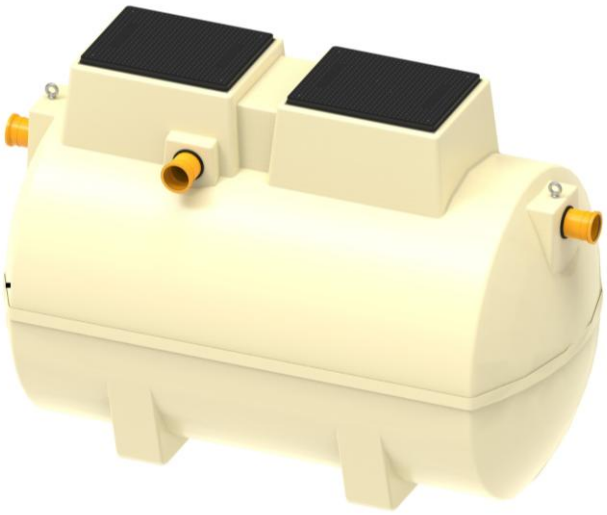
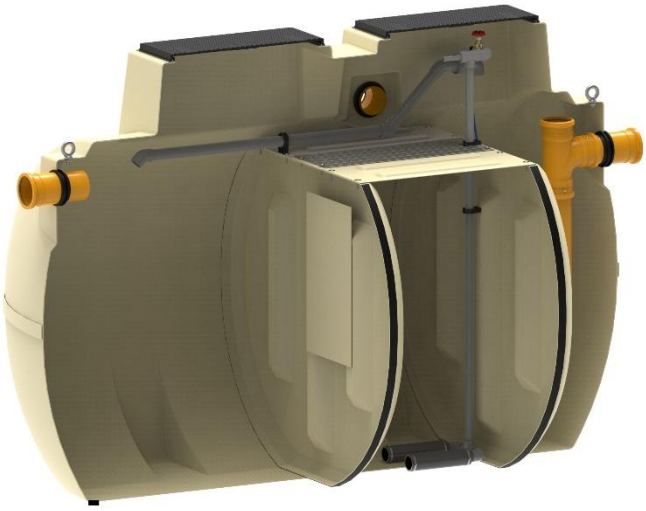
Harlequin®
HydroClear
SEWAGE TREATMENT PLANT

HYDROCLEAR GRP INSTALLATION AND OPERATING INSTRUCTIONS

(HGRP6, HGRP9 & HGRP12)**





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Harlequin HydroClear GRP Key data.

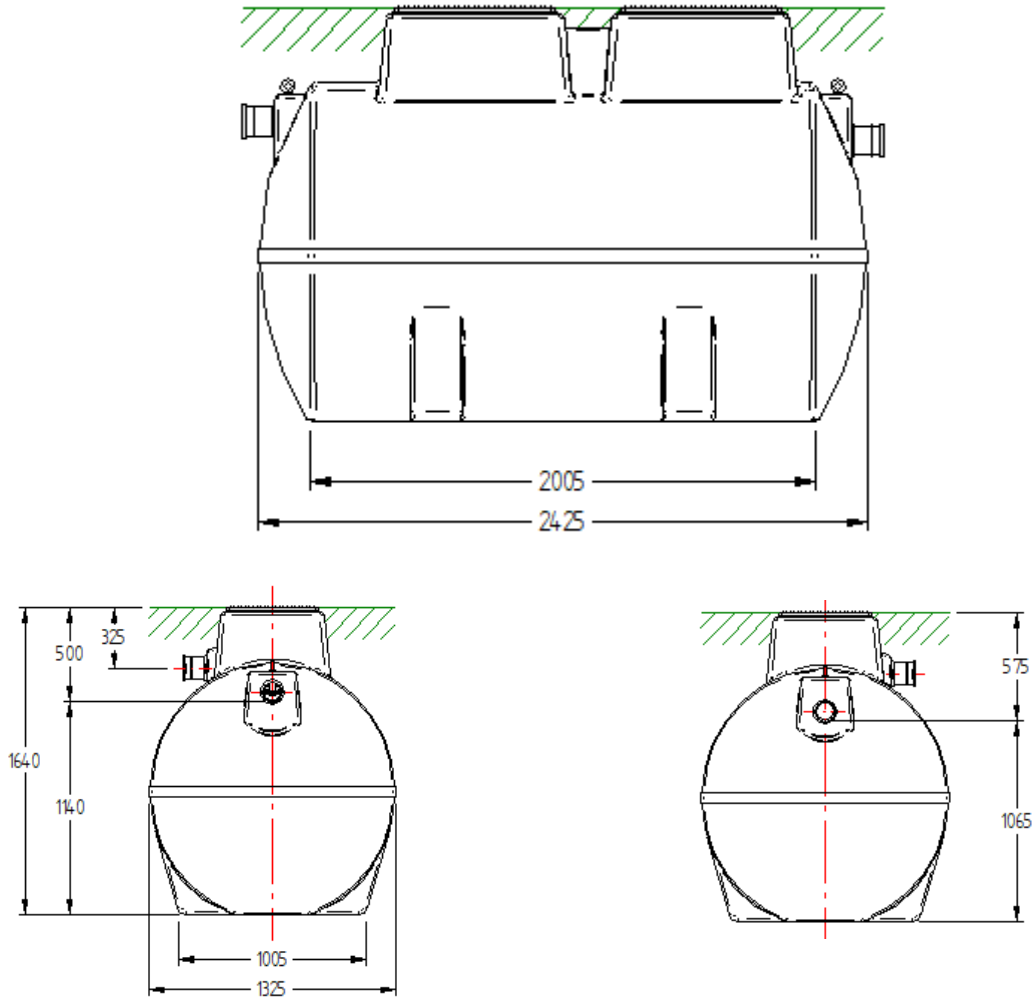


Figure 1: HydroClear GRP 6 Pop

POPULATION	CODE	INLET INVERT (mm)	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)
6	HGRP6	500	2425	1325	1640
9	HGRP9	500	3100	1570	1685
12	HGRP12	500	3630	1880	1810

Table 1: HydroClear GRP Tank Dimensions

General Information

Introduction

It is strongly recommended that you read all sections of this manual before installing and operating your new Harlequin HydroClear GRP. Some installation and operation requirements are specific to HydroClear products and it is important to familiarise yourself with these.

This information is supplied as a best practise guide and it is the responsibility of the user/installer to verify that it is used appropriately for the ground and load conditions.
Installation of the equipment should only be undertaken by a qualified specialist who is covered with professional indemnity insurance.

End-user responsibilities

It is the end-user's responsibility to ensure that their drainage and sewage treatment system complies with statutory requirements and does not cause pollution to the environment. Guidance can be found at Planning & Building Control departments as well as environmental agency offices regarding statutory obligations.
A professional consultant (architect/consulting engineer/drainage consultant) with experience in off-mains systems should be appointed to carry out a detailed site assessment evaluation and design of the groundworks. In addition, the following requirements must be met:

- ***The plant must be installed, operated and maintained in accordance with the requirements of this document***

The Harlequin HydroClear GRP is designed to provide full treatment of normal domestic wastewater to discharge direct to surface waters, removing the need for a drainage field (subject to a "Consent to discharge" license).

The discharge from a treatment plant will require a Discharge Permit from the Environment Agency if the volume of discharge is greater than 5.0m^3/day direct to watercourse or 2.0m^3/day to drainage field, which must be obtained before installation.

In all cases, approval should initially be sought through the local authority Building Regulator. It may also be necessary to obtain the consent of:

- The Environment Agency (EA - England and Wales)
- The Scottish Environment Protection Agency (SEPA -
- Scotland)
- Environmental Protection Agency (EPA - Ireland)
- The Northern Ireland Environment Agency (NIEA)

Health and Safety

The advice given in this document is provided with your safety in mind. This document should be retained for future reference and remain in the household should a new occupier take ownership. The following health and safety guidelines should always be strictly adhered to in relation to the operation and maintenance of any wastewater treatment plant. It is important that:

- ***All electrical work is carried out by a qualified electrician***
- ***All plumbing work is carried out by a qualified plumber or groundworks engineer***
- ***All maintenance activities include appropriate measures to safely isolate electrical and water sources.***

At all times, safe working practices should be observed and adopted to avoid accident and injury when working with the equipment.

