



INSTALLATION INSTRUCTIONS

Biological wastewater
treatment plants
BC SBR EVO
for 4–50 PE



BC  **SBR** **EVO**

www.envi-pur.com



This manual contains important directions and safety warnings.
Please, read this manual carefully before using the WWTP.



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1. Introduction

This document describes the method of installation and commissioning of ENVI-PUR, s.r.o. wastewater treatment plants (abbreviated as "WWTP") of the BC 4-50 SBR EVO, with tanks made of polypropylene ("PP").



During the installation process, we recommend taking photographs to document the work as it progresses, so that you will know in future where the sewer pipes, protective hose, etc. are located.

When transporting, handling and installing the WWTP, comply with generally applicable regulations concerning health and safety at work.

The following sections describe how to prepare the installation pit and install the BC 4-50 SBR EVO WWTP in a polypropylene self-supporting tank. These instructions do not cover commissioning and initial setup.

2. Storage of WWTP before installation

The tank should always be placed/stored on a suitable smooth surface free from sharp objects that could damage the tank.

If the tank is damaged in any way prior to installation, the manufacturer must be informed immediately. Do not leave the tank exposed to direct sunlight for long periods. The tank is not UV-stable.

3. Handling the WWTP tank

When handling the tank, comply with generally applicable regulations concerning health and safety at work. **Handling the tank is prohibited at temperatures below 5 °C**, as there is a risk of damage to the tank due to the material becoming brittle.



The WWTP tank is fitted with rope slings at the top of the tank, which can be used to secure the tank to a trailer during transport and to handle the tank at the installation site.

Before handling, check that there is no rainwater in the tank. If there is, pump it out of the tank. **The plastic WWTP tank should normally be transported in an upright position.**

Table 1: Weight of tanks in the BC 4-50 SBR EVO series (* two-tank WWTPs)

WWTP size	Unit	BC 4 SBR EVO	BC 6 SBR EVO	BC 10 SBR EVO	BC 12 SBR EVO	BC 16 SBR EVO	BC 20 SBR EVO	BC 25 SBR EVO	BC 30 SBR EVO	BC 30 SBR EVO*	BC 40 SBR EVO*	BC 50 SBR EVO*
Tank weight	[kg]	135	150	170	190	250	270	300	540	640	750	850





