

Operating instructions



AQUATO[®]
K-Pilot Control



These operating instructions are available for you to download in DIN A4 format as a PDF file on our home page www.aquato.de in the “Downloads” section.

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1 General description

The switching device controls a submerged aerator, a filling- / sludge pump and a clear water outflow pump of a small wastewater treatment plant in accordance with the SBR principle in cycles. When in operation the currents of the motors are monitored in order to identify plant errors as much as possible. With the K-Pilot 8.4 it is also possible to connect a unit for dosing a precipitant for phosphate elimination.

2 Safety instructions

These operating instructions apply exclusively to the switching device (control) and contain important instructions and warnings.

The operating instructions must be read prior to the assembly and commissioning by the fitter and the responsible operator of the plant and observed.

Not only the **general safety instructions** listed under the main entry “Safety instructions” need to be observed, but rather all the **special safety instructions** included under the following main points.

2.1. Identification of instructions in the operating instructions

The safety instructions included in this doc. which could endanger persons if they are not observed

are identified with the general hazard symbol.



Electrical voltage warnings are specially indicated with the following symbol.



2.2 Please note

These operating instructions do not take all design individualities and versions into account, nor all the possible eventualities and results which might arise during assembly, operation and maintenance.

Prerequisite for the assembly and handling of the switching device is the deployment of specially trained personnel (see EN 50 110-1). Should you require information and instructions that you cannot find in these operating instructions, please do not hesitate to consult the manufacturer.

The manufacturer and supplier of the switching device accepts no responsibility in cases where the instructions are not observed.

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2 Safety instructions

These operating instructions include important information which must be observed when setting-up, commissioning and operating the plant. These operating instructions must be kept readily available at the place where the plant is employed.



The control may only be connected and maintained by a suitably qualified specialist.

Prior to commissioning and turning on the mains it must be ensured that

- the device and the power supply cords are free from visible damage
- in particular the mains connections and the motor connections are connected up properly
- all connections have been performed correctly and expertly
- the laying and conducting of all cables and cords complies with the applicable regulations
- the device is correctly closed
- the plant is expertly fused

The respectively applicable regulations (EN, VDE, ...) And the regulations of the local energy supplier must be observed.

If a fuse is defective, it must only be replaced with a microfuse of the following type:

microfuse, time-lag, type 3,15 A , 5 x 20 mm in accordance with EN 60127-2/III with a maximum power loss of 1,5 W. This fuse is also inserted in the factory.

Note:

A stronger fuse can be employed for larger plants (max. 6,3 AT).

Fuses must always be replaced with a fuse of equal strength.

Prior to replacing the fuse, ensure that the device is completely turned off and disconnected from the electricity supply (unplug).



Ensure device is turned off and disconnected from the power supply before opening it (Unplug!).

Caution:

- Sensitive components
- Risk internal cabling can become loose
- live parts



Always unplug before working on pumps and aerator!

3 Connections

3.1 Mains connection

The plant is connected to the mains by means of the supplied power cable (approx. 1,5 m long) with Shock-proof plug (clips L1, N, PE). Fuse protection on line side: max. 1 x 16 AG.

3.2 7 - pole plug

The following inputs and outputs are routed through a 7 - pole plug on the underside of the device.

Connector assignment of 7 – pole plug (as delivered)		
No.	Cable colour	Function
1	Black	Submerged aerator
2	Brown	Filling / sludge pump
3	Purple	Clear water outflow
4	Blue	N (neutral wire)
5	Orange	Switch contact float switch
6	White	N (float switch)
7	Green / Yellow	Earth wire

3.2.1 Submerged aerator

The submerged aerator is connected via the 7 - pole plug on the underside of the housing.

3.2.2 Filling / sludge pump

The pump is connected via the 7 - pole plug on the underside of the housing.

3.2.3 Clear water pump

The clear water pump is connected via the 7 - pole plug on the underside of the housing.