- The site should preferably be fenced off to prevent unauthorised access, particularly for small children
- The air blower housing should be kept closed at all times when in operation
- The manhole covers should never be removed and left unattended, even during service visits
- The air blower housing contains electrics operating at 240v. All equipment must be isolated before any maintenance is carried out
- Misuse can lead to serious injury and damage to the plant
- Protective clothing and gloves should be worn at all times and careful attention paid to personal hygiene, especially if there is any potential contamination with sewage products
- Medical attention must be sought if a user is feeling unwell after coming into contact with wastewater products

Leaving the tank unattended during servicing should be strictly discouraged in accordance with the health and safety procedures.

Warning: Wastewater treatment processes can produce hazardous gas concentrations even when vessels are fully drained. Never enter vessels without appropriate training and protective equipment.

Maintenance

It is important to note that it is the end user's responsibility to ensure that maintenance is performed on the system at the appropriate period. Maintenance will ensure good operation and avoid breakdown which could lead to environmental pollution. Environmental enforcement agencies responding to pollution will hold the owner of the system responsible for ensuring compliance with any consent parameters imposed on the site.

The Warranty and Maintenance requirements for the HydroClear products start from Page 13 of this document. The Warranty for the product will be dependent on all the installation and servicing guidelines being followed.

In the event of a warranty claim we will require information on the tanks servicing history.

Regulations and Guidelines

The following documents provide guidance on the requirements of design and installation of wastewater treatment plants.

Publicly available guidance documentation

- N. Ireland E.A. Water (Northern Ireland) Order 1999
- The Environmental Permitting Regulations 2016
- The Water Environment (Scotland) Regulations 2011
- Building Control Regulations 2010, part H
- British Water Flows and Loads – 4, Code of Practice

Relevant Design and Testing standards

- EN 12566-3:2005+A2:2013
- BS 6297:2007+A1:2008

Tank Design and Construction

The HydroClear GRP tank is manufactured from glass-reinforced polyester which offers a very high level of stiffness and durability

Secure pedestrian duty manhole covers are supplied as standard to comply with statutory regulations. The tanks have an engineered flat base for stability during transportation and storage prior to installation.

Handling

Tanks should be handled by crane or other designated and suitably rated lifting equipment using the sling slots provided (only when empty). Please contact Harlequin if you require specific product drawings and dimensions of your product.

Harlequin Manufacturing Ltd can accept no responsibility for incorrect offloading or installation. The contractor is responsible for offloading all items of equipment with due regard to the following:

- DO NOT use chains or wire ropes.
- DO NOT lift the tank if it contains any water.
- DO NOT subject the tank to sharp impacts.
- DO check that all items delivered correspond with the delivery note.

When working in deep excavations, make sure that all necessary safety precautions are taken to ensure the stability of the excavation and provide safe working conditions for site personnel. The only time anyone needs to be working at the bottom of the excavation is when levelling the base and ensuring that the first backfill is correctly placed.

Plant Siting

The discharge from a wastewater treatment plant should be sited a minimum of 10m from any buildings. The distance of the plant from properties may vary from area to area but attention should be paid to the invert on the tank, the subsequent drain gradient on the inlet pipework and the potential of superimposed loads. Local building control office advice should always be sought through planning permission, where required.

The direction of the prevailing wind should also be taken into account when considering the plant location as odours may be present when the plant is being desludged or during maintenance. No odour should be present around the tank under normal operation providing the plant has been installed with the venting system (see 'ventilation' on page 11) and the plant has been correctly sized and installed.

For installation, consider the space required on site to allow an excavator to operate; for the removal of soil, delivery of concrete, gravel, etc. For maintenance, consider the access space required for a sludge emptying tanker. Maximum distance of 20m is needed to ensure hose length is sufficient.

Approval for the tank position should always be sought from the controlling authority at an early stage and planning signed off by the local authority building inspector prior to installation.

If using a drainage field, attention is drawn to the minimum recommended distances to other buildings and sources of water which may affect your plant location:

- Drainage Field from habitable dwelling = 15m
- Drainage Field from water course = 10m
- Drainage Field from well/drinking water source = 50m

Drain gradients

Drain gradients from the dwelling to the treatment plant should be 1:40, although 1:80 can sometimes be permitted with approval of Building Control Officer. The gradient of pipes within a drainage field, if applicable, must be <1:200. The drain from the plant to the start of the drainage field should be in the range 1:40 to 1:80. These are only typical recommendations and must be approved by the Building Control Officer for specific sites.

Ground and drain levels

Site plans should show existing and proposed ground levels and invert depths of the drain throughout its length. If the drain is too shallow, or if it passes under walls and foundations, it should be protected by concrete surrounds.

Percolation tests and drainage fields

A soil percolation test should be carried out over the proposed drainage field where necessary. The calculations and drainage layout plan must be submitted to the Council Building Control dept along with the other drawings. The percolation tests should be carried out by a qualified specialist consultant who should be covered with professional indemnity insurance

Superimposed loads/protected areas

Harlequin does not recommend that superimposed loads, such as vehicles, be allowed within 3m of any part of the tank.

The tank should not be situated close to a driveway or roadway, or anywhere there is a risk of it being subjected to additional superimposed loads. The protected area should also be fenced off.

If vehicular or other superimposed loads are required to come within the protected area a qualified civil/structural engineer must be employed to design the installation. This design must prevent loads being transmitted onto the tank.

Harlequin Tanks may not cover the warranty for the tank body under superimposed load conditions; this responsibility must be covered by the civil/structural engineer. It is thus a requirement that the installation is signed off by this third-party engineer.

Installation instructions

Before any tank is installed, appropriate ground condition checks should be made to determine the soil constitution, position of the water table and any flood possibility in the area.

These checks should be performed through test holes in the proposed area and checks with Building Control and the appropriate environmental regulator on any history of level alterations of the local water table. Once the site information has been gathered, the installation type can be selected as either 'Dry' or 'Wet' ground conditions. **If there is any doubt as to the summer/winter water table level, etc, a Wet site installation must be selected**. Failure to follow the guidance instructions during installation may render the warranty null and void.

Tank Access

Installers must ensure that the tank is positioned and installed in a way that allows safe, practical access for all maintenance and inspection activities throughout its entire operational life. This includes considering how engineers will reach, enter, and work within the unit once it is underground.

Failure to allow adequate access may prevent maintenance from being carried out safely or may require excavation or additional works later

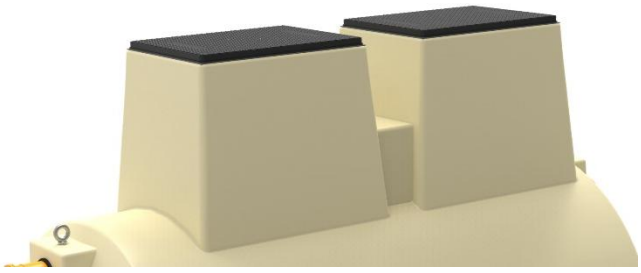


Figure 2: HydroClear HGP6 model fitted with 750mm Invert level

Modifying the tank invert depth

The HydroClear GRP has a standard Inlet Invert of 500mm It is possible to increase the invert level to 750mm or 1000mm using factory fitted 450mm x 600mm risers but only if specific ground condition checks have been made and the installation appropriately modified. It is possible to retrofit 250mm/500mm risers to the HGRP6/HGRP9 model. Installation instructions are available from Harlequin.

If you wish to increase the invert beyond those maximum number of risers (up to a 2.0m maximum invert), we recommend the use of 1200mm concrete rings above the tank to allow access to the main manhole cover of the tank (You can use standard Ø450mm risers to increase the height above the access lid in the primary chamber). The concrete rings need to be fully supported and not transfer any weight to the body of the tank. Installation for this situation **MUST** follow the Wet ground installation procedure. You should also extend any submersible pump power cables to allow them to be removed in the event of maintenance (see Pumped Outlet section below).

Failure to adhere to these design parameters may cause severe structural damage to the tank and will render any warranty null and void.

Dry ground installation conditions

A site is deemed as being dry when at **NO** time does ground water rise above the base of the tank. This is a requirement throughout seasonal changes not just at the time of installation.

NB: If the complete surrounding soil structure is non-porous, eg, Clay or if the tank has been installed in bedrock etc, water will pool around the tank within the backfill. In this circumstance **EITHER** a land drain must be installed to drain the installation to the base of the tank (water must always be free draining) **OR** the wet installation procedure must be used.

Provision should be made for temporary covers and fencing around the excavation site to comply with statutory health and safety requirements.

