› Operating Manual

AQUATO®
umwelttechnologien

AQUATO® K-PILOT
27.6 Control Unit

PLEASE NOTE THE FOLLOWING:

The operating 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

Ernstmeierstr. 24

D-32052 Herford

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SSB®

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1 Manufacturer's Declaration

Declaration of Conformity

This certifies the conformity of the AQUATO® K-Pilot 27.6 control unit with the EC directives for CE marking.

Device type:	**Electronic control units for the automatic operation of a fully biological small wastewater treatment plant in accordance with DIN 4261-2 AQUATO® K-Pilot 27.6**
Directives:	1. EMC Directive 2014 / 300 / EU 2. Low Voltage Directive 2014 / 35 / EU 3. RoHS Directive 2011 / 65 / EU

Applied standards:

Re 1.	EN 61000 - 6 - 3 (2011) EN 61000 - 6 - 1 (2007) EN 61000 - 3 - 2 (2015)
Re 2.	EN 60204 - 1 (2007)
Re 3.	- not applicable –
Special notes:	- none -
Date:	03.02.2020

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2 Important Information

2.1 General Information

This manual describes the operation of the K-Pilot 27.6 control units.

With the AQUATO® K-Pilot 27.6 control unit, you receive a quality product designed for controlling small wastewater treatment plants. For this purpose, compressors and pumps are controlled automatically. During operation, the units are monitored for current and pressure in order to ensure operational safety.

The K-Pilot 27.6 control unit can be used to operate SSB, SBR, fixed-bed and fluidized-bed wastewater treatment plants.

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

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

2.2 Important Notes

Faults are indicated acoustically and visually by the AQUATO® K-Pilot 27.6 control unit. It has mains-independent power failure monitoring.

After commissioning has been completed, make sure you are instructed in the plant technology and the function of the AQUATO® K-Pilot 27.6 control unit.

Improper use will void the warranty!

In the case of repairs, proper function and preservation 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 be in operation!
It must not be switched off.

If you have problems with your control unit, please discuss them with your maintenance company. They will be happy to help you solve the problem.

If the AQUATO® control unit is used for purposes other than those intended without the express approval of AQUATO® Umwelttechnologien GmbH and/or if the safety instructions are disregarded, this may endanger or injure persons and lead to malfunctions or defects in the plant.

In this case, all liability is excluded.

The relevant accident prevention regulations must be observed!

Modifications to the control unit or unauthorized conversion are not permitted.

The Steuerung AQUATO® K-Pilot 27.6 control unit must be properly installed before use and in accordance with the installation instructions; see Chapter 5.

The operating manual of the control unit must be read carefully before installation and commissioning, and the instructions contained therein must be strictly followed!

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

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

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

When connecting the control unit, the nationally applicable regulations and the information on the type plate must be observed. The device may only be operated on mains systems that include a protective conductor (PE). Connection to the power supply must be made via separate fuse protection and a residual current device (RCD). Before commissioning, the proper function of the electrical protective measures must be checked!

Installation work may only be carried out by qualified electricians.
Whenever work is carried out on the device, the mains plug must always be disconnected.

Do not operate any device that
- ► has malfunctions,
- ► has been dropped,
- ► has been damaged in any other way,
- ► obviously has a damaged connection / connecting cable, or
- ► obviously has a damaged plug.

During all maintenance and repair work, the plant must be disconnected from the power supply.

If it is necessary to enter the plant, this may only be done in the presence of a second person and with appropriate safety measures, such as a gas warning device and safety lines.

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

3 Safety Instructions

3.1 General Information on Safety Instructions

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 specialist personnel can consult it at any time.

The safety instructions listed in this operating manual, the existing national accident prevention regulations and any internal work, operating and safety regulations must always be observed.

Failure to observe the safety instructions may pose a risk to persons as well as to the environment and may lead to the loss of any claims for damages.

3.2 Definition of Terms

Operator
The operator of the plant is the person who ensures that the plant is operated in working order.

Qualified Specialist Personnel
Qualified specialist personnel are able, on the basis of their professional training and the knowledge and skills acquired, to assess and carry out assigned work and to recognize and assess hazards..

3.3 Hazard Analysis

The AQUATO® plants have been developed in accordance with the state of the art and subjected to a hazard analysis. In order to eliminate or minimize risks, please observe the following instructions.

3.4 Warning Symbols Used

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

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 prescribed intended purpose; see Chapter 4,
- the plant is operated only when in perfect condition,
- the operator carries out the self-checks,
- the maintenance intervals are observed,
- maintenance and repairs are carried out only by qualified specialist personnel,
- the operating manual for the control unit, as well as the installation, operating and maintenance manual and the operating log, can be consulted at any time,
- only wear parts and spare parts approved by the manufacturer are used.

3.6 General Safety Instructions

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

1. Disconnect the small wastewater treatment plant from the power supply!
Particular care must be taken during maintenance work in the pit. In this case, the plant technology must always be disconnected from the power supply and secured against unintended restoration of the power supply.
Danger of electric shock in the event of a defective compressor or defective power cables.

The AQUATO®- aerator systems produce a water/air bubble mixture during fine-bubble aeration that has a lower density than pure water. This reduces buoyancy in the water. If a person were to accidentally fall into the reactor, swimming would not be possible. **Danger of drowning!**

2. Ventilate the plant well; pit entry only with safety measures and a supervising person!
Biological processes produce gases that are dangerous to humans. These can lead to unconsciousness and/or death by suffocation, even if they cannot be detected by smell. Entry into the small wastewater treatment plant is therefore only permitted under the supervision of a person standing watch outside and after thorough ventilation, with appropriate safety measures, such as a gas warning device and safety lines.
A rescue/fall-arrest harness must be worn by every person entering the plant.
Never enter after unconscious persons; call for help immediately!

3. Electrical protection, residual current device (RCD)!
The AQUATO® plants operate with 230 V / 50 Hz AC voltage or with 400 V / 50 Hz AC voltage. When operating the control unit, personnel must not be exposed to the risk of electric shock, even through carelessness, e.g. wet fingers. The socket intended for the control unit must be separately protected by a residual current device (RCD), DIN VDE 0100-410:2018-10, and connected to the power supply by electrically qualified personnel. Before commissioning the plant, the proper function of the electrical protective measures must be checked by an authorized qualified electrician.

3.7 Safety Instructions for Qualified Specialist Personnel

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

- the knowledge and skills of the personnel correspond to the intended task,
- the personnel have been instructed,
- the **operating manual** has been read and understood.

Before and during work in the tank, ventilation must be used to ensure that no gases occur in concentrations hazardous to health, that no explosive atmosphere is present and that there is no lack of oxygen.

Before and during the work, it must be ensured that the plant has been disconnected from the power supply and secured against being switched back on.

Work in tanks requires protective measures even at low heights. Suitable measures must therefore be taken to prevent falls. If technical measures are not possible, personal fall protection measures should be taken.

Always wear suitable protective clothing as well as hand, foot and face protection.

Avoid contact with wastewater.

We would like to point out that, despite all safety measures taken, residual risks at the installation site cannot be ruled out:

- **Risk of slipping and tripping**
- **Danger due to electrical voltage**

Risk of infection from germs and bacteria

3.8 Rescue Measures

Make sure that a second person is always available to provide safety backup during work in the tank. Never enter after an unconscious person; call for help instead.

4 Application Range of the Control Unit

4.1 Default Settings

The K-Pilot 27.6 control unit is used for operating small wastewater treatment plants. The K-Pilot 27.6 control unit has six electrical outputs as well as two float switch inputs, an integrated power failure warning, and current and pressure monitoring. This control unit allows a wide range of combinations of units.

This control unit can be used to operate SBR, SSB, fixed-bed and fluidized-bed plants. It is suitable for the standard operating modes of treatment classes C and D with one compressor and compressed-air lifts.

The control unit can also be operated with a float switch. In this case, the clear water discharge time is shortened, where possible, and a high-water alarm is triggered if necessary. In addition, energy-saving operation with slightly reduced running times is possible in SBR and SSB plants.

As standard, all required pumping processes are carried out using compressed-air lifts. When operating with the K-Pilot 27.6 control unit, one or more airlifts can also be replaced by submersible motor pumps.

A float switch used solely as a high-water alarm, without any effect on the cycle, can also be used with the K-Pilot 27.6 control unit.

Additional compressors can also be connected. Instead of a single-phase compressor, a three-phase compressor (400 V) can also be operated via an intermediate ORKA-S module. Likewise, if required, one or more additional 230 V compressors can be connected via an ORKA-S module.

4.2 Additional Operating Modes

In addition to the standard operating modes, further functions can also be controlled.

In order to be able to carry out all these different operating modes, the electrical outputs of the K-Pilot 27.6 control unit are freely configurable.

4.2.1 Operation with UV Lamp for Hygienization

In order to achieve discharge classes C+H and D+H, hygienization can be installed 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 in order to cover discharge classes C+P and D+P.

4.2.3 Operation with Dual Float Switch

With the K-Pilot 27.6 control unit, it is possible to work with a dual float switch, 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, no further float switch can be used for an additional buffer.

4.2.4 Operation with Float BP

The Float BP function is intended for SBR plants that have a float switch with very small hysteresis installed. With the Float BP setting, the float switch intervenes in the SBR cycle by terminating feeding when it rises, but it does not terminate clear water discharge when the float switch drops. However, a HW alarm is still issued if the float switch has not dropped after CW discharge,

5 Installation Instructions for the Control Unit

5.1 Safety Instructions

Failure to observe the following safety instructions may lead to restricted liability or to the complete loss of liability on the part of the manufacturer.

The control unit is intended for cabinet mounting.

Commissioning is carried out by connecting the control unit to the power supply.

Do not insert the mains plug until the existing units have been connected to the devices provided for this purpose on the control unit; see Chapter 6.2.

Have the electrical installation carried out exclusively by qualified specialist personnel. The manufacturer accepts no liability for damage caused by carrying out the installation yourself.

Interventions in the device and repairs of any kind may only be carried out by qualified specialists.

Before and during the work, it must be ensured that the plant has been disconnected from the power supply and secured against being switched back on.

Before commissioning and switching on the mains voltage, make sure that

- the device and the connection cables show no visible damage,
- in particular, the mains connection and the connections of the units are properly connected,
- all connections have been made correctly and professionally,
- the routing / execution of all cables and lines complies with the applicable regulations,
- the device is properly closed,
- the plant is properly protected.

Observe the following important notes before working on the control unit:

- Disconnect the plant from the mains before opening the control cabinet.
- Replace individual fuses only when the unit is de-energized.
- Never use fuses with higher current ratings than specified.
- Do not carry out any circuit-related manipulations on the plant.
- The respectively applicable regulations (EN, VDE, etc.) as well as the regulations of the local energy suppliers must be strictly complied with.

- If the fuse is defective, it may only be replaced by a fine-wire fuse of the same type. In the standard case with one compressor, a fuse of the following type is installed at the factory: **fine-wire fuse, time-lag type 5 A, 5 x 20 mm** in accordance with EN 60127-2/III, with a maximum power dissipation of 1.5 W. This type is also used in a two-compressor plant. Output T1 is protected by a 10 A thermal fuse.

Note:
A maximum of one 5 A T fuse may be installed. Always replace fuses with a fuse of the same current rating.

The cables to the device must be routed professionally. In particular, care must be taken to ensure that major mechanical stresses on the cables, e.g. due to insufficiently secured cables, are avoided, as otherwise protection class IP 54 cannot be guaranteed.

5.2 Control Unit in Wall Cabinet

The control unit is mounted in the door of the wall cabinet. The compressor is installed in the wall cabinet on site.

If an outdoor wall cabinet is used, fasten it in a shaded location protected from wind. In locations with unfavourable climatic conditions, it may be necessary to install a heater and/or a cooling fan. If a larger diaphragm compressor or a rotary vane or side-channel compressor is used, a cooling fan is required.

- When selecting the installation location, the weight of the finished unit, here e.g. approx. 20 kg, must be taken into account.
- Building structures that transmit sound or vibrations are unsuitable for mounting.
- The installation location must be dry, clean and well ventilated. High dust levels must be avoided, as otherwise the compressor air filter may become clogged.
- Mount the wall cabinet plumb and level on the wall.
- Place the compressor on the floor of the wall cabinet and connect the air outlet to the valve block.
- Connect the compressor power supply to the designated output of the control unit.
- Please read this manual in full before commissioning the control unit.

If the control cabinet has to be opened, disconnect the plant from the mains before opening the cabinet. Open the wall cabinet carefully to avoid tearing off or damaging cables or hoses.

Figure 1: Control unit in wall cabinet

Caution:
Direct sunlight must be avoided. In unfavourable locations, install a heater and/or cooling fan.

5.3 Solenoid Valve Block in Wall Cabinet

The air is routed from the compressor to the valve block. The solenoid valve block is located in the wall cabinet. The solenoid valves are controlled by the control unit in order to open or close the valve for the respective function, which differs depending on the plant type and configuration, e.g. clear water discharge, sludge return, feeding, aeration, so that the air is available for the function required in each case.

5.4 Installation as Replacement for Existing Control Units

Before and during the work, it must be ensured that the plant has been disconnected from the power supply and secured against being switched back on.

The K-Pilot 27.6 control unit can be used as a replacement for the COMFORT and RELAX control modules as well as as a replacement for control units from other manufacturers.

Disconnect the plant from the power supply before starting work. Clearly label all connections of the units before disconnecting them from the old control unit. Then remove the old control unit and install the K-Pilot 27.6 control unit in the control cabinet in accordance with the regulations. Then plug the labelled connectors into the sockets on the rear side of the K-Pilot 27.6 control unit. During commissioning, assign the channels accordingly; see Chapters 6.2.1, 9.3.2.4, 9.3.4.9, 10.3.2.4, 10.3.4.9, 11.3.2.4 and 11.3.4.8.

Installation as Replacement for COMFORT Control Module
Disconnect the plant from the power supply. Clearly label all connectors of the units before disconnecting them from the old control unit and, if applicable, from the expansion module. Then remove the old control unit and replace it with the K-Pilot 27.6 control unit. Then plug the labelled connectors into the sockets on the rear side of the K-Pilot 27.6 control unit. During commissioning, assign the channels accordingly; see Chapters 6.2.1, 9.3.2.4, 9.3.4.9, 10.3.2.4, 10.3.4.9, 11.3.2.4 and 11.3.4.8.

6 Connections on the Control Unit

The display and the operating buttons are located on the front side of the K-Pilot 27.6 control unit.

Figure 2: Front side of the K-Pilot 27.6 control unit

On the rear panel of the control unit, there are six electrical outputs at the bottom next to the socket for the mains connection. These sockets are marked “T1” to “T6”; see Figure 3. The outputs can be freely assigned with the available functions. The float inputs have fixed assignments. The inlet for the air hose for pressure measurement is located at the top, approximately in the center. An RS232 serial interface is located at the top right.

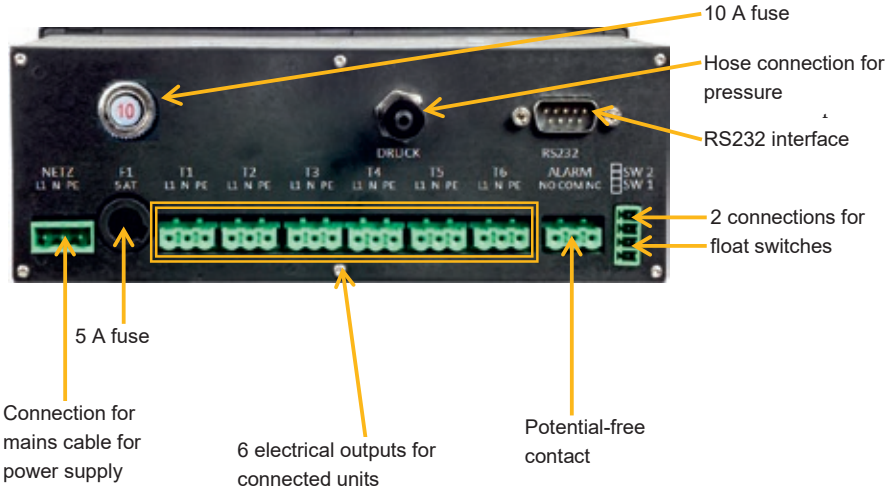


Figure 3: Rear side of the K-Pilot 27.6 control unit

6.1 Air Connections

The air from the compressor is distributed via solenoid valves in the control cabinet, which are controlled by the control unit, in such a way that the different functions are ensured.

The K-Pilot 27.6 control unit itself has only one air connection. This is used for pressure measurement in the control unit. The control unit is equipped with a pressure sensor for pressure monitoring. A hose is routed from this sensor to the housing of the control unit. The hose connection is a 4 mm screw fitting. A 4 mm hose must be connected to this connection on the housing; this hose is connected to the air line between the compressor and the valves.

The hose connection for pressure measurement is located on the rear side of the control unit and is marked with the term “PRESSURE”.

Figure 4: Connection for pressure measurement on the control unit

6.2 Electrical Connections

6.2.1 Arrangement and Function of the Connections

The following figure shows the K-Pilot 27.6 control unit with all connections on the housing. At the top, approximately in the center, is the inlet for the air hose for pressure measurement. At the top left is a 10 ampere fuse and at the top right an RS-232 serial interface. At the bottom left on the rear side is the socket for the mains connection. The fine-wire fuse is arranged to the right of this. This is followed by the six outputs T1 to T6 for controlling the different units. The next socket is a potential-free contact, which can be used, for example, to operate a flashing light. At the far right, the two float switch connections SW 1 and SW 2 are arranged one below the other.

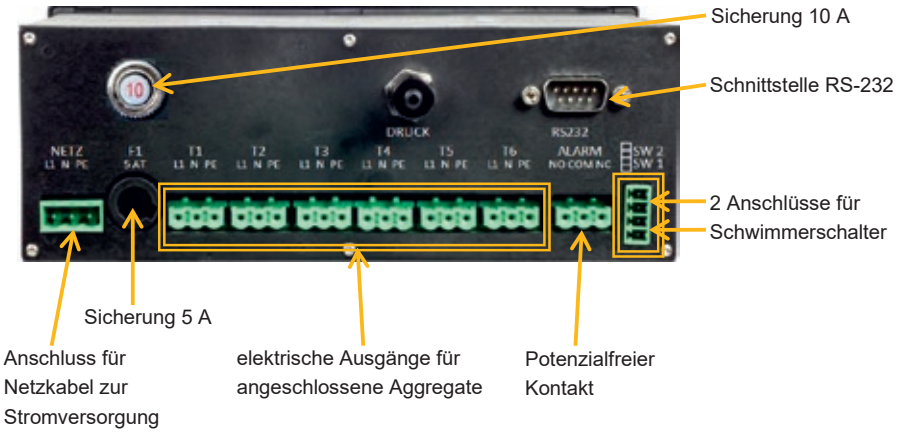


Figure 5: Electrical connections on the control unit

The 10 ampere thermal fuse protects output T1 only. All other outputs are protected via fine-wire fuse F1 with 5 amperes.

The following Table 1 shows the preset standard assignment of the electrical connections for the different plant types.

Function	SBR 4 valves	SBR 3 valves	SSB 3 valves	SSB 2 valves	FB	WSB
Compressor	T1	T1	T1	T1	T1	T1
Sludge return	T2	T2	T2	T2	T2	T2
Clear water discharge	T3	T3	T3	T3		
Feeding	T4	T4				
Aeration	T5		T5			
Thermostat *	T6	T6	T6	T6	T6	T6

* Control cabinet heating or cooling, fan

Table 1: Standard assignment of the electrical connections

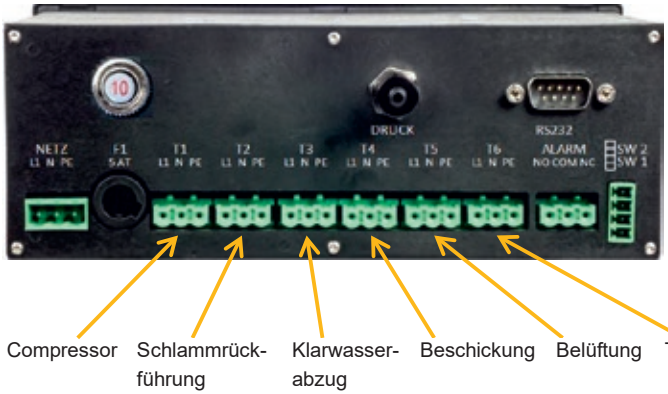


Figure 6: Standard assignment of the K-Pilot 27.6 control unit

The units can be freely assigned to the outputs, even differently from Table 1 and Figure 6. The possible assignments of the electrical connections are shown in Table 2.