4. Construction readiness

4.1. Construction readiness of the BC 4-30 SBR EVO WWTP (single-tank)

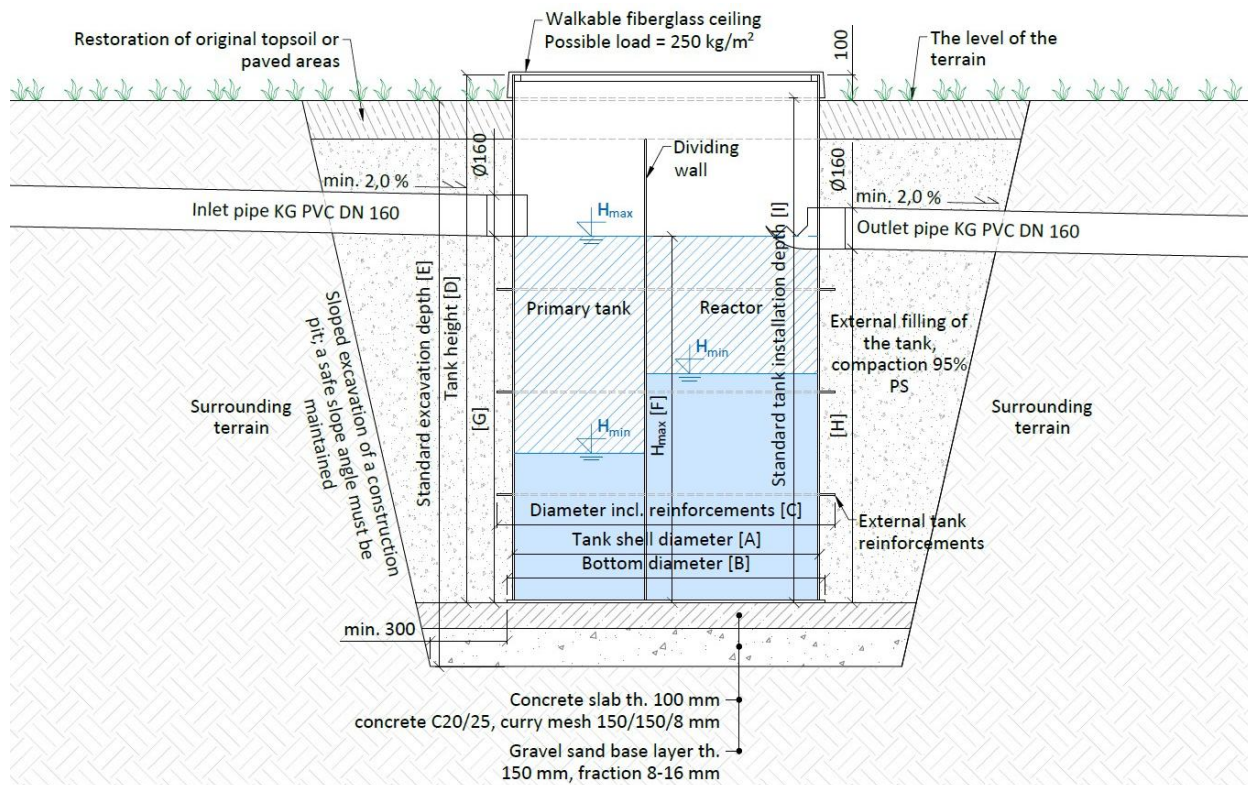


Figure 1: Diagram of the BC 4-30 SBR EVO WWTP with relevant dimensions

Table 2: Dimensions of the BC 4-12 SBR EVO series (as per Figure 1)

Dim.	Description	M.J.	BC 4 SBR EVO	BC 6 SBR EVO	BC 10 SBR EVO	BC 12 SBR EVO
[A]	Outer diameter of the WWTP tank shell	[mm]	1200	1400	1700	1900
[B]	Diameter of the WWTP tank bottom	[mm]	1300	1500	1800	2000
[C]	Tank diameter including external reinforcements	[mm]	1400	1600	1900	2100
[D]	Total height of the WWTP tank	[mm]	2058	2058	2500	2500
[E]	Standard excavation pit depth	[mm]	2208	2208	2750	2750
[F]	Maximum water level in the tank	[mm]	1420	1520	1730	1730
[G]	Height of the inlet pipe bottom from the base slab	[mm]	1430	1530	1750	1750
[H]	Height of the bottom of the outlet pipe from the base slab	[mm]	1380	1480	1700	1700
[I]	Standard depth of WWTP installation below ground level without the use of an extension	[mm]	1958	1958	2400	2400





Table 3: Dimensions of the BC 16–30 SBR EVO WWTP series (as per Figure 1)

Dim.	Description	Unit	BC 16 SBR EVO	BC 20 SBR EVO	BC 25 SBR EVO	BC 30 SBR EVO
[A]	Outer diameter of the WWTP tank shell	[mm]	1900	2100	2400	2600
[B]	Diameter of the WWTP tank bottom	[mm]	2000	2200	2500	2700
[C]	Tank diameter including external reinforcements	[mm]	2100	2300	2600	2800
[D]	Total height of the WWTP tank	[mm]	2888	2889	2889	2889
[E]	Standard excavation pit depth	[mm]	3038	3039	3039	3039
[F]	Maximum water level in the tank	[mm]	2220	2260	2170	2220
[G]	Height of the inlet pipe bottom from the base slab	[mm]	2240	2279	2189	2239
[H]	Height of the bottom of the outlet pipe from the base slab	[mm]	2140	2079	1989	2039
[I]	Standard depth of WWTP installation below ground level without the use of an extension	[mm]	2788	2789	2789	2789

* Note – the tanks will not be fitted with external reinforcements.