Dry installation procedure

Excavations should allow for a minimum thickness of 300mm pea gravel all round and 150mm thickness of concrete below the tank(s). Where difficult ground conditions are encountered, ie, in unstable ground or shrinking clay, etc, an additional depth of 250mm should be excavated below the tank to allow for hardcore and sand blinding to provide a firm base for the concrete bed.

Place wet concrete (slump test 30mm, strength 25N/mm2) in base of the excavation to a depth of 150mm, grade and level to within 20mm. The concrete must extend a minimum of 300mm all around the vertical sides of the tank(s). ***This is vital to ensure a stable base to prevent settling of the tank(s) which could damage the pipe connections. Lower the tank(s) onto the dried concrete and check it is true and level using a spirit level.***

Fill the tank(s) to approximately 600mm water depth once the tank has been lowered onto the concrete. Harlequin recommends that each of the 3 chamber is filled evenly to ensure a balance of liquid across the chambers. Please refer to Appendix 3 for an illustrated guide on this.

Next, place and consolidate additional concrete carefully under the lower radii of the tank(s). This will ensure they are correctly supported once installed. Do not use a vibrating poker. [1]

Continue to fill the tank with water whilst simultaneously backfilling around the tank with 12-15mm pea gravel, ensuring the level of water in the tank is maintained at approximately 200mm higher than the level of backfill. This will maintain equal pressure inside and outside the tank and will prevent any chance of movement during installation. When the tank is full of water to the inlet/outlet height, connect the inlet/outlet pipes to the tank (as labelled) and continue to build up and around the tank with backfill to around 100mm above the body of the tank.

Pea gravel specification

Pea gravel or crushed aggregate of uniform particle size 12- 15mm, free of sharp edges. Chemically inert, washed clean and free of contaminants.

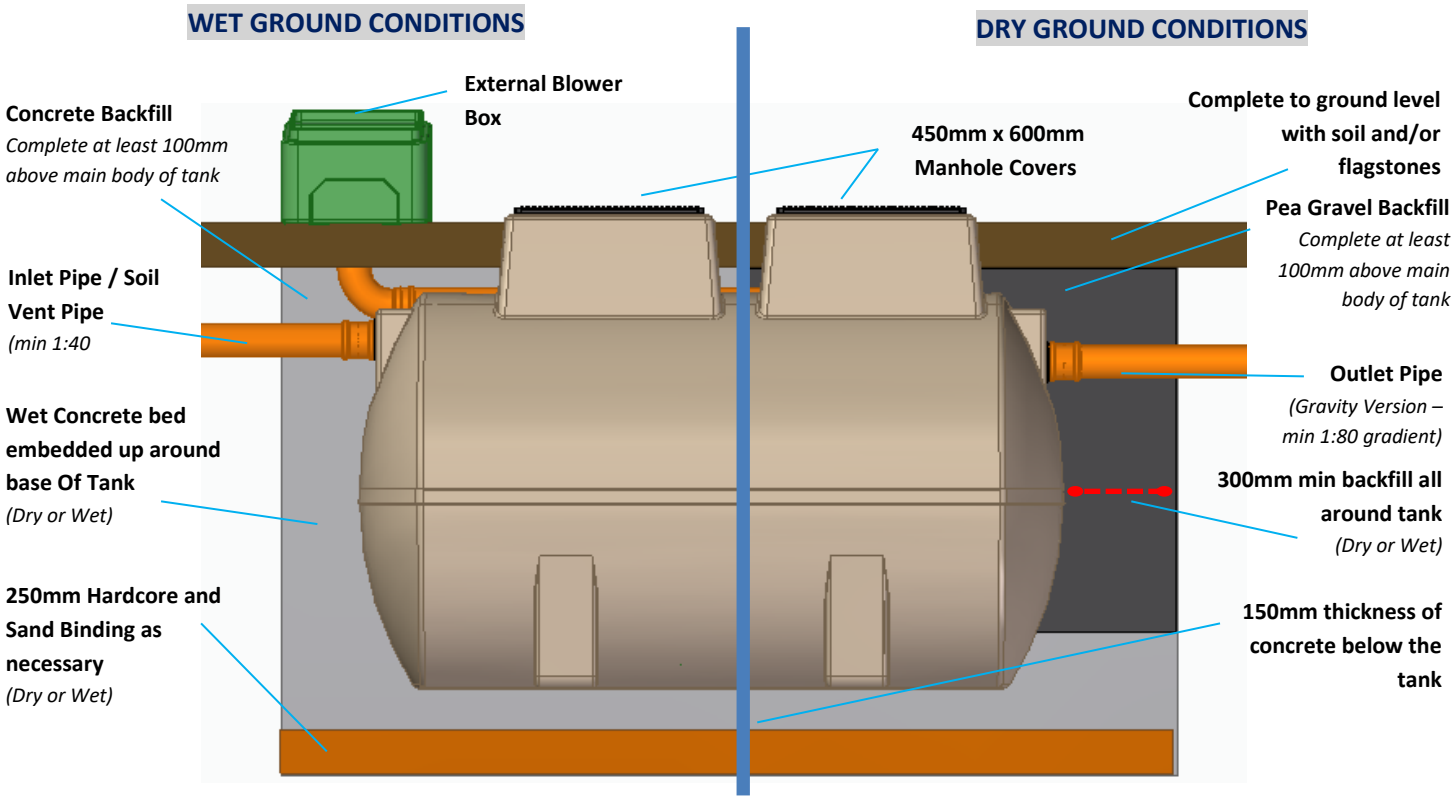


Figure 3: Typical Installation – Dry and Wet Ground Conditions (HGP6 – External Blower version)

"Wet" ground installation conditions

A site is deemed as wet when ground water can rise above the base of the tank. If in doubt of water table position, these Wet ground installation instructions must be followed.

The maximum permissible water table level is 1.6m from the base of the tank (just below the top of the turret) for the HGRP6 & 9 and 1.8m for the HGRP 12. These increase by 0.25m and 0.5m with the 750mm and 100mm Invert versions respectively. Failure to follow the guidance instructions during installation may render the warranty null and void.

In poor soil conditions it is essential to make substantial provision for planking, strutting and temporary shuttering.

Adequate pumps should always be provided to keep the excavation free from ground water during the work. Provision should also be made for temporary covers and fencing around the excavation site to comply with statutory Health and Safety requirements.

Wet installation procedure (continue from [1] above)

Continue to fill the tank with water and carefully place concrete around the tank building up the layers, ensuring that there are no voids remaining around the tank. Do not use a vibrating poker. Ensure that the level of water inside the tank is maintained at a level approximately 400mm higher than that of the concrete backfill.

Fill the tank with water until it reaches the height of the outlet pipe and bring the concrete level up to within 400mm of this level. The concrete must now be allowed to harden – approx 24hrs. This is to prevent an unbalanced buoyancy force from the wet concrete from lifting the tank from the excavation as the backfill is raised above the internal water level.

Once the backfill concrete has hardened, connect the inlet/outlet pipes to the tank and continue to backfill with concrete, covering the top body of the tank by 100mm thick layer.

Inside the External Blower Housing

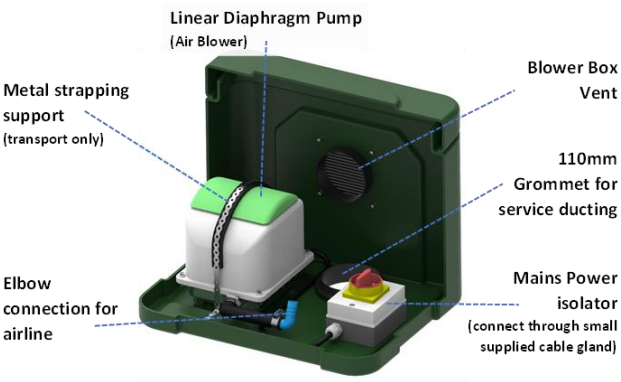


Figure 4: Inside the External Air Blower Housing

The power requirement for the unit is single phase 240V, through a 3-core steel wired armoured (SWA) cable. Refer to the Air Blower specification supplied with your unit for the specific power ratings to size the electrical cable but 1.5mm is usually adequate. The supply to the unit should be by means of a dedicated circuit with isolation and protection devices consistent with the requirements for fixed equipment and in accordance with the latest regulations. The electrical installation of this equipment must only be carried out by a fully qualified electrician.

The standard external Blower Housing (initially stored in the tank for delivery purposes) contains a linear diaphragm pump (air blower) pre-wired to a 20A Isolator (see Figure 6), 10m of airline hose and connection components for the airline and SWA power cable. The unit should be positioned close to the tank at ground level and this distance is limited by the length of airline provided.

