

Assembly, Installation, Operation & Maintenance Instructions Sapphire & Carat Pump Station

600L
900L
1,200L
1,500L
2,700L
3,750L
4,800L
6,500L



The points described in these instructions must be observed in all cases. Failure to do so shall invalidate the warranty. For any additional items purchased through GRAF, you will receive separate installation instructions in the transport packaging.

The components must be checked for any damage before the system is transferred to the pit.

You can download any missing instructions from www.grafaustralia.com.au or request them from GRAF directly.

Table of Contents

1. Safety Notices	2
2. Technical Data	5
3. Installation conditions	8
4. Final installation	12
5. Commissioning	17
6. Operation and Maintenance	19
7. Troubleshooting	20
8. Appendix	22

1. Safety Notices

1. Safety Notices

The applicable accident prevention regulations in accordance with the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996 must be observed during all work. A second person should be present for safety reasons.

Furthermore, all relevant regulations and standards must be observed during assembly, installation, maintenance and repair. Details can be found in the respective paragraphs of these instructions.

The following symbols



General warning sign



Floor-level obstacle



Drop or fall hazard



Slippery Surface



Electricity hazard



Forklift truck and other industrial vehicles



Overhead or Suspended load



Falling Parts



Crushing of hands

The tank lid must always be closed, except when working on the system.

OBSERVE all confined space regulations.

1. Safety Notices

GRAF offers a wide range of accessory parts which are precisely coordinated and can be used to complete systems. The use of different accessory parts can impact the functionality of the system and may void warranty.

	WARNING
	• Electrical: All electrical work must be carried out by a licensed electrician. • Excavation: Always check and obtain all underground service information prior to commencement and record the information.

General Notes

Before installing the system, you must completely read this installation manual. These installation instructions will help you to install the system properly, effectively and safely. You must always observe the instructions in this manual. Pay particular attention to section [1](#)

These different working steps must be carried out by persons with special qualifications:

Working step	Personal qualification
Unloading	Qualified person for unloading
Excavation	Qualified person for digging
Plumbing connections	Licensed Plumber
Electrical connection	Licensed electrician

1.1. Transport

 	 WARNING
	Suspended load. Possibility of falling objects. Risk of injury, if you are under the suspended load. Wear approved hard hat and keep a safe distance.

- Secure the tanks against moving or falling during transport.
- Make sure that the tanks remain undamaged, if the tanks are secured with tie down during transportation.



The tanks must only be lifted empty and should be unloaded as gently as possible to avoid placing excessive strain on the lifting points.

1. Safety Notices

- Always use approved lifting points (see Fig. 1).
- Use only correctly rated and approved lifting equipment.
- Avoid mechanical stress on the tanks: do not roll or drag the tanks on the ground

