Operation Manual

KLÄRMAX®
EINFACH SAUBERES WASSER
DUO

Type:		4 – 6 PE		8 – 10 PE		12 PE

Serial Number:

Date of Installation:

Albert Einstein Straße 20 – 23701 Eutin – Germany

Tel.: +49 4521 790060 Fax: +49 4521 7900669 www.klaertechnik.net info@klaertechnik.net

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1. Maintenance and Operation

Safety Notes:

Safety notes contained in this operating manual, which may be pose a risk to Personnel if not observed, are identified by this general danger symbol:

Voltage warning is marked with this symbol:

In small wastewater treatment plants flammable and toxic gases may occur. Also, the lack of oxygen can be life threatening. Therefore, all necessary safety issues must be carried out to prevent danger while working at the plant.

Always work within the treatment plant guarded by a second person who can react immediately in case of emergency.

Before entering the plant, all conducting devices must be shut down. Always use a gas detection unit before and while in the plant.

Self-Monitoring:

The operation of the system must be monitored by the owner or by a person commissioned by the owner.

The operator has to check the function of the system on a daily basis.

In case of malfunction the owner has to be informed immediately!

Please keep a logbook to note every maintenance, tests, sludge levels and other incidents, please copy the monthly operations notebook also to have a record for the authorities.

1.1. Maintenance

The frequency of the service calls will be determined by the responsible authority. The wastewater plant has to be serviced at least twice a year by a qualified servicing company. It is the responsibility of the operator to commission a servicing company.

The following maintenance tasks are to be performed at least twice per year in 6-monthly intervals:

a. Inspection of the logbook and reading of the hour-meter. Confirmation of the regular operation (target/actual comparison).

b. Function check of the important mechanical and electrical operating functions as well as other plant areas such as ventilation, removal pump, control panel and float switch.

c. Servicing of the technical facilities.

d. Adjust optimal operating values, e.g. oxygen supply (~ 2 mg/l)

e. Determination of sludge level in the reactor and sludge removal if the maximum level of 700 ml/L has been exceeded. Make sure to keep some activated sludge in the reactor.

f. General cleaning such as removal of sediments and coarse materials.

g. Control of the constructional condition of the plant, e.g. corrosion, access, ventilation, connections and hoses.

h. Once completed, the service is to be recorded in the logbook.

As part of the service the following checks have to be performed also:

Attention! SBR-plants samples of the treated water can only be taken during the actual pumping action or from a separate sampling vessel.

i. Examination of a sample of the treated water for:
   - Temperature
   - pH-Value
   - Sediments
   - Transparency
   - COD (at least with every 2nd service)

j. Examination of the reactor for:
   - Oxygen concentration
   - Settled sludge volume
   - Sludge volume index

The results and the service performed are to be recorded in the logbook.

The maintenance report has to be handed to the plant operator.

The operator has to file the maintenance report with the operating manual.

The maintenance report must be presented to the responsible authority on demand.

1.2. Prevent malfunctions

Materials you should not dispose in your toilet or drain:

Solid or liquid material that should not disposed in the toilet or drain	What can happen	Where to dispose
Adhesive plaster	Clogs the SBR	Trashcan
Ashes	Does not decompose	Trashcan
Bird litter	Clogs the SBR	Trashcan
Brush cleaner	Poisons treated water	Waste collection
Cat litter	Clogs the SBR	Trashcan
Chemicals	Poisons treated water	Waste collection
Cigarettes	Clogs the SBR	Trashcan
Cleaning supplies	Poisons treated water	Waste collection
Cleaning tissues	Clogs the SBR	Trashcan
Condoms	Clogs the SBR	Trashcan
Cooking oil	Clogs the SBR	Trashcan
Cork	Clogs the SBR	Trashcan
Cotton swabs	Clogs the SBR	Trashcan
Diapers	Clogs the SBR	Trashcan
Disinfectants	Kills necessary bacteria	Do not use
Engine oil	Poisons treated water	Waste collection
Frying oil	Clogs the SBR	Trashcan
Leftovers	Clogs the SBR	Trashcan
Medicine, drugs	Poisons treated water	Waste collection, pharmacy
Milk, cream	Clogs the SBR, influences the biology	Trashcan
Oily waste	Poisons treated water	Waste collection
Paints and varnishes	Clogs the SBR	Waste collection
Pesticides, herbicides	Poisons treated water	Waste collection
Photo chemicals	Poisons treated water	Waste collection
Pipe cleaner	Poisons treated water	Waste collection
Razorblades	Clogs the SBR	Trashcan
Sanitary napkins, tampons	Clogs the SBR	Trashcan
Textiles	Clogs the SBR	Trashcan
Wallpaper paste	Clogs the SBR	Trashcan
WC blocks	Kills necessary bacteria	Do not use
Wet wipes	Clogs the SBR	Trashcan