If the HydroClear is not to be installed upon delivery, we recommend storing the blower housing at ambient temperature until ready to commission. We also recommend shielding the blower box from direct sunlight when installed, as increased temperatures can reduce the lifespan of the diaphragms.

The mains power can be brought into the unit through the cable gland (supplied) with the drill location on the unit determined by the end user and then connected directly to the Isolator (Illustrations of the wiring of the Isolator can be found in Appendix 5)

The incoming power supply to the tank must be installed with a separate earth leakage circuit breaker in the source building. Ensure the SWA cable is correctly installed, earthing the outer steel armouring at both ends. You can reduce the level of vibrations from the compressor unit by removing the perforated metal straps holding the unit down with the box. These are fixed to prevent movement during product transport and should be removed prior to use.

Connecting the airline to the tank

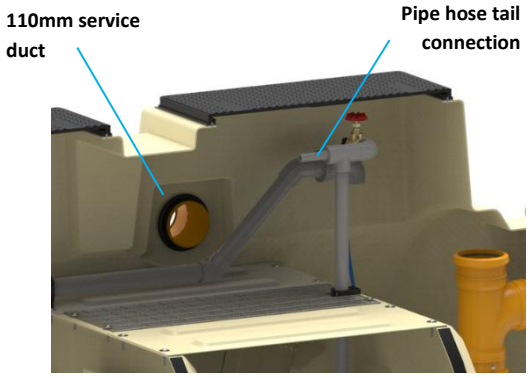


Figure 5: Tank Airline connection and Service duct

The system is designed so that 110mm service duct should be used to connect the tank through the bottom of the blower box assembly. The supplied airline should be fed through the ducting and connected to the blue plastic elbow/hose-tail on the air blower using a jubilee clip that comes in the kit.

The other end of the airline should be cut to length and joined to the fixed pipe hosetail connection installed on the tank just below the manhole lid using the jubilee clips provided (as shown in Figure 5). All pipework/cables should be fed through the 110mm service duct connection at the top of the tank. The flow regulator be set to achieve an effluent return rate of a limited but consistent flow (the desired setting will have the flow around 1.0-1.5L/min on a HC6 unit).

If the air in the recirculation line is operating correctly you will be able to see the return flow through the 30mm hole at the top of the recirculation pipework. Under no circumstances should this valve be fully open or beyond a limited flow as this will detrimentally affect the efficiency of the performance of the plant.

Inside the Internal Blower Housing

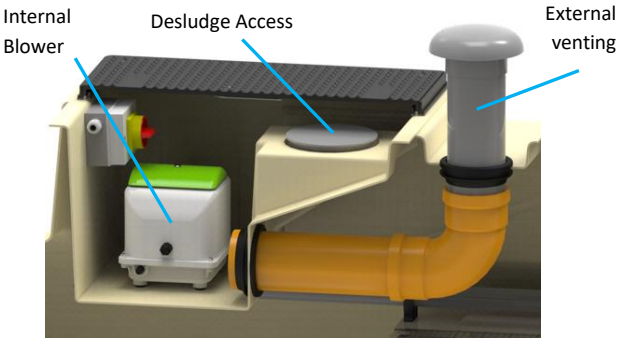


Figure 6: Internal Blower Assembly

The HydroClear GRP also comes with the option to have a factory fitted internal blower option. The blower and its components are protected from the conditions within the tank inside a housing under the 1st access manhole in the tank.

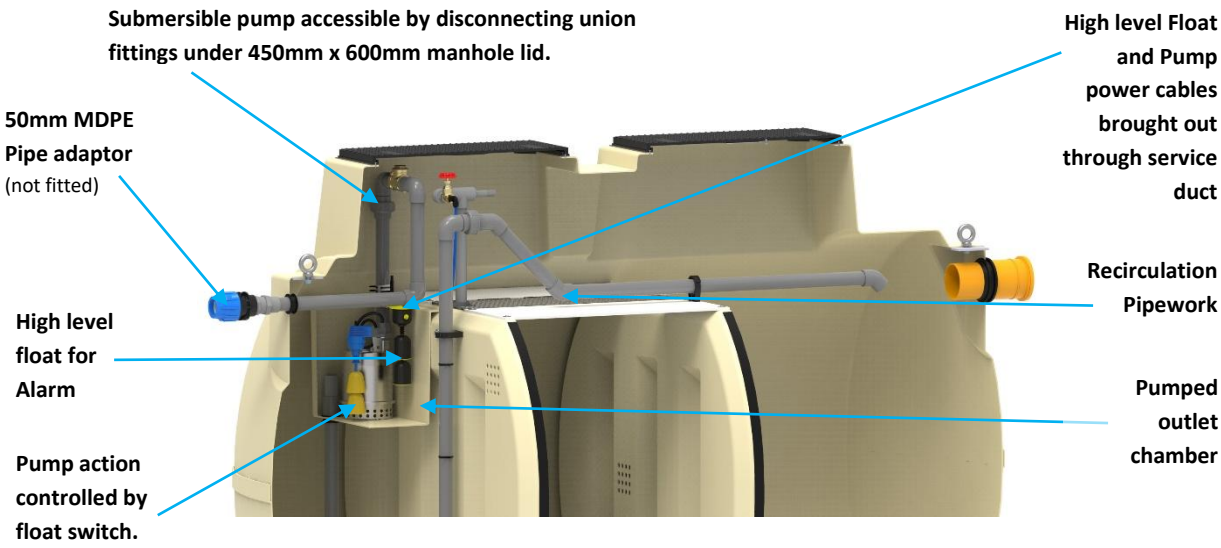


Figure 7: Tank Configuration in Pumped Outlet version

This housing is also externally vented. As with the external blower option, this comes fitted with a pre-wired 20A isolator and a SWA power cable. In this option, the tank comes pre-fitted with a hose connecting the blower to the diffuser. The Power is brought to this unit by connecting a mains line to the isolator through the cable gland provided.

Pumped Outlet Version (Optional)

Integrated pumped outlets can be used where gravity drainage is not possible. This process uses a submersible pump that is fitted within an individual pump basin situated in the final chamber of the tank. This pump (shown in Figure 8) operates by use of an integrated float switch. As the water level rises in the pump basin, the float will activate the pump. The pump will then switch off when the water level drops again. The float switch is set to turn on and off at predefined levels for pumping a specific volume of effluent out to a sample chamber or to discharge. This version of the product comes fitted with a 50mm MDPE Pipe Adaptor as an outlet connection on the tank as opposed to the standard 110mm pipework.

Installation

The pumped outlet version of the product should be installed physically by the same procedure as the standard gravity tank. The cables for the high-level float and submersible pump should be brought out through the 110mm service duct as shown in Figure 8 above to the external blower box. If necessary, the submersible pump can be accessed in the final chamber through the removal of the manhole access lid and disconnecting the union fitting as also shown in Figure 7.

The external blower box for the pumped outlet version will also contain a high-level alarm as shown in Figure 9 below. The cable for the high-level float should be connected to the Overflow Alarm Control box and the power connection from the submersible pump should be connected to the isolator within the blower chamber.

We recommend always leaving enough slack in the power cable to allow the pump to be removed from the tank in the event of servicing without needing to disconnect the power supply from the blower box.

Wiring diagrams for connecting the cables can be found in Appendix 5 at the end of this document. We recommend installing a separate power connection/isolation for the Overflow Alarm Control in the External Blower Box to ensure continued operation in the event of a pump power failure.

The high-level float is attached to the outlet PVC piping connected to the submersible pump. This switch activates the alarm in the blower box (Figs 9-10) and is designed to only be triggered when the water level rises towards the top of the inner chamber (failure of the pump). If the alarm activates while the pump is operating, the float has been installed too low on the pipework. Please check the operation of all floats when installing.