3.2.4 Float switch

The float switch is connected via the 7 - pole plug on the underside of the housing.

Control voltage: 230 V~ approx. 5 mA, switching between input and N.



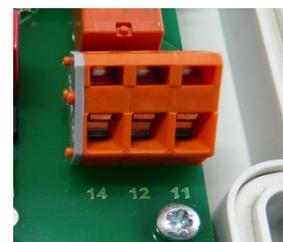
Cutting through the control cable results in loss of warranty!

3.3 Floating contact

The floating contact can be used to connect an additional warning lamp / flashing light.

This can be supplied with electricity via the control or over another independent / external cable.

In the case of an alarm, the relay closes the connection between clips 11 and 12 and opens the connection between 11 and 14.

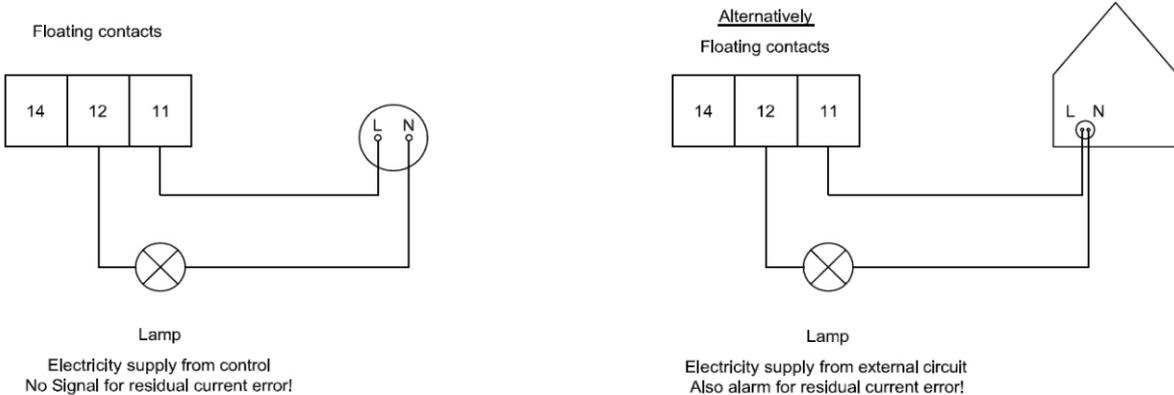


Continued on page 7

3 Connections

If you want the warning light / flashing light to illuminate / flash in the event of an error, it should be connected via contacts 11 and 12 (see diagram).

For continuous illumination, the connection between 11 and 14 should be chosen.



4 Function

4.1 Operation and displays

The control has a graphic LCD - display mit 128 x 64 pixels.

The displays appear in plain text.

It is operated via three buttons and two LEDs.



● The green LED is illuminated continuously if a motor is on.



● In the event of an malfunction / error, the red LED flashes.



If both the green and red LEDs are illuminated continuously, the unit is in the initialisation phase.

During normal operation, the green LED flashes and in addition a flashing triangle ◀ can be seen in the lower right handcorner of the LCD display.

Each menu is composed of a row of displays on the LDC display.

You can change from menu to menu using the arrow keys .

By pressing the key you can enter the input mode for the respective menu.

The input mode can be identified by a selected (shown reversed) line.

The keys can now be used to select the lines and the key used to change the value.

If a multi-digit numerical input is required, the highest digit is changed first.

You can use the key to proceed on to the next digit and so on.

If the input is a selection from several options (e.g., YES / NO), the required selection can be reached using the arrow keys .

When the required option appears on the display, it can be confirmed using the key.

4 Function

4.2 Commissioning

When commissioning the unit, the following information must be entered first:

- Password
- Language (see menu item 5.4.4)
- Date and time (see menu item 5.4.1)
- Plant size (see menu item 5.3.3)
- Denitrification (see menu item 5.5.2)
- PO₃-elimination (only for type K-Pilot 8.4, see menu item 5.3.4)
- Test mode - lasts approx. 1 minute (see menu item 5.3.1)

Following the test mode, a window appears with the prompt input ok?. This can be answered with YES / NO. If the input is NO, you start again by entering the password, if YES, the standard display is shown.