4.2. Construction readiness of the BC 30–50 SBR EVO WWTP (two-tank)

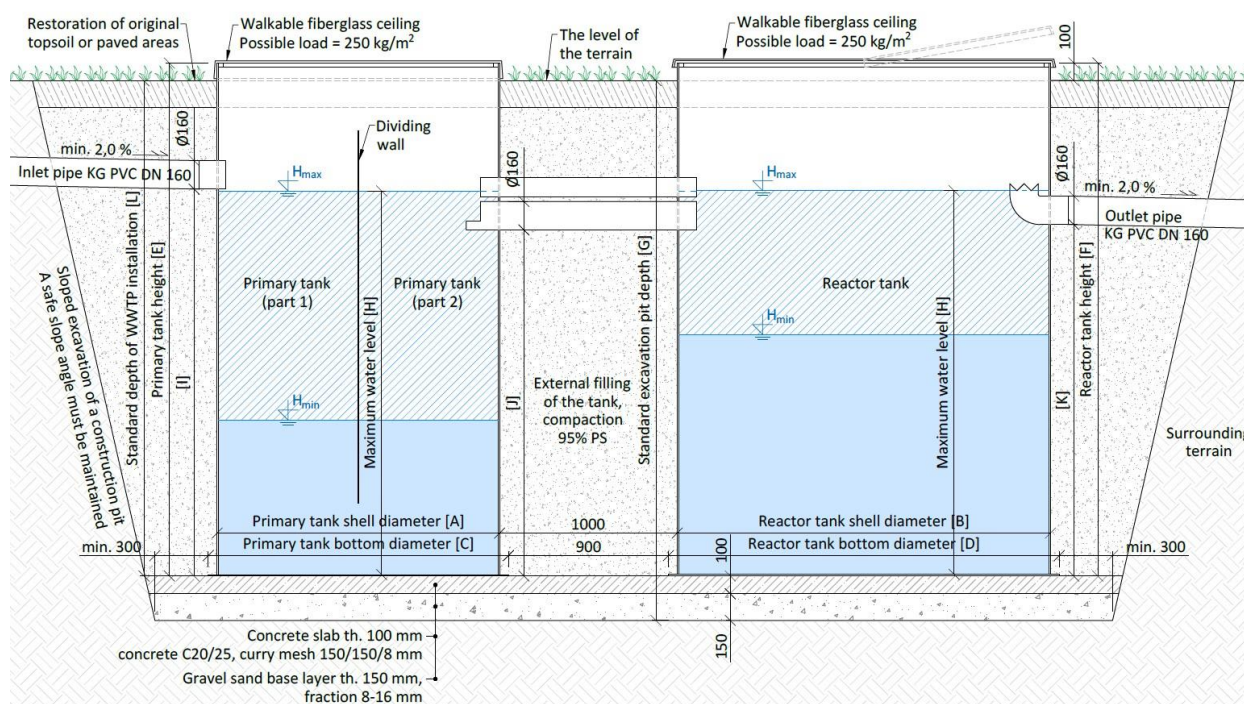


Figure 2: Diagram of the BC 30–50 SBR EVO WWTP with relevant dimensions





Table 4: Dimensions of the BC 30–50 SBR EVO WWTP series (as per Figure 2)

Dim.	Description	Unit	BC 30 SBR EVO	BC 40 SBR EVO	BC 50 SBR EVO
[A]	Outer diameter of the primary tank shell	[mm]	1590	1700	1900
[B]	Outer diameter of the reactor tank shell	[mm]	2100	2400	2600
[C]	Primary tank bottom diameter	[mm]	1690	1800	2000
[D]	Diameter of the reactor tank bottom	[mm]	2200	2500	2700
[E]	Total height of the primary tank	[mm]	2888	2888	2888
[F]	Total height of the reactor tank	[mm]	2889	2889	2889
[G]	Standard excavation pit depth	[mm]	3039	3039	3039
[H]	Maximum water level in WWTP tanks	[mm]	2160	2260	2360
[I]	Height of the inlet pipe bottom from the base slab	[mm]	2178	2278	2378
[J]	Height of the connecting pipe bottom from the base slab	[mm]	1948	2028	2158
[K]	Height of the bottom of the outlet pipe from the base slab	[mm]	1979	2078	2179
[L]	Standard depth of WWTP installation below ground level without the use of an extension	[mm]	2789	2789	2789

5. Installation layout

Installation of the WWTP tank is carried out in accordance with the design documentation prepared by a qualified designer. During installation, local topographical, geological and hydrogeological conditions must be taken into account.

5.1. Excavation pit for the WWTP tank

The construction pit must be adapted to the specific type of WWTP (for tank dimensions, see Chapter 4) and local conditions, which should be assessed in the design documentation. During installation, safety regulations and requirements for earthworks and excavation must be observed.

Before installing the tank, the composition and properties of the soil must be checked. The base of the construction pit should be compacted and stable.

The excavation pit should always be at least 600–1000 mm larger than the footprint dimensions of the WWTP. The walls of the excavation should be constructed in such a way as to maintain a safe slope angle and prevent the risk of landslides. Alternatively, a vertical excavation can be carried out with the installation of a suitable type of shoring without central struts.

Excavated soil must not be deposited directly at the edge of the excavation.

5.2. Reinforced concrete base slab

A compacted layer of 8–16 mm gravel-sand, 150 mm thick, shall be laid on the levelled and load-bearing bottom of the excavation pit. A reinforced concrete base slab with a minimum thickness of 100 mm will be constructed on the gravel-sand bed. A 150 x 150 x 6 mm reinforcement mesh will be used.





The thickness of the gravel bed and the parameters of the reinforced concrete base slab are specified for standard conditions. For specific installations (presence of groundwater, bedrock, etc.), it is the designer's responsibility to determine special foundation conditions.

The specified flatness of the base slab is 2.0 mm over 2.0 m.

6. Installation of the WWTP tank(s)

The following chapter describes the method of installing the WWTP in the ground depending on local conditions.



Care must always be taken to ensure pressure equalisation – fill the tank with water continuously during backfilling. The tank must never be left empty for long periods.

6.1. Standard conditions

The WWTP tank is designed as a self-supporting structure for backfilling with sharp-edged gravel, e.g. 4–8 mm fraction. The material used to fill the construction pit must be properly graded. Under normal conditions, no additional structural reinforcement is required.

The tank must always be placed on a reinforced concrete base slab; see section [5.2](#).

Before placing the tank on the reinforced concrete base slab, remove any loose debris (soil, stones) located between the tank base and the foundation slab so that the base of the WWTP rests completely and evenly on the surface of the slab and no particles remain beneath it that could damage the tank base – deforming or puncturing it after the WWTP is filled with water.

The backfill must be properly compacted; the recommended Proctor Standard compaction degree is 95%. It is recommended that compaction be carried out in layers no more than 30 cm thick.

During backfilling, the tank must be filled with water to ensure that the external and internal pressures on the WWTP tank wall are balanced. The difference between the water level in the tank and the backfill level should never exceed 30 cm. Larger differences may result in irreversible deformation of the tank.