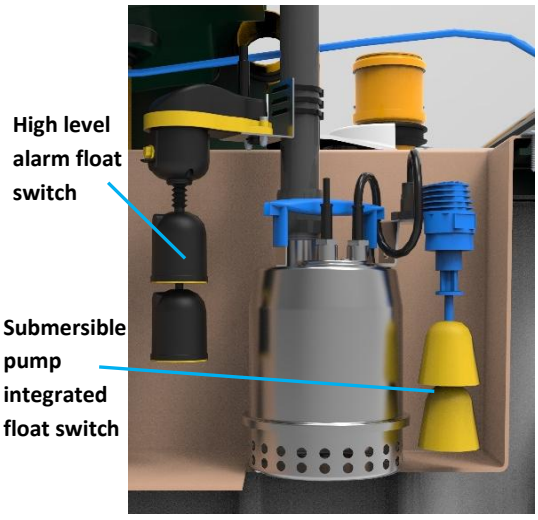


Figure 8: Pump and High-level Float Configurations in Pumped Outlet versions

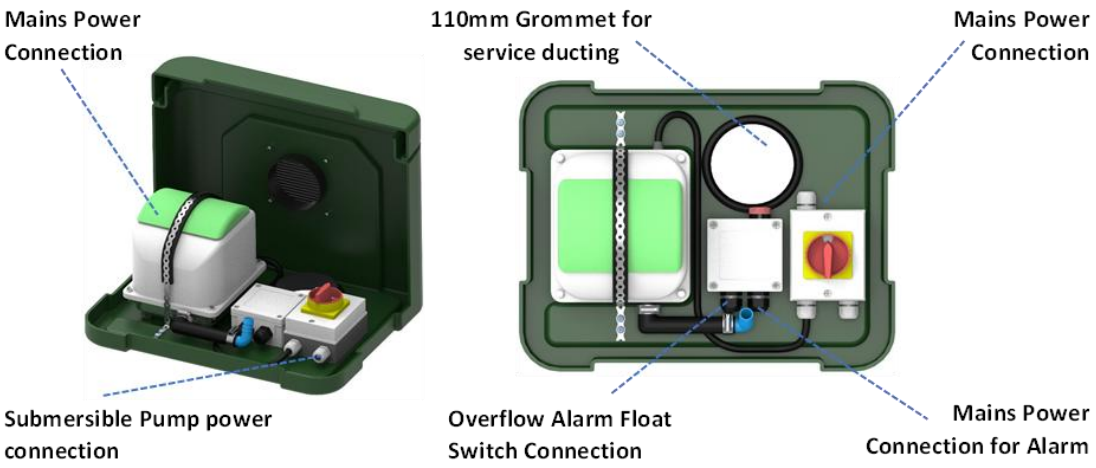


Figure 9: External Blower box assembly (Pumped Outlet version)

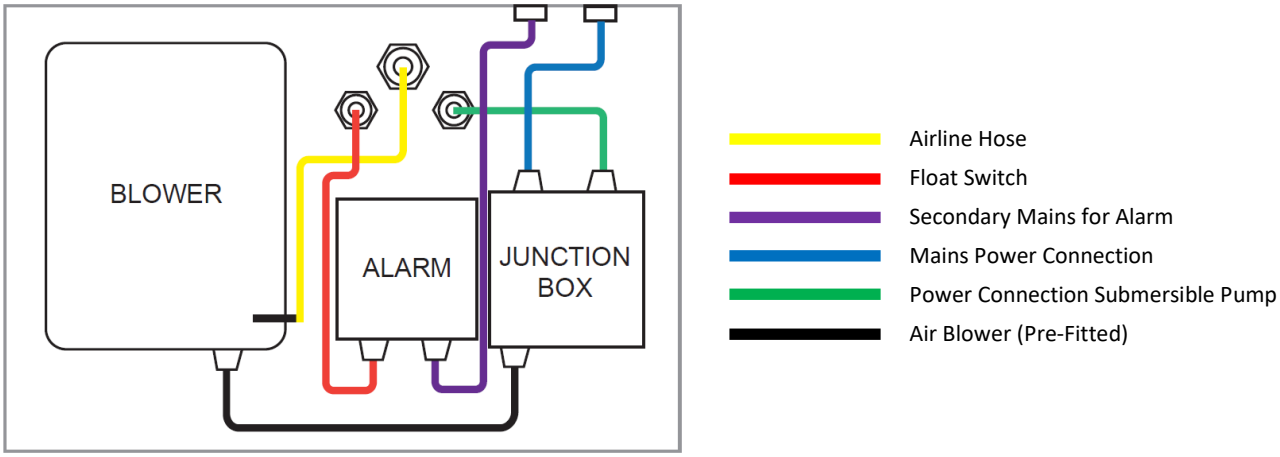


Figure 10: Connections inside External Air Blower Housing (Pumped Outlet Version)

As with the gravity version of the system, we would recommend removing the submersible pump and (as well as the blower box) storing in dry conditions until the system is ready to be commissioned.

Ventilation

It is important that a specific air venting point is provided by the installer to allow the system to freely vent and disperse gas. This should be achieved through the installation of a soil stack running to the top ridge of the dwelling(s), this must not terminate at eve height. The air from the system must be allowed to freely vent back the inlet pipe from the tank to this soil stack. The internal pipe work of the tanks allows ventilation from all chambers to the inlet pipe work. The soil stack can usually be installed through vertical extension of the dwelling's wastewater pipe where it leaves the building.

Consideration should be given to the prevailing wind and any local site geography that might inhibit air dispersion. If in doubt as to the installation of an appropriate vent, please contact Harlequin Tanks for advice.

Operating Instructions

The Harlequin HydroClear GRP is a biological aeration treatment plant designed to produce high effluent quality for safe discharge. It has several functions that minimise the amount of maintenance required for the system. These include:

- A Moving Bed Biofilm Reactor (MBBR) biological system that maximises bacterial growth without the potential for clogging in the system.
- The bacteria receive a continuous air supply and are mixed and aerated by the high-volume fine bubble diffuser.
- There are no mechanical moving parts or electrical components in the standard tank (excluding Pumped Outlet and Internal Blower versions). All functions are operated by air power generated by a linear diaphragm pump (air blower) This allows safe and easy maintenance.

Wastewater enters the first of three chambers, the Primary, where settlement takes place with the heaviest solids sinking and the floating matter rising. These solids are retained and stored in this chamber where anaerobic bacteria, ie, bacteria which do not utilise oxygen, break down the organic matter.

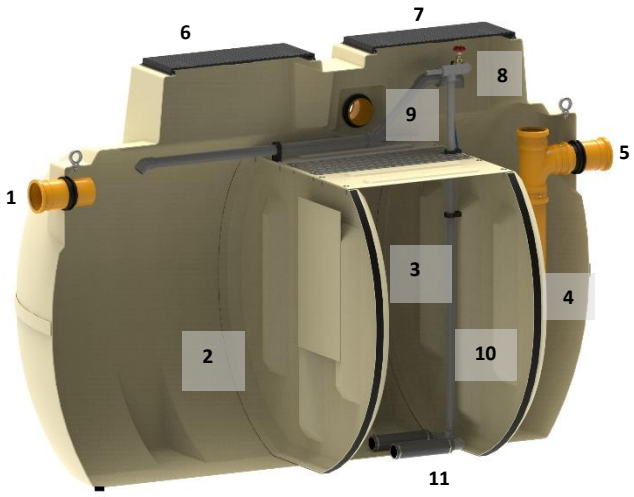
The clarified water is transferred to the aeration chamber where it is mixed with freely moving plastic media elements. The media elements support large bacterial populations over their surfaces which are mixed with the water in the chamber.

Through contact with the bacteria, the organic and nutrient constituents of the water are removed. The chamber is continuously aerated by a fine bubble diffuser which provides the oxygen to nourish the bacteria. The air blower which drives the bubble diffuser is easily accessed for maintenance in the external housing.

The treated water finally flows through into a smaller final settlement chamber where any sloughed off bacteria or escaping solids are collected.

There is also recirculation pipework (sludge return) connecting the bottom of the final settlement chamber back to the primary settlement chamber. The recirculation flow comes from an airline installed within that pipework. This airline is connected to the main air supply by means of a control tap which ensures the correct balance of flow between the recirculation pipe and the diffuser. This pipework allows the system to recirculate the effluent to prevent stagnation, especially in times of low influent loading.

The final effluent will either flow by gravity through the 110mm PVC outlet or will be pumped out through the 50mm MDPE connection by a submersible pump (Optional Pumped Outlet version). From here the completely treated water flows to the outlet where it is discharged back into the environment either directly to a water course or through an underground drainage field.



1	110mm Inlet
2	Primary Settlement chamber
3	Aeration chamber
4	Final Settlement chamber
5	110mm Outlet
6	Primary chamber 450mm x 600mm Inspection Cover
7	Aeration chamber and final settlement chamber 450mm x 600mm Inspection Cover
8	External Air Pipe Connection and Air Control Valve for Sludge Return
9	Sludge return Pipework into Primary Settlement
10	Bio media (not shown)
11	250mm Bubble diffuser

Figure 12: Process Description – HydroClear GRP (External Blower Version)

Components inside the tank

There are no electro/mechanical moving parts within the plant, making the system very reliable and simple to maintain.