The commissioning engineer must ensure that the parameters are set in such a way that they comply with any requirements from the construction approval for the plant on which the control is intended to be employed.

4.3 Main display

In the standard display, the control shows the switching status of the plant and the motors, e.g.:



1. line: Date and time
2. line: Current SBR cycle
2. line (right): Normal or eco-mode operation of plant, (remaining) time that the current phase has left
3. line: Display of which motor is running or "motors off", if all the motors are turned off
4. line: Operating current of the motors
5. line: Error display
6. line: Floater status up or down

If the  key is pressed, the following appears:

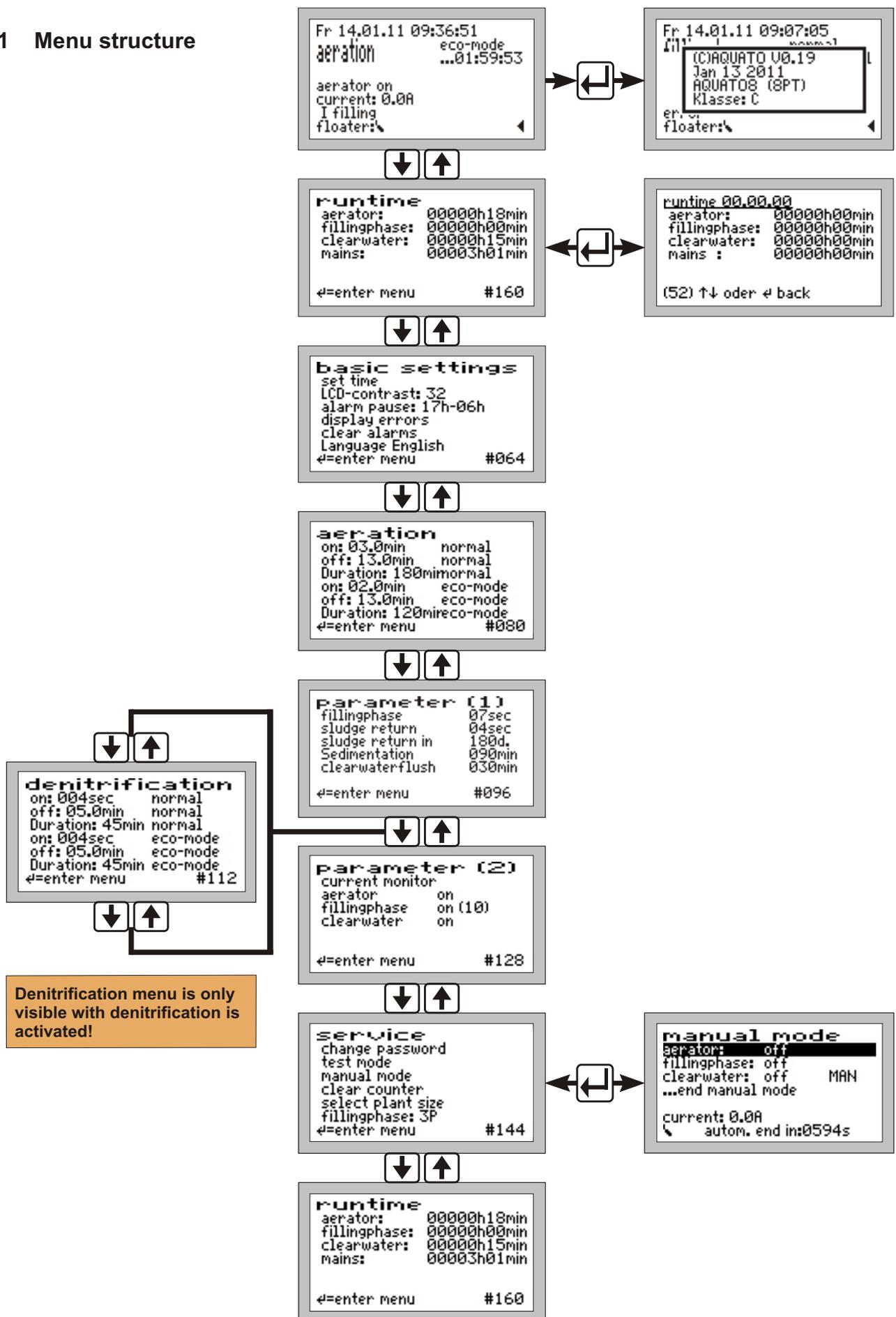


- Version
- Date of version
- Type (set PT)
- Effluent class

The  key can also be used to turn off the buzzer in this menu (see also 5.4.6)

5 Menu

5.1 Menu structure

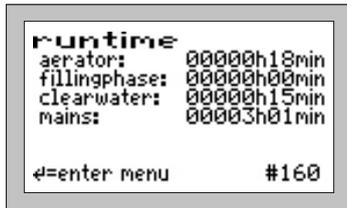


5 Menu

The exact display is dependent on the plant's status and the set parameters.

The different display versions are described in more detail below.

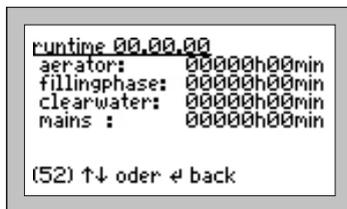
5.2 Runtime display



The menu item "runtime" displays the runtimes of the respective motors. The runtimes are counted when the control has turned on the aerator or the pumps.

The display shows hours and minutes.

The runtimes of the last (up to 52) weeks can be viewed by pressing the key (operations diary).



The last line shows the date of the week (e.g., CW 52) in which the values were saved (always Sunday).

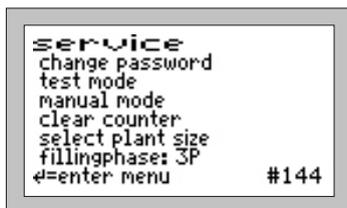
The keys can be used to change from week to week.

Note:

This function only works correctly if the date and time have been set correctly.

The runtimes of the dosing pump are only shown when phosphate elimination is active.

