› Operation Manual

AQUATO®
umwelttechnologien

AQUATO® K-PILOT
9.7 Control

PLEASE NOTE THE FOLLOWING:

The installation manual and the operating diary must be kept directly at the facility, so that both operators and qualified personnel can inspect it at any time.

Manufacturer

AQUATO® Umwelttechnologien GmbH

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D-32052 Herford

I Table of contents

II List of figures

1 Manufacturer's declaration

Declaration of Conformity

This certifies the conformity of the AQUATO® K-Pilot 9.7 controller with the EC directives for CE marking.

Device type:	**Electronic control devices for the automatic operation of a fully biological small wastewater treatment plant according to DIN 4261-2** **AQUATO® K-Pilot 9.7**
Directives:	1. EMC Directive 89 / 336 / EEC 2. Low Voltage Directive 73 / 23 / EEC 3. RoHS Directive

Applied standards:

for 1.	EN 61000 - 6 - 3 (2006) EN 61000 - 6 - 1 (2007) EN 61000 - 3 - 2 (2014)
for 2.	EN 6 204 - 1 (2007)
for 3.	- not applicable -
Special notes:	- none -
Date:	03/02/2020

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Germany

2 Important information

2.1 General information

This manual describes the operation of the K-Pilot 9.7 controller.

With the AQUATO® K-Pilot 9.7 controller, you receive a quality product that is designed for controlling small wastewater treatment plants. In addition, it automatically controls compressors and pumps. During operation, the units are current- and pressure-controlled in order to ensure operational safety.

The K-Pilot 9.7 controller can be used to operate SSB, SBR, fixed bed and fluidised bed wastewater treatment plants.

Please read this information in advance to ensure proper operation and compliance with the required discharge values.

The complete operation manual must be kept directly at the plant so that both the operator and qualified personnel can inspect it at any time.

2.2 Important information

The AQUATO® K-Pilot 9.7 controller indicates faults acoustically and optically. It features a mains-independent power failure monitoring system.

After commissioning, please receive instruction in the plant engineering and functioning of the AQUATO® K-Pilot 9.7 controller.

The warranty shall become void in the event of improper use!

In the case of repairs, the proper functioning of the plant and the continued validity of the warranty can only be guaranteed if original spare parts or spare parts approved by AQUATO® are used.

The small wastewater treatment plant must always remain in operation! It must not be switched off.

If you have any problems with your controller, please consult your maintenance company. They will be happy to help you solve any problem you might have.

If the AQUATO® controller is used for other purposes without the express consent of AQUATO Umwelttechnologien GmbH and/or if the safety instructions are disregarded, this may result in danger or injury to persons and malfunctions or defects in the plant.

In this case, all liability shall be excluded.

The relevant accident prevention regulations must be observed!

Modifications to the controller and unauthorised conversions are not permitted.

The AQUATO® K-Pilot 9.7 controller must be installed properly and in accordance with the installation instructions (see Chapter 5).

The Controller Operation Manual must be read carefully before installation and commissioning and the instructions contained therein must be strictly followed!

During assembly and installation, commissioning and operation, as well as, if applicable, decommissioning, the applicable standards and regulations must be observed.

All work may only be carried out by trained specialists with an appropriate certificate of qualification.

The operator of the plant must be instructed in its operation by the fitter.

When connecting the controller, national regulations and the specifications on the nameplate must be observed. The device may only be operated on mains types which contain a protective conductor (PE). Connection to the mains must be made by means of a separate fuse and an RCD fuse. Before commissioning, the electrical protective measures must be checked to verify their proper functioning!

Installation work may only be carried out by qualified electricians.
When working on the device, always pull out the power plug.

Never operate a device that
- ► has a malfunction,
- ► was dropped or
- ► was otherwise damaged,
- ► apparently has a damaged connection cable or
- ► apparently has a damaged plug.

The plant must be disconnected from the mains supply for all maintenance and repair work.

If it is necessary to enter the plant, this may only be done in the presence of a second person with appropriate safeguards (gas detector, safety ropes)!

The applicable accident prevention regulations and the accepted rules of technology must be observed!

3 Safety instructions

3.1 General information on the safety information

This manual contains basic instructions that must be observed during installation, commissioning and maintenance.

The complete manual must be kept directly at the plant so that both the operator and qualified personnel can inspect it at any time.

The safety instructions contained in this operation manual, the applicable national accident prevention regulations and any internal work, operating and safety regulations must be observed at all times.

Non-observance of the safety instructions may endanger both persons and the environment and result in the loss of any claims for damages.

3.2 Definition of Terms

Operator
The operator of the plant is considered to be the person who ensures that the plant is kept in proper operation.

Qualified personnel
Qualified personnel are in a position to assess and perform work assigned to them and to recognize and assess dangers on the basis of the technical training and the knowledge and skills imparted to them.

3.3 Hazard analysis

The AQUATO® plants were developed according to the state of the art and subjected to a risk analysis. To eliminate or minimize risks, please follow the instructions below.

3.4 Warning symbols used

Below you will find an overview of the symbols used in this manual and their meanings:

Warning of a danger point

Warning of dangerous electrical voltage

3.5 Duty of care of the operator

Make sure that

- the plant is used only in accordance with its intended purpose (see Chapter 4),
- the plant is only operated in perfect condition,
- the self-checks are carried out by the operator,
- the maintenance intervals are complied with,
- maintenance and repairs are only carried out by qualified personnel,
- the Controller Operation Manual, the Installation, Operation and Maintenance Manual and the operation log can be inspected at any time,
- and only wear and spare parts approved by the manufacturer are used.

3.6 General safety instructions

The accident prevention regulations for work on wastewater plants (DGUV regulation 21 and DGUV regulation 22, formerly: BGV C5) must be observed. The relevant applicable regulations (EN, VDE, etc.) as well as the regulations of local energy suppliers must be strictly complied with. The work should only be carried out by skilled personnel. The following safety instructions must always be observed for your own safety when working and coming into contact with the small wastewater treatment plant:

1. Disconnect the small wastewater treatment plant from the mains!
Special care should be taken when performing maintenance work in the pit. In this case, the plant technology must always be disconnected from the mains and secured against unintentional reconnection of the power supply!
Risk of electric shock in case of defective compressor or defective power cables.

The fine-bubble aeration of AQUATO ® diffuser systems causes a water-air bubble mixture with a lower density than pure water. This reduces the buoyancy in the water. Should a person accidentally fall into the reactor, he/she would not be able to swim. (**Danger of drowning**!)

2. Ventilate the plant well, access to the pit only with safeguard and supervisor!
Biological processes produce gases that are dangerous to humans. These can lead to fainting and/or death by suffocation, even if they cannot be detected by smell. For this reason, access to the small wastewater treatment plant is only permitted under the supervision of a person keeping watch outdoors and after a good ventilation with appropriate safeguards (gas detector, safety ropes).
A rescue/safety harness must be worn by each person entering the v
Never climb in after unconscious persons. Instead, get help immediately!

3. Electrical fuse protection, RCD fuse!
Die AQUATO® operate with 230 V / 50 Hz alternating voltage or with 400 V / 50 Hz alternating voltage. When operating the controller, the personnel must also not be exposed to the risk of electric shock due to carelessness (e.g. wet fingers). The socket provided for the control device must be separately protected by an RCD fuse (DIN VDE 0100-410:2018-10) and connected to the mains supply by electrically qualified personnel. Before commissioning the plant, a qualified electrician must check the proper functioning of the electrical protective measures.

3.7 Safety instructions for qualified personnel

Installation, maintenance and repairs may only be carried out by qualified personnel. Before carrying out the work, it must be ensured that

- the knowledge and skills of the personnel are adequate to the intended use,
- the personnel have received instruction,
- have read and understood the **operation manual**.

Before beginning and while carrying out work in the tank, ventilation must be provided to ensure that neither gases in concentrations dangerous to health nor a potentially explosive atmosphere or oxygen deficiency can occur.

Before beginning and while carrying out work, it must be ensured that the plant is disconnected from the mains and secured against being switched on again.

Working in tanks requires protective measures even at low heights. Appropriate measures must therefore be taken against the risk of falling.
If technical measures are not possible, personal protective measures against falling should be taken.

Always wear suitable protective clothing as well as hand, foot and face protection.
Avoid contact with wastewater.

It should be pointed out that, despite all the safety measures taken, residual risks at the installation site cannot be ruled out:

- **Danger of slipping and tripping**
- **Danger due to electrical voltage**
- **Risk of infection by germs and bacteria**

3.8 Rescue measures

Ensure that a second person is always available for protection when working in the tank. Never climb in after an unconscious person. Instead, get help.

4 Area of application of the controller

4.1 Standard settings

The K-Pilot 9.7 controller is used for the operation of small wastewater treatment plants. The K-Pilot 9.7 controller has seven electrical outputs as well as three float switch inputs, an integrated power failure warning and current and pressure monitoring. This controller allows various combinations of units.

This controller can be used to operate SBR, SSB, fixed bed, fluidised bed as well as trickling filter and constructed wetland wastewater treatment plants.

For the standard operating modes, it is equipped with a compressor and compressed air lifters that are controlled via solenoid valves.

In the standard version, cleaning classes C and D are provided for SSB and SBR plants, and cleaning class C for the other plant types.

The controller can also be operated with a float switch, in which case the clear water draw-off time is – if possible – shortened and a flood alarm triggered, if necessary. In addition, an economy mode with somewhat shorter running times is possible for SBR and SSB plants.

In the standard version, all necessary pumping operations are carried out with compressed air lifters. However, when operated with the K-Pilot 9.7 controller, one or more lifters can also be replaced by submersible motor pumps.

The K-Pilot 9.7 controller allow allows the use of a float switch purely as a flood detector – with no effect on the cycle.

Additional compressors can also be connected. A three-phase compressor (400 V) can also be operated via an intermediate ORKA-S module instead of a single-phase compressor. If necessary, one or more additional 230 V compressors can also be connected via an ORKA-S module.

4.2 Further operating modes

In addition to the standard operating modes, other functions can also be controlled with the controller.

In order to implement all these different operating modes, the electrical outputs of the K-Pilot 9.7 controller can be configured freely.

4.2.1 Operation with UV lamp for hygienisation

In order to achieve effluent classes C+H and D+H, hygienisation can be implemented downstream with the aid of a UV lamp.

4.2.2 Operation with precipitant dosing for phosphate precipitation

For phosphate elimination, the dosing of a precipitant can be activated to cover effluent classes C+P, D+P.

4.2.3 Operation with hygienisation and phosphate precipitation

A plant with phosphate precipitation and hygienisation (i.e. +P +H) can also be operated with the K-Pilot 9.7 controller to cover effluent classes C+P+H or D+P+H.

4.2.4 Operation with double float

With the K-Pilot 9.7 controller, it is possible to work with double float switches, i.e. to use one float switch for the lower switching point and another for the upper switching point, thereby increasing the buffer. In this case, however, it is not possible to use another float switch for an additional buffer.

4.2.5 Operation with additional pump

With the K-Pilot 9.7 controller, an additional cycle-independent pump can also be operated in addition to the standard functions.

5 Installation manual for the controller

5.1 Safety instructions

Non-compliance with the following safety instructions may result in a limitation or complete loss of liability on the part of the manufacturer.

The controller is intended for cabinet mounting.

Commissioning is carried out by connecting the controller to the mains.

Only plug in the power plug after the existing units have been connected to the appropriate devices in the controller (see Chapter 6.4).

Only allow qualified personnel to carry out the electrical installation. The manufacturer accepts no liability for any damage caused as a result of carrying out the installation on one's own.

Only specialists may perform any actions on the device or repairs of any kind.

Before beginning and while carrying out work, it must be ensured that the plant is disconnected from the mains and secured against being switched on again.

Before commissioning and switching on the mains voltage, it must be ensured that:

- there is no visible damage to the device and the connection cables,
- in particular the mains connection and the connections of the units are properly connected,
- all connections have been made properly and professionally,
- the laying / routing of all cables and lines comply with the applicable regulations,
- the device is closed properly,
- the plant is properly secured. Fuse protection on grid side: max. 1 x 16 A G.

Before working on the controller, please note the following important instructions:

- Disconnect the plant from the mains before opening the device.
- Replace individual fuses only in a de-energised state.
- Never use fuses with currents higher than those specified.
- Do not manipulate the circuitry of the system in any way.
- The relevant applicable regulations (EN, VDE, etc.) as well as the regulations of local energy suppliers must be strictly complied with.
- If a fuse is defective, it may only be replaced by a microfuse of the same type. In the standard case with one compressor, a fuse of the following type is installed at the factory: **microfuse, slow-blow,**

type 3.15 A, 5 x 20 mm according to EN 60127-2/III with a maximum power loss of 1.5 W. With a 2-compressor plant, the following type is used: microfuse, slow-blow, type 5 A, 5 x 20 mm.

Note:
For larger plants, a stronger fuse may be installed (max. 6.3 A T). Always replace fuses with a fuse of the same current rating.

The cables to the device must be laid correctly. In particular, it is important to prevent high mechanical stress on the cables, e.g. due to insufficiently fixed cables, as otherwise protection class IP 54 cannot be guaranteed.

5.2 Installation of the K-Pilot 9.7 controller

The controller allows you to control different treatment processes with different equipment. The valves required for this are arranged outside the housing.

The controller can be mounted on a wall bracket or directly on a mounting plate.

When installed in the wall cabinet, the controller is mounted on the rear wall of the wall cabinet. The compressor is installed (on site) in the wall cabinet.

If an outside wall cabinet or outdoor cabinet is used, place it in a shady and wind-protected location. In climatically unfavourable locations, it may be necessary to install a heater and/or cooling fan. The use of a larger diaphragm compressor or a rotary vane or side channel compressor requires a cooling fan.

- Before commissioning the controller, **please read this manual carefully as well as the manual for the respective process**, especially the chapters "**Safety instructions**", "**Commissioning of the controller**" and "**Selecting plant types**".
- When selecting the installation location, the weight of the finished unit (e.g. approx. 20 kg as in this example) must be taken into account.
- A structure that transmits sound or vibrations is unsuitable for installation.
- The installation site must be dry, clean and well-ventilated – high dust accumulation must be avoided, as otherwise the air filter of the compressor can become clogged.
- Mount the wall cabinet plumb and level to the wall.
- Place the compressor on the floor of the wall cabinet and connect the air outlet to the valve block.
- Connect the required units to the controller.
- Plug the plug for the power supply of the compressor into the 230 V socket on the bottom of the controller.

If the controller has to be opened, disconnect the plant from the mains before opening the controller. To prevent tearing or damaging cables or hoses, open it carefully and do not simply drop the cover.

Attention:
Direct solar radiation must be avoided with all installation variants. Place the controller in a shady and wind-protected location. Install a heating and/or cooling fan in climatically unfavourable locations. Install a cooling fan for larger compressors.

5.3 Solenoid valve block

The air is conducted from the compressor to the valve block. The solenoid valve block is generally located in the wall cabinet. The solenoid valves are controlled by the controller to open or close the valve for the respective function (which varies depending on the plant type and configuration, e.g. clear water discharge, sludge recirculation, charging, aeration) so that the air is available for the function required. For this purpose, the control cables are connected to terminals T1 to T7 (see Chapter 6.4.5).

6 Connections on the controller

6.1 Overview

The display and the control buttons are on the front of the K-Pilot 9.7 controller.

The bottom of the controller has a connection for the power cable, the socket for the compressor as well as cable bushings for the units to be connected and a connection for pressure measurement.

Figure 1: K-Pilot 9.7 controller

Inside, there are 7 electrical outputs on the rear wall of the controller at the bottom, next to the socket for the mains connection. These connections are marked "T1" to "T7" (see Figure 5). The outputs can be freely assigned to the available functions. The float inputs are permanently occupied. At the top, roughly in the middle, is the input for the air hose for pressure measurement. At the top right is a serial interface RS232.

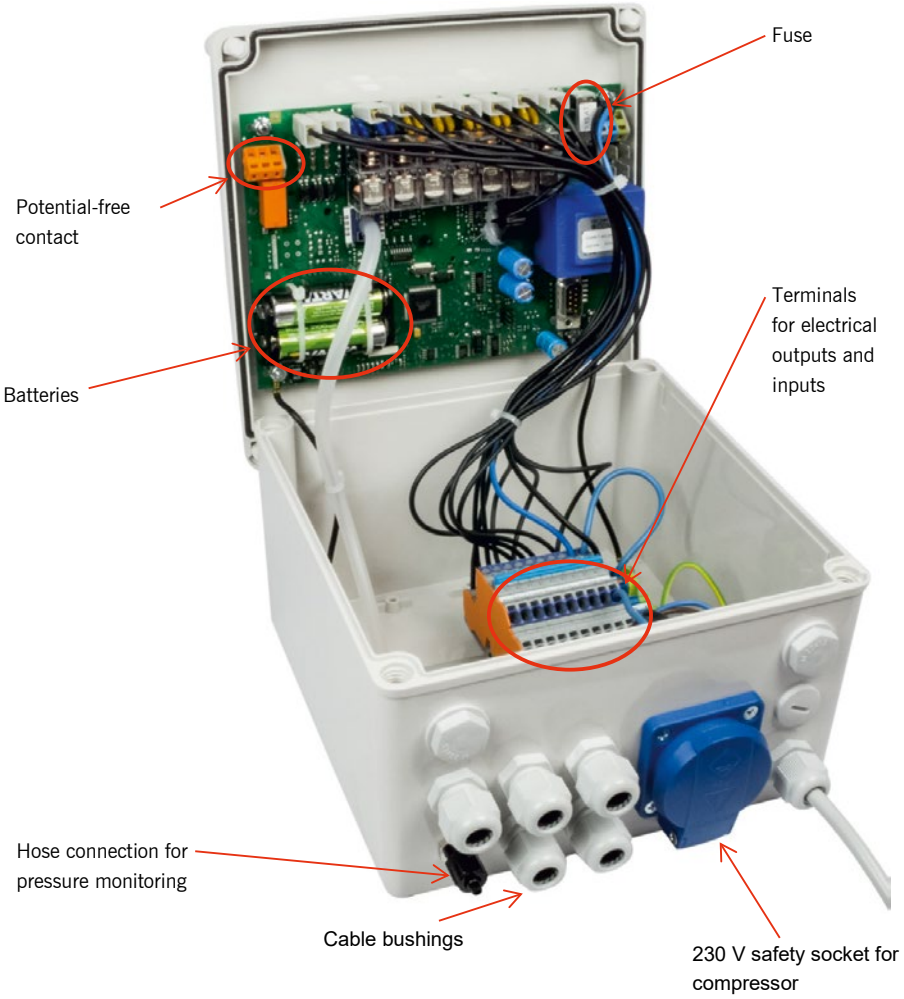


Figure 2: K-Pilot 9.7 controller opened

6.2 Air connections

From the compressor, the air is distributed via solenoid valves in the control cabinet – which are controlled by the controller – in such a way that the various functions are assured.

The K-Pilot 9.7 controller itself has only one air connection. This is used to measure the pressure in the controller. The controller has a pressure sensor for monitoring the pressure. A hose is led from this sensor to the controller housing. The hose connection is a 4 mm screw connection. A 4 mm hose connected to the air line between the compressor and the valves must be connected to this connection on the housing.

The hose connection for pressure measurement is located on the bottom of the controller (see Figure 3).

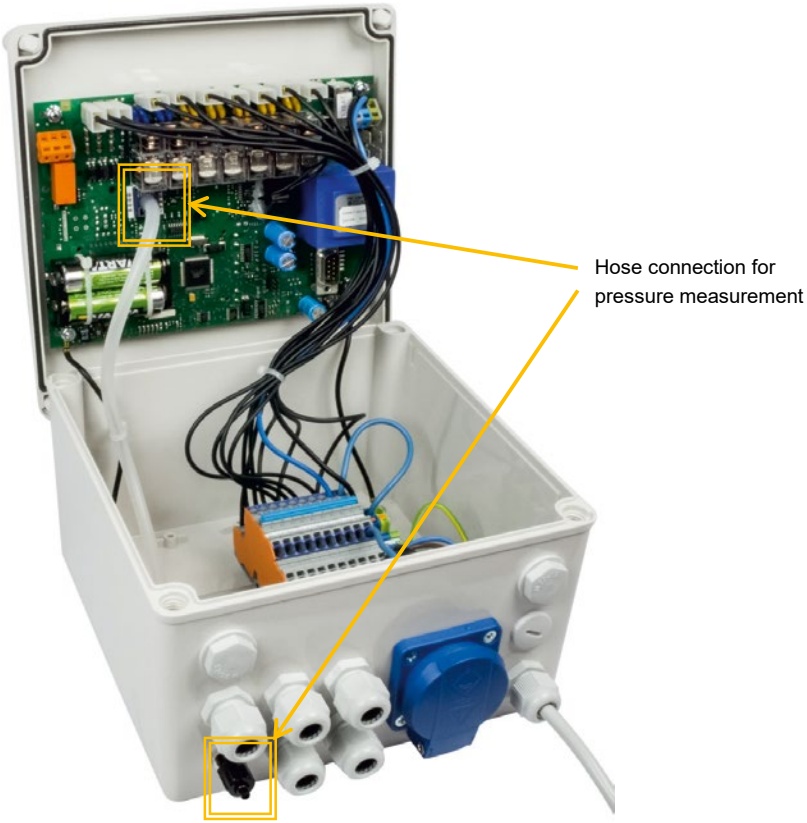


Figure 3: Connection for pressure measurement on and in the controller

6.3 Pressure monitoring

The controller has a pressure sensor for monitoring the pressure. A hose is led from this sensor to the controller housing. The hose connection is a 4 mm screw connection. A 4 mm hose connected to the air line between the compressor and the valves must be connected to this connection on the housing.

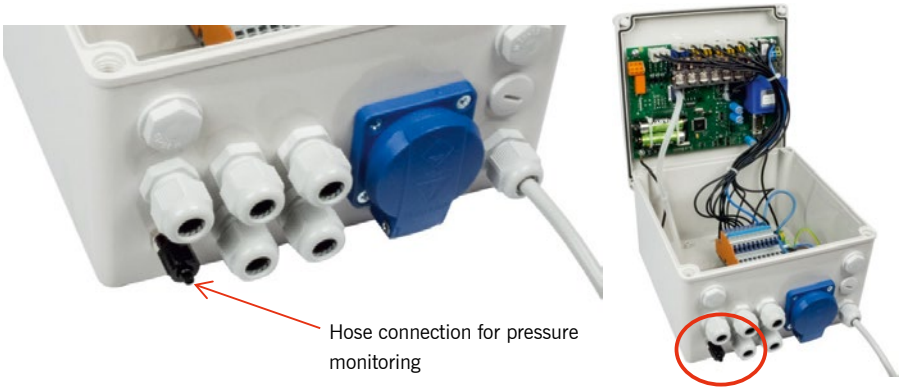


Figure 4: Hose connection for pressure monitoring

If there is no connection option for pressure monitoring on the plant, then the pressure monitoring of the controller must be switched off during commissioning or in the "Select plant type" menu.

6.4 Electrical connections

The electrical connections for the units to be connected (e.g. float switch, clear water pump, ...) are located in the terminal compartment inside the controller housing. The selection of the connections used in the terminal compartment depends on the equipment required for the small wastewater treatment plant (see Assignment options for the electrical connectionsTable 3).

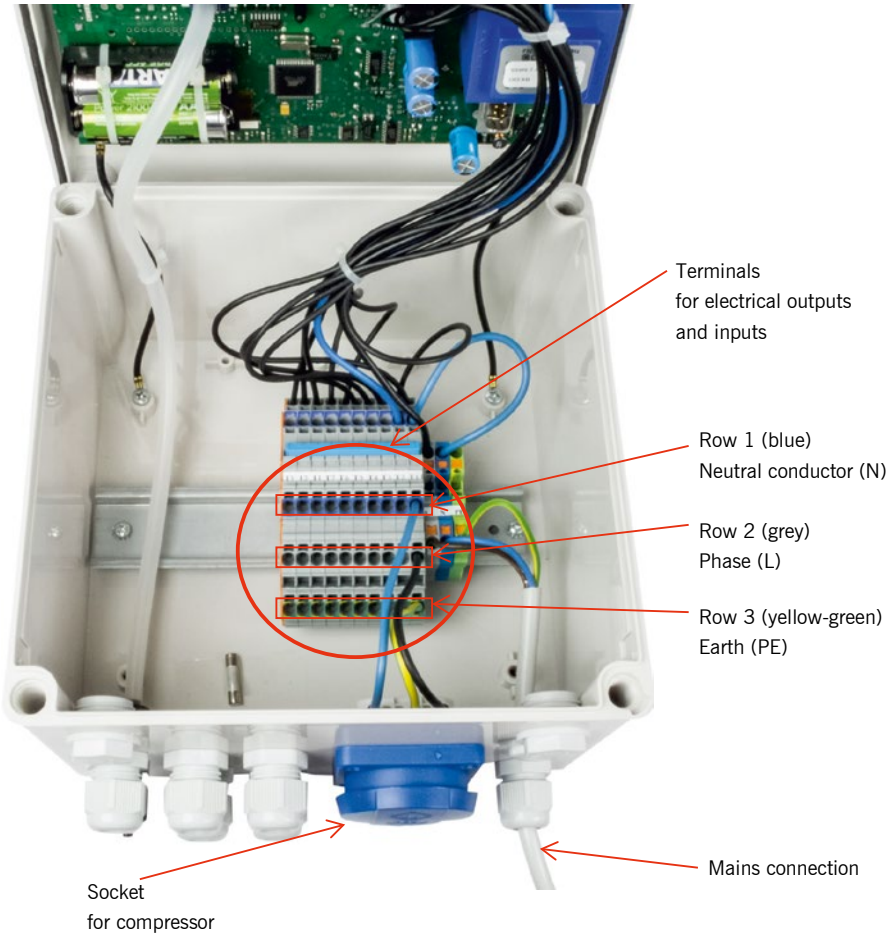


Figure 5: Electrical connections of the K-Pilot 9.7 controller

6.4.1 Arrangement and function of the outputs and inputs

The K-Pilot 9.7 controller has multiple electrical outputs and inputs for controlling the required units. The neutral conductor (N) of the unit to be connected is connected to the terminal strip in row 1 (in blue), the phase (L) in row 2 (in grey) and the earth (PE) in row 3 (in yellow-green). In Figure 6, the socket for the compressor – as provided by default – is connected in column (= terminal) T1 as described.

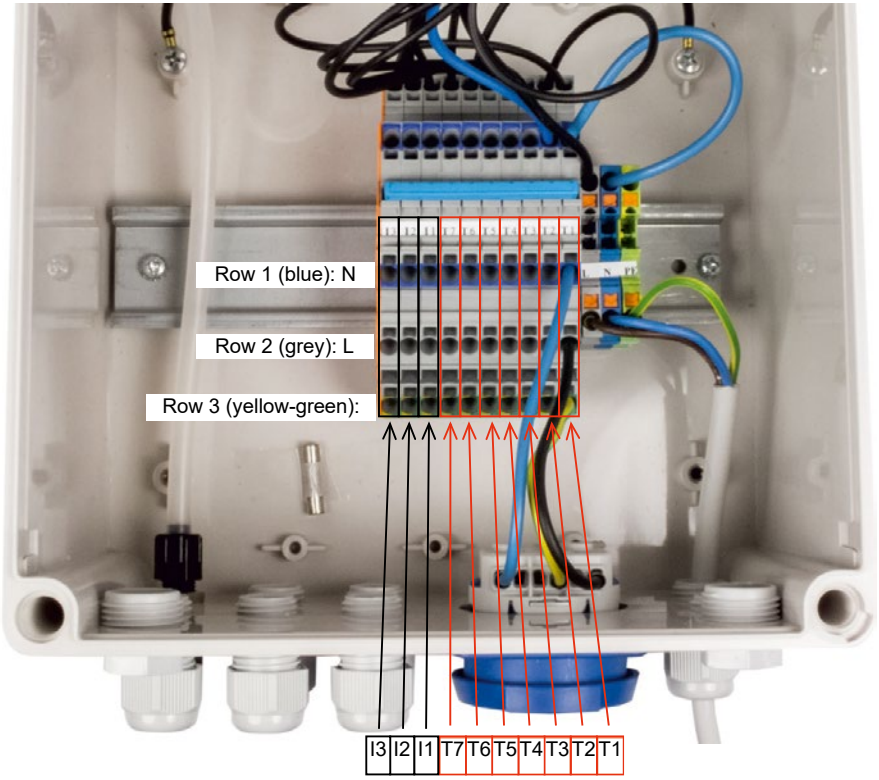


Figure 6: 9.7 controller – terminal strip

The tables below (Table 1 and Table 2) show the preset default assignments of the electrical connections for the different plant types.

Function	SBR 4 valves	SBR 3 valves	SSB 3 valves	SSB 2 valves	Fixed bed	Moving bed
Compressor	T1	T1	T1	T1	T1	T1
Sludge recirculation	T2	T2	T2	T2	T2	T2
Clear water discharge	T3	T3	T3	T3		
Charging	T4	T4				
Ventilation	T5		T5			

Table 1: Default assignment of the electrical connections with SBR, SSB, FB, MBBR

Function	TFP	WP
Pump 1	T2	T2
Pump 2	T3	T3
Pump 3	T4	T4
Pump 4	T5	T5

Table 2: Default assignment of the electrical connections with TFP, WP

However, it is possible to deviate from the default assignment if necessary: Table 3 below lists the possible assignments.

Outputs T1 to T7:	Input I3:	Input I2:	Input I1:
Charging pump Clear water pump Sludge pump Ventilation Compressor 2. Compressor 3-phase diffuser UV lamp PO3 elimination Pump	Float for economy mode with control type: Float Float for temporary flood indicator with control type: Time Float 1 with control type: Double Float Float for flood indicator with WP	Float for temporary flood indicator with trickling filter Float for temporary flood indicator with control type: Float Float 2 with control type: Double Float Float for flood indicator + with WP	Float for additional buffer with SSB, SBR without error messages Float for Motor-pump with FB, MBBR without error messages

Table 3: Assignment options for the electrical connections

For example, the 2nd diffuser can be connected to output T6 and the clear water pump to output T7. The corresponding outputs must then be assigned to the connected units during commissioning (see Chapter 9.1, 9.3.2.4, 10.1 and 10.3.2.4).

6.4.2 Mains connection of the controller

A 230 V / 50 Hz power supply line must be installed on site at the location of the controller. This must be separately protected with a B 16 A slow-blow fuse and 25 A / 30 mA RCD fuse. A mains disconnection device must be used to connect the controller.

The mains connection is established via the supplied connection cable with safety plug (length approx. 1.5 m). This is fixed to the controller by an M 20 cable gland. The controller may only be used on a 230 V / 50 Hz +/-10 % mains supply. The plant must be protected on the mains side by a residual current protective device (RCD) and a fuse.

All protective devices must be checked for proper functioning before commissioning.

