitored output returns the pressure values based on the set parameters. At the end of the teach-in phase, these are used to derive a minimum and a maximum limit value. If the menu does not present a minimum and maximum value, the controller is still in the teach-in phase. We recommend setting the teach-in phase to thirty days.

#### 9.2.4 Monitoring phase

The set parameters provide the basis for pressure measurements that are compared with the calculated minimum and maximum values with consideration to the set tolerance. If a measured value exceeds this tolerance, a fault is generated and entered in the log book.

### 9.3 Dosing installations

The oneAdvanced wastewater treatment plant can be fitted with dosing installations.

Dosing applications include:

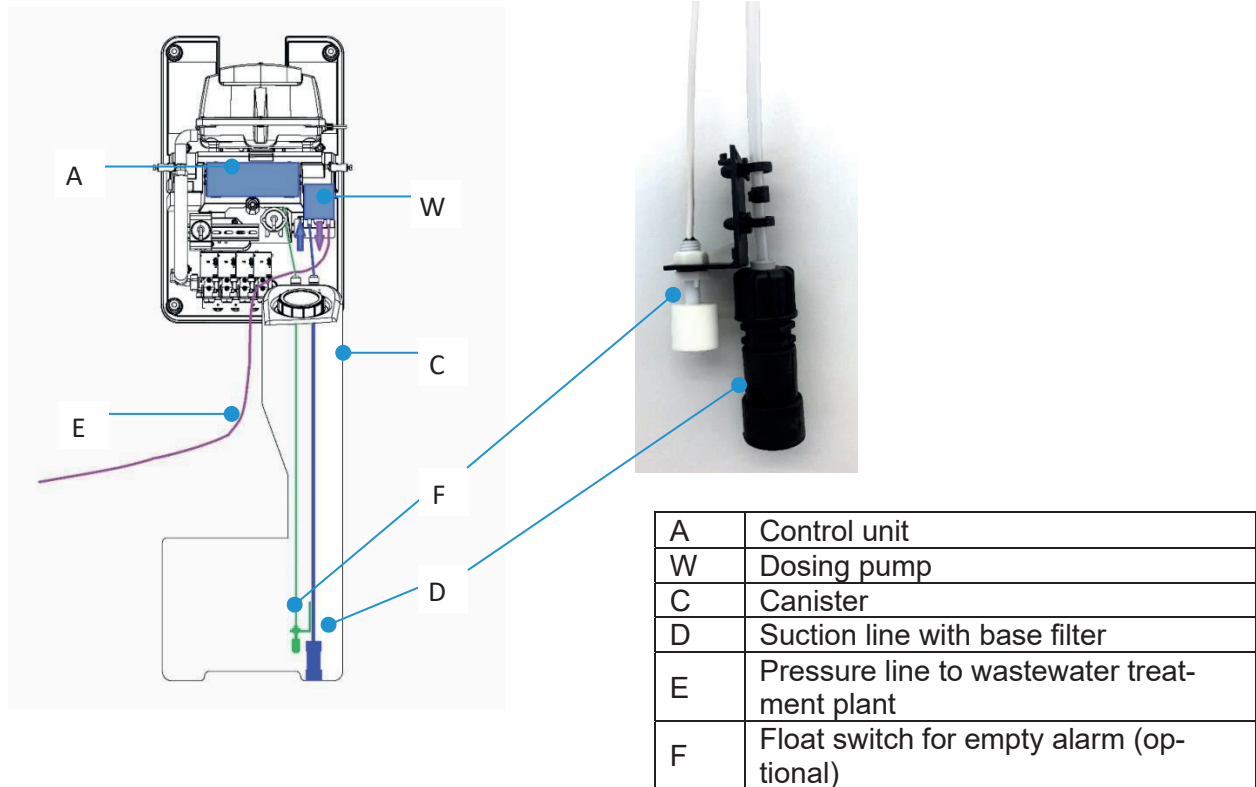
- phosphate precipitation
- dosed carbon additions

## 9. Additional controller functions

- chlorination

The control unit provides a number of components and functions for these applications.



### 9.3.1 Components



## 9. Additional controller functions

### 9.3.2 Dosing pumps

Two types of dosing pumps are used. These can be fitted with various suction lines for a range of delivery rates. The suction lines fitted as standard are highlighted grey.

Description		DP24	Compact			
Image						
Voltage	[V]	DC 24	DC 24			
Rpm	[rpm]	5	Variable			
Suction line	Type	PS 138-3.2x1.6 PH		PS 138- 1.6x1.6 PH	PS 138- 3.2x1.6 PH	PS 140- 4.8x1.6 PH
I/E diameter	[mm]	3.2/6.4	P	1.6/4.8	3.2/6.4	4.8/8.0
Pump capacity	[ml/min]	4.4	1	0.3	1.1	2.0
			2	1.3	5.0	10.0
			3	3.1	10.9	20.2
			4	4.4	16.3	32.3
			5	5.7	20.6	39.8
			6	7.0	24.9	48.2
			7	8.1	29.1	57.7
			8	9.5	34.9	69.5
			9	11.5	39.9	77.6
			10	12.4	44.0	83.4

## 9. Additional controller functions

### 9.3.3 Phosphate precipitation with P module

The function and the principle of P precipitation with the P module are described in *Subsection 3.2.4.6* on page 22.

#### 9.3.3.1 Control unit settings

Plants with P module are provided with defaults prior to shipping. The settings can be viewed and edited on the service level.

<b>Module » P module</b>	Select “P module” in the module’s submenu.
<b>Output</b>	This presents the control unit’s outputs addressed via the P module. Provided here as standard are “Dosing pump 2” and output “X12.1”.
<b>Modules</b>	Also more than one dosing pump can be operated in parallel via various outputs. The number of pumps is set here (1, 2, 3).
<b>Start with T-step</b>	T-step with which the dosing pump is to start. In principle, all steps from T1 to T22 are possible here. We recommend starting the dosing pump for P precipitation with T07 (aeration phase).
<b>Runtime</b>	The dosing pump’s runtime is set here. Possible are 0–99 min.
<b>Canister monitoring (KIcontrol.M only)</b>	<p>When a float switch is fitted for “canister empty” monitoring, this monitoring can be activated here. This involves selecting the input used. The control unit then signals: “P canister empty”. The treatment cycle and the dosing pump are not suspended.</p> <p>Select “–” to deactivate monitoring.</p>

## 9. Additional controller functions

### 9.3.3.2 Precipitant

The choice of precipitant depends on availability, pH value, water hardness, concentration of the active ingredient, shelf life, thermal stability, and other factors. Please bear in mind that all of these agents are declared hazardous substances!

There are a number of precipitants available for phosphorus. The most common of these are:

- polyaluminium chloride (PAC)
- iron(III) chloride ( $\text{FeCl}_3$ )
- sodium aluminate



### WARNING

#### Highly corrosive and harmful substances



- The precipitant sodium aluminate causes serious chemical burns. This may result in serious injury and damage to eyes.
  - The precipitants iron(III) chloride and polyaluminium chloride are harmful to health. There is a danger of severe irritation to skin and eyes. Ingestion can be harmful to health.
- Wear goggles, protective gloves, and protective clothing.  
→ Consult the safety data sheet provided by the manufacturer.
- 

### 9.3.3.3 Set dosing

The correct dosage of precipitant depends on several factors, e.g. the quantity of dissolved phosphate, the targeted cleaning level, the precipitant used, etc.

During commissioning, the runtime per cycle can be preset according to the values in the table below. We recommend during maintenance to measure the P content in the discharge and to adjust the dosage by adjusting the runtime.

## 9. Additional controller functions

DP24			Compact		
					
PE	ml/min	Runtime min	P	ml/min	Runtime min
4	4.4	2	1	2	5
5		3			6
6		3			7
8		4			9
10		5			11
12		5	2	10	2
15		6			3
16		7			3
20		8			4
25		10			4
30		12			5
35		15			6
40		17			7
50		21			9

### 9.3.3.4 Initial use

The precipitant tank must be placed in a frost-proof location (e.g. in the machine cabinet or the plant's dome shaft). The pressure and intake hoses must also be laid in frost-free areas. The pressure hose is to be routed into the SBR reactor and placed inside the reactor with the outlet located above the reactor basin. The precipitant must fall directly into the wastewater to be treated and not dampen any components. Precipitants are aggressive chemicals and may cause damage to components. The outlet must never be submerged in the water!

- Insert the suction hose into the precipitant tank until you are sure it is drawing precipitant from the base.
- Connect the suction and pressure hoses to the pump's hose connectors and lock with union nuts.

## 9. Additional controller functions

### 9.3.4 Pumped carbon dosing (C module)

Doses added from an external carbon source are described in *Subsection 3.2.4.8* on page 22.

#### 9.3.4.1 Control unit settings

Plants with C module are provided with defaults prior to shipping. The settings can be viewed and edited on the service level.

<b>Module » C module</b>	Select “C module” in the module’s submenu.
<b>Output</b>	This presents the control unit’s outputs addressed via the C module. Provided here as standard are “Dosing pump 1” and output “X12.7”.
<b>Modules</b>	Also more than one dosing pump can be operated in parallel via various outputs. The number of pumps is set here (1, 2, 3).
<b>Start with T-step</b>	<p>T-step with which the dosing pump is to start. In principle, all steps from T1 to T22 are possible here. We recommend the following starting procedures:</p> <ul style="list-style-type: none"> <li>• to support denitrification, to start at commencement of denitrification (T04 denitrification), or before (01 charging)</li> <li>• on underload T07 (aeration phase)</li> </ul>
<b>Runtime</b>	The dosing pump’s runtime is set here. Possible are 0–99 min.
<b>Holiday mode</b>	With holiday mode (operator-)activated, added dosing always commences when the cycle start time is reached, and no longer as set in “Start with T-step”.
<b>Canister monitoring</b>	<p>For KLcontrol.M only.</p> <p>When a float switch is fitted for “canister empty” monitoring, this monitoring can be activated here. This involves selecting the input used. The control unit then signals: “C-canister empty”. The treatment cycle and the dosing pump are not suspended.</p> <p>Select “–” to deactivate monitoring.</p>

#### 9.3.4.2 Carbon source

## 9. Additional controller functions

The usual carbon sources serving as nutrient solutions are:

- Brenntapplus VP1 (recommended, available from Otto Graf GmbH: item no. 106556)
- simple alcohols like methanol, ethanol, etc.
- sugar solutions, syrup, molasses, etc.

The choice of carbon source depends on availability, C fraction (how effective is the agent?), shelf life, thermal stability, and other factors. The nutrient solutions are generally harmless and completely biodegradable. Please bear in mind that the nutrient content and the odour may attract vermin (e.g. ants).

### 9.3.4.3 Dosing

The right C dose depends above all on the application. Approximate or calculated values are therefore first entered for the dose and control unit settings during commissioning. Please refer any questions to GRAF. Maintenance work may then readjust the dosage by changing the runtime.

### 9.3.5 Pumped chlorination (chlorination module)

#### 9.3.5.1 Function

The biologically purified wastewater may afterwards be treated with a chlorine solution that destroys bacteria and other microbes.



### CAUTION

#### Substances harmful to health

- The liquid chlorine compound (sodium hydrochloride) is harmful to health. There is a danger of severe irritation to eyes and the respiratory tract. Ingestion can be harmful to health.
  - Wear goggles, protective gloves, and protective clothing.
  - Consult the safety data sheet provided by the manufacturer.
-

## 9. Additional controller functions

### 9.3.5.2 Control unit settings:

Plants fitted as ordered with the chlorine module are provided with defaults prior to shipping.

The settings can be viewed and edited on the service level.

<b>Modules</b>	Select "Chlorine module" in the module's submenu.
<b>Chlorination module</b>	
<b>Output</b>	This presents the control unit's outputs addressed via the Chlorine module. The default here is "Dosing pump 3". An unassigned output must then be selected.
<b>Modules</b>	Also more than one dosing pump can be operated in parallel via various outputs. The number of pumps is set here (1, 2, 3).
<b>Start with T-step</b>	T-step with which the dosing pump is to start. In principle, all steps from T1 to T22 are possible here. We recommend starting with clear water extraction T13.
<b>Runtime</b>	The dosing pump's runtime is set here. Possible are 0–99 min.
<b>Input</b>	You can select here the input for a float switch that enables the module to operate in level dependent mode.
<b>Canister monitoring (KIcontrol.M only)</b>	<p>When a float switch is fitted for "canister empty" monitoring, this monitoring can be activated here. This involves selecting the input used. The control unit then signals: "Chlorine canister empty". The treatment cycle and the dosing pump are not suspended.</p> <p>Select "–" to deactivate monitoring.</p>

The installation, operation, and maintenance of the chlorine module is described in separate instructions.

### 9.4 UV reactor (UV module)

#### 9.4.1 Function

The biologically purified wastewater may afterwards be treated with UV radiation that destroys bacteria and other microbes. To this end, GRAF offers separate UV modules that can be sited directly in the SBR chamber or a downstream shaft. See also *Subsection 3.2.4.7* for further details.



#### CAUTION

##### Danger to health from UV radiation

- UV radiation is harmful to skin and eyes.
  - Operate UV emitters in closed reactors only.
  - Before all repair, maintenance, and cleaning work, first disconnect the UV module from its power supply.
  - Consult the operating instructions provided for the UV module.
-

## 9. Additional controller functions

### 9.4.2 Control unit settings:

Plants fitted as ordered with a UV module are provided with defaults prior to shipping. The settings can be viewed and edited on the service level.

<b>Module » UV module</b>	Select “UV module” in the module’s submenu.
<b>Output</b>	This presents the control unit’s outputs addressed via the UV module.
<b>Start with T-step</b>	T-step with which the UV module is to start. In principle, all steps from T1 to T22 are possible here. We recommend starting with clear water extraction T13.
<b>Runtime</b>	The runtime is set here. Possible are 0–99 min.
<b>Input</b>	You can select here the input for a float switch that enables the module to operate in level dependent mode.
<b>Max operating hours</b>	<p>This lets you activate an operating hours countdown. UV emitters are prone to wear. The UV emitters have a service life of 1500 h, after which they must be replaced. When the entered number of operating hours has been reached, the message H.4 “UV operating hours” appears.</p> <p>Select “0 h” to deactivate monitoring.</p>
<b>Reset</b>	After the emitter’s replacement, the counter can be reset.

The installation, operation, and maintenance of the UV module is described in separate instructions.

## 9.5 Submersible pumps

The control units KLcontrol.M can work together with 230 V submersible pumps. These can be used either in lieu of pneumatic lifters or for an additional transport process (e.g. from a secondary buffer tank).

### NOTE

A total current of 10 A is provided for the outputs. Make sure that this total current cannot be exceeded.

## 9. Additional controller functions

### 9.5.1 Submersible pump in lieu of pneumatic lifters

Here the pump is actuated in lieu of the valve; the starting point and runtime depend on the valve's T-step.