1.3. What to do in an event of malfunction?

Disorders are indicated by an acoustic alarm. An error message will be displayed on the control panel screen. Keep calm, a disorder is not a disaster and is usually recovered quick and easy!

Should it turn out that you cannot deal with the disorder yourself, please contact your service company. Do not delay to ensure the plant is returned to proper operation as quickly as possible.

Further details to alarm announcements can be obtained from section “1 Problems / Alarms”.

1.4. Expected treatment results

KLÄRMAX® IDEAL treatment performance is designed to perform under the following limits:

Parameter	Unit	Maximum Limit	Expected Value
COD	mg/l	150	60
BOD_5	mg/l	45	10
N_{tot}, anorg (=NH4-N, NO2-N, NO3-N)	mg/l	25	15
NH_4-N	mg/l	10	0

2. Installation Guide

KLÄRMAX®
EINFACH SAUBERES WASSER
DUO

Fully biological wastewater treatment plant

for treatment of domestic wastewater
according to DIN EN 12566-3

2.1. Delivery contents

1x Control Cabinet Klärmax DUO
Compressor and control unit mounted in a control cabinet

1x „one tank“ SBR kit
Adjusted for tank with chain mounting brackets.
Figure shows SBR kit with clear water extraction

1x Air-Diffusers
Number of Air-Diffusers will increase by the system capacity.

10m air hoses $^1/_2$ “ for airlift system.

Various Equipment parts
Drain pipes, hose clips, connectors, screw anchors, screws and cable straps.

Note: Delivery contents may vary according to your order type.

2.2. Installation and preparation

Prior to the installation of the system the following works have to be finished and the following conditions are to be met:

1. The tank has to be watertight and have to meet the required standards.
2. The tank has to have the appropriate volume.

Attention!

- Maximum distance between tank and control cabinet is 5 m. for standard retrofit kit.
- Size of the empty pipe min. DN 75
- There should be no bends >30° to ensure the air hoses cannot kink and that they can be inserted smoothly into the empty pipe.
- Power supply secured FI-cable (switch) cable 3 x 1,5

2.2.1. Klärmax® DUO installation

- „Single-Tank“ SBR Kit bracket (DN 110) fill with gravel +- 80% to the marking (to give kit weight).
- 2 x stainless steel hooks. Attach at manhole parallel to each other (8mm) hang the kit up-right on the mounted hooks.
- Adjust the height of the clear Water discharge, so the volume discharged is 150 L per population equivalent (PE) minus 5 centimeter.
- Fill the pipe with gravel to the marking (B) (approx. 80%).
- Connect the Clearwater Flush Pipe (blue) with the outlet tube to extract the cleaned water.
- Attach the air hoses with the connectors from the control panel and secure with the hose clips.

NOTE!!

Please do not disarrange the colors to prevent malfunction:

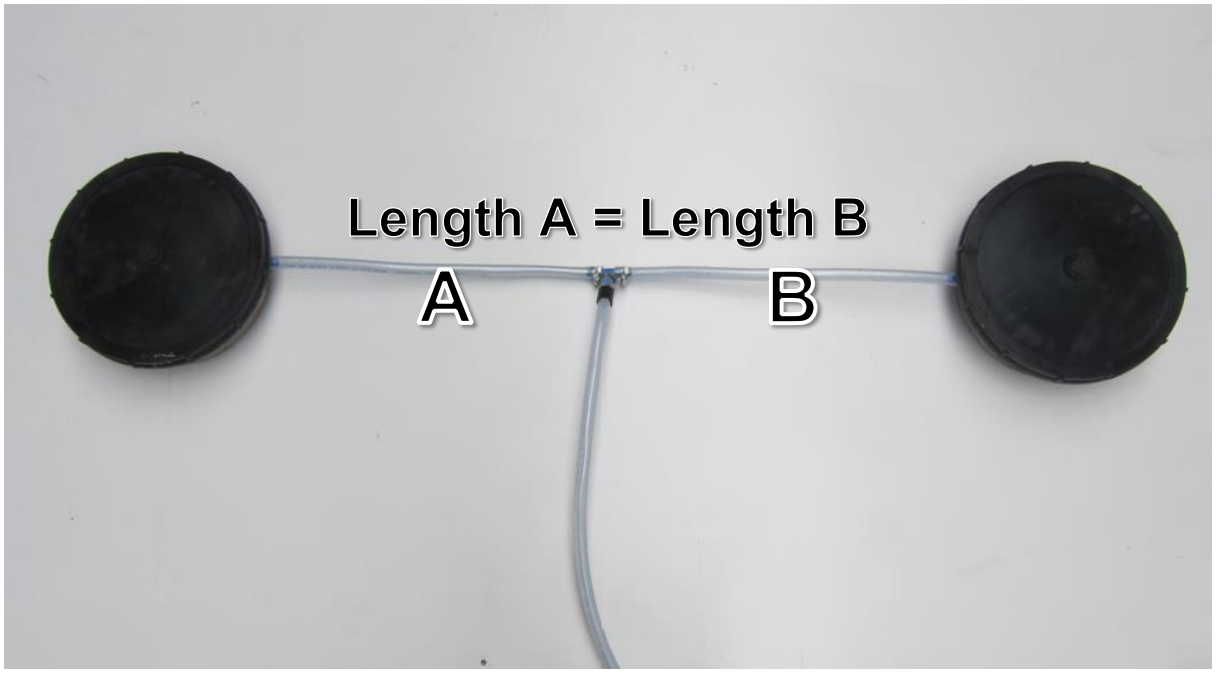
BLUE = Clearwater Flush

BLACK = Disc Aerators

2.2.2. Air-diffusers Installation

Attach the air-hose from the control panel (black) with T-fittings at the air-diffusers connectors and fasten with hose clips.

The number of the air-diffusers increases by the plant capacity.



Place the plate diffusers on the bottom of the tank equally to get even aeration.

NOTE!!

The length of the hoses between the plate diffusers (A & B) must be the same.

2.2.3. Installation of the control panel

A. with cabinet or pedestal (optional)

B. On wall bracket (standard)

A. cabinet / or pedestal (see page 22)

- For indoor or outdoor Installation, lockable.
- Install at maximum distance 10 meters from tank.
- Remove transportation protection (polystyrene) from compressor.

B. wall bracket

- For indoor installation (splash-proof)
- Install at maximum distance 10 meters from tank.
- Remove transportation protection from compressor

NOTE!!

- The control has to be levelled by a spirit level.
- Never switch on the control unless levelled.

2.2.4. Installation of air hoses

Cut the air-hoses at the right length, push through the empty tube (DN 75) and connect the air hoses with the Control Panel. Fasten with hose clips.

NOTE!
Mark the air hoses with the right color and connect the valve pins with the right color on the Control Panel.

- „aeration“ rotation motor valve (BLACK)
- „clearwater“ rotation motor valve (BLUE)

NOTE!
The empty tube for the air hoses must be sealed with insulating foam on both openings to prevent odor and sounds.

2.3. Check list – First use (test run)

Check:

1. All aggregates (air pressure hoses) are properly connected.
2. The heights of the withdrawal points are correct.
3. For an existing overflow.
4. The tightness of the tank and the SBR reactor are fulfilling requirements (if necessary, a tightness check has to be carried out).
5. Sufficient air ventilation is provided (e.g. roof ventilation).
6. The SBR reactor must be filled up with water to the suction level. A proper performance test of the air lift system is only possible with maximum water levels in all chambers!
7. Ensure that all cables and tubes are long enough that the units can be removed easily from the tank if required.

2.4. Installation of the electronic control unit

Please consult the control panel manual (4 “Operating the KLÄRMAX® DUO control unit”) for further details.