6.2. Installing the WWTP at a greater depth

Under less favourable conditions (deeply buried sewer pipes, issues with pipe gradient), the WWTP tank must be installed at a greater depth. In such cases, an extension of the appropriate height (400, 800 or custom-made) must be ordered. The extension is made from welded PP sheet.

The extension is a slip-on type and has a slightly larger diameter than the WWTP tank. The exact required height of the extension can be adjusted on site. Once the correct height has been set, the extension is connected to the top of the WWTP tank by riveting or bolting. The joint between the extension and the WWTP tank shell must be sealed with a suitable sealing material (e.g. silicone).

If the height of the extension is greater than 500 mm, the lower part of the WWTP tank must be encased in dry concrete from the outside. During the encasing/backfilling process, the tank must be filled with water at the same time.



6.3. High groundwater level (concreting)

In the event of a risk of the groundwater level rising above the level of the WWTP's reinforced concrete base slab, it is essential to encase the tank in hydraulic (waterproof) concrete of at least class C30/37 XA1 as follows:

- Fill the tank with water up to the level of the inlet pipe.
- Concrete the tank up to half its height.
- Seal the inlet and outlet.
- Fill the tank with water up to the level of the upper edge (full tank).
- Concrete the tank to a height of 1.80 m.
- On the second day, carry out the second phase of concreting:
 - For the BC 4-12 PP SBR EVO WWTP – up to the top edge of the tank.
 - For the BC 16-50 PP SBR EVO WWTP – up to a height of 2.50 m, the remainder on the third day.
- Once the concrete has set, clear the outlet pipe. Once the water level in the WWTP tank has fallen below the bottom of the inlet pipe, clear the inlet pipe as well.

6.4. Additional load on the tank

The tank is designed to be walkable and is not dimensioned for additional loads, e.g. from moving vehicles. If necessary, the tank must be structurally secured, for example by encasing it in concrete.

Once encased in concrete, the concrete surrounding the WWTP tank assumes the load-bearing function, whilst the WWTP tank itself ensures watertightness against internal water pressure throughout the structure's service life.

6.5. Connection of inlet and outlet pipes

The WWTP tank is fitted with inlet and outlet pipes as standard ex-works.

- **Inlet** = connect by inserting a KG PVC DN 150 pipe into the prepared socket.
- **Outlet** = connect by sliding the KG PVC DN 150 sewer pipe socket onto the prepared outlet pipe.

Both the inlet and outlet sewer pipes connected to the WWTP must be laid in a sand bed at least 50 mm thick so that the prescribed longitudinal slope of the pipe is maintained, ideally at 3% – a 3 cm drop per 1 m length. The minimum gradient for DN 150 sewage pipes is 2%. Furthermore, the KG pipe sockets must be secured to prevent them from sinking or shifting during soil compaction or settlement.





6.6. Connection of air hoses for the BC 4-12 SBR EVO

A thicker air hose will run between the blower and the control unit. Four thinner air hoses will run from the control unit, passing below ground level in a corrugated double-walled PVC protective conduit (DN 90) into the WWTP tank.

Inside the WWTP tank, braided PVC hoses with quick-connect couplings are provided for air distribution within the tank.

The WWTP tank is fitted as standard with an opening for the conduit, including the air hoses. The corrugated double-walled conduit must be laid at least 300 mm below ground level, without sharp bends, ideally following the straightest possible route from the blower to the WWTP tank.