5.3 Service menu



The service menu is basically intended for the service technician.

The following are typically selected:

- Change password (only with special password)
- System test / test mode
- Manual mode
- Clear counter (only with special password)
- Select plant size

5.3.1 System test / test mode



The automatic test mode is selected via the selection menu "start test".

The test mode checks whether the motors accept current properly.

In addition, the float switch is raised to test the function of the float switch.

The main display changes during test mode.

5 Menu

System test process

```
Fr 14.01.11 09:58:18
fillingphase normal
...00:22:17
test since 11sec
aerator I=0.0A
error current
no error
floaters:\
```

1. Aerator 10 s
2. Filling pump 10 s
3. Clear water pump 10 s
4. If the float switch is down, wait until float switch changes position
5. Aerator until float switch changes ist position once again
6. System END

5.3.2 Manual mode

```
manual mode
aerator: off
fillingphase: off
clearwater: off MAN
...end manual mode

current: 0.0A
\ autom. end in:0594s
```

In manual mode each motor can be turned on an off manually (e.g.,for a test). In addition, you can check the power consumption of the motors switched on.

The   keys are used to select the motor and the  key is used to turn the motor on and off.

For the clear water pump there is the additional option of the auto mode. In this mode, the pump only runs when the float switch is up. Manual mode is ended via the menu item “end manual mode”. Once manual mode has ended, the clear cycle continues.

5.3.3 Select plant size

```
plant size
AQUATO53
AQUATO4
AQUATO8
AQUATO12
AQUATO16
```

In this menu you can set the plant size.

Select the menu item “SELECT PLANT SIZE” and press the  Key. The   keys are used to select the appropriate plant size with the PT no.