The air bubble diffuser in the reactor vessel can be disconnected from the airline pipework just below the main manhole access lid and removed from the tank for service if necessary. Rodding access is also provided on all pipework as per normal Building Control guidelines for underground drainage. All other components for the tank can now be found inside the External Blower box.

Plant Start Up

1. Fill the plant with clean water until there is a discharge from the outlet (See Appendix 3 below for illustrated guide on filling of these tanks)
2. Check all the airline connections are connected per the instructions on Pages 8-9 to ensure air tightness
3. Check the blower ventilation is unobstructed.
4. Turn on the main power supply to the blower unit.
5. Turn the isolator switch inside the External blower housing to the on position. This will start the blower running.
6. It will take a minute or so for the pressure to build up in the system depending on the distance of the blower from the treatment plant.
7. Check that bubbles are breaking the surface in the filter media section of the treatment plant.

8. The flow regulator valve on the airlift recycle should be set to achieve an effluent return rate of approximately 1.0-1.5L/min. This may need adjustment due to temperature conditions or distance of blower from the treatment plant. Under no circumstances must this tap be fully open as this will detrimentally affect the process performance of the treatment plant.
9. If a discharge pump is fitted in the final settlement area, check for operation.
10. Refit all manhole covers and lock if necessary.

The wastewater treatment system is now in an operational state. However, the treatment process relies on the growth of microorganisms on the filter media. The time taken for these naturally occurring organisms to develop is dependent on temperature and may take up to six weeks in winter.

Until the biomass is fully developed, the treatment process will be incomplete. During this time do not allow any strong cleaning agents or bleaches to enter the system.

Plant Shut Down

Short temporary absences of flow to the plant will not be detrimental as sludge levels within the primary settlement should maintain the micro-organisms until flow returns. However, if the flow of sewage to the plant will be interrupted for more than two weeks, the following procedure should be completed:

1. Desludge the primary and final settlement tank compartments in accordance with the instructions below.

2. Refill the plant with clean water through the final settlement tank.

3. Fit the manhole cover and lock if necessary.

4. Stop the blower by turning the isolator switch to off.

5. Switch off the power supply to the blower enclosure.

Warranty

It is ultimately the customer/house owners' responsibility to ensure that their drainage and sewage treatment system complies with all statutory requirements.

Harlequin Manufacturing cannot guarantee the quality of effluent produced as we cannot control what enters the plant. The warranty policy covers the plant only and does not cover or guarantee an effluent quality. Drainage fields and the emptying of primary tanks remain the responsibility of the treatment plant owner.

The plant will have a 20-year extended warranty (if the product is registered with Harlequin – 5 year otherwise) that is valid from the date of sale – this warranty covers the body of the tanks where a replacement will be delivered to site. Ancillary equipment (excluding consumables) will have a 2-year warranty (1 year if not registered). These are subject to the tank being installed correctly according to the instructions listed in this guide and the servicing requirements being met. The warranty does not cover anything before or after the tank i.e. drainage field, venting and it does not cover damage done to the plant by any other product within the system.

In the event of a warranty claim we will require information on the tanks servicing history

If a Harlequin Wastewater Treatment Plant arrives on site damaged, it is to be reported by the end user / installer at the time of delivery/installation.

It is the installer's responsibility to check the plant internally for damage. It is also the installer's responsibility for the electrical supply, safety, connection, suitability and testing non-interference with other electrical systems as well as the ducting, hoses, venting and sealing.

The plant is not designed to have any non-biological waste going into the tank and is not suitable for any excess flow outside the plants design parameters. If a fault develops with the tank due to unsuitable waste entering the system this is not covered by the warranty agreement.

To ensure that the plant continues to operate efficiently, your attention is drawn to the following points:

DO NOT exceed the maximum design loading of the plant.

DO NOT allow surface water to enter the system.

DO NOT allow high volume discharges such as from swimming pools or Jacuzzis to enter the system.

DO NOT allow large quantities of non-biological waste/chemicals such as water softeners, disinfectants, strong acids or alkalis, oil and grease, pesticides or photographic chemicals to enter the system.

DO NOT use chemical or biological emulsifiers in grease traps.

DO NOT allow fats, oil or grease from catering applications to enter the system

Maintenance:

Desludging

As with any packaged treatment plant, it is extremely important that the HydroClear is desludged and serviced at the prescribed intervals so that the maximum working life of the components is obtained, and that effluent quality does not deteriorate.

It is a requirement of the product warranty that desludging is performed at the required intervals. Proof of desludging, in the form of invoices clearly showing the desludging date, may be required. Failure to carry out regular desludging may affect your Harlequin product warranty. Failure to desludge the system at the appropriate time can also cause excessive solids to build up. This could result in solids washout which can pollute water courses or block drainage fields.

Please refer to Appendix 3 for the location of the desludge points. The primary settlement chamber should always be emptied at the desludging intervals. The sludge level of the final settlement chamber should be evaluated

at every desludging interval, and the necessity of emptying should be judged based on the level.

It is important **NOT** to desludge the aeration chamber which contains the active bacteria affixed to the media. This will stop your system operating correctly.

Once desludging is complete the plant should be refilled immediately with water (waste or clean) to re-balance internal and external pressures on the plant.

Desludging intervals

We recommend that these HydroClear systems be desludged at least once a year. The desludging interval may be extended on sites where lower solid concentrations exist (ie a plant is not meeting its full utilisation) but the sludge level should not rise above 700mm before desluding. Contact Harlequin Manufacturing for further information.

Maintenance General Checks:

- Check the operation of the blower. If the blower has failed for any reason other than a mains power failure the warning beacon will be flashing.
- Check the operation of the diffusers (bubbles rising in the Biological zone).
- Check the inlet and outlet pipework (if possible) are clear of debris. (Remove any obstructions).
- Check the blower ventilation is un-obstructed.
- Check the biomass growth on the filter media. The biomass should be a light brown colour, not white or grey. The odour in the plant should be 'earthy'. There should not be a noticeable 'rotten eggs' smell.
- Check the final effluent. If this is cloudy or contains many suspended particles, then the final settlement tank is likely to require desludging.

Filters: It is a recommendation that the air blower filter be checked/cleaned/replaced (if necessary) every 3 months, particularly on sites which are prone to dusty conditions. Service kits and instructions for the checking/replacement of a filter are available on request. The warranty on the blower unit is subject to the filter quality being maintained.

Diaphragms: The working life of the diaphragm depends on the operating conditions and the work environment but for optimal operation and both parts need to be replaced every 12 months. The warranty on the blower unit is subject to the diaphragm being maintained. Diaphragms kits and instructions are available on request.

Valve Boxes: It is recommended by the manufacturer that these covers are replaced every three years to maintain optimum performance.

24-monthly intervals

A full service on the plant should be performed. The service should ensure that all aspects of the system are functioning correctly.
Particular areas of detail include:

- Checking all chambers for damage
- Checking the full air system including the air blower and diffusers
- Checking lid seals and air blower chamber
- Checking ventilation system
- Checking electrical connections at the plant.

FINAL INSTALLATION CHECK LIST

Tank Installed correct distance from property	☐
Tank installed on a flat concrete base	☐
Final Settlement Chamber filled with water before Primary Chamber	☐
Tank backfilled with pea-gravel in "dry" ground conditions (See Page 6 for definitions)	☐
Tank backfilled with concrete in "wet" ground conditions	☐
Air hose cut to length and connected to blower box and tank connections securely	☐
Perforated metal straps securing blower removed prior to use	☐
Electrical installation completed and Air blower running	☐
Effluent return is operating at minimum consistent level with no air bubbles in final chamber	☐
Check Diffuser is in correct position with air bubbles passing up through media evenly	☐
Customer has been advised on desludging and servicing of tank	☐
Customer has been given copy of Installation and Servicing Guide	☐

Pumped Outlet Version:

Secondary power supply for High level alarm (recommended)	☐
Ensure Submersible pump starts operating as float rises above pump	☐
Ensure Pump turns off as liquid level lowers below top of pump	☐
Ensure high level alarm operates if water level rises towards top of chamber	☐