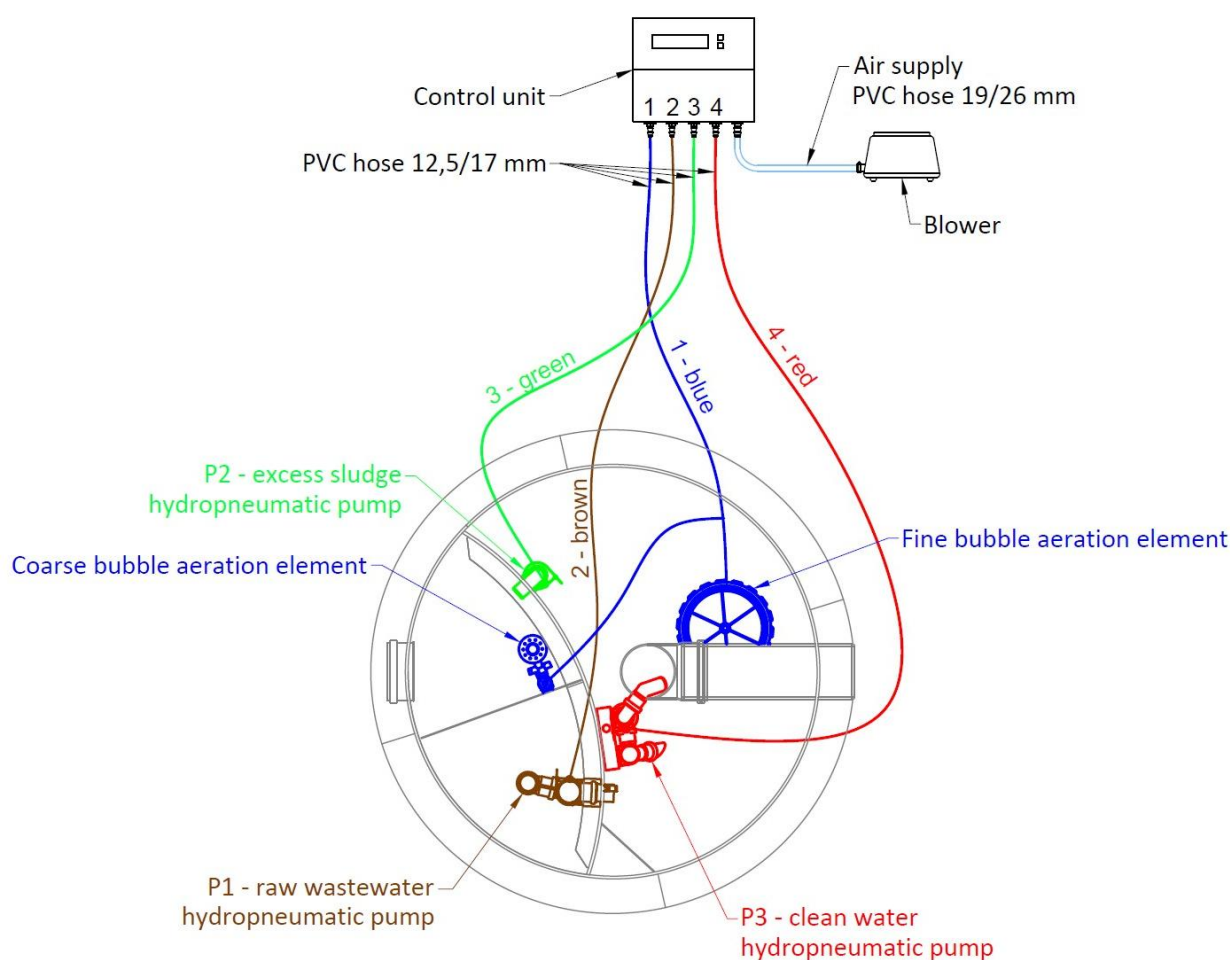


Figure 3: Air hose connection diagram (BC 4-12 SBR EVO)





6.7. Connection of air hoses for BC 16–30 SBR EVO

For BC 16–50 SBR EVO-sized treatment plants, the BonBloc Sequetrol IoT control unit with external solenoid valves is used.

Four electrical cables run from the control unit to the individual solenoid valves, to which the air hoses are connected. The supply air hose from the blower is fed into this block containing the solenoid valves. The hose diameter depends on the size of the WWTP.

Air hoses run from the individual solenoid valves to the individual intake points inside the WWTP tank.

All air hoses laid underground must be housed in plastic corrugated conduits. The route of the conduits should be as short and straight as possible, without unnecessary bends.