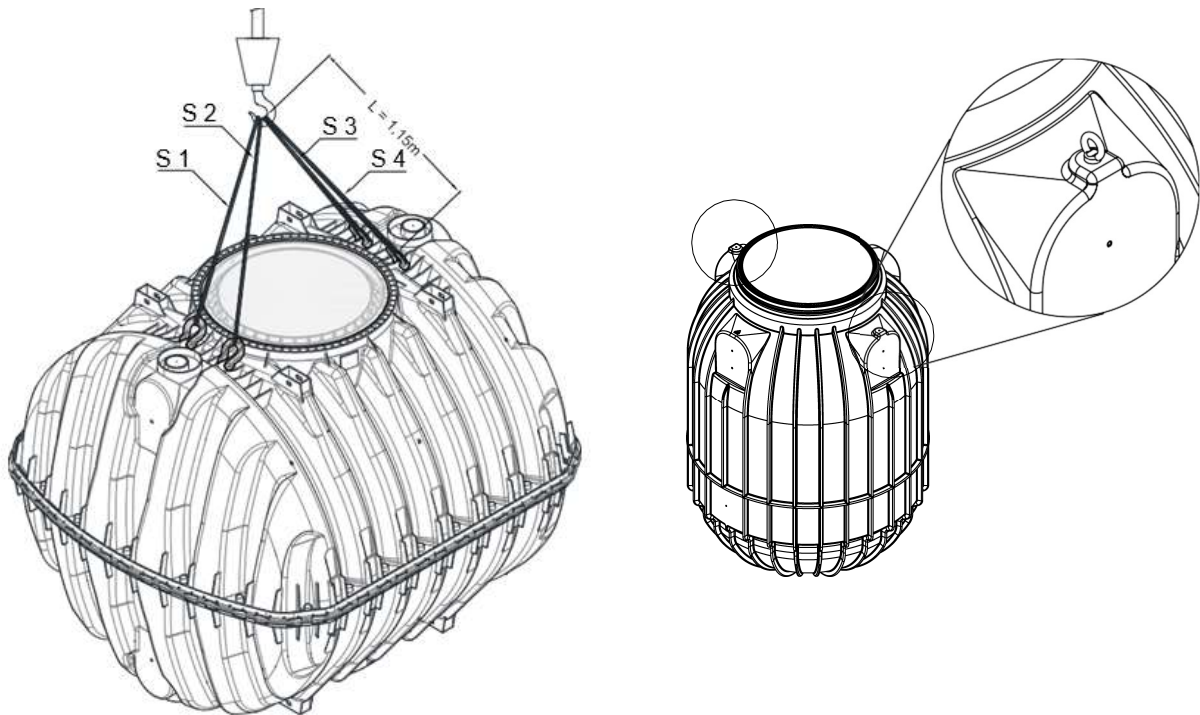


Fig. 1: Lifting points of Carat & Sapphire Tank

1.2. Checking the delivery

- Check the product for transport damage. Contact the transporter immediately in case of damage.
- Check that the delivered products correspond to the order.
- Check the positions and sizes of fittings.
- Retighten various connections, as they may have become loose during transport.
- Check that all valves are open.
- Check other equipment, such as vent pipes.



GRAF Australia will not acknowledge claims made at a later date (refer to our T&Cs). Damaged parts should not be installed.

1.3. Storage

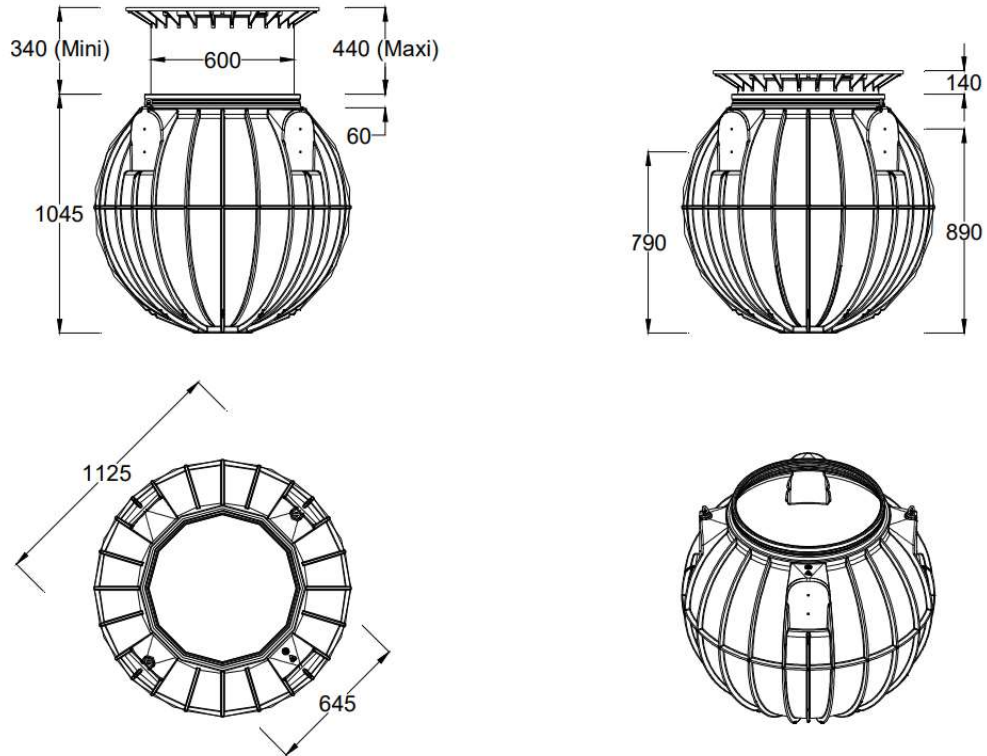
- Store the tanks on a suitable and level surface (free from sharp objects, e.g. stones).
- Avoid damage due to environmental impacts or third persons during storage.