#### Procedure:

1. Open the menu Service » Cycle settings » Assign outputs.
2. Select the valve you want to replace and the 230 V output (X ...) you want to connect to the pump.
  - You are then prompted with "Deactivate compressor Yes/No".
3. Select **"Yes"**.
  - (The compressor is not needed to operate the pump and would otherwise work against the closed valve)
4. Open the menu Service » Current limits » Min current limits.
5. Select the valve you want and set its value to "0 mA".
6. The pump's current monitor is deactivated. Otherwise, deactivation would cause a fault to be signalled by dry running protection (float switch).
7. Open the menu Service » Current limits » Max current limit.
  - The value for the valve to be actuated in lieu of the pump must be set to "5000 mA".


### 9.5.2 Submersible pump for additional transport process

The pump is actuated via the reserve module. Starting point and runtime can be selected.

#### Procedure:

1. Open the menu Service » Cycle settings » Assign outputs.
2. Select the pump and the 230 V output (X ...) you want to connect to it.
3. Open the menu Service » Modules » Reserve module, and set the starting point and runtime.
4. Open the menu Service » Current limits » Min current limit.
  - Current monitoring for the "Pump" function is disabled prior to shipping. This setting should therefore be checked to dispel any doubts.
  - The "Pump" value must be "0 mA". Otherwise, deactivation would cause a fault to be signalled by dry running protection (float switch).

### 9.6 External warning indicator

A warning lamp can be connected to one of the 24 V outputs. The output X12.5 has been configured as the factory default for the warning lamp. The output for the warning lamp is configured in the menu  “Service”, “Cycle settings”, “Assign outputs”. The warning lamp is activated at the same time as the buzzer. The warning lamp and the buzzer are switched OFF when the fault message has been acknowledged in the menu.

### 9.7 Actuate solenoid valves

KLcontrol.M can also be used to operate solenoid valves (230 V) in lieu of step motor valves (24 V).

#### Procedure:

1. Open the menu Service » Cycle settings » Assign outputs.
2. Select the valve you want and the 230 V output (X32–35) connected to the solenoid valve.
  - You are then prompted with “Deactivate compressor Yes/No”.
3. Select **<No>**.
  - The compressor is necessary and may not be deactivated.
  - The valve and compressor are always switched ON and OFF together.
  - Normally, the current monitor need not be adjusted

## 10 Electrical connections



### WARNING

#### Hazardous voltage

- Danger from electric shock. An electric shock can cause serious burns and life threatening injury.
- Only specialised electricians may be assigned to work on the electrical installations and to connect the plant to its power supply.
- Before all work on the electrical system, disconnect the controller from its power source and secure it against reactivation.
- On removal of the power supply, there may still be voltage across charged capacitors.
- Wait until the capacitors have discharged!

An onsite all-pole circuit breaker for the mains voltage must be used for the electrical connections. The controller for wastewater treatment plants may be operated in a switch cabinet only, which must comply with IP44 or NEMA 3 or higher. All electrical connections to the rear side of this controller must lie inside the switch cabinet.

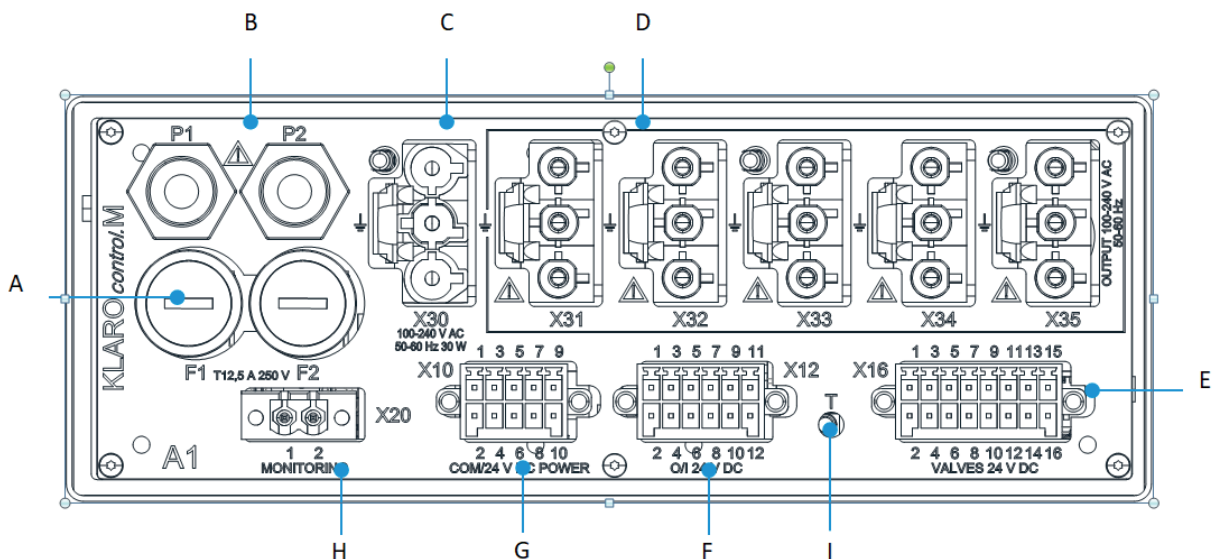


Figure 15: Electrical connections for KLcontrol.M

## 10. Electrical connections

		KLcontrol.M
<b>A</b>	Microfusing	F1, F2: T12.5 A / 250 V 5x20 mm
<b>W</b>	Pressure sensor	P1, P2
<b>C</b>	Mains IN 230 V	X30
<b>D</b>	Outputs 230 V	X31, X32, X33, X34, X35
<b>E</b>	Valve outputs 24 V	X16 for 4 step motor valves
<b>F</b>	Inputs/outputs 24 V	X12: 4 outputs 2 inputs
<b>G</b>	Serial interface	X10: RS485
<b>H</b>	Contactor monitoring	X20
<b>I</b>	Temperature sensor	D

### NOTE

A total current of 10 A is provided for the outputs. Make sure that this total current cannot be exceeded.

The 230 V sockets X30–X35 are fitted with an interlock preventing the plugs from detaching. The plugs must be inserted into the control unit until they click audibly. The plugs can be detached only when this interlock has first been bent open or loosened with a fully insulated screwdriver (e.g. voltage tester).



Figure 16: Loosening the claw for the 230 V plug




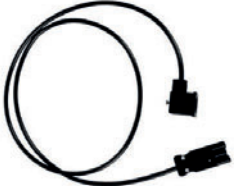







Figure 17: Opening the terminal

To connect the conductors to the plugs X12 and X20, use a small flat tpi screwdriver to press down the terminal springs (see Figure 17), then insert the conductors into the aperture, and withdraw the screwdriver. The conductors are now clamped tightly.


Before their use, newly connected components must first be assigned their respective function in the menu Service » Cycle settings » Assign outputs (see *Subsection 8.2*).

## 10. Electrical connections

Cables and connecting plugs on the control unit		
 <p>230 V power cable</p>	 <p>230 V cable for output with safety (Schuko) plug</p>	 <p>230 V cable for output with Phoenix (terminal) plug</p>
 <p>230 V cable for output with plug for solenoid valve</p>	 <p>230 V cable for output (UV module &amp; submersible pump)</p>	 <p>24 V cable for output to step motor valves</p>
 <p>Cable X10 for communication module</p>	 <p>Plug X12 for 24 V inputs and outputs</p>	 <p>Plug X20 for contactor monitoring</p>

# 11 Fault messages and rectification

Technical plant operation faults (failure of a consumer) are indicated both visually and acoustically. Pressing [OK] deactivates the control unit's acoustic fault signal for 10 minutes. The displayed error can be acknowledged when the message is selected with the cursor key [▲] and [OK] is pressed.

If the power supply fails, an integrated non-mains-dependent power cut detector emits an alarm which alternates with a visual signal. This fault signal cannot be acknowledged. The acoustic fault signal can be deactivated in advance in the menu  "Settings" > "Buzzer" > "Mains voltage".

**Please note:** This setting is not reset automatically.

## 11.1 Power failure

The controller KLcontrol.M for wastewater treatment plants comes with a wide-range power supply delivering alternating voltages of 100–240 V at a frequency of 50–60 Hz. Voltage failure within this range can be safely offset.

In addition, all relevant data are saved to nonvolatile EEPROM in the controller. In other words, these saved data can be retrieved after a power failure or controller reset (if undamaged).

The following data are saved to EEPROM:

- general data (UI language, treatment process settings, current T-step, E number, pressure measuring method, holiday period, etc.)
- calibration data and settings for both pressure sensors
- event memory data (information, error, fault)
- current cycle settings adopted from the cycle editor
- operating hours (valves, UV lamp, phosphate pump, compressor)

## 11. Fault messages and rectification

### 11.2 events in tabular form

events are sorted in ascending order of urgency and divided into information (**H.xx**), faults (**S.xx**), and errors (**F.xx**).

All occurred events appear on the home screen. Events can be deleted with the **[OK]** key in the operator menu. An ongoing event (fault or error only) cannot be deleted. After acknowledgement, the entry remains in the log book.

code	Event	LED	Acoustic alarm	Warning lamp	Clarification cycle
H.xx	note	yellow	no	no	continues running
S.xx	fault	yellow	yes	yes	continues running
F.xx	error	red	yes	yes	stops

## 11. Fault messages and rectification

### 11.2.1 Information messages

Information messages refer the operator, service personnel, etc., to mandatory actions. The program continues running normally in the background.

code	Event	Meaning	Measures, remedy
H.1	Maintenance due	Message from maintenance timer, maintenance due	Notify specialist
H.2	Maintenance message acknowledged	Read confirmation from H.1 Entered in log book only.	-
H.3	Service completed	Completed maintenance can be confirmed in the Service menu.	-
H.4	Max operating hours	The UV lamp has reached its maximum operating hours	Notify specialist to replace UV lamp
H.6	System restart	The system has been restarted (software update, power failure). Entered in log book only.	-
H.7	Temp 2: Tmax	Warning of overheating. The entered alarm temperature "Max temp 2" has been exceeded (KLcontrol.M only)	Ensure cooling, e.g. by providing shades for exterior cabinets  Test cooling fan in manual mode (if fitted); if necessary, install one  Check air filter fleece  Notify specialist
H.8	Overflow cycle time	Cycle time too long. Entered in log book only.	-
H.9	Change to cycle settings.	The cycle settings have been edited. Entered in log book only.	-
H.10	Manual mode ON	Manual mode has been activated manually. Entered in log book only.	-
H.11	Mains voltage back	Mains voltage back after power failure.	-

## 11. Fault messages and rectification

### 11.2.2 Fault messages

Fault messages appear when the system is not operating properly and needs to be checked. This may require the expertise of a specialist. The program continues running in the background, possibly with restrictions. The status LED lights up yellow, and also a warning tone sounds. Confirmation deactivates the warning tone temporarily. Not until after the fault has been remedied can the event be acknowledged at [OK]. An entry is made in the log book.

#### Note

If you are unable to remedy the fault yourself or at short notice, you can at least disable the acoustic alarm temporarily in the menu “Settings” (see *Subsection 4.4.5 on page 39*)

**Please note:** This setting is not reset automatically.

code	Event	Meaning	Measures, remedy
S.1	Max level	The maximum (set) level has been exceeded; the treatment process continues for the purpose of lowering the high water level.	<ul style="list-style-type: none"> <li>Check in the tank for back-flow or whether the water level has regulated itself independently</li> <li>If necessary, notify specialist</li> </ul>
S.2	Min level	An unusually low level has been measured; for safety reasons, the treatment plant switches back to purely time-controlled operations and no longer takes any level measurements	<ul style="list-style-type: none"> <li>Check in the tank whether the water level is unusually low</li> <li>If necessary, notify specialist</li> </ul>
S.3 S.4	Pressure sensor P1 Pressure sensor P2	The pressure sensor has encountered a problem; the treatment plant switches back to purely time-controlled operations and no longer takes any level measurements; pressure can no longer be monitored.	<ul style="list-style-type: none"> <li>Notify specialist</li> </ul>
S.6 S.7 S.8	Cooling fan 1 Cooling fan 2 Cooling fan 3	Short circuit or break at the fan output	<ul style="list-style-type: none"> <li>Notify specialist</li> </ul>
S.9	Temperature sensor	Temperature sensor defective or not connected	<ul style="list-style-type: none"> <li>Plug sensor firmly in control unit</li> <li>Notify specialist</li> </ul>
S.10	USB	The USB storage medium has encountered a problem. (E.g. defective file system or memory full)	<ul style="list-style-type: none"> <li>Try another USB stick</li> </ul>
S.11 S.13 S.15 S.17	Min valve pressure 1–4	The compressed air monitor detects an unusually low pressure at valve 1–4. Manual examination necessary.	<ul style="list-style-type: none"> <li>In manual mode, run the compressor with the valve and check for air leaks</li> <li>Notify specialist</li> </ul>
S.12 S.14 S.16	Max valve pressure 1–4	The compressed air monitor detects an unusually high pressure at valve 1–4. Manual examination	<ul style="list-style-type: none"> <li>In manual mode, run the compressor with the valve and check for any hose kinks or blocked valves</li> </ul>

## 11. Fault messages and rectification

code	Event	Meaning	Measures, remedy
<b>S.18</b>		necessary.	<ul style="list-style-type: none"> <li>• <b>Notify specialist</b></li> </ul>
<b>S.19</b>	Min compressor pressure	Apparently the compressor can no longer build up adequate pressure.	<ul style="list-style-type: none"> <li>• <b>In manual mode, test the compressor</b></li> <li>• <b>Notify specialist</b></li> </ul>
<b>S.20</b>	XX d until plant stops	The control unit prompts for an activation code. Refer to your specialist or the manufacturer.	<ul style="list-style-type: none"> <li>• <b>Notify specialist</b></li> </ul>
<b>S.21</b> <b>S.22</b> <b>S.23</b>	C-canister empty P-canister empty Chlorine-canister empty	Canister monitoring of carbon dosing, P precipitation, or chlorine dosing signals an empty tank	<ul style="list-style-type: none"> <li>• <b>Check the level in the canister</b></li> <li>• <b>Refill</b></li> <li>• <b>Notify specialist</b></li> </ul>
<b>S.24 – S.26</b>	Dosing pump 1–3	Short circuit / break at the output for dosing pump 1–3	<ul style="list-style-type: none"> <li>• <b>Notify specialist</b></li> </ul>
<b>S.27</b>	<b>Warning lamp</b>	<b>Short circuit or break at the output for warning lamp</b>	<ul style="list-style-type: none"> <li>• <b>Notify specialist</b></li> </ul>

### 11.2.3 Error messages

Error messages appear when the system is not operating properly and needs to be checked. This may require the expertise of a specialist. The program is stopped as a measure to prevent damage. The status LED lights up red, and also a warning tone sounds. Confirmation deactivates the warning tone temporarily. Not until after the error has been remedied can the event be acknowledged at **[OK]**. An entry is made in the log book.

#### Note

If you are unable to remedy the fault yourself or at short notice, you can at least disable the acoustic alarm temporarily in the menu “Settings” (see *Subsection 4.4.5 on page 39*).