Prior to commissioning and switching on the main power supply, you must ensure that:

- The control unit and the connected cable show no sign of damage.
- All connections have been properly carried out.
- The control unit has been connected properly and is professionally secured.
- Note official regulations (EN, VDE …) as well as regulations by local energy providers.

2.5. Test Run

Press „Start test run” on the menu to start an automatic test (Note: the test run starts with a delay of 120 seconds). The test run checks if the compressor has a proper power intake and if the floating switch (if attached, optional equipment) is working (floating switch must be switched manually during the test). The test run also checks the air lift system.

Ensure to hand out the accident prevention regulations!

3. Principle of Operation

Main Features of KLÄRMAX® DUO are:

- The use of a single tank for the treatment process
- The one-cycle per day SBR operation.

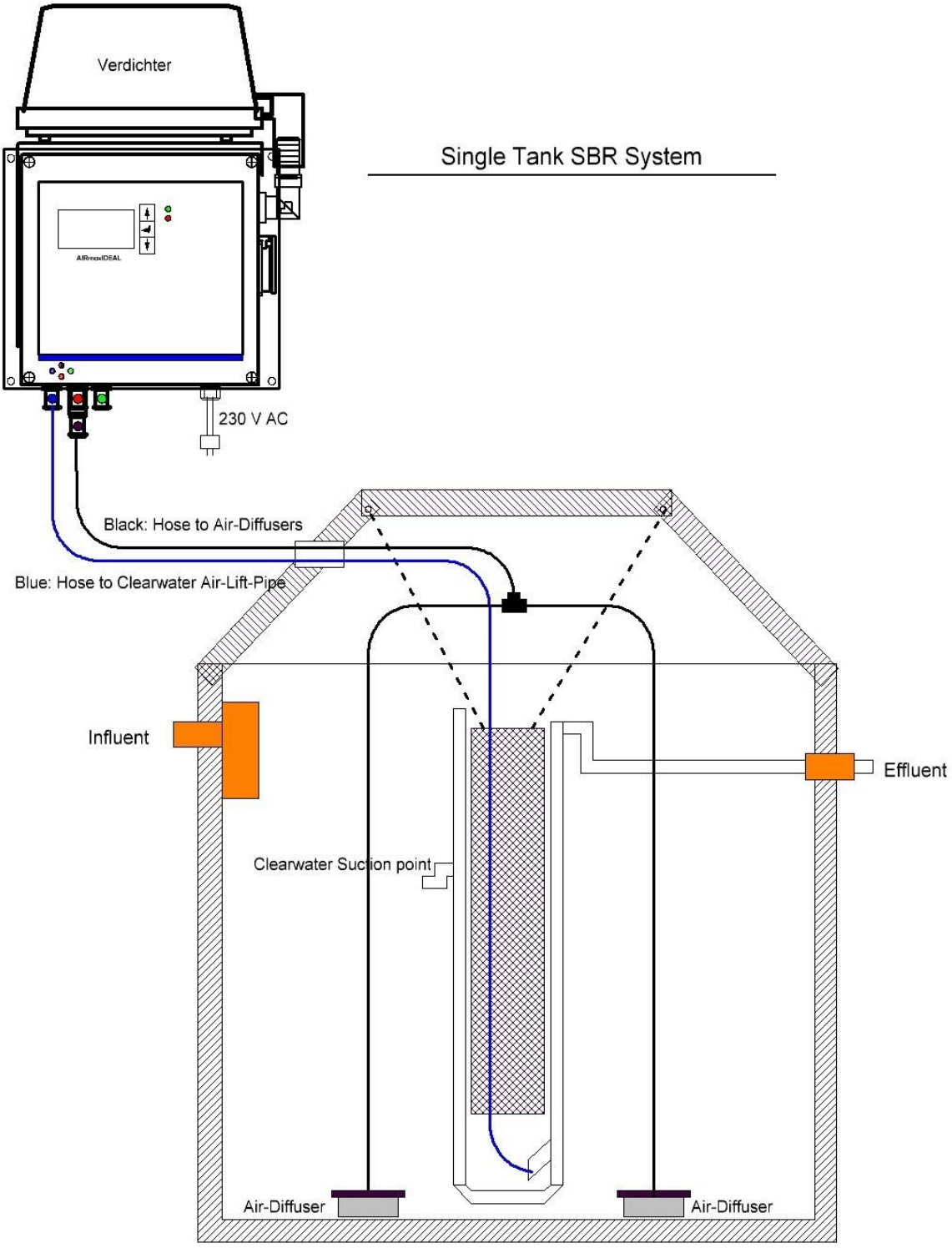
The duration of a SBR-cycle is 24 hours, resulting in 1 cycle per day. The plant purifies the average daily amount of an average family or small business. Therefore, the sedimentation phase is during breaks (late at night), when no further (or minimal occasionally) wastewater influent is expected.