After plugging in the plug, the controller starts with a self-test with a duration of approx. 3 seconds while displaying "booting system...". Then the start message "AQUATO" appears. The display Vx.xx.xx (e.g. V2.07.09) in the lower part of the message is the version number of the software. A few seconds later, the standard display appears. (A number of settings must still be made at this point during commissioning – see Chapter 9.1, 9.3.2.4, 10.1 and 10.3.2.4.) The device is now ready for operation.

If the compressor (or another optional unit) is running, the LED lights up green. The LED flashes red in the event of a fault/error.

Attention: Prior to commissioning the plant, the septic tank(s) must be filled with water up to 5 cm above $H_{W,min}$. Compressors and lifters must also be connected, as well as pumps and floats if necessary.

6.4.3 Compressor

The compressor should be placed in the immediate vicinity of the controller.

- If the controller is installed on a bracket, place the compressor on the bracket.
- Connect the air outlet to the air distribution (e.g. solenoid valves) using the 90° hose bend and two clamps provided.
- The installation site must be dry, clean and well-ventilated – high dust accumulation must be avoided, as otherwise the air filter of the compressor can become clogged.
- Plug the plug for the power supply of the compressor into the 230 V socket on the controller.

The compressor is connected by plugging the plug into the socket on the bottom of the controller (see Figure 7). Its running times are regulated by the connection via this socket.

Figure 7: K-Pilot 9.7 controller with socket for compressor

Attention: The compressor must **not be connected to an external socket**, as otherwise the aeration cycles will not be maintained.
It must be connected to the designated socket on the side of the controller.

6.4.4 Potential-free contact

The controller has a potential-free contact. It is located on the left-hand side of the circuit board. This contact can be used to connect a warning/flashing light in addition to the warning signals of the controller. This can be supplied with power via the controller or via an independent external line. In **case of an alarm**, the relay closes the connection between **terminals 11 and 12** and opens the connection between 11 and 14.

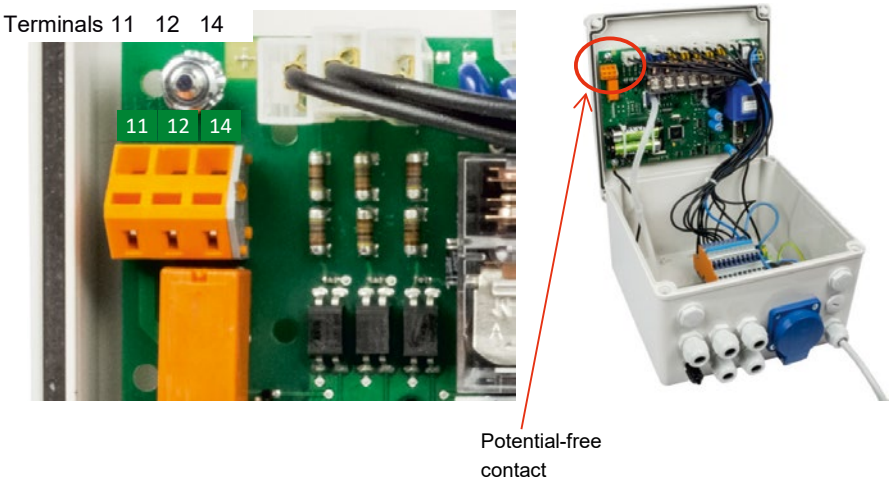


Figure 8: Potential-free contact

Contacts 11 and 14 are available for connection should an additional light be required as an operation indicator.

If, in the event of a fault, the warning/flashing light should light up or flash to indicate the fault, select the connection via contacts 11 and 12 (see Figure 8).

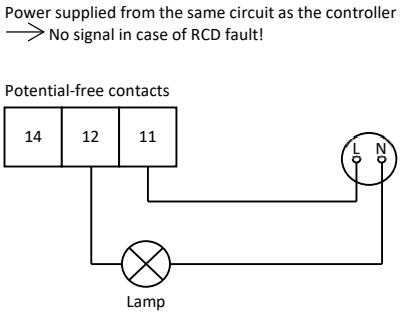


Figure 9: Potential-free contact with error indication – power supplied by controller

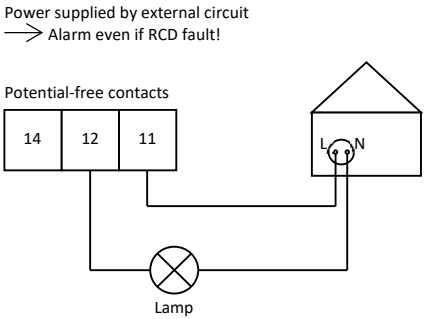
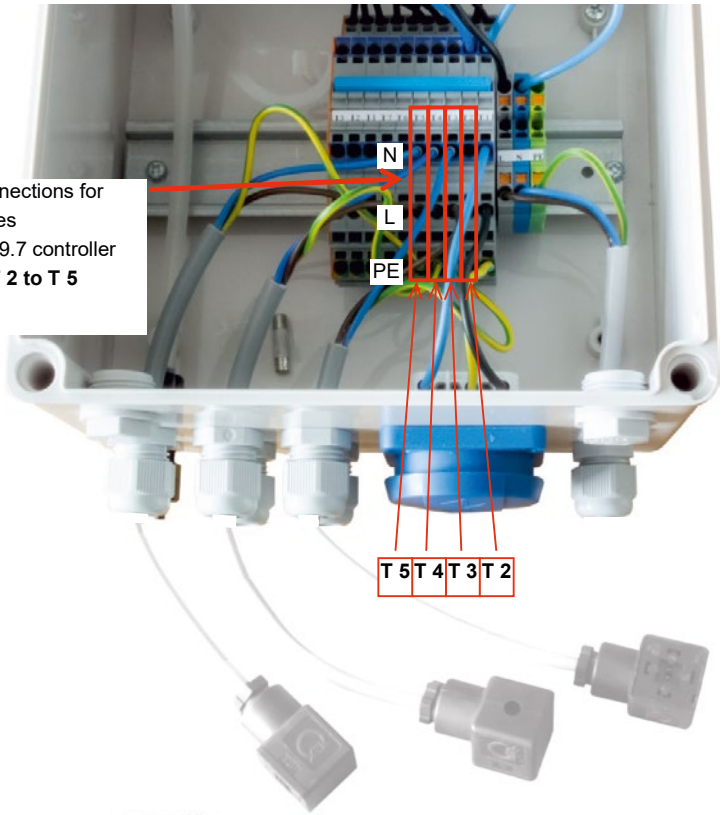


Figure 10: Potential-free contact with error indication even in case of power failure

In order to receive the additional warning signal even in the event of a power failure in the controller, the warning/flashing light must be connected to an external circuit (see Figure 10).

6.4.5 Solenoid valves

With the standard K-Pilot 9.7 controller, the solenoid valves are connected to the terminals T 2, T 3, T 4, and T 5, which are provided for this purpose.
(For the required setting of the controller, please refer to the instructions for the process used).



Default assignment of the connections:

T 2	Valve for sludge recirculation
T 3	Valve for clear water discharge
T 4	Valve for charging
T 5	Valve for ventilation

Figure 11: K-Pilot 9.7 controller – connection of solenoid valves

In Figure 11 , the cubic plugs for the solenoid valves for ventilation, clear water discharge and sludge recirculation are connected to connections T 3, T 4 and T 5.

6.4.6 Float switch

A float switch can be used as an option. The float switch for the **"Float" control type** is connected to the K-Pilot 9.7 controller at terminals I 3 or I 2 provided for this purpose (see Figure 5). The float inputs are permanently occupied (see Table 4).

As a standard, a normally open contact is used with the control voltage: 230 V~ approx. 5 mA; switching between input L and N.

Input I3:	**Input I2:**	**Input I1:**
Float for economy mode with control type: Float	Float for temporary flood indicator with trickling filter	Float for additional buffer with SSB, SBR without error messages
Float for temporary flood indicator with control type: Time	Float for temporary flood indicator with control type: Float	Float for Motor-pump with FB, MBBR without error messages
Float 1 with control type: Double Float	Float 2 with control type: Double Float	
Float for flood indicator with WP	Float for flood indicator + with WP	

Table 4: Assignment of the inputs

6.4.6.1 Float with "Float" control type

If the float switch for the **"Float" control type** is connected to terminal "I 3" provided for this purpose (this is the leftmost of the float connections, see Figure 12) on the terminal block and "FLOAT" control type is selected during commissioning, this controls the clear water discharge as well as the aeration times and gives a flood alarm.

If the float switch drops down, it switches off the clear water discharge. If it does not drop down by the end of the clear water discharge, it triggers a flood alarm. If it remains down after the clear water discharge – or the subsequent sludge discharge – until the end of the aeration time, the plant switches to economy mode (shorter running times of the units and no clear water discharge). If the float switch floats up again, economy operation ends and the cycle continues with the aeration phase.

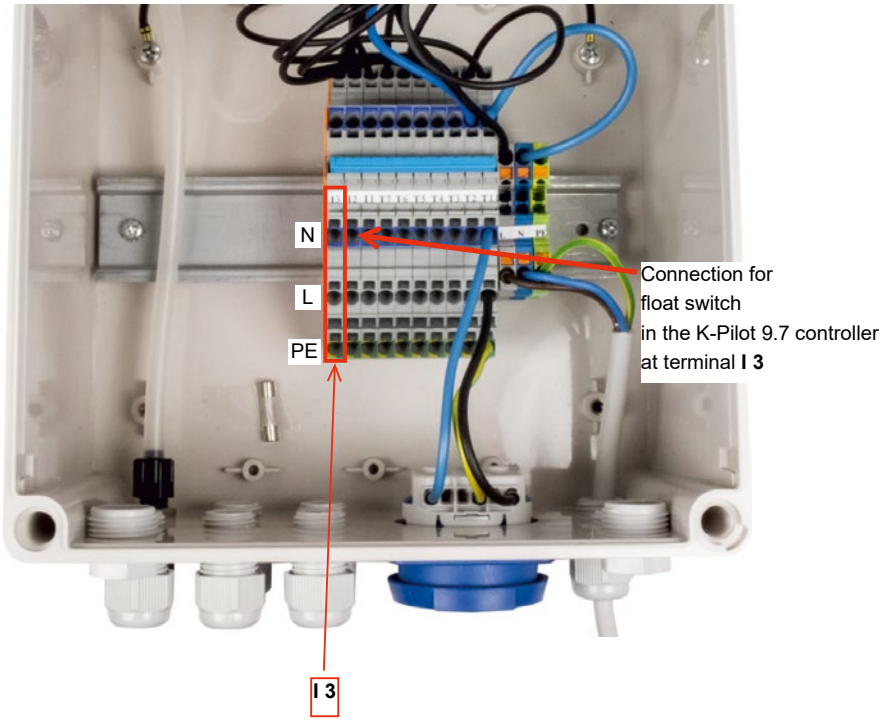


Figure 12: K-Pilot 9.7 controller – float switch connection

6.4.6.2 Float with control type "Time" as flood detector

If the option **"Time" control type** is selected and the float switch is connected to terminal "I 3" provided for this purpose (this is the leftmost of the float connections, see Figure 12), the float works merely as a flood detector without intervening in the cycle sequence. The float display for this float is then only shown temporarily on the display in the event of flooding.

6.4.6.3 Second float as flood detector

If the float switch for the **"Float" control type** is connected to the terminal "I 3" provided for this purpose and the "FLOAT" control type is selected during commissioning, a **second float switch** can also be connected to the terminal "I 2" provided for this purpose (see Figure 13). This works purely as a flood detector without intervening in the cycle sequence (see Chapter 9.3.2.4 and 10.3.2.4).

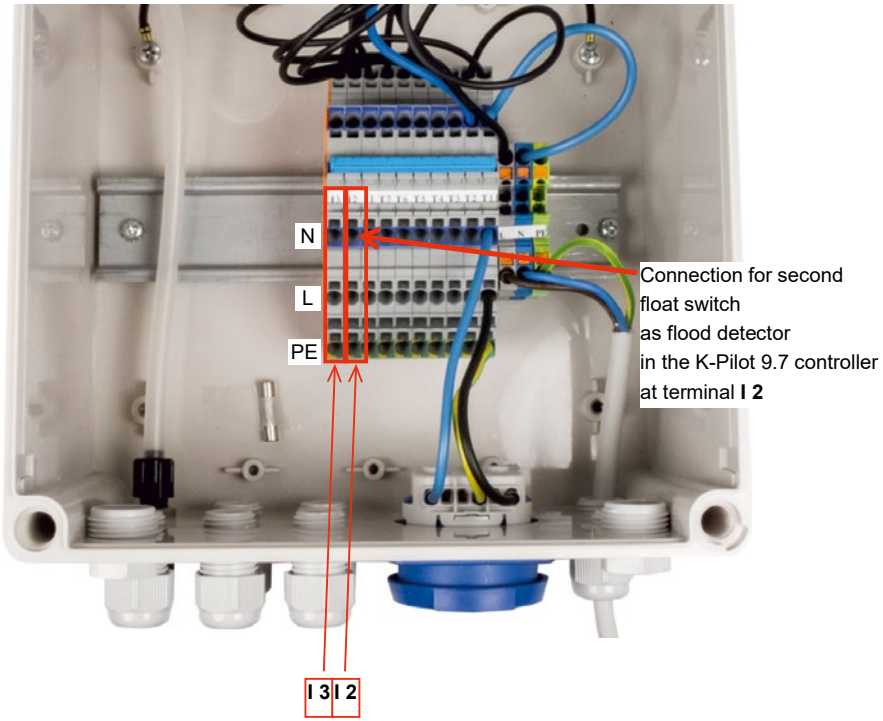


Figure 13: Connection of 2nd float switch as flood detector

6.4.6.4 Double Float

With the K-Pilot 9.7 controller, it is possible to work with a double float switch. For this, the float switch (S1) for the **"Double Float" control type** is connected to terminal "I 3" provided for the purpose (see Figure 14). The float switch (S2) is connected to socket "I 3" (see Figure 14).

With this controller setting, the two float switches are AND-linked, i.e. the controller always switches ON only when **both** float switches have floated up and always switches OFF only when **both** float switches have sunk down.

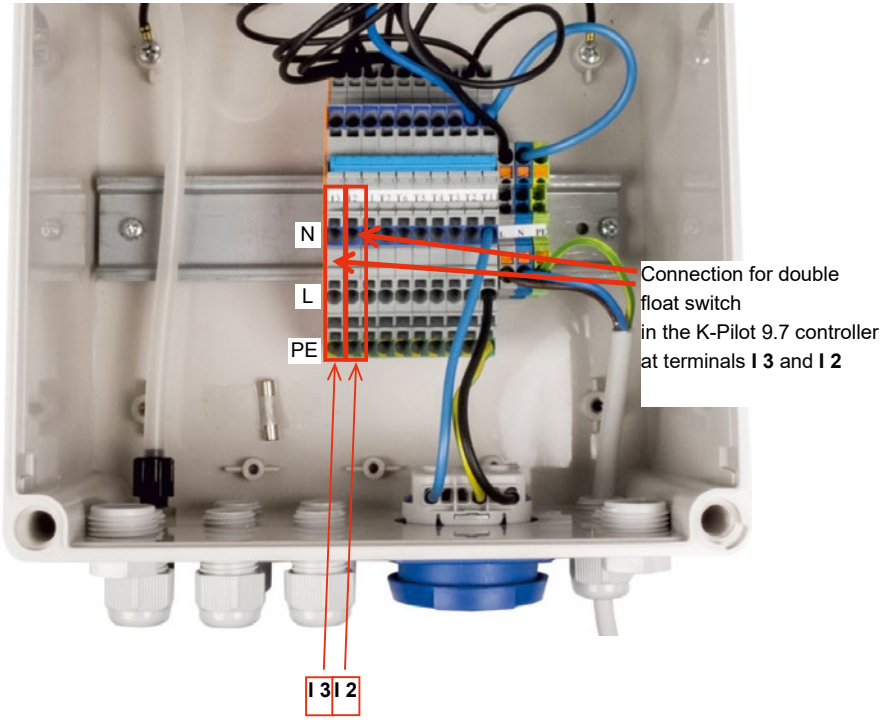


Figure 14: Connection of double float switch to K-Pilot 9.7 controller

6.4.6.5 Float BP

With the float BP setting, the float switch intervenes in the SBR cycle in the following way:
When the float switch floats up, charging is ended. The clear water discharge is not terminated when the float switch drops down. However, a HW error is reported if the float switch has not dropped after the CW discharge.

For this purpose, the float switch is connected to the designated terminal "I 3" (this is the leftmost of the float connections, see Figure **12**) on the terminal block (for assignment, see Table 4) and the control type "FLOAT BP" is selected during commissioning.

This function is particularly useful for existing SBR systems that have a float switch with a very small hysteresis.

6.4.7 Further assignments of the outputs

6.4.7.1 Compressor

The compressor can be connected to outputs T1 to T7.

Attention: The compressor must **not be connected to an external socket**, as otherwise the aeration cycles will not be maintained.
It must be connected to the designated socket in the control cabinet.

6.4.7.2 Plants with two compressors

If a second compressor is required to operate the plant, the safety socket for the first compressor could remain connected to output socket T1 (as provided by default) and the safety socket for the second compressor to socket T5. The running times are regulated by the controller (setting: "2nd COMPRESSOR") through this connection via the socket (see Chapter 9.3.2.4 and Chapter 10.3.2.4).

Attention: Compressors must **not be connected to an external socket**, as otherwise the aeration cycles will not be maintained.
They must be connected to the designated sockets in the control cabinet.

6.4.7.3 Plants with three compressors

If three compressors are required to operate the plant, a safety socket for the first compressor could remain connected to output socket T1, for example (as provided by default), and the second and third compressors could be connected in parallel – via a double safety socket – to socket T5, for example (see Figure 9.3.2.4). The running times are regulated by the controller (setting: "2nd COMPRESSOR") through this connection via the socket (see Chapter 9.3.2.4 and Chapter 10.3.2.4).

Attention: Compressors must **not be connected to an external socket**, as otherwise the aeration cycles will not be maintained.
They must be connected to the designated sockets in the control cabinet.

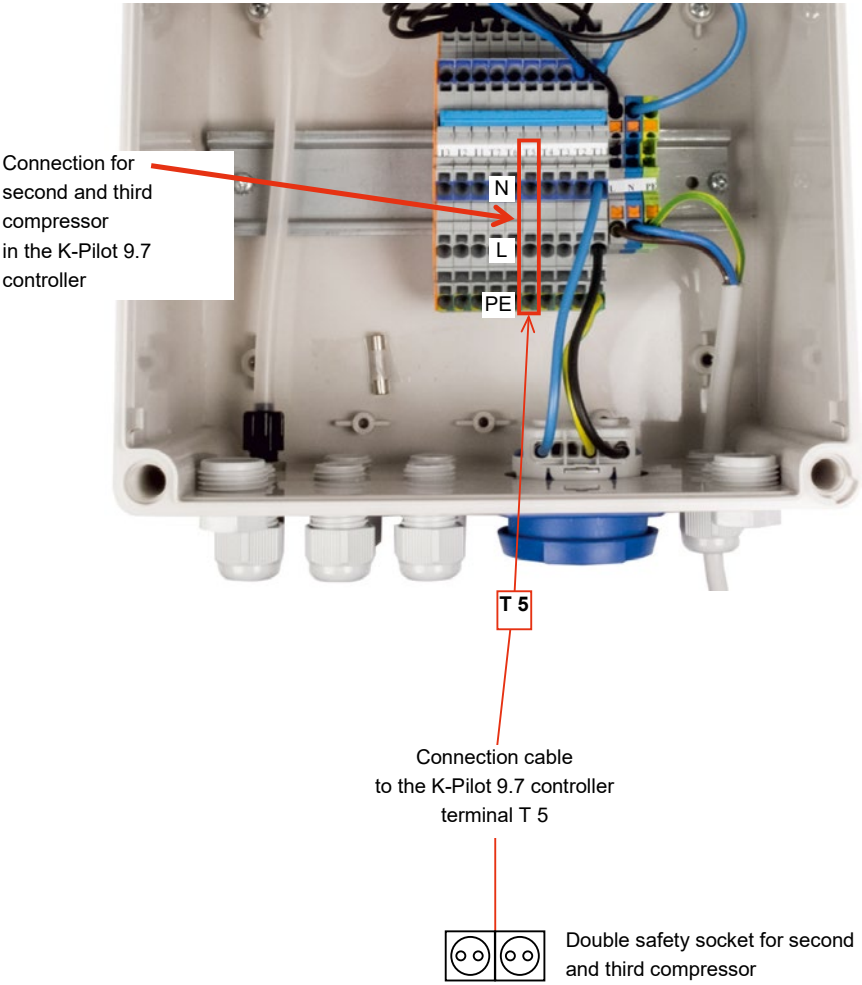


Figure 15: K-Pilot 9.7 controller – connection of second and third compressor

6.4.7.4 Clear water pump

A **clear water pump** is used to overcome greater delivery heads. This then replaces the clear water lifter. A pump and an external float switch are used. The float switch is attached to the pump holder of the clear water pump.

Figure 16: Clear water pump with external float switch

The clear water pump and the external float are connected to the controller at the terminals inside the housing (see Figure 5 and Table 3). The float switch is connected to I 3, and the pump can be connected to T2 to T7 (T3 by default). For operation with a clear water pump, the control type "Float" must be selected (for the required controller setting, see Chapter 9.3.2.4 and 10.3.2.4).

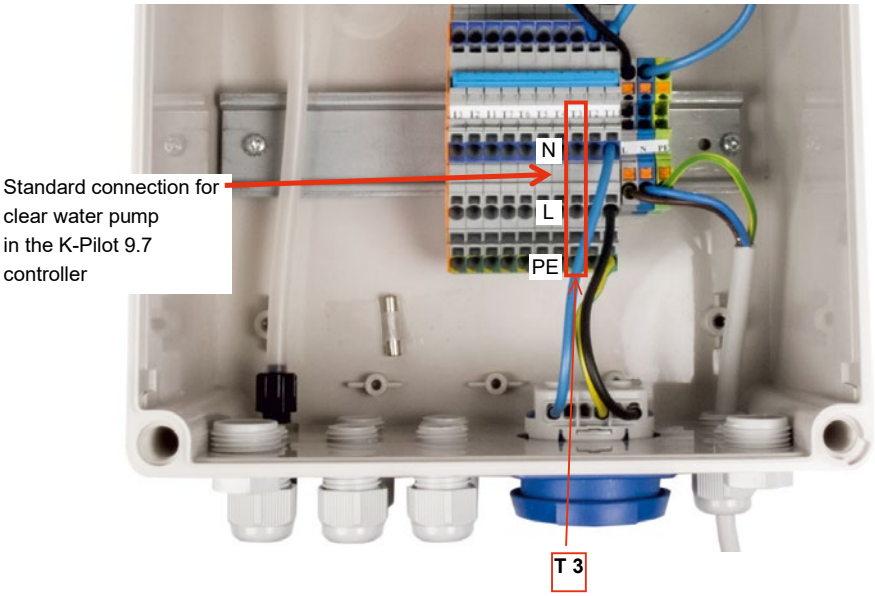


Figure 17: K-Pilot 9.7 controller – clear water pump connection

6.4.7.5 Other connectible units

If a **surplus sludge pump** or a **charging pump** is required, it can be connected in the same way as a clear water pump. In addition, a **2nd compressor**, a **UV system** (always with float switch and clear water pump) or a **dosing pump for phosphate precipitation** (always with float switch) can be connected.

Different combinations of units are also possible.

If the plant is to be connected to a **UV lamp** for the purpose of hygienisation, "FLOAT" must be selected as the control type and a clear water pump and a float switch are required for operation (see Chapter 9.3.2.4 and 10.3.2.4).

If a **precipitant dosing** is to be selected, "FLOAT" must be selected as the control type. The dosing pump is activated by selecting "PO3 elimination" for **phosphate precipitation** (see Chapter 9.3.2.4 and Chapter 10.3.2.4).

It is also possible to use a **3-phase compressor** should this become necessary, e.g. due to high water depth (see Chapter 9.3.2.4 and 10.3.2.4). This is then connected via an ORKA-S module and the compressor for the lifters is not controlled for aeration purposes. The current monitoring can be switched on or off separately for this compressor.

If, for example, a **second compressor** and **phosphate elimination** are required to operate the plant, the compressor could be connected to T6 and the phosphate elimination to T7.

When **operating with two additional compressors**, these are operated in parallel – via a double safety socket – with the setting "2ND COMPRESSOR" and connected to **one output**. For example, the sockets for the two additional compressors could be connected to T6 and a sludge pump to T2.

An **additional pump**, which can be operated **independently of the cycle** time, can also be operated with the controller. For this purpose, "ON" must be selected in the query "Motor pump".

7 Commissioning of the plant

7.1 Prior to commissioning

The relevant accident prevention regulations, guidelines, safety rules and leaflets of the responsible employers' liability insurance association (DGUV), as well as the regulations of the Association of German Electrical Engineers (VDE) must be observed when constructing and operating wastewater treatment plants.

Before commissioning the plant, the installation and setup of the plant components – as described in the installation and operation manual – must be completed.

The volumes and structure of the tanks must be designed in accordance with the wastewater treatment and process engineering specifications. The pipelines must be connected appropriately.

Make sure that the roof ventilation functions properly. If it is not sufficient, a separate vent pipe must be installed. Forced ventilation may also be required (check by means of smoking, for example).

The leak test must be carried out before commissioning.

The technology must be properly installed in accordance with the wastewater treatment and process engineering requirements and all required units must be connected to the controller.

Prior to commissioning, the plant must be filled with water up to 5 cm above $H_{W,min}$.

The electrical installation must have been carried out and completed by qualified personnel. **If opened, the housing of the controller must be closed before commissioning.**
(See Chapter 5 and 6)

All required units (compressor, membrane diffusers, lifters, float switches, pumps, …) must be connected to the controller electrically and/or by hose to the proper inputs and outputs before commissioning.

7.2 Commissioning

After connecting the required units, the plant is put into operation by plugging the mains plug of the controller into the mains. (see Chapter 9.1 and 10.1)

Only plug in the controller power plug after the compressor and – if present – the air hose, float switch and/or submersible motor pump have been connected to the designated devices on/in the controller.
(See Chapter 6.4)

After plugging in the plug, the controller starts (see 9.1 and 10.1) by displaying the message "booting system...". Then the red LED lights up briefly and afterwards the green LED. At the same time, the start message "AQUATO" appears. The display Vx.xx.xx (e.g. V2.07.09) in the lower part of the message is the version number of the software.

Then the following points, among others, must first be worked through when commissioning the controller for the first time (see Chapter 9.1 and 10.1): password, language, date and time, basic type, aeration, plant type with PE number, control type time/float and denitrification. Depending on the selection, further points can be added (for details, see Chapter 9.1, 10.1, 9.3.2.4 and 10.3.2.4). The controller then switches to manual mode so that the commissioning engineer can test the functions individually.

At the end of manual mode, the controller switches to the standard display. The device is now ready for operation. This is indicated by a flashing triangle ◄ in the lower right corner of the LCD display. The plant now runs fully automatically.

The commissioning engineer must ensure that the parameter settings in the controller have been made in such a way that they comply with the requirements (e.g. basic type and effluent class) from the approval and the water law license for the system on which the controller is to be used.

8 Operation and displays of the controller

8.1 Operation

The controller has a graphic LCD display with 128 x 64 pixels. Indications are made in plain text and with two LEDs, one green, the other red. Operation is carried out via three buttons.

Arrow button for selecting menu items

Middle button to confirm inputs

Arrow button for selecting menu items

Figure 18: Control buttons

The display is switched on during the entire operation. A flashing triangle ◄ is visible in the lower right corner of the LCD display and flashes every second. If a unit (e.g. pump or compressor) is running, this is indicated by the illuminated green LED at the top right of the display.

In the event of a fault, the red LED flashes and the buzzer sounds.

The standard display on the LCD shows the date and time in the top line and the current cycle phase in large letters below, e.g. "AERATION". In the other menus, the name of the respective menu is located at the top and the individual menu items below this. The buttons are used to change from menu to menu. Press the middle button to enter the desired menu. The buttons are also used to switch between the menu entries.

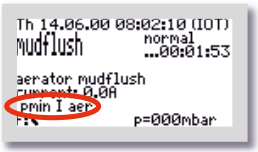
The selected menu item is marked by means of a dark bar with inversely displayed text. After selecting the line of the desired menu item, press the middle button to enter the input mode of the respective submenu. Input mode is indicated by a selected (inversely displayed) line or digit. The buttons can now be used to select or change the options or digits. The desired entry is confirmed by pressing the middle button.

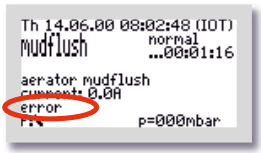
If a multi-digit number input is required, the highest digit is changed first using the buttons. The middle button is used to confirm the selection, after which one moves on to the next digit, etc. If the selection of different options is required for the input (e.g. YES / NO), the desired selection is also made using the buttons. If the desired option appears on the display, it is confirmed with the middle button.

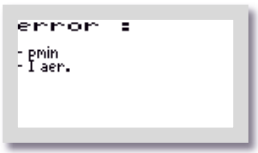
You can also switch back from the submenus to the main menu level using the ↓↑ buttons. If the selection bar is moved in one direction until it disappears from the menu, the next main menu opens.

8.2 Faults

Faults are indicated by the flashing of the operating LED in red and the sounding of the buzzer. In the display, errors are reported by the display in the main menu in alternation with the fault display. The following figures show an example of an error message:



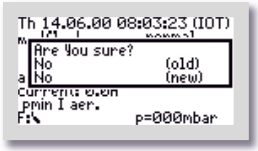




These three views alternate until the error is acknowledged.

An error message is acknowledged by pressing the ↵ button.

This switches off the buzzer and the "DELETE ALARM" window opens. This is immediately followed by the "ARE YOU SURE?" query.
This query can be answered with either "NO" or "YES" by selecting with the ↓↑ buttons in the bottom line "(NEW)". If "NO" is selected, the error message remains and only the acoustic warning signal is switched off.



If "YES" is selected, the error message in the display is also deleted and the red flashing LED goes out.

Then the info window opens with the information about the selected controller settings. After approx. 3 seconds, the view changes back to the standard window.

The fault message in the display only disappears if the error is eliminated and also reset on the controller – as described above or in the "SETTINGS" menu.

The error message remains stored in the error logbook and can thus be evaluated later.

You can find the possible faults/messages and troubleshooting information in Chapter 16.

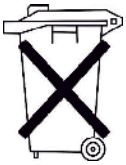
8.3 Power failure alarm

The controller has a battery-powered power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to notify the operator that wastewater treatment has stopped. The display shows "No power available" and a crossed-out socket (without backlighting). If you press the ↵ button once briefly, the alarm tone is switched off and the text "<CR> Key pressed" appears. If you press the ↵ button and hold it down until an acknowledgement tone sequence sounds, the text "Alarm is now OFF" is displayed briefly and the alarm is permanently switched off. If the power supply returns after a power failure, the device switches on again automatically.