**Please note:** This setting is not reset automatically.

## 11. Fault messages and rectification

code	Event	Meaning	Measures, remedy
<b>F.1</b> <b>F.2</b>	Compressor 1–2	Short circuit or break at the output for compressor 1 or 2	<ul style="list-style-type: none"> <li>• Test compressor in manual mode</li> <li>• Test compressor at external power supply (wall socket)</li> <li>• Notify specialist</li> </ul>
<b>F.3</b>	UV module	Short circuit or break at the output for UV lamp	<ul style="list-style-type: none"> <li>• Notify specialist</li> </ul>
<b>F.4</b>	Pump	Short circuit or break at the output for pump	<ul style="list-style-type: none"> <li>• Notify specialist</li> </ul>
<b>F.9</b>	Reserve module	Short circuit or break at the reserve output	<ul style="list-style-type: none"> <li>• Notify specialist</li> </ul>
<b>F.11 –</b> <b>F.14</b>	Valve 1–4	Short circuit or break at the output for valve 1–4	<ul style="list-style-type: none"> <li>• Test valve in manual mode</li> <li>• Notify specialist</li> </ul>
<b>F.15</b>	Mains voltage	Power failure. The treatment cycle must be stopped. A data backup is made.	<ul style="list-style-type: none"> <li>• Check power supply</li> <li>• Notify specialist</li> </ul>
<b>F.16</b>	Temp 3: Compressor OFF	Emergency shutdown for protecting components against overheating. All power outputs are switched OFF, except for cooling fans. This message is cleared automatically as soon as the temperature returns within its normal range.	<ul style="list-style-type: none"> <li>• Ensure cooling, e.g. by providing shades for exterior cabinets</li> <li>• Test cooling fan in manual mode (if fitted); if necessary, install one</li> <li>• Check air filter fleece</li> <li>• Notify specialist</li> </ul>
<b>F.21</b>	EEPROM	Control unit has encountered memory problem; proper functioning is no longer ensured.	<ul style="list-style-type: none"> <li>• Notify specialist</li> </ul>
<b>F.22</b>	230 V output	Fault on 230 V outputs If more than one mains output is active at the same time, the controller is unable to derive from the total current measurements the precise location of this error.	<ul style="list-style-type: none"> <li>• Test all fitted 230 V consumers in succession in manual mode</li> <li>• Notify specialist</li> </ul>
<b>F.23</b>	24 V output	Fault on 24 V outputs If more than one output is active at the same time, the controller is unable to derive from the total current measurements the precise location of this error.	<ul style="list-style-type: none"> <li>• Test all fitted 24 V consumers in succession in manual mode</li> <li>• Notify specialist</li> </ul>
<b>F.24</b>	Activation required	Control unit is disabled. Activation codes required, Not until the code provided by the manufacturer has been entered in the Service menu can the plant be put back into operation and the message acknowledged.	<ul style="list-style-type: none"> <li>• Notify specialist</li> </ul>

## 11. Fault messages and rectification

### 11.3 Unusual water levels– remedying a fault

It is normal that the water levels fluctuate in the chambers of SBR wastewater treatment plant. The water levels depend on the supplied quantity, the time of day, and/or the current step of the treatment cycle.

Observation	Possible cause	Rectification
Unusually low water level making the lifter's inlet visible	<ul style="list-style-type: none"> <li>No adequate refilling after sludge removal</li> <li>Tank leaking</li> </ul>	<ul style="list-style-type: none"> <li>Continue refilling and observe tank</li> <li>If necessary, notify specialist</li> </ul>
<p>Only for plants larger than 10 PE:</p> <p>The water level in the first stage (preliminary cleaning) reaches to the emergency overflow, but is normal in the aeration section.</p>	<ul style="list-style-type: none"> <li>Unusually large supply (e.g. after family party)</li> </ul>	<ul style="list-style-type: none"> <li>Continue observing water level; it should normalise over the course of one day</li> </ul>
	<ul style="list-style-type: none"> <li>The charging lifter (valve 1) not activating</li> </ul>	<ul style="list-style-type: none"> <li>In manual mode, test valve 1</li> <li>Notify specialist</li> </ul>
	<ul style="list-style-type: none"> <li>The runtime set for the charging lifter is too short</li> </ul>	<ul style="list-style-type: none"> <li>Have the settings checked by a specialist</li> </ul>
	<ul style="list-style-type: none"> <li>The charging lifter is blocked</li> </ul>	<ul style="list-style-type: none"> <li>Try to wash the lifter back with a garden hose</li> <li>Pump off chamber and clean lifter</li> </ul>
	<ul style="list-style-type: none"> <li>The air supply to the feed lifter is leaking.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten hose clips according to feeling</li> </ul>
<p>The water level in all chambers reaches to the emergency overflow.</p> <p>The plant overflows.</p>	<ul style="list-style-type: none"> <li>Plant running in holiday mode although house again occupied</li> </ul>	<ul style="list-style-type: none"> <li>End holiday mode</li> </ul>
	<ul style="list-style-type: none"> <li>Plant runs in level dependent mode and "Cycle pause" appears on display although the water levels are high</li> </ul>	<ul style="list-style-type: none"> <li>Notify specialist to check the level measurements</li> </ul>
	<ul style="list-style-type: none"> <li>Unusually large supply (e.g. after family party)</li> </ul>	<ul style="list-style-type: none"> <li>Continue observing water level; it should normalise over the course of one day; otherwise notify specialist</li> </ul>
	<ul style="list-style-type: none"> <li>Tank's outlet pipe blocked, or infiltration not working</li> </ul>	<ul style="list-style-type: none"> <li>Test outflow lifter in manual mode and check whether water can discharge</li> <li>Notify specialist</li> </ul>
	<ul style="list-style-type: none"> <li>Flooding in the discharging system is not allowing water to drain from the system.</li> </ul>	<ul style="list-style-type: none"> <li>Wait for flooding to drain away</li> </ul>
	<ul style="list-style-type: none"> <li>Clear water lifter is blocked</li> </ul>	<ul style="list-style-type: none"> <li>Try to wash the lifter back with a garden hose</li> <li>Pump off chamber and clean lifter</li> </ul>
	<ul style="list-style-type: none"> <li>Air supply to clear water lifter leaking.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten hose clips according to feeling</li> </ul>
	<ul style="list-style-type: none"> <li>The runtime set for the clear water lifter is too short</li> </ul>	<ul style="list-style-type: none"> <li>Have the settings checked by a specialist</li> </ul>

## 11. Fault messages and rectification

### 11.4 Possible faults on step motor valves

Observation	Possible cause
Valve does not close.	<ul style="list-style-type: none"><li>• Rated voltage not present</li><li>• Motor winding defective</li><li>• Gears defective</li><li>• Valve seized</li></ul>
Valve does not open.	<ul style="list-style-type: none"><li>• Rated voltage not present</li><li>• Motor winding defective</li><li>• Gears defective</li><li>• Valve seized</li></ul>

### 11.5 Water quality

In most cases, also nonprofessionals can recognise bad cleaning performance: The discharge water is smelly, cloudy, and discoloured and contains a lot of suspended matter. The cause can be technical problems, overload, or incorrect introduction. Identifying the cause is the job of a specialist with the right knowhow and the right instruments. Consult the information in *Subsection 6 “Operating instructions”* on *page 48*.

## 11. Fault messages and rectification

### 11.6 Odours

Operating a wastewater treatment system can give rise to odours. This is predominantly the case in anaerobic conditions (no oxygen dissolved in the water), e.g. in the preliminary cleaning stage. This can form ammonia ( $\text{NH}_3$ ), hydrogen sulfide ( $\text{H}_2\text{S}$ ), organic acids, etc.

In all cases, the exhaust air should carry any odours out of the plant and through the roof ventilation. Fully operative roof ventilation is therefore important.

Observation	Possible cause	Rectification
Odours in the building	• Conduit at the cabinet's site not closed properly (when odours in this room)	• Reseal conduit
	• Siphon has run dry; frequently floor drains or other rarely "used" facilities	• Refill with water from a watering can
Odours at the tank	• Technical problem, e.g. too little aeration • Roof ventilation not working properly	• Commission a specialist
Odours only on certain days (e.g. weekends)	• Overload as a result e.g. of many visitors, laundry day, etc.	• Try to distribute the peaks better • Have a specialist identify potential optimisations for the settings
Odours only in sultry weather	• Roof ventilation not working or properly or to capacity (natural phenomenon)	-

### 11.7 Noise levels

The switch cabinet generates noise; specifically, compressor humming (comparable with a refrigerator), cooling fan noise (if fitted), and the control unit's acoustic alarm. The other components are virtually soundless. If you can hear a loud humming or vibration, check whether the compressor has shifted its position in the cabinet and is touching the cabinet wall directly or indirectly (e.g. cables) If necessary, reposition the components or notify a specialist.

## 12. Disposing of the controller

### 12 Disposing of the controller

Electric and electronic products may not be disposed of as domestic or bulky waste and must be collected at a separate site.

Introduce the device to a collecting point provided by your community, and contribute actively to the protection of the environment.



# 13 Declarations of performance

## Declaration of performance oneAdvanced 3-9 PE

Nr. 45/Translation



1. Unique identification code of the product-type	oneAdvanced 3 PE oneAdvanced 5 PE oneAdvanced 7 PE oneAdvanced 9 PE
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)	Type size and serial number on control cabinet type plate
3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer	EN 12566-3:2005+A2:2013: Prefabricated and/or site assembled domestic wastewater treatment plants
4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5)	Otto Graf GmbH Kunststoffzeugnisse Carl-Zeiss-Str. 2-6 79331 Teningen Germany
5. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V	System 3
6. Name and identification number of the notified body	PIA - Prüfinstitut für Abwassertechnik GmbH - NB 1739

7. Declared performance (with regard to the harmonised standard EN 12566-3:2005+A2:2013)		
	Performance	Test report No.
Cleaning capacity	Nominal organic daily dirt cargo (BOD <sub>5</sub> ) = 0.08 kg/d per PE. Nominal daily inflow (Q <sub>N</sub> ) = 150 l per PE.	
Treatment efficiency	COD: 94,2 % 43 mg/l BOD <sub>5</sub> : 98,0 % 7 mg/l NH <sub>4</sub> -N: 98,3 % 0,5 mg/l N <sub>tot</sub> : 87,0 % 8 mg/l SS: 96,3 % 14 mg/l	PIA2014-216B14.01
Watertightness	Passed	PIA2016-WD-1509-1050.02 / PIA2021-WD-2101-1002.03 (Carat S)
Stability	Passed	PIA2016-ST-PIT-1509-1050.02 (Carat S)
Durability	Passed	PIA2016-DH-1509-1050.02 (Carat S)
Reaction to fire	Class E	PIA2016-RF-1509-1050.02 (Carat S)
Release of dangerous substances	NPD	

8. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 7. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

Ralf Oestreicher  
Head of Product Division  
-DIY / garden / wastewater treatment-  
Teningen, 12.12.2022

## 13. Declarations of performance

### Declaration of performance oneAdvanced 10-50 PE



Nr. 47/Translation

1. Unique identification code of the product-type	oneAdvanced 8-10 PE oneAdvanced 10-14 PE oneAdvanced 12-16 PE oneAdvanced 16-22 PE oneAdvanced 20-28 PE oneAdvanced 25-32 PE oneAdvanced 32-44 PE oneAdvanced 42-50 PE																
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)	type size and serial number on control cabinet type plate																
3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer	EN 12566-3:2005+A2:2013: Prefabricated and/ on-site installations for the treatment of domestic waste water																
4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5)	Otto Graf GmbH Kunststoffzeugnisse Carl-Zeiss-Str. 2-6 79331 Teningen, Germany																
5. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V	System 3																
6. Name and identification number of the notified body	PIA Prüfinstitut für Abwassertechnik GmbH - NB 1739																
7. Declared performance (according to the harmonised standard EN 12566-3:2005+A2:2013)																	
	<table><tr><th>Performance</th><th>Test report No.</th></tr><tr><td>Treatment capacity</td><td>Nominal organic daily load (BOD<sub>5</sub>) = 0,08 kg/d per PT Nominal hydraulic daily flow (Q<sub>N</sub>) = 150 l per PT</td></tr><tr><td>Treatment efficiency</td><td>COD: 91,9 % 51 mg/l BOD<sub>5</sub>: 95,9 % 12 mg/l NH<sub>4</sub>-N: 85,6 % 12 mg/l N<sub>tot</sub>: 62,0 % 21 mg/l SS: 94,4 % 20 mg/l PIA2011-141B15</td></tr><tr><td>Watertightness</td><td>Passed PIA2016-WD-1509-1050.02 / PIA2021-WD-2101-1002.03 (Carat S)</td></tr><tr><td>Stability</td><td>Passed PIA2016-ST-PIT-1509-1050.02 (Carat S)</td></tr><tr><td>Durability</td><td>Passed PIA2016-DH-1509-1050.02 (Carat S)</td></tr><tr><td>Reaction to fire</td><td>Class E PIA2016-RF-1509-1050.02 (Carat S)</td></tr><tr><td>Release of dangerous substances</td><td>NPD</td></tr></table>	Performance	Test report No.	Treatment capacity	Nominal organic daily load (BOD <sub>5</sub> ) = 0,08 kg/d per PT Nominal hydraulic daily flow (Q <sub>N</sub> ) = 150 l per PT	Treatment efficiency	COD: 91,9 % 51 mg/l BOD <sub>5</sub> : 95,9 % 12 mg/l NH <sub>4</sub> -N: 85,6 % 12 mg/l N <sub>tot</sub> : 62,0 % 21 mg/l SS: 94,4 % 20 mg/l PIA2011-141B15	Watertightness	Passed PIA2016-WD-1509-1050.02 / PIA2021-WD-2101-1002.03 (Carat S)	Stability	Passed PIA2016-ST-PIT-1509-1050.02 (Carat S)	Durability	Passed PIA2016-DH-1509-1050.02 (Carat S)	Reaction to fire	Class E PIA2016-RF-1509-1050.02 (Carat S)	Release of dangerous substances	NPD
Performance	Test report No.																
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Stability	Passed PIA2016-ST-PIT-1509-1050.02 (Carat S)																
Durability	Passed PIA2016-DH-1509-1050.02 (Carat S)																
Reaction to fire	Class E PIA2016-RF-1509-1050.02 (Carat S)																
Release of dangerous substances	NPD																
8. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 7. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.																	