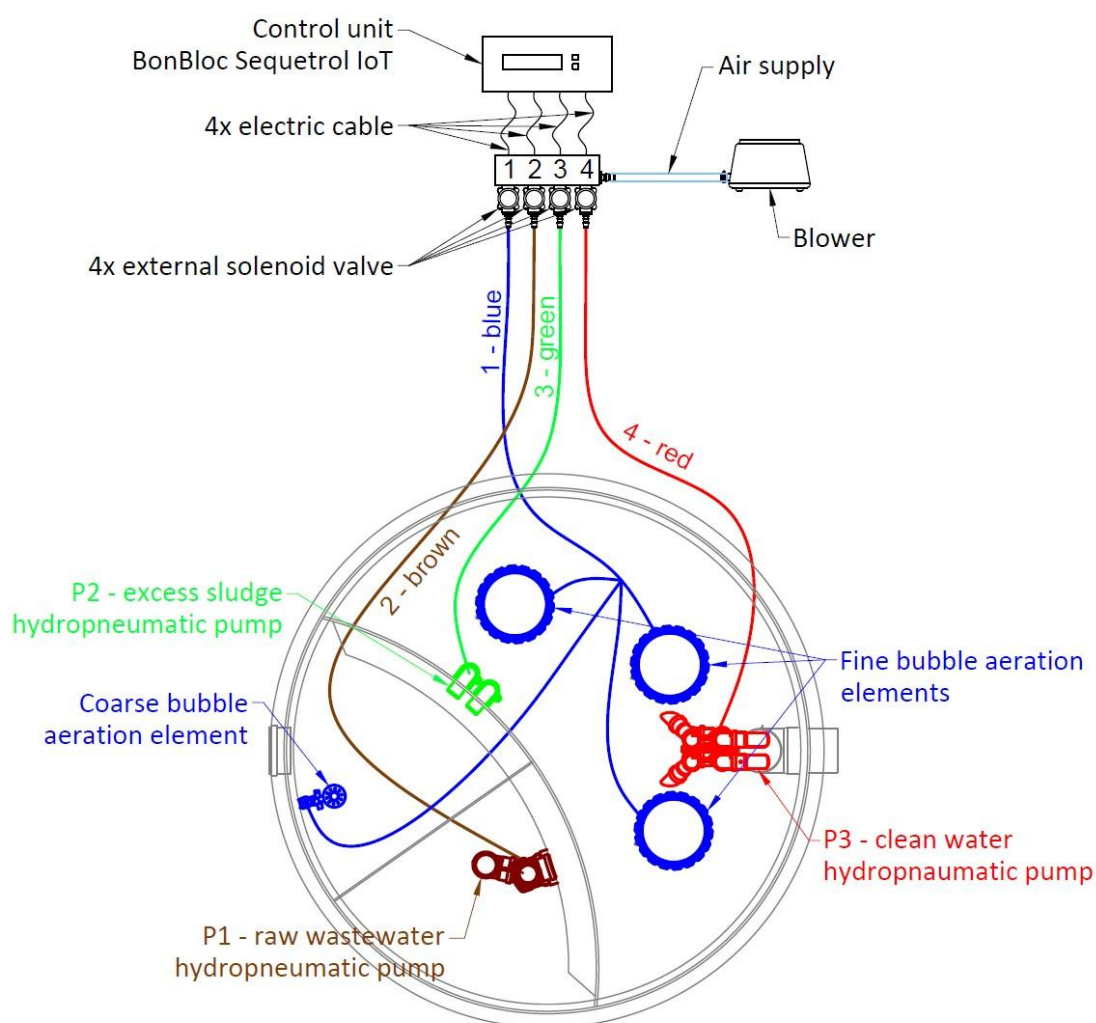


Figure 4: Air hose connection diagram (BC 16-30 SBR EVO)





6.8. Connection of air hoses for the BC 30–50 SBR EVO

The air circuit diagram is very similar to that for sizes BC 16–30 SBR EVO, but with the difference that these sizes are dual-tank models. Some of the air hoses lead to the primary tank.

Four electrical cables run from the control unit to the individual solenoid valves, to which the air hoses are connected. The supply air hose from the blower is fed into this block containing the solenoid valves. The hose diameter depends on the size of the WWTP.

Air hoses run from the individual solenoid valves to the individual intake points inside the WWTP tank.

All air hoses laid underground must be housed in plastic corrugated conduits. The route of the conduits should be as short and straight as possible, without unnecessary bends.

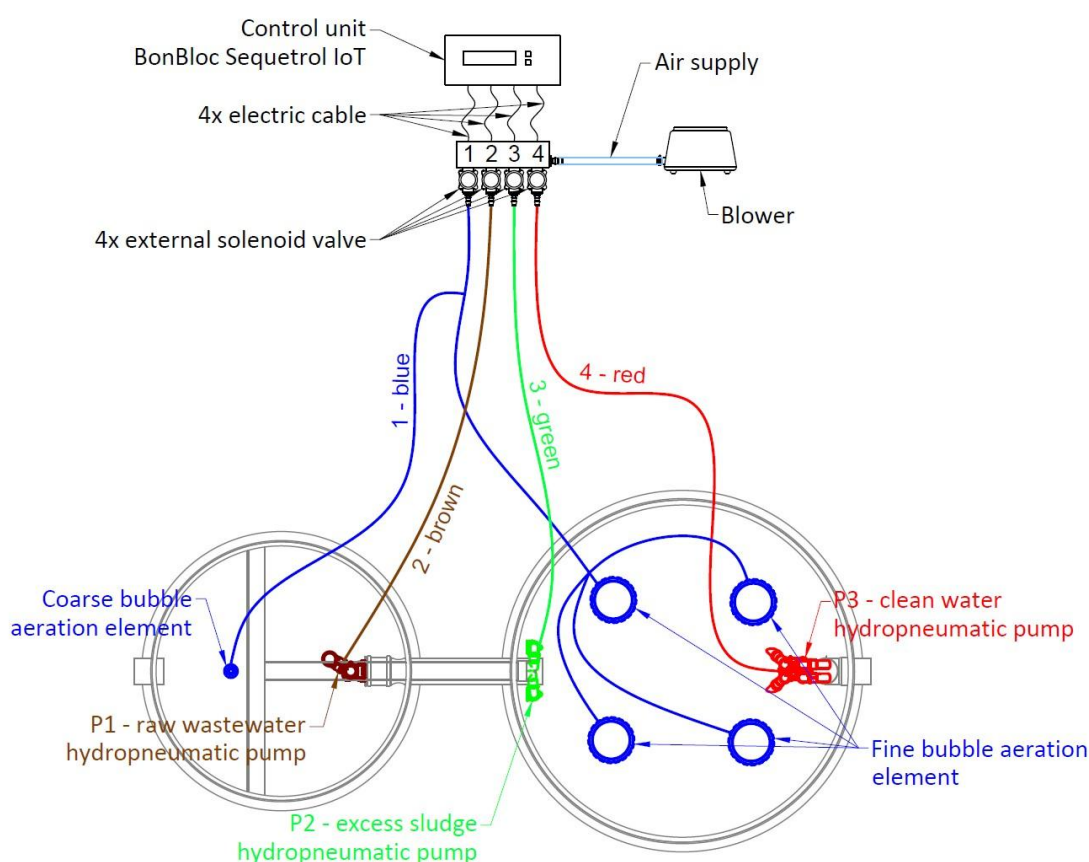


Figure 5: Air hose connection diagram (BC 30–50 SBR EVO)

7. Electrical installation

The electrical installation typically consists only of the blower and the WWTP control unit, or possibly phosphorus precipitation equipment. All electrical equipment must always be located outside the WWTP tank in suitable dust-free areas.