Output T1 to T6	Connection SW 1	Connection SW 2
Compressor Clear water discharge Sludge return Feeding Aeration 2nd compressor 3-phase aerator UV lamp PO3 elimination Pump Thermostat *	Float switch for energy-saving operation for control type: Float and Float BP Float switch for temporary high-water indication for control type: Time Float switch 1 for control type: Dual Float Switch	Schwimmer für temporäre Hochwasseranzeige bei Steuerungstyp: Schwimmer Schwimmer 2 bei Steuerungstyp: Doppel-Schwimmer

* Control cabinet heating or cooling, fan

Table 2: Possible assignments of the electrical connections

For example, the 2nd aerator can be connected to output T6 and the clear water pump to output T2. During commissioning, the corresponding outputs must then be assigned to the connected units; see Chapter 9.1 and Chapter 9.3.2.4 as well as Chapter 9.3.4.9; Chapter 10.1 and Chapter 10.3.2.4 as well as Chapter 10.3.4.9; Chapter 11.1 and Chapter 11.3.2.4 as well as Chapter 10.3.4.9.

6.2.2 Mains Connection

A 230 V / 50 Hz power supply cable must be routed to the location of the control unit on site. This must be separately protected with a B 16 A time-lag fuse and a residual current device (RCD) 25 A / 30 mA. A mains isolating device must be used for connecting the control unit.

After the plug has been inserted, or after the ON/OFF switch has been switched on, the control unit starts with a self-test lasting approx. 3 seconds with the display “booting system…”. The start message “AQUATO” then appears. The display Vx.xx.xx, e.g. V2.07.09, in the lower area of the message is the software version number. A few seconds later, the standard display appears. During commissioning, several settings are still required at this point; see Chapters 9.1, 9.3.2.4, 10.1, 10.3.2.4, 11.1 and 11.3.2.4. The device is now ready for operation.

When the compressor, or another optional unit, is running, the LED lights up green. In the event of a fault / error, the LED flashes red.

Caution: Before commissioning the plant, the wastewater treatment tank(s) must be filled with water up to 5 cm above HW,min. In addition, the compressor and airlifts as well as any pumps and float switches must be connected.

6.2.3 Potential-Free Contact

An additional warning lamp/flashing light can be connected via the potential-free contact on the rear of the control unit housing, marked “ALARM”. This can be supplied with power via the control unit or via an independent external line. In the event of an **alarm**, the relay closes the connection between the **left-hand (NO) pin** and the **middle (COM) pin** of the socket and opens the connection between the **middle (COM) pin** and the **right-hand (NC) pin** of the socket. This means that the plug must be adapted accordingly.

If the warning lamp/flashing light is to light up/flash for fault indication in the event of a fault, the connection via the left-hand (NO) and middle pin (COM) must be selected; see Figure 7, Figure 8 and Figure 9.

Figure 7: Potential-free contact

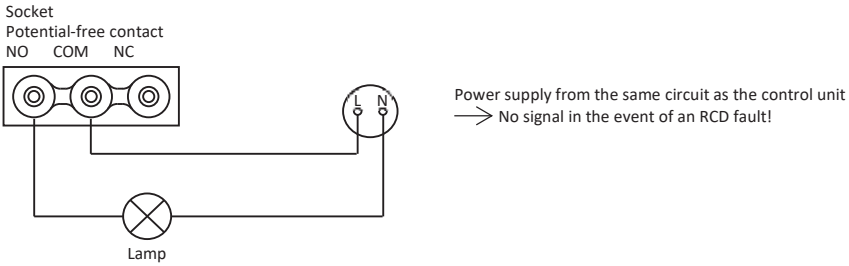


Figure 8: Potential-free contact with fault message

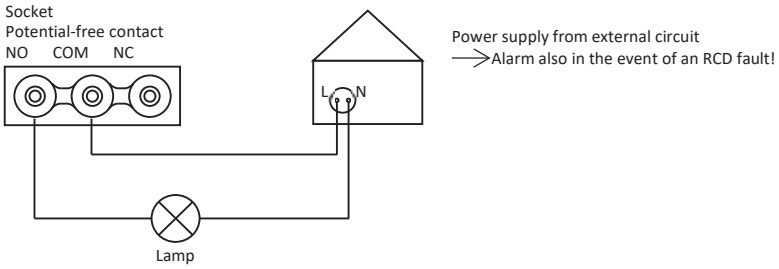


Figure 9: Potential-free contact with fault message in the event of power failure

In order to receive the additional warning signal even in the event of a power failure in the control unit, the warning lamp/flashing light must be connected to an external circuit; see Figure 9.

6.2.4 Float Switch

Optionally, one or two float switches can be used. The float switch or switches are connected to the K-Pilot 27.6 control unit via the connection sockets “SW 1” and “SW 2” located on the rear panel of the control unit; see Figure 10, Figure 11 and Figure 12. The float inputs have fixed assignments; see Figure 5 and Table 2.

A normally open contact with control voltage 230 V~, approx. 5 mA, switching between input L and N, is used as standard as the float switch.

6.2.4.1 Float Switch for Control Type Float

If the float **switch for the “Float”** control type is connected to the designated “SW 1” socket on the rear panel of the control unit and the “FLOAT” control type is selected during commissioning, this float switch controls the clear water discharge as well as the aeration times and issues a high-water alarm; see Figure 5 and Table 2.

When the float switch drops, it switches off the clear water discharge. If it does not drop by the end of the clear water discharge, it triggers a high-water alarm. If it remains down after the clear water discharge, or after the following sludge discharge, until the end of the aeration time, the plant switches to energy-saving operation, with reduced running times of the units and no clear water discharge. When the float switch rises again, energy-saving operation ends and the cycle continues with the aeration phase.

Figure 10: Float switch connection on K-Pilot 27.6

6.2.4.2 Float Switch for Control Type Time as High-Water Alarm

If the **“Time” control type** option is selected and the float switch is connected to the designated “SW 1” socket on the rear panel of the control unit; see Figure 10, the float switch works only as a high-water alarm without intervening in the sequence of the cycle. The float switch indication for this float switch is then shown temporarily on the display only in the event of high water.

6.2.4.3 Second Float Switch as High-Water Alarm

If the float switch for the **“Float” control type** is connected to the designated “SW 1” socket on the rear panel of the control unit and the “FLOAT” control type is selected during commissioning, an additional **second float switch** can be connected to the designated “SW 2” socket; see Figure 11. This works solely as a high-water alarm without intervening in the sequence of the cycle. The float switch indication for this float switch is then shown temporarily on the display only in the event of high water; see Table 2.

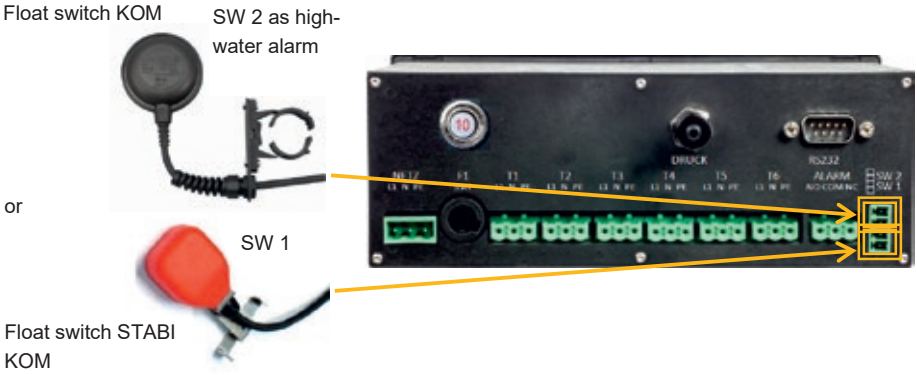


Figure 11: Connection of 2nd float switch as high-water alarm

6.2.4.4 Dual Float Switch

With the K-Pilot 27.6 control unit, it is possible to work with a dual float switch. In this case, the float switch (S1) for the **"Dual Float Switch" control** type is connected to the designated "SW 1" socket on the rear panel of the control unit. The float switch (S2) is connected to the "SW 2" socket; see Figure 12 and Table 2.

With this control unit setting, the two float switches are AND-linked, i.e. the control unit only switches ON when **both** float switches have risen, and it only switches OFF when **both** float switches have dropped.

Figure 12: Connection of dual float switch

6.2.4.5 Float BP

With the Float BP setting, the float switch intervenes in the SBR cycle as follows:

When the float switch rises, feeding is terminated. Clear water discharge is not terminated when the float switch drops. However, an HW fault is reported if the float switch has not dropped after CW discharge.

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

6.2.5 Outputs of the Control Unit

The control unit has the six outputs T1 to T6 for controlling the different units. The software-side assignment is generally carried out automatically, but can be adjusted if required.

Do not **assign output T7!** It is not physically available..

6.2.5.1 Compressor

The compressor can be connected to output T1 to T6. In the standard case, it is connected to output T1.

Caution: The compressor must **not be connected to an external socket**, as in this case the aeration cycles will not be observed.

It must be connected to one of the designated outputs on the control unit.

6.2.5.2 Plants with Two Compressors

If a second compressor is required to operate the plant, the first compressor could, for example, be connected to output socket T1 (default setting) and the second compressor to socket T6. After the corresponding outputs have been assigned, the running times are regulated by the control unit (setting “2ND COMPRESSOR”) via the assigned output.

Caution: Compressors must **not be connected to an external socket connected to the power supply**, as in this case the aeration cycles will not be observed.

They must be connected to the designated outputs of the control unit.

6.2.5.3 Plants with Three Compressors

If three compressors are required to operate the plant, the first compressor could, for example, be connected to output socket T1 (default setting), and the second and third compressors could be connected in parallel, for example to socket T6. After the corresponding outputs have been assigned, the running times are regulated by the control unit (setting “2ND COMPRESSOR”) via the assigned output.

Caution: Compressors must **not be connected to an external socket connected to the power supply**, as in this case the aeration cycles will not be observed.

They must be connected to the designated outputs on the control unit.

6.2.5.4 Clear Water Pump

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

The clear water pump and external float switch are connected to the control unit via the connections on the rear of the housing; see Figure 5, Table 1, Figure 6 and Table 2. The float switch is connected to SW 1; the pump can be wired to outputs T1 to T6 (default setting T3). When operating with a clear water pump, the “Float” control type must be selected. For the required control unit setting, see Chapter 9.3.2.4 and Chapter 10.3.2.4.

Figure 13: Clear water pump with external float switch

Possible connections for clear water pump on K-Pilot 27.6 control unit: Sockets T1 to T6 Default: T3

Figure 14: Clear water pump connection

Connection for float switch for “Float” control type to socket SW 1

Figure 15: Connection of float switch for clear water pump

6.2.5.5 Control Cabinet Thermostat

The thermostat function can be used to operate either control cabinet heating or control cabinet cooling.

If a ventilation fan is connected, it switches on at a temperature 5 degrees above the setpoint and switches off at 2 degrees below the setpoint.

If a heater is connected, it switches on at a temperature 5 degrees below the setpoint and switches off at 2 degrees above the setpoint.

Example 1:
An axial fan for **cooling** is connected. During commissioning, the control unit was set to “VENTILATION” in the Thermostat window. The target temperature is set to 35 °C. The fan switches on when the temperature has risen to 40 °C (35 + 5 = 40) and runs until the temperature has dropped again to 33 °C (35 - 2 = 33); the control unit then switches it off.

Example 2:
An **electric heater** is connected. During commissioning, the control unit was set to “HEATING” in the Thermostat window. The target temperature is set to 15 °C. The heater switches on when the temperature has dropped to 10 °C (15 - 5 = 10) and runs until the temperature has risen again to 17 °C (15 + 2 = 17); the control unit then switches it off.

6.2.5.6 Further Connectable Units

If, for example, an excess **sludge pump** or **feed pump** is required, it can be connected instead of an airlift, in the same way as a clear water pump. A **three-phase compressor**, a **UV system** or a dosing pump for **PO3 elimination** can also be connected.

If the plant is to be connected with a **UV lamp** for hygienization, the “FLOAT” control type must be selected, and a clear water pump and a float switch are required for operation; see Chapter 9.3.2.4 and Chapter 10.3.2.4 as well as Table 2.

If **PO3 elimination** is to be selected, the “FLOAT” control type must be selected. By selecting “PO3”, the dosing pump can be used for precipitant dosing for phosphate precipitation; see Chapter 9.3.2.4 and Chapter 10.3.2.4 as well as Table 2.

It is also possible to use **a three-phase compressor** if this should be necessary, for example, due to the great water depth. This is then connected via an ORKA-S module, and the compressor for the airlifts is not controlled for aeration purposes, but is used only for water or sludge transport. For the three-phase compressor, current monitoring can be switched on or off separately; see Chapter 9.3.2.4, Chapter 10.3.2.4 and Chapter 11.3.2.4.

Several additional functions can also be used. If, for example, the plant is to be operated with a **second compressor** and **phosphate elimination**, the compressor could be connected to T3 and the phosphate elimination to T6; see Chapter 9.3.2.4 and Chapter 10.3.2.4.

7 Commissioning of the Plant

7.1 Before Commissioning

When constructing and operating wastewater treatment plants, the relevant accident prevention regulations (UVV), guidelines, safety rules and information sheets of the responsible employers' liability insurance association (DGUV), as well as the regulations of the Association for Electrical, Electronic & Information Technologies (VDE), must be observed.

Before commissioning the plant, the installation and assembly of the plant components must be completed as described in the **installation** and **operating manual**.

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

Care must be taken to ensure that the roof ventilation is functioning. If this is not sufficient, a separate ventilation pipe must be installed. Forced ventilation may also be required, for example after checking by means of smoke testing.

The watertightness test must be carried out before commissioning.

The technical equipment must be properly installed and connected in accordance with the wastewater engineering and process engineering requirements.

Before commissioning, the plant must be filled with water up to 5 cm above HW,min.

The electrical installation must have been carried out and completed by qualified specialist personnel. **The housing of the control unit must be closed if it has been opened.**

See Chapter 5 and Chapter 6.

7.2 Commissioning

The plant is commissioned by connecting the mains cable of the control unit to the power supply, or by switching on the ON/OFF switch on the wall cabinet; see Chapters 9.1, 10.1 and 11.1.

Do not insert the mains plug, or switch on the ON/OFF switch, until the compressor and, if present, the float switch and motor pump(s) have been connected to the devices provided for this purpose on the control unit.
See Chapter 6.

After the plug has been inserted, or after the ON/OFF switch has been switched on, the control unit starts, see Chapters 9.1, 10.1 and 11.1, with the message “booting system...”. The LED then briefly flashes red and changes to steady green light. At the same time, the start message “AQUATO” appears. The display Vx.xx.xx, e.g. V3.07.04, in the lower area of the message is the software version number.

During initial commissioning of the control unit, the following points, among others, must then be processed first: password, language, date and time, basic type, plant type with PE number, control type Time/Float. Depending on the selection, further points may be added; for more details, see Chapters 9.1, 10.1 and 11.1. The control unit then switches to manual operation so that the commissioning engineer can test the functions individually.

After manual operation has ended, the control unit changes to the standard display. The device is now ready for operation. This is indicated by a flashing triangle ◄ in the lower right-hand corner of the LCD display. The plant now runs fully automatically.

The commissioning engineer must ensure that the parameter settings in the control unit have been made in such a way that they correspond to the requirements, e.g. basic type and discharge class, from the approval and the water-law permit for the plant in which the control unit is to be used.

8 Operation and Displays of the Control Unit

8.1 Operation

The control unit has a graphic LCD display with 128 x 64 pixels. The displays are shown in plain text and with a two-colour LED (green/red). Operation is carried out using three buttons.

Arrow button for selecting the menu items

Middle button for confirming the input

Arrow button for selecting the menu items

Figure 16: Operating buttons

Figure 17: Display indication and LED

The display is switched on during the entire operation. A flashing triangle ◄ can be seen in the lower right-hand corner of the LCD display; it flashes once per second. If a unit, e.g. pump or compressor, is running, this is indicated by the green LED lighting up at the top left next to the display.

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

The standard display of the LCD display shows the date and time in the top line and, below this, the current cycle phase in large letters, e.g. “AERATION”. In the other menus, the name of the respective menu is located at the very top, and the individual menu items are located below it. Switching from menu to menu is carried out using the ↓ ↑ buttons. Pressing the middle ↵ button takes you into the respective menu. Switching between the menu entries is also carried out using the ↓ ↑ buttons.

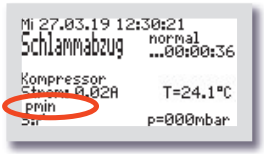
The selected menu item is marked by a dark bar with inverse display. After selecting the line of the desired menu item, pressing the middle ↵ button takes you to the input mode of the respective submenu. The input mode can be recognized by a selected line or digit shown in inverse display. The options or digits can now be selected or changed using the ↓ ↑ buttons. The desired entry is confirmed by pressing the middle ↵ button.

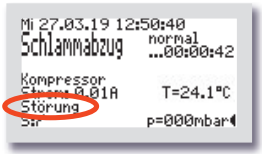
If a multi-digit numerical entry is required, the highest digit is changed first using the ↓ ↑ buttons. The selection is confirmed with the middle ↵ button, and you then move to the next digit, and so on. If the input requires the selection of different options, e.g. YES / NO, the desired selection is also made using the ↓ ↑ buttons. When the desired option appears on the display, it is confirmed with the middle button.

Returning from the subitems to the main menu level is also carried out using the ↓ ↑ buttons, by moving the marking bar in one direction until it disappears from the menu; the next main menu then opens.

8.2 Faults

Faults are indicated by the operating LED flashing red and by the buzzer sounding. The errors are reported in the display by an indication in the main menu, alternating with the fault indication. An example of a fault message is shown in the following figures:



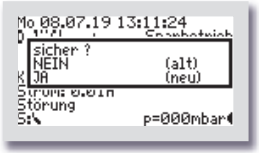


These three views alternate until the fault is acknowledged.

A fault message is acknowledged by pressing the button ↵.

This switches off the buzzer and opens the “CLEAR ALARM” window. Immediately afterwards, the prompt “SURE?” appears.

This prompt can be answered by selecting either “NO” or “YES” in the lower line “(NEW)” using the ↓ ↑ buttons. If “NO” is selected, the fault message remains active; only the acoustic warning signal is switched off.



If “YES” is selected, the fault indication in the display is also cleared and the red flashing of the LED goes out.

The information window with the details of the selected control unit setting then opens. After approx. 3 seconds, the view changes back to the standard window.

The fault message in the display only goes out when the fault has been rectified and also reset on the control unit, either as described above or in the “SETTINGS” menu.

The fault message remains stored in the error logbook and can therefore also be evaluated later.

Information on troubleshooting can be found in Chapter 12.

8.3 Power Failure Alarm

The control unit is equipped with a rechargeable-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 alert the operator to the missing treatment function. A crossed-out socket is shown on the display, without backlighting. If the ↵ button is pressed and held until an acknowledgement tone sounds, the alarm is permanently switched off. When the power supply returns after the power failure, the device switches on again automatically.

Note:

In a new device, the internal rechargeable batteries only reach their full performance after a few days in order to achieve the maximum alarm duration. If the function of the internal rechargeable batteries decreases, they must be replaced with 2 NiMH rechargeable batteries, size AA.

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

According to the German Federal Government's Battery Ordinance (BGBl. 1998/I/20 of 02/04/1998), since 01/10/1998 all end users of batteries and rechargeable batteries have been obliged to return them to retailers or recycling/disposal companies, 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 by a competent person commissioned by the owner (operator).

After commissioning, the plant operates fully automatically. It is controlled by a PLC. The sequence and progression of the phases are programmed in the control unit. The times for the aeration intervals, the denitrification phase (optional), as well as for the discharge of the treated wastewater and the return of the excess sludge, are preset, but can be readjusted if required.

In the standard case, the cycles run purely time-controlled. However, it is possible to use a float switch; see Chapter 6.2.4, and thereby also have the plant controlled by the water level.

If faults occur during operation of the plant, they are indicated visually and acoustically by the control unit. The LED flashes red and the buzzer sounds. The fault message remains in the main display until the fault is acknowledged; see Chapter 9.3.3.5.

The fault message remains stored in the error logbook and can therefore also be evaluated later.

The control unit is equipped with a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to alert the operator to the missing treatment function. When the power supply returns after the power failure, the device switches on again automatically.

9.1 Commissioning of the Control Unit

Before commissioning the plant, all chambers of the wastewater treatment plant must be filled with water up to 5 cm above $H_{W,min}$, and the housing of the control unit must be closed if it has been opened.

Commissioning of the control unit begins by inserting the mains plug of the control unit, or by switching on the ON/OFF switch. The control unit then starts with a self-test lasting approx. 3 seconds with the display “booting system…”.

The red LED then lights up briefly, followed by 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 area of the message is the software version number.