Fault Finding

Symptom	**Cause**	**Action** (all work must be performed by a specialized company)
Strong smell	Blocked or damaged air diffuser	Remove the diffuser; clean or replace if necessary
	Blocked or damaged air hose	Change the damaged hose, unblock it if necessary
	Kinks/bends in the air hose	Change damaged air hose
	Air escaping from joints	Check connections and tighten them if necessary
	The joints of the pipes are damaged	Check and replace the seals if necessary
	The air diffuser is no longer at the bottom of the tank	Re-Install the diffuser at the bottom of the tank, replace the weight if necessary
	High sludge level	Arrange a desludging of the tank
	The diaphragm of the air blower is damaged	Replace the diaphragm
The treated water is of poor quality	The air diffuser is clogged or torn	Remove the diffuser; clean or replace if necessary
	Blocked or damaged air hose	Change the damaged hose, unblock it if necessary
	Kinks/bends in the air hose	Change damaged air hose
	Air escaping from joints	Check connections and tighten them if necessary
	There is an organic overload because of the use of garbage grinders	Compost biological wastes
	High sludge level	Arrange a desludging of the tank
	There is no power supply	Check power
	The diaphragm of the air blower is damaged	Replace the diaphragm
Treated water contains large amounts of solids	High sludge level	Arrange a desludging of the tank
	Excessive use of the washing machine	Minimise continuous use of equipment that will dispose to the tank
Fat build-up within the tank	Excessive use of the washing machine	Minimise continuous use of equipment that will dispose to the tank
	Excessive fatty components coming to tank through waste streams	Separate fatty waste streams and minimise amounts going to tank
	The air diffuser is clogged or torn	Remove the diffuser; clean or replace if necessary
	Blocked or damaged air hose	Change the damaged hose, unblock it if necessary
	Kinks/bends in the air hose	Change damaged air hose
	Air escaping from joints	Check connections and tighten them if necessary
High water level (above the pipes)	Blockage in the pipes	Clean all pipes (Inlet, outlet and inside the tank where possible)
Air Blower warning	Issue with the Air Blower	Check the power supply, the diaphragm and air filter. Replace/repair if necessary

There is no recirculation flow from the final settlement tank	Issue with the Air blower	As above
	Recirculation pipework is blocked	Use a wooden pole to agitate any sludge which has settled around the bottom of the recirculation pipework in the final settlement tank. If there is a substantial level of sludge, then arrange a service
	No air getting to the recirculation line	Check that the air control valve has been opened to a suitable level so that a limited constant flow of liquid is achieved
	The air control valve is blocked	Remove and clean the valve. In cleaning the valve, ensure the part is not damaged
	Air bubbles in Final Settlement tank	Check the connection of the blue airline and ensure that the control valve is not turned on too high
Higher Noise Levels	Issue with the Air Blower	Ensure that the perforated metal straps holding the unit down within the external blower housing have been removed
		Check the diaphragm is not damaged
Deflection of internal tank walls after desludge	Unequal level between chambers causing excess pressure on the walls of the empty chamber.	Fill empty chamber with water immediately.

Appendix 1: EN Structural Tests Certification EN Treatment Efficiency Certification

Certificate

Nr. 382.01C03

Hydroclear

Moving bed biofilm reactor (MBBR)

Harlequin Manufacturing Ltd
21 Clarehill Road, Moira, County Armagh, Northern Ireland, BT67 0PB, UK

EN 12566-3:2005+A2:2013, Annex B: Treatment efficiency test
Small wastewater treatment systems for up to 50 PT – Part 3: Packaged and/or site assembled domestic wastewater treatment plants

Detailed results and information on the test are provided in test report PIA2021-382B23.

Extract of performance details (EN 12566-3, Annex B: Treatment efficiency test)

Organic daily load (influent, nominal)	0.31 kg BOD_5/d		
Hydraulic daily load (nominal)	0.9 m^3/d		
Treatment efficiency (nominal)		Efficiency	Effluent
	COD	94.4 %	47 mg/l
	BOD_5	97.5 %	9 mg/l
	TN_b*	57.8 %	28 mg/l
	NH_4-N*	95.0 %	2.3 mg/l
	P_{tot}	43.1 %	4.3 mg/l
	SS	96.9 %	12 mg/l
Electrical consumption (nominal)			1.1 kWh/d
Number of desludging (excluding start-up phase)			1
Number of maintenance operations during the test (without start-up phase)			0

** determined for temperatures ≥ 12 ° C in the bioreactor*

Tested by:
PIA – Prüfinstitut für Abwassertechnik GmbH
Hergenrather Weg 30
52074 Aachen, Germany

This certificate is for information purposes only and replaces neither the related test report nor the declaration of performance or the CE marking. The results relate only to the tested object.

PIA – Sustainable Certification
Geprüft – tested – testé

April 2024, Dipl.-Ing. Gabriel Schatzki
Head of department "Wastewater Treatment"

Notified Body No.: 1739

Certified according to ISO 9001:2015

Appendix 2: EN Structural Tests Certification

Certificate

Nr. 382.01C05

Harlequin GRP Tank

Harlequin Manufacturing Ltd
21 Clarehill Road, Moira, County Armagh, Northern Ireland, BT67 0PB, UK

EN 12566-3:2005+A2:2013, Annex A (Watertightness test), Annex C (Calculation and test methods for structural behaviour) and Chapter 6.5 (Durability)
Small wastewater treatment systems for up to 50 PT – Part 3: Packaged and/or site assembled domestic wastewater treatment plants

Detailed results and information on the test are provided in the following test reports:
PIA2024-ST-PIT-2407-1057
PIA2024-WD-2407-1057
PIA2024-DH-2310-1051

Watertightness:	Pass
Structural behaviour:	Pass (wet conditions)
Durability:	Pass

Tested by:
PIA – Prüfinstitut für Abwassertechnik GmbH
Hergenrather Weg 30
52074 Aachen, Germany

This certificate is for information purposes only and replaces neither the related test reports nor the declaration of performance or the CE marking.
The results relate only to the tested object.

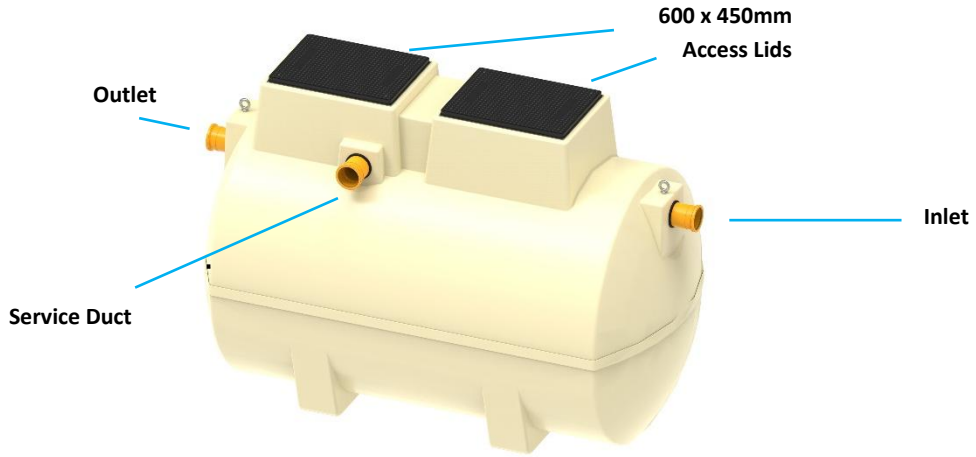
PIA – Sustainable Certification
geprüft – tested – testé

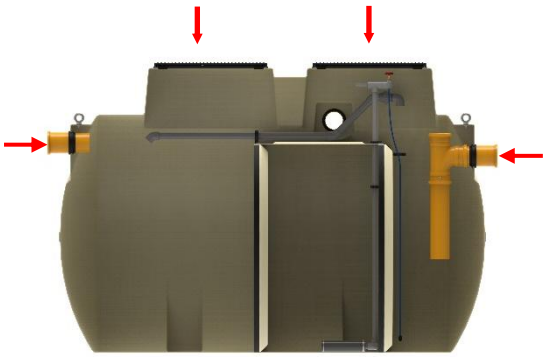
January 2025, Daniela Schmitz, M.Sc.
Head of department "Urban Drainage"

Notified Body No.: 1739

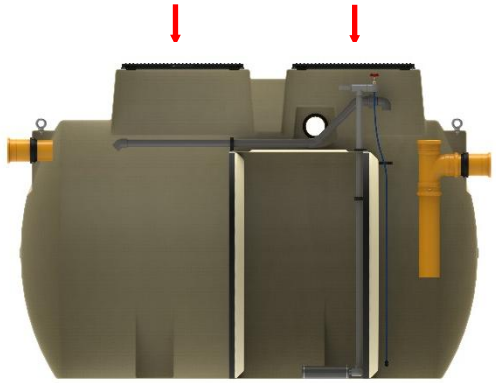
Certified according to ISO 9001:2015

Appendix 3: HydroClear GRP Installation and Desludge Illustration

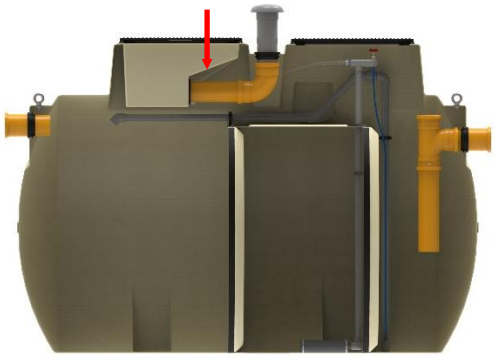




- Once tank has been lowered onto concrete base, fill the tank either via the manway access lid, the inlet, or the outlet. The chambers should be filled equally as to avoid excess pressure on the chamber walls. The tank will be full when the level has reached the outlet.