Electrical equipment is not designed to come into contact with rain or snow, due to the risk of electric shock. The blower should not be placed in direct sunlight. High temperatures can cause





premature ageing of the blower's diaphragms. The blower should be located in a place where sufficient natural ventilation is ensured.

It can be installed, for example, in outdoor utility sheds, pillars, garages, cellars, external enclosures on the façade, etc. The blower requires an air supply, so airtight enclosures are not suitable.

Electricity must be supplied to the areas where the electrical equipment is to be installed. Both the blower and the control unit should be easily accessible for adjustment or servicing.



Do not place the blower freely in outdoor areas or in living spaces. The blower is a source of noise and vibration.

The blower is connected to the WWTP tank via PVC air hoses, the length of which must not exceed 7.0 m to prevent excessive resistance to air flow in the system – reduced air flow decreases the efficiency of wastewater treatment.

Table 2: Electrical installation parameters for the BC 4-50 SBR EVO WWTP

WWTP size	Blower type	Installed power cons.	Noise emissions	Voltage / frequency	Cable protection	Supply cable	Switchboard connection
BC 4 SBR EVO	JDK 50	40 W	36 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	Connection via a fused 230 V socket, connected via a residual current device.
BC 6 SBR EVO	JDK 60	40 W	36 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 10 SBR EVO	JDK 100	75 W	42 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 12 SBR EVO	JDK 120	95 W	45 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 16 SBR EVO	JDK 150	115 W	44 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 20 SBR EVO	JDK 200	180 W	45 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 25 SBR EVO	JDK 300	230 W	52 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 30 SBR EVO	JDK 300	230 W	52 dB	230 V / 50 Hz	10 A	CYKY-J 3x2.5	
BC 40 SBR EVO	JDK 400	360 W	54 dB	230 V / 50 Hz	16 A	CYKY-J 3x2.5	
BC 50 SBR EVO	JDK 500	450 W	58 dB	230 V / 50 Hz	16 A	CYKY-J 3x2.5	

Note: *) Power consumption of blowers supplied with BC SBR EVO wastewater treatment plants only.



Before commissioning the equipment, an initial inspection of the electrical installations must be carried out at the WWTP by a qualified inspection technician.





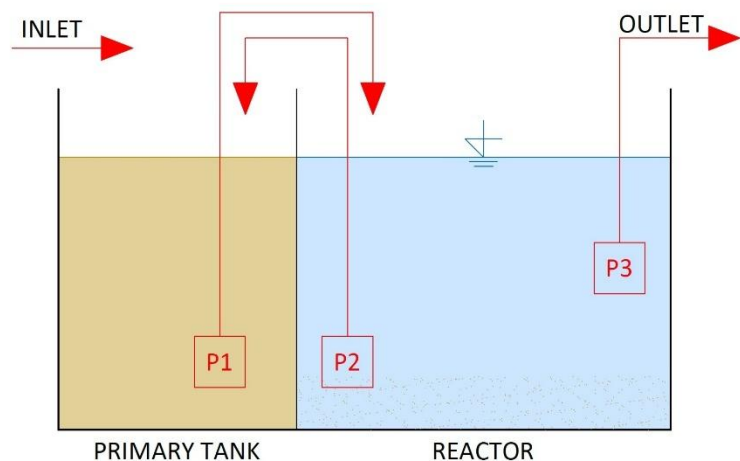
8. Description of wastewater treatment technology

The principle of comprehensive wastewater treatment is based on biological treatment using heterogeneous biological sludge maintained in suspension with simultaneous denitrification, where the carbon source for the denitrification process is the organic pollution in the wastewater itself.

Sewage from the sewerage system is fed into the primary tank, which combines the functions of a settling tank, a trap for floating impurities, a storage tank for incoming wastewater, and a sludge storage tank (known as a 'sludge tank'). The primary tank is divided into two sections by a baffle wall; the inflow is directed into the first section, whilst the second is equipped with a hydropneumatic pump (known as a 'mamutka') and an overflow for wastewater into the biological reactor. Incoming wastewater is accumulated in the primary tank and, during the denitrification phase, is pumped in a controlled manner into the reactor. If the storage volume is filled due to a high inflow, or in the event of a failure (e.g. a power cut), the wastewater flows into the reactor via a safety overflow, which is channelled to the bottom of the reactor so that the discharge of treated water is not affected by the raw wastewater.