Signed for and on behalf of the manufacturer by:

Ralf Oestreicher  
 Head of Product Division  
 -DIY / garden / wastewater treatment-  
 Teningen, 12.12.2022

## 13. Declarations of performance

# Declaration of performance oneAdvanced 3-9 EW +P



Nr. 46/Translation

1. Unique identification code of the product-type	oneAdvanced 3 PE +P oneAdvanced 5 PE +P oneAdvanced 7 PE +P oneAdvanced 9 PE +P		
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)	Type size and serial number on control cabinet type plate		
3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer	EN 12566-3:2005+A2:2013: Prefabricated and/or site assembled domestic wastewater treatment plants		
4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5)	Otto Graf GmbH Kunststoffherzeugnisse Carl-Zeiss-Str. 2-6 79331 Teningen, Germany		
5. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V	System 3		
6. Name and identification number of the notified body	PIA - Prüfinstitut für Abwassertechnik GmbH - NB 1739		
7. Declared performance (with regard to the harmonised standart EN 12566-3:2005+A2:2013)			
	Performance		Test report No.
Cleaning capacity	Biochemical oxygen demand (BODs) = 0.08 kg/d per PE. Nominal daily inflow (Q <sub>N</sub> ) = 150 l per PE.		
Treatment efficiency	COD: 94,7 % 38 mg/l BOD <sub>5</sub> : 98,1 % 6 mg/l NH <sub>4</sub> -N: 88,7 % 4,6 mg/l N <sub>tot</sub> : 86,1 % 9 mg/l SS: 95,7 % 14 mg/l P <sub>tot</sub> : 95,1 % 0,4 mg/l		PIA2015-208B15
Watertightness	Passed		PIA2016-WD-1509-1050.02 / PIA2021-WD-2101-1002.03 (Carat S)
Stability	Passed		PIA2016-ST-PIT-1509-1050.02 (Carat S)
Durability	Passed		PIA2016-DH-1509-1050.02 (Carat S)
Reaction to fire	Class E		PIA2016-RF-1509-1050.02 (Carat S)
Release of dangerous substances	NPD		
8. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 7. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.			

Signed for and on behalf of the manufacturer by:

Ralf Oestreicher  
 Head of Product Division  
 -DIY / garden / wastewater treatment-  
 Teningen, 12.12.2022

## 13. Declarations of performance

# Declaration of performance oneAdvanced 10-50 PE +P

Nr. 48/Translation



1. Unique identification code of the product-type	oneAdvanced 8*-10 PE +P oneAdvanced 10*-14 PE +P oneAdvanced 12*-16 PE +P oneAdvanced 16*-22 PE +P *Maximum population equivalents (PE) with phosphate removal (+P)	oneAdvanced 20*-28 PE +P oneAdvanced 25*-32 PE +P oneAdvanced 32*-44 PE +P oneAdvanced 42*-50 PE +P
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)	Type size and serial number on control cabinet type plate	
3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer	EN 12566-3:2005+A2:2013: Prefabricated and/ on-site installations for the treatment of domestic waste water	
4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5)	Otto Graf GmbH Kunststoffzeugnisse Carl-Zeiss-Str. 2-6 79331 Teningen/ Germany	
5. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V	System 3	
6. Name and identification number of the notified body	PIA Prüfinstitut für Abwassertechnik GmbH - NB 1739	
7. Declared performance (according to the harmonised standard EN 12566-3:2005+A2:2013)		
	Performance	Test report No.
Treatment capacity	Nominal organic daily load (BOD <sub>5</sub> ) = 0,06 kg/d per PE Nominal hydraulic daily flow (Q <sub>N</sub> ) = 150 l per PE	
Treatment efficiency	COD: 93,1 %    47 mg/l BOD <sub>5</sub> : 96,9 %    10 mg/l NH <sub>4</sub> -N: 74,7 %    11 mg/l N <sub>tot</sub> : 89,9 %    21 mg/l P <sub>ges</sub> : 94,5 %    0,4 mg/l SS: 96,9 %    10 mg/l	PIA2014-194B16.02
Watertightness	Passed	PIA2016-WD-1509-1050.02 / PIA2021-WD-2101-1002.03 (Carat S)
Stability	Passed	PIA2016-ST-PIT-1509-1050.02 (Carat S)
Durability	Passed	PIA2016-DH-1509-1050.02 (Carat S)
Reaction to fire	Class E	PIA2016-RF-1509-1050.02 (Carat S)
Release of dangerous substances	NPD	
8. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 7. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.		

Signed for and on behalf of the manufacturer by:

Ralf Oestreicher  
 Head of Product Division  
 -DIY / garden / wastewater treatment-  
 Teningen, 13.01.2023

## 14. Maintenance log for KLARO wastewater treatment systems

### 14 Maintenance log for KLARO wastewater treatment systems

Location (address): \_\_\_\_\_

Maintenance company: \_\_\_\_\_

Date of maintenance: \_\_\_\_\_

Serial number: \_\_\_\_\_

Order no.: \_\_\_\_\_

Plant size: \_\_\_\_\_

PE

Actual Connection

PE

Operator's name: \_\_\_\_\_

Customer no.: \_\_\_\_\_

Street: \_\_\_\_\_

Town/city, postcode: \_\_\_\_\_

Installed by: \_\_\_\_\_

Commissioning: \_\_\_\_\_

Will the plant process commercial wastewater too? \_\_\_\_\_

☐ No

☐ Restaurant without kitchen

☐ Restaurant with kitchen

☐ Other \_\_\_\_\_

☐ Grease separator present, NG \_\_\_\_\_

☐ Emptying needed

#### Function check of plant parts important to operation:

☐ Aeration / valve 1 (blue)

☐ Charging / valve 2 (red)

☐ Excess sludge lifter / valve 3 (white)

☐ Clear water lifter / valve 3 (black)

☐ Power cut indicator

Air inlet / aeration: \_\_\_\_\_

☐ moderate

☐ intensive, circulation clearly visible

Aerator pattern / aeration: \_\_\_\_\_

☐ fine bubbles

☐ even

Comments: \_\_\_\_\_

#### Sludge accumulator + buffer:

Sludge height: \_\_\_\_\_ cm

Floating sludge height: \_\_\_\_\_ cm

☐ The operator should arrange for the cesspit to be emptied.

SBR reactor:

Oxygen concentration: \_\_\_\_\_

mg/l (normally approx. 4-6 mg/l, at least 2 mg/l)

Sludge as proportion of volume: \_\_\_\_\_

ml/l (maximum 700 ml/l)

Comments: \_\_\_\_\_

## 14. Maintenance log for KLARO wastewater treatment systems

### Control unit:

Control unit type: \_\_\_\_\_  $\Sigma$  operating hours: \_\_\_\_\_

Aeration (valve 1): \_\_\_\_\_ Discharge (valve 2): \_\_\_\_\_

Excess sludge reservoir (valve 3): \_\_\_\_\_

Comments: \_\_\_\_\_

### Blower:

Blower type: \_\_\_\_\_ ☐ Blower OK  
☐ Change the slats (slat length: \_\_\_\_\_ mm) ☐ Change the membranes  
☐ Filter change ☐ Cooling fan OK

Comments: \_\_\_\_\_

**Time of sampling:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **Time:** \_\_\_\_\_

Sampling site: \_\_\_\_\_ ☐ Sampling shaft ☐ SBR chamber

Sample transport: \_\_\_\_\_ ☐ cooled 4°C ☐ frozen

Air temperature:	_____ °C	Water temperature:	_____ °C
odour	<input type="checkbox"/> none <input type="checkbox"/> weak <input type="checkbox"/> strong	<input type="checkbox"/> rotten <input type="checkbox"/> earthy	
Colouring	<input type="checkbox"/> none <input type="checkbox"/> weak <input type="checkbox"/> strong	<input type="checkbox"/> beige <input type="checkbox"/> brown	
Cloudiness	<input type="checkbox"/> none <input type="checkbox"/> weak <input type="checkbox"/> strong	<input type="checkbox"/> opaque	
Floating matter	<input type="checkbox"/> none <input type="checkbox"/> a little <input type="checkbox"/> a lot		

Activated sludge \_\_\_\_\_ kg SOL / m<sup>3</sup>  $P_{total}$  \_\_\_\_\_ ml / l

Substances that can settle \_\_\_\_\_ ml / l pH \_\_\_\_\_

BOD<sub>5</sub> \_\_\_\_\_ ml / l COD \_\_\_\_\_ ml / l

NH<sub>4</sub>-N \_\_\_\_\_ ml / l N<sub>tot</sub> \_\_\_\_\_ ml / l

## 14. Maintenance log for KLARO wastewater treatment systems

### Additional comments:

☐ Operating log available.

☐ Maintenance noted in the log.

☐ Programming modified:

---

☐ Fault rectified:

---

☐ Additional comments:

---

---

### To be arranged by the operator:

☐ The operator is asked to note the substances which must not enter the plant (see operating manual).

☐ Pit is overflowing, operator must discharge content.

☐ Sludge removal

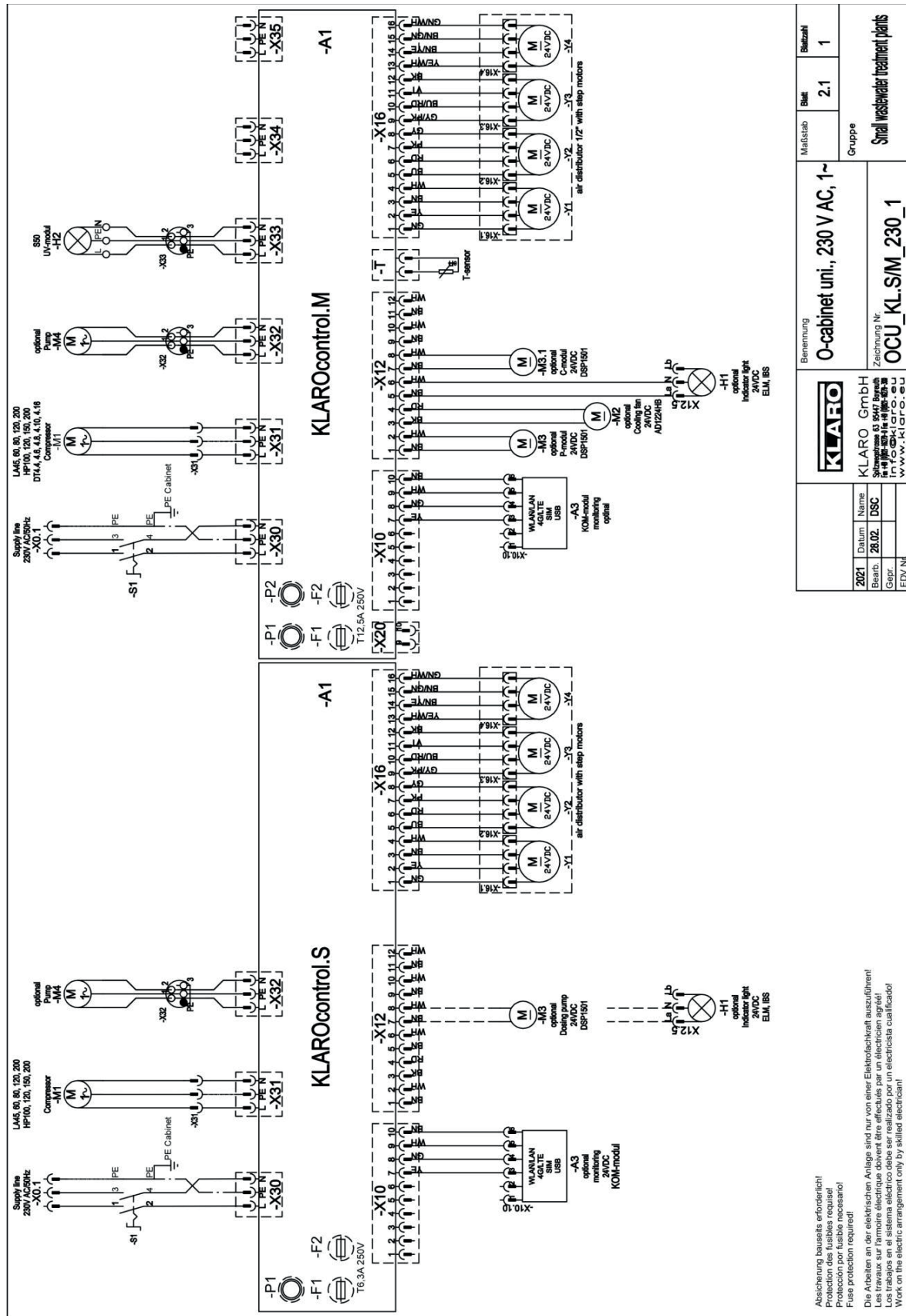






## 15. Circuit diagrams

### 15.4 E cabinet with KLcontrol.S and KLcontrol.M



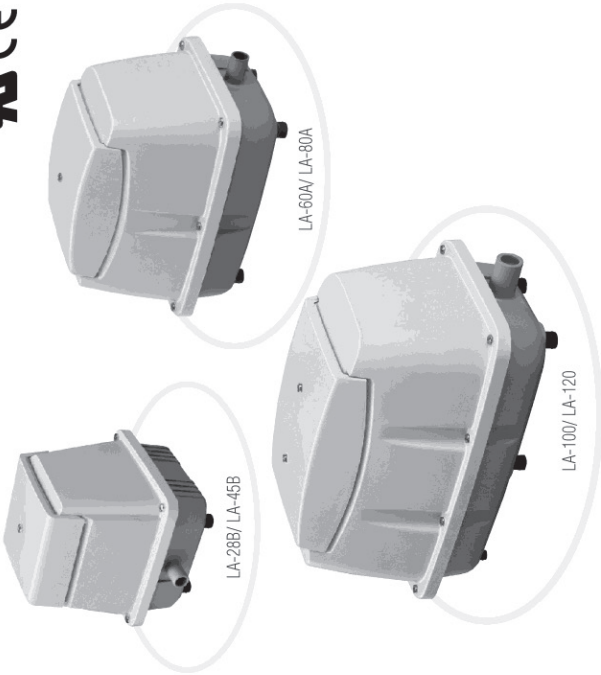
16 Maintenance instructions for compressor


16.1 Operating and maintenance instructions for LA compressor



**CONTENTS**

1. Model and Specifications .....	2
2. Dimensions .....	2
3. Safety Instruction .....	3
4. Installation (Septic tank application) .....	4
5. Maintenance .....	5
■ Parts List (LA-28B/LA-45B) .....	8
■ Parts List (LA-60A/LA-80A) .....	9
■ Parts List (LA-100/LA-120) .....	10



 This instruction manual should be read and understood thoroughly before any installation and maintenance work is executed.

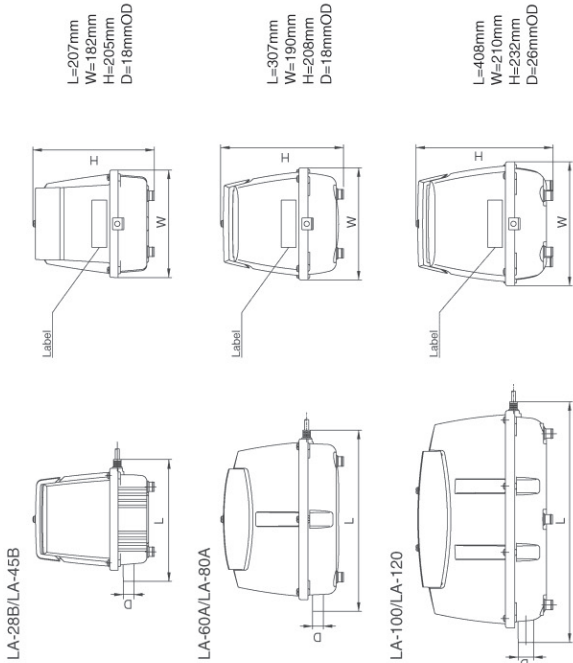
After reading this instruction manual, please keep it handy for reference.