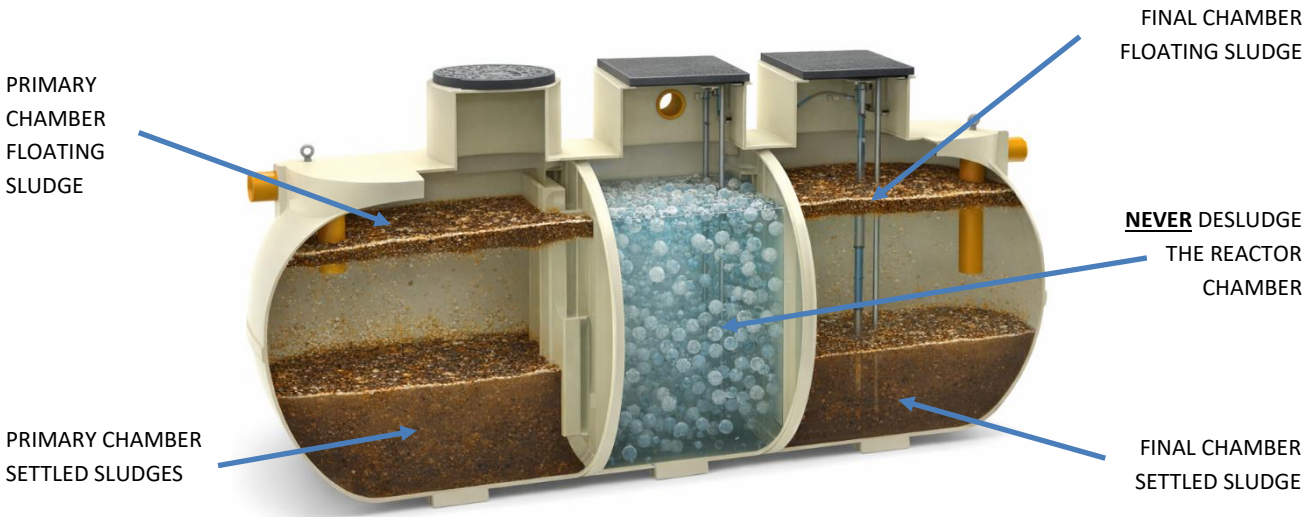


- The primary chamber and final settlement chamber are desludged through the manway access lids. If the tank has 2 lids the final chamber will be accessed through the lid above the reactor chamber. In 3 lid tanks, there will be a lid above each individual chamber
-



- If the Hydroclear GRP has an internal blower, the manhole access lid nearest to the inlet is intended for accessing the blower and components. Desludging and filling can be carried out there through a 160mm access point under the manhole lid. (see Figure 6 in the main text for images)

Appendix 4: Desludging Guide



Harlequin Manufacturing cannot guarantee the quality of effluent produced as we cannot control what enters the plant. As with any packaged treatment plant, it is extremely important that the tank is desludged and serviced at the prescribed intervals so that the maximum working life of the components is obtained, and that effluent quality does not deteriorate.

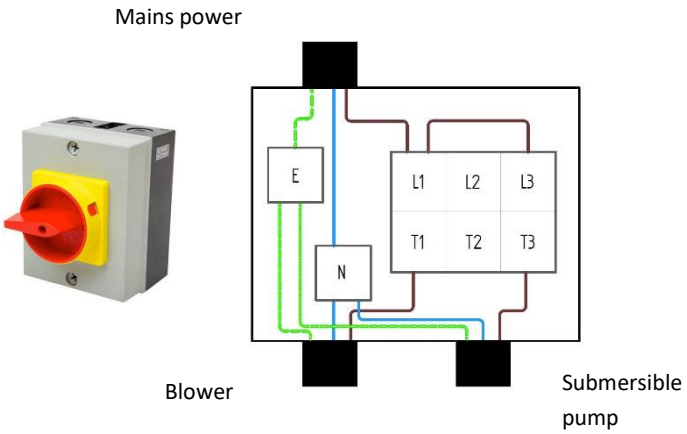
It is a requirement of the product warranty that desludging is performed at the required intervals. Proof of desludging, in the form of invoices clearly showing the desludging date, may be required. The image above is for illustrative purposes only to demonstrate how sludge might present itself in a HydroClear GRP Tank

- When desludging, we recommend that the focus should be on removing both the settled and floating sludge in the tank but not on emptying the tank
- You MUST refill the tank with water as soon as possible after the desludge event
- This should be carried out at a minimum of once a year
- You should not desludge the Reactor chambers as you end up removing the media from the tank and lowering the efficiency of your system
- There will be less sludge present in the final settlement chamber in comparison to the primary, but it should be removed in a similar manner when required. You may be able to decrease the frequency of desludging in this chamber but still maintain a regular schedule

Failure to carry out regular desludging may affect your Harlequin product warranty. Failure to desludge the system at the appropriate time can also cause excessive solids to build up. This could result in solids washout which can pollute water courses or block drainage fields.

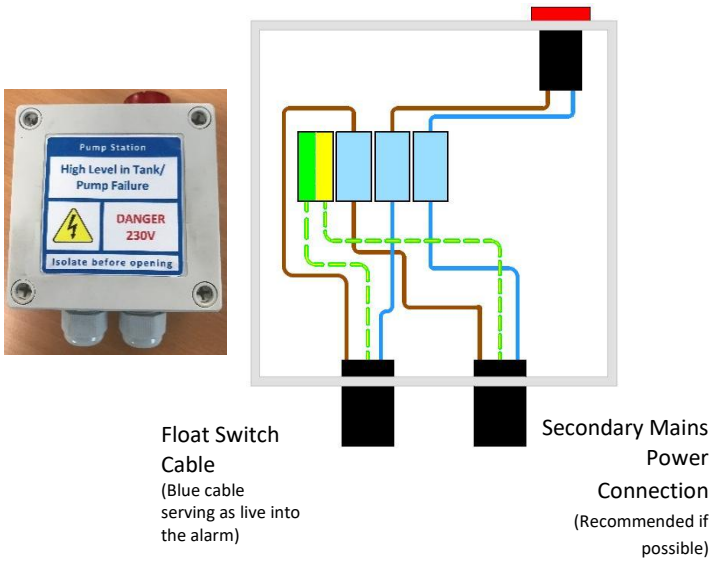
Appendix 5: Basic Wiring Diagrams

- **20 Amp Isolator Switch**



- The image here shows the basic wiring schematic for the Isolator Switch when installing the pumped outlet version of the product
- In these blower boxes, the blower will be pre-wired to the isolator, but you will need to connect the mains power and power cable from the submersible pump.
- Always leave enough slack in the power cable to allow the removal of the submersible pump from the tank in the event of servicing without needing to disconnect the power supply
- In the gravity version of the product, you will only be required to connect the mains power to the isolator

- **High Level Alarm Box**



- The image here shows the basic wiring schematic for the high level alarm box when installing the pumped outlet version of the product
- We would recommend using a secondary mains supply for this box so that it continues to operate in the event that something has tripped the main supply to the tank
- If you have the high-level alarm switch as shown in Figure 8 above, you connect the brown and blue cores as shown in this image and earth this float connection as well
- If you have the alternate blue and yellow float fitted you should use the Black and Brown cores to complete this circuit (and terminate the blue core). This float will not need earthed

Appendix 6: Service History

Service Date	**Maintenance Details** (Service/call out/de-sludge)	**Signature** (with Company name)

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