During initial commissioning, the display “COMMISSIONING” then appears. During commissioning of the K-Pilot 27.6 control unit, the following must first be entered; see Chapter 9.3.2.4 as well as 9.3.3.1 and 9.3.3.6:

- Password (4-digit):
  Password 1 or
  Password 2 for advanced options
- Language
- Date and time
- Basic plant type, here selection: „**SSB**“
- Valve for aeration YES / NO
- Plant size, e.g. “4 PE”
- Control type: “TIME”, “FLOAT”, “FLOAT BP” or “DUAL FLOAT SWITCH”
  Caution! If one of the additional functions hygienization with **UV lamp** or **PO3 elimination** is required, select control type: **“Float”** at this point.
  Function “FLOAT BP” not useful for SSB.
- Denitrification YES / NO
- With pressure monitoring YES / NO

Only if Password 2 was entered during password entry can the following additional options be selected during commissioning; see Chapter 9.3.2.4:

- Thermostat “OFF” / “VENTILATION” / “HEATING”
- UV lamp YES / NO
- PO3 elimination YES / NO
- Clear water discharge “AIRLIFT PUMP” / “MOTOR PUMP”
  Caution! If the additional function hygienization with **UV lamp** is required, a clear water pump is also required; therefore select **“MOTOR PUMP”** at this point.
- Sludge discharge “AIRLIFT PUMP” / “MOTOR PUMP”
- 2nd compressor YES / NO
- 3~ compressor YES / NO

If additional options have been selected, further options may follow and settings in the “OUTPUTS” and/or “PARAMETER 3” menus may be required; see Chapter 9.3.2.4, 9.3.4.9 and 0.

After these entries, the control unit automatically switches to manual operation; see Chapter 9.3.2.2. In manual operation, the different functions can be checked.

After manual operation has been ended, the window with the display “booting system…” opens, followed by the window with the start message “AQUATO”. The automatic cycle then starts. Commissioning is now complete.

Depending on the selection, e.g. thermostat, PO3 elimination, supplementary settings may then still be required in the “Outputs” menu or in the “Parameter 3” menu; see Chapter 9.3.2.4, 9.3.4.9 and 9.3.4.7.

The commissioning engineer must ensure that the parameter settings in the control unit have been made in such a way that they correspond to the requirements, e.g. basic type and discharge class, from the approval and the water-law permit for the plant in which the control unit is to be used.

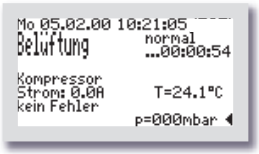
The automatic cycle runs through the following operating phases; these may vary depending on the exact setting:

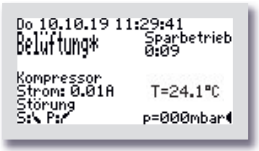
- Excess sludge discharge
- Pressure monitoring
- Aeration
- Settling phase
-Clear water discharge

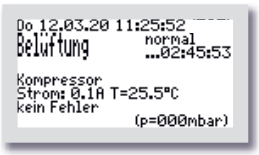
After these phases have been completed, the next cycle starts again from the beginning.

9.2 Main Display

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







1st line: Date and time.

2nd line: Current SSB phase, including “Sludge discharge”, “Pressure monitoring”, “Aeration”, “Settling phase”, “Clear water discharge” and, depending on the setting, further phases.

2nd line (right): Normal, energy-saving or holiday mode of the plant and, below this, in normal operation, the remaining time for which the current phase will continue; in energy-saving operation, the time elapsed since the start of the energy-saving phase.

3rd line: Display of denitrification, only for discharge class D; otherwise blank line.

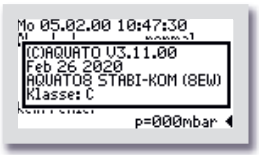
4th line: Display of which unit is active; otherwise, if no unit is switched on, blank line.

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

6th line Fault indication; otherwise “NO FAULT” if no fault message is present.

7th line: Float switch status up / down only visible when the float switch is activated; on the right, the currently present back pressure, shown in brackets if pressure monitoring has been switched off; at the far right, a triangle “◀” flashing once per second as operating status indication.

If the ↵ button is pressed in the standard display, an information window appears for approx. 3 seconds. The following is displayed in this window:



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

The exact display depends on the selected settings.

The buzzer or alarm can also be switched off in this menu using the ↵ button. See also Chapter 9.3.3.5.

9.3 Menu

9.4 Menu Structure

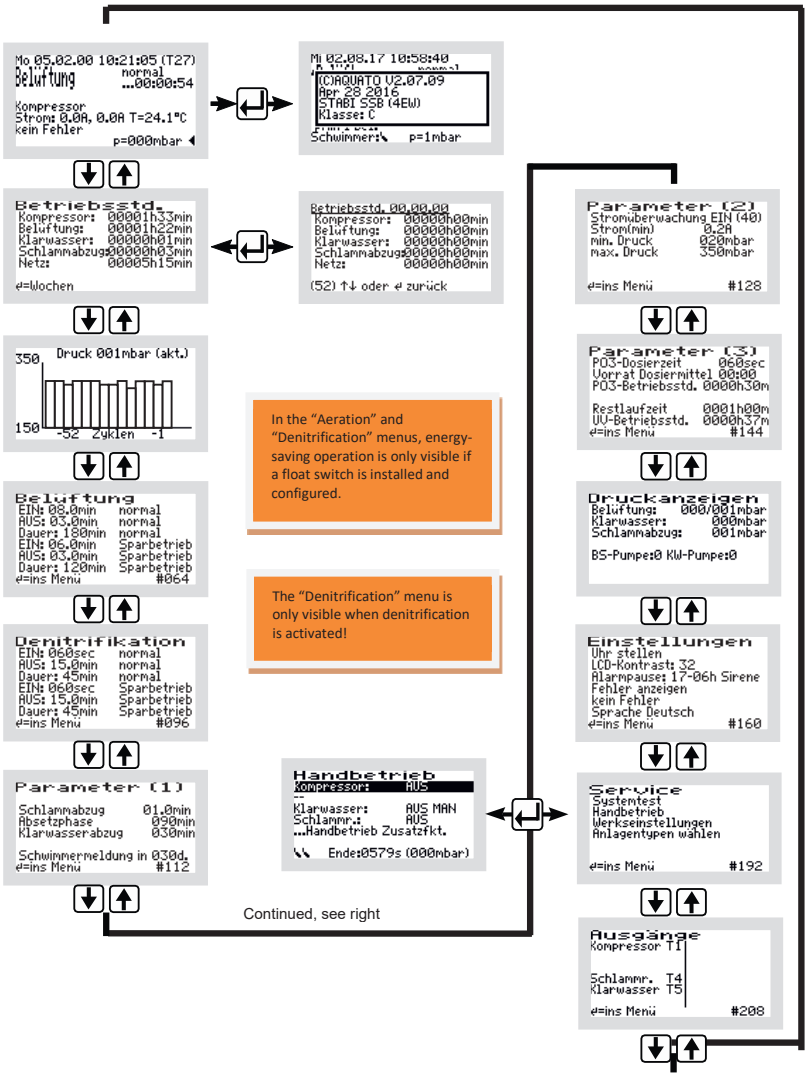


Figure 18: SSB menu structure

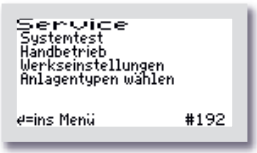
The exact display depends on the status of the plant as well as on the set parameters. The different display variants are explained in more detail below.

You move from menu to menu using the ↓ ↑ buttons. If you continue moving in the same direction, you will eventually return to the standard display.

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

The individual items are selected using the ↓ ↑ buttons. With the ↵ button, you can enter the submenu or editing mode, if possible.

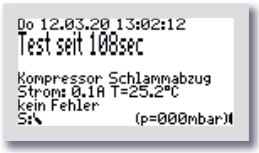
9.4.1 "Service" Menu



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

9.4.1.1 System Test / Test Operation

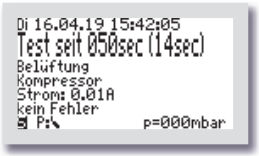
In test operation, it is checked whether the units are drawing current properly. If automatic test operation has been marked with the ↓ ↑ buttons via the "SYSTEM TEST" menu item, it is called up with the ↵ button. The "System Test" window offers the selection "CANCEL" or "START TEST". These two options are selected with the ↓ ↑ buttons in the lower line "(NEW)". After "START TEST" has been selected and confirmed, the system test begins.



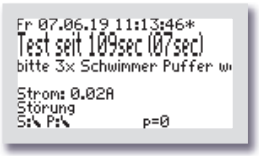
The test runs fully automatically. The individual functions are checked one after the other, each for approx. 15 seconds. If everything functions without faults, no alarm message appears. Test operation can be cancelled by pressing the ↵ button.

After all functions have been checked, test operation ends automatically and the interrupted cycle is continued in automatic operation. If the settling phase was interrupted by the system test during the last 30 minutes of its running time, the remaining running time of the settling phase is automatically extended to 30 minutes after manual operation, in order to ensure that only the treated water can be pumped out of the plant.

Function test of the float switch at the start of the system test only for CONTROL TYPE “FLOAT”.



During test operation, which lasts approx. 100 seconds, the main display in line 2 changes to: “Test for XX sec”.
The system test checks the individual functions one after the other and tests whether they are working correctly. If everything functions without faults, no alarm message appears.
Test operation can be cancelled by pressing the ↵ button.



If the option “BUFFER WITH FLOAT SWITCH” is set, the float switch for the buffer must be moved up and down 3 times at the end of the system test in order to check the function of the float switch. Test operation then ends.

Function test of the float switch in the buffer at the end of the system test only when the option “BUFFER WITH FLOAT SWITCH” is selected.

The system test lasts approx. 100 seconds. Test operation then ends automatically. If the function test of the float switch is not carried out, the system test ends without further checking after approx. 300 seconds.

After test operation has ended, the interrupted cycle is continued in automatic operation. If the settling phase was interrupted by the system test during the last 30 minutes of its running time, the remaining running time of the settling phase is automatically extended to 30 minutes after manual operation, in order to ensure that only the treated water can be pumped out of the plant.

9.4.1.2 Manual Operation

In manual operation of the K-Pilot 27.6 control unit, further settings can be made in addition to the parameters that are always present, “Compressor”, “Clear Water” and “Sludge R.” (= sludge return). The exact display depends on the parameters set during commissioning.

The Manual Operation menu consists of 2 windows. In the first manual operation window, with the standard functions, the ↓ ↑ buttons can be used to select between the parameters that are always present: “COMPRESSOR”, “CLEAR WATER” and “SLUDGE R.” (= sludge return), by moving the black bar to the desired entry. If, for example, “COMPRESSOR” is selected, it can be switched “ON” and “OFF” with the ↵-button.

The second manual operation window, with the additional functions, is accessed via the last line “...MANUAL OPERATION ADDITIONAL FUNCTIONS”. This window displays the additional functions selected during commissioning.

Depending on the default setting, different menu items can be selected in the 2nd manual operation window, such as “2ND COMPRESSOR”, “UV LAMP” or “PO3 elimination”, by moving the black bar to the desired entry. This function is then switched “ON” and “OFF” with the ↵-button.

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

At the bottom left of the display, 2 float switch symbols with the current float switch position are visible.
If no float switch is connected, this corresponds to the symbol position down.

If a float switch is moved up and down, the indication in the display also changes.

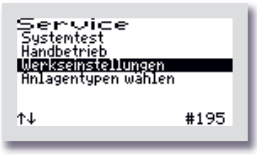
Manual operation is ended by moving the marking bar to the menu item "... End Manual Operation" using the ↓ ↑ buttons and then confirming by pressing the ↵ button.

If manual operation is not ended with "... END MANUAL OPERATION", the control unit automatically switches back to automatic operation 15 minutes after the last press of a button.

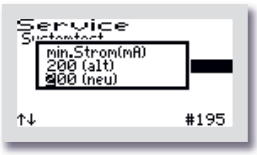
After manual operation has ended, the control unit continues the interrupted cycle in automatic operation. If the settling phase was interrupted by manual operation during the last 30 minutes of its running time, the remaining running time of the settling phase is automatically extended to 30 minutes after manual operation, in order to ensure that only the treated water can be pumped out of the plant.

9.4.1.3 Factory Settings

Under "FACTORY SETTINGS", the limit for current faults can be changed. **Resetting** the control unit, which is also possible under Factory Settings, is **not permitted** during the entire operation. Access to the factory settings is **only possible with Password 2**.



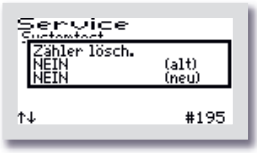
In "FACTORY SETTINGS", the following values can be changed/reset.



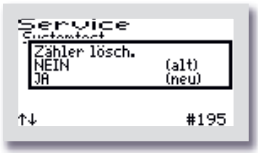
The first window that opens is "MIN. CURRENT (mA)". Here, the limit at which a fault is displayed can be changed. The default setting is 200 mA. The lowest possible limit is 50 mA. Using the ↓ ↑ buttons, the values can be changed digit by digit in the lower line "(NEW)", starting from the left. The selected value is accepted with the ↵ button. After the 3rd digit has been confirmed, the next window opens automatically.

The deletion options that follow are not permitted during the entire operating period of a small wastewater treatment plant. The prompts must be answered with "NO".

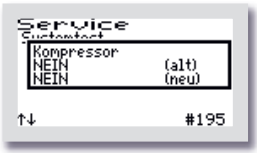
All prompts in the Factory Settings menu must be answered with "NO". The data must not be deleted.



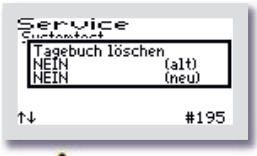
The “CLEAR COUNTERS:” window opens.
If “NO” is selected, the menus with the individual units are skipped and you go directly to the “CLEAR LOGBOOK” window.
→ **Answer: “NO”.**



If “YES” is selected, the control unit switches on to the individual units each time the ↵ button is pressed. In the first following window, “COMPRESSOR”, the counter for the compressor running time can be reset to zero by setting “YES” in the lower line “(NEW)” using the ↓ ↑ buttons.
→ **Answer: “NO”.**



The same procedure is used for the following windows: “FEEDING”, “AERATION”, “CLEAR WATER”, “SLUDGE DISCHARGE”, “MAINS”, “DOSING TIME”, “UV”.
→ **Answer: “NO”.**

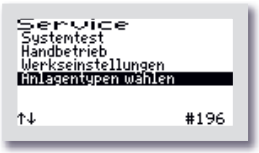


The last window in this menu to open is “CLEAR LOGBOOK”. If “YES” is selected here, all entries and settings are deleted. The control unit then restarts with commissioning.
→ **Answer: “NO”.**

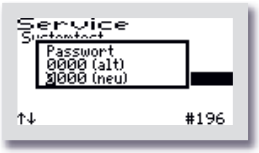
CAUTION! The procedures **“Clear counters:”** and “**Clear logbook**” are prohibited during the entire operation of a plant, as the operating log must record the running times of the units.

9.4.1.4 Select Plant Type

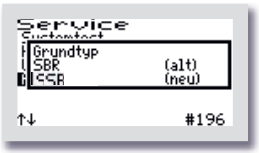
In this menu, the plant type and plant size as well as further parameters required for operation can be set/changed.



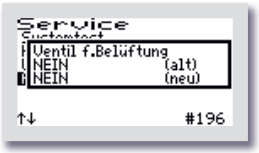
Select the menu item “SELECT PLANT TYPES”.



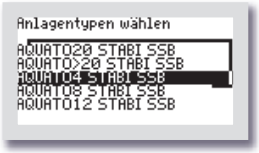
Then enter Password 1, or Password 2 for advanced settings, digit by digit and confirm each time with the ↵ button in order to access the menu.



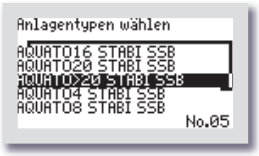
First, the “BASIC TYPE” of the plant is requested. Use the ↓↑ buttons to select the desired type in the second line “(NEW)”.
For operation as an SSB plant, select “SSB” and confirm with the ↵ button.



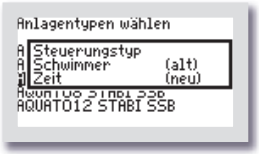
After the basic type has been selected, the “VALVE FOR AERATION” window asks whether aeration is controlled with a valve. In the standard case, aeration is controlled without a valve. To do this, confirm the selection “NO” with the ↵, button in order to select this setting.



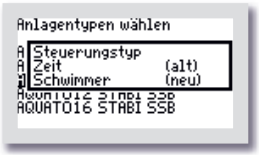
Then, in the “SELECT PLANT TYPES” window, select the desired or required PE number using the ↓↑ buttons. When the marking (= black bar) is on the correct PE number, according to the wastewater engineering calculation, confirm with the ↵ button. If the required PE number is not directly available for selection, select the next larger entry.
All parameters for the treatment cycle are automatically preset by this selection, but can be readjusted if required.



For plant sizes from 21 to 50 PE, please select “AQUATO>20 STABI SSB”. The preset cycle settings for plant sizes from 21 to 50 PE are the same; the different required air volumes are achieved by using different sizes and quantities of membrane aerators and compressors. If required, these settings can be readjusted.



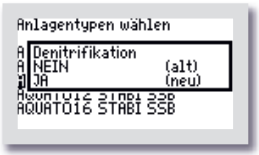
In the “CONTROL TYPE” window, you can select between a time-controlled or float-controlled cycle. The desired control type can be set in the second line “(NEW)”. Use the ↓ ↑ buttons to select between “TIME” and “FLOAT”. The selected control type is accepted with the ↵ button. With the “TIME” setting, the sequence of the cycle is controlled only by time; with the “FLOAT” setting, it is additionally controlled by the float switch. The selection of “FLOAT BP” is not useful for SSB plants.



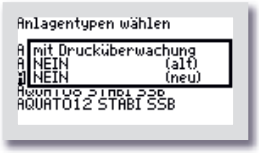
For operating a plant with UV lamp or dosing, the “FLOAT” CONTROL TYPE must be selected.

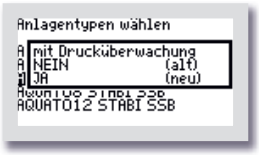
For further options and information on using the float switches, see Chapter 6.2.4.

For operation with “**UV lamp**” or “**PO3 elimination**”, “**FLOAT**” must always be selected as the control type.
The selection of “FLOAT BP” is not useful for SSB plants.



If “DENITRIFICATION” is desired/required, it can be activated in the next window. The desired option can be selected in the second line “(NEW)”. Use the ↓ ↑ buttons to select between “YES” and “NO”. The selected status is accepted with the middle ↵ button. “YES” means that the plant runs with a denitrification phase; with “NO”, this phase is switched off.





The next decision is made in the “WITH PRESSURE MONITORING” menu, namely whether the plant is to be monitored for pressure. If you do not need this monitoring, you can switch it off with “NO”.

If you switch monitoring on in the “WITH PRESSURE MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

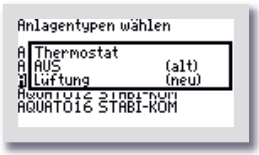
To use this monitoring, the pressure sensor connection “PRESSURE” must be connected to the air hose between the compressor and the aerators.

If the sensor, connection “Pressure” on the control unit, is not connected to the air hose, “NO” must be selected.

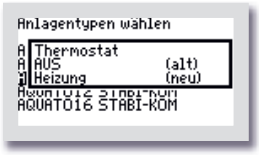
If Password 1 was used, the “SELECT PLANT TYPES” menu item is completed here and the software returns to the “SERVICE” main menu.

If the “SELECT PLANT TYPES” menu item was selected with Password 2, the following additional functions are available as further setting options.

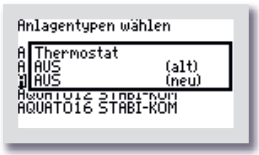
The **additional functions** can only be commissioned with **Password 2**.



First, in the window with the “THERMOSTAT” prompt, you can select control for a fan or heater.

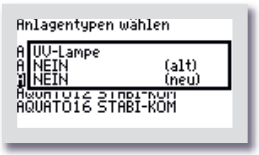


Further settings for this can be found in the “PARAMETER 3” menu.



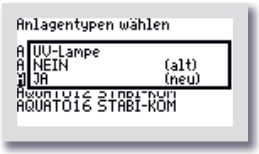
If you do not need this option, please answer the prompt with “OFF”.

Confirm your selection with the ↵ button.



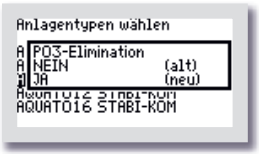
If you require hygienization, select the option “YES” in the “UV LAMP” window in the second line “(NEW)” using the ↓ ↑ buttons.

Further settings for this can be found in the “PARAMETER 3” menu.



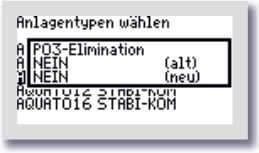
If you do not need this option, please answer the prompt with “NO”.

Confirm your selection with the ↵ button.



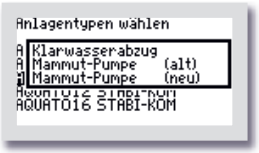
To activate phosphate precipitation, select the option “YES” in the “PO3 ELIMINATION” window in the second line “(NEW)” using the ↓ ↑ buttons.

Further settings for this can be found in the “PARAMETER 3” menu.