Note:

With a new device, the internal batteries only reach their full capacity after a few days in order to achieve a maximum alarm duration.
If the functioning of the internal rechargeable batteries deteriorates, they must be replaced by 2 NiMH size AA rechargeable batteries.

The batteries may only be replaced by a qualified electrician.
Disconnect the power plug before opening the device.
The batteries must only be disposed of properly.



According to the Battery Ordinance of the German Government (BGBl 1998/I/20 from 02/04/1998), all end users of batteries and accumulators are obligated as of 01/10/1998 to return them to retailers or recyclables disposers, e.g. municipal collection points. Disposal with household waste is expressly prohibited.

9 Operation as an SSB plant

The small wastewater treatment plant must be operated by the owner or a competent person commissioned by the owner (operator).

After commissioning, the plant is operated fully automatically. It is controlled by a PLC. The sequence and flow of the phases are programmed in the controller. The times for the aeration intervals, the denitrification phase (optional) as well as for the discharge of the purified wastewater and the return of the surplus sludge are preset, but can be readjusted if necessary.

In the standard case, the cycles run on a purely time-controlled basis. However, it is possible to use a float switch (see Chapter 6.4.6) and thereby additionally control the plant via the water level.

If any faults occur during operation of the plant, they are reported visually and acoustically by the controller. The LED flashes red and the buzzer sounds. The error message remains in the main display until the error is acknowledged (see Chapter 9.3.3.5).

The error message remains stored in the error logbook and can thus be evaluated later.

The controller has a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to notify the operator that wastewater treatment has stopped. If the power supply returns after a power failure, the device switches on again automatically.

9.1 Commissioning of the controller

Before commissioning the plant, primary sedimentation and biological treatment must be filled with water up to 5 cm above $H_{W,min}$ and the housing of the controller – if it was opened – must be closed. All required units must be connected to the controller electrically and/or by hose.

The commissioning of the controller begins with the insertion of the power plug of the controller. After plugging in the plug, the controller starts with a self-test with a duration of approx. 3 seconds while displaying "booting system...".

Then the red LED lights up briefly and afterwards the green LED. At the same time, the start message "AQUATO" appears on the display. The display Vx.xx.xx (e.g. V3.07.04) in the lower part of the message is the version number of the software.

The display "COMMISSIONING" then appears during initial commissioning. Subsequently, when commissioning the K-Pilot 9.7 controller, the following must first be entered (see Chapter 9.3.2.4, 9.3.3.1 and 9.3.3.6):

- Password (4-digit) with password 1
  or password 2 for advanced options
- Language

- Date and time
- Basic plant type – here select: "**SSB**"
- Valve for aeration YES / NO
- Plant size, e.g. "4 PE"
- Control type: "TIME", "FLOAT" or "DOUBLE FLOAT"
  (Attention! If either hygienisation with **UV lamp** or **PO3 elimination** is required as an additional function, select control type: "**Float**" here.)
- Denitrification YES / NO
- with pressure monitoring YES / NO

The following additional options can only be selected during commissioning if password 2 was entered (see Chapter 9.3.2.4):

- UV lamp YES / NO
- PO3 elimination YES / NO
- Clear water discharge "AIRLIFT PUMP" / "MOTOR PUMP"
  (Attention! If you require hygienisation with **UV lamp** as an additional function, a clear water pump is also required. Therefore, select "**MOTOR PUMP**" here).
- Sludge discharge "AIRLIFT PUMP" / "MOTOR PUMP"
- Additional motor pump OFF / ON (only if motor pump ON selected)
- Additional pump with float YES / NO
- 2nd compressor YES / NO
- 3~compressor YES / NO
- Current monitoring YES / NO (only if 3~compressor YES selected)
- Pressure monitoring YES / NO (only if 3~compressor YES selected)

After these inputs, the controller automatically switches to manual mode (see Chapter 9.3.2.2). The various functions can be checked in manual mode.

After ending manual mode, the controller continues to boot with the window "booting system..." and then "Fuse Check: values" with the message "Fuses o.k." before the start message "AQUATO" appears with the indication of the selected system type. Immediately afterwards, automatic mode is started automatically.

If additional options have been selected, additional settings may be required in the "Outputs" menu or in the "Parameters 3" menu depending on the selection (see Chapter 9.3.4.7 and Chapter 9.3.4.9).

The commissioning engineer must ensure that the parameter settings in the controller have been made in such a way that they comply with the requirements (e.g. basic type and effluent class) of the approval and the water law license for the system on which the controller is to be used.

This concludes the commissioning process.

The automatic cycle goes through the following work phases (these may vary depending on the exact setting):

- Surplus sludge discharge
- Pressure monitoring
- Aeration
- Settling phase
- Clear water discharge

- After completing these phases, the next cycle starts again from the beginning.

9.2 Main display

In the standard display, the controller shows the switching status of the plant and the units, e.g.:

1st line: Date and time.

2nd line: Current SSB phase, e.g. "Sludge Discharge", "Pressure Monitoring", "Aeration", "Settling Phase", "Clear Water Discharge" and additional phases depending on the setting

2nd line (right): Normal, economy or holiday mode of the plant and below that, in normal mode, the remaining time of the current phase or, in economy mode, the time that has elapsed since the start of the economy mode phase.

3rd line Indicates denitrification (for effluent class D only), otherwise blank line

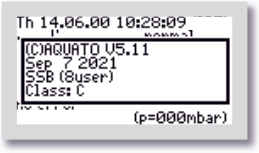
4th line: Indicates which unit is active, otherwise – if no unit is switched on – blank line

5th line: Operating current of the active unit (e.g. compressor, clear water pump, followed by the current temperature in the controller)

6th line: Error display, otherwise "NO ERROR" if there is no error message

7th line: Float status up / down (only visible if float is activated), on the right the currently available back pressure (if pressure monitoring has been switched off, shown in brackets), on the far right a triangle "◄" flashing every second as an operation indicator

If the ↵ button is pressed in the standard display, an info window appears for approx. 3 seconds. This window displays the following:



- Software version
- Date of the version
- Type STABI SSB and the set PE number
- Effluent class, special settings, e.g.: CW pump

The exact appearance of the display depends on the selected settings.

In addition, the ↵ button can be used in this menu to shut off the buzzer or the alarm (see also Chapter 9.3.3.5).

9.3 Menu

9.3.1 Menu structure

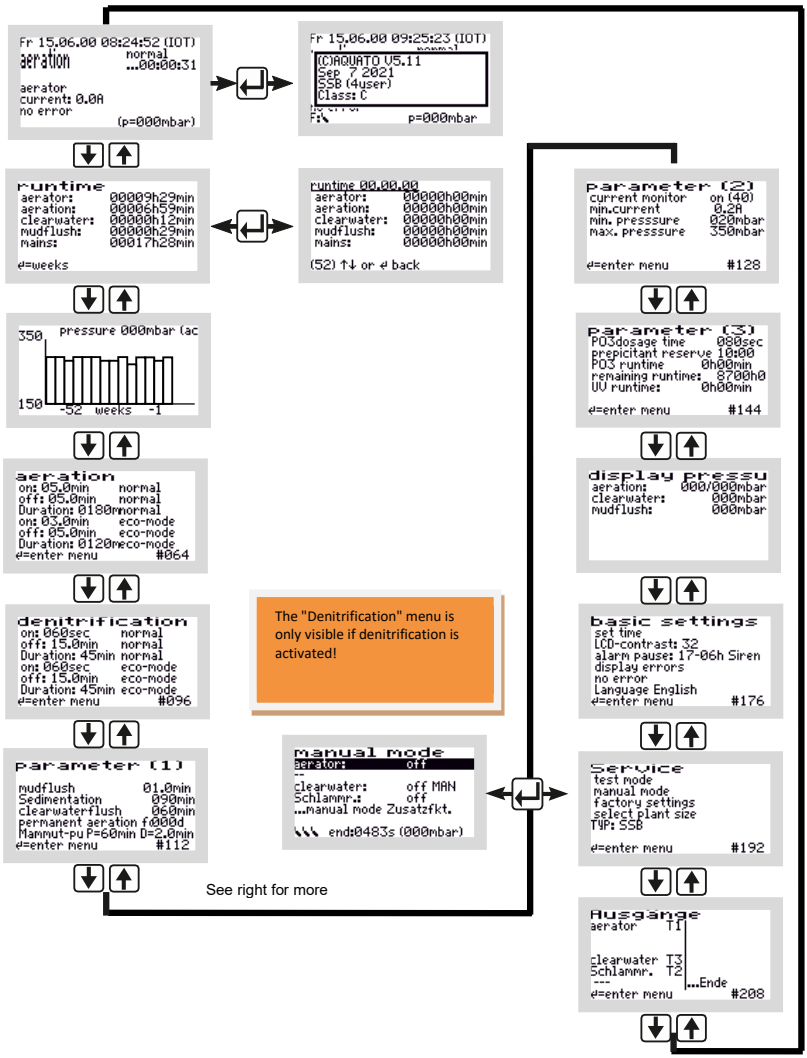


Figure 19: Menu structure for SSB

The exact appearance of the display depends on the status of the system and the set parameters. The different variants of the display are explained in more detail below.

Use the ↓↑ buttons to move from menu to menu. If you move constantly in the same direction, you will eventually return to the standard display.

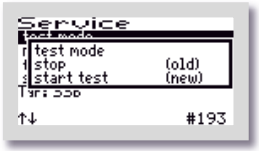
To access the submenus in the menu displayed, the ↵ button must be pressed. After pressing the ↵ button, either a window opens directly or the first menu item is marked by a black bar, depending on the selected menu.

The individual points are selected with the ↓↑ buttons. The ↵ button is used, wherever possible, to enter the submenu or edit mode.

9.3.2 "Service" menu

The Service menu is basically intended for the service technician. The following can be selected:
- System test / test mode
- Manual mode
- Factory settings (only with password 2)
- Select plant types (only with password 1 or 2)

9.3.2.1 System test / test mode



Test mode is used to check whether the units consume power properly. If the automatic test mode has been selected with the ↓↑ buttons via the menu item "SYSTEM TEST", it is called up with the ↵ button. The "System Test" window offers the selection "CANCEL" or "START TEST". These two options are selected with the ↓↑ buttons in the bottom line "(NEW)". After selecting and confirming "START TEST", the system test begins.

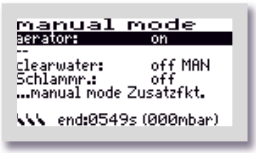
The test runs fully automatically as a standard test. It is independent of the selected program. The individual functions are tested in sequence (approx. 15 seconds each). If everything is functioning correctly, no alarm message is issued.

Test operation can be cancelled by pressing the ↵ button.

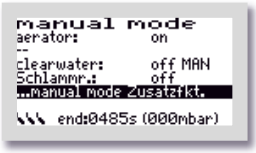
After testing all the functions, test mode ends automatically and the interrupted cycle is continued in automatic mode. If the settling phase is interrupted by the system test in the last 30 minutes of its running time, the remaining time of the settling phase is automatically extended to 30 minutes following manual mode in order to ensure that only the purified water can be discharged from the plant.

9.3.2.2 Manual mode

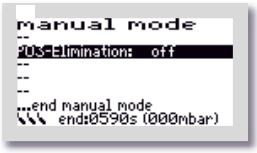
In addition to the "Compressor", "Clear Water" and "Sludge Recirculation" parameters, which are always available, the manual mode of the K-Pilot 9.7 controller allows further settings to be made. The exact display depends on the parameters set (during commissioning).



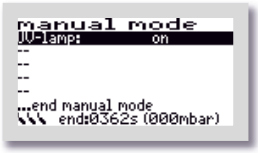
The manual mode menu consists of 2 windows. The ↓ ↑ buttons can be used to select between the permanently available parameters "COMPRESSOR" and "CLEAR WATER" as well as "SLUDGE R" (= sludge recirculation) in the first window (with the standard functions) by moving the black bar to the desired entry.
If "COMPRESSOR" is selected, for example, it can be switched "ON" and "OFF" with the ↵ button.

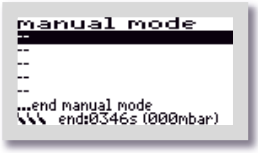


The second manual mode window (with the additional functions) is accessed via the last line "...MANUAL MODE ADD. FNCT.". The additional functions selected during commissioning are displayed in this window.

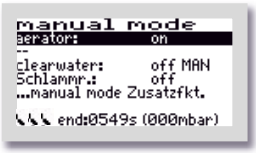


Depending on the preset, different menu items, such as "2nd COMPRESSOR", "UV LAMP" or "PO3 Elimination" can be selected in the 2nd manual mode window by moving the black bar to the desired entry. Then this function is switched "ON" and "OFF" with the ↵ button.

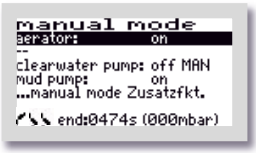




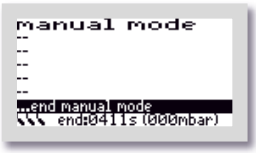
If no additional function has been selected, no function is displayed in this window. Manual mode can then be ended directly.



Three float switch symbols indicating the current float position are visible at the bottom left.
If no float switch is connected, this corresponds to the symbol position down.



If a float switch is moved up and down, the indicator in the display changes accordingly.



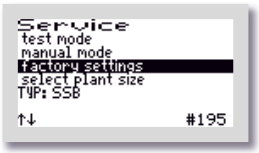
Manual mode is ended by using the buttons to move the selection bar to the menu item "... End manual mode" and then confirming by pressing the button.

If the manual mode is not ended with "... END MANUAL MODE", the controller automatically switches back to automatic mode 15 minutes after the last pressing of a button.

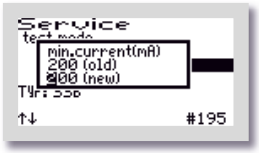
Once manual mode has been ended, the controller continues the interrupted cycle in automatic mode. If the settling phase is interrupted by manual mode in the last 30 minutes of its running time, the remaining time of the settling phase is automatically extended to 30 minutes following manual mode in order to ensure that only the purified water can be discharged from the plant.

9.3.2.3 Factory settings

Under "FACTORY SETTINGS", the current error limit can be changed. The **resetting** of the controller, which is also possible in the factory settings, is **not permitted** throughout operation. Access to the factory settings is possible **with password 2 only**.



The following values can be changed/reset in the "FACTORY SETTINGS".

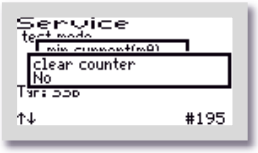


The first window that opens is "MIN. CURRENT (mA)". Here you can change the limit at which an error is displayed. The default setting is 200 mA. The lowest possible limit is 50 mA. The ⬇⬆ buttons can be used to change the values digit by digit starting from the left in the bottom line "(NEW)". The selected value is accepted with the ↵ button. After confirming the 3rd digit, the next window opens automatically.

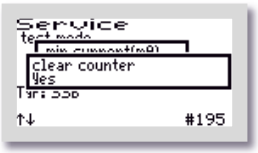
In the next window, "HW error deactivated" the flooding error message can be deactivated. This is usually unnecessary. After confirming the selection, the next window opens automatically.

The subsequent deletion options are not permitted during the entire operating time of a small wastewater treatment plant. The queries must be answered with "NO".

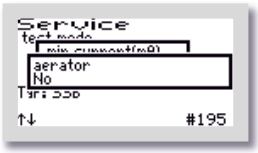
All queries in the Factory Settings menu must be answered with "NO". This data must not be deleted.



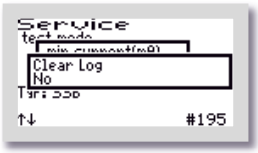
The "DELETE COUNTER" window opens.
If "NO" is selected, the menus with the individual units are skipped and the "DELETE LOG" window opens immediately.
→ **Answer: "NO".**



If "YES" is selected, the controller moves on to the individual units each time the ↵ button is pressed. In the first window to follow, i.e. "COMPRESSOR", the counter of the running time of the compressor can be reset to zero with the ↓↑ buttons by selecting "YES".
→ **Answer: "NO".**



The same procedure can be followed in the subsequent windows "CHARGING", "AERATION", "CLEAR WATER", "SLUDGE CLEANING", "MAINS", "DOSING TIME" and "UV".
→ **Answer: "NO".**

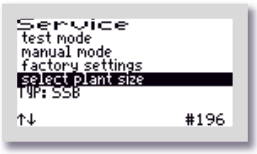


The last window to open in this menu is "DELETE LOG". If "YES" is selected here, all entries and settings are deleted. Then the controller starts over again with commissioning.
→ **Answer: "NO".**

PLEASE NOTE! The operations "**Delete counter**:" and "**Delete log**" are **prohibited** throughout the operation of a plant, as the operation log must record the running times.

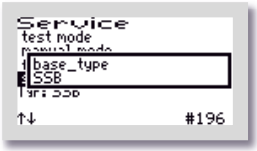
9.3.2.4 Selecting a plant type

In this menu, you can set/change the plant type and size, as well as other parameters required for operation.



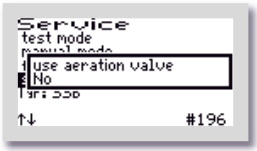
Select the menu item "SELECT PLANT TYPES".

Then enter password 1 – or, for further settings, password 2 – digit by digit and confirm with the ↵ button to enter the menu.

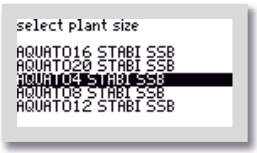


First, the "BASIC TYPE" of the system is requested. Use the ↓ ↑ buttons to select the desired type in the second line of the window.

For operation as SSB plant, select "**SSB**" and confirm with the ↵ button.

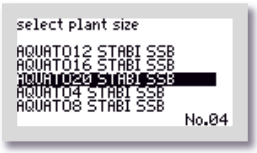


After selecting the basic type, the "VALVE F. AERATION" window asks you whether aeration is controlled with a valve. In the standard case, aeration is controlled without a valve. In this case, confirm the selection "NO" with the ↵ button to select this setting.

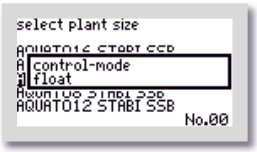


Then use the ↓ ↑ buttons to select the desired/required EW number as the "PLANT TYPE". If the marker (= black bar) is on the correct PE number (according to the wastewater treatment calculation), confirm with the ↵ button. If the required PE number is not directly available for selection, select the next largest entry.

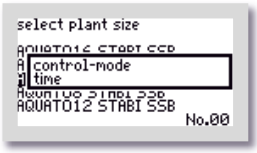
All parameters for the treatment cycle are automatically preset through this selection, but can be readjusted if necessary.



For plant sizes from 21 to 50 PE, please select "AQUATO>20 STABI SSB". The cycle presets for plant sizes from 21 to 50 PE are the same; the different air volumes required are reached with different sizes and volumes of membrane diffusers and compressors. These settings can be readjusted where necessary.



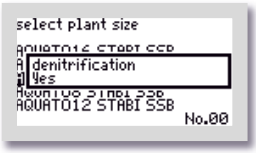
The "CONTROL TYPE" window allows you to choose between a time-controlled cycle or a float-controlled cycle. The desired control type can be set in the second line. Press the ↓ ↑ buttons to select "TIME" or "FLOAT". The selected Control type is accepted with the ↵ button. If "TIME" is selected, the cycle sequence is only controlled through time, but if "FLOAT" is selected, it is also float-controlled.



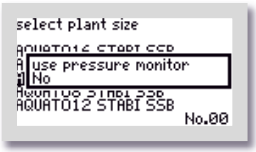
To operate a system with UV lamp or a dosing unit, the "FLOAT" CONTROL TYPE must be selected.

For further options and information on using the float switches, see Chapter 6.4.6.

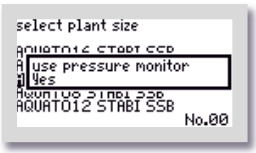
For operation with "**UV Lamp**" or "**PO3 Elimination**", "**FLOAT**" must always be selected as the control type.



If "DENITRIFICATION" is desired/required, it can be activated in the next window. The desired option can be selected in the second line. Use the ↓ ↑ buttons to select "YES" or "NO". The selected state is accepted with the middle ↵ button. "YES" means that the plant is running with a denitrification phase, "NO" means that this phase is switched off.



Then, in the next window, "WITH PRESSURE MONITORING", you will be asked whether the plant should be monitored for pressure. If you do not require this monitoring, you can switch it off with "NO".



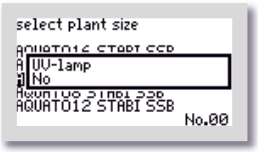
If you switch on the monitoring by selecting "YES" in the menu "WITH PRESSURE MONITORING", an error message will be generated if the device fails. **To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the diffusers.** If the sensor (hose connection for pressure monitoring, see Figure 4) is not connected to the air hose, select "NO".

If password 1 was used, the menu item "SELECT PLANT TYPES" is completed here and the software jumps back to the "SERVICE" main menu.

If the menu item "SELECT PLANT TYPES" was selected with password 2, the additional functions follow as further setup options.

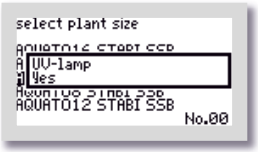
The **additional functions** can only be put into operation **with password 2**.

The additional functions follow directly and start with the next window with the query as to whether you require hygienisation:



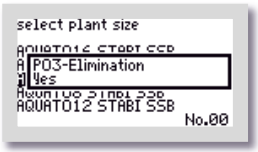
If you require hygienisation, use the ↓↑ buttons to select the option "YES" in the "UV LAMP" window.

Further settings can be found in the "PARAMETERS 3" menu.



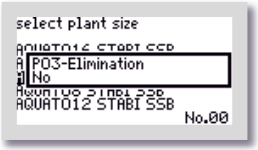
If you do not require this option, please answer the query with "NO".

Confirm your selection with the ↵ button.



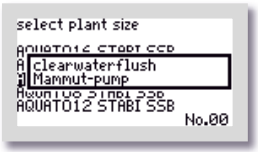
To activate phosphate precipitation, use the ↓↑ buttons to select the option "YES" in the "PO3 ELIMINATION" window.

Further settings can be found in the "PARAMETERS 3" menu.

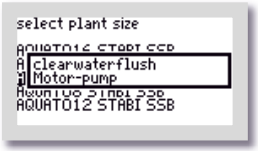


If you do not require this option, please answer the query with "NO".

Confirm your selection with the ↵ button.

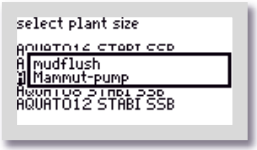


If a compressed air lifter is used for the clear water discharge, please use the ↓↑ buttons to select "AIRLIFT PUMP" in the "CLEAR WATER DISCHARGE" window.

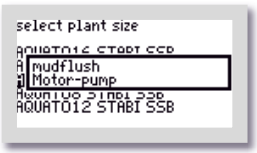


If the clear water discharge is equipped with a submersible motor pump instead of the compressed air lifter, please select "MOTOR PUMP" in the "CLEAR WATER DISCHARGE" window.

Confirm your selection with the ↵ button.



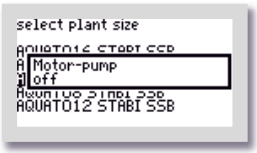
If a compressed air lifter is used for the surplus sludge discharge, please use the ↓ ↑ buttons to select "AIRLIFT PUMP" in the "SLUDGE DISCHARGE" window.



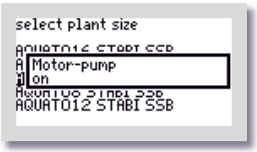
If the surplus sludge discharge is equipped with a submersible motor pump instead of the compressed air lifter, please select "MOTOR PUMP" in the "SLUDGE DISCHARGE" window.

Confirm your selection with the ↵ button.

In the next window, you can activate an additional pump that runs independently of the cycle.



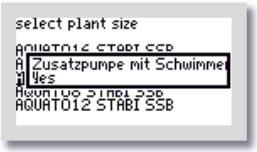
If you do not require this option, please answer the query with "OFF".



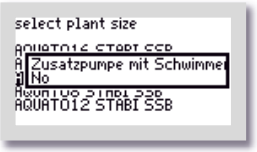
If you require such a pump, please use the ↓ ↑ buttons to select "ON" in the "MOTOR PUMP" window.

Confirm your selection with the ↵ button.

If you have selected the option motor pump "ON", you will next be asked whether you want to operate the pump with an external float switch.

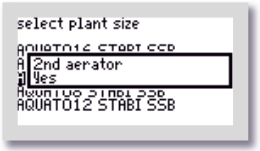


If the additional pump is to be operated with an external float switch, please use the ↓ ↑ buttons to select the option "YES" in the "ADDITIONAL PUMP WITH FLOAT" window.

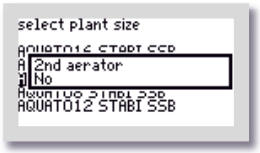


If the external float switch is not required, please select "NO".

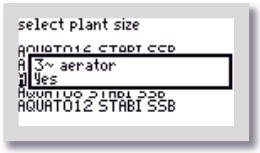
Confirm your selection with the ↵ button.



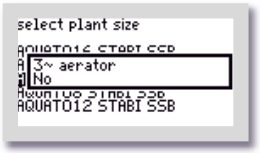
If you are operating a plant with 2 (or 3) compressors, please use the ↓ ↑ buttons to select "YES" in the window with the query "2nd COMPRESSOR".



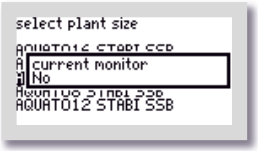
If you do not require this option, please answer the query with "NO".



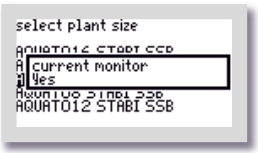
In the window with the query "3~COMPRESSOR", you can select "YES" to allow a 3-phase compressor with 400 V to be controlled. With this option, the standard current monitoring is switched off. This setting is required if an ORKA S200 or ORKA S400 module is selected to control the compressor(s). The option "YES" must always be selected if one or more units are controlled via one contactor. With this setting, the compressor for the lifters is connected as usual. It is not switched on during aeration.



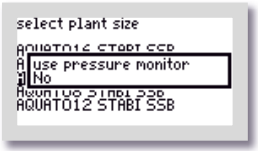
If you do not require this option, please answer the query with "NO".



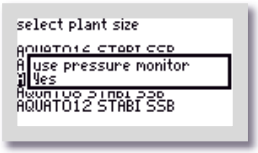
If you have selected a three-phase compressor, you will be asked in the "CURRENT MONITORING" window whether the three-phase compressor should be monitored for current errors.
If you do not require this monitoring, you can switch it off with "NO".



If you switch on this monitoring by selecting "YES" in the window "PRESSURE MONITORING", an error message will be generated if the device fails. **For this monitoring, however, the controller must be prepared at the factory.** If the controller was not prepared, select "NO".



Then, in the "WITH PRESSURE MONITORING" window, you will be asked whether the 3-phase compressor should be monitored for pressure.
If you do not require this monitoring, you can switch it off with "NO".



If you switch on the monitoring by selecting "YES" in the "WITH PRESSURE MONITORING" window, an error message will be generated if the device fails. **To use this monitoring, the pressure sensor ("PUMP" connection) must be connected to the air hose between the compressor and the diffusers.** If the sensor ("PUMP" connection) is not connected to the air hose, select "NO".

For operation with "**UV LAMP**" or "**PO3-ELIMINATION**", "**FLOAT**" must always be selected beforehand as the control type.
If the additional function "**UV LAMP**" is selected, the function "**CLEAR WATER DISCHARGE**" must also be selected with the option "**MOTOR PUMP**".

The software then jumps back to the "SERVICE" main menu. Use the ↓ ↑ buttons to exit the menu.

If additional options have been selected, additional settings may be required in the "OUTPUTS" menu and/or in the "PARAMETERS 3" menu. You can find the setup options for this in Chapter 9.3.4.7 and Chapter 9.3.4.9.

9.3.3 "Settings" menu

The operator settings can be configured in the "SETTINGS" menu. Press the middle ↵ button to enter the menu to select the desired item.

9.3.3.1 Setting the date and time

To correct the time and/or date, use the ↓↑ buttons to select the "SET CLOCK" line. If the marker (=black bar) is on the desired entry, the middle ↵ button opens the window for adjusting the values.

The first digit can be changed with the ↓↑ buttons. If the correct value has been set, the middle ↵ button is used to accept the digit. The same procedure applies to all subsequent digits.
Input sequence: 2 digits each:
day, month, year, hour, minute (DD/MM/YY_hh:mm)

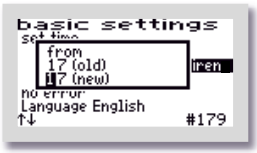
The clock is quartz-controlled. It should also be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes it easier to evaluate the maintenance.

Example: Time changed from 13:20 to 13:26.

9.3.3.2 LCD contrast

The LCD contrast can be optimised here. As a rule, no change is necessary.

9.3.3.3 Alarm buzzer ("Alarm pause")



By default, the acoustic alarm is switched off from 17:00 to 6:00. During this time, errors are only displayed optically. This setting can be changed in the menu item "ALARM PAUSE".

<u>Attention:</u>
No acoustic alarm is sounded during the time set here!

The sound for the alarm buzzer is set here. You can choose between: "SIREN", "MELODY" and "OFF"

The default setting is "SIREN".

<u>Attention:</u>
No acoustic alarm is sounded if the "OFF" setting is selected.

9.3.3.4 Display errors

The error logbook is called up via the "DISPLAY ERRORS" menu item.

The error logbook shows the last 30 error events with the date and time. The buttons are used to scroll through the logbook, the button is used to exit the menu.
Nothing can be deleted in the error logbook!

9.3.3.5 Delete alarm

If a fault (alarm) has occurred, the alarm message can be reset by pressing the ↵ button after selecting the "CLEAR ALARM" line. A window with the message "OK" opens for approx. 1 second and then the display in the menu changes to "NO ERRORS". The red flashing LED goes out and the error message in the standard window is deleted.
The error message remains stored in the error logbook and can thus be evaluated later.

Note: If the ↵ button is pressed in the main display – which is the standard display during operation – in the event of a fault, the buzzer is switched off and the "DELETE ALARM" window opens, which automatically changes to the query "SAFE?" after a short time.
If you answer "YES", the error display is deleted and the red flashing LED goes out. The error message remains stored in the error logbook and can thus be evaluated later.
If the "ARE YOU SURE?" query is answered with "NO", the error message remains in the main display.

Then the info window opens for approx. 3 seconds with the information about the plant settings.