1. Model and Specifications

Model	LA-28B	LA-45B	LA-60A	LA-80A	LA-100	LA-120
Standard Voltage *	120V AC OR 230V AC					
Rated Frequency	50Hz/60Hz					
Rated Pressure	0.011MPa(0.11kgf/cm <sup>2</sup> )	0.015MPa(0.15kgf/cm <sup>2</sup> )	0.018MPa(0.18kgf/cm <sup>2</sup> )	0.018MPa(0.18kgf/cm <sup>2</sup> )	0.018MPa(0.18kgf/cm <sup>2</sup> )	0.018MPa(0.18kgf/cm <sup>2</sup> )
Operating Pressure	0.005 ~ 0.02MPa (0.05 ~ 0.2kgf/cm <sup>2</sup> )	0.005 ~ 0.02MPa (0.05 ~ 0.2kgf/cm <sup>2</sup> )	0.005 ~ 0.02MPa (0.05 ~ 0.2kgf/cm <sup>2</sup> )	0.005 ~ 0.02MPa (0.05 ~ 0.2kgf/cm <sup>2</sup> )	0.005 ~ 0.02MPa (0.05 ~ 0.2kgf/cm <sup>2</sup> )	0.005 ~ 0.02MPa (0.05 ~ 0.2kgf/cm <sup>2</sup> )
Rated Airflow	28ℓ/min. 45ℓ/min.	60ℓ/min. 80ℓ/min.	100ℓ/min. 120ℓ/min.	100ℓ/min. 120ℓ/min.	100ℓ/min. 120ℓ/min.	100ℓ/min. 120ℓ/min.
Power Consumption	29/26W 47/45W	64/60W 86/80W	100/95W 130/118W	100/95W 130/118W	100/95W 130/118W	100/95W 130/118W
Weight	2.9kg	3.0kg	5.0kg	5.3kg	9.4kg	9.4kg

\* The unit must only be operated at the voltage as indicated on the outer casing of the blower.

2. Dimensions



3. Safety Instruction

Explanation of Diagrammatic Expressions

The term "Attention" used in this manual is to alert you to dangers such as the following:

**Degree of Danger Indicated by The Term**

This term indicates the possibility that continuing to work while ignoring this "Attention", or working incorrectly without full understanding, may cause personal injury or physical damage.

**ATTENTION**

The Meaning of the Symbols

- Symbols**
- This symbol advises you of an item which should **BE NOTED** (including Danger and Warning) and the general notes will be shown by a picture, word or explanatory text inside or along the symbol mark.
  - This symbol advises you of an action which must **NOT BE TAKEN (IS PROHIBITED)** in order to avoid danger. The general actions which must not be taken will be shown by a picture or explanatory text inside or along the symbol mark.
  - This symbol advises you of an action which must **BE TAKEN (IS MANDATORY)** in order to avoid danger and the general emphasis of the action which must be taken will be shown by a picture or explanatory text inside or along the symbol mark.

Safety and Operating Instructions

The following safety precautions should always be followed to reduce the risk of breakdown and/or accident.

- ATTENTION** ●●● To Prevent Electric Shock And Fire
- ① Don't install the blower where it will be flooded with water.
  - ② Electrical work must be done by a qualified electrician.
  - ③ The power supply should be the rated voltage shown on the label on the blower and be fitted with an earth leakage breaker and over current breaker.
  - ④ The power outlet used should be waterproof and include an earth connected to ground.
  - ⑤ If the supply cord is damaged, it must be replaced by the manufacturer or its service agent or similarly qualified person in order to avoid a hazard.
  - ⑥ Don't place any objects on the electric cable.
  - ⑦ Be sure to unplug the blower before starting maintenance.
  - ⑧ Be sure to put the Upper Case back after maintenance.
  - ⑨ Don't touch the metal part of the blower until it is cooled down as the blower runs very hot.
- Ignoring any of the above may cause an electric shock, a fire or a burn.

## 4. Installation (Septic Tank Application)

### 1. Installation site selection

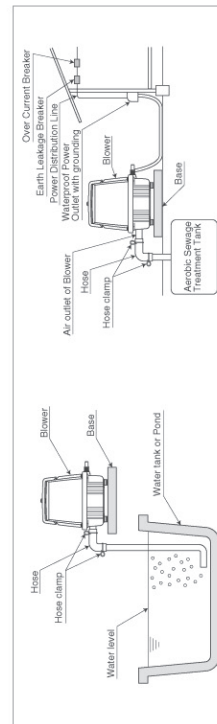
1. Install near the septic tank.
2. If the pipeline is long, the sewage treatment may not perform well due to an insufficient airflow.
3. Install in a place which is convenient for maintenance.
4. Don't install over a manhole or on soft ground.
5. Avoid areas where wind-blown leaves and dust gathers.
6. Install in a well ventilated place.
7. Install at least 30cm away from the wall of a house.
8. Installation in the shade is recommended to suppress heat generation of the blower.
9. Don't install the blower where it will be flooded with water.
10. Don't install where there is excess moisture or humidity.

### 2. Method of Installation

1. The base should be made of concrete strong enough to bear the weight and block vibration from the blower.
2. The base should be at least 10cm above the ground level and 5cm larger than the external dimensions of the blower.
3. Provide a separate power outlet to be only used for the blower.
4. Electrical work must be done by a qualified electrician.
5. The power supply should be the rated voltage shown on the label on the blower and be fitted with an earth leakage breaker and over-current breaker.
6. The power outlet used should be waterproof and include an earth connected to ground.
7. Place the blower horizontally on the base.
8. A soft rubber hose must be used for connection between the air outlet of the blower and the pipe.
9. The rubber hose must be fastened with hose clamps.
10. When making the connection, level the air outlet and the pipe to ensure the hose is not kinked or blocked.
11. Before starting the operation of the blower, ensure that the water level in the septic tank is appropriate and the valves on the pipeline are properly opened.

### 3. Start operation

1. Insert the power plug into the power outlet with full contact so that the plug itself does not wobble. Incomplete connection may cause electric shock or a fire.
2. After starting operation ensure that there is:  
No air leakage from the hose and the pipe connection.  
No abnormal noise from the blower.  
No vibration transmitted to the ground due to strained piping.



4

## 5. Maintenance (Refer the sketches on the next page)

### 1. Cautions

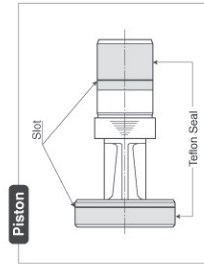
1. MEDO blowers are OILLESS. Never lubricate them.
2. All blowers have already been precisely adjusted. Never disassemble them.
3. Do not try to loosen the Hex Bolts on the Endcap.

### 2. Replacement of Filter Element

1. Be sure to unplug the blower before starting the replacement work.
2. Loosen the Blind Screw (1) and remove the Filter Cover (4).
3. Remove the Filter Element(s) from the Upper Case (6) and replace with new One(s). At the same time, clean the air inlet of the Filter Cover (4) and the Upper Case (6).
4. Assemble the Filter Cover (4) with the Filter Cover Gasket (3) securely positioned.
5. Mount the Filter Cover (4) to the Upper Case (6), then tighten with the Blind Screw(s) (1).
6. Time to replace the Filter Element  
It is recommended that the Filter Element(s) is cleaned or replaced with new one(s) depending on the extent of its deterioration as determined by the atmospheric conditions around the application. The filter element(s) should be checked every three months.

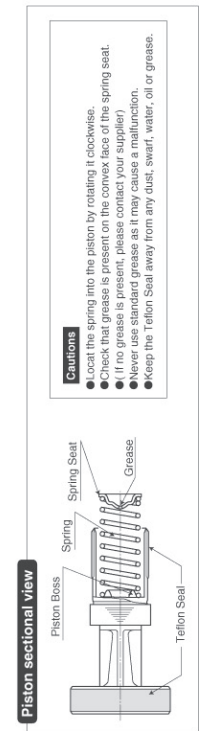
### 3. Replacement of Piston Set Assy

1. Be sure to unplug the blower before starting the maintenance work.
2. Remove the Upper Case (6), loosen all the Hex Bolts (9) on the Headcover (10) and remove it. In case it is hard to remove the Headcover (10) insert a flat head screwdriver to the slot(s) on the edge of the Headcover (10) and twist the screwdriver gently to open.
3. Take out the Piston Set Assy(s).
4. Replace all Piston Set Assys, Gasket A (11) and Gasket B (12) with new ones.  
Be sure to keep the Teflon Seal of the Piston (13) away from any dust, swarf, water, oil or grease. Try not to touch the Teflon Seal of the Piston (13) with your fingers.
5. Insert the Piston Set Assy(s) into the Pump Body. Install Gasket A (11) on the Headcover (10) and Gasket B (12) on the Pump Body, then fasten the Headcover (10) with the Hex Bolts (9). Tighten the Hex Bolts (9) evenly and alternately then gradually fully tighten.
6. Before putting the Upper Case (6) back, start the blower and check if there is any air leakage along the Headcover (10) or the Nozzle Seal(s) (33) by briefly blocking the air outlet. In case there is an air leakage along the Headcover (10), re-position Gasket A (11) and Gasket B (12) then re-fasten the Hex Bolts (9). In case there is an air leakage along the Nozzle Seal(s) (33) check if the nozzle seal is installed on the air tank properly and press the pump body down to allow the outlet port of the Headcover to catch the Nozzle Seal(s) correctly.
7. Put the Upper Case (6) back after installing Gasket C (8) on the Bottom Case properly. Fasten the Blind Screws/Torx Screws (7) evenly and alternately.
8. Time to replace the Piston Set Assy  
It is suggested that the Piston Set Assy is replaced every 12 to 24 months depending on the extent of pressure and airflow drop of the blower. There is a slot on each Teflon Seal of the Piston. The slot shows the degree of wear. If one or both slots have gone, the replacement of the Piston Set Assy is recommended.



5

16. Maintenance instructions for compressor



4. Purchasing suggestion for the maintenance parts

① Filter Element

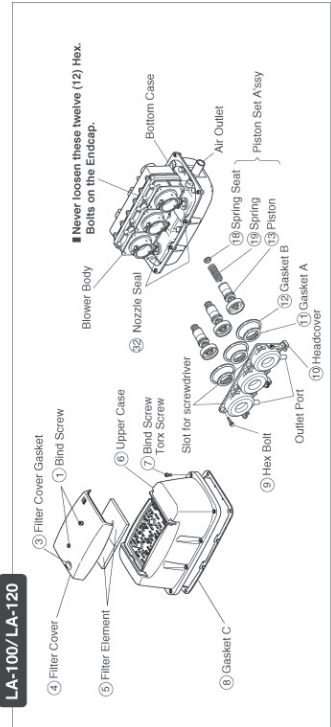
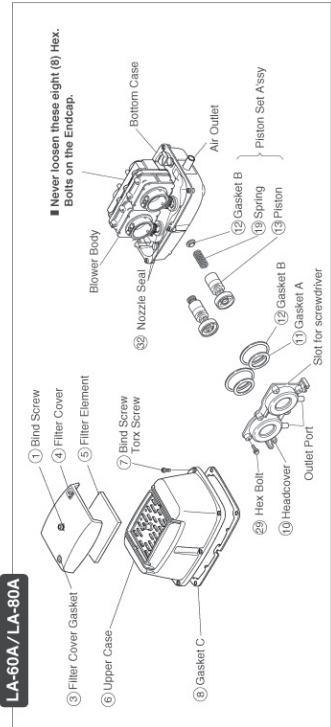
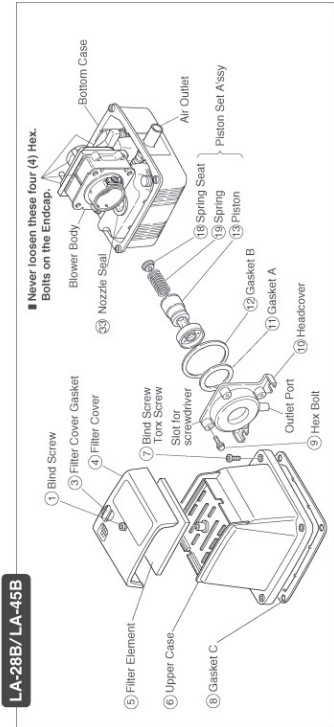
Model	Part No.	Quantity
LA-28B/LA-45B/LA-100/LA-120	LB02369	10pcs.set
LA-60A/LA-80A	LB03937	10pcs.set

② Repair Parts Kit

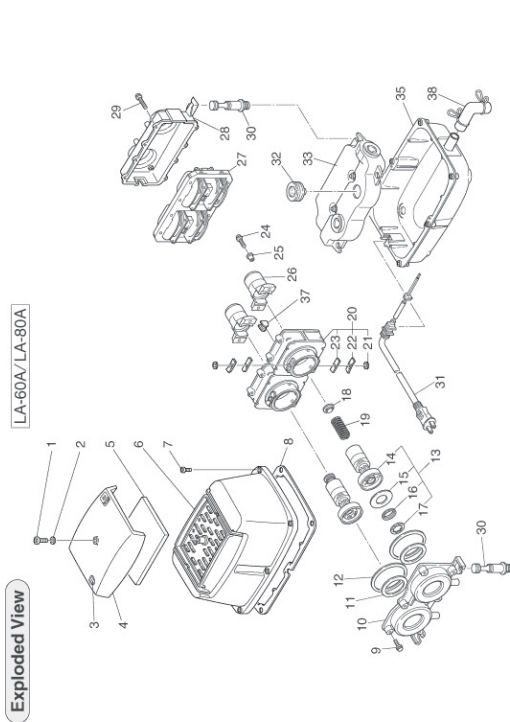
Model	Part No.	Quantity
LA-28B	LB01288	1 set
LA-45B	LB03514	1 set
LA-60A	LB03519	1 set
LA-80A	LB03517	1 set
LA-100/LA-120	LB04151	1 set

③ Contents of Repair Parts Kit

Parts Included	LA-28B/LA-45B	LA-60A/LA-80A	LA-100/LA-120
⑤ Filter Element	1	1	2
⑪ Gasket A	1	2	3
⑫ Gasket B	1	2	3
⑬ Piston	1	2	3
⑮ Spring Seat	1	2	3
⑰ Spring	1	2	3