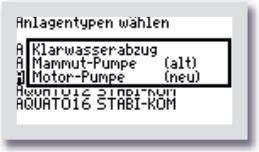


If you do not need this option, please answer the prompt with “NO”.

Confirm your selection with the ↵ button.

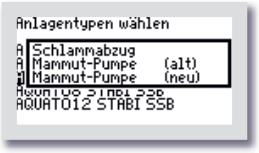


If a compressed-air lift is used for clear water discharge, please select “AIRLIFT PUMP” in the “CLEAR WATER DISCHARGE” window using the ↓ ↑ buttons.

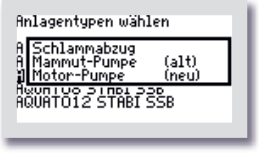


If clear water discharge is equipped with a submersible motor pump instead of the compressed-air lift, please select “MOTOR PUMP” in the “CLEAR WATER DISCHARGE” window.

Confirm your selection with the ↵ button.

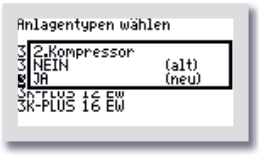


If a compressed-air lift is used for sludge discharge, please select “AIRLIFT PUMP” in the “SLUDGE DISCHARGE” window using the ↓ ↑ buttons.

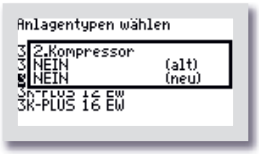


If sludge discharge is equipped with a submersible motor pump instead of the compressed-air lift, please select “MOTOR PUMP” in the “SLUDGE DISCHARGE” window.

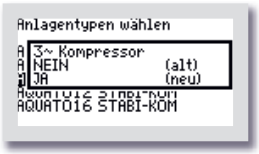
Confirm your selection with the ↵ button.



If you operate a plant with 2 compressors, please select the answer “YES” in the window with the prompt “2ND COMPRESSOR” in the lower line “(New)”.

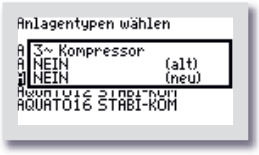


If you do not need this option, please answer the prompt with “NO”.

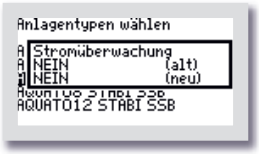


In the window with the prompt “3~COMPRESSOR”, you can select “YES” in the lower line “(New)” to enable control of a 3-phase compressor with 400 V. With this option, the standard current monitoring is switched off. This setting is required if an ORKA-S200 or ORKA-S400 module is selected for controlling the compressor or compressors. The option “YES” must always be selected if one or more units are controlled via a contactor. With this setting, the compressor for the airlifts is connected in the same way as usual. It is not switched on during aeration.

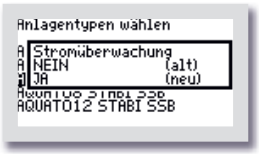
After completing the plant type selection, or commissioning, select a free output (T1 to T6) for connecting the three-phase compressor in the “OUTPUTS” menu; Chapter 9.3.4.9.



If you do not need this option, please answer the prompt with “NO”.



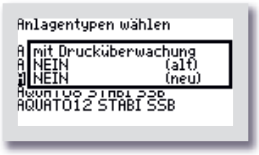
If you selected “YES” for the “3~COMPRESSOR” prompt, the “CURRENT MONITORING” window follows, with the decision as to whether the three-phase compressor is to be monitored for current faults.



If you do not need this monitoring, you can switch it off with “NO”.
If you switch on monitoring in the “CURRENT MONITORING” menu by selecting “YES”, a fault message will be issued if the compressor fails.

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

If the control unit has not been prepared, “NO” must be selected.



The next decision is made in the “WITH PRESSURE MONITORING” menu, namely whether the 3-phase compressor is to be monitored for pressure.

If you do not need this monitoring, you can switch it off with “NO”.

If you switch monitoring on in the “WITH PRESSURE MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

To use this monitoring, the pressure sensor connection “PRESSURE” must be connected to the air hose between the compressor and the aerators.

If the sensor, connection “Pressure” on the control unit, is not connected to the air hose, “NO” must be selected.

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

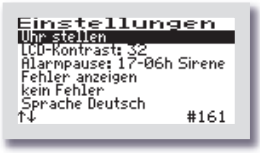
The software then returns to the “SERVICE” main menu. Use the buttons to exit the menu ↓ ↑.

If additional options have been selected, settings in the “OUTPUTS” menu may still be required; see Chapter 9.3.4.9. Further supplementary setting options that may be required can be found in the “PARAMETER 3” menu; see Chapter 0.

9.4.2 “Settings” Menu

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

9.4.2.1 Setting Date and Time



To correct the time and/or date, use the ↓ ↑ buttons to select the “SET CLOCK” line. When the marking (= black bar) is on the desired entry, press the ↵ middle button to open the window for adjusting the values.

The first digit can be changed using the ↓ ↑ buttons. When the correct value has been set, the digit is accepted with the ↵ middle button. The same procedure is used for all following digits.
Input sequence, each with 2 digits:
day, month, year, hour, minute (DD.MM.YY_hh.mm)

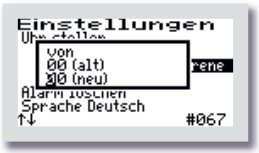
The clock is quartz-controlled. It should be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes maintenance evaluation easier.

Example: Changing the time from 13:20 to 13:26.

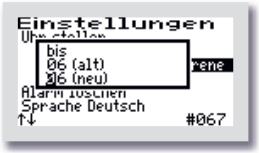
9.4.2.2 LCD Contrast

The LCD contrast can be optimized here. Usually, no change is necessary.

9.4.2.3 Alarm Buzzer (“Alarm Pause”)



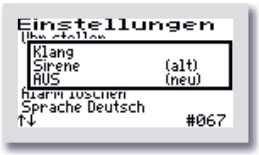
The acoustic alarm is switched off by default from 5:00 p.m. to 6:00 a.m. During this time, faults are only indicated visually. This setting can be changed in the “ALARM PAUSE” menu item.



Caution:
No acoustic alarm is issued during the period set here!

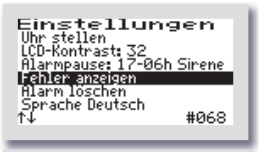
The sound for the alarm buzzer is set here. The selection options are: “SIREN”, “MELODY” and “OFF”.

The default setting is “SIREN”.



Caution:
With the “OFF” setting, no acoustic alarm is issued!

9.4.2.4 Display Errors



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

The error logbook displays the last 30 error events with 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!

9.4.2.5 Clear Alarm

If a fault, i.e. an alarm, has occurred, the alarm message can be reset after marking the “CLEAR ALARM” line by pressing th ↵ button. A window with the message “OK” then opens for approx. 1 second, and the display in the menu then changes to “NO FAULT”. The red flashing of the LED goes out and the fault message is cleared in the standard window.

The fault message remains stored in the error logbook and can therefore also be evaluated later.

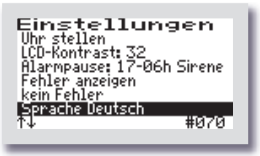
Note: If, in the event of a fault, the ↵ button is pressed in the main display, i.e. the standard display during operation, the buzzer is switched off and the “CLEAR ALARM” window opens, which after a short time automatically changes to the prompt “SURE?”.

If this is answered with “YES”, the fault indication is cleared and the red flashing of the LED goes out. The fault message remains stored in the error logbook and can therefore also be evaluated later.

If the prompt “SURE?” is answered with “NO”, the fault message remains in the main display.

The information window with the details of the plant setting then opens for approx. 3 seconds.

9.4.2.6 Language



The language of the control unit is selected here. The control unit is prepared for several languages. The currently programmed languages are:
– German
– English

9.4.3 Further Menus with Displays or Settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually set.
Adjustment may only be carried out by a specialist, as otherwise the treatment performance of the plant may be reduced and the building authority approval may become void.

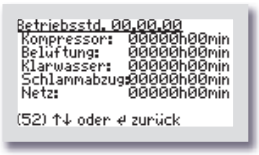
In order to be able to change the displayed values, the password must first be entered.

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. The standard values will then be set again.

9.4.3.1 Operating Hours Display

In the “OPERATING HOURS” menu, the operating hours of the respective units are displayed. The operating hours are counted up when the control unit has switched on the compressor, or possibly a pump. The display is shown in hours and minutes.

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

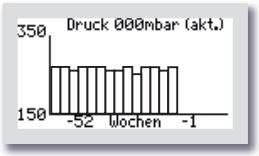


The last line shows the week, e.g. calendar week 52, in which the values were stored, always on Sunday.

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

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

9.4.3.2 Pressure Log



Note:
The “PRESSURE” graphic menu is only visible if pressure monitoring was selected during commissioning.

In this menu, the current pressure is shown in the top line, and the back pressure from pressure monitoring is documented weekly in the graphic.
The pressure is only shown graphically from 150 mbar.

9.4.3.3 Aeration

In the “AERATION” menu, the selected aeration intervals in normal operation are displayed, i.e. for how many minutes aeration is switched “ON” and “OFF” alternately (cycling).

The total aeration duration (“DURATION:”) is also displayed.

If required, the times can be changed individually. Press the ↵- button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. The menu item is called up with the ↵- button. The settings are changed using the ↓ ↑ buttons and confirmed with the ↵ button.
The aeration interval is also displayed for energy-saving operation, i.e. for how many minutes aeration is switched “ON” and “OFF”.

The total duration of aeration in energy-saving operation (“DURATION: XXX min ENERGY-SAVING OPERATION”) is also displayed.

Note:
The displays for “ENERGY-SAVING OPERATION” at the bottom of the AERATION window are only visible if the “FLOAT” CONTROL TYPE is set.

Energy-saving operation starts when the float switch has not risen after the first aeration phase and runs for three days. If the float switch does not rise again during this time, the plant switches to holiday mode. The aeration times for this cannot be set. They are automatically set to one third of the set energy-saving operation time. As soon as the float switch rises again, energy-saving or holiday mode is cancelled and the plant switches to normal operation. This begins with the aeration phase.

9.4.3.4 Denitrification

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

In the “DENITRIFICATION” menu, the selected aeration intervals in normal operation are displayed, i.e. for how many minutes aeration is switched “ON” and “OFF” alternately (cycling).

The total aeration duration (“DURATION:”) is also displayed.

If required, the times can be changed individually.

Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed using the ↓ ↑ buttons and confirmed with the ↵ button.

Note:
The display for “ENERGY-SAVING OPERATION” in the “DENITRIFICATION” menu is only visible if the “FLOAT” CONTROL TYPE is set.

The aeration interval is also displayed for energy-saving operation, i.e. for how many minutes aeration is switched “ON” and “OFF”.
The total duration of aeration in energy-saving operation (“DURATION: XXX min ENERGY-SAVING OPERATION”) is also displayed.

9.4.3.5 Parameter 1

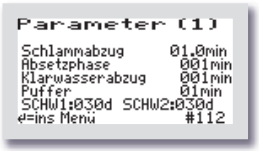
In the “PARAMETER 1” menu, different parameters are displayed depending on the setting. The parameters “SLUDGE DISCHARGE”, “SETTLING PHASE” and “CLEAR WATER DISCHARGE” are always present.

In this menu, the duration of the following cycle phases is displayed:
- SLUDGE DISCHARGE
- SETTLING PHASE
- CLEAR WATER DISCHARGE
- CONTINUOUS AERATION FOR XXX D

If required, the times can be changed individually.

In addition, continuous aeration during the start-up phase is possible with the menu item “CONTINUOUS AERATION FOR XXX D”. With this setting, aeration can be used in continuous operation for a certain number of days.

In the “Parameter 1” menu, when Password 2 is entered, the connected float switch(es) with the set waiting time until warning are displayed in the bottom line.
In the example, the float switch message becomes active after 30 days without a switching operation of the float switch.



If 2 float switches are connected, the time until the message is displayed separately for each one.
In the example, the float switch message becomes active for each float switch after 30 days without a switching operation of the float switch.

The waiting times until warning can be adjusted in the bottom line by entering Password 2.

If 0 days are entered, the float switch message is switched off.

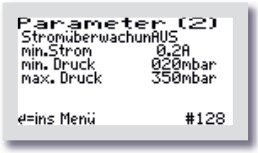
In the example, the float switch message for float switch 1 becomes active after 14 days without a switching operation of the float switch. The message for float switch 2 is switched off.

9.4.3.6 Parameter 2

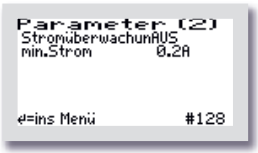
In the “PARAMETER 2” menu, different parameters can be displayed and adjusted depending on the setting.

When the control unit switches on a unit, e.g. the compressor or a pump, it cannot be guaranteed beyond doubt that this unit is actually running. Overheating, defective cables or other defects may result in the switching relay being switched on, while the unit nevertheless does not run. The control unit therefore monitors whether current is flowing in the circuit. If the current falls below a limit value, which is set by default in the software to 0.2 A, a current alarm is displayed, e.g. I AER.

The control unit also monitors the pressure generated during aeration, sludge return and clear water discharge. The minimum pressure is set by default to 20 mbar and the maximum pressure to 350 mbar. If the pressure falls below the minimum permissible pressure or exceeds the maximum permissible pressure, the control unit issues an alarm (pmin or pmax).



In this menu, current monitoring can be switched “OFF” or “ON”. In the standard case, current monitoring is set to “ON”. In addition, the current currently flowing is displayed in the main display for monitoring purposes.

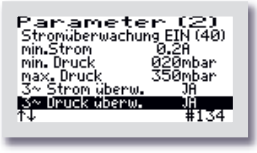


In the “PARAMETER 2” menu, the minimum and maximum permissible pressure can also be changed if required, as can the minimum current as the monitoring limit value.

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

If a three-phase compressor is selected, current monitoring for this compressor can be switched separately “ON” or “OFF” using the menu item “3~CURRENT MONITORING”.

For this monitoring, however, the control unit must be prepared at the factory. If the control unit has not been prepared, “NO” must be selected.



If a three-phase compressor is selected, pressure monitoring for this compressor can be switched separately “ON” or “OFF” using the menu item “3~PRESSURE MONITORING”.

To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the aerators. If the sensor is not connected to the air hose, “NO” must be selected.

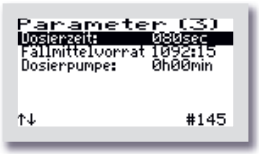
9.4.3.7 Parameter 3

Depending on the default setting, different parameters can be displayed and adjusted in the “PARAMETER 3” menu.

The exact appearance of the menu depends on the respective default settings. If no corresponding functions have been selected, the menu remains empty.

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

Press the ↵ button to enter the menu. The line to be changed is selected using 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 using the ↓ ↑ buttons, here from 80 to 60 seconds, and confirmed with the ↵ button.

In this example, a ventilation fan with a target temperature of 30 °C is connected.

The “OFF” / “ON” display after the word Ventilation shows the current operating status of the fan.
In the example, it is switched off.
The fan switches on at a temperature 10 degrees above the target value, here: 30 + 10 = 40 °C, and runs until the target value, here: 30 °C, is reached again.

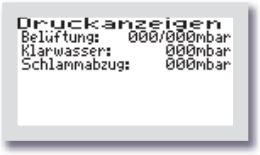
In this example, a heater with a target temperature of 10 °C is connected.

The “OFF” / “ON” display after the word Heating shows the current operating status of the heater.

In the example, it is switched off.

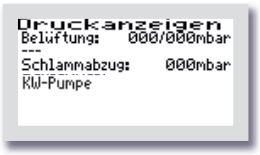
The heater switches on at a temperature 5 degrees below the target value, here: 10 - 5 = 5 °C, and runs until 2 degrees above the target value, here: 10 + 2 = 12 °C, has been reached.

9.4.3.8 Pressure Displays



Note:
The “PRESSURE DISPLAYS” menu is only visible if pressure monitoring was selected during commissioning.

In this menu, the respective pressure during the last cycle is displayed. The clear water and excess sludge back pressures are stored during the respective individual processes. Only the pressure measurement of the respective last phase is displayed.
For aeration, 2 values are displayed in each case: the minimum and maximum pressure.
If pressure monitoring is switched off, this menu is omitted.

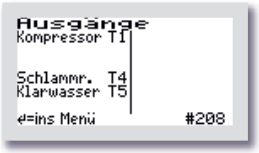


If a sludge pump and/or clear water pump is connected instead of the respective airlift, this is shown as text below the actual pressure displays. In addition, this output is not displayed as a pressure output.
In the example, a clear water pump is connected.

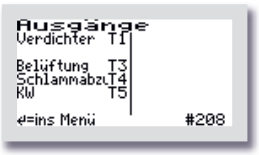
9.4.3.9 Outputs

In the “OUTPUTS” menu, it is displayed 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. They are assigned by default by the control unit. If required, the standard assignment can be changed.

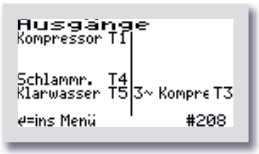
Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. You can exit the menu again by using the ↓ ↑ buttons to move continuously in one direction until the next menu opens.



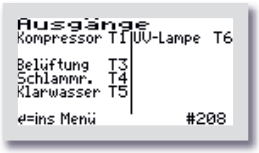
In this example, the compressor is controlled via output T1, sludge discharge via output T4 and clear water discharge via output T5.



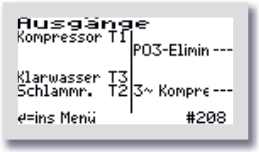
In this example, aeration is additionally controlled via output T3.



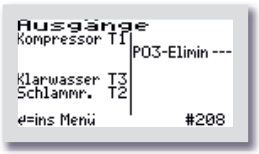
In this example, the compressor is controlled via output T1, sludge discharge via output T4 and clear water discharge via output T5. In addition, a three-phase compressor is controlled via output T3.

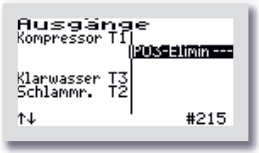


In this example, the compressor is controlled via output T1, aeration via output T3, sludge discharge via output T4 and clear water discharge via output T5. In addition, a UV lamp is controlled via output T6.



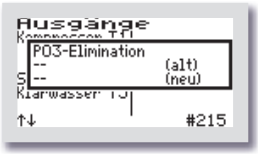
If one or more additional functions have been selected, in this example PO3 elimination and the three-phase compressor, each of these functions must still be assigned its own output. This can be seen from the blank symbols “--” after the units.



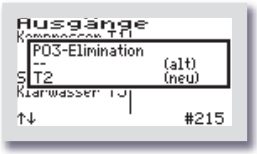


In this example, PO3 elimination has been selected as an additional function. This function must still be assigned a free output.

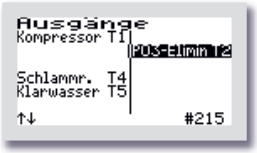
Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons.



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



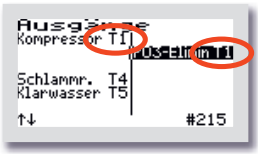
Select a free output, T2 in the example. To accept the setting, confirm with the ↵ button.



Here, output T2 has been selected.

You exit the menu using the ↓ ↑ buttons.

Further setting options for the special functions can be found in the “PARAMETER 3” menu.



Each selected function must be assigned a different output. **No output may be assigned with 2 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 exiting the submenu, and the menu is not exited, so that the selection in the relevant lines can be corrected.

The outputs cannot be assigned with 2 functions! This means that the same output must **not be selected twice**.

9.5 Default Settings

PE number:	8
Aeration 1st chamber:	Yes
Control type:	Time
Denitrification:	No

9.6 Switching Times – Basic Settings

PE number	Aeration Normal			Belüftung Sparbetrieb			Denitrifikation Normalbetrieb			Denitrifikation Sparbetrieb			Settling phase (min)	Clear water discharge (min)	Sludge discharge (min)
	Aerator ON (min)	Aerator OFF (min)	Duration (min)	Aerator ON (min)	Aerator OFF (min)	Duration (min)	Aerator ON (min)	Aerator OFF (min)	Duration (min)	Aerator ON (min)	Aerator 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 energy-saving and holiday mode when a float switch is installed and the control type “FLOAT” is set. Energy-saving operation is switched on if the float switch has not risen after sludge discharge. Holiday mode begins after energy-saving operation if the float switch has not risen within 3 days of energy-saving operation. In holiday mode, the aeration time is reduced again by 2/3. As soon as the float switch rises again, the plant switches back to normal operation. With the control type setting “FLOAT”, 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 by a competent person commissioned by the owner (operator).

After commissioning, the plant operates fully automatically. It is controlled by a PLC. The sequence and progression of the phases are programmed in the control unit. The times for the aeration intervals, the denitrification phase (optional), as well as for feeding, discharge of the treated wastewater and return of the excess sludge, are preset, but can be readjusted if required.