9.3.3.6 Language

The language of the controller is selected here. The controller is prepared for several languages. The languages currently programmed are:
– German
– English
– Swedish
– French
– Finnish

9.3.4 Other menus with displays or settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually set.
An adjustment may only be performed by a specialist, as the purification performance of the system may be reduced under certain circumstances and the national technical approval may become void.

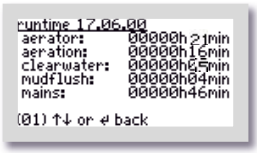
In order to change the displayed values, however, the password must first be entered.

In order to restore the original factory settings after changes have been made to the settings (e.g. changed aeration times), you can select the plant type again (see Chapter 9.3.2.4). This will restore the default values.

9.3.4.1 Operating hours display

The operating hours of the individual units are displayed in the "OPERATING HOURS" menu. The operating hours are counted up if the controller has switched on the compressor (or possibly a pump). The display is in hours and minutes.

If the ↵ button is pressed, the operating hours of the last (up to 52) weeks are displayed (operation log).

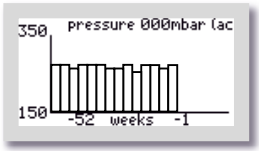


The last line shows the calendar week (in the example: the 52th CW) in which the values were stored (always on Sunday).

The ↓ ↑ buttons can be used to scroll from week to week.

Note:
This function only works correctly if the date and time were set correctly.

9.3.4.2 Pressure log



In the graphic menu "PRESSURE", the current pressure is documented in the upper line and the counterpressure (from the pressure monitoring) is documented on a weekly basis in the graphic.
The pressure is only displayed graphically starting at 150 mbar.
When operating with a buffer, however, the display has only limited informative value.

9.3.4.3 Ventilation

The "AERATION" menu displays the selected aeration intervals in normal mode, i.e. for how many minutes aeration is alternately switched "ON" / "OFF" (clocking).
In addition, it displays the total aeration duration ("DURATION:").
The times can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons and confirmed with the ↵ button.

The aeration interval is also displayed for economy mode, i.e. for how many minutes aeration is switched "ON" or "OFF".
In addition, it displays the total aeration duration in economy mode ("DURATION: XXXmin ECONOMY MODE").

Note:
The "ECONOMY MODE" displays at the bottom of the AERATION window are only visible when "FLOAT" CONTROL TYPE is set.

Economy mode starts after the first aeration phase with the float switch not floated up and runs for three days. If the float does not float up again during this time, the plant goes into holiday mode. The aeration times for this are not adjustable. They are automatically set to one third of the set economy mode duration. As soon as the float floats up again, economy or holiday mode is interrupted and the plant returns to normal mode. This begins with the aeration phase.

9.3.4.4 Denitrification

Note:
This menu is only visible if denitrification is activated.

The "DENITRIFICATION" menu displays the selected aeration intervals in normal mode, i.e. for how many minutes aeration is alternately switched ON / OFF (clocking).
In addition, it displays the total aeration duration ("DURATION:").
The times can be changed individually, if necessary.
Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons and confirmed with the ↵ button.

Note:
The "ECONOMY MODE" display in the "DENITRIFICATION" menu is only visible if "FLOAT" CONTROL TYPE is set.

The aeration interval is also displayed for economy mode, i.e. for how many minutes aeration is switched "ON" or "OFF".
In addition, it displays the total aeration duration in economy mode ("DURATION: XXXmin ECONOMY MODE").

9.3.4.5 Parameters 1

Different parameters are displayed in the "PARAMETERS 1" menu depending on the setting. The parameters "SLUDGE DISCHARGE", "SETTLING PHASE" and "CLEAR WATER DISCHARGE" are always available.

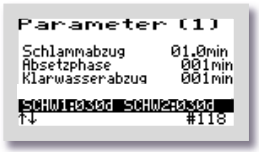
This menu displays the duration of the following cycle phases:
- SLUDGE DISCHARGE
- SETTLING PHASE
- CLEAR WATER DISCHARGE
- CONTINUOUS AERATION FOR XXX D

The times can be changed individually, if necessary.

For this purpose, there is the option of continuous aeration during the start-up phase via the menu item "CONTINUOUS AERATION FOR XXX D". With this setting, aeration can be used continuously for a certain number of days.

In the example, the continuous aeration is working for 30 days.

If password 2 is entered, the "Parameters 1" menu displays the connected float switch(es) with the set waiting time until warning in the bottom line.
In the example, the float message becomes active after 30 days without a float switching operation.



In the bottom line, the waiting times until the warning can be adjusted by entering password 2.

Entering 0 days switches the float message off.

In the example, the float message for float 1 becomes active after 14 days without a float switching operation. The message for float switch 2 is switched off.

9.3.4.6 Parameters 2

Different parameters are displayed in the "PARAMETERS 2" menu depending on the setting. The parameters "CURRENT MONITORING" and "MIN. CURRENT" are always available.

If the controller switches on a unit (e.g. the compressor or a pump), it is not ensured with certainty that it will run. Even if the switching relay is switched on, overheating, defective cables or other defects may nevertheless prevent the unit from running. The controller therefore monitors whether a current is also flowing in the circuit. If the current falls below a limit value that is set by default to 0.2 A on the software side, a current alarm is displayed (e.g.: I Bel).

The controller also monitors the pressure generated during aeration, sludge return and clear water discharge. By default, the minimum pressure is set to 20 mbar and the maximum pressure to 350 mbar. If the minimum permissible pressure is not reached or the maximum permissible pressure is exceeded, the controller issues an alarm (pmin or pmax).

In this menu, current monitoring can be switched "OFF" or "ON". By default, current monitoring is set to "ON".

In addition, the currently flowing current is displayed in the main display for monitoring purposes.

The minimum and maximum permissible pressures can also be changed in this menu, if necessary.

If pressure monitoring is switched off, the min. pressure and max. pressure displays are omitted.

9.3.4.7 Parameters 3

Various parameters may be displayed and adjusted in the "PARAMETERS 3" menu depending on the presetting.

The exact appearance of the menu depends on the respective presets. If no relevant functions are selected, the menu remains empty.

In the example, a dosing pump for phosphate precipitation and a UV module are connected. In this case, the data regarding the dosing agent supply and the dosing time can be adjusted and the remaining UV time can be reset.

Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons.

In this example, the dosing time is to be adjusted.

The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons – in this case from 80 to 60 seconds – and confirmed with the ↵ button.

9.3.4.8 Pressure displays

This menu displays the respective pressure during the last cycle. The clear water and surplus sludge counterpressures are each stored for each individual process. Only the pressure measurement of the respective last phase is displayed.

For aeration, 2 values are displayed: the minimum and maximum pressure.

If pressure monitoring is switched off, this menu is omitted.

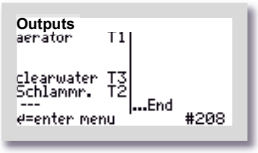
If a sludge and/or clear water pump is connected instead of the relevant lifter, this is displayed as text below the actual pressure displays. In addition, this output is not displayed as a pressure output.

In the example, a clear water pump is connected.

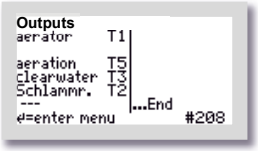
9.3.4.9 Outputs

The "OUTPUTS" menu shows which electrical output is assigned to which function. The exact display depends on the selected plant parameters. Only as many outputs are displayed as were selected during commissioning. These are preassigned by the controller by default. If necessary, the default assignment can be changed.

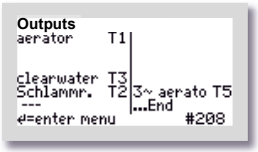
Use the ↵ button to access the menu. The lines to be changed are selected with the ↓↑ buttons. To exit the menu again keep pressing one of the ↓↑ buttons in one direction until the next menu opens.



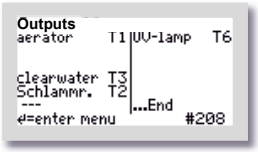
In this example, the compressor is controlled via output T1, the clear water discharge via output T3 and the sludge discharge via output T2.



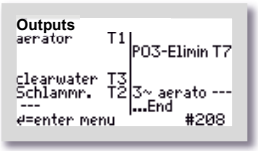
In addition, aeration is controlled via output T5 in this example.



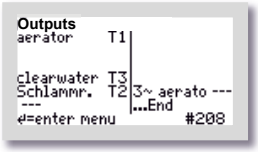
In this example, the compressor is controlled via output T1, the clear water discharge via output T3 and the sludge discharge via output T2. In addition, a three-phase compressor is controlled via output T5.



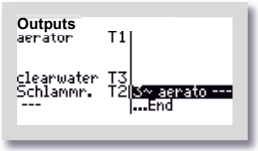
In this example, the compressor is controlled via output T1, clear water discharge via output T3, the sludge discharge via output T2 and the UV lamp via output T6. In addition, a UV lamp is controlled via output T6.



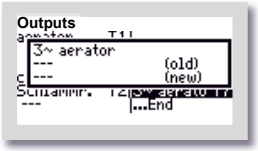
If one or more additional functions – in this example PO3 elimination and the three-phase compressor – have been selected, a separate output must be assigned to each of these functions. This can be seen from the blank space symbols "---" after the units.



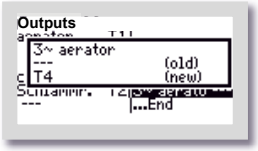
In this example, the three-phase compressor is selected as an additional function. A free output must be assigned to this function.



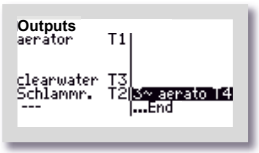
Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons.



The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons.



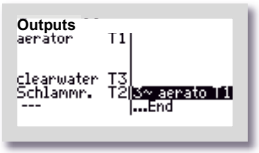
Select a free output – in the example: T4. To accept the settings, confirm by pressing the ↵ button.



Here, output T4 was selected.

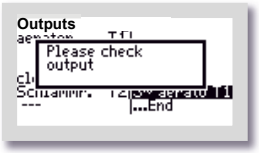
Exit the menu with the ↓ ↑ buttons.

You can find further setup options for the special function in the "PARAMETERS 3" menu.



A different output must be assigned to each selected function. **No output** may be assigned with **2 different functions**!

In the example, T1 was incorrectly assigned twice.



If an output is selected twice, a window with the warning "Please check outputs" appears when you attempt to exit the submenu and you are prevented from exiting the menu so that you can correct the relevant lines.

The outputs may not be assigned 2 different functions! In other words, **the same output must not be selected twice**.

9.4 Presets

Number of inhabitants:	8
Aeration 1st C.:	Yes
Control type:	Time
Denitrification:	No

9.5 Switching times – Basic settings

PE number	Aeration Normal mode			Aeration Economy mode			Denitrification Normal mode			Denitrification Economy mode			Settling phase (min)	Clear water discharge (min)	Sludge discharge (min)
	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)			
4	3.0	5.0	180	2.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	5	1.0
8	5.0	5.0	180	3.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	10	1.0
12	7.0	3.0	180	5.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	15	2.0
16	7.0	3.0	180	5.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	15	2.0
20	8.0	3.0	180	6.0	3.0	120	1.0	15.0	45	1.0	15.0	45	90	20	2.0
>20	8.0	3.0	180	6.0	3.0	120	1.0	15.0	45	1.0	15.0	45	90	20	2.0

The plant only switches to economy and holiday mode if the float switch is fitted and "Float" control type is selected. Economy mode is activated if the float switch has not floated up after sludge discharge. Holiday mode starts after economy mode if the float switch has not floated up within 3 days of operation in economy mode. Holiday mode reduces the aeration time by another 2/3. As soon as the float switch floats up again, the plant switches back to normal mode. If "Float" control mode is selected, all clear water discharge times are preset to 30 minutes.

10 Operation as an SBR plant

The small wastewater treatment plant must be operated by the owner or a competent person commissioned by the owner (operator).

After commissioning, the plant is operated fully automatically. It is controlled by a PLC. The sequence and flow of the phases are programmed in the controller. The times for the aeration intervals, the denitrification phase (optional) as well as for charging, the discharge of the purified wastewater and the return of the surplus sludge are preset, but can be readjusted if necessary.

In the standard case, the cycles run on a purely time-controlled basis. However, it is possible to use a float switch (see Chapter 6.4.6) and thereby additionally control the plant via the water level.

If any faults occur during operation of the plant, they are reported visually and acoustically by the controller. The LED flashes red and the buzzer sounds. The error message remains in the main display until the error is acknowledged (see Chapter 10.3.3.5).

The error message remains stored in the error logbook and can thus be evaluated later.

The controller has a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to notify the operator that wastewater treatment has stopped. If the power supply returns after a power failure, the device switches on again automatically.

10.1 Commissioning of the controller

Before commissioning the plant, primary sedimentation and biological treatment must be filled with water up to 5 cm above $H_{W,min}$ and the housing of the controller – if it was opened – must be closed. All required units must be connected to the controller electrically and/or by hose.

The commissioning of the controller begins with the insertion of the power plug of the controller. After plugging in the plug, the controller starts with a self-test with a duration of approx. 3 seconds while displaying "booting system...".

Then the red LED lights up briefly and afterwards the green LED. At the same time, the start message "AQUATO" appears on the display. The display Vx.xx.xx (e.g. V3.07.04) in the lower part of the message is the version number of the software.

The display "COMMISSIONING" then appears during initial commissioning. Subsequently, when commissioning the K-Pilot 9.7 controller, the following must first be entered (see Chapter 10.3.2.4, 10.3.3.1 and 10.3.3.6):

- Password (4-digit) with password 1
  or password 2 for advanced options
- Language

- Date and time
- Basic plant type – here select: "**SBR**"
- Valve for aeration YES / NO
- Plant size, e.g. "4 PE"
- Control type: "TIME", "FLOAT" or "DOUBLE FLOAT"
  (Attention! If either hygienisation with **UV lamp** or **PO3 elimination** is required as an additional function, select control type: "**Float**" here.)
- Denitrification YES / NO
- with pressure monitoring YES / NO

The following additional options can only be selected during commissioning if password 2 was entered (see Chapter 10.3.2.4):

- UV lamp YES / NO
- PO3 elimination YES / NO
- Clear water discharge "AIRLIFT PUMP" / "MOTOR PUMP"
  (Attention! If you require hygienisation with **UV lamp** as an additional function, a clear water pump is also required. Therefore, select "**MOTOR PUMP**" here).
- Charging "AIRLIFT PUMP" / "MOTOR PUMP"
- Sludge discharge "AIRLIFT PUMP" / "MOTOR PUMP"
- Additional motor pump OFF / ON
- Only if motor pump ON selected:
  Additional pump with float YES / NO
- 2nd compressor YES / NO
- 3~compressor YES / NO
- Only if 3~compressor YES selected:
  Current monitoring YES / NO and
  Pressure monitoring YES / NO
-

If additional options have been selected, additional settings may be required in the "Outputs" menu (see Chapter 10.3.4.9).

After these inputs, the controller automatically switches to manual mode (see Chapter 10.3.2.2). The various functions can be checked in manual mode.

The automatic cycle starts after ending manual mode. This concludes the commissioning process.

Depending on the selection, additional settings may still have to be made in the "Parameters 3" menu or in the "Outputs" menu (see Chapter 10.3.2.4, 10.3.4.7 and 10.3.4.9).

The commissioning engineer must ensure that the parameter settings in the controller have been made in such a way that they comply with the requirements (e.g. basic type and effluent class) of the approval and the water law license for the system on which the controller is to be used.

The automatic cycle goes through the following work phases (these may vary depending on the exact setting):

- Surplus sludge discharge
- Pressure monitoring
- Charging
- Aeration
- Settling phase
- Clear water discharge

- After completing these phases, the next cycle starts again from the beginning.

10.2 Main display

In the standard display, the controller shows the switching status of the plant and the units, e.g.:

1st line: Date and time

2nd line: Current SBR phase, including "Charging," "Aeration", "Settling Phase", "Clear Water Discharge", "Sludge Discharge", "Pressure Monitoring" and additional phases depending on the setting

2nd line (right): Normal, economy or holiday mode of the plant and below that, in normal mode, the remaining time of the current phase or, in economy mode, the time that has elapsed since the start of the economy mode phase.

3rd line Indicates denitrification (for effluent class D only), otherwise blank line

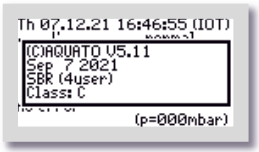
4th line: Indicates which unit is active, otherwise – if no unit is switched on – blank line

5th line: Operating current of the active unit (e.g. compressor, if applicable clear water pump, etc.)

6th line: Error display, otherwise "NO ERROR" if there is no error message

7th line: Float status up / down (only visible if float is activated), on the right the currently available back pressure (if pressure monitoring has been switched off, shown in brackets), on the far right a triangle "◄" flashing every second as an operation indicator

If the ↵ button is pressed in the standard display, an info window appears for approx. 3 seconds. This window displays the following:



- Software version
- Date of the version
- Type KOM SBR and the set PE number
- Effluent class, special settings, e.g.: CW pump or buffer

The exact display depends on the selected settings.

In addition, the ↵ button can be used in this menu to shut off the buzzer or the alarm (see also Chapter 10.3.3.5).

10.3 Menu

10.3.1 Menu structure

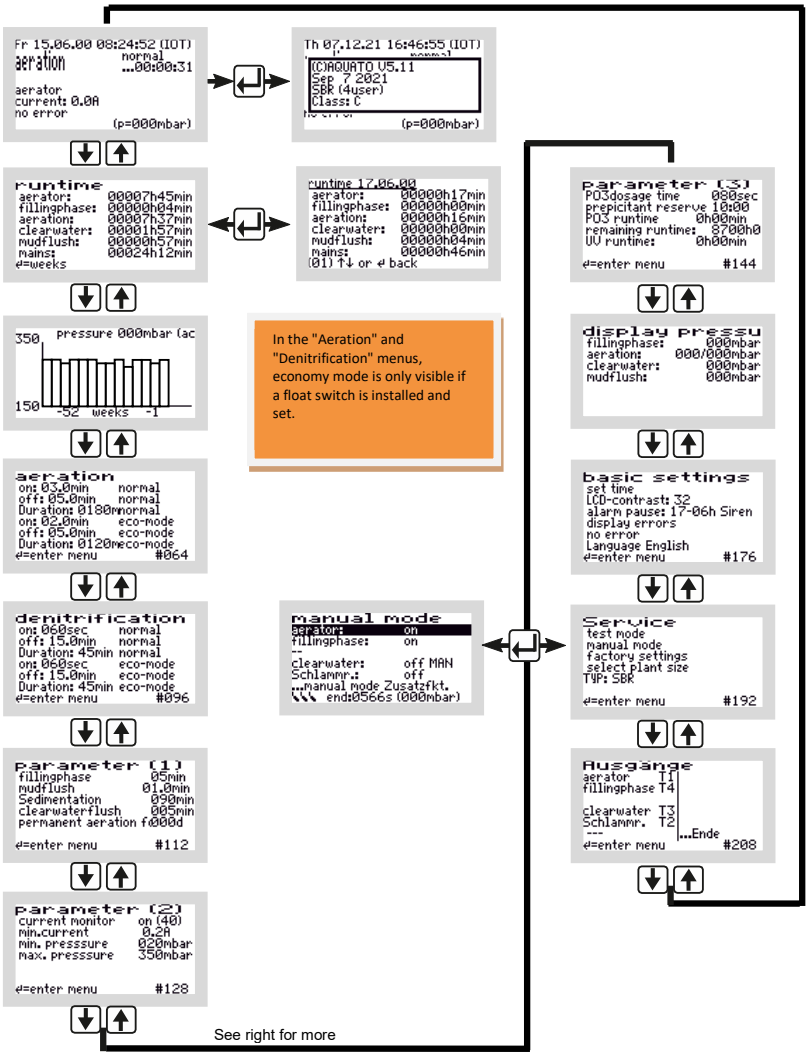


Figure 20: Menu structure for SBR

The exact display depends on the status of the system and the set parameters. The different variants of the display are explained in more detail below.

Use the ↓↑ buttons to move from menu to menu. If you move constantly in the same direction, you will eventually return to the standard display.

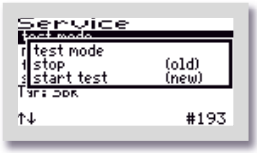
To access the submenus in the menu displayed, the middle ↵ button must be pressed. After pressing the ↵ button, either a window opens directly or the first menu item is marked by a black bar, depending on the selected menu.

The individual points are selected with the ↓↑ buttons. The ↵ button is used, wherever possible, to enter the submenu or edit mode.

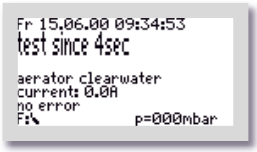
10.3.2 "Service" menu

The Service menu is basically intended for the service technician. The following can be selected:
- System test / test mode
- Manual mode
- Factory settings (only with password 2)
- Select plant types (only with password 1 or 2)

10.3.2.1 System test / test mode



Test mode is used to check whether the units consume power properly. If the automatic test mode has been selected with the ↓↑ buttons via the menu item "SYSTEM TEST", it is called up with the ↵ button. The "System Test" window offers the selection "CANCEL" or "START TEST". These two options are selected with the ↓↑ buttons in the bottom line "(NEW)". After selecting and confirming "START TEST", the system test begins.



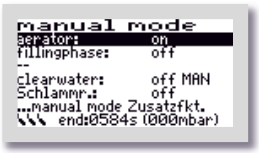
The test runs fully automatically as a standard test. It is independent of the selected program. The individual functions are tested in sequence (approx. 15 seconds each). If everything is functioning correctly, no alarm message is issued.

Test operation can be cancelled by pressing the ↵ button.

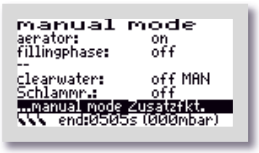
After testing all the functions, test mode ends automatically and the interrupted cycle is continued in automatic mode. If the settling phase is interrupted by the system test in the last 30 minutes of its running time, the remaining time of the settling phase is automatically extended to 30 minutes following manual mode in order to ensure that only the purified water can be discharged from the plant.

10.3.2.2 Manual mode

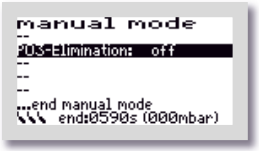
In addition to the "Compressor", "Charging", "Clear Water" and "Sludge Recirculation" parameters, which are always available, the manual mode of the K-Pilot 9.7 controller allows further settings to be made. The exact display depends on the parameters set (during commissioning).



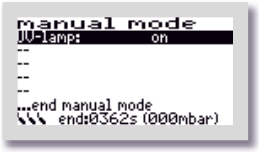
The manual mode menu consists of 2 windows. The ↓ ↑ buttons can be used to select between the permanently available parameters "COMPRESSOR" and "CLEAR WATER" as well as "SLUDGE R" (= sludge recirculation) in the first window (with the standard functions) by moving the black bar to the desired entry.
If "COMPRESSOR" is selected, for example, it can be switched "ON" and "OFF" with the ↵ button.



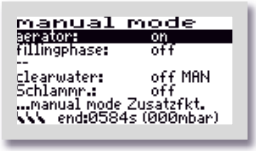
The second manual mode window (with the additional functions) is accessed via the last line "...MANUAL MODE ADD. FNCT.". The additional functions selected during commissioning are displayed in this window.



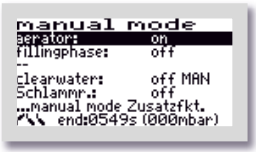
Depending on the preset, different menu items, such as "2nd COMPRESSOR", "UV LAMP" or "PO3 Elimination" can be selected in the 2nd manual mode window by moving the black bar to the desired entry. Then this function is switched "ON" and "OFF" with the ↵ button.



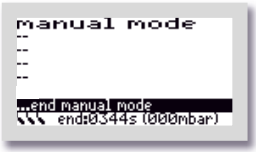
If no additional function has been selected, no function is displayed in this window. Manual mode can then be ended directly.



Three float switch symbols indicating the current float position are visible at the bottom left.
If no float switch is connected, this corresponds to the symbol position down .



If a float switch is moved up and down, the indicator in the display changes accordingly.



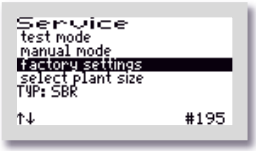
Manual mode is ended by using the buttons to move the selection bar to the menu item "... End manual mode" and then confirming by pressing the button.

If the manual mode is not ended with "... END MANUAL MODE", the controller automatically switches back to automatic mode 15 minutes after the last pressing of a button.

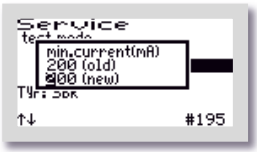
Once manual mode has been ended, the controller continues the interrupted cycle in automatic mode. If the settling phase is interrupted by manual mode in the last 30 minutes of its running time, the remaining time of the settling phase is automatically extended to 30 minutes following manual mode in order to ensure that only the purified water can be discharged from the plant.

10.3.2.3 Factory settings

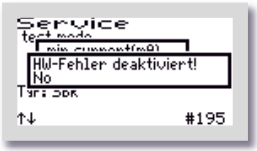
Under "FACTORY SETTINGS", the current error limit can be changed. The **resetting** of the controller, which is also possible in the factory settings, is **not permitted** throughout operation. Access to the factory settings is possible **with password 2 only**.



The following values can be changed/reset in the "FACTORY SETTINGS".



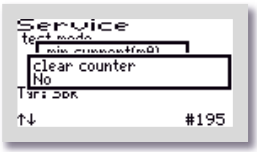
The first window that opens is "MIN. CURRENT (mA)". Here you can change the limit at which an error is displayed. The default setting is 200 mA. The lowest possible limit is 50 mA. The ↓ ↑ buttons can be used to change the values digit by digit starting from the left in the bottom line "(NEW)". The selected value is accepted with the ↵ button. After confirming the 3rd digit, the next window opens automatically.



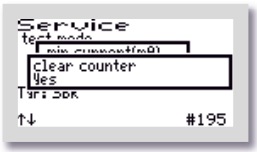
In the next window, "HW error deactivated" the flooding error message can be deactivated. This is usually unnecessary. After confirming the selection, the next window opens automatically.

The subsequent deletion options are not permitted during the entire operating time of a small wastewater treatment plant. The queries must be answered with "NO".

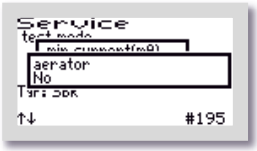
All queries in the Factory Settings menu must be answered with "NO". This data must <u>not</u> be deleted.



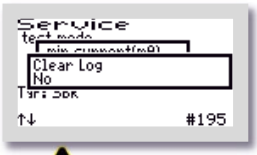
The "DELETE COUNTER" window opens.
If "NO" is selected, the menus with the individual units are skipped and the "DELETE LOG" window opens immediately.
→ **Answer: "NO".**



If "YES" is selected, the controller moves on to the individual units each time the ↵ button is pressed. In the first window to follow, i.e. "COMPRESSOR", the counter of the running time of the compressor can be reset to zero with the ↓↑ buttons by selecting "YES".
→ **Answer: "NO".**



The same procedure can be followed in the subsequent windows "CHARGING", "AERATION", "CLEAR WATER", "SLUDGE CLEANING", "MAINS", "UV" and "DOSING TIME".
→ **Answer: "NO".**

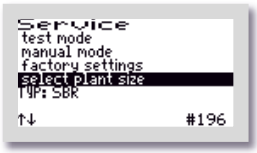


The last window to open in this menu is "DELETE LOG". If "YES" is selected here, all entries and settings are deleted. Then the controller starts over again with commissioning.
→ **Answer: "NO".**

PLEASE NOTE! The operations "**Delete counter:**" and "**Delete log**" are **prohibited** throughout the operation of a plant, as the operation log must record the running times of the units.

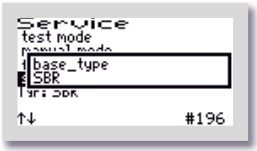
10.3.2.4 Selecting a plant type

In this menu, you can set/change the plant type and size, as well as other parameters required for operation.



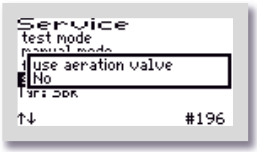
Select the menu item "SELECT PLANT TYPES".

Then enter password 1 – or, for further settings, password 2 – digit by digit and confirm with the ↵ button to enter the menu.

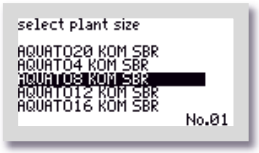


First, the "BASIC TYPE" of the system is requested. Use the ↓ ↑ buttons to select the desired type in the second line of the window.

For operation as SBR plant, select " **SBR**" and confirm with ↵.

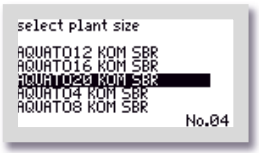


After selecting the basic type, the "VALVE F. AERATION" window asks you whether aeration is controlled with a valve. In the standard case, aeration is controlled without a valve. In this case, confirm the selection "NO" with the ↵ button to select this setting.

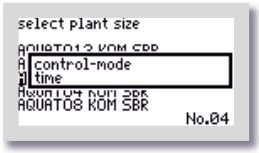


Then use the ↓ ↑ buttons to select the desired/required EW number as the "PLANT TYPE". If the marker (= black bar) is on the correct PE number (according to the wastewater treatment calculation), confirm with the ↵ button. If the required PE number is not directly available for selection, select the next largest entry.

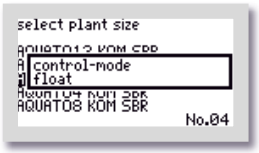
All parameters for the treatment cycle are automatically preset through this selection, but can be readjusted if necessary.



For plant sizes from 21 to 50 PE, please select "AQUATO>20 KOM SBR". The cycle presets for plant sizes from 21 to 50 PE are the same; the different air volumes required are reached with different sizes and volumes of membrane diffusers and compressors. These settings can be readjusted where necessary.



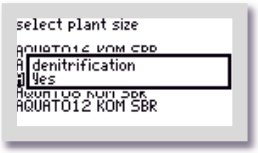
The "CONTROL TYPE" window allows you to choose between a time-controlled cycle or a float-controlled cycle. The desired control type can be set in the second line. Press the ↓ ↑ buttons to select "TIME" or "FLOAT". The selected Control type is accepted with the ↵ button. If "TIME" is selected, the cycle sequence is only controlled through time, but if "FLOAT" is selected, it is also float-controlled.



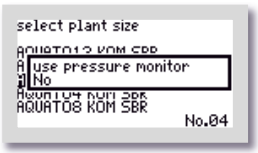
To operate a system with UV lamp or a dosing unit, the "FLOAT" control type must be selected.

For further options and information on using the float switches, see Chapter 6.4.6.