1) FEEDING - The wastewater influent, is free to enter the aeration tank, through a flow-equalization pipe.

2) AERATION PHASE - During the aeration-phase, an intensive, intermittent aeration is programmed to support the biological process.

3) SEDIMENTATION PHASE - Is programmed in the expected inflow breaks (late at night), when no further (or minimal occasionally) wastewater influent is expected.

4) CLEARWATER FLUSH - After sedimentation, the treated water is pumped out of the tank, through an air-lift-pump.


Verdichter
AIRmaxIDEAL
230 V AC
Single Tank SBR System
Black: Hose to Air-Diffusers
Blue: Hose to Clearwater Air-Lift-Pipe
Influent
Effluent
Clearwater Suction point
Air-Diffuser
Air-Diffuser

4. Operating the KLÄRMAX® DUO control unit

4.1. General description

The control unit controls a compressor (blower) and four rotary valves, which control the plant based on the SBR- timing principle.
The clear water disposal pipe is working with the air lift principle. To initiate the transport of water respectively the aeration, the corresponding valve opens. With a delay of two seconds the blower starts. Reversely, when turning off, the blower will switch off first and then the valve will close with a delay of two seconds.

4.2. Safety Notes

This documentation applies solely to the control unit. It contains important safety notes and instructions. Therefore, this document must be read by the operator prior to installation and commissioning. Not only must the general safety notes under this main heading be observed but also the special safety notes

4.2.1. Notice!

This document does not take into account all constructional details and variations nor all possible contingencies and events which may occur during installation, operation or maintenance.

Prerequisite for the installation and the handling of the control unit is the use of suitably qualified staff (refer EN 50110-1). If not all information and instructions can be found in this manual please consult the manufacturer. The manufacturer will not take warranty if these instructions are disregarded. This document contains fundamental notes which have to be followed during installation, commissioning and operation.

Therefore, this manual must be read by the responsible operator prior to installation and commissioning, and it must be permanently available at the location of the plant. Running and maintenance of the plant may only be performed by qualified staff.

Prior to set up and switch-on main power, the operator has to make sure that:

- The plant and the connecting cables do not show any visible sign of damage.
- Especially main power and the plant connections have been installed properly.
- All connections have been professionally installed.
- The installation and specifications of all cables correspond with applicable laws.
- The unit is installed properly.
- The unit is secured professionally.

Applicable regulations (EN, VDE …) as well as the regulations of your local energy provider must be respected. A damaged fuse may only be replaced by a slow blow fuse of the following type:

3,15A, 5 x 20 mm to EN 60127-2/III with a maximum loss rate of 1.5W.

These fuses are installed by default.

A fuse may only be replaced with another fuse of the same amperage. Before replacing a fuse the plant must be disconnected from main power (unplug).

(Attention: sensitive components. Danger of loose cables or power conducting components)

4.3. Function

4.3.1. Operation and Displays

The device is equipped with a graphic LCD-display with 128x64 pixels. The values are shown in plain text mode. Operation is via three keys (UP, LEFT, DOWN). During normal operation a triangle cursor flashes, visible in the bottom right corner of the LCD display. The green LED is on when the device is in operation (valve or diffuser). The red LED is on in case of malfunction. In the initiating phase both LED are on (the device is not yet operational).