In the standard case, the cycles run purely time-controlled. However, it is possible to use a float switch; see Chapter 6.2.4, and thereby also have the plant controlled by the water level.

If faults occur during operation of the plant, they are indicated visually and acoustically by the control unit. The LED flashes red and the buzzer sounds. The fault message remains in the main display until the fault is acknowledged; see Chapter 10.3.3.5.

The fault message remains stored in the error logbook and can therefore also be evaluated later.

The control unit is equipped with a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approx. every 30 seconds in order to alert the operator to the missing treatment function. When the power supply returns after the power failure, the device switches on again automatically.

10.1 Commissioning of the Control Unit

Before commissioning the plant, the primary treatment chamber and the biological treatment chamber must be filled with water up to 5 cm above $H_{W,min}$, and the housing of the control unit must be closed if it has been opened.

Commissioning of the control unit begins by inserting the mains plug of the control unit, or by switching on the ON/OFF switch. The control unit then starts with a self-test lasting approx. 3 seconds with the display “booting system…”.

The red LED then lights up briefly, followed by 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 area of the message is the software version number.

During initial commissioning, the display “COMMISSIONING” then appears. During commissioning of the K-Pilot 27.6 control unit, the following must first be entered; see Chapter 10.3.2.4 as well as 10.3.3.1 and 10.3.3.6:

- Password (4-digit):
  Password 1 or
  Password 2 for advanced options
- Language
- Date and time
- Basic plant type, here selection: “**SBR**”
- Valve for aeration YES / NO
- Plant size, e.g. “4 PE”
- Control type: “TIME”, “FLOAT”, “FLOAT BP” or “DUAL FLOAT SWITCH”
  Caution! If one of the additional functions hygienization with **UV lamp** or **PO3 elimination** is required, select control type: “**Float**” at this point.
- Denitrification? YES / NO
- With pressure monitoring YES / NO

Only if Password 2 was entered during password entry can the following additional options be selected during commissioning; see Chapter 10.3.2.4:

- Thermostat “OFF” / “VENTILATION” / “HEATING”
- UV lamp YES / NO
- PO3 elimination YES / NO
- Clear water discharge “AIRLIFT PUMP” / “MOTOR PUMP”
  Caution! If the additional function hygienization with **UV lamp** is required, a clear water pump is also required; therefore select “**MOTOR PUMP**” at this point.
- Feeding “AIRLIFT PUMP” / “MOTOR PUMP”
- Sludge discharge “AIRLIFT PUMP” / “MOTOR PUMP”
- 2nd compressor YES / NO
- 3~ compressor YES / NO

If additional options have been selected, further options may follow and settings in the “OUTPUTS” and/or “PARAMETER 3” menus may be required; see Chapter 10.3.4.9 and 0.

After these entries, the control unit automatically switches to manual operation; see Chapter 10.3.2.2. In manual operation, the different functions can be checked.

After manual operation has been ended, the window with the display “booting system…” opens, followed by the window with the start message “AQUATO”. The automatic cycle then starts. Commissioning is now complete.

Depending on the selection, e.g. thermostat, PO3 elimination, supplementary settings may then still be required in the “Outputs” menu or in the “Parameter 3” menu; see Chapter 10.3.2.4, 10.3.4.9 and 10.3.4.7.

The commissioning engineer must ensure that the parameter settings in the control unit have been made in such a way that they correspond to the requirements, e.g. basic type and discharge class, of the approval and the water-law permit for the plant in which the control unit is to be used.

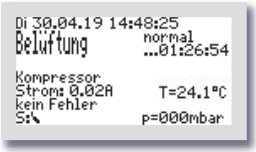
The automatic cycle runs through the following operating phases; these may vary depending on the exact setting:

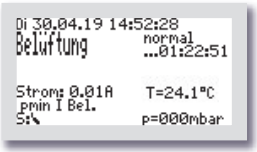
- Excess sludge discharge
- Pressure monitoring
- Feeding
- Aeration
- Settling phase
- Clear water discharge

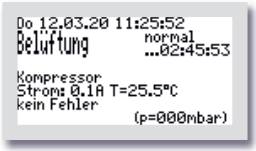
After these phases have been completed, the next cycle starts again from the beginning.

10.2 Main Display

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







1st line: Date and time

2nd line: Current SBR phase, including “Feeding”, “Aeration”, “Settling phase”, “Clear water discharge”, “Sludge discharge”, “Pressure monitoring” and, depending on the setting, further phases

2nd line (right): Normal, energy-saving or holiday mode of the plant and, below this, in normal operation, the remaining time for which the current phase will continue; in energy-saving operation, the time elapsed since the start of the energy-saving phase

3rd line: Display of denitrification, only for discharge class D; otherwise blank line

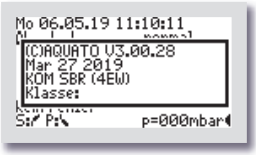
4th line: Display of which unit is active; otherwise, if no unit is switched on, blank line

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

6th line: Fault indication; otherwise “NO FAULT” if no fault message is present

7th line: Float switch status up / down only visible when the float switch is activated; on the right, the currently present back pressure, shown in brackets if pressure monitoring has been switched off; at the far right, a triangle “◀” flashing once per second as operating status indication

If the ↵ button is pressed in the standard display, an information window appears for approx. 3 seconds. The following is displayed in this window:



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

The exact display depends on the selected settings.

The buzzer or alarm can also be switched off in this menu using the ↵ button. See also Chapter 10.3.3.5.

10.3 Menu

10.4 Menu Structure

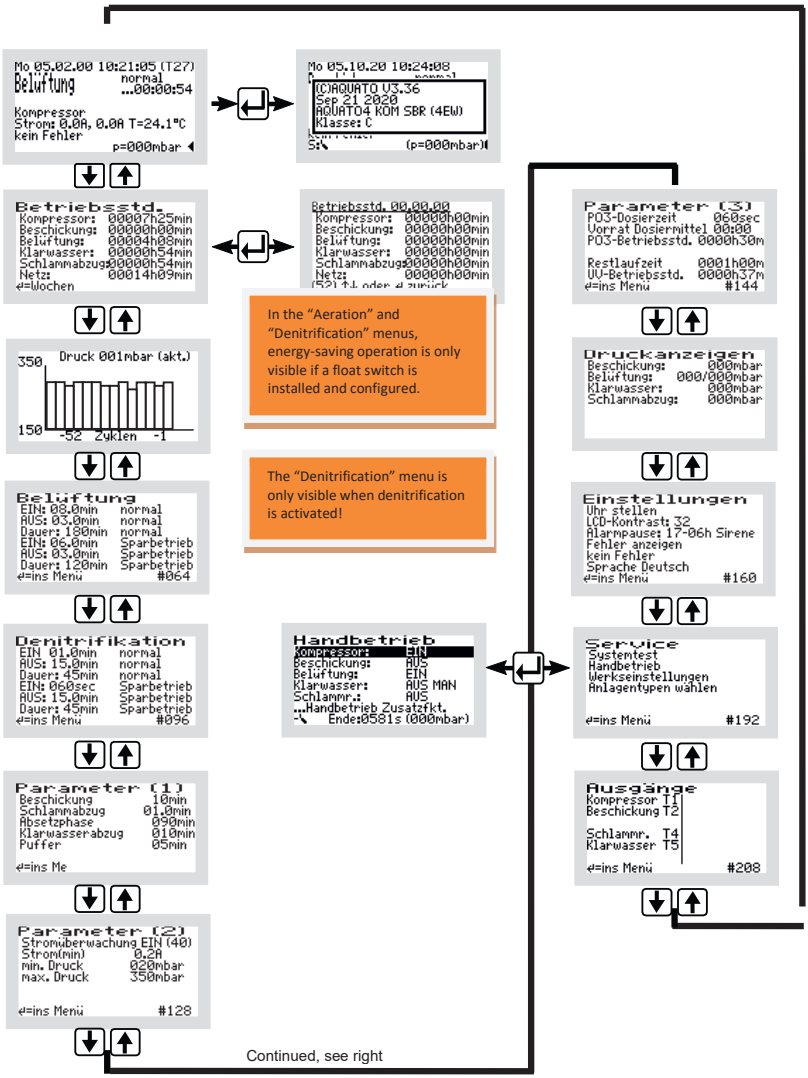


Figure 19: SBR menu structure

The exact display depends on the status of the plant as well as on the set parameters. The different display variants are explained in more detail below.

You move from menu to menu using the ↓ ↑ buttons. If you continue moving in the same direction, you will eventually return to the standard display.

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

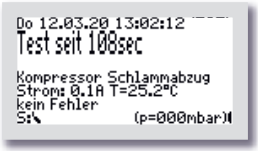
The individual items are selected using the ↓ ↑ buttons. With the ↵ button, you can enter the submenu or editing mode, if possible.

10.4.1 "Service" Menu

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

10.4.1.1 System Test / Test Operation

In test operation, it is checked whether the units are drawing current properly. If automatic test operation has been marked with the ↓ ↑ buttons via the "SYSTEM TEST" menu item, 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 lower line "(NEW)". After "START TEST" has been selected and confirmed, the system test begins.



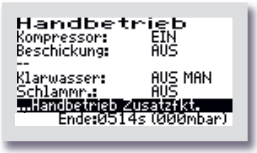
The test runs fully automatically. The individual functions are checked one after the other, each for approx. 15 seconds. If everything functions without faults, no alarm message appears. Test operation can be cancelled by pressing the ↵ button.

After all functions have been checked, test operation ends automatically and the interrupted cycle is continued in automatic operation. If the settling phase was interrupted by the system test during the last 30 minutes of its running time, the remaining running time of the settling phase is automatically extended to 30 minutes after manual operation, in order to ensure that only the treated water can be pumped out of the plant.

10.4.1.2 Manual Operation

In manual operation of the K-Pilot 27.6 control unit, further settings can be made in addition to the parameters that are always present: “Compressor”, “Feeding”, “Clear Water” and “Sludge R.” (= sludge return). The exact display depends on the parameters set during commissioning.

The Manual Operation menu consists of 2 windows. In the first manual operation window, with the standard functions, the ↓ ↑-buttons can be used to select between the parameters that are always present: “COMPRESSOR”, “FEEDING”, “CLEAR WATER” and “SLUDGE R.” (= sludge return), by moving the black bar to the desired entry.



If, for example, “COMPRESSOR” is selected, it can be switched “ON” and “OFF” with the ↵ button.

The second manual operation window, with the additional functions, is accessed via the last line “...MANUAL OPERATION ADDITIONAL FUNCTIONS”. This window displays the additional functions selected during commissioning.

Depending on the default setting, different menu items can be selected in the 2nd manual operation window, such as “2ND COMPRESSOR”, “UV LAMP” or “PO3 elimination”, by moving the black bar to the desired entry. This function is then switched “ON” and “OFF” with the ↵ button.

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

At the bottom left of the display, 2 float switch symbols with the current float switch position are visible.
If no float switch is connected, this corresponds to the symbol position down.

If a float switch is moved up and down, the indication in the display also changes.

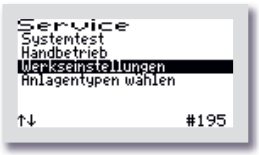
Manual operation is ended by moving the marking bar to the menu item “... End Manual Operation” using the ↓ ↑ buttons and then confirming by pressing the ↵ button.

If manual operation is not ended with “... END MANUAL OPERATION”, the control unit automatically switches back to automatic operation 15 minutes after the last press of a button.

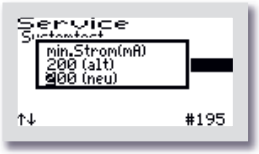
After manual operation has ended, the control unit continues the interrupted cycle in automatic operation. If the settling phase was interrupted by manual operation during the last 30 minutes of its running time, the remaining running time of the settling phase is automatically extended to 30 minutes after manual operation, in order to ensure that only the treated water can be pumped out of the plant.

10.4.1.3 Factory Settings

Under “FACTORY SETTINGS”, the limit for current faults can be changed. **Resetting** the control unit, which is also possible under Factory Settings, is **not permitted** during the entire operation. Access to the factory settings is **only possible with Password 2**.



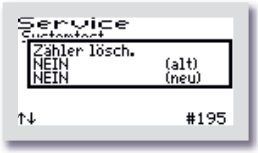
In “FACTORY SETTINGS”, the following values can be changed/reset.



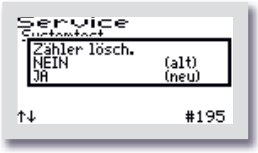
The first window that opens is “MIN. CURRENT (mA)”. Here, the limit at which a fault is displayed can be changed. The default setting is 200 mA. The lowest possible limit is 50 mA. Using the ↓ ↑ buttons, the values can be changed digit by digit in the lower line “(NEW)”, starting from the left. The selected value is accepted with the ↵ button. After the 3rd digit has been confirmed, the next window opens automatically.

The deletion options that follow are not permitted during the entire operating period of a small wastewater treatment plant. The prompts must be answered with “NO”.

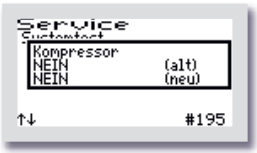
All prompts in the Factory Settings menu must be answered with “NO”. The data must not be deleted.



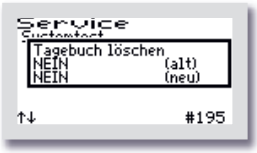
The “CLEAR COUNTERS:” window opens.
If “NO” is selected, the menus with the individual units are skipped and you go directly to the “CLEAR LOGBOOK” window.
→ **Answer: “NO”.**



If “YES” is selected, the control unit switches on to the individual units each time the ↵ button is pressed. In the first following window, “COMPRESSOR”, the counter for the compressor running time can be reset to zero by setting “YES” in the lower line “(NEW)” using the ↓ ↑ buttons.
→ **Answer: “NO”.**



The same procedure is used in the following windows: “FEEDING”, “AERATION”, “CLEAR WATER”, “SLUDGE DISCHARGE”, “MAINS”, “UV”, “DOSING TIME”.
→ **Answer: “NO”.**

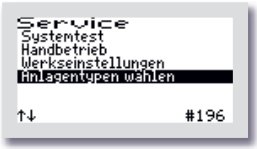


The last window in this menu to open is “CLEAR LOGBOOK”. If “YES” is selected here, all entries and settings are deleted. The control unit then restarts with commissioning.
→ **Answer: “NO”.**

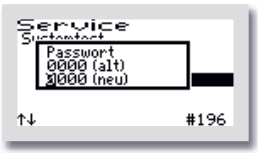
CAUTION! The procedures “**Clear counters:”** and “**Clear logbook**” are prohibited during the entire operation of a plant, as the operating log must record the running times of the units.

10.4.1.4 Select Plant Type

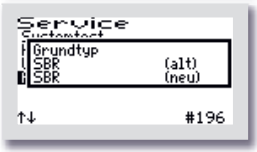
In this menu, the plant type and plant size as well as further parameters required for operation can be set/changed.



Select the menu item “SELECT PLANT TYPES”.

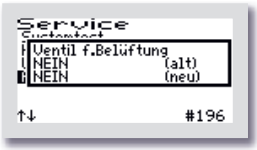


Then enter Password 1, or Password 2 for advanced settings, digit by digit and confirm each time with the ↵ button in order to access the menu.



First, the “BASIC TYPE” of the plant is requested. Use the ↓ ↑-buttons to select the desired type in the second line “(NEW)”.

For operation as an SBR plant, select “SBR” and confirm with the ↵ button.



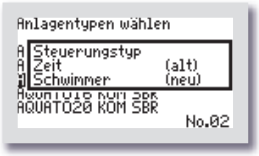
After the basic type has been selected, the “VALVE FOR AERATION” window asks whether aeration is controlled with a valve. In the standard case, aeration is controlled without a valve. To do this, confirm the selection “NO” with the ↵ button in order to select this setting.

Then, in the “SELECT PLANT TYPES” window, select the desired or required PE number using the ↓ ↑ buttons. When the marking (= black bar) is on the correct PE number, according to the wastewater engineering calculation, confirm with the ↵ button. If the required PE number is not directly available for selection, select the next larger entry.

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

For plant sizes from 21 to 50 PE, please select “AQUATO>20 KOM SBR”. The preset cycle settings for plant sizes from 21 to 50 PE are the same; the different required air volumes are achieved by using different sizes and quantities of membrane aerators and compressors. If required, these settings can be readjusted.

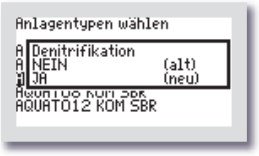
In the “CONTROL TYPE” window, you can select between a time-controlled or float-controlled cycle. The desired control type can be set in the second line “(NEW)”. Use the ↓ ↑ buttons to select between “TIME” and “FLOAT”. The selected control type is accepted with the ↵ button. With the “TIME” setting, the sequence of the cycle is controlled only by time; with the “FLOAT” setting, it is additionally controlled by the float switch.



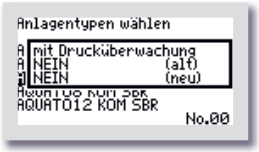
For operating a plant with UV lamp or dosing, the “FLOAT” control type must be selected.

For further options and information on using the float switches, see Chapter 6.2.4.

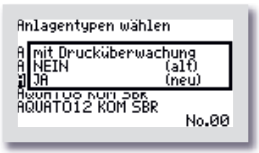
For operation with “**UV lamp**” or “**PO3 elimination**”, “**FLOAT**” must always be selected as the control type.



If “DENITRIFICATION” is desired/required, it can be activated in the next window. The desired option can be selected in the second line “(NEW)”. Use the ↓ ↑ buttons to select between “YES” and “NO”. The selected status is accepted with the ↵ button. “YES” means that the plant runs with a denitrification phase; with “NO”, this phase is switched off.



The next decision is made in the “WITH PRESSURE MONITORING” menu, namely whether the plant is to be monitored for pressure. If you do not need this monitoring, you can switch it off with “NO”.



If you switch monitoring on in the “WITH PRESSURE MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

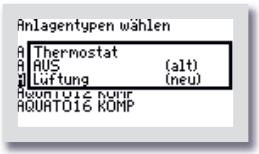
To use this monitoring, the pressure sensor connection “Pressure” must be connected to the air hose between the compressor and the aerators.

If the sensor, connection “Pressure” on the control unit, is not connected to the air hose, “NO” must be selected.

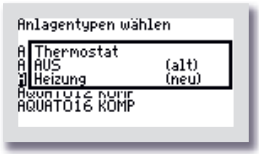
If Password 1 was used, the “SELECT PLANT TYPES” menu item is completed here and the software returns to the “SERVICE” main menu.

If the “SELECT PLANT TYPES” menu item was selected with Password 2, the additional functions are available as further setting options.

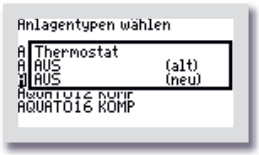
The **additional functions** can only be commissioned with **Password 2**.



First, in the window with the “THERMOSTAT” prompt, you can select control for a fan or heater.



Further settings for this can be found in the “PARAMETER 3” menu.

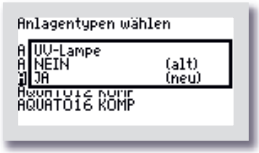


If you do not need this option, please answer the prompt with “OFF”.

Confirm your selection with the ↵ button.

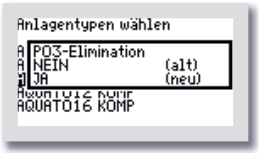
If you require hygienization, select the option “YES” in the “UV LAMP” window in the second line “(NEW)” using the ↓ ↑ buttons.

Further settings for this can be found in the Parameter 3 menu.



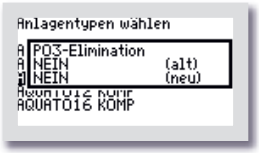
If you do not need this option, please answer the prompt with “NO”.

Confirm your selection with the ↵ button.



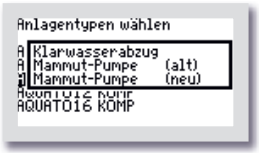
To activate phosphate precipitation, select the option “YES” in the “PO3 ELIMINATION” window in the second line “(NEW)” using the ↓ ↑ buttons.

Further settings for this can be found in the Parameter 3 menu.

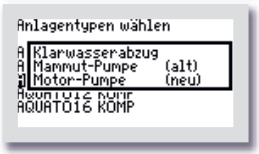


If you do not need this option, please answer the prompt with “NO”.

Confirm your selection with the ↵ button.

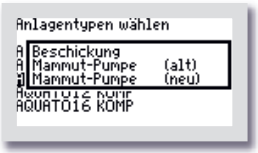


If a compressed-air lift is used for clear water discharge, please select “AIRLIFT PUMP” in the “CLEAR WATER DISCHARGE” window using the ↓ ↑ buttons.

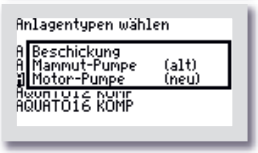


If clear water discharge is equipped with a submersible motor pump instead of the compressed-air lift, please select “MOTOR PUMP” in the “CLEAR WATER DISCHARGE” window.