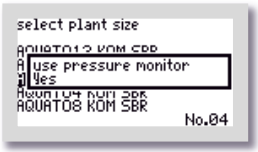
For operation with "**UV**" lamp or "**Dosing**", "**FLOAT**" must always be selected as the control type.



f "DENITRIFICATION" is desired/required, it can be activated in the next window. The desired option can be selected in the second line. Use the ↓ ↑ buttons to select "YES" or "NO". The selected state is accepted with the ↵ button. "YES" means that the plant is running with a denitrification phase, "NO" means that this phase is switched off.



Then, in the next window, "WITH PRESSURE MONITORING", you will be asked whether the plant should be monitored for pressure. If you do not require this monitoring, you can switch it off with "NO".



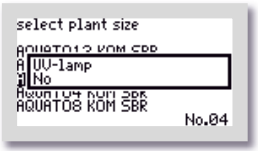
If you switch on the monitoring by selecting "YES" in the menu "WITH PRESSURE MONITORING", an error message will be generated if the device fails. **To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the diffusers.** If the sensor (hose connection for pressure monitoring, see Figure 4) is not connected to the air hose, select "NO".

If password 1 was used, the menu item "SELECT PLANT TYPES" is completed here and the software jumps back to the "SERVICE" main menu.

If the menu item "SELECT PLANT TYPES" was selected with password 2, the additional functions follow as further setup options.

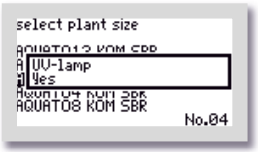
The **additional functions** can only be put into operation **with password 2**.

The additional functions follow directly and start with the next window with the query as to whether you require hygienisation:



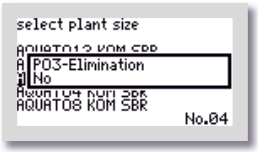
If you require hygienisation, use the ↓↑ buttons to select the option "YES" in the "UV LAMP" window.

Further settings can be found in the "PARAMETERS 3" menu.



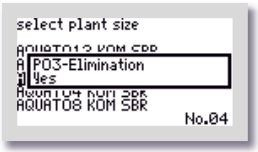
If you do not require this option, please answer the query with "NO".

Confirm your selection with the ↵ button.



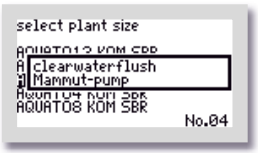
To activate phosphate precipitation, use the ↓↑ buttons to select the option "YES" in the "PO3 ELIMINATION" window.

Further settings can be found in the "Parameters 3" menu.

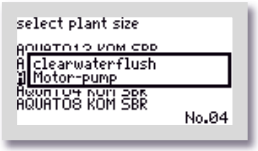


If you do not require this option, please answer the query with "NO".

Confirm your selection with the ↵ button.

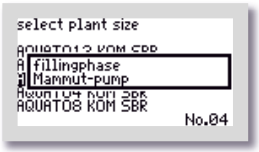


If a compressed air lifter is used for the clear water discharge, please use the ↓↑ buttons to select "AIRLIFT PUMP" in the "CLEAR WATER DISCHARGE" window.

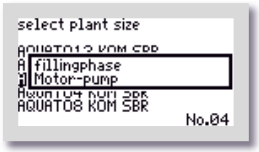


If the clear water discharge is equipped with a submersible motor pump instead of the compressed air lifter, please select "MOTOR PUMP" in the "CLEAR WATER DISCHARGE" window.

Confirm your selection with the ↵ button.

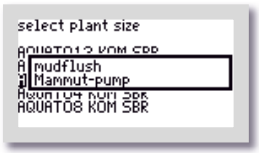


If a compressed air lifter is used for charging, please use the ↓ ↑ buttons to select "AIRLIFT PUMP" in the "CHARGING" window.

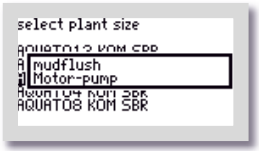


If the charging is equipped with a submersible motor pump instead of the compressed air lifter, please select "MOTOR PUMP" in the "CHARGING" window.

Confirm your selection with the ↵ button.



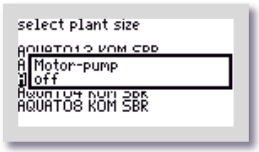
If a compressed air lifter is used for the surplus sludge discharge, please use the ↓ ↑ buttons to select "AIRLIFT PUMP" in the "SLUDGE DISCHARGE" window.



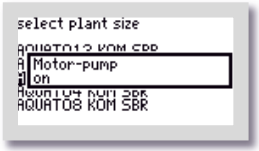
If the surplus sludge discharge is equipped with a submersible motor pump instead of the compressed air lifter, please select "MOTOR PUMP" in the "SLUDGE DISCHARGE" window.

Confirm your selection with the ↵ button.

In the next window, you can activate an additional pump that runs independently of the cycle.



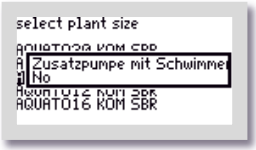
If you do not require this option, please answer the query with "OFF".



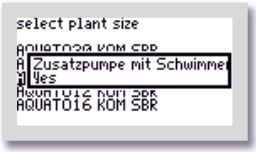
If you require such a pump, please use the ↓ ↑ buttons to select "ON" in the "MOTOR PUMP" window.

Confirm your selection with the ↵ button.

If you have selected the option motor pump "ON", you will next be asked whether you want to operate the pump with an external float switch.

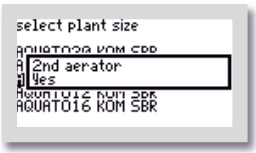


If the additional pump is to be operated with an external float switch, please use the ↓ ↑ buttons to select the option "YES" in the "ADDITIONAL PUMP WITH FLOAT" window.

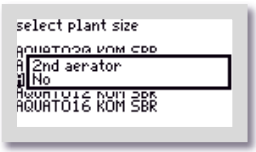


If the external float switch is not required, please select "NO".

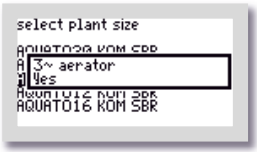
Confirm your selection with the ↵ button.



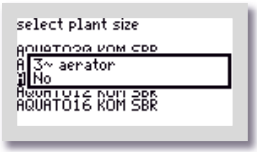
If you are operating a plant with 2 (or 3) compressors, please use the ↓ ↑ buttons to select "YES" in the window with the query "2nd COMPRESSOR".



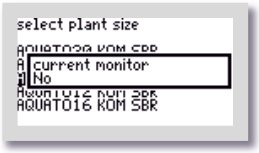
If you do not require this option, please answer the query with "NO".



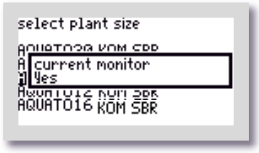
In the window with the query "3~COMPRESSOR", you can select "YES" to allow a 3-phase compressor with 400 V to be controlled. With this option, the standard current monitoring is switched off. This setting is required if an ORKA S200 or ORKA S400 module is selected to control the compressor(s). The option "YES" must always be selected if one or more units are controlled via one contactor. With this setting, the compressor for the lifters is connected as usual. It is not switched on during aeration.



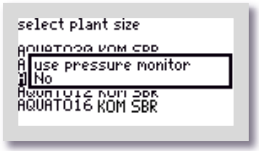
If you do not require this option, please answer the query with "NO".



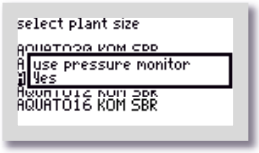
If you have selected a three-phase compressor, you will be asked in the "CURRENT MONITORING" window whether the three-phase compressor should be monitored for current errors.
If you do not require this monitoring, you can switch it off with "NO".



If you switch on this monitoring by selecting "YES" in the window "PRESSURE MONITORING", an error message will be generated if the device fails. **For this monitoring, however, the controller must be prepared at the factory.** If the controller was not prepared, select "NO".



Then, in the "WITH PRESSURE MONITORING" window, you will be asked whether the 3-phase compressor should be monitored for pressure.
If you do not require this monitoring, you can switch it off with "NO".



If you switch on the monitoring by selecting "YES" in the menu "WITH PRESSURE MONITORING", an error message will be generated if the device fails. **To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the diffusers.** If the sensor is not connected to the air hose, select "NO".

For operation with "**UV LAMP**" or "**PO3-ELIMINATION**", "**FLOAT**" must always be selected beforehand as the control type.
If the additional function "**UV LAMP**" is selected, the function "**CLEAR WATER DISCHARGE**" must also be selected with the option "**MOTOR PUMP**".

The software then jumps back to the "SERVICE" main menu. Use the ↓ ↑ buttons to exit the menu.

If additional options have been selected, additional settings may be required in the "OUTPUTS" menu (see Chapter 10.3.4.9). You will find any necessary additional setting options in the "PARAMETERS 3" menu (see Chapter 10.3.4.7).

10.3.3 "Settings" menu

The operator settings can be configured in the "SETTINGS" menu. Press the ↵ button to enter the menu to select the desired item.

10.3.3.1 Setting the date and time

To correct the time and/or date, use the ↓ ↑ buttons to select the "SET CLOCK" line. If the marker (=black bar) is on the desired entry, the middle ↵ button opens the window for adjusting the values.

The first digit can be changed with the ↓ ↑ buttons. If the correct value has been set, the middle ↵ button is used to accept the digit. The same procedure applies to all subsequent digits.
Input sequence: 2 digits each:
day, month, year, hour, minute (DD/MM/YY_hh:mm)

The clock is quartz-controlled. It should also be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes it easier to evaluate the maintenance.

Example: Time changed from 13:20 to 13:26.

10.3.3.2 LCD contrast

The LCD contrast can be optimised here. As a rule, no change is necessary.

10.3.3.3 Alarm buzzer ("Alarm pause")

By default, the acoustic alarm is switched off from 17:00 to 6:00. During this time, errors are only displayed optically. This setting can be changed in the menu item "ALARM PAUSE".

Attention:
No acoustic alarm is sounded during the time set here!

The sound for the alarm buzzer is set here. You can choose between: "SIREN", "MELODY" and "OFF"

The default setting is "SIREN".

Attention:
No acoustic alarm is sounded if the "OFF" setting is selected.

10.3.3.4 Display errors

The error logbook is called up via the "DISPLAY ERRORS" menu item.

The error logbook shows the last 30 error events with the date and time. The ↓ ↑ buttons are used to scroll through the logbook, the ↵ button is used to exit the menu.
Nothing can be deleted in the error logbook!

10.3.3.5 Delete alarm

If a fault (alarm) has occurred, the alarm message can be reset by pressing the ↵ button after selecting the "CLEAR ALARM" line. A window with the message "OK" opens for approx. 1 second and then the display in the menu changes to "NO ERRORS". The red flashing LED goes out and the error message in the standard window is deleted.
The error message remains stored in the error logbook and can thus be evaluated later.

Note: If the ↵ button is pressed in the main display – which is the standard display during operation – in the event of a fault, the buzzer is switched off and the "DELETE ALARM" window opens, which automatically changes to the query "SAFE?" after a short time.
If you answer "YES", the error display is deleted and the red flashing LED goes out. The error message remains stored in the error logbook and can thus be evaluated later.
If the "ARE YOU SURE?" query is answered with "NO", the error message remains in the main display.

Then the info window opens for approx. 3 seconds with the information about the plant settings.

10.3.3.6 Language

The language of the controller is selected here. The controller is prepared for several languages. The languages currently programmed are:
– German
– English
– Swedish
– French
– Finnish

10.3.4 Other menus with displays or settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually set.
An adjustment may only be performed by a specialist, as the purification performance of the system may be reduced under certain circumstances and the national technical approval may become void.

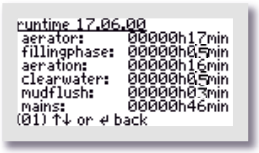
In order to change the displayed values, however, the password must first be entered.

In order to restore the original factory settings after changes have been made to the settings (e.g. changed aeration times), you can select the plant type with the correct settings again (see Chapter 10.3.2.4).

10.3.4.1 Operating hours display

The operating hours of the individual units are displayed in the OPERATING HOURS menu. The operating hours are counted up if the controller has switched on the compressor (or possibly the pump). The display is in hours and minutes.

If the ↵ button is pressed, the operating hours of the last (up to 52) weeks are displayed (operation log).



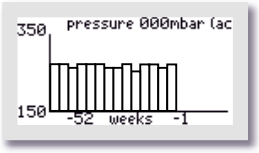
The last line shows the calendar week (in the example: the 52th CW) in which the values were stored (always on Sunday).

The ↓ ↑ buttons can be used to scroll from week to week.

Note:

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

10.3.4.2 Pressure log



In the graphic menu "PRESSURE", the current pressure is documented in the upper line and the counterpressure (from the pressure monitoring) is documented on a weekly basis in the graphic.
The pressure is only displayed graphically starting at 150 mbar.
When operating with a buffer, however, the display has only limited informative value.

10.3.4.3 Ventilation

The "AERATION" menu displays the selected aeration intervals in normal mode, i.e. for how many minutes aeration is alternately switched "ON" / "OFF" (clocking).
In addition, it displays the total aeration duration ("DURATION:").
The times can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓↑ buttons. The menu item is called up with the ↵ button.
The settings are changed with the ↓↑ buttons and confirmed with the ↵ button.

The aeration interval is also displayed for economy mode, i.e. for how many minutes aeration is switched ON or OFF.
In addition, it displays the total aeration duration in economy mode ("DURATION: XXXmin ECONOMY MODE").

Note:
The "ECONOMY MODE" displays at the bottom of the AERATION window are only visible when "FLOAT" CONTROL TYPE is set.

Economy mode starts with the first aeration phase if the float switch does float up in the charging phase and runs for three days. If the float does not float up again during this time, the plant goes into holiday mode. The aeration times for this are not adjustable. They are automatically set to one third of the set economy mode duration. As soon as the float floats up again in the charging phase, economy or holiday mode is interrupted and the plant returns to normal mode. This begins with the aeration phase.

10.3.4.4 Denitrification

Note:
This menu is only visible if denitrification is activated.

The "DENITRIFICATION" menu displays the selected aeration intervals in normal mode, i.e. for how many minutes aeration is alternately switched ON / OFF (clocking).
In addition, it displays the total aeration duration ("DURATION:").
The times can be changed individually, if necessary.
Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons and confirmed with the ↵ button.

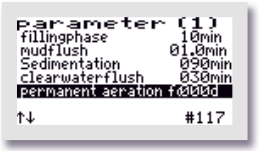
Note:
The "ECONOMY MODE" display in the "DENITRIFICATION" menu is only visible if "FLOAT" CONTROL TYPE is set.

The aeration interval is also displayed for economy mode, i.e. for how many minutes aeration is switched "ON" or "OFF".
In addition, it displays the total aeration duration in economy mode ("DURATION: XXXmin ECONOMY MODE").

10.3.4.5 Parameters 1

Different parameters are displayed in the "PARAMETERS 1" menu depending on the setting. The parameters "CHARGING", "SLUDGE DISCHARGE", "SETTLING PHASE" and "CLEAR WATER DISCHARGE" are always available.

This menu displays – depending on the setting – the duration of the following cycle phases:
- CHARGING
- SLUDGE DISCHARGE
- SETTLING PHASE
- CLEAR WATER DISCHARGE
- CONTINUOUS AERATION FOR XXX D



The times can be changed individually, if necessary.

For this purpose, there is the option of continuous aeration during the start-up phase via the menu item "CONTINUOUS AERATION FOR XXX D". With this setting, aeration can be used continuously for a certain number of days.

In the example, the continuous aeration is working for 30 days.

If password 2 is entered, the "Parameters 1" menu displays the connected float switch(es) with the set waiting time until warning in the bottom line.
In the example, the float message becomes active after 30 days without a float switching operation.

In the bottom line, the waiting times until the warning can be adjusted by entering password 2.

Entering 0 days switches the float message off.

In the example, the float message for the float becomes active after 14 days without a float switching operation. The message for float switch 2 is switched off.

10.3.4.6 Parameters 2

Different parameters are displayed in the "PARAMETERS 2" menu depending on the setting. The parameters "CURRENT MONITORING" and "MIN. CURRENT" are always available.

If the controller switches on a unit (e.g. the compressor or a pump), it is not ensured with certainty that it will run. Even if the switching relay is switched on, overheating, defective cables or other defects may nevertheless prevent the unit from running. The controller therefore monitors whether a current is also flowing in the circuit. If the current falls below a limit value that is set by default to 0.2 A on the software side, a current alarm is displayed (e.g.: I Bel).

The controller also monitors the pressure generated during charging, aeration, sludge return and clear water discharge. By default, the minimum pressure is set to 20 mbar and the maximum pressure to 350 mbar. If the minimum permissible pressure is not reached or the maximum permissible pressure is exceeded, the controller issues an alarm (pmin or pmax).

In this menu, current monitoring can be switched "OFF" or "ON". By default, current monitoring is set to "ON".

In addition, the currently flowing current is displayed in the main display for monitoring purposes.

The minimum and maximum permissible pressures can be changed in this menu, if necessary.

If pressure monitoring is switched off, the min. pressure and max. pressure displays are omitted.

10.3.4.7 Parameters 3

Various parameters may be displayed and adjusted in the "PARAMETERS 3" menu depending on the presetting.

The exact appearance of the menu depends on the respective presets. If no relevant functions are selected, the menu remains empty.

In the example, a dosing pump for phosphate precipitation and a UV module are connected. In this case, the data regarding the dosing agent supply and the dosing time can be adjusted and the remaining UV time can be reset.

Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons.

In this example, the dosing time is to be adjusted.

The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons – in this case from 80 to 60 seconds – and confirmed with the ↵ button.

10.3.4.8 Pressure displays

This menu displays the respective pressure during the last cycle. The charging, clear water and surplus sludge counterpressures are each stored for each individual process. Only the pressure measurement of the respective last phase is displayed.

For aeration, 2 values are displayed: the minimum and maximum pressure.

If pressure monitoring is switched off, this menu is omitted.

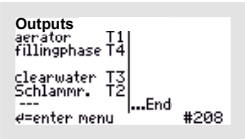
If a charging, sludge and/or clear water pump is connected instead of the relevant lifter, this is displayed as text below the actual pressure displays. In addition, this output is not displayed as a pressure output.

In the example, a clear water pump is connected.

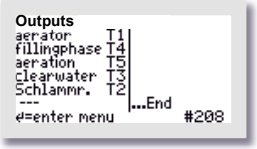
10.3.4.9 Outputs

The "OUTPUTS" menu shows which electrical output is assigned to which function. The exact display depends on the selected plant parameters. Only as many outputs are displayed as were selected during commissioning. These are preassigned by the controller by default. If necessary, the default assignment can be changed.

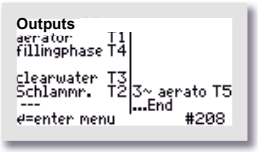
Use the ↵ button to access the menu. The lines to be changed are selected with the ↓↑ buttons. To exit the menu again keep pressing one of the ↓↑ buttons in one direction until the next menu opens.



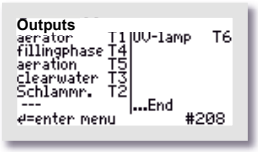
In this example, the compressor is controlled via output T1, charging via output T4, the clear water discharge via output T3 and the sludge discharge via output T2.



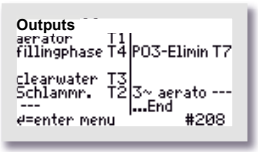
In addition, aeration is controlled via output T5 in this example.



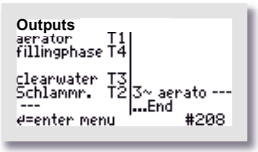
In this example, the compressor is controlled via output T1, charging via output T4, the clear water discharge via output T3 and the sludge discharge via output T2. In addition, a three-phase compressor is controlled via output T5.



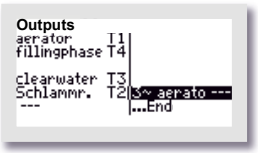
In this example, the compressor is controlled via output T1, charging via output T4, aeration via output T5, the clear water discharge via output T3 and the sludge discharge via output T2. In addition, a UV lamp is controlled via output T6.



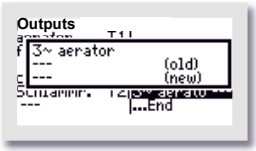
If one or more additional functions – in this example PO3 elimination and the three-phase compressor – have been selected, a separate output must be assigned to each of these functions. This can be seen from the blank space symbols "---" after the units.



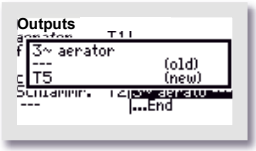
In this example, the three-phase compressor is selected as an additional function. A free output must be assigned to this function.



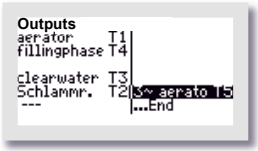
Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons.



The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons.



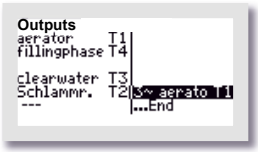
Select a free output – in the example: T5. To accept the settings, confirm by pressing the ↵ button.



Here, output T5 was selected.

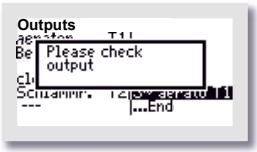
Exit the menu with the ↓ ↑ buttons.

You can find further setup options for the special function in the "PARAMETERS 3" menu.



A different output must be assigned to each selected function. **No output** may be assigned with **2 different functions**!

In the example, T1 was incorrectly assigned twice.



If an output is selected twice, a window with the warning "Please check outputs" appears when you attempt to exit the submenu and you are prevented from exiting the menu so that you can correct the relevant lines.

The outputs may not be assigned 2 different functions! In other words, **the same output must not be selected twice**.

10.4 Presets

Number of inhabitants:	8
Control type:	Time
Denitrification:	No

10.5 Switching times – Basic settings

PE number	Aeration Normal mode			Aeration Economy mode			Denitrification Normal mode			Denitrification Economy mode			Settling phase (min)	Clear water discharge (min)	Sludge discharge (min)	Charging (min)
	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)				
4	3.0	5.0	180	2.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	5	1.0	5
8	5.0	5.0	180	3.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	10	1.0	10
12	7.0	3.0	180	5.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	15	2.0	15
16	7.0	3.0	180	5.0	5.0	120	1.0	15.0	45	1.0	15.0	45	90	15	2.0	15
20	8.0	3.0	180	6.0	3.0	120	1.0	15.0	45	1.0	15.0	45	90	20	2.0	20
>20	8.0	3.0	180	6.0	3.0	120	1.0	15.0	45	1.0	15.0	45	90	20	2.0	20

The plant only switches to economy and holiday mode if the float switch is fitted and "Float" control type is selected. Economy mode is activated if the float switch has not floated up after sludge discharge. Holiday mode starts after economy mode if the float switch has not floated up within 3 days of operation in economy mode. Holiday mode reduces the aeration time by another 2/3. As soon as the float switch floats up again, the plant switches back to normal mode. If "Float" control mode is selected, all clear water discharge times are preset to 30 minutes.

11 Operation as fluidised or fixed bed plant

The small wastewater treatment plant must be operated by the owner or a competent person commissioned by the owner (operator).

After commissioning, the plant is operated fully automatically. It is controlled by a PLC. The sequence and flow of the phases are programmed in the controller. The times for the aeration intervals as well as for the return of the surplus sludge are preset, but can be readjusted if necessary.

In the standard case, the cycles run on a purely time-controlled basis. However, it is possible to use a float switch as a flood detector (see Chapter 6.4.6).

If any faults occur during operation of the plant, they are reported visually and acoustically by the controller. The LED flashes red and the buzzer sounds. The error message remains in the main display until the error is acknowledged (see Chapter 11.3.3.5).

The error message remains stored in the error logbook and can thus be evaluated later.

The controller has a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to notify the operator that wastewater treatment has stopped. If the power supply returns after a power failure, the device switches on again automatically.

11.1 Commissioning of the controller

Before commissioning the plant, all chambers of the treatment plant must be filled with water up to the overflow and the housing of the controller – if it was opened – must be closed. All required units must be connected to the controller electrically and/or by hose.

The commissioning of the controller begins with the insertion of the power plug of the controller. After plugging in the plug, the controller starts with a self-test with a duration of approx. 3 seconds while displaying "booting system...".

Then the red LED lights up briefly and afterwards the green LED. At the same time, the start message "AQUATO" appears on the display. The display Vx.xx.xx (e.g. V3.07.04) in the lower part of the message is the version number of the software.

The display "COMMISSIONING" then appears during initial commissioning. Subsequently, when commissioning the K-Pilot 27.6 controller, the following must first be entered (see Chapter 11.3.2.4, 11.3.3.1 and 11.3.3.6):

- Password (4-digit) with password 1
  or with password 2 for advanced options

- Language
- Date and time
- Basic plant type – here select: "**FLUIDISED BED**" or "**FIXED BED**"
- Plant size, e.g. "4 PE"
- Control type, here select: "**TIME**"
- with pressure monitoring YES / NO

The following additional options can only be selected during commissioning if password 2 was entered (see Chapter 11.3.2.4):

- Motor pump ON / OFF
- Airlift pump ON / OFF
- Sludge discharge, airlift pump / motor pump
- 2nd compressor YES / NO
- 3~compressor YES / NO

If additional options have been selected, additional settings may be required in the "Outputs" menu (see Chapter 11.3.4.8).

After these inputs, the controller automatically switches to manual mode (see Chapter 11.3.2.2). The various functions can be checked in manual mode.

The automatic cycle starts after ending manual mode. This concludes the commissioning process.

Depending on the selection, additional settings may still have to be made in the "Parameters 3" menu or in the "Outputs" menu (see Chapter 11.3.2.4, 11.3.4.6 and 11.3.4.8).

The commissioning engineer must ensure that the parameter settings in the controller have been made in such a way that they comply with the requirements (e.g. basic type and effluent class) of the approval and the water law license for the system on which the controller is to be used.

The automatic cycle goes through the following work phases (these vary depending on the exact setting):

- Aeration
- Surplus sludge discharge

- After completing these phases, the next cycle starts again from the beginning.

11.2 Main display

In the standard display, the controller shows the switching status of the plant and the units, e.g.:

1st line: Date and time

2nd line: Current phase: "Aeration", "Sludge Discharge" and additional phases depending on the setting

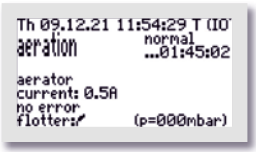
2nd line (right): Normal or economy mode of the plant and below that, in normal mode, the remaining time of the current phase or, in economy mode, the time that has elapsed since the start of the economy mode phase

3rd line Indicates denitrification (for effluent class D only), otherwise blank line

4th line: Indicates which unit is active, otherwise – if no unit is switched on – blank line

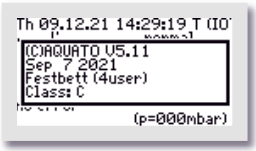
5th line: Operating current of the active unit (e.g. compressor, if applicable clear water pump, etc.)

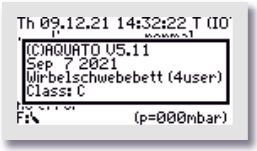
6th line: Error display, otherwise "NO ERROR" if there is no error message



7th line: Float status up / down (only visible if float is activated), on the right the currently available back pressure (if pressure monitoring has been switched off, shown in brackets), on the far right a triangle "◄" flashing every second as an operation indicator

If the ↵ button is pressed in the standard display, an info window appears for approx. 3 seconds. This window displays the following:





- Software version
- Date of the version
- Type of fluidised bed or fixed bed and the set PE number
- Effluent class, special settings, e.g.: CW pump or buffer

The exact display depends on the selected settings.

In addition, the ↵ button can be used in this menu to shut off the buzzer or the alarm (see also Chapter 11.3.3.5).

11.3 Menu

11.3.1 Menu structure

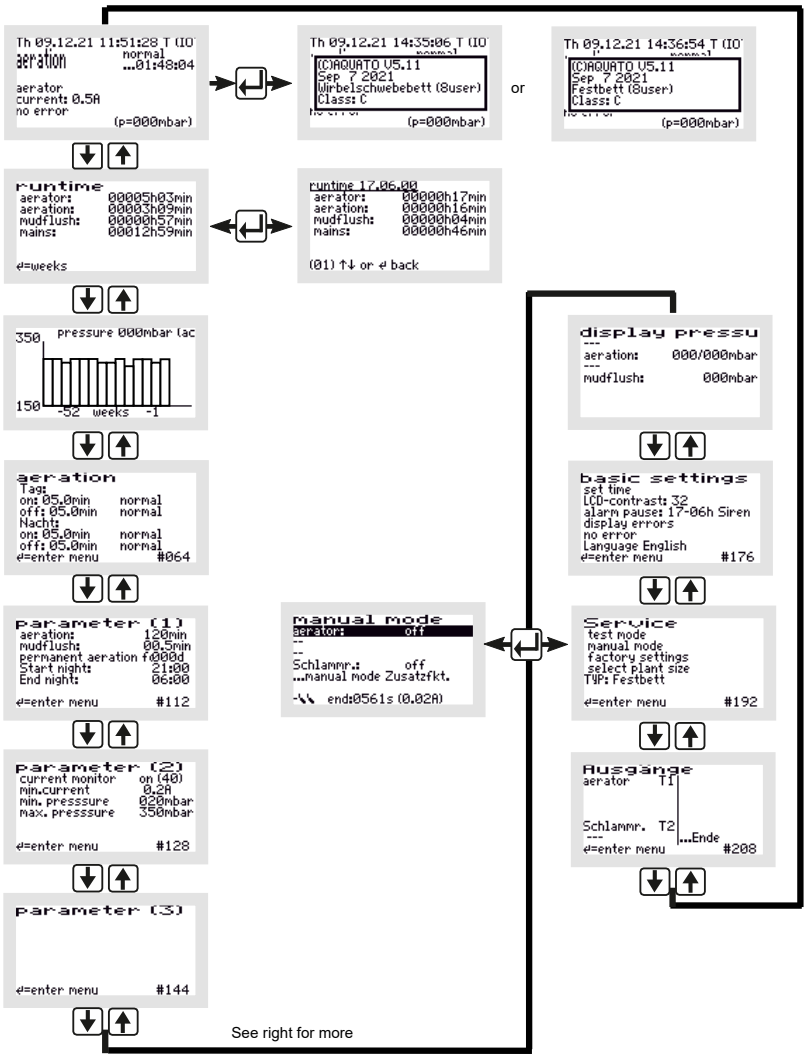


Figure 21: Menu structure for fluidised/fixed bed plant

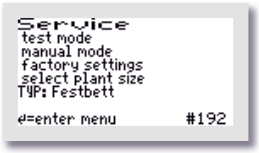
The exact display depends on the status of the system and the set parameters. The different variants of the display are explained in more detail below.

Use the ↓↑ buttons to move from menu to menu. If you move constantly in the same direction, you will eventually return to the standard display.