Unlike flow-through WWTPs, in SBR EVO-type WWTPs all biological wastewater treatment processes take place in a single tank (reactor) in a fixed sequence of time. During the aeration phase, the activated sludge is aerated and, among other things, the nitrification process (oxidation of ammonia nitrogen to nitrates) takes place. The amount of air supplied is regulated by intermittently switching the membrane blower on and off according to preset programmes in

the control unit. During the denitrification phase, the accumulated wastewater is pumped in a controlled manner from the primary tank into the reactor, resulting in both the removal of organic substances from the wastewater and the reduction of nitrates. During the dosing phase (if the WWTP is equipped with a phosphorus precipitation system), a coagulant is added to the reactor to remove phosphorus from the wastewater, and during the mixing phase, the coagulant is mixed throughout the entire volume of the activated sludge mixture by intensive aeration. Once the set operating level in the reactor is reached, the sedimentation phase begins, during which the activated sludge settles at the bottom of the tank. The treated water is then pumped out into the discharge pipe via the treated water discharge pipe during the treated water discharge phase. The final phase of the basic cycle is the removal of excess sludge by the Mamutka pump to the primary tank, where the excess sludge is mixed with raw wastewater. The individual phases are repeated cyclically depending on the level in the reactor.



9. Control unit

SBR EVO treatment plants can be equipped with three different control units, the use of which depends on the size of the treatment plant and the customer's requirements.





All three types of control units feature integrated level measurement in the reactor and, based on this measurement, issue instructions to start and stop sedimentation/clear water discharge and, if necessary, trigger an alarm in the event of an emergency. Thanks to the level measurement, the control unit automatically switches the WWTP to economy mode if no inflow to the WWTP is recorded for 24 hours. This ensures economical operation and also allows the activated sludge to be maintained in optimal condition even during periods of minimal inflow.

Table 2: Possible applications of control units for the BC 4-50 SBR EVO WWTP

WWTP size	BonBloc Compact	BonBloc Advanced IoT	BonBloc Sequetrol IoT
	Without remote management	With remote management	With remote management
BC 4-12 SBR EVO	YES (standard)	YES (extra charge)	NO
BC 16-50 SBR EVO	NO	NO	YES (standard)

9.1. BonBloc Compact control unit (for BC 4-12 SBR EVO)

The BonBloc Compact control unit is the simplest type of control unit used for the BC SBR EVO wastewater treatment plant. The unit is equipped with a simple graphic display, built-in solenoid valves for individual air outlets (aeration elements, air diffusers) and relay outputs for controlling the blower and dosing pump (if the WWTP is equipped with one).

The control unit is not equipped with software for remote management.



9.2. BonBloc Advanced IoT control unit (for BC 4-12 SBR EVO)

The BonBloc Advanced IoT control unit is an optional version of the control unit for BC 4-12 SBR EVO models. The control unit operates on a similar principle to the more affordable BonBloc Compact control unit, but enables full remote management via the AQUAVISOR web interface, allowing the WWTP to be monitored from virtually anywhere (providing access for users, service partners and the manufacturer).



9.3. BonBloc Sequetrol IoT control unit (for BC 16-50 SBR EVO)

The BonBloc Sequetrol IoT control unit is designed for the BC 16-50 SBR EVO models; it is the only version of the control system available for these models. The control programme, operating mode, control unit functions and remote management principles are virtually identical to those of the BonBloc Advanced IoT model. The only significant difference lies in the design of the control unit, which does not have built-in solenoid valves inside the unit. External solenoid valves must be installed for this control unit, which are controlled via the control unit's outputs.





10. Sludge management

The SBR EVO treatment plant features a primary tank, one of whose functions is to accumulate excess sludge, which is mixed with raw wastewater in the primary tank.

The excess sludge discharge valve automatically regulates the optimum sludge level in the biological reactor. The recommended interval for sludge removal from the WWTP tank is approximately once or twice a year, depending on the actual load on the WWTP. To determine the sludge concentration in the WWTP tank, a sedimentation test must be carried out regularly.

11. Sampling

In BC SBR EVO wastewater treatment plants, samples can be taken from the recessed pocket in the outlet pipe beneath the treated water outlet. **With this type of WWTP, it is not necessary to construct a dedicated sampling shaft.** If a larger sample volume is required, it is necessary to wait for the treated water discharge phase.

The frequency and type of sample are determined by the water authority.

Typically, samples of treated wastewater are taken twice a year using sample type A, which refers to a two-hour composite sample obtained by combining 8 individual samples of equal volume at 15-minute intervals. If the treatment plant is equipped with a storage tank for treated wastewater allowing a hydraulic retention time of at least 2 hours, a single sample taken from the storage tank may be used.

12. Professional commissioning of the BC 4-50 SBR EVO WWTP

The BC 4-50 SBR EVO domestic wastewater treatment plants must be professionally commissioned by a certified dealer of ENVI-PUR, s.r.o. Professional competence is required for commissioning:

- For carrying out construction work,
- for carrying out electrical installations.