Confirm your selection with the ↵ button.

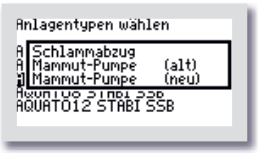


If a compressed-air lift is used for feeding, please select “AIRLIFT PUMP” in the “FEEDING” window using the ↓ ↑ buttons.

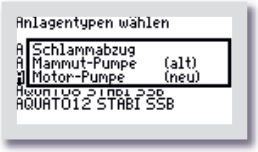


If feeding is equipped with a submersible motor pump instead of the compressed-air lift, please select “MOTOR PUMP” in the “FEEDING” window.

Confirm your selection with the ↵ button.

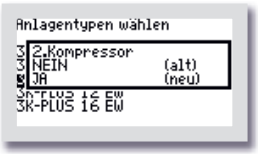


If a compressed-air lift is used for sludge discharge, please select “AIRLIFT PUMP” in the “SLUDGE DISCHARGE” window using the ↓ ↑ buttons.

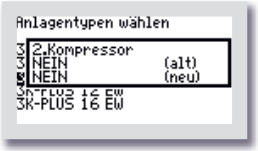


If sludge discharge is equipped with a submersible motor pump instead of the compressed-air lift, please select “MOTOR PUMP” in the “SLUDGE DISCHARGE” window.

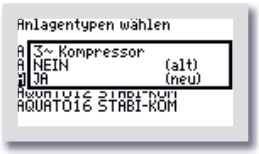
Confirm your selection with the ↵ button.



If you operate a plant with 2 compressors, please select the answer “YES” in the window with the prompt “2ND COMPRESSOR” in the lower line “(New)”.

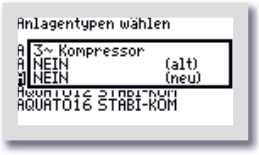


If you do not need this option, please answer the prompt with “NO”.

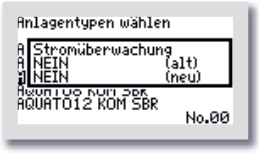


In the window with the prompt “3~COMPRESSOR”, you can select “YES” in the lower line “(New)” to enable control of a 3-phase compressor with 400 V. With this option, the standard current monitoring is switched off. This setting is required if an ORKA-S200 or ORKA-S400 module is selected for controlling the compressor or compressors. The option “YES” must always be selected if one or more units are controlled via a contactor. With this setting, the compressor for the airlifts is connected in the same way as usual. It is not switched on during aeration.

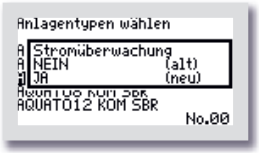
After completing the plant type selection, or commissioning, select a free output (T1 to T6) for connecting the three-phase compressor in the “OUTPUTS” menu; Chapter 10.3.4.9.



If you do not need this option, please answer the prompt with “NO”.



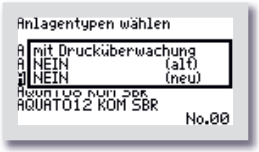
If you selected “YES” for the “3~COMPRESSOR” prompt, the “CURRENT MONITORING” window follows, with the decision as to whether the three-phase compressor is to be monitored for current faults. If you do not need this monitoring, you can switch it off with “NO”.



If you switch on monitoring in the “CURRENT MONITORING” menu by selecting “YES”, a fault message will be issued if the compressor fails.

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

If the control unit has not been prepared, “NO” must be selected.



The next decision is made in the “WITH PRESSURE MONITORING” menu, namely whether the 3-phase compressor is to be monitored for pressure. If you do not need this monitoring, you can switch it off with “NO”.

If you switch monitoring on in the “WITH PRESSURE MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

To use this monitoring, the pressure sensor connection “Pressure” must be connected to the air hose between the compressor and the aerators.

If the sensor, connection “Pressure” on the control unit, is not connected to the air hose, “NO” must be selected.

For operation with “**UV LAMP**” or “**PO3 ELIMINATION**”, the “**FLOAT**” control type must always be selected beforehand.

If the additional function “**UV LAMP**” is selected, the “**CLEAR WATER DISCHARGE**” function must also be selected with the “**MOTOR PUMP**” option.

The software then returns to the “SERVICE” main menu. Use the ↓ ↑ buttons to exit the menu.

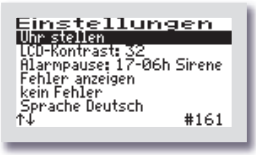
If additional options have been selected, settings in the “OUTPUTS” menu may still be required; see Chapter 10.3.4.9. Further supplementary setting options that may be required can be found in the “PARAMETER 3” menu; see Chapter 0.

10.4.2 “Settings” Menu

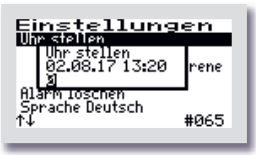
The operator settings can be configured in the “SETTINGS” menu.

Press the ↵ button to enter the menu and select the desired item.

10.4.2.1 Setting Date and Time



To correct the time and/or date, use the ↓ ↑ buttons to select the “SET CLOCK” line. When the marking (= black bar) is on the desired entry, press the ↵ middle button to open the window for adjusting the values.



The first digit can be changed using the ↓ ↑ buttons. When the correct value has been set, the digit is accepted with the ↵ middle button. The same procedure is used for all following digits.
Input sequence, each with 2 digits:
day, month, year, hour, minute (DD.MM.YY_hh.mm)

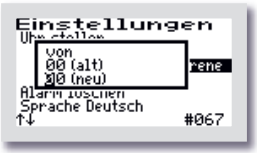
The clock is quartz-controlled. It should be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes maintenance evaluation easier.

Example: Changing the time from 13:20 to 13:26.

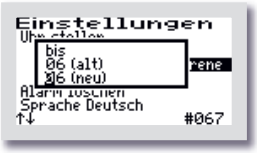
10.4.2.2 LCD Contrast

The LCD contrast can be optimized here. Usually, no change is necessary.

10.4.2.3 Alarm Buzzer (“Alarm Pause”)



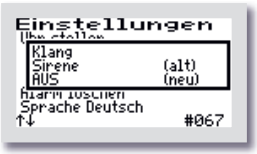
The acoustic alarm is switched off by default from 5:00 p.m. to 6:00 a.m. During this time, faults are only indicated visually. This setting can be changed in the “ALARM PAUSE” menu item.



<u>Caution:</u> No acoustic alarm is issued during the period set here!

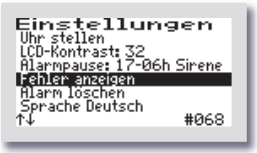
The sound for the alarm buzzer is set here. The selection options are: “SIREN”, “MELODY” and “OFF”.

The default setting is “SIREN”.



<u>Caution:</u> With the “OFF” setting, no acoustic alarm is issued!

10.4.2.4 Display Errors



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

The error logbook displays the last 30 error events with 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!

10.4.2.5 Clear Alarm

If a fault, i.e. an alarm, has occurred, the alarm message can be reset after marking the “CLEAR ALARM” line by pressing the ↵-button. A window with the message “OK” then opens for approx. 1 second, and the display in the menu then changes to “NO ERROR”. The red flashing of the LED goes out and the fault message is deleted in the standard window.

The fault message remains stored in the error logbook and can therefore still be evaluated later.

Note: If, in the event of a fault, the ↵ button is pressed in the main display, i.e. the standard display during operation, the buzzer is switched off and the “CLEAR ALARM” window opens, which automatically changes to the “ARE YOU SURE?” prompt after a short time.

If this is answered with “YES”, the fault display is cleared and the red flashing of the LED goes out. The fault message remains stored in the error logbook and can therefore still be evaluated later.

If the “ARE YOU SURE?” prompt is answered with “NO”, the fault message remains in the main display. The info window with details of the plant settings then opens for approx. 3 seconds.

10.4.2.6 Language

The language of the control unit is selected here. The password must be entered for this. The control unit is prepared for several languages. The languages currently programmed are:
– German
– English

10.4.3 Further Menus with Displays or Settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually adjusted.
Adjustments may only be carried out by a specialist, as the treatment performance of the plant may otherwise be reduced and the building authority approval may become invalid.

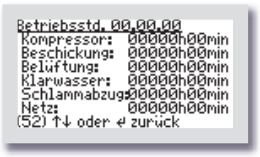
However, in order to change the displayed values, the password must first be entered.

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 10.3.2.4. The standard values are then set again.

10.4.3.1 Operating Hours Display

The operating hours of the respective units are displayed in the “OPERATING HOURS” menu. The operating hours are counted up when the control unit has switched on the compressor, or possibly a pump. The display is shown in hours and minutes.

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

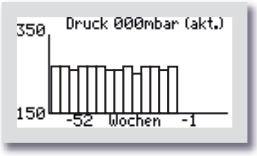


The last line shows the week, example calendar week 52, in which the values were stored, always on Sunday.

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

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

10.4.3.2 Pressure Log



Note:
The “PRESSURE” graph menu is only visible if pressure monitoring was selected during commissioning.

In this menu, the current pressure is documented in the upper line, and the back pressure from the pressure monitoring is documented weekly in the graph.

The pressure is only shown graphically from 150 mbar.

10.4.3.3 Aeration

In the “AERATION” menu, the selected aeration intervals in normal operation are displayed, i.e. for how many minutes aeration is alternately switched “ON” and “OFF” cycle by cycle.

The total duration of aeration, “DURATION:”, is also displayed.

The times can be changed individually if required. Press the ↵-button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. The menu item is called up with the ↵-button. The settings are changed using the ↓ ↑-buttons and confirmed with the ↵ button.
The aeration interval is also displayed for energy-saving operation, i.e. for how many minutes aeration is switched “ON” and “OFF”.

The total duration of aeration in energy-saving operation, “DURATION: XXXmin ENERGY-SAVING OPERATION”, is also displayed.

Note:
The displays for “ENERGY-SAVING OPERATION” at the bottom of the AERATION window are only visible if the “FLOAT” CONTROL TYPE is set.

Energy-saving operation starts with the aeration phase if the float switch has not floated up during the feeding phase, and runs for three days. If the float switch does not float up again during this time, the plant switches to holiday mode. The aeration times for this cannot be set. They are automatically set to one third of the configured energy-saving operation time. As soon as the float switch floats up again during the feeding phase, energy-saving or holiday mode is cancelled and the plant switches to normal operation. This begins with the aeration phase.

10.4.3.4 Denitrification

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

In the “DENITRIFICATION” menu, the selected aeration intervals in normal operation are displayed, i.e. for how many minutes aeration is alternately switched “ON” and “OFF” cycle by cycle.

The total duration of aeration, “DURATION:”, is also displayed.
The times can be changed individually if required.
Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑- buttons. The menu item is called up with the ↵- button. The settings are changed using the ↓ ↑- buttons and confirmed with the ↵ button.

Note:
The “ENERGY-SAVING OPERATION” display in the “DENITRIFICATION” menu is only visible if the “FLOAT” CONTROL TYPE is set.

The aeration interval is also displayed for energy-saving operation, i.e. for how many minutes aeration is switched “ON” and “OFF”.
The total duration of aeration in energy-saving operation, “DURATION: XXXmin ENERGY-SAVING OPERATION”, is also displayed.

10.4.3.5 Parameter 1

In the “PARAMETER 1” menu, different parameters are displayed depending on the setting. The parameters “FEEDING”, “SLUDGE DISCHARGE”, “SETTLING PHASE” and “CLEAR WATER DISCHARGE” are always present.

In this menu, depending on the setting, the duration of the following cycle phases is displayed:
- FEEDING
- SLUDGE DISCHARGE
- SETTLING PHASE
- CLEAR WATER DISCHARGE
- CONTINUOUS AERATION FOR XXX D

The times can be changed individually if required.

In addition, continuous aeration during the start-up phase is possible using the menu item “CONTINUOUS AERATION FOR XXX D”. With this setting, aeration can be used in continuous operation for a specific number of days.

In the “Parameter 1” menu, when Password 2 is entered, the connected float switch(es) with the set waiting time until warning are displayed in the bottom line.
In the example, the float switch message becomes active after 30 days without a switching operation of the float switch.

If 2 float switches are connected, the time until the message is displayed separately for each one.
In the example, the float switch message for each float switch becomes active after 30 days without a switching operation of the float switch.

The waiting times until warning can be adjusted in the bottom line by entering Password 2.

If 0 days is entered, the float switch message is switched off.

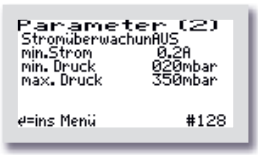
In the example, the float switch message for the float switch becomes active after 10 days without a switching operation of the float switch.

10.4.3.6 Parameter 2

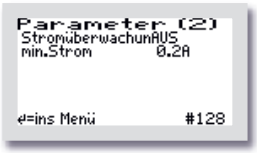
In the “PARAMETER 2” menu, different parameters can be displayed and adjusted depending on the setting.

When the control unit switches on a unit, e.g. the compressor or a pump, it cannot be guaranteed beyond doubt that this unit is actually running. Overheating, defective cables or other defects may result in the switching relay being switched on, while the unit still does not run. The control unit therefore monitors whether current is also flowing in the circuit. If the current falls below a limit value, which is set in the software to 0.2 A as standard, a current alarm is displayed, e.g. I Aer.

The control unit also monitors the pressure generated during feeding, aeration, sludge return and clear water discharge. The minimum pressure is set to 20 mbar as standard, and the maximum pressure to 350 mbar. If the pressure falls below the minimum permissible pressure or exceeds the maximum permissible pressure, the control unit issues an alarm, pmin or pmax.

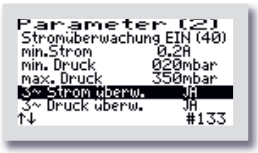


In this menu, current monitoring can be switched “OFF” or “ON”. In the standard case, current monitoring is set to “ON”. In addition, the current currently flowing is displayed in the main display for monitoring.



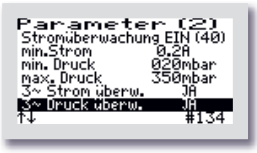
In the “PARAMETER 2” menu, the minimum and maximum permissible pressure can be changed if required, as can the minimum current as the monitoring limit value.

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



If a three-phase compressor has been selected, current monitoring for this compressor can be switched separately “ON” or “OFF” using the menu item “3~CURRENT MONITORING”.

For this monitoring, however, the control unit must be prepared at the factory.
If the control unit has not been prepared, “NO” must be selected.



If a three-phase compressor has been selected, pressure monitoring for this compressor can be switched separately “ON” or “OFF” using the menu item “3~PRESSURE MONITORING”.

To use this monitoring, the pressure sensor must be connected to the air hose between the compressor and the aerators. If the sensor is not connected to the air hose, “NO” must be selected.

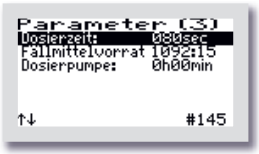
10.4.3.7 Parameter 3

Depending on the default setting, different parameters can be displayed and adjusted in the “PARAMETER 3” menu.

The exact appearance of the menu depends on the respective default settings. If no corresponding functions have been selected, the menu remains empty.

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

Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons.



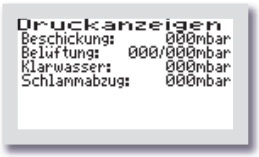
In this example, the dosing time is to be adjusted.

The menu item is called up with the ↵ button. The settings are changed using the ↓ ↑ buttons, here from 80 to 60 seconds, and confirmed with the ↵ button.

In this example, a ventilation fan with a target temperature of 30 °C is connected.
The display “OFF” / “ON” after the word Ventilation shows the current operating status of the fan.
In the example, it is switched off.
The fan starts at a temperature 10 degrees above the target value, here: 30 + 10 = 40 °C, and runs until the target value, here: 30 °C, is reached again.

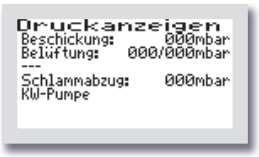
In this example, a heater with a target temperature of 10 °C is connected.
The display “OFF” / “ON” after the word Heating shows the current operating status of the heater.
In the example, it is switched off.
The heater starts at a temperature 5 degrees below the target value, here: 10 - 5 = 5 °C, and runs until 2 degrees above the target value, here: 10 + 2 = 12 °C, is reached.

10.4.3.8 Pressure Displays



Note:
The “PRESSURE DISPLAYS” menu is only visible if pressure monitoring was selected during commissioning.

In this menu, the respective pressure during the last cycle is displayed. The feeding, clear water and excess sludge back pressure values are stored during the individual processes. Only the pressure measurement of the respective last phase is displayed.
For aeration, 2 values are displayed in each case: the minimum and maximum pressure.
If pressure monitoring is switched off, this menu is omitted.



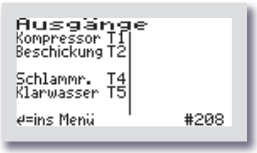
If a feed pump, sludge pump and/or clear water pump is connected instead of the corresponding airlift, this is displayed as text below the actual pressure displays. In addition, this output is not displayed as a pressure output.

In the example, a clear water pump is connected.

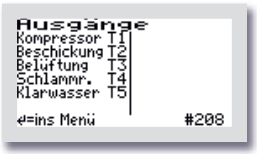
10.4.3.9 Outputs

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. They are preassigned by the control unit as standard. If required, the standard assignment can be changed.

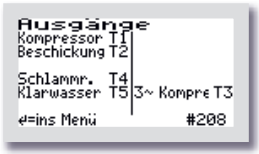
Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. You can exit the menu again by using the ↓ ↑ buttons to continue in one direction until the next menu opens.



In this example, the compressor is controlled via output T1, feeding via output T2, sludge discharge via output T4 and clear water discharge via output T5.

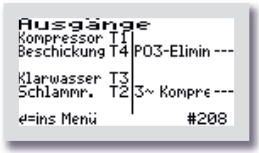


In addition, in this example, aeration is controlled via output T3.

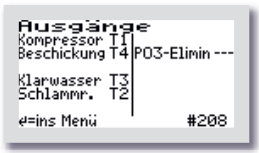


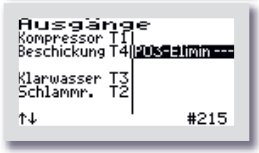
In this example, the compressor is controlled via output T1, feeding via output T2, sludge discharge via output T4 and clear water discharge via output T5. In addition, a three-phase compressor is controlled via output T3.

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



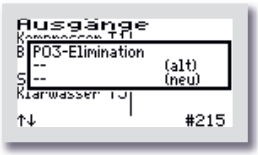
If one or more additional functions, in this example PO3 elimination and the three-phase compressor, have been selected, each of these functions must still be assigned their own output. This can be seen from the blank symbols “--” after the units.



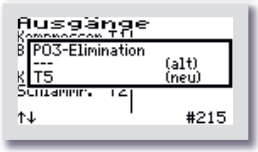


In this example, PO3 elimination is selected as an additional function. A free output must still be assigned to this function.

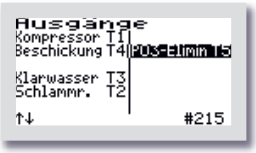
Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons.



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



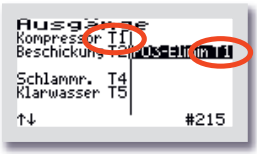
Select a free output, T5 in the example. To accept the setting, confirm with the ↵ button.



Output T5 has been selected here.

You exit the menu using the ↓ ↑ buttons.

Further setting options for the special functions can be found in the “PARAMETER 3” menu.



Each selected function must be assigned a different output. **No output may be assigned 2 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 exiting the submenu, and the menu is not exited. This allows the selection in the relevant lines to be corrected.

The outputs cannot be assigned 2 functions! This means that the same output must **not be selected twice**.

10.5 Default Settings

PE number:	8
Control type:	Time
Denitrification:	No

10.6 Switching Times – Basic Settings

PE number	Aeration Normal			Aeration energy-saving operation			Denitrification normal operation			Denitrification energy-saving operation			Settling phase (min)	Clear water discharge (min)	Sludge discharge (min)	Feeding (min)
	Aerators ON (min)	Aerators OFF (min)	Duration (min)	Aerators ON (min)	Aerators OFF (min)	Duration (min)	Aerators ON (min)	Aerators OFF (min)	Duration (min)	Aerators ON (min)	Aerators 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 switches to energy-saving and holiday mode only with an installed float switch and with the “FLOAT” control type setting. Energy-saving operation is switched on if the float switch has not floated up after sludge discharge. Holiday mode begins after energy-saving operation if the float switch has not floated up within 3 days of energy-saving operation. In holiday mode, the aeration time is reduced again by 2/3. As soon as the float switch floats up again, the plant switches back to normal operation. With the “FLOAT” control type setting, all clear water discharge times are preset to 30 minutes.