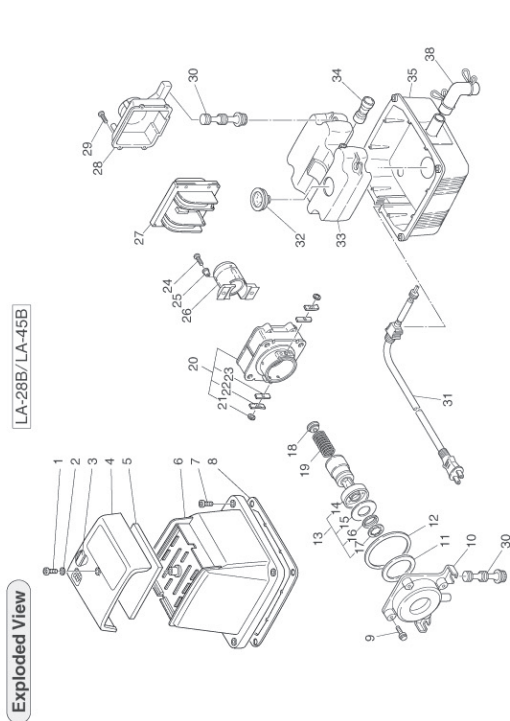


# 16. Maintenance instructions for compressor



**Parts List**

No.	Part Name	LA60A	QTY	LA80A	QTY	Part Name	No.	QTY	LA60A	QTY	LA80A	QTY
1	Bind Screw	LP30681	1	LP30681	1	Field Core Assy P	27	1	LB04901	1	LB04905	1
2	Seal Washer	LP30635	2	LP30635	2	Field Core Assy Q	28	1	LB05126	1	LB05134	1
3	Filter Cover Gasket	LQ02607	2	LQ02607	2	Field Core Assy E	29	1	LB05099	1	LB05048	1
4	Filter Cover	LB03213	1	LB03213	1	Endcap	30	1	LQ03767	1	LQ03767	1
5	Filter Element	LQ02730	1	LQ02730	1	Hex Bolt	31	8	LP31316	8	LP31316	8
6	Upper Case	LB04597	1	LB04597	1	Rubber Feet	32	4	LQ04256	4	LQ04256	4
7	Bind Screw UL	LP30681	6	LP30681	6	Cable Assy UK	33	1	LB05341	1	LB05341	1
8	Ton Screw CE	LQ03082	6	LQ03082	6	Cable Assy D	34	1	LB05307	1	LB05307	1
9	Gasket C	LQ03768	1	LQ03768	1	Cable Assy A	35	1	LB05220	1	LB05220	1
10	Hex Bolt	LP31316	6	LP31316	6	Cable Assy J	36	1	LQ01037	1	LQ01037	1
11	Headcover	LQ03766	1	LQ03766	1	Cable Assy UL	37	1	LB04770	1	LB04770	1
12	Gasket A	LQ01043	2	LQ01043	2	Nozzle Seal	38	3	LQ02598	3	LQ02598	3
13	Gasket B	LQ01042	2	LQ01042	2	Air Tank Assy	39	1	LB04600	1	LB04600	1
14	Piston	LB03132	2	LB03132	2	Joint Hose	40	1	LB04599	1	LB04599	1
15	Piston Sub Assy	LA70626	1	LA70626	1	Bottom Case	41	1	LB04599	1	LB04599	1
16	Inlet Valve	LP30916	2	LP30916	2	Cushion	42	1	LQ03775	1	LQ03775	1
17	Valve Retainer A	LP11548	2	LP11548	2	Rubber Plug	43	1	LQ03775	1	LQ03775	1
18	CS Ring	LP12948	2	LP12948	2	OPTION	44	1	LQ03775	1	LQ03775	1
19	Spring Seat	LP12155	2	LP12155	2	Hose Assy	45	1	LQ03775	1	LQ03775	1
20	Spring	LP30620	2	LP30620	2	Hose Assy	46	1	LQ03775	1	LQ03775	1
21	Housing	LB03164	2	LB03164	2	Hose Assy	47	1	LQ03775	1	LQ03775	1
22	SE Ring	LP12475	4	LP12475	4	Hose Assy	48	1	LQ03775	1	LQ03775	1
23	Valve Retainer B	LP13735	4	LP13735	4	Hose Assy	49	1	LQ03775	1	LQ03775	1
24	Outlet Valve	LP10359	4	LP10359	4	Hose Assy	50	1	LQ03775	1	LQ03775	1
25	Screw 5 x 20	LP12599	4	LP12599	4	Hose Assy	51	1	LQ03775	1	LQ03775	1
26	Insulation Bush	LP10355	4	LP10355	4	Hose Assy	52	1	LQ03775	1	LQ03775	1
27	Rear Cylinder	LB02443	2	LB02443	2	Hose Assy	53	1	LQ03775	1	LQ03775	1

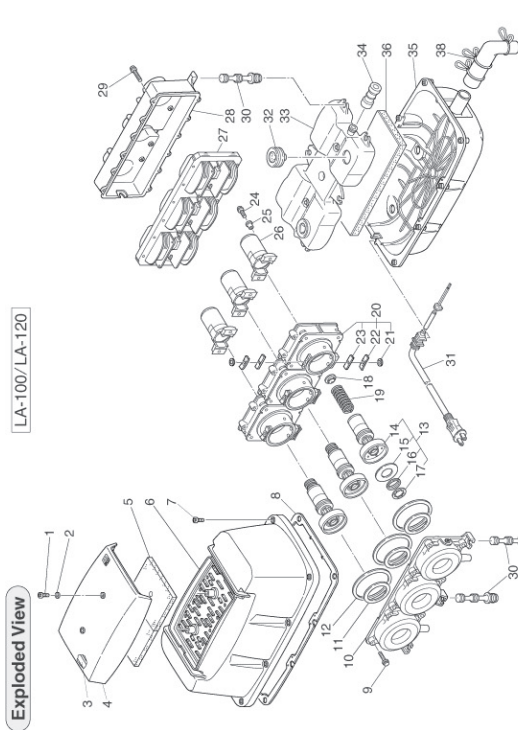


**Parts List**

No.	Part Name	LA28B	QTY	LA45B	QTY	Part Name	No.	QTY	LA28B	QTY	LA45B	QTY
1	Bind Screw	LP30681	1	LP30681	1	Field Core Assy P	27	1	LB01536	1	LB03466	1
2	Seal Washer	LP30635	2	LP30635	2	Field Core Assy Q	28	1	LB04038	1	LB04028	1
3	Filter Cover Gasket	LQ02607	2	LQ02607	2	Field Core Assy E	29	1	LQ01052	1	LQ02892	1
4	Filter Cover	LQ02575	1	LQ02575	1	Endcap	30	1	LP31316	4	LP31316	4
5	Filter Element	LQ02605	1	LQ02605	1	Hex Bolt	31	4	LQ04256	4	LQ04256	4
6	Upper Case	LB02937	1	LB02937	1	Rubber Feet	32	4	LB05341	1	LB05341	1
7	Bind Screw UL	LP30681	4	LP30681	4	Cable Assy UK	33	1	LB05307	1	LB05307	1
8	Ton Screw CE	LQ03082	4	LQ03082	4	Cable Assy D	34	1	LQ01037	1	LQ01037	1
9	Gasket C	LQ02601	1	LQ02601	1	Cable Assy A	35	1	LB04770	1	LB04770	1
10	Hex Bolt	LP31316	4	LP31316	4	Cable Assy J	36	1	LQ02598	1	LQ02598	1
11	Headcover	LQ02567	1	LQ02567	1	Cable Assy UL	37	1	LB02987	1	LB02987	1
12	Gasket A	LQ01043	1	LQ01043	1	Nozzle Seal	38	1	LQ02602	1	LQ02602	1
13	Gasket B	LQ01042	1	LQ01042	1	Air Tank Assy	39	1	LB02638	1	LB02638	1
14	Piston	LA70625	1	LA70625	1	Joint Hose	40	1	LB02638	1	LB02638	1
15	Piston Sub Assy	LA70626	1	LA70626	1	Bottom Case	41	1	LB02638	1	LB02638	1
16	Inlet Valve	LP30916	1	LP30916	1	Cushion	42	1	LB02638	1	LB02638	1
17	Valve Retainer A	LP11548	1	LP11548	1	Rubber Plug	43	1	LB02638	1	LB02638	1
18	CS Ring	LP12948	1	LP12948	1	OPTION	44	1	LB02638	1	LB02638	1
19	Spring Seat	LP12155	1	LP12155	1	Hose Assy	45	1	LB02638	1	LB02638	1
20	Spring	LP30620	1	LP30620	1	Hose Assy	46	1	LB02638	1	LB02638	1
21	Housing	LB03164	1	LB03164	1	Hose Assy	47	1	LB02638	1	LB02638	1
22	SE Ring	LP12475	2	LP12475	2	Hose Assy	48	1	LB02638	1	LB02638	1
23	Valve Retainer B	LP13735	2	LP13735	2	Hose Assy	49	1	LB02638	1	LB02638	1
24	Outlet Valve	LP10359	2	LP10359	2	Hose Assy	50	1	LB02638	1	LB02638	1
25	Screw 5 x 20	LP12599	2	LP12599	2	Hose Assy	51	1	LB02638	1	LB02638	1
26	Insulation Bush	LP10355	2	LP10355	2	Hose Assy	52	1	LB02638	1	LB02638	1
27	Rear Cylinder	LA71843	1	LA71843	1	Hose Assy	53	1	LB02638	1	LB02638	1

16. Maintenance instructions for compressor

Exploded View



Parts List

No.	Part Name	LA100	QTY	LA120	QTY	No.	Part Name	LA100	QTY	LA120	QTY
1	Bind Screw	LP00581	2	LP00581	2	27	Field Core Assy P	LB04855	1	LB04909	1
2	Seal Washer	LP00635	4	LP00635	4		Field Core Assy Q	LB04280	1	LB04280	1
3	Filter Cover Gasket	LQ03101	2	LQ03101	2		Field Core Assy E	LB04180	1	LB04171	1
4	Filter Cover	LB00769	1	LB00769	1	28	Endcap	LQ03108	1	LQ03108	1
5	Filter Element	LQ02605	2	LQ02605	2	29	Hex Bolt	LP31316	12	LP31316	12
6	Upper Case	LB03763	1	LB03763	1	30	Rubber Feet	LQ03089	6	LQ03089	6
7	Bind Screw UL	LP00581	8	LP00581	8	31	Cable Assy UK	LB05341	1	LB05341	1
8	Torx Screw CE	LQ03082	8	LQ03082	8		Cable Assy D	LB05307	1	LB05307	1
9	Gasket C	LQ03091	1	LQ03091	1		Cable Assy J	LB05220	1	LB05220	1
10	Hex Bolt	LP31316	12	LP31316	12		Cable Assy A	LQ01037	1	LQ01037	1
11	Headcover	LB03834	1	LB03834	1		Cable Assy UL	LB04770	1	LB04770	1
12	Gasket A	LQ01359	3	LQ01359	3	32	Nozzle Seal	LQ02598	2	LQ02598	2
13	Gasket B	LQ01400	3	LQ01400	3	33	Air Tank Assy	LB03771	1	LB03771	1
14	Piston	LB03779	3	LB03779	3	34	Joint Hose	LQ03096	1	LQ03096	1
15	Piston Sub Assy	LB03780	3	LB03780	3	35	Bottom Case	LB03762	1	LB03762	1
16	Inlet Valve	LQ03230	3	LQ03230	3	36	Cushion	LQ03112	1	LQ03112	1
17	Valve Retainer A	LP11548	3	LP11548	3	37	Rubber Plug				
18	CS Ring	LP12948	3	LP12948	3	OPTION					
19	Spring Seat	LP10357	3	LP10357	3	38	Hose Assy				
20	Spring	LQ03117	3	LQ03117	3						
21	Housing	LB03778	3	LB03778	3						
22	SE Ring	LP12475	6	LP12475	6						
23	Valve Retainer B	LP13735	6	LP13735	6						
24	Outlet Valve	LP10359	6	LP10359	6						
25	Screw 5 x 20	LP12599	6	LP12599	6						
26	Insulation Bush	LP10355	6	LP10355	6						
	Rear Cylinder	LB01415	3	LB01415	3						



**Head Office**  
9-4, Nakaikegami 2-chome,  
Ohita-ku, Tokyo 146-8555, Japan  
Phone:03(3755)9592 Fax:03(3753)8791  
URL <http://www.nitto-kohki.co.jp>  
e-mail:s-linear@nitto-kohki.co.jp

**MEDO U.S.A., INC.**  
4525 TURBERRY DRIVE, HANOVER PARK  
IL 60103, U.S.A.  
TEL(630)624-8811 FAX(630)624-0608

**NITTO KOHKI EUROPE CO., LTD.**  
UNIT21 THE EMPIRE CENTRE IMPERIAL WAY  
WATFORD, HERTS. WD24 4TS, U.K.  
TEL(01923)236668 FAX(01923)248815

**NITTO KOHKI AUSTRALIA PTY. LTD.**  
UNIT 1, 11 BORAN DRIVE, UNDERWOOD  
QUEENSLAND 4116, AUSTRALIA  
TEL(07)3808-3422 FAX(07)3808-3146

## 16. Maintenance instructions for compressor

### 16.2 Becker rotary multivane compressor



<b>1. Warning Notice</b>		
	High Voltage Only qualified staff may work on electronic components	 High Voltage according to ANSI American, National Standards Institute
	Automatic Start-Up When servicing the device must be turned off	 Hot Surface will cause burns. Let device cool down before maintenance
	Qualified Staff Marked operations may only be executed by qualified electricians	 Note Ignoring notices will cause severe damage to the pump
<b>2. Interdiction</b>		
	Pump works without oil Avoid absorption of oil fumes	 Marked areas may not be subject to weight
	Explosive substances may not be conveyed	 Flammable Substances may not be conveyed
	Toxic Substances may not be conveyed	 Liquids may not be conveyed
	Assembly Incorrect fitting position	
<b>3. Rules</b>		
	Wear protective goggles	 Wear protective gloves
	Wear protective ear-muffs Sound level information e.g. 85 dB (A)	
<b>4. Advice</b>		
 AIR	Active principle Rotary vane pump Only air may be conveyed	 AIR Active principle side channel fan only air may be conveyed
	Storing / Assembly Protect pump from humidity	 max. 800m Assembly Characteristic data is valid up to 800m above sea level
 VACUUM	Specification Vacuum pump	 PRESSURE Specification Compressor
	Factory-made Revolving field clockwise as pre-requisite for pump attachment	 Switch interval Not more than 10x per hour
	Blow out marked areas with air pressure	 3000 h Maintenance interval Observe minimum gate valve measurement every 3.000 hours
	Safety valve	 Arrange Motor-circuit switch
	Filter Maintenance Service according to dust accumulation exchange old cartridge dispose old	

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## 16. Maintenance instructions for compressor
















#### DT 4.4

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Driftsinstruktør  
Käyttöohje  
Driftsvejledning  
Instrukcja obsługi  
Kezelési útmutató  
Návod k obsluze  
Navodilo za uporabo  
Návod na obsluhu  
El Kitabı  
Инструкция по эксплуатации  
使用说明书

2006/42/EG



**1**

7 kg  
15.4 lbs

**2**

A > 100mm  
A > 4"