2. Technical Data

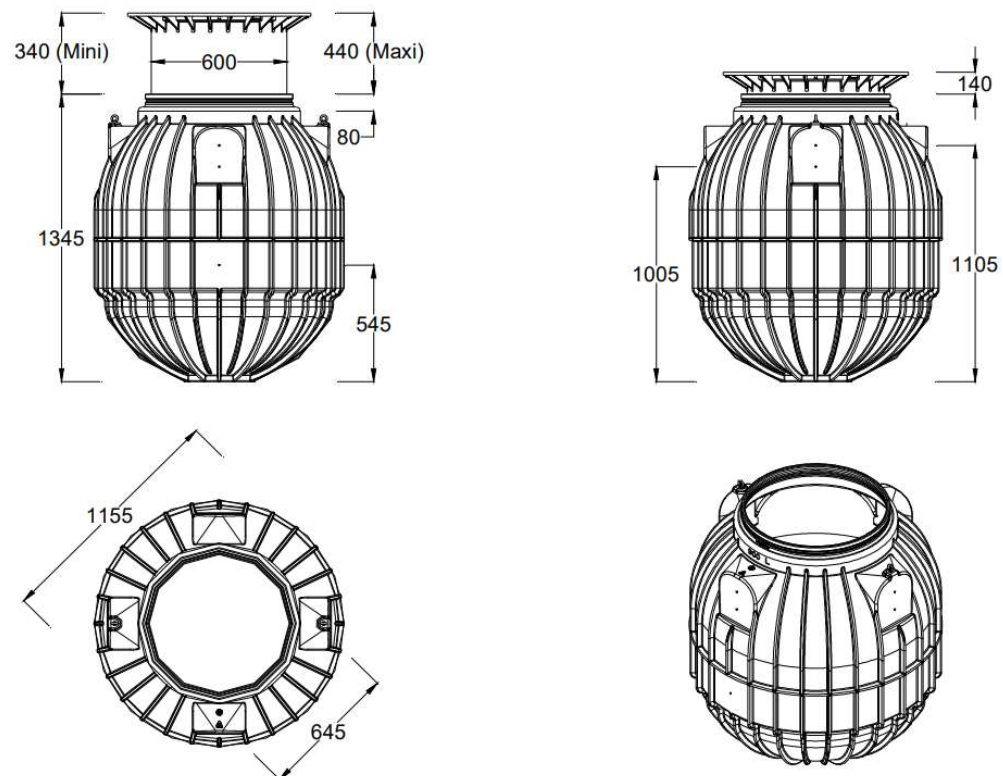
2. Technical Data

2.1. Sapphire dimensional drawings

2.1.1. 600L