11 Operation as a Fluidized-Bed or Fixed-Bed Plant

The small wastewater treatment plant must be operated by the owner or by a competent person appointed by the owner, the operator.

After commissioning, the plant operates fully automatically. It is controlled by a PLC. The sequence and course of the phases are programmed in the control unit. The times for the aeration intervals and for the return of the excess sludge are preset, but can be readjusted if required.

In the standard case, the cycles run purely time-controlled. However, it is possible to use a float switch as a high-water alarm; see Chapter 6.2.4.

If faults occur during operation of the plant, these are reported visually and acoustically by the control unit. The LED flashes red and the buzzer sounds. The fault message remains in the main display until the fault is acknowledged; see Chapter 11.3.3.5.

The fault message remains stored in the error logbook and can therefore still be evaluated later.

The control unit has a power failure alarm. In the event of a power failure, an alarm tone sequence is generated approximately every 30 seconds to alert the operator to the missing treatment function. When the power supply returns after a power failure, the device switches itself back on automatically.

11.1 Commissioning of the Control Unit

Before commissioning the plant, all chambers of the wastewater treatment plant must be filled with water up to the overflow, and the housing of the control unit must be closed if it has been opened.

Commissioning of the control unit begins by plugging in the mains plug of the control unit, or by switching on the ON/OFF switch. The control unit then starts with a self-test lasting approx. 3 seconds, displaying “booting system…”

The red LED then lights up briefly, followed by 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 software version number.

During initial commissioning, the display “COMMISSIONING” then appears. During commissioning of the K-Pilot 27.6 control unit, the following must first be entered; see Chapter 11.3.2.4 as well as 11.3.3.1 and 11.3.3.6:

- Password, 4 digits, with Password 1
  or with Password 2 for advanced options
- Language
- Date and time
- Basic plant type, here selection: **“FLUIDIZED BED”** or **“FIXED BED”**
- Plant size, e.g. “4 PE”
- Control type, here selection: **“TIME”**, except with additional motor pump
- With pressure monitoring YES / NO

Only if Password 2 was entered during password entry can the following additional options be selected during commissioning; see Chapter 11.3.2.4:

- Thermostat “OFF” / “VENTILATION” / “HEATING”
- 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, settings in the “Outputs” menu may still be required; see Chapter 11.3.4.8.

After these entries, the control unit automatically switches to manual operation; see Chapter 11.3.2.2. The different functions can be checked in manual operation.

After manual operation has been ended, the automatic cycle starts. Commissioning is then complete.

Depending on the selection, supplementary settings may then still be required in the “Parameter 1”, “Parameter 2”, “Parameter 3” or “Outputs” menus; see Chapters 11.3.2.4, 11.3.4.4, 11.3.4.5, 11.3.4.6 and 11.3.4.8.

The person carrying out commissioning must ensure that the parameter settings in the control unit have been made in such a way that they correspond to the requirements, e.g. basic type and discharge class, from the approval and the water-law permit for the plant on which the control unit is to be used.

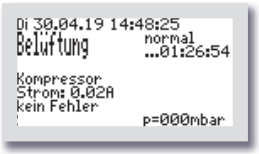
The automatic cycle runs through the following operating phases; these vary depending on the exact setting:

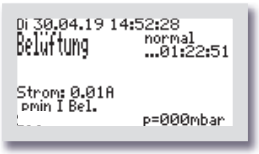
- Aeration
- Excess sludge discharge

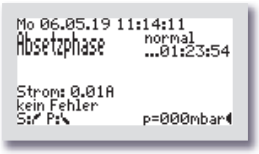
After these phases have been completed, the next cycle starts again from the beginning.

11.2 Main Display

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







Line 1: Date and time

Line 2: Current phase: “Aeration”, “Sludge Discharge”, and further phases depending on the setting

Line 2 (right): Normal or energy-saving operation of the plant and, below this, in normal operation, the remaining time for which the current phase will continue; in energy-saving operation, the time elapsed since the start of the energy-saving phase

Line 3: Display of denitrification, only for discharge class D; otherwise blank line

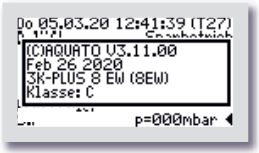
Line 4: Display of which unit is active; otherwise, if no unit is switched on, blank line

Line 5: Operating current of the active unit, e.g. compressor, clear water pump if applicable, etc.

Line 6: Fault display; otherwise “NO ERROR” if no fault message is present

Line 7: Float switch status up / down only visible when float switch is activated; on the right, the current back pressure, shown in brackets if pressure monitoring has been switched off; on the far right, a triangle “◀” flashing every second as operating status indication

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



- Software version
- Date of the version
- Type 3K-FLOW or 3K-PLUS and set PE number
- Discharge class, special settings

The exact display depends on the selected settings.

The ↵ button can also be used in this menu to switch off the buzzer or alarm. See also Chapter 11.3.3.5.

11.3 Menu

11.4 Menu Structure

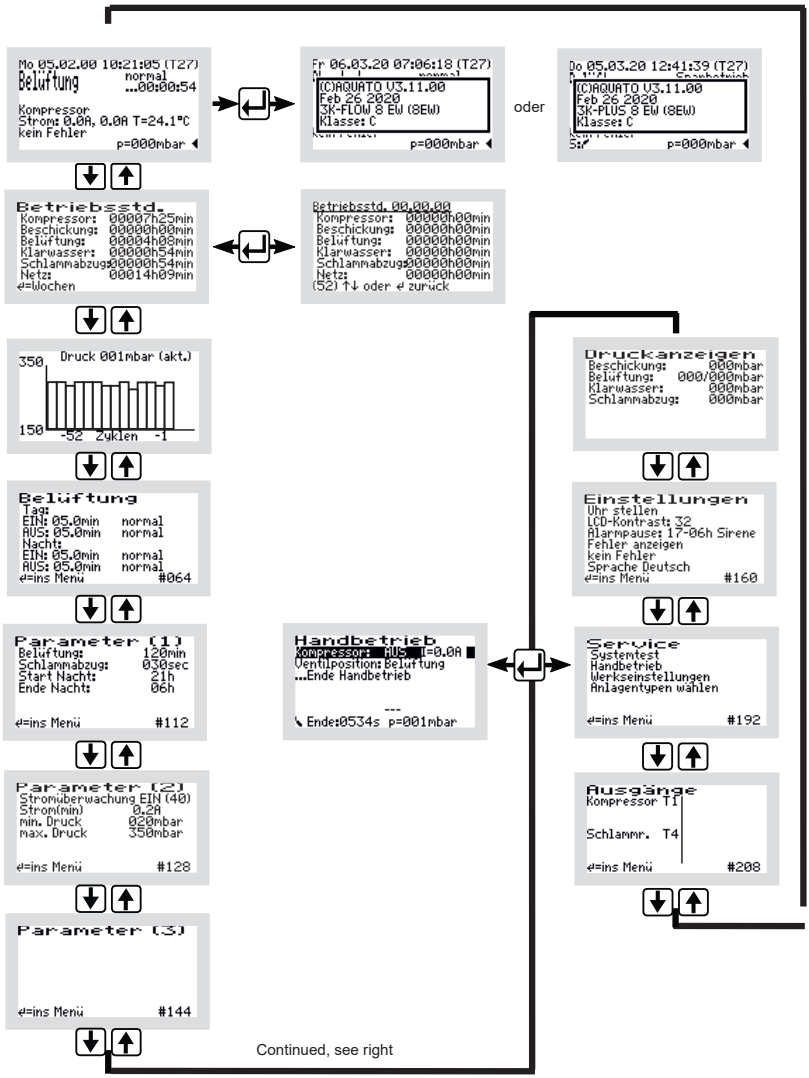


Figure 20: Menu structure for fluidized-bed or fixed-bed plant

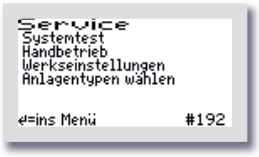
The exact display depends on the status of the plant and on the configured parameters. The different display variants are explained in more detail below.

You move from menu to menu using the ↓ ↑ buttons. If you continue moving in the same direction, you will eventually return to the standard display.

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

The individual items are selected using the ↓ ↑ buttons. If possible, the ↵ button takes you to the submenu or to edit mode.

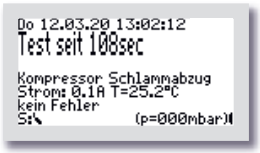
11.4.1 "Service" Menu



The service menu is mainly intended for the service technician. The following can be selected:
- System test / test operation
- Manual operation
- Factory settings, only with Password 2
- Select plant types, only with Password 1 or 2

11.4.1.1 System Test / Test Operation

In test operation, it is checked whether the units are drawing current properly. If automatic test operation has been marked with the ↓ ↑ buttons via the "SYSTEM TEST" menu item, 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 lower line "(NEW)". After "START TEST" has been selected and confirmed, the system test begins.



The test runs fully automatically. The individual functions are checked one after the other, each for approx. 15 seconds. If everything functions without errors, no alarm message appears. Test operation can be cancelled by pressing the ↵ button.

After all functions have been checked, test operation ends automatically and the interrupted cycle is continued in automatic operation.

11.4.1.2 Manual Operation

In manual operation of the K-Pilot 27.6 control unit, further settings can be made in addition to the parameters that are always present: “Compressor” and “Sludge R.” (= sludge return). The exact display depends on the parameters set during commissioning.

The Manual Operation menu consists of 2 windows. In the first Manual Operation window, with the standard functions, the ↓ ↑ buttons can be used to select between the parameters that are always present, “COMPRESSOR” and “SLUDGE R.” (= sludge return), 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 Operation window, with the additional functions, is accessed via the last line “...MANUAL OPERATION ADDITIONAL FUNCTIONS”.

In this window, the additional functions selected during commissioning are displayed.

Depending on the default setting, different menu items, such as “2ND COMPRESSOR” or “THERMOSTAT”, can be selected in the 2nd Manual Operation window by moving the black bar to the desired entry. This function is then switched “ON” and “OFF” with the ↵ button.

If no additional function was selected, no function is displayed in this window either. Manual operation can then be ended directly.

A float switch symbol with the current float switch position is visible at the bottom left of the display.
If no float switch is connected, this corresponds to the lower symbol position.

If a float switch is moved up and down, the display indication also changes.

Manual operation is ended by moving the marking bar to the menu item "... End Manual Operation" using the ↓ ↑ buttons and then confirming by pressing the ↵ button.

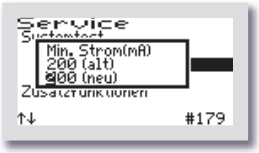
If manual operation is not ended with "... END MANUAL OPERATION", the control unit automatically switches back to automatic operation 15 minutes after the last press of a button.

After manual operation has been ended, the control unit continues the interrupted cycle in automatic operation.

11.4.1.3 Factory Settings

Under “FACTORY SETTINGS”, the limit for current faults can be changed. **Resetting** the control unit, which is also possible under Factory Settings, is **not permitted** during the entire operation. Access to the factory settings is **only possible with Password 2**.

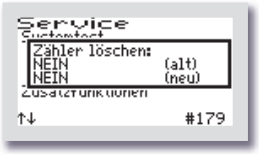
The following values can be changed/reset in “FACTORY SETTINGS”.



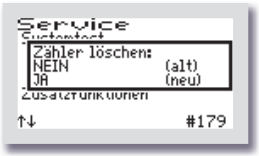
The first window to open is “MIN. CURRENT (mA)”. Here, the limit at which a fault is displayed can be changed. The default setting is 200 mA. The lowest possible limit is 50 mA. Using the ↓ ↑-buttons, the values can be changed digit by digit in the lower line “(NEW)”, starting from the left. The selected value is accepted each time with the ↵ button. After the 3rd digit has been confirmed, the next window opens automatically.

The delete options that follow are not permitted during the entire operating time of a small wastewater treatment plant. The prompts must be answered with “NO”.

All prompts in the Factory Settings menu must be answered with “NO”. The data must <u>not</u> be deleted.



The “CLEAR COUNTERS:” window opens.
If “NO” is selected, the menus with the individual units are skipped and you go directly to the “CLEAR LOGBOOK” window.
→ **Answer: “NO”.**



If “YES” is selected, the control unit switches on to the individual units each time the ↵ button is pressed. In the first following window, “COMPRESSOR”, the counter for the compressor running time can be reset to zero by setting “YES” in the lower line “(NEW)” using the ↓ ↑ buttons.
→ **Answer: “NO”.**

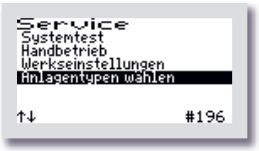
The same procedure is used in the following windows: “FEEDING”, “AERATION”, “CLEAR WATER”, “SLUDGE DISCHARGE”, “MAINS”, “DOSING TIME”, “UV”..
→ **Answer: “NO”.**

The last window in this menu to open is “CLEAR LOGBOOK”. If “YES” is selected here, all entries and settings are deleted. The control unit then restarts with commissioning.
→ **Answer: “NO”.**

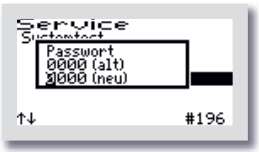
CAUTION! The procedures **“Clear counters:”** and **“Clear logbook”** are prohibited during the entire operation of a plant, as the operating log must record the running times of the units.

11.4.1.4 Select Plant Type

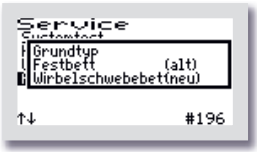
In this menu, the plant type and plant size as well as further parameters required for operation can be set/changed.



Select the menu item “SELECT PLANT TYPES”.

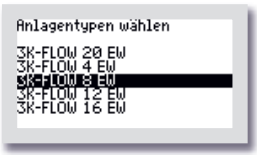


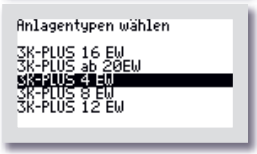
Then enter Password 1, or Password 2 for advanced settings, digit by digit and confirm each time with the ↵ button in order to access the menu.



First, the “BASIC TYPE” of the plant 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 fluidized-bed plant, select “**FLUIDIZED BED**”. Confirm your selection with the ↵ button.

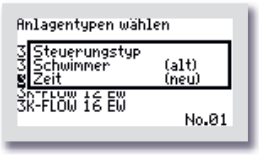




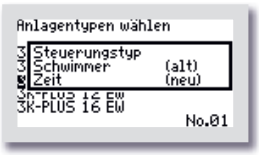
Then, as the “PLANT TYPE”, select the desired or required PE number using the ↓ ↑ buttons. When the marking (= black bar) is on the correct PE number, according to the wastewater engineering calculation, confirm with the ↵ button. If the required PE number is not directly available for selection, select the next larger entry.

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

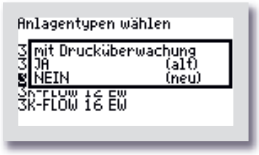
For plant sizes from 21 to 50 PE, please select “3K-FLOW from 20” or “3K-PLUS from 20”. The preset cycle settings for plant sizes from 21 to 50 PE are the same; the different required air volumes are achieved by using different sizes and quantities of membrane aerators and compressors. If required, these settings can be readjusted.



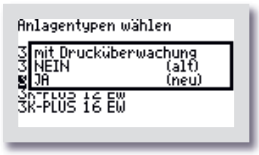
In the “CONTROL TYPE” window, you can select between a time-controlled or float-controlled cycle. The desired control type can be set in the second line “(NEW)”. Use the ↓ ↑ buttons to select between “TIME” and “FLOAT”. The selected control type is accepted with the ↵ button.



For operation of a **fluidized-bed** or **fixed-bed plant**, the “**TIME**” control type should be selected as standard. The “FLOAT” setting may only be required for operation with an additional “MOTOR PUMP”; see below.



The next decision is made in the “WITH PRESSURE MONITORING” menu, namely whether the plant is to be monitored for pressure.
If you do not need this monitoring, you can switch it off with “NO”.



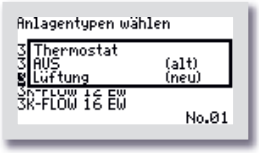
If you switch monitoring on in the “WITH PRESSURE MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

To use this monitoring, the pressure sensor connection “Pressure” must be connected to the air hose between the compressor and the aerators.
If the sensor, connection “Pressure” on the control unit, is not connected to the air hose, “NO” must be selected.

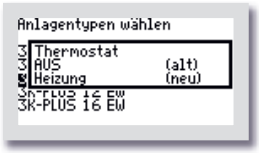
If Password 1 was used, the “SELECT PLANT TYPES” menu item is completed here and the software returns to the “SERVICE” main menu.

If the “SELECT PLANT TYPES” menu item was selected with Password 2, the additional functions are available as further setting options.

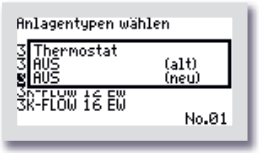
The **additional functions** can only be commissioned with **Password 2**.



First, in the window with the “THERMOSTAT” prompt, you can select control for a fan or heater.



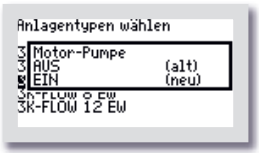
Further settings for this can be found in the “PARAMETER 3” menu.



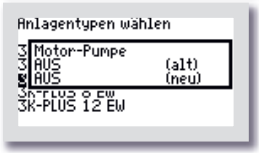
If you do not need this option, please answer the prompt with “OFF”.

Confirm your selection with the ↵ button.

If you require a pump function in addition to the standard treatment function of the plant, the following two windows allow you to select an additional submersible motor pump, “Motor Pump”, and/or an additional compressed-air lift, “Airlift Pump”.



If you require a pump in addition to the standard treatment function, select the option “ON” in the “MOTOR PUMP” window in the second line “(NEW)” using the ↓ ↑ buttons.



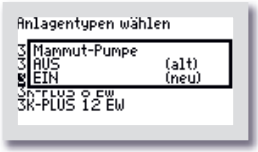
If you do not need this option, please answer the prompt with “OFF”.

Confirm your selection with the ↵ button.

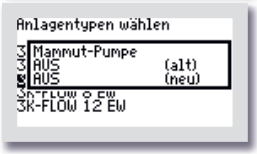
If you have selected the additional “Motor Pump”, it is operated purely time-cycled in standard operation with the “TIME” CONTROL TYPE. The cycle times can be adjusted in the Parameter 1 menu, Chapter 11.3.4.4.

If the “FLOAT” CONTROL TYPE is selected, the pump also operates with this cycle timing, but only when the float switch is in the upper switching position.

If “0000” is entered for PUMP “OFF”, the pump operates without cycle timing and only depending on the float switch position: if the float switch drops to the lower position, the pump is switched off; if the float switch floats up to the upper position, it operates in continuous operation.



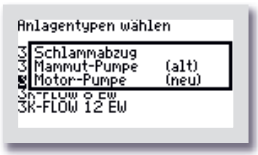
If you require an airlift pump in addition to the standard treatment function, select the option “ON” in the next window “AIRLIFT PUMP” in the second line “(NEW)” using the ↓ ↑ buttons.



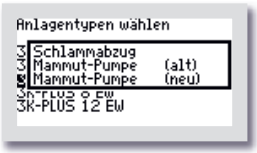
If you do not need this option, please answer the prompt with “OFF”.

Confirm your selection with the ↵ button.

If you have selected the additional “Airlift Pump”, it is operated purely time-cycled. The cycle times can be adjusted in the Parameter 2 menu, Chapter 11.3.4.5.

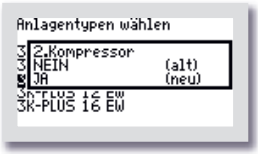


The next prompt asks how sludge discharge is to take place: with a submersible motor pump or with a compressed-air lift. If sludge return is to be carried out with a pump instead of an airlift, select the option “MOTOR PUMP” in the following “SLUDGE DISCHARGE” window in the second line “(NEW)” using the ↓ ↑ buttons.



If you do not need this option, please answer the prompt with “AIRLIFT PUMP”.

Confirm your selection with the ↵ button.



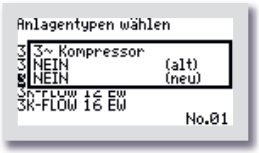
If you operate a plant with 2 compressors, please select the answer “YES” in the window with the prompt “2ND COMPRESSOR” in the lower line “(New)”.

After completing the plant type selection, or commissioning, select a free output (T1 to T6) for connecting the second compressor in the “Outputs” menu.

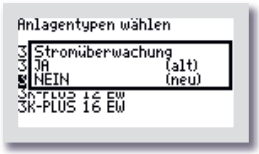
If you do not need this option, please answer the prompt with “NO”.

In the window with the prompt “3~COMPRESSOR”, you can select “YES” in the lower line “(New)” to enable control of a 3-phase compressor with 400 V. With this option, the standard current monitoring is switched off. This setting is required if an ORKA-S200 or ORKA-S400 module is selected for controlling the compressor or compressors. The option “YES” must always be selected if one or more units are controlled via a contactor. With this setting, the compressor for the airlift is connected in the same way as usual. It is not switched on during aeration.