Each menu consists series of values on the LCD display. You can navigate from menu to menu with the arrow (UP, DOWN) keys. Within a menu you also navigate with the arrow keys. By pressing the LEFT key you enter the respective menu item. The entry mode is recognised by highlighted menu line. With the UP / DOWN keys you can select the lines. By pressing the LEFT key, the values can be changed. If a multi-digit number is required, the highest value is selected first; then you move with the LEFT key to the next lower value etc. If the entry of various options is required, you also use the arrow keys (UP / DOWN).

Once the desired option is displayed select it with the LEFT key.

4.3.2. Main Display

In the main display mode the control unit displays the switching state of the device eg.:

The 1st line displays the actual SBR cycle and the time of the duration of the actual phase.

The 2nd line displays whether the device runs in normal or power saving mode.

The 3rd line displays, which aggregate is operating resp. SBR pause if all aggregates are off.

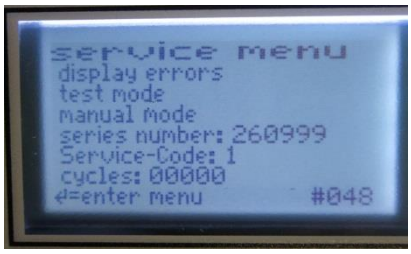
The 4th line displays if there is an error. Otherwise „No Error“ is displayed.

The 5th line displays the operating current of the aggregates.

The 6th line displays date and time.

The 7th line displays the position of the floating switch (up or down).

With the LEFT key the buzzer can be switched off within this menu and, if pressed again, the alarms are reset.

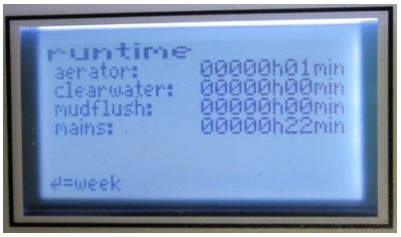


4.3.3. Operation

With the arrow keys (UP / DOWN) you can switch from the main menu from menu item to menu item. By pressing the LEFT arrow key, one enters the input mode of the respective menu item. Now one can scroll the menu with the arrow keys (Up/Down). The chosen menu item is highlighted. By pressing the LEFT arrow key again you can change the values of the highlighted line.
Hereafter the menu structure of the system menus is explained. The exact display, however, depends on the status of the plant, the set parameters and occurring disorders. The different variations of the displays are below.

4.4. Menus

4.4.1. Operating Hours Display



The menu item „runtime“ displays the operating hours of the respective aggregate. Hours are added after the Control has switched on the aeration with the corresponding valve. The operating hours of the blower are the sum of the individual running times. The display shows hours and minutes.

If OK (LEFT arrow key) is pressed, the total previous operating hours of the previous weeks (up to 52 weeks) are displayed. The first line displays the week in which values were saved (a new week starts every Sunday). Scroll between the weeks with the arrow keys (UP / DOWN). Hint: This feature will only work if date and time have been set correctly.

4.4.2. Service Menu

The Service Menu is used for maintenance or by a technician during service operation.

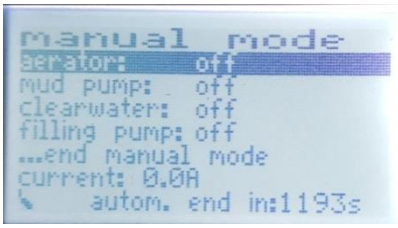
4.4.3. Error Log Book

The Error Log is available via the first menu item. The error log displays the previous 20 error events with date and time. Scroll within the error log with the arrow keys. Leave the menu with the LEFT key.

4.4.3.1. Test Run

If „Test Run“ from the main menu is chosen, an automatic test run starts. The test run checks whether all aggregates work properly and the floating switch is operating. During the test run, all valves will be opened and closed in their normal sequence (the aerator delays by two seconds). The system changes to the next step every 15 seconds.