To access the submenus in the menu displayed, the middle ↵ button must be pressed. After pressing the ↵ button, either a window opens directly or the first menu item is marked by a black bar, depending on the selected menu.

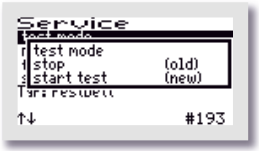
The individual points are selected with the ↓↑ buttons. The ↵ button is used, wherever possible, to enter the submenu or edit mode.

11.3.2 "Service" menu



The Service menu is basically intended for the service technician. The following can be selected:
- System test / test mode
- Manual mode
- Factory settings (only with password 2)
- Select plant types (only with password 1 or 2)

11.3.2.1 System test / test mode



Test mode is used to check whether the units consume power properly. If the automatic test mode has been selected with the ↓↑ buttons via the menu item "SYSTEM TEST", it is called up with the ↵ button. The "System Test" window offers the selection "CANCEL" or "START TEST". These two options are selected with the ↓↑ buttons in the bottom line "(NEW)". After selecting and confirming "START TEST", the system test begins.

The test is fully automatic. The individual functions are tested in sequence (approx. 15 seconds each). If everything is functioning correctly, no alarm message is issued.

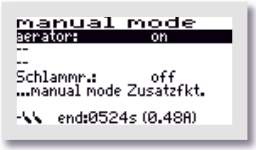
Test operation can be cancelled by pressing the ↵ button.

After testing all the functions, test mode ends automatically and the interrupted cycle is continued in automatic mode. If the settling phase is interrupted by the system test in the last 30 minutes of its running time, the remaining time of the settling phase is automatically extended to 30 minutes following manual mode in order to ensure that only the purified water can be discharged from the plant.

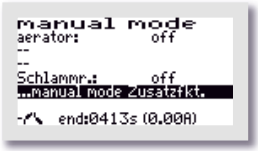
11.3.2.2 Manual mode

In addition to the "Compressor" parameter, which is always available, the manual mode of the K-Pilot 9.7 controller allows further settings to be made. The exact display depends on the parameters set (during commissioning).

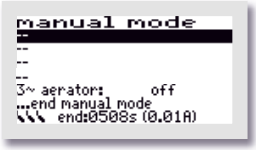
The ↓↑ buttons can be used to select between the permanently available parameter "COMPRESSOR" and further menu items varying according to the preset, e.g. "2nd COMPRESSOR", by moving the black bar to the desired entry.



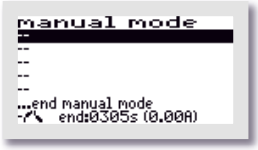
If "COMPRESSOR" is selected, it can be switched "ON" and "OFF" with the ↵ button.



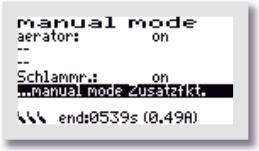
The second manual mode window (with the additional functions) is accessed via the last line "...MANUAL MODE ADD. FNCT.". The additional functions selected during commissioning are displayed in this window.



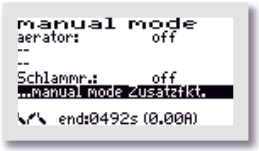
Depending on the preset, different menu items, such as "3~COMPRESSOR", can be selected in the 2nd manual mode window by moving the black bar to the desired entry. Then this function is switched "ON" and "OFF" with the ↵ button.



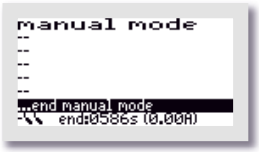
If no additional function has been selected, no function is displayed in this window. Manual mode can then be ended directly.



Three float switch symbols indicating the current float position are visible at the bottom left of the display.
If no float switch is connected, this corresponds to the symbol position down .



If a float switch is moved up and down, the indicator in the display changes accordingly.



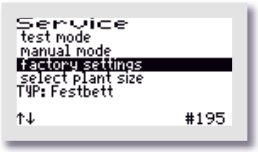
Manual mode is ended by using the buttons to move the selection bar to the menu item "... End manual mode" and then confirming by pressing the button.

If the manual mode is not ended with "... END MANUAL MODE", the controller automatically switches back to automatic mode 15 minutes after the last pressing of a button.

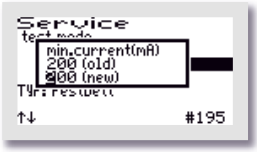
Once manual mode has been ended, the controller continues the interrupted cycle in automatic mode.

11.3.2.3 Factory settings

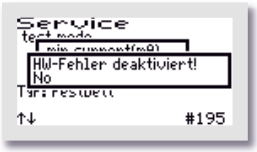
Under "FACTORY SETTINGS", the current error limit can be changed. The **resetting** of the controller, which is also possible in the factory settings, is **not permitted** throughout operation. Access to the factory settings is possible **with password 2 only**.



The following values can be changed/reset in the "FACTORY SETTINGS".



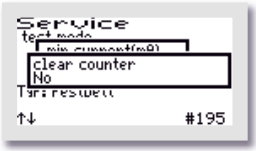
The first window that opens is "MIN. CURRENT (mA)". Here you can change the limit at which an error is displayed. The default setting is 200 mA. The lowest possible limit is 50 mA. The ↓ ↑ buttons can be used to change the values digit by digit starting from the left in the bottom line "(NEW)". The selected value is accepted with the ↵ button. After confirming the 3rd digit, the next window opens automatically.



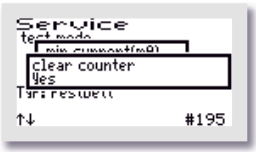
In the next window, "HW error deactivated" the flooding error message can be deactivated. This is usually unnecessary. After confirming the selection, the next window opens automatically.

The subsequent deletion options are not permitted during the entire operating time of a small wastewater treatment plant. The queries must be answered with "NO".

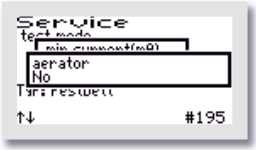
All queries in the Factory Settings menu must be answered with "NO".



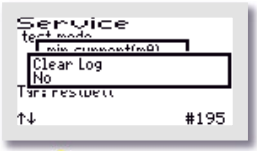
The "DELETE COUNTER" window opens.
If "NO" is selected, the menus with the individual units are skipped and the "DELETE LOG" window opens immediately.
→ **Answer: "NO".**



If "YES" is selected, the controller moves on to the individual units each time the ↵ button is pressed. In the first window to follow, i.e. "COMPRESSOR", the counter of the running time of the compressor can be reset to zero with the ↓↑ buttons by selecting "YES" in the bottom line "(NEW)".
→ **Answer: "NO".**



The same procedure can be followed in the subsequent windows "CHARGING", "AERATION", "CLEAR WATER", "SLUDGE CLEANING", "MAINS", "UV", "DOSING TIME", 2nd COMPRESSOR" and "PUMP".
→ **Answer: "NO".**

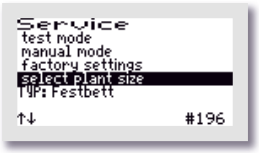


The last window to open in this menu is "DELETE LOG". If "YES" is selected here, all entries and settings are deleted. Then the controller starts over again with commissioning.
→ **Answer: "NO".**

PLEASE NOTE! The operations "**Delete counter**:" and "**Delete log**" are **prohibited** throughout the operation of a plant, as the operation log must record the running times of the units.

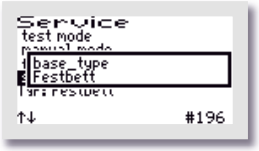
11.3.2.4 Selecting a plant type

In this menu, you can set/change the plant type and size, as well as other parameters required for operation.

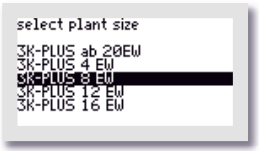


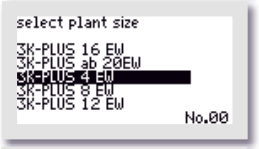
Select the menu item "SELECT PLANT TYPES".

Then enter password 1 – or, for further settings, password 2 – digit by digit and confirm with the ↵ button to enter the menu.



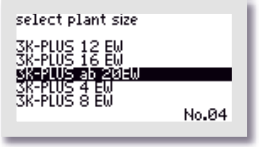
First, the "BASIC TYPE" of the system is requested. Use the ↓ ↑ buttons to select the desired type in the second line "(NEW)".
For operation as a fixed bed plant, select "**FIXED BED**", for operation as a fluidised bed plant, select "**FLUIDISED BED**". Confirm your selection with the ↵ button.



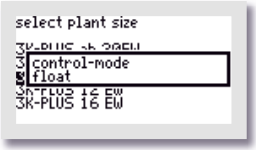


Then use the ↓ ↑ buttons to select the desired/required EW number as the "PLANT TYPE". If the marker (= black bar) is on the correct PE number (according to the wastewater treatment calculation), confirm with the ↵ button. If the required PE number is not directly available for selection, select the next largest entry.

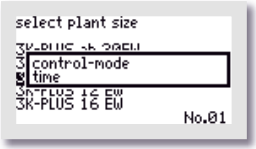
All parameters for the treatment cycle are automatically preset through this selection, but can be readjusted if necessary.



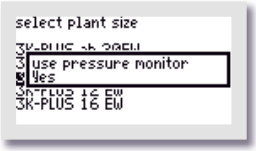
For plant sizes from 21 to 50 PE, please select "3K-FLOW from 20" or "3K-PLUS from 20". The cycle presets for plant sizes from 21 to 50 PE are the same; the different air volumes required are reached with different sizes and volumes of membrane diffusers and compressors. These settings can be readjusted where necessary.



The "CONTROL TYPE" window allows you to choose between a time-controlled cycle or a float-controlled cycle. The desired control type can be set in the second line. Press the ↓ ↑ buttons to select "TIME" or "FLOAT". The selected Control type is accepted with the ↵ button.



For the operation of a **fluidised** or **fixed bed plant**, the control type "**TIME**" should be selected by default. Only if an additional PUMP is operated (see below) may the setting FLOAT be required.



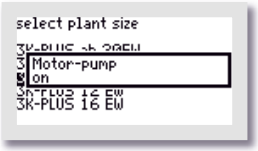
Then, pressure monitoring can be switched "ON" or "OFF" in the "WITH PRESSURE MONITORING" window.

To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the diffusers.
If the sensor is not connected to the air hose, select "NO".

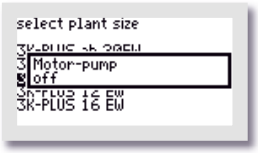
If password 1 was used, the menu item "SELECT PLANT TYPES" is completed here and the software jumps back to the "SERVICE" main menu.

If the menu item "SELECT PLANT TYPES" was selected with password 2, the additional functions follow as further setup options.

The **additional functions** can only be put into operation **with password 2**.



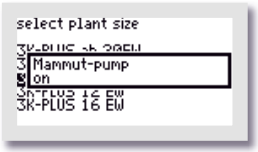
If you need a pump in addition to the standard wastewater treatment function, use the ↓ ↑ buttons to select the "ON" option in the second line of the next window, "MOTOR PUMP".



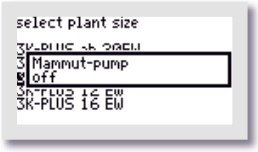
If you do not require this option, please answer the query with "OFF".

Confirm your selection with the ↵ button.

If you have selected the additional pump, it will be operated in standard mode with control type "TIME" purely according to a time cycle, as specified in the Parameters 1 menu.
If the "FLOAT" CONTROL TYPE is selected, the pump also operates according to a time cycle, but only if the float switch is in the upper switching position.
If "0000" is entered for PUMP "OFF", the pump operates without a time cycle and is only dependent on the float switch position: If the float switch drops to the lower position, the pump is switched off, and if the float switch rises to the upper position, it operates continuously.



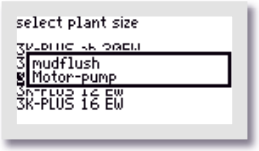
The pump required in addition to the standard wastewater treatment function can also be designed as a lifter. In this case, use the ↓ ↑ buttons to select the "ON" option in the second line of the next window, "AIRLIFT PUMP".



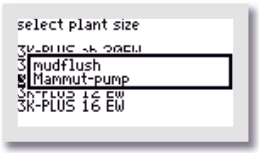
If you do not require this option, please answer the query with "OFF".

Confirm your selection with the ↵ button.

This lifter is controlled as described above for the motor pump.

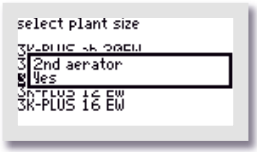


Then you are asked how the sludge discharge is to take place, with a submersible motor pump or with a compressed air lifter. If the sludge recirculation is to take place with a pump instead of a lifter, use the ↓ ↑ buttons to select the option "MOTOR PUMP" in the second line "(NEW)" of the next window, "SLUDGE DISCHARGE".



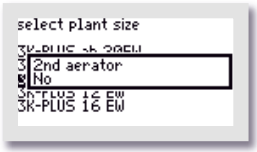
If you do not require this option, please answer the query with "AIRLIFT PUMP".

Confirm your selection with the ↵ button.

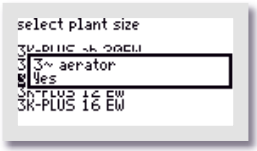


If you are operating a plant with 2 (or 3) compressors, please select "YES" in the window with the query "2nd COMPRESSOR".

After completing the system type selection (or commissioning), select another free output (T1 to T7) for connecting the second compressor (or the second and third compressors, both of which are controlled via a single output) in the "Outputs" menu.

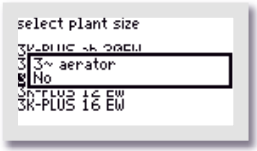


If you do not require this option, please answer the query with "NO".

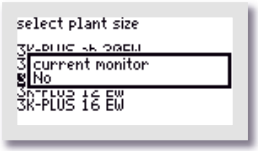


In the window with the query "3~COMPRESSOR", you can select "YES" in the bottom line "(New)" to allow a 3-phase compressor with 400 V to be controlled. With this option, the standard current monitoring is switched off. This setting is required if an ORKA S200 or ORKA S400 module is selected to control the compressor(s). The option "YES" must always be selected if one or more units are controlled via one contactor. With this setting, the compressor for the lifters is connected as usual. This is not switched on during aeration.

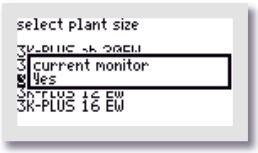
After completing the plant type selection (or commissioning), select another free output (T1 to T7) for connecting the three-phase compressor in the "Outputs" menu.



If you do not require this option, please answer the query with "NO".



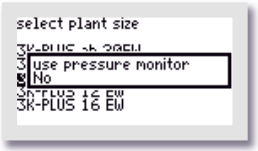
If you have selected "YES" for the query "3~COMPRESSOR", you will be asked in the "CURRENT MONITORING" window whether the three-phase compressor should be monitored for current errors.
If you do not require this monitoring, you can switch it off with "NO".



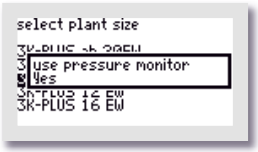
If you switch on the monitoring by selecting "YES" in the menu "CURRENT MONITORING", an error message will be generated if the device fails.

For this monitoring, however, the controller must be prepared at the factory.

If the controller was not prepared, select "NO".



In the "WITH PRESSURE MONITORING" window that follows, you will be asked whether the 3-phase compressor should be monitored for pressure.
If you do not require this monitoring, you can switch it off with "NO".



If you switch on the monitoring by selecting "YES" in the menu "WITH PRESSURE MONITORING", an error message will be generated if the device fails.

To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the diffusers.
If the sensor is not connected to the air hose, select "NO".

The software then jumps back to the "SERVICE" main menu. Use the ↓ ↑ buttons to exit the menu.

If additional options have been selected, additional settings may be required in the "OUTPUTS" menu or in the "PARAMETERS 3" menu (see Chapter 11.3.4.6 and Chapter 11.3.4.8).

11.3.3 "Settings" menu

The operator settings can be configured in the "SETTINGS" menu. Press the ↵ button to enter the menu to select the desired item.

11.3.3.1 Setting the date and time

To correct the time and/or date, use the ↓↑ buttons to select the "SET CLOCK" line. If the marker (=black bar) is on the desired entry, the middle ↵ button opens the window for adjusting the values.

The first digit can be changed with the ↓↑ buttons. If the correct value has been set, the middle ↵ button is used to accept the digit. The same procedure applies to all subsequent digits.
Input sequence: 2 digits each:
day, month, year, hour, minute (DD/MM/YY_hh:mm)

The clock is quartz-controlled. It should also be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes it easier to evaluate the maintenance.

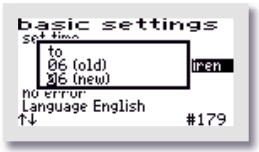
Example: Time changed from 13:20 to 13:26.

11.3.3.2 LCD contrast

The LCD contrast can be optimised here. As a rule, no change is necessary.

11.3.3.3 Alarm buzzer ("Alarm pause")

By default, the acoustic alarm is switched off from 17:00 to 6:00. During this time, errors are only displayed optically. This setting can be changed in the menu item "ALARM PAUSE".



Attention:
No acoustic alarm is sounded during the time period set here!

The sound for the alarm buzzer is set here. You can choose between: "SIREN", "MELODY" and "OFF"

The default setting is "SIREN".

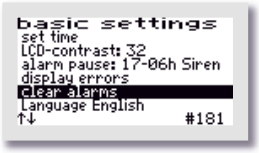
Attention:
No acoustic alarm is sounded if the "OFF" setting is selected.

11.3.3.4 Display errors

The error logbook is called up via the "DISPLAY ERRORS" menu item.

The error logbook shows the last 30 error events with the date and time. The ↓ ↑ buttons are used to scroll through the logbook, the ↵ button is used to exit the menu.
Nothing can be deleted in the error logbook!

11.3.3.5 Delete alarm



If a fault (alarm) has occurred, the alarm message can be reset by pressing the ↵ button after selecting the "CLEAR ALARM" line. A window with the message "OK" opens for approx. 1 second and then the display in the menu changes to "NO ERRORS". The red flashing LED goes out and the error message in the standard window is deleted.
The error message remains stored in the error logbook and can thus be evaluated later.

Note: If the ↵ button is pressed in the main display – which is the standard display during operation – in the event of a fault, the buzzer is switched off and the "DELETE ALARM" window opens, which automatically changes to the query "SAFE?" after a short time.
If you answer "YES", the error display is deleted and the red flashing LED goes out. The error message remains stored in the error logbook and can thus be evaluated later.
If the "ARE YOU SURE?" query is answered with "NO", the error message remains in the main display.

Then the info window opens for approx. 3 seconds with the information about the plant settings.

11.3.3.6 Language

The language of the controller is selected here. The controller is prepared for several languages. The languages currently programmed are:
– German
– English
– Swedish
– French
– Finnish

11.3.4 Other menus with displays or settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually set.
An adjustment may only be performed by a specialist, as the purification performance of the system may be reduced under certain circumstances and the national technical approval may become void.

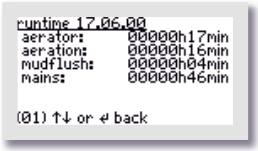
In order to change the displayed values, however, the password must first be entered.

In order to restore the original factory settings after changes have been made to the settings (e.g. changed aeration times), you can select the plant type again (see Chapter 11.3.2.4). This will restore the default values.

11.3.4.1 Operating hours display

The operating hours of the individual units are displayed in the "OPERATING HOURS" menu. The operating hours are counted up if the controller has switched on the compressor (or possibly a pump). The display is in hours and minutes.

If the ↵ button is pressed, the operating hours of the last (up to 52) weeks are displayed (operation log).

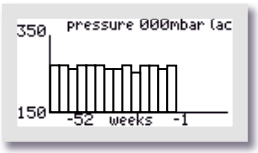


The last line shows the calendar week (in the example: the 52th CW) in which the values were stored (always on Sunday).

The ↓ ↑ buttons can be used to scroll from week to week.

Note:
This function only works correctly if the date and time were set correctly.

11.3.4.2 Pressure log



In the graphic menu "PRESSURE", the current pressure is documented in the upper line and the counterpressure (from the pressure monitoring) is documented on a weekly basis in the graphic.
The pressure is only displayed graphically starting at 150 mbar.
When operating with a buffer, however, the display has only limited informative value.

11.3.4.3 Ventilation

The "AERATION" menu displays the selected aeration intervals in day and in night mode, i.e. it displays for how many minutes aeration is alternately switched "ON" / "OFF" (clocking).

The times can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓↑ buttons and confirmed with the ↵ button.

11.3.4.4 Parameters 1

This menu displays the duration of the total aeration phase and the sludge discharge, the start and end of night mode and other parameters depending on the setting.

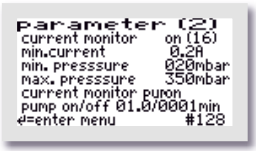
The times can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓↑ buttons and confirmed with the ↵ button.

11.3.4.5 Parameters 2

Different parameters are displayed in the "PARAMETERS 2" menu depending on the setting. The parameters "CURRENT MONITORING" and "MIN. CURRENT" are always available.

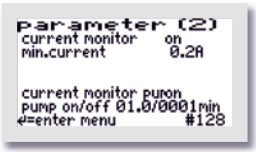
If the controller switches on a unit (e.g. the compressor or a pump), it is not ensured with certainty that it will run. Even if the switching relay is switched on, overheating, defective cables or other defects may nevertheless prevent the unit from running. The controller therefore monitors whether current is also flowing in the circuit. If the current falls below a limit value that is set by default to 0.2 A on the software side, a current alarm is displayed (e.g.: I Bel).

The controller also monitors the pressure generated during aeration and sludge recirculation. By default, the minimum pressure is set to 20 mbar and the maximum pressure to 350 mbar. If the minimum permissible pressure is not reached or the maximum permissible pressure is exceeded, the controller issues an alarm (pmin or pmax).



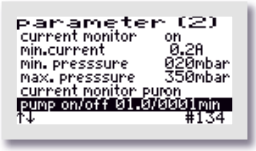
In this menu, current monitoring can be switched "OFF" or "ON". By default, current monitoring is set to "ON".

In addition, the currently flowing current is displayed in the main display for monitoring purposes.



The minimum and maximum permissible pressures can be changed in this menu, if necessary.

If pressure monitoring is switched off, the min. pressure and max. pressure displays are omitted.



In the example, an additional pump is selected. The time intervals for ON and OFF can be changed via "PUMP ON/OFF". If the interval for "OFF" is set to "0000" and "FLOAT" is set as the CONTROL TYPE, the pump operates without a time cycle, only depending on the position of the float switch; i.e. if the float switch drops to the lower position, the pump is switched off, and if the float switch rises to the upper position, it operates continuously.

11.3.4.6 Parameters 3

Various parameters may be displayed and adjusted in the "PARAMETERS 3" menu depending on the presetting.

The exact appearance of the menu depends on the respective presets. If no relevant functions are selected, the menu remains empty.

In the example, a dosing pump for phosphate precipitation and a UV module are connected. In this case, the data regarding the dosing agent supply and the dosing time can be adjusted and the remaining UV time can be reset.

Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons.

In this example, the dosing time is to be adjusted.

The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons – in this case from 80 to 60 seconds – and confirmed with the ↵ button.

11.3.4.7 Pressure displays

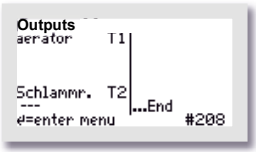
This menu displays the respective pressure during the last cycle. The aeration and surplus sludge counterpressures are each stored for each individual process. Only the pressure measurement of the respective last phase is displayed.
For aeration, 2 are displayed: the minimum and maximum pressure.
If pressure monitoring is switched off, this menu is omitted.

If a sludge pump is connected instead of the lifter, this output is not shown as a pressure output.

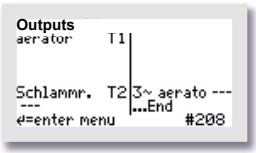
11.3.4.8 Outputs

The "OUTPUTS" menu shows which electrical output is assigned to which function. The exact display depends on the selected plant parameters. Only as many outputs are displayed as were selected during commissioning. These are preassigned by the controller by default. If necessary, the default assignment can be changed.

Use the ↵ button to access the menu. The lines to be changed are selected with the ↓↑ buttons. To exit the menu again keep pressing one of the ↓↑ buttons in one direction until the next menu opens.



In this example, the compressor is controlled via output T1 and the sludge recirculation via output T4.



In this example, the compressor is controlled via output T1 and the sludge discharge via output T4. In addition, a three-phase compressor is controlled via output T3.

The functions can also be assigned a different output if required. The respective menu item is called up with the ↵ button. The settings are changed with the ↓↑ buttons. Use these to select a free output. To accept the settings, confirm by pressing the ↵ button (see Chapter 9.3.4.9 and 10.3.4.9).

11.4 Presets

Number of inhabitants: 8
Control type: Float

11.5 Switching times – Basic settings

Aeration phase, day mode		Aeration phase, night mode			Aeration phase, day mode			Aeration phase, night mode			
Start of day mode (h)	End of day mode (h)	Start of night mode (h)	End of night mode (h)	PE number	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Diffuser ON (min)	Diffuser OFF (min)	Duration (min)	Sludge discharge (s)
6:00	21:00	21:00	6:00	4	5.0	5.0	60	5.0	10.0	60	30
6:00	21:00	21:00	6:00	8	5.0	5.0	60	5.0	5.0	60	30
6:00	21:00	21:00	6:00	12	10.0	5.0	60	10.0	5.0	60	30
6:00	21:00	21:00	6:00	16	10.0	5.0	60	10.0	5.0	60	30
6:00	21:00	21:00	6:00	20	10.0	5.0	60	10.0	5.0	60	30
6:00	21:00	21:00	6:00	>20	10.0	5.0	60	10.0	5.0	60	30

12 Operation as a trickling filter plant

The small wastewater treatment plant must be operated by the owner or a competent person commissioned by the owner (operator).

After commissioning, the plant is operated fully automatically. It is controlled by a PLC. The sequence and flow of the phases are programmed in the controller. The times for pumping out the clear water and charging the trickling filter and primary sedimentation from the pump sump, as well as for the recirculation of the excess sludge from the secondary sedimentation, must be adjusted to the plant in the controller.

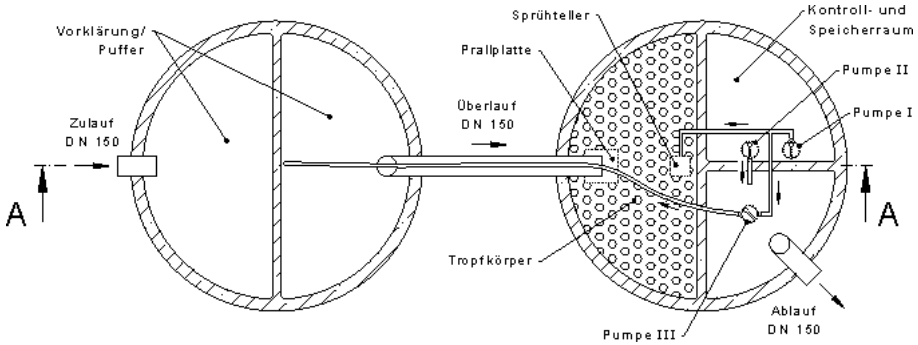


Figure 22: Trickling filter plant with pumps

If any faults occur during operation of the plant, they are reported visually and acoustically by the controller. The red LED flashes and the buzzer sounds. The error message remains in the main display until the error is acknowledged (see Chapter 12.3.3.5).

The error message remains stored in the error logbook and can thus be evaluated later.

The controller has a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to notify the operator that wastewater treatment has stopped. If the power supply returns after a power failure, the device switches on again automatically.

If pump 2 is a pump fitted with a float switch, the current monitoring for the pump in question must be switched off (see Chapter 12.3.4.2).

Operation as a trickling filter plant is possible 3 different configurations:

Configuration A

Units of the TYPE C trickling filter plant with 3 pumps

3-pump plant with 2 separate float switches for pump 2

Pump 1: Feed pump of the trickling filter pumps from pump chamber to TF and into PS
Pump 2: Drain pump (corresponds to clear water pump) delivers from pump chamber to SS
Pump 3: Surplus sludge return pump delivers from SS to PS
SW1: Dry-running protection for P2 in the pump chamber
SW2 Flood alarm for P2 in the pump chamber

P1

Pump 1 delivers to the trickling filter and/or to the primary sedimentation (return) according to the preset time cycle. In addition, the flushing time takes place at night at 03:00 h.

P2

As soon as the (external) lower float switch (SW1 = dry-running protection) in the pump chamber is closed, pump 2 delivers from the pump chamber to the secondary sedimentation according to the preset time cycle.
If the (external) upper float switch in the pump chamber (SW2 = flood alarm) is closed, pump 2 is permanently put into operation. In addition, an acoustic and optical warning (flooding) is given if the float switch 2 does not drop below the switching point within one hour.

P3

Pump 3 (sludge recirculation) delivers from the secondary sedimentation to the primary sedimentation according to the preset time cycle.

Interaction of the pumps

Only one pump runs at a time (exception: flooding**!**) Pump 1 has priority over pumps 2 and 3, pump 3 has priority over pump 2.
The switch-off point of SW1 for pump 2 (clear water discharge) must be selected in such a way that pump 1 (TF charging) is always left with sufficient water for the return flow.

Configuration B

Units of the TYPE C trickling filter plant with 2 pumps

2-pump plant with 2 separate float switches for pump 2

Pump 1: active: NO

Pump 2: Drain pump (corresponds to clear water pump) delivers from pump chamber to SS and onto the trickling filter

Pump 3: Surplus sludge return pump delivers from SS to PS

SW1: Dry-running protection for P2 in the pump chamber

SW2 Flood alarm for P2 in the pump chamber

P1

Deactivate

P2

As soon as the (external) lower float switch (SW1 = dry-running protection) in the pump chamber is closed, pump 2 delivers from the pump chamber to the secondary sedimentation according to the preset time cycle.

If the (external) upper float switch in the pump chamber (SW2 = flood alarm) is closed, pump 2 is permanently put into operation. In addition, there is an acoustic and optical warning message (flooding).

P3

Pump 3 (SS recirculation) delivers from the secondary sedimentation into the primary sedimentation and/or onto the trickling filter (return) according to the preset time cycle.

Interaction of the pumps

Only one pump runs at a time (exception: flooding**!**)

Configuration C

Units of the TYPE N trickling filter plant with 2 pumps

2-pump plant with 1 separate float switch for pump 2
Pump 1: active: NO
Pump 2: Drain pump (corresponds to clear water pump) delivers from pump chamber to SS and onto the trickling filter
Pump 3: Surplus sludge return pump delivers from SS to PS
SW2 Flood alarm for P2 in the pump chamber

P1
Deactivate

P3
Pump 3 (SS recirculation) delivers from the secondary sedimentation into the primary sedimentation and/or onto the trickling filter (return) according to the preset time cycle.