All the parameters for the cleaning process are then automatically present.

The following function prompts then appear:

```
plant size
A Denitrifikation
A No (old)
A Yes (new)
AQUATO12
AQUATO16
```

Denitrification:

The current denitrification setting (YES / NO) is shown in the first line. The second line gives you the possibility to change this setting. By pressing the   keys you can select YES or NO for the denitrification. The  key is used to adopt the selected setting.

5.3.4 Phosphate elimination

```
plant size
A PO3-Elimination
A No (old)
A Yes (new)
AQUATO12
AQUATO16
```

Phosphate elimination:

The dosing pump can be activated on the K-Pilot 8.4. (Activation like denitrification)

5 Menu

5.4 Basic settings



The operator settings are configured in this menu.

5.4.1 Setting the date and time



Example: Changing the date from 04.03.00 to 14.03.00 and the time from 07:53 to 07:54 o'clock.
The clock is quartz-controlled. It must also be checked as part of maintenance.

5.4.2 Alarm buzzer



The alarm buzzer can be turned off.

The acoustic alarm can be turned off for example from 18.00 to 06.00 o'clock.

Caution:

No alarm will sound during the set time period!

5.4.3 Display errors



This menu is used to call up the error log book.

The error log book displays the last 20 errors with the date and time.

The arrow keys   are used to browse in the log book, the middle  key is used to exit the menu.

(Nothing can be deleted in the error log book)

5.4.4 Language

This is where the control language can be selected. It is necessary to enter the password for this.

There are a number of languages available for the control.

The languages currently programmed are:

- English

- Finnish

- German

- Polish

- Swedish

5 Menu

5.4.5 LCD contrast

The LCD contrast can be optimised here. A change is not normally necessary.

5.4.6 Clear alarm



If a malfunction occurs (alarm), this can be reset by pressing the  key on “NO ERRORS”.

Nevertheless, the error remains saved in the error log book.

The display shows OK for approx. 1 second and then returns to the menu display.

Note: If the  key is pressed once in the main display (standard display during operation) in the event of a malfunction, the buzzer is provisionally turned off.

The error message is saved in the error log book and remains in the main display until it is deleted with “CLEAR ALARMS”.

5.5 System menus for individual settings



The following menus are used to set all the plants' parameters individually.

These may only be adjustment by qualified specialists and in certain circumstances they may reduce the cleaning capacity of the plant and void the technical approval.

However, first of all a special password must be entered for you to be able to change the values.

It is not normally necessary to adjust the parameters as these are automatically present when you select the PT no. (under “SELECT PLANT SIZE”).

To reset the original default settings, the plant size must be reselected again. (see menu item 5.3.3)

5.5.1 Aeration



This menu is used to set for how many minutes the aerator should be turned ON or OFF (cycle).

This is specified for both normal operation and ecomode.

5.5.2 Denitrification



This menu is used to set for how many minutes the aerator should be turned ON or OFF. This is done for both normal operation and ecomode, but only for denitrification.

In addition, the duration of the denitrification is also set.

Note:

This menu is only visible when denitrification is activated.

5 Menu

5.5.3 Parameters

```
parameter (1)
fillingphase 07sec
sludge return 04sec
sludge return in 180d
Sedimentation 090min
clearwater-flush 030min
←=enter menu #096
```

In this menu you can set the following parameters:

- Filling
- Sludge return
- Sludge return in x days
- Sedimentation
- Clear water flush

5.5.4 Current monitor

```
parameter (2)
current monitor
aerator on
fillingphase on (10)
clearwater on
←=enter menu #128
```

When the control turns on the aerator or a pump, there is no guarantee that it will run. Overheating, defective cables or other defects can mean that the switch relay is turned on but the motor still doesn't run. For this reason, the control monitors whether the current is flowing in the switching circuit.

If the current exceeds a limit, which is set at 0.2 A on the software side, a current alarm is emitted.