4.4.3.2. Manual Operation

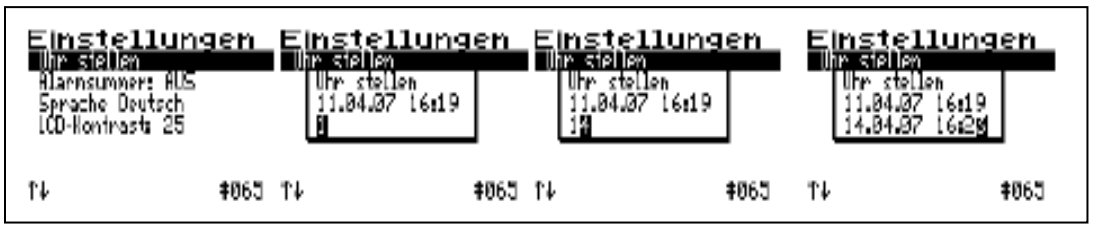


During manual operation each function of the plant can be manually switched on or off. At all times the blower and the corresponding valve are activated first. The valve opens one second before the blower starts. Another function can only be selected if the previously active function has been switched off. At the end of the manual operation the standard treatment cycle is resumed. The aggregate is selected with the arrow keys.
With the LEFT key you switch the aggregate on or off. Manual operation is switched off by selecting the menu item: “End of Manual Operation”.

4.4.4. Menu Settings

4.4.4.1. Set Time

To set the system time, follow the steps:



In the example above the time is changed from 11.04.07 to 14.04.2007 and the time is changed to 16:19.
The timer is quartz-controlled. If necessary the timer should be checked during regular service calls.

4.4.4.2. Alarm Buzzer

The alarm buzzer can be switched on or off.
Note: if the buzzer is set to OFF, the acoustic alarm is mute.

4.4.4.3. Language

It is possible to alter the system language. Default language is English.

4.4.5. System Menu

In the following menus all parameters of the plant can be set individually. To change current values you first have to enter a password. Default parameters don't need to be changed as all parameters are automatically set to appropriate values when the model is selected. Parameters should only be changed by a qualified service technician as poor settings can change the performance of the plant. [Password: 2007]

4.4.4.1. Menu Aeration

The duration of aeration is set in this menu for normal and holiday mode.

4.4.4.2. Menu Parameter

In this menu, the parameter of nitrification and denitrification processes can be modified (optional).

4.4.4.3. Menu Parameters for filling, sedimentation and decanting

In this menu the parameter for filling, sedimentation and clear water flush can be modified.

4.4.4.4. Pressure Control

When the control unit switches on the aerator, the pressure within the system should set within a range predetermined by the manufacturer. If the pressure is too low the blower or aerator may be defective or there may be a leak in the hose and pipe system. If the pressure is too high, a valve is not working or an air hose is blocked.

In the first line on the monitor the measured pressure is displayed. If the minimum pressure is not achieved (while blower is running) an alarm will sound. If the maximum pressure is exceeded (while blower is running) an alarm will sound. To set the values follow the instructions of the manufacturer. If the values are set to 000, the pressure monitoring (Min/Max) is deactivated.

4.5. Problems/ Alarms

4.5.1. Error Messages

The following errors can appear:

HW	High Water (flooding); after flushing the treated water the floating switch is not down
Akku	The battery is empty, defective or not inserted
Clock	Clock not set
p_min	Pressure is below minimum
p_max	Maximum pressure exceeded
Power ON	Power is switched on
Power OFF	Power is switched off
Cycle Error	Timing error in the SBR cycle
Power Failure	Power Failure, SBR Cycle continued

Errors will be shown on the display.

The error message in the display will only disappear after the problem has been rectified and the error has been reset. Errors are indicated by the red LED light.

4.5.2. Reset Alarms

If an alarm occurs it can be reset by twice pressing OK (LEFT). The display will show “Alarms deleted” for one second and revert back to the main display afterwards.

4.6. Power failure alarm

The plant control is featured with a power failure alarm. During a power failure an acoustic beep will sound every 30 seconds to notify the operator that the plant is not operating. The display shows a crossed plug. Press and hold the middle key until a confirmation beep will stop the alarm sound.

Note: With a new installation the internal battery packs must be charged for a few days until they reach their maximum performance. The capacity of the batteries will reduce after a period of time. They can be replaced with two NiMH, size AA batteries (recommended capacity: 2100mAh).

The battery exchange must be made by a qualified electrician. Unplug before opening the control unit.

The batteries should be disposed properly. Please refer to your local legislation.

When power returns after a power failure the plant switches on automatically. After brief interruptions the system resumes the cycle where it left off. If the interruption lasts for more than a minute the treatment cycle will restart (reset).