P2
As soon as the (external) float switch (SW2) in the pump chamber is closed, pump 2 delivers from the pump chamber to the secondary sedimentation according to the preset time cycle.
If the (external) float switch in the pump chamber (SW2) is closed, pump 2 is permanently put into operation. In addition, there is an acoustic and optical warning message (flooding).

Interaction of the pumps
Only one pump runs at a time (exception: flooding**!**)

12.1 Commissioning of the controller

Before commissioning the plant, the primary and secondary sedimentation must be filled with water up to the outlet, and the pump interior must be filled until the (lower) float floats up. If opened, the housing of the controller must be closed. All the required units must be connected to the controller.

PLEASE NOTE! The **pump running times** must be **read out** from the **previously used controller before switching it off** and **noted down** in order to transfer them to the new controller during commissioning.

Please make a note of the pump running times set on the old controller **before** you switch it off. The commissioning of the controller begins with the insertion of the power plug of the controller. After plugging in the plug, the controller starts with a self-test with a duration of approx. 3 seconds while displaying "booting system..." and an hourglass symbol. At the same time, the green LED lights up.

After the indication "Fuse Check: values" with the message "Fuses o.k.", the start message "AQUATO" appears on the display. The display Vx.xx.xx (e.g. V5.01.04) in the lower part of the message is the version number of the software.

The display "COMMISSIONING" then appears during initial commissioning. Subsequently, when commissioning the K-Pilot 14.5 controller, the following must first be entered (see Chapter 12.3.2.4, 12.3.3.1 and 12.3.3.6):

- Password (4-digit) with password 1
  or with password 2
- Language
- Date and time
- Basic plant type – here select: "**TRICKLING FILTER C**" or "**TRICKLING FILTER N**"
  For **3**-pump plants, select "Trickling filter **C**".
  For **2**-pump plants with 1 float switch, select "Trickling filter **N**".

After these inputs, the controller automatically switches to manual mode (see Chapter 12.3.2.2). The various functions can be checked in manual mode.

After ending manual mode, the controller continues to boot with the window "booting system..." and then "Fuse Check: values" with the message "Fuses o.k." before the start message "AQUATO" appears with the indication of the selected system type. Immediately afterwards, automatic mode is started automatically.

The commissioning engineer must ensure that the parameter settings in the controller have been made in such a way that they comply with the requirements (e.g. basic type and effluent class) of the approval and the water law license for the system on which the controller is to be used.

For trickling filter plants with 2 pumps, "PUMP 1" must be deactivated (see Chapter 12.3.4.2).

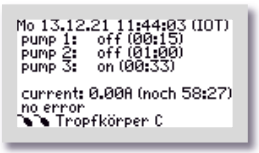
The pump running times still have to be adjusted for all trickling filter plants. To do this, please **carry over the settings from the old controller** and enter them in the menus "PUMP 1", "PUMP 2" and "PUMP 3" (see Chapter 12.3.4.2).

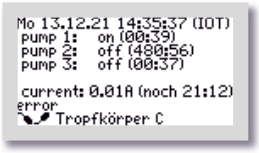
This concludes the commissioning process

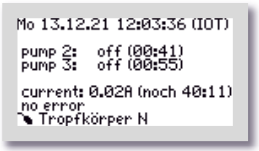
PLEASE NOTE!
The pump running times must be read out from the previous controller and transferred to the new one.

12.2 Main display

In the standard display, the controller shows the switching status of the plant and the units, e.g.:







1st line: Date and time

2nd line: Switching status of "PUMP 1:", "ON" or "OFF" and remaining time of this switching status

3rd line: Switching status of "PUMP 2:", "ON" or "OFF" and remaining time of this switching status

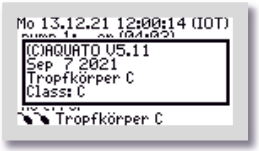
4th line: Switching status "PUMP 3:", "ON" or "OFF" and remaining time of this switching status

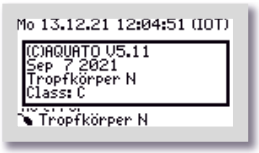
5th line: Blank line or (another pump may have been selected) switching status of "PUMP 4:", "ON" or "OFF" and remaining time of this switching status

6th line: Error display, otherwise "NO ERROR" if there is no error message

7th line: Float status up / down (1 float symbol for trickling filter N, 2 float symbols for trickling filter C), next to it the selected plant type: "Trickling Filter C" or "Trickling Filter N"

If the ↵ button is pressed in the standard display, an info window appears for approx. 3 seconds. This window displays the following:





- Software version
- Date of the version
- Type: Trickling Filter C or Trickling Filter N
- Effluent class C

The exact display depends on the selected settings.

In addition, the ↵ button can be used in this menu to shut off the buzzer or the alarm (see also Chapter 12.3.3.5).

12.3 Menu

12.3.1 Menu structure

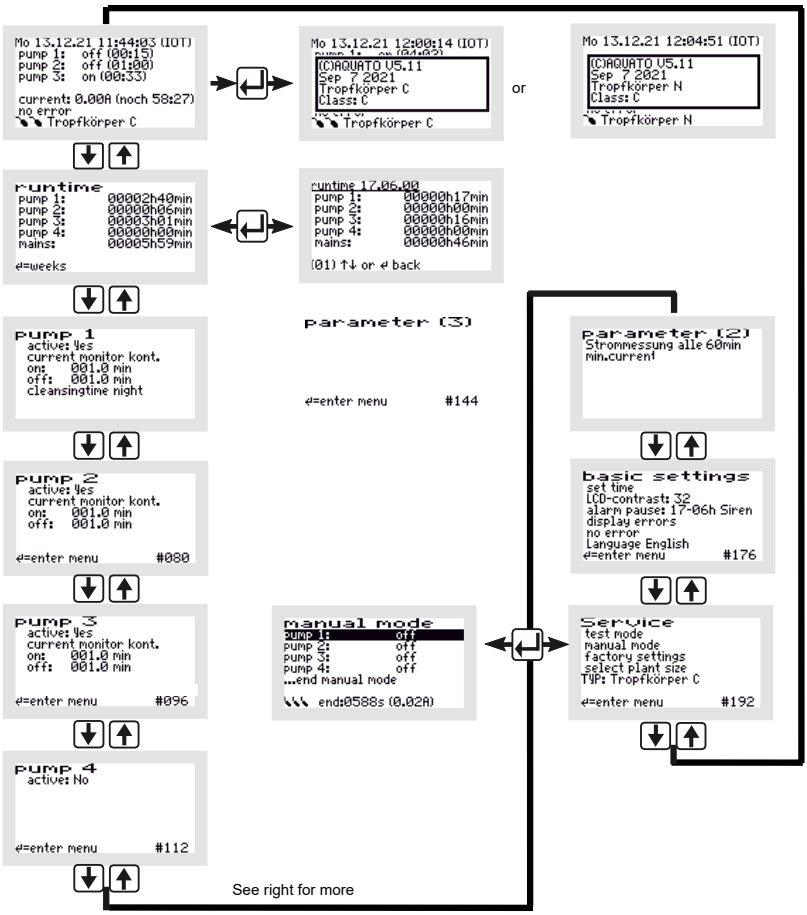


Figure 23: Menu structure of Trickling Filter C and Trickling Filter N

The exact display depends on the status of the system and the set parameters. The different variants of the display are explained in more detail below.

Use the ↓↑ buttons to move from menu to menu. If you move constantly in the same direction, you will eventually return to the standard display.

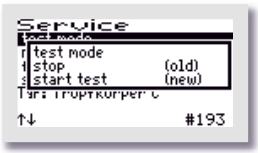
To access the submenus in the menu displayed, the middle ↵ button must be pressed. After pressing the ↵ button, either a window opens directly or the first menu item is marked by a black bar, depending on the selected menu.

The individual points are selected with the ↓↑ buttons. The ↵ button is used, if available, to enter the submenu or edit mode.

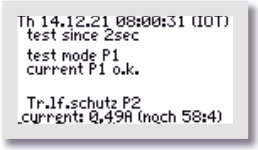
12.3.2 "Service" menu

The Service menu is basically intended for the service technician. The following can be selected:
- System test / test mode
- Manual mode
- Factory settings (only with password 2)
- Select plant types (only with password 1 or 2)

12.3.2.1 System test / test mode



Test mode is used to check whether the units consume power properly. If the automatic test mode has been selected with the ↓↑ buttons via the menu item "SYSTEM TEST", it is called up with the ↵ button. The "System Test" window offers the selection "CANCEL" or "START TEST". These two options are selected with the ↓↑ buttons in the bottom line "(NEW)". After selecting and confirming "START TEST", the system test begins.



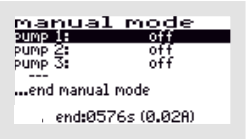
The test is fully automatic. The individual functions are tested in sequence (approx. 15 seconds each). If all the units are functioning correctly, no alarm message is issued.

Test operation can be cancelled by pressing the ↵ button.

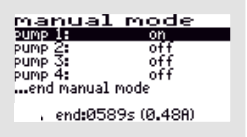
After testing all the functions, test mode ends automatically and the interrupted automatic mode is continued.

12.3.2.2 Manual mode

In manual mode of the K-Pilot 14.5 controller, the activated pumps can be operated for the basic types Trickling Filter C and Trickling Filter N, respectively. The exact display depends on the parameters set (during commissioning).



The ↓ ↑ buttons can be used to select between the available parameters "PUMP 1" to "PUMP 4" – the pumps displayed differ depending on the preset – by moving the black bar to the desired entry.



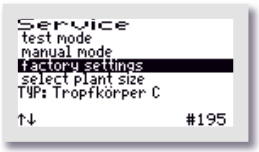
If "PUMP 1" is selected, for example, it can be switched "ON" and "OFF" with the ↵ button.

Manual mode is ended by using the ↓ ↑ buttons to move the selection bar to the menu item "... End manual mode" and then confirming by pressing the ↵ button. If the manual mode is not ended with "... END MANUAL MODE", the controller automatically switches back to automatic mode 15 minutes after the last pressing of a button.

Once manual mode has been ended, the controller continues the interrupted sequence in automatic mode.

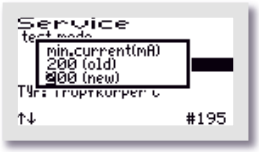
12.3.2.3 Factory settings

Under "FACTORY SETTINGS", the current error limit can be changed. The **resetting** of the controller, which is also possible in the factory settings, is **not permitted** throughout operation. Access to the factory settings is possible **with password 2 only**.



The following values can be changed/reset in the "FACTORY SETTINGS".

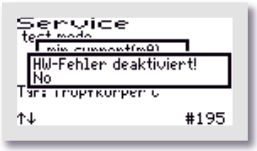
First enter password 1 – or, for further settings, password 2 – digit by digit and confirm with the ↵ button to enter the menu.



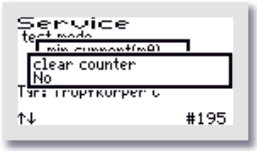
The first window that opens is "MIN. CURRENT (mA)". Here you can change the limit at which an error is displayed. The default setting is 200 mA. The lowest possible limit is 50 mA. The ↓ ↑ buttons can be used to change the values digit by digit starting from the left in the bottom line "(NEW)". The selected value is accepted with the ↵ button. After confirming the 3rd digit, the next window opens automatically.

The subsequent deletion options are not permitted during the entire operating time of a small wastewater treatment plant. The queries must be answered with "NO".

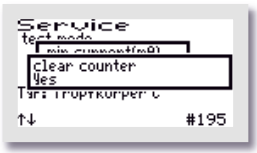
All queries in the Factory Settings menu must be answered with "NO". This data must <u>not</u> be deleted.



In the next window, "HW error deactivated" the flooding error message can be deactivated. This is usually unnecessary. After confirming the selection, the next window opens automatically.



The "DELETE COUNTER" window opens.
If "NO" is selected, the menus with the individual units are skipped and the "DELETE LOG" window opens immediately.
→ **Answer: "NO".**



If "YES" is selected, the controller moves on to the individual units each time the ↵ button is pressed. In the first window to follow, i.e. "P1", the counter of the running time of the compressor can be reset to zero with the ↓↑ buttons by selecting "YES" in the bottom line.
→ **Answer: "NO".**

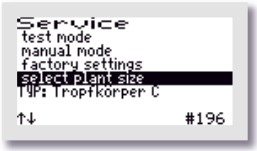
The same procedure can be followed in the subsequent windows "P2", "P3", "P4" and "MAINS".
→ **Answer: "NO".**

The last window to open in this menu is "DELETE LOG". If "YES" is selected here, all entries and settings are deleted. Then the controller starts over again with commissioning.
→ **Answer: "NO".**

PLEASE NOTE! The operations "**Delete counter**:" and "**Delete log**" are **prohibited** throughout the operation of a plant, as the operation log must record the running times of the units.

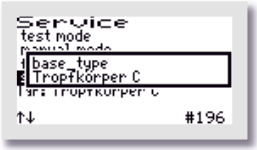
12.3.2.4 Selecting a plant type

In this menu, you can set/change the plant type and size, as well as other parameters required for operation.

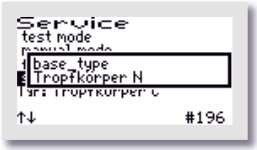


Select the menu item "SELECT PLANT TYPES".

Then enter password 1 – or password 2 – digit by digit and confirm with the ↵ button to enter the menu.



First, the "BASIC TYPE" of the system is requested. Use the ↓ ↑ buttons to select the desired type in the second line.



For operation as a trickling filter plant with 3 pumps and 2 floats, please select "**TRICKLING FILTER C**". For operation as a trickling filter plant with 2 pumps and 2 floats, please also select "**TRICKLING FILTER C**". For operation as a trickling filter plant with 2 pumps and 1 float, please select "**TRICKLING FILTER N**". Confirm your selection with the ↵ button.

The parameters for the pump running times are automatically preset through this selection, but these parameters **must** be readjusted. To do this, you need the **running times from the previous controller** in order to accept the correct settings.

The menu item "SELECT PLANT TYPES" is thereby completed and the software jumps back to the "SERVICE" main menu. Use the ↓ ↑ buttons to exit the menu.

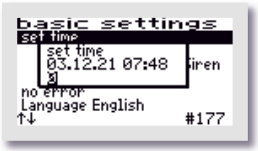
PLEASE NOTE! The pump running times must be read out from the previous controller and transferred to the new one.

12.3.3 "Settings" menu

The operator settings can be configured in the "SETTINGS" menu. Press the ↵ button to enter the menu to select the desired item.

12.3.3.1 Setting the date and time

To correct the time and/or date, use the ↓ ↑ buttons to select the "SET CLOCK" line. If the marker (=black bar) is on the desired entry, the middle ↵ button opens the window for adjusting the values.



The first digit can be changed with the ↓ ↑ buttons. If the correct value has been set, the middle ↵ button is used to accept the digit. All subsequent digits are selected the same way.
Input sequence: 2 digits each:
day, month, year, hour, minute (DD/MM/YY_hh:mm)

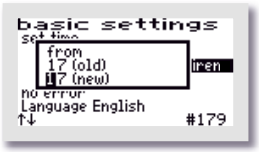
The clock is quartz-controlled. It should also be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes it easier to evaluate the maintenance.

Example: Time changed from 13:20 to 13:26.

12.3.3.2 LCD contrast

The LCD contrast can be optimised here. As a rule, no change is necessary.

12.3.3.3 Alarm buzzer ("Alarm pause")



By default, the acoustic alarm is switched off from 17:00 to 6:00. During this time, errors are only displayed optically. This setting can be changed in the menu item "ALARM PAUSE".

Attention:
No acoustic alarm is sounded during the time period set here!

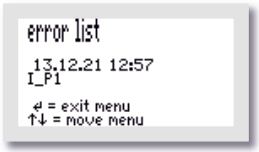
The sound for the alarm buzzer is set here. You can choose between: "SIREN", "MELODY" and "OFF"

The default setting is "SIREN".

Attention:
No acoustic alarm is sounded if the "OFF" setting is selected.

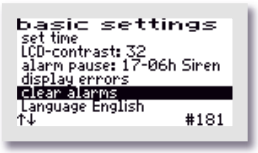
12.3.3.4 Display errors

The error logbook is called up via the "DISPLAY ERRORS" menu item.



The error logbook shows the last 30 error events with the date and time. The ↓ ↑ buttons are used to scroll through the logbook, the ↵ button is used to exit the menu.
Nothing can be deleted in the error logbook!

12.3.3.5 Delete alarm



If a fault (alarm) has occurred, the alarm message can be reset by pressing the ↵ button after selecting the "CLEAR ALARM" line. A window with the message "OK" opens for approx. 1 second and then the display in the menu changes to "NO ERRORS". The red flashing LED goes out and the error message in the standard window is deleted.
The error message remains stored in the error logbook and can thus be evaluated later.

Note: If the ↵ button is pressed in the main display – which is the standard display during operation – in the event of a fault, the buzzer is switched off and the "DELETE ALARM" window opens, which automatically changes to the query "SAFE?" after a short time.
If you answer "YES", the error display is deleted and the red flashing LED goes out. The error message remains stored in the error logbook and can thus be evaluated later.
If the "ARE YOU SURE?" query is answered with "NO", the error message remains in the main display.

Then the info window opens for approx. 3 seconds with the information about the plant settings.

12.3.3.6 Language

The language of the controller is selected here. The password must be entered to do this. The controller is prepared for several languages. The currently programmed languages are:
– German
– English
– Swedish
– French
– Finnish

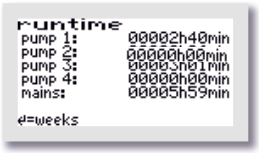
12.3.4 Other menus with displays or settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually set.
An adjustment may only be performed by a specialist, as the purification performance of the system may be reduced under certain circumstances and the national technical approval may become void.

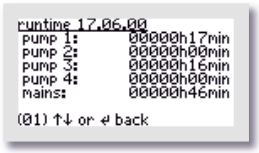
In order to change the displayed values, however, the password must first be entered.

In order to restore the original factory settings after changes have been made to the settings (e.g. changed running times), you can select the plant type again (see Chapter 12.3.2.4). This will restore the default values.

12.3.4.1 Operating hours display



The operating hours of the individual units are displayed in the "OPERATING HOURS" menu. The operating hours are counted up if the controller has switched on the compressor (or possibly a pump). The display is in hours and minutes.



If the ↵ button is pressed, the operating hours of the last (up to 52) weeks are displayed (operation log).
The last line shows the calendar week (in the example: Week 1) in which the values were stored (always on Sunday).
The ↓ ↑ buttons can be used to scroll from week to week.

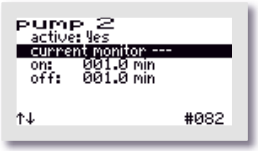
Note:
This function only works correctly if the date and time were set correctly.

12.3.4.2 Pump 1 to Pump 4

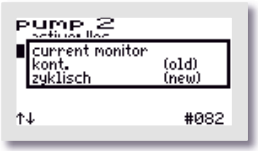
Different parameters are displayed in the "PUMP 1" to "PUMP 4" menus depending on the setting. The parameter "ACTIVE" is always included.

If the parameter "ACTIVE" is set to "NO", no further parameters are displayed.

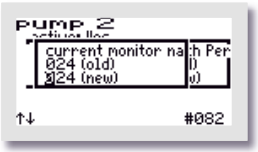
The parameters can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓↑ buttons and confirmed with the ↵ button.



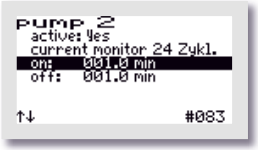
There are 3 options for "CURRENT MONITORING". The default presetting is "CONT." (= continuous), but it can also be set to "CYCLIC" or switched off entirely (display: "---"). If the "CYCLICAL" option was selected, the time period can be set in the "PARAMETERS (2)" menu (see Chapter 12.3.4.3).



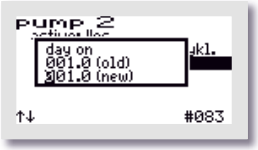
If the pump is fitted with a float switch, the "CYCLE" option is used to check whether it is working correctly. For this purpose, you can set the number of cycles in which the function is queried before an error message occurs. In the example, 24 cycles are selected (see Chapter 12.3.4.3, "PARAMETERS (2)").



In addition, the currently flowing current is displayed in the main display for monitoring purposes.



The running times of the pumps are also set here. The "ON" switching time and the "OFF" switching time can be set independently of each other. They then take place in alternation.



12.3.4.3 Parameters 2

The Parameters (1) menu is omitted for the trickling filter plant, as it has no function for this plant type. Different parameters are displayed in the "PARAMETERS (2)" menu depending on the setting. The parameters "CURRENT MEASUREMENT" and "MIN. CURRENT" are always available.

If the controller switches on a unit (e.g. a pump), it is not ensured with certainty that it will run. Even if the switching relay is switched on, overheating, defective cables or other defects may nevertheless prevent the unit from running. The controller therefore monitors whether current is also flowing in the circuit. If the current falls below a limit value that is set by default to 0.2 A on the software side, a current alarm is displayed (e.g.: "I_P1").

In this menu, current monitoring can be switched "OFF" or "ON". By default, "CURRENT MEASUREMENT" is set to every "60" minutes. However, this parameter only has an effect if the setting "CYCLIC" has been selected for "CURRENT MONITORING" in one or more of the "PUMP 1" to "PUMP 4" menus (see Chapter 12.3.4.2). Then the cycle time (in the example = 60 minutes) and the number of cycles from the menu of the respective "PUMP" (e.g. 24 cycles) result in the time after which an error message is output. For example: 24 cycles times 60 minutes results in an error message being output if the pump has not started at least once within a period of 1440 minutes (= 1 day).

The parameters can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons and confirmed with the ↵ button.

In addition, the currently flowing current is displayed in the main display for monitoring purposes.

12.4 Presets

PUMP 1, 2, 3:	active: YES Current monitoring continuous ON: 1.0 minute OFF: 1.0 minute
PUMP 4:	active: NO

13 Operation as a constructed wetland plant

The small wastewater treatment plant must be operated by the owner or a competent person commissioned by the owner (operator).

After commissioning, the plant is operated fully automatically. It is controlled by a PLC. The sequence and flow of the phases are programmed in the controller. The pumping times adapted to the plant must be set in the controller.

Units of a constructed wetland plant
Pump 1: Charging pump
Pump 2: Clear water pump (fitted with float switch) in a pump shaft (continuously running)
Pump 3: optional
SW1: Flood alarm for P1 in the charging shaft
SW2: Flood alarm for P2 in the charging shaft (pumping out purified water)

P1
Pump 1 delivers the water from the preliminary sedimentation to the plant bed according to the preset time cycle.

P2
Pump 2, which is controlled by the float switch, delivers the purified water from the pump shaft into the infiltration or the receiving water.

Interaction of the pumps
The two pumps run independently of each other.

If a pump is designed to be fitted with a float switch, the current monitoring for the pump in question must be switched off (see Chapter 13.3.4.2).

If any faults occur during operation of the plant, they are reported visually and acoustically by the controller. The red LED flashes and the buzzer sounds. The error message remains in the main display until the error is acknowledged (see Chapter 13.3.3.5).

The error message remains stored in the error logbook and can thus be evaluated later.

The controller has a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to notify the operator that wastewater treatment has stopped. If the power supply returns after a power failure, the device switches on again automatically.

13.1 Commissioning of the controller

Before commissioning the plant, the preliminary sedimentation and the secondary sedimentation or the pump shaft must be filled with water at least up to the lower switching point of the respective float and the housing of the controller – if it was opened – must be closed. All the required units must be connected to the controller.

PLEASE NOTE! The **pump running times** must be **read out** from the **previously used controller before switching it off** and **noted down** in order to transfer them to the new controller during commissioning.

Please make a note of the pump running times set on the old controller **before** you switch it off. The commissioning of the controller begins with the insertion of the power plug of the controller. After plugging in the plug, the controller starts with a self-test with a duration of approx. 3 seconds while displaying "booting system..." and an hourglass symbol. At the same time, the green LED lights up.

After the indication "Fuse Check: values" with the message "Fuses o.k.", the start message "AQUATO" appears on the display. The display Vx.xx.xx (e.g. V5.01.04) in the lower part of the message is the version number of the software.

The display "COMMISSIONING" then appears during initial commissioning. Subsequently, when commissioning the K-Pilot 27.6 controller, the following must first be entered (see Chapter 13.3.2.4, 13.3.3.1 and 13.3.3.6):

- Password (4-digit) with password 1
  or with password 2
- Language
- Date and time
- Basic plant type – here select: "**Wetland plant**" for constructed wetland plant

After these inputs, the controller automatically switches to manual mode (see Chapter 13.3.2.2). The various functions can be checked in manual mode.

After ending manual mode, the message "booting system..." appears again and then, after the display "Fuse Check: values" appears together with the message "Fuses o.k.", the start message "AQUATO" appears again with the indication of the selected plant type. Immediately afterwards, automatic mode is started automatically.

The commissioning engineer must ensure that the parameter settings in the controller have been made in such a way that they comply with the requirements (e.g. basic type and effluent class) of the approval and the water law license for the system on which the controller is to be used.

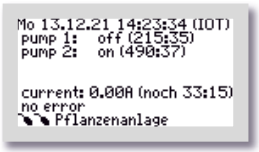
The pump running times still have to be adjusted for all constructed wetland plants. To do this, please **carry over the settings from the old controller** and enter them in the menus "PUMP 1" and "PUMP 2" (see Chapter 13.3.4.2).

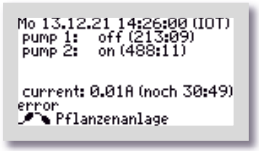
This concludes the commissioning process

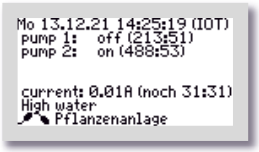
PLEASE NOTE!
The pump running times must be read out from the previous controller and transferred to the new one.

13.2 Main display

In the standard display, the controller shows the switching status of the plant and the units, e.g.:







1st line: Date and time

2nd line: Switching status of "PUMP 1:", "ON" or "OFF" and remaining time of this switching status

3rd line: Switching status of "PUMP 2:", "ON" or "OFF" and remaining time of this switching status

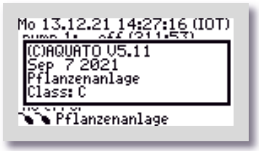
4th line: Blank line or (another pump may have been selected) switching status of "PUMP 3:", "ON" or "OFF" and remaining time of this switching status

5th line: Blank line

6th line: Error display, otherwise "NO ERROR" if there is no error message

7th line: Float state above / below , next to it the selected plant type: "Wetland Plant" for the type Constructed Wetland

If the button is pressed in the standard display, an info window appears for approx. 3 seconds. This window displays the following:



- Software version
- Date of the version
-"Wetland Plant" type for constructed wetland plant
- Effluent class C

The exact display depends on the selected settings.

In addition, the button can be used in this menu to shut off the buzzer or the alarm (see also Chapter 13.3.3.5).

13.3 Menu

13.3.1 Menu structure

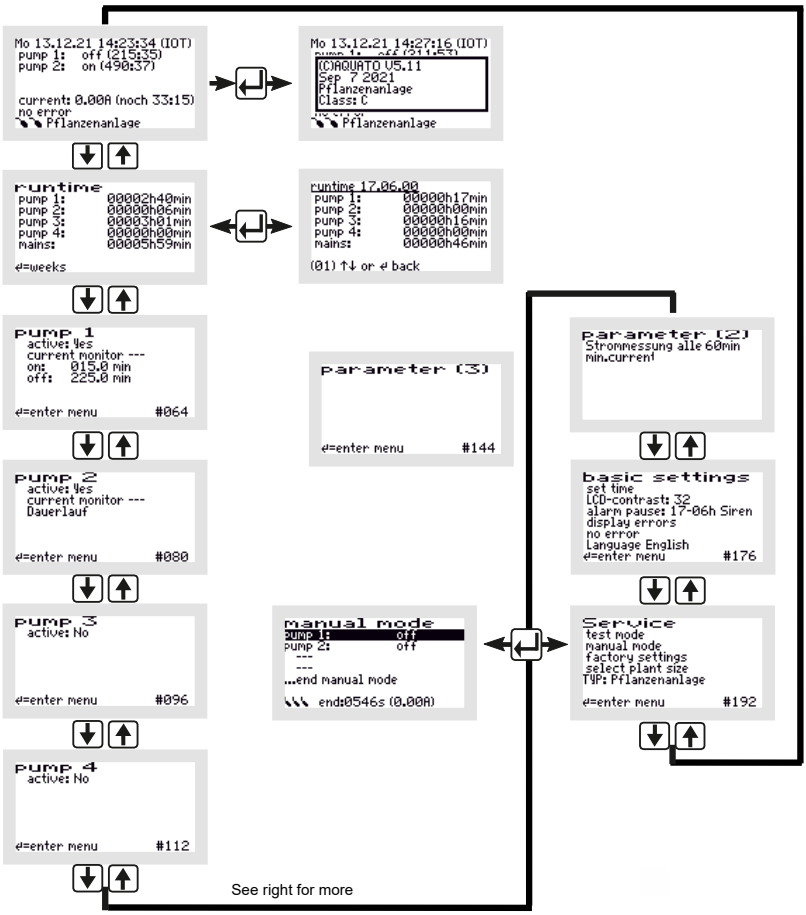


Figure 24: Menu structure of Trickling Filter C and Trickling Filter N

The exact display depends on the status of the system and the set parameters. The different variants of the display are explained in more detail below.

Use the ↓↑ buttons to move from menu to menu. If you move constantly in the same direction, you will eventually return to the standard display.

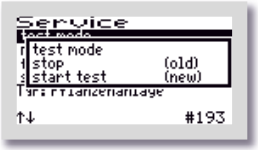
To access the submenus in the menu displayed, the middle ↵ button must be pressed. After pressing the ↵ button, either a window opens directly or the first menu item is marked by a black bar, depending on the selected menu.

The individual points are selected with the ↓↑ buttons. The ↵ button is used, if available, to enter the submenu or edit mode.

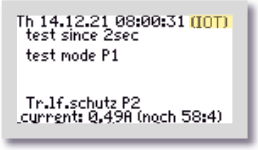
13.3.2 "Service" menu

The Service menu is basically intended for the service technician. The following can be selected:
- System test / test mode
- Manual mode
- Factory settings (only with password 2)
- Select plant types (only with password 1 or 2)

13.3.2.1 System test / test mode



Test mode is used to check whether the units consume power properly. If the automatic test mode has been selected with the ↓↑ buttons via the menu item "SYSTEM TEST", it is called up with the ↵ button. The "SYSTEM TEST" window offers the selection "CANCEL" or "START TEST". These two options are selected with the ↓↑ buttons in the bottom line "(NEW)". After selecting and confirming "START TEST", the system test begins.