This menu is used to turn the current monitor ON or OFF.

This function can be turned on or off for each motor.

In addition, the current value for monitoring is displayed in the main display and manual mode.

6 Malfunctions / Alarm

The following malfunctions can be displayed in the display :

1.	HW	High water: After clear water outflow, the float switch is not down
2.	Battery	Battery empty, defective or not inserted
3.	Time	Time not set
4.	I Aer	Aerator current error
5.	I Fill	Filling pump current error
6.	I Clear	Clear water outflow pump current error
7.	Aerator stopped	If a current error is identified three times by the aerator, while the aerator continues to run in the meantime, it will be stopped to be protected from bearings destroyed
8.	Fuse?	If a current error is registered for all three outputs, the fuse is probably defective
9.	MAINS ON	Mains is turned on
10.	MAINS OFF	Mains is turned off
11.	Power failure	Power failure < 1 min, the SBR cycle is continued Power failure > 1 min, the SBR cycle is restarted



Malfunctions are displayed by the flashing of the red operating LED.

The error message in the display once disappears once the error has been resolved and cleared in the control. (see menu entries 5.4.3 u. 5.4.6)

7 Power failure alarm

The control has a power failure alarm.

In the case of a power failure, the alarm is given every 30 seconds to alert the operator to the lacking treatment function. A crossed-out plug is shown in the display.

If the  key is held depressed, an acknowledgement sounds and the alarm is turned off permanently. If the energy supply is reconnected after the power failure, the device turns itself back on automatically.



Note: For a new device, the internal batteries only reach their full capacity to be able to attain a maximum alarm duration after a few days.

If the function of the internal batteries decreases, these must be replaced with 2 NiMH - AA batteries.



They may only be replaced by a qualified electrician.

Unplug the device before opening it.

The batteries must be disposed of properly.



According to the German Battery Directive (BGBI 1998/I/20 from 2.4.98), since 1.10.98 all end customers of batteries are required to return these to the trader / body responsible for the disposal of recyclable materials e.g., communal coll. points. It is expressly forbidden to dispose of batteries in household waste.

8 Assembly instructions



The control is intended for assembly on a wall.



Connect the motors by means of the 7-pole plug.

Only then connect the mains plug!

After the control's test mode, approximately 3 sec. later the text with the start message will appear.

Vx.xx (e.g. V0.04) is the software version no. A few seconds later, the standard display appears.

The green LED is illuminated continuously if a motor is on.

In the event of a malfunction / error, the red LED flashes.

If necessary, you can now adjust the parameters to suit your requirements (see menu item 4.2) and return the main menu. The device is now ready for use.

The cables to the devices must be laid properly. In particular, special attention should be paid to avoid heavy mechanical loads on the cables, e. g., through insufficiently fixed cables, as the protection class IP 54 can otherwise not be guaranteed.

The 7-pole plug must be fastened correctly.

9 Technical data

Temperature range (operation)	0°C ... +40 °C
Temperature range (storage)	-20°C ... +70 °C
Air humidity (operation and storage)	0 ... 90 % RH, non-condensing
Protection class	Protective insulated
Type of protection	IP 54
Dimensions (without cable connections, plug) approx.	200 x 120 x 60 mm
Assembly	Wall assembly via screws
Housing material	Light grey plastic
Mains connection (L1, N, PE) cable approx. 1,5 m long with extruded shock-proof plug	230 V~ 50 Hz 10 %
Motors (pumps / aerator) Max. capacity (with fuse 3.15 A)	230 V/ 50 Hz, P < 0.7 KVA
Internal fuse (max 1.5 W)	1 x 3.15 AT, max. 6.3 AT
Protection of pumps against overheating	Via thermocontact in motor in row with motor
Monitoring of current via a transformer	max 10 A, Type 10% full power (10 A)
Power consumption control device	Type 5 VA
Float switch input (switches against N)	Control voltage 230 V~ I < 10 mA
Requisite pre-fuse (s)	max. 1 x 16 A G
Connection to treatment plant	7-pole and 4-pole plug for motors / float switch
Cable diameter	1.5 mm ² (with ferrule)
Alarm relay	max. contact voltage max. contact
Internal buzzer	Type 70 dB(A)
Displays	Graphic LCD display 128 x 64 mm 1 x LED green 1 x LED red