4.7. Technical Data

Temperature range (operation)	0 °C … +40 °C
Temperature range (storage)	-20 °C … +70 °C
Air humidity (operation and storage)	0 … 90 % RH not considered
Protection class	Protection insulated
Type of protection	IP54
Dimensions (incl. Cabinet) approx.	255 x 220 x 193 mm
Assembly	Wall installation with four screws
Cabinet material	Plastic, light-grey Powder-coated steel sheet
Main power (L1, N, PE)	230V AC 50Hz 10%
Blower connection and safety socket Maximum output (with Fuse 3,15 A)	230V AC 50Hz P < 0.7KVA
Internal Fuse (max. 1,5 W)	1 x 3.15AT max. 6.3AT
Blower overheating protection	Thermal contact in blower
power control unit	Typical 5VA
required pre-fuses	Max. 1 x 16A G
Connection type	Clamps
Maximum cable diameters	1.5 mm² flexible (with ferrule) 2.5 mm² rigid
Floating switch input: maximum contact voltage maximum contact current	 230V AC <4mA
Alarm relay floating on ports 11, 12, 14 maximum contact voltage maximum contact current	 230V AC 5A; AC1
Pressure measuring measuring accuracy connection	0 … 0.4 bar Typical 2% v.E. Internal hose
Internal buzzer	typical 70dB (A)
Batteries	2 x NiMH; Size AA Minimum 1800mAh
Display	Graph. LCD-Display 128 x 64 1 x LED green 1 x LED red

Operation	3 keys
Cable fastening	M 16
Hose connections Blower: Aerator: Filling / Sludge return / clear water flush	 19mm 19/16mm 16mm

4.8. Assembly Notes

The units are designed for upright and balanced wall mounting.

Disconnect control unit from power source before performing any installation work.

Floater connection (optional)

Arrange cable through the cable fastenings on the lower side and connect the cable to the corresponding clamb in the terminal chamber. Close the terminal chamber. Attention: **230 V! Disconnect from power source.**

After a self-test a start notice should appear after three seconds. Vx.xx (e.g. V0.04) is the software version. After a few seconds the regular display menu appears. If required set the parameters (see above) and return to the main menu. The unit is now set up. The power cable must be installed professionally. Do not put too much physical stress on the cables due to insufficient fastening as otherwise the protection class IP54 cannot be warranted.

Klärtechnik Reinhardt GmbH

Wastewater Treatment

5. Declaration of Performance

CE

The manufacturer:

Klärtechnik Reinhardt GmbH

Albert-Einstein-Str. 20
D-23701 Eutin
Tel.: +49 4521 79 006 0
Fax: +49 4521 79 006 69

declares that the products:

Klärmax® DUO
(Small Wastewater Treatment Plants for 4 – 50 PE)

comply with the current regulations of the European Union as follows:

"Regulation No. 305/2011 of the European Parliament and the Council of 9 March 2011 laying down Harmonized conditions for the Marketing of construct products."	**2011/305/EU**
Small wastewater treatment plants for 4 - 50 PE, pre-manufactured or assembled on site, for the treatment of domestic wastewater.	**DIN EN 12556-3:2005+A1:2013**
Guidelines by the European Parliament and Council for machines.	**Machine Guideline 2006/42/EU**
Guidelines by the European Parliament and Council for the harmonization of regulations of member states for electromagnetic compatibility.	**Electromagnetic Compatibility 2014/30/EU**
Council Guideline concerning electrical resources for use within certain voltage limits.	**Low Voltage Guideline 2014/35/EU**

Updated: February 2020

Klärtechnik

Wastewater Treatment Reinhardt GmbH

You have selected a product made by Klärtechnik Reinhardt GmbH

Thank you for your confidence!

Please contact us, in case of queries or questions.

Albert Einstein Straße 20 - 23701 Eutin

Tel.: +49 4521 790060 Fax: +49 4521 7900669 www.klaertechnik.net info@klaertechnik.net

Operator Log

Date	Operating hour meter in h				Floating sludge		Visual check		Special features
	Loading	Aeration	Treatedt water removal	Sludge removal	yes	no	ok	not ok	