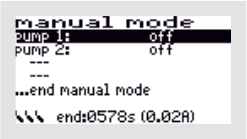
The test is fully automatic. The individual functions are tested in sequence (approx. 15 seconds each). If all the units are functioning correctly, no alarm message is issued.

Test operation can be cancelled by pressing the ↵ button.

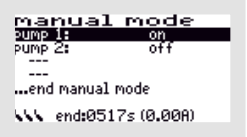
After testing all the functions, test mode ends automatically and the interrupted automatic mode is continued.

13.3.2.2 Manual mode

In manual mode of the K-Pilot 14.5 controller, the activated pumps can be operated for the basic types Trickling Filter C and Trickling Filter N, respectively. The exact display depends on the parameters set (during commissioning).



The ↓ ↑ buttons can be used to select between the available parameters "PUMP 1" to "PUMP 4" – the pumps displayed differ depending on the preset – by moving the black bar to the desired entry.



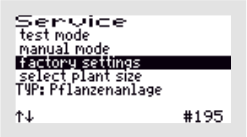
If "PUMP 1" is selected, for example, it can be switched "ON" and "OFF" with the ↵ button.

Manual mode is ended by using the ↓ ↑ buttons to move the selection bar to the menu item "... End manual mode" and then confirming by pressing the ↵ button.
If the manual mode is not ended with "... END MANUAL MODE", the controller automatically switches back to automatic mode 15 minutes after the last pressing of a button.

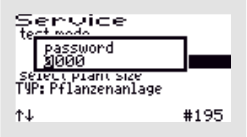
Once manual mode has been ended, the controller continues the interrupted sequence in automatic mode.

13.3.2.3 Factory settings

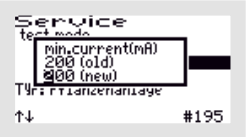
Under "FACTORY SETTINGS", the current error limit can be changed. The **resetting** of the controller, which is also possible in the factory settings, is **not permitted** throughout operation. Access to the factory settings is possible **with password 2 only**.



The following values can be changed/reset in the "FACTORY SETTINGS".



First enter password 1 – or, for further settings, password 2 – digit by digit and confirm with the ↵ button to enter the menu.

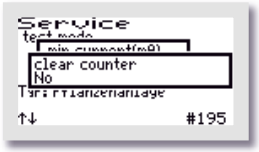


The first window that opens is "MIN. CURRENT (mA)". Here you can change the limit at which an error is displayed. The default setting is 200 mA. The lowest possible limit is 50 mA. The ↓ ↑ buttons can be used to change the values digit by digit starting from the left in the bottom line "(NEW)". The selected value is accepted with the ↵ button. After confirming the 3rd digit, the next window opens automatically.

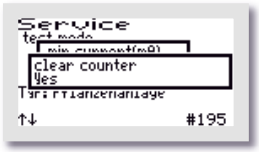
The subsequent deletion options are not permitted during the entire operating time of a small wastewater treatment plant. The queries must be answered with "NO".

All queries in the Factory Settings menu must be answered with "NO". This data must <u>not</u> be deleted.

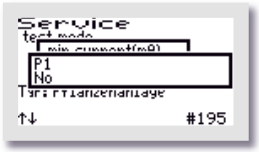
In the next window, "HW error deactivated" the flooding error message can be deactivated. This is usually unnecessary. After confirming the selection, the next window opens automatically.



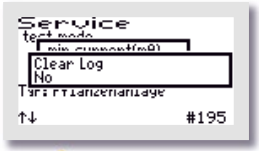
The "DELETE COUNTER" window opens.
If "NO" is selected, the menus with the individual units are skipped and the "DELETE LOG" window opens immediately.
→ **Answer: "NO".**



If "YES" is selected, the controller moves on to the individual units each time the ↵ button is pressed. In the first window to follow, i.e. "P1", the counter of the running time of the compressor can be reset to zero with the ↓↑ buttons by selecting "YES" in the bottom line.
→ **Answer: "NO".**



The same procedure can be followed in the subsequent windows "P2", "P3", "P4" and "MAINS".
→ **Answer: "NO".**



The last window to open in this menu is "DELETE LOG". If "YES" is selected here, all entries and settings are deleted. Then the controller starts over again with commissioning.
→ **Answer: "NO".**

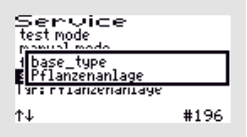
PLEASE NOTE! The operations "**Delete counter**:" and "**Delete log**" are **prohibited** throughout the operation of a plant, as the operation log must record the running times of the units.

13.3.2.4 Selecting a plant type

In this menu, you can set/change the plant type and size, as well as other parameters required for operation.

Select the menu item "SELECT PLANT TYPES".

Then enter password 1 – or password 2 – digit by digit and confirm with the ↵ button to enter the menu.



First, the "BASIC TYPE" of the system is requested. Use the ↓ ↑ buttons to select the desired type in the second line.

For operation as a constructed wetland plant, please select the "**Wetland plant**" option. Confirm your selection with the ↵ button.

The parameters for the pump running times are automatically preset through this selection, but these parameters **must** be readjusted. To do this, you need the **running times from the previous controller** in order to accept the correct settings.

The menu item "SELECT PLANT TYPES" is thereby completed and the software jumps back to the "SERVICE" main menu.

PLEASE NOTE! The pump running times must be read out from the previous controller and transferred to the new one.

13.3.3 "Settings" menu

The operator settings can be configured in the "SETTINGS" menu. Press the ↵ button to enter the menu to select the desired item.

13.3.3.1 Setting the date and time

To correct the time and/or date, use the ↓ ↑ buttons to select the "SET CLOCK" line. If the marker (=black bar) is on the desired entry, the middle ↵ button opens the window for adjusting the values.

The first digit can be changed with the ↓ ↑ buttons. If the correct value has been set, the middle ↵ button is used to accept the digit. All subsequent digits are selected the same way.
Input sequence: 2 digits each:
day, month, year, hour, minute (DD/MM/YY_hh:mm)

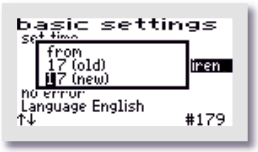
The clock is quartz-controlled. It should also be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes it easier to evaluate the maintenance.

Example: Time changed from 13:20 to 13:26.

13.3.3.2 LCD contrast

The LCD contrast can be optimised here. As a rule, no change is necessary.

13.3.3.3 Alarm buzzer ("Alarm pause")



By default, the acoustic alarm is switched off from 17:00 to 6:00. During this time, errors are only displayed optically. This setting can be changed in the menu item "ALARM PAUSE".

Attention:
No acoustic alarm is sounded during the time period set here!

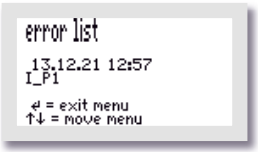
The sound for the alarm buzzer is set here. You can choose between: "SIREN", "MELODY" and "OFF"

The default setting is "SIREN".

Attention:
No acoustic alarm is sounded if the "OFF" setting is selected.

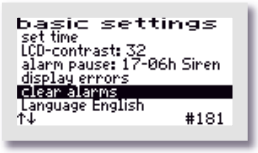
13.3.3.4 Display errors

The error logbook is called up via the "DISPLAY ERRORS" menu item.



The error logbook shows the last 30 error events with the date and time. The ↓ ↑ buttons are used to scroll through the logbook, the ↵ button is used to exit the menu.
Nothing can be deleted in the error logbook!

13.3.3.5 Delete alarm



If a fault (alarm) has occurred, the alarm message can be reset by pressing the ↵ button after selecting the "CLEAR ALARM" line. A window with the message "OK" opens for approx. 1 second and then the display in the menu changes to "NO ERRORS". The red flashing LED goes out and the error message in the standard window is deleted.
The error message remains stored in the error logbook and can thus be evaluated later.

Note: If the ↵ button is pressed in the main display – which is the standard display during operation – in the event of a fault, the buzzer is switched off and the "DELETE ALARM" window opens, which automatically changes to the query "SAFE?" after a short time.
If you answer "YES", the error display is deleted and the red flashing LED goes out. The error message remains stored in the error logbook and can thus be evaluated later.
If the "ARE YOU SURE?" query is answered with "NO", the error message remains in the main display.

Then the info window opens for approx. 3 seconds with the information about the plant settings.

13.3.3.6 Language

The language of the controller is selected here. The password must be entered to do this. The controller is prepared for several languages. The currently programmed languages are:
– German
– English
– Swedish
– French
– Finnish

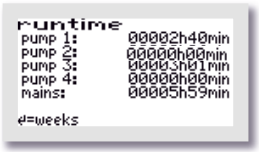
13.3.4 Other menus with displays or settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually set.
An adjustment may only be performed by a specialist, as the purification performance of the system may be reduced under certain circumstances and the national technical approval may become void.

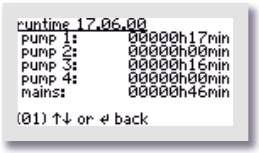
In order to change the displayed values, however, the password must first be entered.

In order to restore the original factory settings after changes have been made to the settings (e.g. changed running times), you can select the plant type again (see Chapter 13.3.2.4). This will restore the default values.

13.3.4.1 Operating hours display



The operating hours of the individual units are displayed in the "OPERATING HOURS" menu. The operating hours are counted up if the controller has switched on the compressor (or possibly a pump). The display is in hours and minutes.



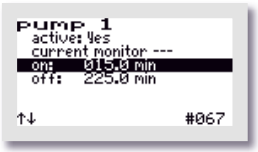
If the ↵ button is pressed, the operating hours of the last (up to 52) weeks are displayed (operation log).
The last line shows the calendar week (in the example: Week 1) in which the values were stored (always on Sunday).
The ↓ ↑ buttons can be used to scroll from week to week.

Note:
This function only works correctly if the date and time were set correctly.

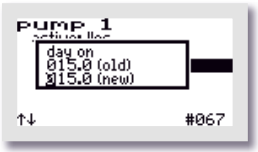
13.3.4.2 Pump 1 to Pump 4

Different parameters are displayed in the "PUMP 1" to "PUMP 4" menus depending on the setting. The parameter "ACTIVE" is always included.

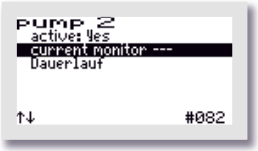
If the parameter "ACTIVE" is set to "NO", no further parameters are displayed.



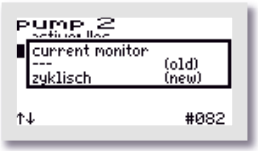
The parameters can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓↑ buttons and confirmed with the ↵ button.



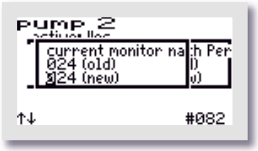
The running times of the pumps are set here. The "ON" switching time and the "OFF" switching time can be set independently of each other. They then take place in alternation.



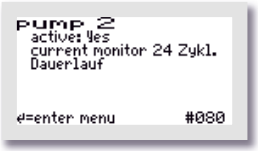
There are 3 options for "CURRENT MONITORING". The default presetting is "CONT." (= continuous), but it can also be set to "CYCLIC" or switched off entirely (display: "---"). If the "CYCLICAL" option was selected, the time period can be set in the "PARAMETERS (2)" menu (see Chapter 13.3.4.3).



If the pump is fitted with a float switch, the "CYCLE" option is used to check whether it is working correctly. For this purpose, you can set the number of cycles in which the function is queried before an error message occurs. In the example, 24 cycles are selected (see Chapter 13.3.4.3, "PARAMETERS (2)".



In addition, the currently flowing current is displayed in the main display for monitoring purposes.



13.3.4.3 Parameters 2

The "Parameters 1" menu is omitted for the constructed wetland plant, as it has no function for this plant type. Different parameters are displayed in the "PARAMETERS (2)" menu depending on the setting. The parameters "CURRENT MEASUREMENT" and "MIN. CURRENT" are always available.

If the controller switches on a unit (e.g. a pump), it is not ensured with certainty that it will run. Even if the switching relay is switched on, overheating, defective cables or other defects may nevertheless prevent the unit from running. The controller therefore monitors whether current is also flowing in the circuit. If the current falls below a limit value that is set by default to 0.2 A on the software side, a current alarm is displayed (e.g.: "I_P1").

In this menu, current monitoring can be switched "OFF" or "ON". By default, "CURRENT MEASUREMENT" is set to every "60" minutes. However, this parameter only has an effect if the setting "CYCLIC" has been selected for "CURRENT MONITORING" in one or more of the "PUMP 1" to "PUMP 4" menus (see Chapter 13.3.4.2. Then the cycle time (in the example = 60 minutes) and the number of cycles from the menu of the respective "PUMP" (e.g. 24 cycles) result in the time after which an error message is output. For example: 24 cycles times 60 minutes results in an error message being output if the pump has not started at least once within a period of 1440 minutes (= 1 day).

The parameters can be changed individually, if necessary. Use the ↵ button to enter the menu. The lines to be changed are selected with the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed with the ↓ ↑ buttons and confirmed with the ↵ button.

In addition, the currently flowing current is displayed in the main display for monitoring purposes.

13.4 Presets

PUMP 1:	active: YES
	Current monitoring --- (OFF)
	ON: 15.0 minutes
	OFF: 225.0 minutes
PUMP 2:	active: YES
	Current monitoring --- (OFF)
	Continuous operation
PUMP 3 and 4:	active: NO

14 Operation with UV lamp for hygienisation

Hygienisation by means of a UV lamp is always carried out during clear water discharge. To ensure the flow through the UV reactor, it is necessary to use a clear water pump which pumps the mechanically and biologically purified water through the reactor. In order to avoid unnecessary running times of the UV lamp, the plant is operated with a float switch, so that the UV lamp is switched on only if water is actually pumped out.

The UV lamp is switched on 10 seconds before the clear water pump and switched off again shortly after the clear water pump to irradiate the flowing clear water with full intensity and to kill the germs effectively.

In order to implement hygienisation by means of a UV lamp, commissioning (or the selection of the plant type) must be carried out with password 2.

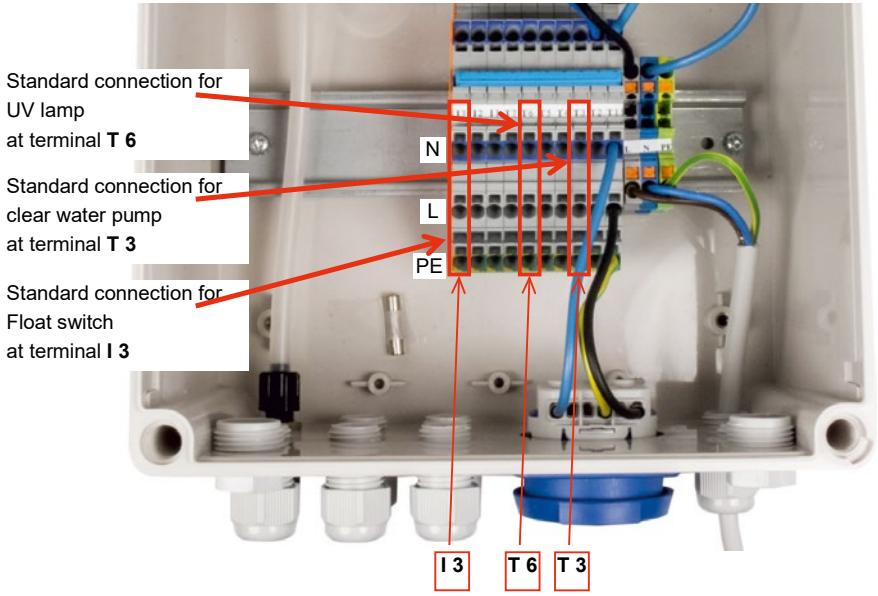


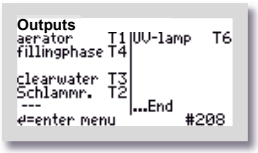
Figure 25: K-Pilot 9.7 controller – UV lamp connection

The UV lamp is connected to the controller prior to commissioning (see Figure 25), as are the clear water pump and the float switch, both of which are required in this case. The output selected for the UV lamp must then be assigned to the additional function UV Lamp during commissioning (or under "Select plant types"). Likewise, the output selected for the clear water pump must be assigned to the additional function Clear Water Pump .

In the example, the UV lamp is connected to output T 6, the clear water pump to T 3 and the float to I 3.

The hygienisation function must be activated during commissioning or in the additional functions in the "Select plant types" menu. For the procedure, see Commissioning of the controller, Chapter 9.1 and 10.1 and/or Selecting a plant type, Chapter 9.3.2.4 and 10.3.2.4

During commissioning (or under "Select plant type"), "FLOAT" must be selected as the control type and the options CLEAR WATER with "MOTOR PUMP" and "UV lamp" must be selected in the additional functions. Also, the outputs selected during installation for connecting the units must be assigned in the Outputs menu (see Chapter 9.1 and 10.1, as well as 9.3.2.4 and 10.3.2.4).



If, as in the example, the "UV Lamp" function was assigned to output T 6, the electrical connection for the hygienisation (here: with a UV lamp) must also be connected to contact T 6. In the example, the "CLEAR WATER PUMP" function was also assigned to output "T1.3", so the electrical connection of the clear water pump must also be connected to contact T1.3.

The remaining running time of the UV lamp must then be entered in the Parameters 3 menu.

According to manufacturer specifications, the UV lamp has a service life of approx. 2000 operating hours in order to achieve the desired purification performance. Assuming the small wastewater treatment plant runs through full cycles, this means that the lamp has to be replaced after an operating time of approx. 2 years.
This results in the **entry in "Remaining running time": 2000**.
The clock then counts backwards and, when it reaches 0000:00, i.e. when the 2000 operating hours have elapsed, outputs the error message "UV lamp".

The **Remaining running time** of the UV lamp **must** be entered as **2000 hours** when it is changed and must not be changed in between. If higher times are set, the purification performance cannot be ensured.

The Parameters 3 menu displays the "REMAINING RUNNING TIME" of the UV lamp and the total running time of the UV lamp as "UV OP. HRS". The settings of "REMAINING RUNNING TIME" are reset here to 2000 hours after the lamp has been changed.

Use the (middle) ↵ button to enter the menu. To select the line "REMAINING RUNNING TIME", use the ↓ ↑ buttons.

The menu item is called up with the ↵ button. The digits are individually changed with the ↓ ↑ buttons and also confirmed digit-by-digit with the ↵ button.

15 Operation with precipitant dosing for phosphate precipitation

The addition of precipitant for phosphate precipitation takes place before the settling phase, after which the reactor is mixed again in order to distribute the precipitant, thereby achieving a good degree of efficiency. If no wastewater is flowing in, the plant switches to economy mode. In this case, no dosing is carried out in order to prevent unnecessary precipitant consumption.

In order to implement phosphate precipitation, commissioning (or the selection of the plant type) must be carried out with password 2.

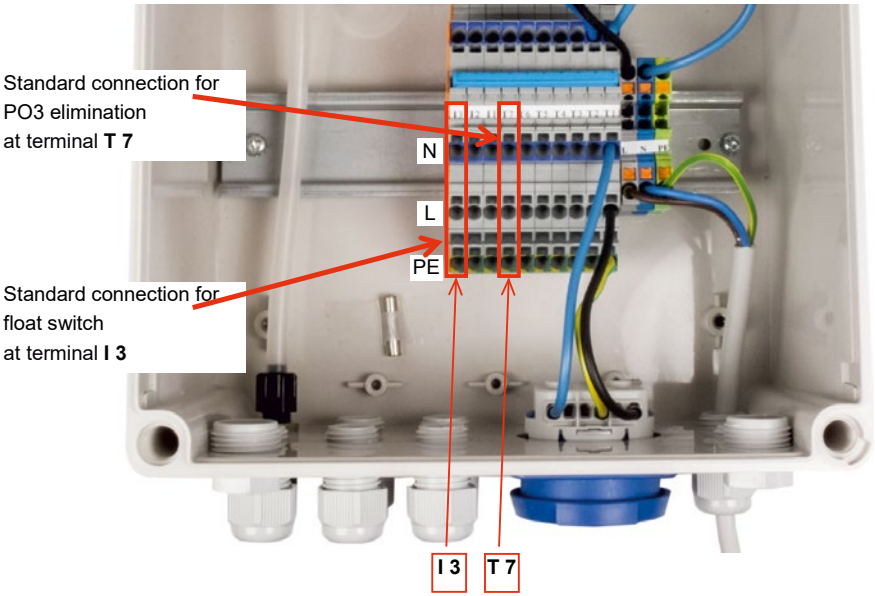


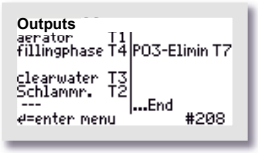
Figure 26: K-Pilot 9.7 controller – phosphate precipitation connection

The dosing pump is connected to the controller prior to commissioning (see Figure 26), as is the float switch, which is required in this case. The output selected for the dosing pump must then be assigned to the additional function PO3 Elimination during commissioning (or under "Select plant types").

In the example, the dosing pump is connected to output T 7 and the float to I 3.

The PO3 Elimination function must be activated during commissioning or in the additional functions in the "Select plant types" menu. For the procedure, see Commissioning of the controller, Chapter 9.1 and 10.1 and/or Selecting a plant type, Chapter 9.3.2.4 and 10.3.2.4

During commissioning (or under "Select plant type"), "FLOAT" must be selected as the control type and the option "PO3 Elimination" must be selected in the additional functions. Also, the outputs selected during installation for connecting the units must be assigned in the Outputs menu (see Chapter 9.1 and 10.1, as well as 9.3.2.4 and 10.3.2.4).



If, as in the example, the "UV Lamp" function was assigned to output T 7, the electrical connection for the hygienisation (here: with a UV lamp) must also be connected to contact T 7.

Then the supply of available dosing agent and the dosing time per cycle must be entered in the Parameters 3 menu.

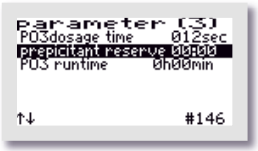
The Parameters 3 menu displays the "PO3 DOSING TIME" per cycle, the "DOSING AGENT SUPPLY" and the total running time of the dosing pump as "PO3 OP. HRS". The settings "PO3 DOSING TIME" per cycle and "DOSING AGENT SUPPLY" can also be adjusted here.

Use the (middle) ↵ button to enter the menu. To select the line "PO3 DOSING TIME", use the ↓ ↑ buttons.

The menu item is called up with the ↵ button. The digits are individually changed with the ↓ ↑ buttons and also confirmed digit-by-digit with the ↵ button.

In the example, the PO3 dosing time is being changed from 60 to 12 seconds per cycle.

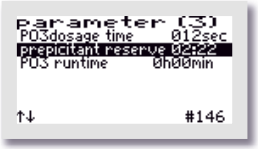
(Calculation in operating manual for P precipitation)



In order to set how long the precipitant supply will last, use the ↓ ↑ buttons to select the line "DOSING AGENT SUPPLY".

The menu item is called up with the ↵ button. The digits are individually changed with the ↓ ↑ buttons and also confirmed digit-by-digit with the ↵ button.

The stored quantity of the dosing agent is not entered directly, but rather the total dosing pump running time for which the supply is adequate. (Calculation in operating manual for P precipitation)



In the example, a dosing agent supply is set with a total dosing pump running time of 2 hours and 22 minutes.

16 Error messages and troubleshooting

Display	Possible cause	Remedy
I Bel The compressor has not consumed any power	- Compressor defective - Fuse defective	- Replace compressor - Replace fuse
I 2nd Bel The 2nd (and/or 3rd) compressor has not consumed any power	- 2nd (and/or 3rd) compressor defective - Fuse defective	- Replace the 2nd (and/or 3rd) compressor - Replace fuse
I_3~comp. The (three phase) compressor has not consumed any power	- Compressor defective - Fuse defective	- Replace compressor - Replace fuse
I Clearw. The clear water pump / add. pump has not consumed any power	- Clear water pump defective - Fuse defective - Add. pump defective	- Replace clear water pump - Replace fuse - Replace add. pump
I Sludge The sludge pump has not consumed any power	- Sludge pump defective - Fuse defective	- Replace sludge pump - Replace fuse
I Charg. The charging pump has not consumed any power	- Charging pump defective - Fuse defective	- Replace charging pump - Replace fuse
I Buffer The buffer pump has not consumed any power	- Buffer pump defective - Fuse defective	- Replace buffer pump - Replace fuse
p min Permissible pressure not reached	- Hoses not or incorrectly connected - Hose connections or hose leaking / defective	- Check hose connections and hoses
p max Permissible pressure exceeded	- Water level too high - Hose kinked - Aeration element contaminated	- Check water level - Check hoses - Clean/replace aeration element
Battery	- Battery empty, defective or not inserted	- Insert new battery
Clock	- Clock not set	- Set clock

Display	Possible cause	Remedy
F Flood: After the clear water has been discharged, the float switch did not drop below the switching point; flood warning with "Float" control type	- Inflow of outside water - Receiving water backed up - Power failure - Float switch defective - Clear water pump congested - Clear water hose defective	- Locate and stop inflow - Possibly a one-time event - Establish permanent power supply - Replace float switch - Eliminate congestion - Replace clear water hose
F ++ Flooding: The float switch has floated up, temporary error, flood warning with "Time" control type	- Inflow of outside water - Receiving water backed up - Power failure - Float switch defective - Clear water pump congested - Clear water hose defective	- Locate and stop inflow - Possibly a one-time event - Establish permanent power supply - Replace float switch - Eliminate congestion - Replace clear water hose
UV lamp Remaining running time at 00:00	- The remaining running time counter counted down to 00:00, exceeding the intended running time of the	- Replace the UV lamp and reset counter to level for new lamp
Tank empty? Dosing agent supply at 00:00	- The dosing agent supply counter counted down to 00:00, the tank is empty	- Refill dosing agent and reset counter to level for filled tank
No float switch	- The float switch has not switched for the preset number of days, The period is manually adjustable	- Check float - Possibly due to holiday mode

Display	Possible cause	Remedy
POWER ON	- Power has been switched on	
POWER OFF > 15 min: Cycle restart	- Power has been switched off - Power failure - Fuse blown	- Switch on power - Check fuse
Power interruption < 15 min and > 1 min: Cycle restart < 1 min: Cycle is continued	- Power has been switched off - Power failure - Fuse blown	- Switch on power - Check fuse

If the above measures do not result in the elimination of the fault, please contact your maintenance service / installation company.

The power plug must be disconnected when working on the compressor and pumps and before opening the controller. Secure the plant against being switched on again when performing work.

17 Technical Data

Temperature range (operation)	0 °C … + 40 °C
Temperature range (storage)	0°C … + 50 °C
Air humidity (operation and storage)	0 … 90% RH *non-condensing*
Protection class	double-insulated
Protection class	IP 54
Dimensions approx. (without cable glands, socket)	200 mm x 200 mm x 140 mm
Assembly	Wall mounting with screws
Housing material	Plastic, light grey
Power supply (L1, N, PE) cable approx. 1.5 m with moulded safety plug	230 V~ 50 Hz ± 10%
Max. output of units (compressor / pumps) (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
Pump overtemperature protection	Via thermal contact in the motor in series with the motor
Current monitoring via a current transformer	Max. 10 A, type 10% FS (10 A)
Control device power consumption	Type 5 VA
Float input (switches against N)	Control voltage 230 V~, I < 10 mA
Required pre-fuse(s)	Max. 1 x 16 A G
Cable cross-section	1.5 mm^2 (with end sleeves)
Alarm relay Max. contact voltage: Max. contact current:	 230 V~ 8 A; AC1
Internal buzzer	Type 70 dB(A)
Displays	Graphic LCD display 128 x 64 pixels 1 x LED green 1 x LED red

18 Operation log

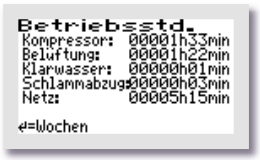
In order to guarantee long-term smooth operation of your small wastewater treatment plant, the following checks are prescribed by the operator in accordance with the user approval.

Operation of the system	daily
Reading of the operating hours Visual inspection of the effluent for sludge flotation Detection and, if necessary, removal of floating sludge Inspection of inlets and outlets for clogging	monthly

It is not necessary to make a written entry of the operating hours in the operation log when using the AQUATO® STABI-KOM plant, as the controller records the operating hours in an electronic logbook.

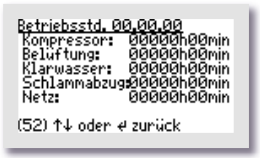
Any detected faults or malfunctions must be noted in the **operation log** (included with the plant), reported to the maintenance service and rectified immediately.

Reading of the operating hours



The operating hours of the individual units are displayed in the OPERATING HOURS chapter for your controller. The operating hours are counted up if the controller has switched on the compressor (or possibly the pump if the K-Pilot 18.3 controller is in use). The display is in hours and minutes.

If the ↵ button is pressed, the operating hours of the last (up to 52) weeks are displayed (operation log).



The last line shows the date of the week (in the example: the 52th CW) in which the values were stored (always on Sunday).

The ↓ ↑ buttons can be used to scroll from week to week.

Note:

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

The data you collect is important for the maintenance of your small wastewater treatment plant.
The more carefully you perform these checks, the easier it will be for your trusted specialist company!

19 Decommissioning and disposal

Ensure that only qualified personnel with suitable safety equipment have access to the plant. Ensure that the general safety regulations and the safety regulations at the installation site are observed.

Before starting the temporary decommissioning and final disassembly, switch off the plant by pulling out the power plug. Secure the plant against being switched on again.

19.1 Temporary decommissioning

Temporary decommissioning is required for maintenance work or when replacing the following components:

- Control unit
- Compressor
- Rotary valve
- Wear parts (e.g. membrane diffusers, pumps)

19.2 Disassembly of the whole plant

The complete disassembly of the whole plant may only be carried out by qualified personnel.

Disconnect the plant from the power supply before starting disassembly.
Disconnect the hoses and cables from the controller/control cabinet.
Pull out the hoses and – if present – the float switch cable in the direction of the tank.
Remove the tank.
Remove the controller / control cabinet.

19.3 Disposal

Ensure that the plant is disposed of properly.

20 Addresses

Manufacturer	
Company	**AQUATO® Umwelttechnologien GmbH**
Address	**Ernstmeierstr. 24**
	32052 Herford
Telephone	**+49(0)5221 / 10 21 9-0**
Internet	**www.aquato.de**
E-mail	**info@aquato.de**

Plant supplied / installed by	
Company	
Address	
Telephone	
Fax	
Internet	
E-mail	

Your maintenance company	
Company	
Address	
Telephone	
Fax	
Internet	
E-mail	

The warranty will void if operation and maintenance of the sewage treatment plant are not carried out in accordance with the instructions and specifications of the operating instructions.

VERSION 09.2023

Installation Company:

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