10 Default settings

Population total (PT): 8

Denitrification: NO

Po₃ - elimination: NO

11 Switching times

Population total	Filling (sec)	Normal aerator ON (min)	Normal aerator OFF (min)	Duration normal (min)	Eco-mode aerator ON (min)	Eco-mode aerator OFF (min)	Duration eco-mode (min)	Denitrif. aerator ON (sec)	Denitrif. aerator OFF (min)	Denitrif. duration normal (min)	Denitrif. eco-mode aerator ON (sec)	Denitrif. eco-mode aerator OFF (min)	Denitrif. duration eco-mode (min)	Mud flush (sec)	Sedimentation (min)	Clear water (min)
4	7	3,0	13,0	180	2,0	13,0	120	4	5,0	45	4	5,0	45	2	90	20
8	7	5,0	13,0	180	3,0	13,0	120	4	5,0	45	4	5,0	45	4	90	30
12	7	7,0	13,0	180	5,0	13,0	120	4	5,0	45	4	5,0	45	6	90	40
16	7	8,0	13,0	180	6,0	13,0	120	4	5,0	45	4	5,0	45	8	90	70
20	30	7,0	13,0	180	3,0	13,0	120	6	5,0	45	6	5,0	45	10	90	70
24	30	8,0	13,0	180	4,0	13,0	120	6	5,0	45	6	5,0	45	12	90	70
28	30	9,0	13,0	180	4,0	13,0	120	6	5,0	45	6	5,0	45	14	90	70
32	30	11,0	13,0	180	5,0	13,0	120	6	5,0	45	6	5,0	45	16	90	70
36	30	13,0	13,0	180	6,0	13,0	120	6	5,0	45	6	5,0	45	18	90	80
40	30	14,0	13,0	180	7,0	13,0	120	6	5,0	45	6	5,0	45	20	90	85
44	30	15,0	13,0	180	7,0	13,0	120	6	5,0	45	6	5,0	45	22	90	90
48	30	17,0	13,0	180	8,0	13,0	120	6	5,0	45	6	5,0	45	24	90	95
53	30	19,0	13,0	180	9,0	13,0	120	6	5,0	45	6	5,0	45	24	90	95

12 Error messages

Display	Possible cause	Remedy
I Aer The aerator pump has not drawn the current	- Aerator pump defective - Fuse defective	- Replace aerator - Replace fuse
I Fill The filling pump has not drawn the current	- Filling pump defective - Fuse defective	- Replace filling pump - Replace fuse
I Clear The clear water pump has not drawn the current	- Clear water pump defective - Fuse defective	- Replace clear water pump - Replace fuse
HW High water	- Ingress of other water - Backwater receiving water - Power failure - Float switch defective - Clear water pump blocked - Clear water tube defective	- Localise ingress and block - Possible one-off - Ensure permanent energy supply - Replace float switch - Remove blockage - Replace clear water tube
Battery	- Battery empty, defective or not inserted	- Insert new battery
Time	- Time not set	- Set time
Aerator stopped?	- Aerator is turned off after third current error for protective reasons	- Check current supply - Check aerator for blockage
Fuse?	- Current error at all outputs	- Replace fuse



Always unplug before working on pumps and aerator!

If it proves impossible to reinstate the seamless running of the clarification plant, please contact our customer service department.

Address

AQUATO[®]

umwelttechnologien GmbH

Ernstmeierstr. 24

32052 Herford

Germany

Tel.: + 49 (0) 5221-10 219 - 0

Fax: + 49 (0) 5221-10 219 - 20

E-mail: info@aquato.de

www.aquato.de