> 5°C/41°F  
< 45°C/113°F

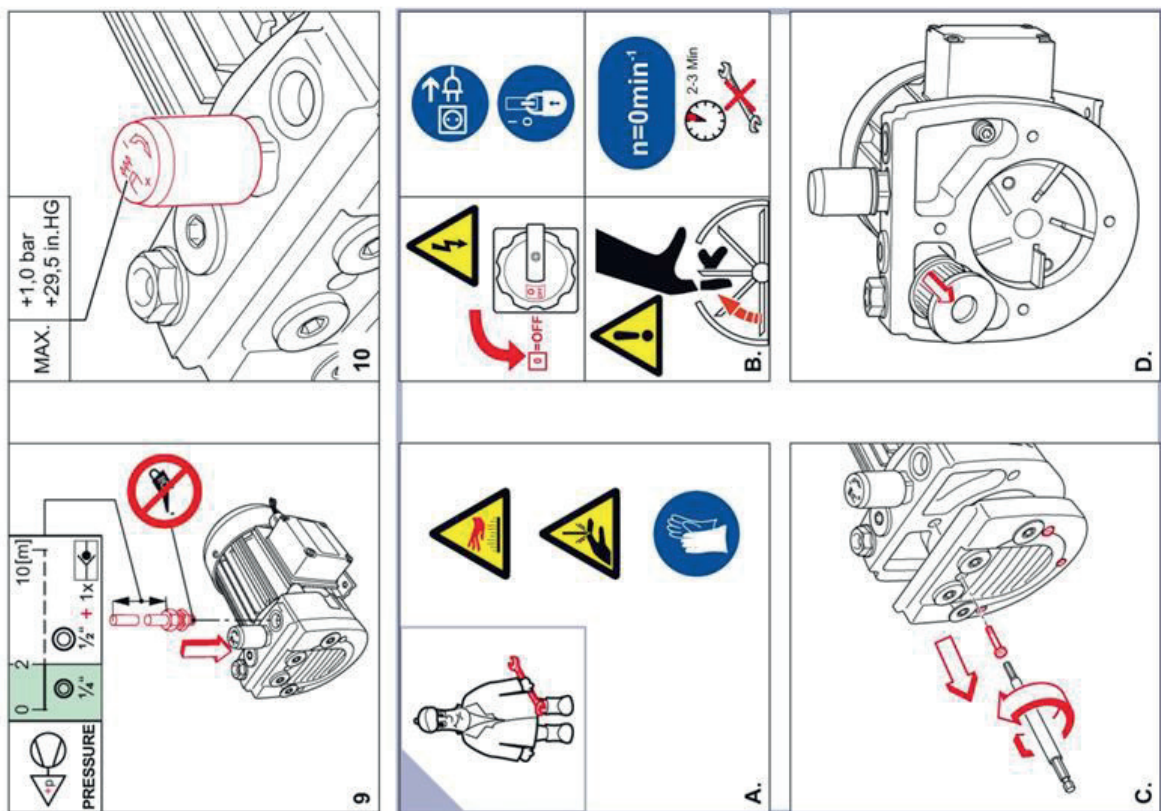
max. 800mm

max. 90%

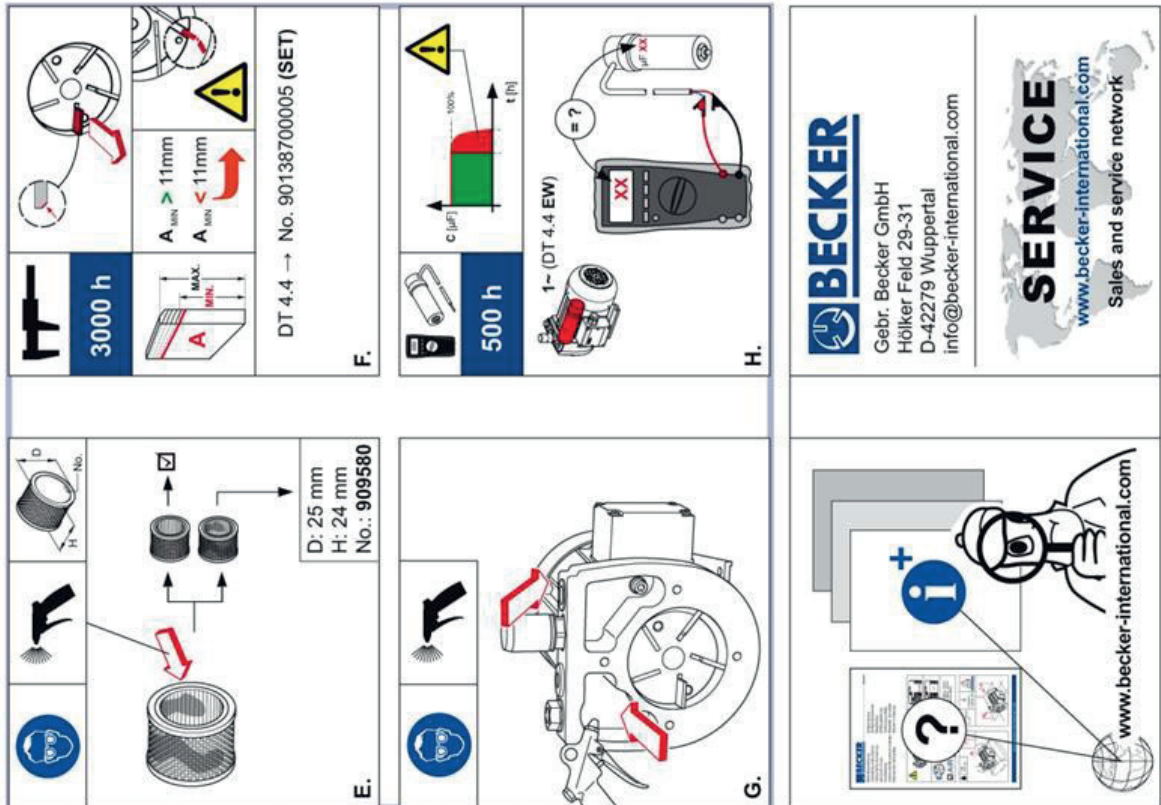
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## 16. Maintenance instructions for compressor



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**BECKER**

Gebr. Becker GmbH  
Hölder Feld 29-31  
D-42279 Wuppertal  
info@becker-international.com

**SERVICE**  
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Sales and service network

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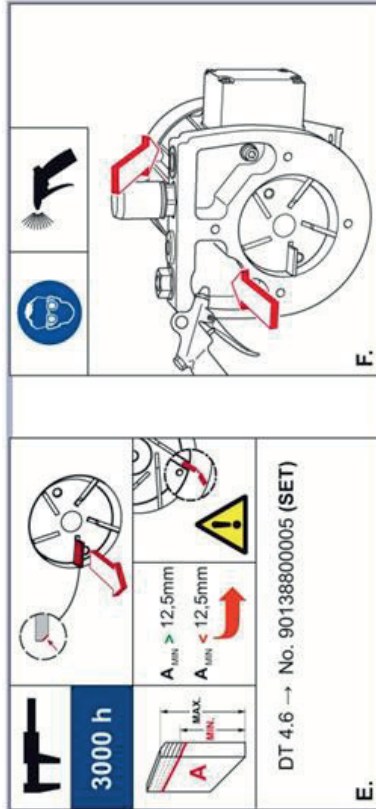
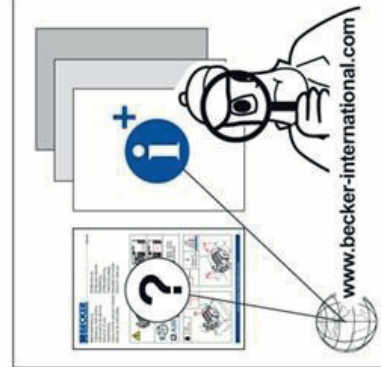
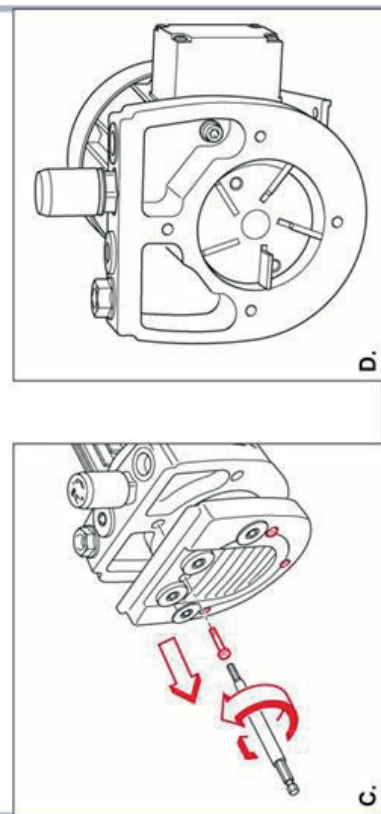
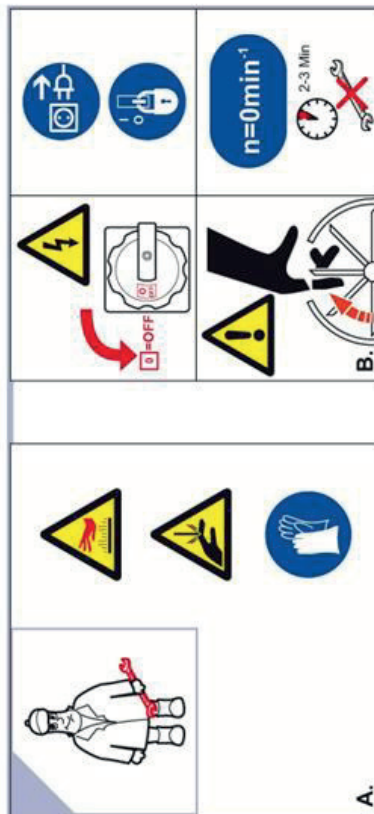
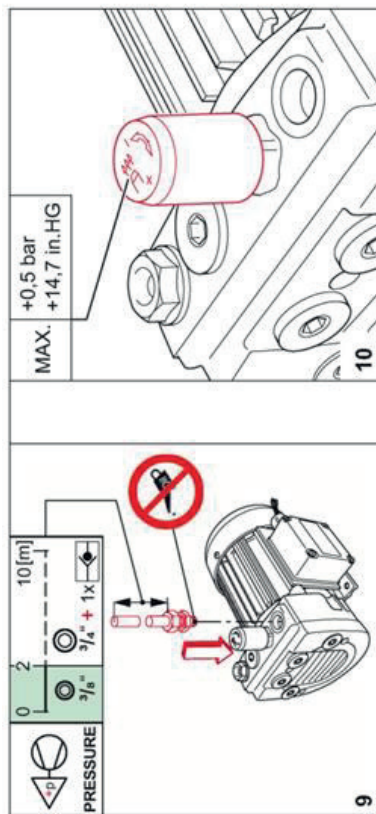
## 16. Maintenance instructions for compressor

5

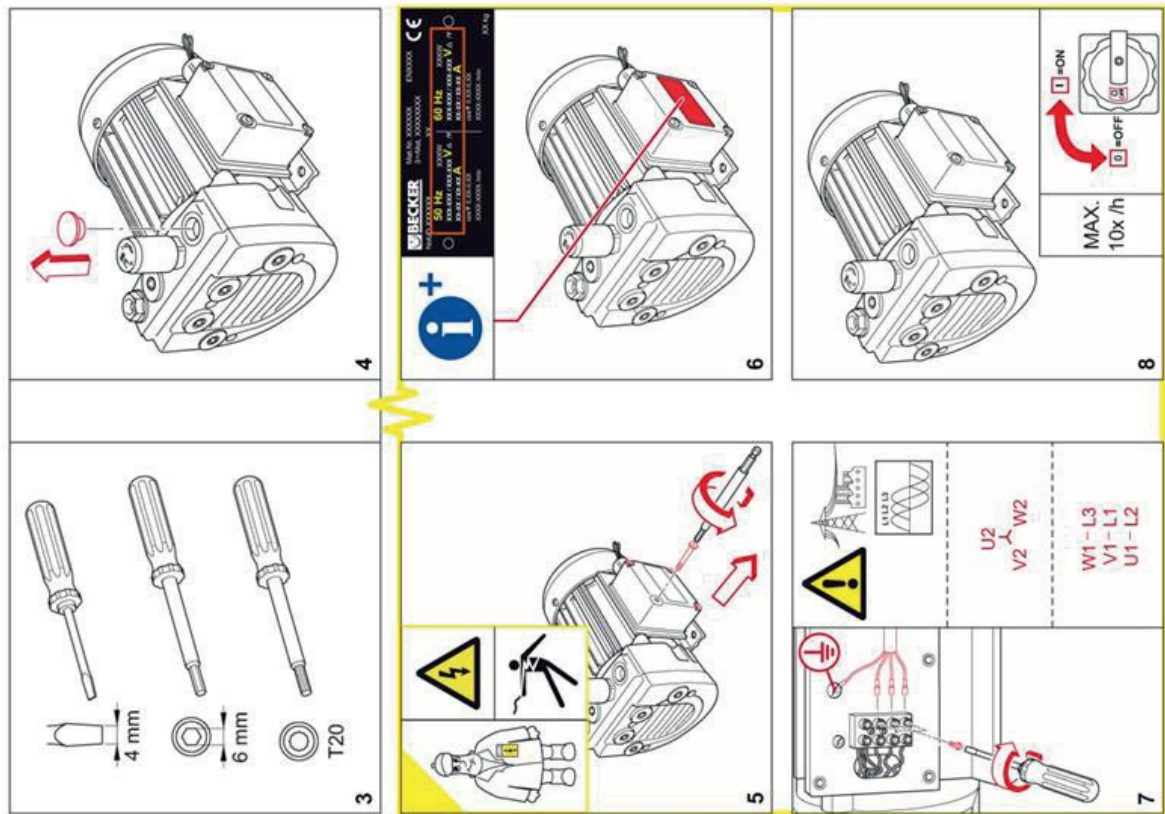
6

Figure 8 illustrates the motor connection. The top diagram shows a 3-phase motor with terminals U1, V1, W1 and U2, V2, W2. A red arrow points from the 'ON' position of a switch to the 'OFF' position, labeled 'MAX. 10x/h'. The bottom diagram shows a terminal block with a ground symbol and a red arrow pointing to the terminal block, labeled 'U2 V2 W2'.