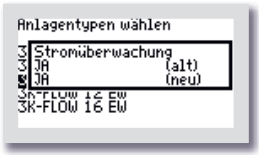
After completing the plant type selection, or commissioning, select a free output (T1 to T6) for connecting the three-phase compressor in the “OUTPUTS” menu; Chapter 11.3.4.8.



If you do not need this option, please answer the prompt with “NO”.



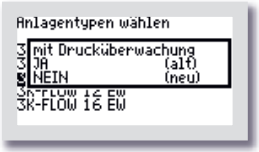
If you selected “YES” for the “3~COMPRESSOR” prompt, the “CURRENT MONITORING” window follows, with the decision as to whether the three-phase compressor is to be monitored for current faults.
If you do not need this monitoring, you can switch it off with “NO”.



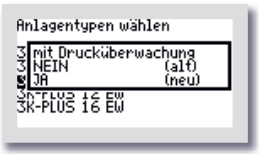
If you switch on monitoring in the “CURRENT MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

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

If the control unit has not been prepared, “NO” must be selected.



The next decision is made in the “WITH PRESSURE MONITORING” menu, namely whether the 3-phase compressor is to be monitored for pressure.
If you do not need this monitoring, you can switch it off with “NO”.



If you switch monitoring on in the “WITH PRESSURE MONITORING” menu by selecting “YES”, a fault message will be issued if the device fails.

To use this monitoring, the pressure sensor connection “PRESSURE” must be connected to the air hose between the compressor and the aerators.

If the sensor, connection “Pressure” on the control unit, is not connected to the air hose, “NO” must be selected.

The software then returns to the “SERVICE” main menu. Use the ↓ ↑ buttons to exit the menu.

If additional options have been selected, settings in the “OUTPUTS” menu may still be required; see Chapter 11.3.4.8. Further supplementary setting options that may be required can be found in the “PARAMETER 1”, “PARAMETER 2” and “PARAMETER 3” menus; see Chapters 11.3.4.4, 11.3.4.5 and 11.3.4.6.

11.4.2 “Settings” Menu

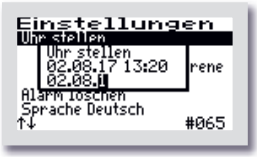
The operator settings can be configured in the “SETTINGS” menu. Press the ↵ button to enter the menu and select the desired item.

11.4.2.1 Setting Date and Time

To correct the time and/or date, use the ↓ ↑ buttons to select the “SET CLOCK” line. When the marking (= black bar) is on the desired entry, press the ↵ middle button to open the window for adjusting the values.

The first digit can be changed using the ↓ ↑ buttons. When the correct value has been set, the digit is accepted with the ↵ middle button. The same procedure is used for all following digits.

Input sequence, each with 2 digits:
day, month, year, hour, minute (DD.MM.YY_hh.mm)



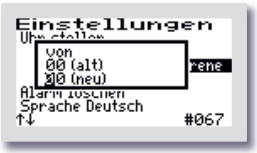
The clock is quartz-controlled. It should be checked during maintenance. Care should be taken to ensure that the clock is set correctly, as this makes maintenance evaluation easier.

Example: Changing the time from 13:20 to 13:26.

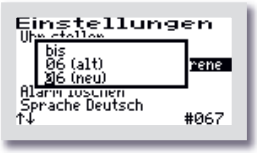
11.4.2.2 LCD Contrast

The LCD contrast can be optimized here. Usually, no change is necessary.

11.4.2.3 Alarm Buzzer (“Alarm Pause”)



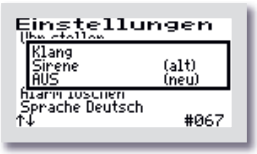
The acoustic alarm is switched off by default from 5:00 p.m. to 6:00 a.m. During this time, faults are only indicated visually. This setting can be changed in the “ALARM PAUSE” menu item.



Caution:
No acoustic alarm is issued during the period set here!

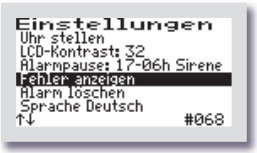
The sound for the alarm buzzer is set here. The selection options are: “SIREN”, “MELODY” and “OFF”.

The default setting is “SIREN”.



Caution:
With the “OFF” setting, no acoustic alarm is issued!

11.4.2.4 Display Errors



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

The error logbook displays the last 30 error events with 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!

11.4.2.5 Clear Alarm

If a fault, i.e. an alarm, has occurred, the alarm message can be reset after marking the “CLEAR ALARM” line by pressing the ↵-button. A window with the message “OK” then opens for approx. 1 second, and the display in the menu then changes to “NO ERROR”. The red flashing of the LED goes out and the fault message is deleted in the standard window.
The fault message remains stored in the error logbook and can therefore still be evaluated later.

Note: If, in the event of a fault, the ↵ button is pressed in the main display, i.e. the standard display during operation, the buzzer is switched off and the “CLEAR ALARM” window opens, which automatically changes to the “ARE YOU SURE?” prompt after a short time.
If this is answered with “YES”, the fault display is cleared and the red flashing of the LED goes out. The fault message remains stored in the error logbook and can therefore still be evaluated later.

If the “ARE YOU SURE?” prompt is answered with “NO”, the fault message remains in the main display.

The info window with details of the plant settings then opens for approx. 3 seconds.

11.4.2.6 Language

The language of the control unit is selected here. The password must be entered for this. The control unit is prepared for several languages. The languages currently programmed are:
– German
– English

11.4.3 Further Menus with Displays or Settings

In the following menus, all current parameters of the plant can be displayed and, in some cases, individually adjusted.
Adjustments may only be carried out by a specialist, as the treatment performance of the plant may otherwise be reduced and the building authority approval may become invalid.

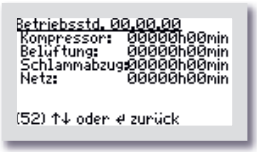
However, in order to change the displayed values, the password must first be entered.

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. The standard values are then set again.

11.4.3.1 Operating Hours Display

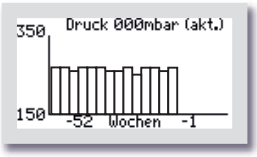
The operating hours of the respective units are displayed in the “OPERATING HOURS” menu. The operating hours are counted up when the control unit has switched on the compressor, or possibly a pump. The display is shown in hours and minutes.

If the ↵ button is pressed, the operating hours of the last up to 52 weeks are displayed, operating log.
The last line shows the week, example calendar week 52, 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 have been set correctly.

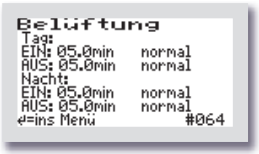
11.4.3.2 Pressure Log



Note:
The “PRESSURE” graph menu is only visible if pressure monitoring was selected during commissioning.
In this menu, the current pressure is documented in the upper line, and the back pressure from the pressure monitoring is documented weekly in the graph.

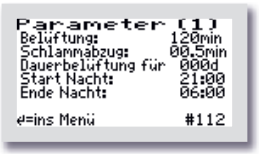
The pressure is only shown graphically from 150 mbar.

11.4.3.3 Aeration



In the “AERATION” menu, the selected aeration intervals for day and night operation are displayed, i.e. it is displayed for how many minutes aeration is alternately switched “ON” and “OFF” cycle by cycle.
The times can be changed individually if required. Press the ↵-button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed using the ↓ ↑ buttons and confirmed with the ↵ button.

11.4.3.4 Parameter 1



In this menu, the duration of the total aeration phase and sludge discharge is displayed, as well as the start and end of night operation and, depending on the setting, further parameters.

The times can be changed individually if required. Press the ↵-button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. The menu item is called up with the ↵ button. The settings are changed using the ↓ ↑ buttons and confirmed with the ↵ button.

In addition, continuous aeration during the start-up phase is possible using the menu item “CONTINUOUS AERATION FOR XXX D”. With this setting, aeration can be used in continuous operation for a specific number of days.

In the example, an additional motor pump is selected. The time intervals for ON and OFF can be changed via the “PUMP ON/OFF” menu item. If the interval for “OFF” is set to “0000” and “FLOAT” is set as the CONTROL TYPE, the pump operates without cycle timing and only depending on the float switch position; i.e. if the float switch drops to the lower position, the pump is switched off; if the float switch floats up to the upper position, it operates in continuous operation.

11.4.3.5 Parameter 2

In the “PARAMETER 2” menu, different parameters are displayed depending on the setting. The parameters “CURRENT MONITORING” as well as “MIN. PRESSURE” and “MAX. PRESSURE” are always present.

When the control unit switches on a unit, e.g. the compressor or a pump, it cannot be guaranteed beyond doubt that this unit is actually running. Overheating, defective cables or other defects may result in the switching relay being switched on, while the unit still does not run. The control unit therefore monitors whether current is also flowing in the circuit. If the current falls below a limit value, which is set in the software to 0.2 A as standard, a current alarm is displayed, e.g. I Aer.

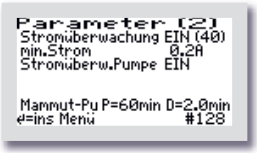
The control unit also monitors the pressure generated during aeration and sludge return. The minimum pressure is set to 20 mbar as standard, and the maximum pressure to 350 mbar. If the pressure falls below the minimum permissible pressure or exceeds the maximum permissible pressure, the control unit issues an alarm, pmin or pmax.

In this menu, current monitoring can be switched “OFF” or “ON”. In the standard case, current monitoring is set to “ON”.

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

In this menu, the minimum and maximum permissible pressure as well as the min. current can be changed if required.

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



In the example, an additional airlift pump is selected. For this pump, current monitoring can be switched separately “ON” or “OFF” in the “CURRENT MONITORING PUMP” menu item. The delivery times of the compressed-air lift (= airlift pump) are set in the “AIRLIFT PUMP” menu item. “P” indicates the pause length and “D” is the duration of the switch-on time. This means that, in the example, the pump cycle lasts 62 (= 60 + 2) minutes. During this time, the airlift operates for 2 minutes and then pauses for 60 minutes.

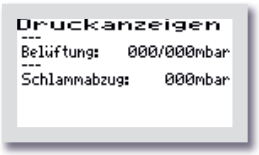
11.4.3.6 Parameter 3

Depending on the default setting, different parameters can be displayed and adjusted in the “PARAMETER 3” menu.

In this example, a ventilation fan with a target temperature of 30 °C is connected and is currently switched off.
The display “OFF” / “ON” after the word Ventilation shows the current operating status of the fan.
The fan starts at a temperature 10 degrees above the target value, here: 30 + 10 = 40 °C, and runs until the target value, here: 30 °C, is reached again.

In this example, a heater with a target temperature of 10 °C is connected and is currently switched off.
The display “OFF” / “ON” after the word Heating shows the current operating status of the heater.
The heater starts at a temperature 5 degrees below the target value, here: 10 - 5 = 5 °C, and runs until 2 degrees above the target value, here: 10 + 2 = 12 °C, is reached.

11.4.3.7 Pressure Displays



Note:
The “PRESSURE DISPLAYS” menu is only visible if pressure monitoring was selected during commissioning.

In this menu, the respective pressure during the last cycle is displayed. The aeration and excess sludge back pressure values are stored during the individual processes. Only the pressure measurement of the respective last phase is displayed.
For aeration, 2 values are displayed in each case: the minimum and maximum pressure.
If pressure monitoring is switched off, this menu is omitted.

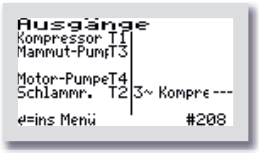
If a sludge pump is connected instead of the airlift, this output is not displayed as a pressure output.

11.4.3.8 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. They are preassigned by the control unit as standard. If required, the standard assignment can be changed.

Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons. You can exit the menu again by using the ↓ ↑ buttons to continue in one direction until the next menu opens.

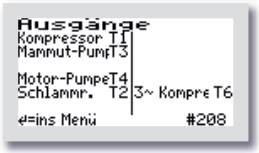
In this example, the compressor is controlled via output T1 and sludge return via output T4.



In this example, the compressor is controlled via output T1 and sludge discharge via output T2. In addition, an airlift pump is controlled via T3 and a motor pump via T4. A three-phase compressor was selected as an additional function during commissioning. An output must still be assigned to this.

Press the ↵ button to enter the menu. The line to be changed is selected using the ↓ ↑ buttons.

In the example, output T6 is selected for controlling the three-phase compressor.



11.5 Default Settings

PE number:	8
Control type	Float

11.6 Switching Times – Basic Settings

Day Operation Aeration Phase		Night Operation Aeration Phase			Day Operation Aeration Phase			Night Operation Aeration Phase			
Start of Day Operation (time)	End of Day Operation (time)	Start of Night Operation (time)	End of Night Operation (time)	PE number	Aerators ON (min)	Aerators OFF (min)	Duration (min)	Aerators ON (min)	Aerators OFF (min)	Duration (min)	Sludge Discharge (sec)
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 Error Message and Troubleshooting

Display	Possible Cause	Remedy
I Aer. The compressor has not drawn any current	- Compressor defective - 10 A fuse has tripped - Fuse defective	- Replace compressor - Press the 10 A fuse back in after a short waiting time to allow it to cool down - Replace fuse
I 2nd Aer The 2nd and/or 3rd compressor has not drawn any current	- 2nd and/or 3rd compressor defective - Fuse defective	- Replace 2nd and/or 3rd compressor - Replace fuse
I_3~Comp. The three-phase compressor has not drawn any current	- Compressor defective - Fuse defective	- Replace compressor - Replace fuse
I Clear W. The clear water pump has not drawn any current	- Clear water pump defective - Fuse defective	- Replace clear water pump - Replace fuse
I Sludge The sludge pump has not drawn any current	- Sludge pump defective - Fuse defective	- Replace sludge pump - Replace fuse
I Feed. The feed pump has not drawn any current	- Feed pump defective - Fuse defective	- Replace feed pump - Replace fuse
I Buffer The buffer pump has not drawn any current	- Buffer pump defective - Fuse defective	- Replace buffer pump - Replace fuse
p min Permissible pressure was not reached	- Hoses not connected or incorrectly connected - Hose connections or hose leaking / defective	- Check hose connections and hoses
p max Permissible pressure was exceeded	- Water level too high - Hose kinked - Aeration element dirty	- Check water level - Check hoses - Clean/replace aeration element
Buffer OK?	- Buffer float switch has not switched for the preset number of days; period can be set manually	- Check buffer - Check float switch - Replace buffer pump if necessary
Battery	- Battery empty, defective or not inserted	- Insert new battery
Clock	- Clock not set	- Set clock

Display	Possible Cause	Remedy
HW High water: after clear water discharge has ended, the float switch has not fallen below the switching point; high-water warning with “Float” control type	- Infiltration water inflow - Backwater from receiving water - Power failure - Float switch defective - Clear water pump blocked - Clear water hose defective	- Locate and stop inflow - Possibly a one-time event - Establish permanent power supply - Replace float switch - Remove blockage - Replace clear water hose
HW ++ High water: float switch has floated up; temporary fault; high-water warning with “Time” control type	- Infiltration water inflow - Backwater from receiving water - Power failure - Float switch defective - Clear water pump blocked - Clear water hose defective	- Locate and stop inflow - Possibly a one-time event - Establish permanent power supply - Replace float switch - Remove blockage - Replace clear water hose
UV Lamp Remaining running time at 00:00	- The remaining running time counter has counted down to 00:00; the intended running time of the UV lamp has been	- Replace UV lamp and reset the counter to the value for a new lamp
Tank empty? Dosing agent supply at 00:00	- The dosing agent supply counter has counted down to 00:00; the container is empty	- Refill dosing agent and reset the counter to the value for a full container
No float switch change	- Float switch has not switched for the preset number of days; period can be set manually	- Check float switch - Possibly due to holiday mode
Too warm	- Temperature has risen above the set maximum temperature, standard 70 °C	- Allow control cabinet to cool down - Install control cabinet ventilation - Shade the control cabinet

Display	Possible Cause	Remedy
MAINS ON	- Mains power was switched on.	
MAINS OFF > 15 min: Restart of the cycle	- Mains power was switched off - Power failure - Fuse has tripped	- Switch on power - Check fuse
Mains interruption < 15 min: Cycle is continued	- Mains power was switched off - Power failure - Fuse has tripped	- Switch on power - Check fuse

If the measures listed above do not remedy the fault, please contact your maintenance service or installation company.

When working on the compressor and pumps, the mains plug must be disconnected.

13 Technical Data

Temperature range, operation	0 °C … + 40 °C
Temperature range, storage	0 °C … + 50 °C
Humidity, operation and storage	0 … 90 % RH, non-condensing
Degree of protection	IP 54 at the front panel, otherwise IP 20
Installation	Control panel installation according to DIN, 184 x 67 mm
Approx. dimensions, without cables	192 mm x 72 mm x 120 mm (W x H x D)
Mains connection (L1, N, PE)	230 V~ 50 Hz ± 10 % Phoenix connector, male
Relay output T1 Relay outputs T2 ... T6 Max. total power of units, compressors / pumps / solenoid valve block	230 V / 50 Hz, 10 A AC-1 230 V / 50 Hz, 5 A AC-1 P < 1,5 kVA Phoenix connector, female
Alarm relay Max. contact voltage Max. contact current Terminals	 230 V~ AC, 5 A; AC1 external separate fuse required! Phoenix connector, female
Float switch inputs Max. contact voltage Max. contact current Terminals	2 units 230 V < 5 mA Phoenix connector, 2-pin, male
Pressure sensor Measuring range Tolerance	4 mm hose connection at bulkhead fitting 0 ... 500 mbar Type ± 2 % of full scale at 25 °C
Temperature sensor	0 ... 80 °C +/- 2 °C
Internal total fuse protection, max. 1.5 W Internal fuse T2 to T6, max. 1.5 W	Bimetal 10 A 5 x 20 mm, 1 x 5 A T, max.
Overtemperature protection of pumps / compressors	Via thermal contact in the motor, model-dependent
Current measurement range	0.5 – 5 A typ. ± 10 % of full scale
Power consumption of control unit	typ. 5 VA
Required upstream fuse(s)	max. 1 x 16 A G
Power failure monitoring Battery Charging current Alarm duration	2 x 1.2 V / NiMH AA, typ. 1800 mAh typ. 40 mA typ. 1 – 2 weeks
Internal buzzer	typ. 70 dB(A)
Displays	Graphic LCD display, 128 x 64 pixels, illuminated 1 x LED, green / red
Operation	3 buttons

14 Operating Log

In order to ensure the smooth long-term operation of your small wastewater treatment plant, the following checks by the operator are prescribed in accordance with the user approval.

Operation of the plant	daily
Reading the operating hours Visual inspection of the discharge for sludge carryover Determination and, if necessary, removal of floating sludge Checking the inlets and outlets for blockages	monthly
Drinking water consumption	annually

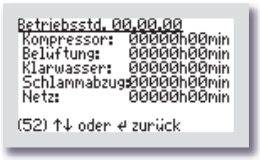
The written entry of the operating hours in the operating log may be omitted for the AQUATO® STABI-KOM plant, as the control unit records the operating hours in an electronic logbook.

Any defects or faults detected must be recorded in the operating log, enclosed with the plant, reported to the maintenance service and remedied immediately.

Reading the Operating Hours

In the OPERATING HOURS chapter of your control unit, the operating hours of the respective units are displayed. The operating hours are counted up when the control unit has switched on the compressor, or possibly the pump. The display is shown in hours and minutes.

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



The last line shows the date of the week, example calendar week 52, 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 have been set correctly.

The data you record is important for the maintenance of your small wastewater treatment plant.
The more carefully you carry out these checks, the easier it will be for the specialist company you trust!

15 Decommissioning and Disposal

Ensure that only qualified specialist personnel with suitable safety equipment have access. Make sure that the general safety regulations and the safety regulations at the installation site are observed.

Before starting final dismantling, switch off the plant by disconnecting the mains plug of the control unit. Secure the plant against being switched on again.

15.1 Temporary Decommissioning

Temporary decommissioning is required during maintenance work or when replacing the following components:

- Control unit
- Compressor
- Rotary valve
- Wear parts, e.g. membrane aerators

15.2 Dismantling of the Complete Plant

Complete dismantling of the entire plant may only be carried out by qualified specialist personnel.

Disconnect the plant from the power supply.
Disconnect the hoses and cables from the control unit/control cabinet.
Pull the float switch cable, optional, and the hoses out towards the tank.
Remove the tank.
Remove the control unit / control cabinet.

15.3 Disposal

Ensure that the plant is disposed of properly.

16 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**

Purchase / Installation of the Plant from	
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 manual.

VERSION 05.2026

Installation Company:

AQUATO® Umwelttechnologien GmbH
Ernstmeierstr. 24
32052 Herford
fon +49 5221 10219-0
fax +49 5221 10219-20
www.aquato.de
info@aquato.de