## 16. Maintenance instructions for compressor



## 16. Maintenance instructions for compressor



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**DT 4.8**

2006/42/EG

**CE**

**MAX. PRESSURE**

**MAX. V**

**DIN EN ISO 3744**

**L<sub>PA</sub> = 58 dB(A) - 50Hz**  
**L<sub>PA</sub> = 61,5 dB(A) - 60Hz**  
**K<sub>PA</sub> = 3 dB(A)**

**AIR**

**11,5 kg**  
**25,3 lbs**

**Driftsinstruks**  
Driftsinstruktioner  
Käyttöohje  
Driftsvejledning  
Instrukcja obsługi  
Kezelési útmutató  
Navodilo za uporabo  
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Ei Kitabi  
Инструкция по эксплуатации  
使用说明书

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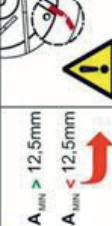


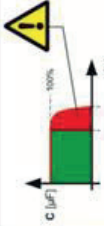


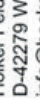










**AIR**










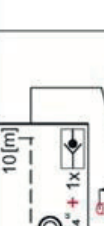




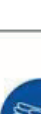



**11,5 kg**  
**25,3 lbs**

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2810002720100 05/11

## 16. Maintenance instructions for compressor

 <b>3000 h</b>	 <p><math>A_{\text{MAX}} &gt; 12,5\text{mm}</math> <math>A_{\text{MIN}} &lt; 12,5\text{mm}</math></p>	 <p>DT 4.8 → No. 90138800005 (SET)</p>	 <b>500 h</b>		 <p>1- (DT 4.8 EW)</p>			 <p>Gebr. Becker GmbH Hölker Feld 29-31 D-42279 Wuppertal info@becker-international.com</p>
	 <p>D: 30 mm H: 32 mm No.: 909581</p>							 <p><b>SERVICE</b> www.becker-international.com Sales and service network</p>

 <p>MAX. +1.0 bar +29.5 in.HG</p>								
 <p>10</p>								



## 16. Maintenance instructions for compressor

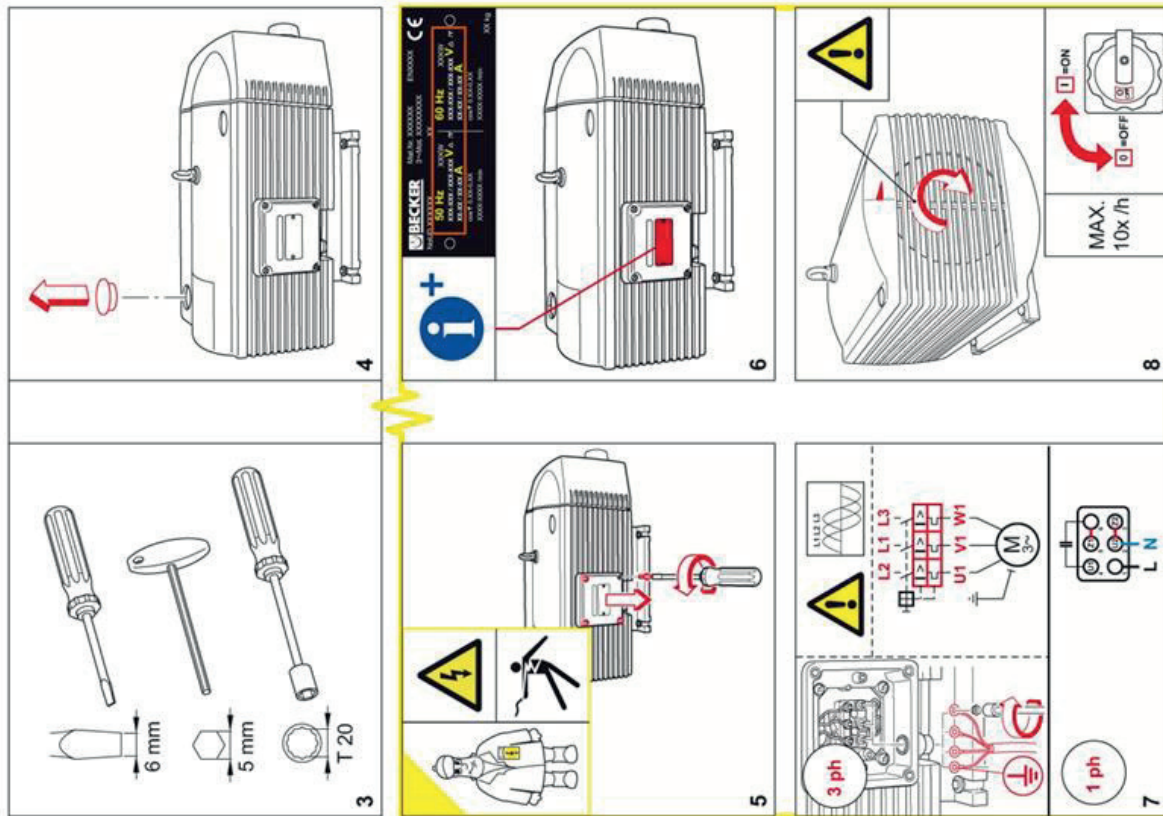
<p><b>E.</b></p>	<p><b>G.</b></p>	<p><b>H.</b></p>
<p><b>F.</b></p>	<p><b>BECKER</b>          Gebr. Becker GmbH          Hölker Feld 29-31          D-42279 Wuppertal          info@becker-international.com</p> <p><b>SERVICE</b>  <a href="http://www.becker-international.com">www.becker-international.com</a>          Sales and service network</p>	

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<p><b>9</b></p>	<p><b>A.</b></p>	<p><b>C.</b></p>
<p><b>10</b></p>	<p><b>B.</b></p>	<p><b>D.</b></p>

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## 16. Maintenance instructions for compressor



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**DT 4.25K**

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281000227501 05/11

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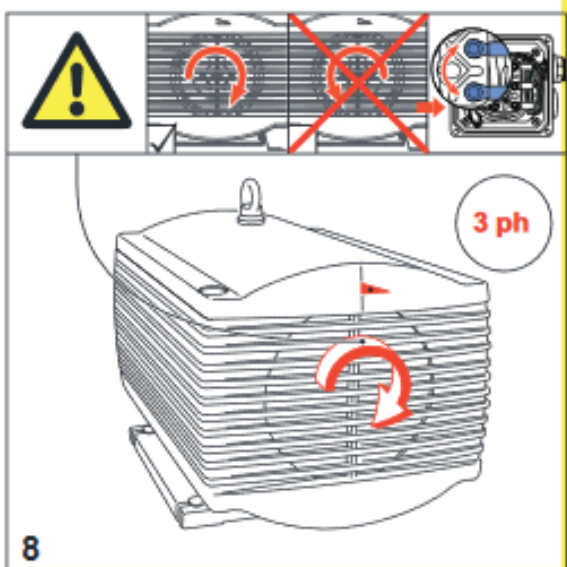
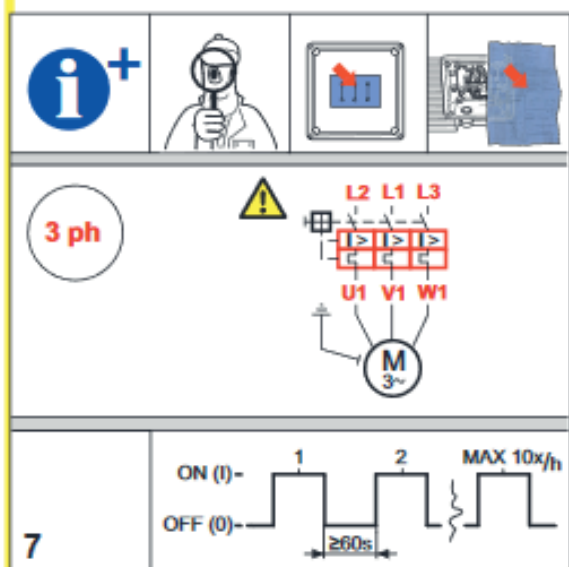
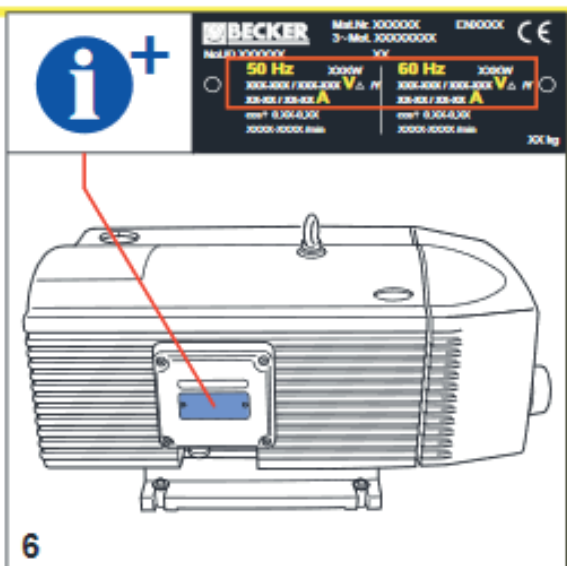
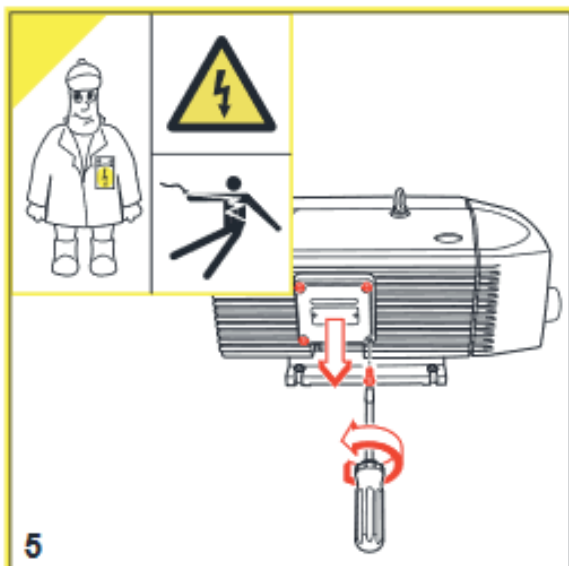
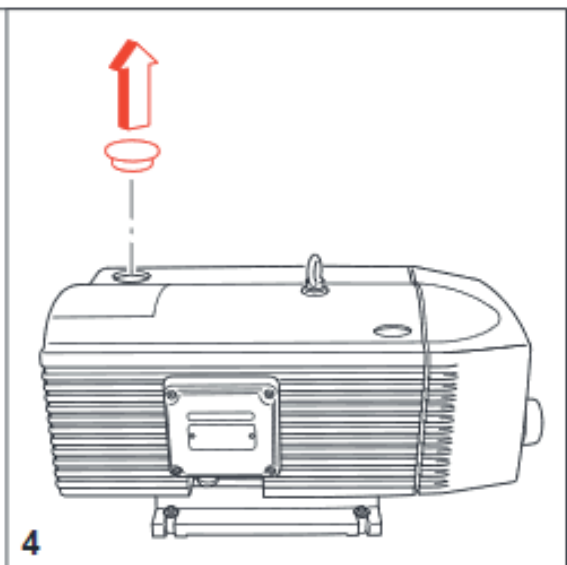
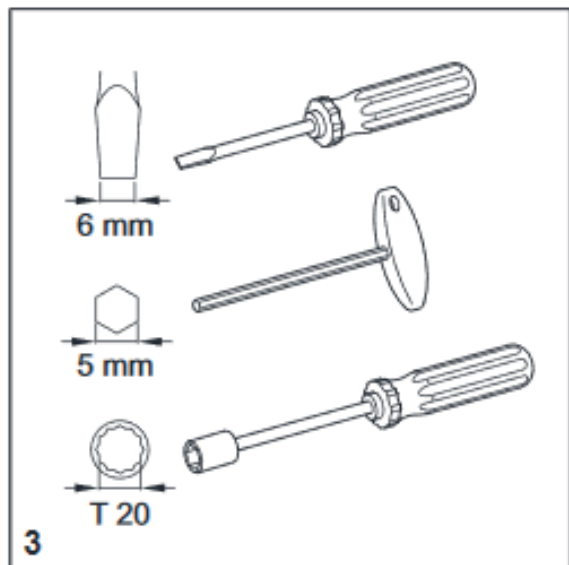

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DT 4.40K

				<p> <math>L_{pA} = 67 \text{ dB(A)} - 50\text{Hz}</math>  <math>L_{pA} = 70 \text{ dB(A)} - 60\text{Hz}</math>  <math>K_{pA} = 3 \text{ dB(A)}</math> </p>


## 16 Maintenance instructions for compressor



## 16 Maintenance instructions for compressor

**9**

0 2 10 [m]  
PRESSURE 3/4" 1" + 1x

**10**

MAX. +1,0 bar +29,5 in.Hg

**A.**

**B.**

n=0 min<sup>-1</sup>  
2-3 Min

**C.**

3x A-✓  
2x B-✗ 2Nm


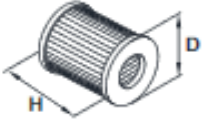

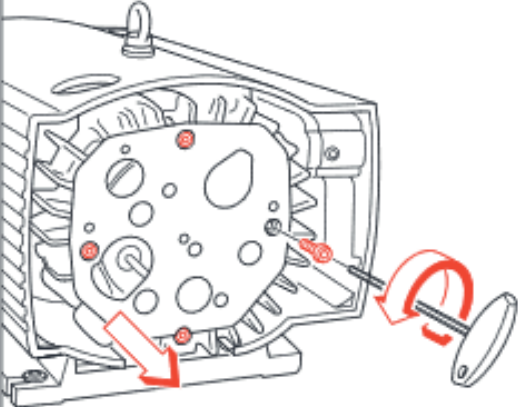

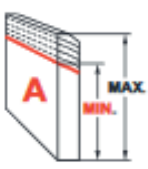



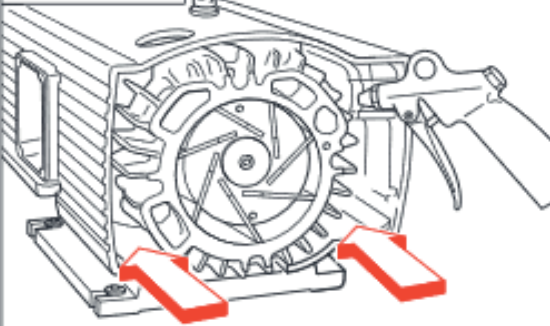



B  
A  
B

**D.**

40 - 200 h AIR ?

(F2) F1

## 16 Maintenance instructions for compressor

  <p><b>F1:</b> D: 64 mm H: 70 mm No.: 90950500000</p>  <p><b>F2:</b> D: 64 mm H: 60 mm No.: 90952900000</p> <p>EN149 - FFP3 42 CFR 84 - N100</p> <p><b>E.</b></p>	 <p><b>F.</b></p>
 <p><b>3000 h</b></p>  <p><math>A_{MAX} = 43mm</math> <math>A_{MIN} = 28mm</math></p> <p><math>A_{MIN} &lt; 28mm</math> → </p>  <p>→ No. 90135200007 (SET)</p> <p><b>G.</b></p>	  <p><b>H.</b></p>
 <p><a href="http://www.becker-international.com">www.becker-international.com</a></p>	 <p>Gebr. Becker GmbH Hölker Feld 29-31 D-42279 Wuppertal <a href="mailto:info@becker-international.com">info@becker-international.com</a></p>  <p><b>SERVICE</b> <a href="http://www.becker-international.com">www.becker-international.com</a> Sales and service network</p>

## Notes

[illegible]

## Notes

[illegible]



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Cet appareil  
se recycle

REPRISE  
À LA LIVRAISON



OU

À DÉPOSER  
EN MAGASIN



OU

À DÉPOSER  
EN DÉCHÈTERIE



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