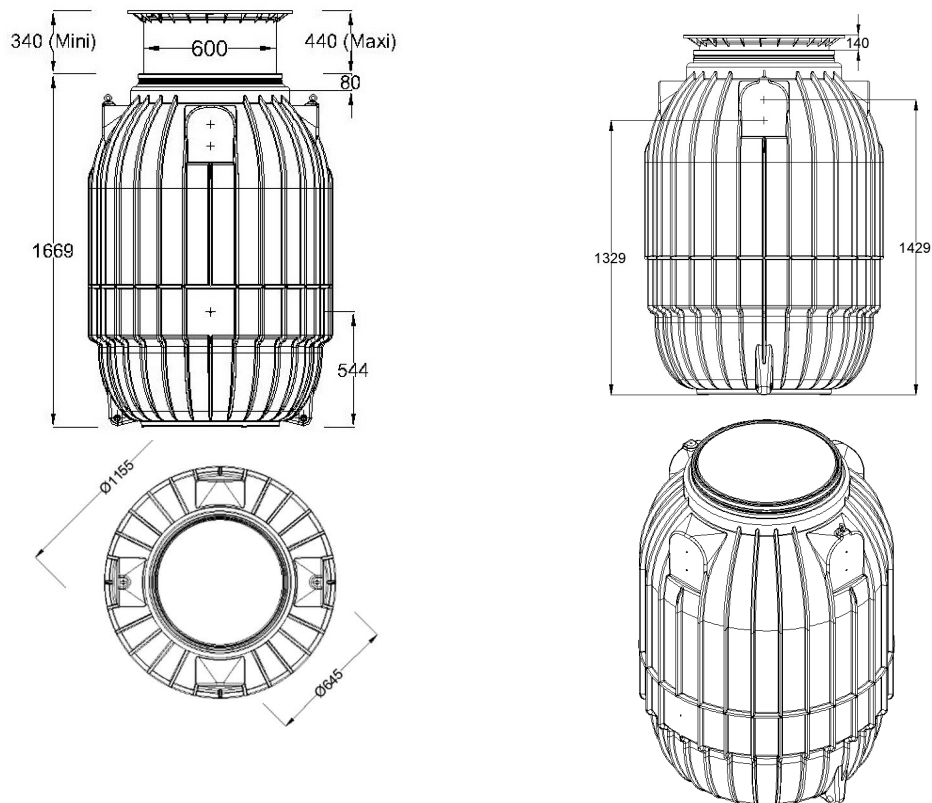


2.1.2. 900L

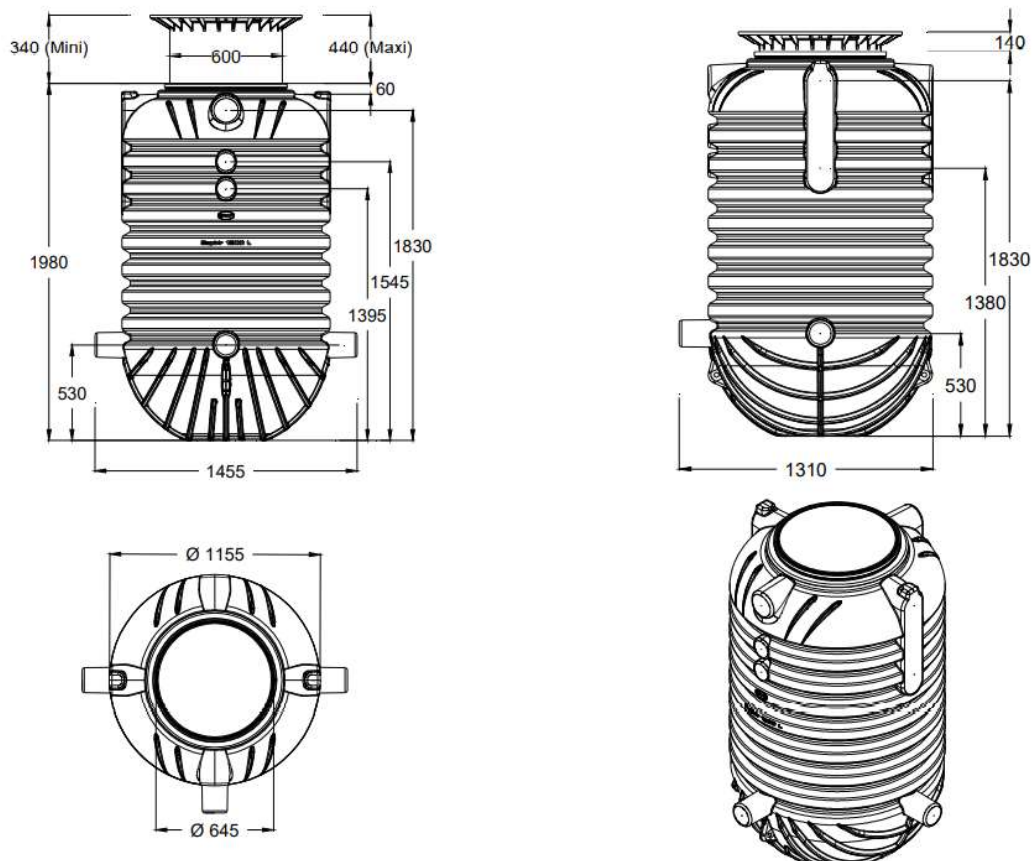


2. Technical Data

2.1.3. 1,200L

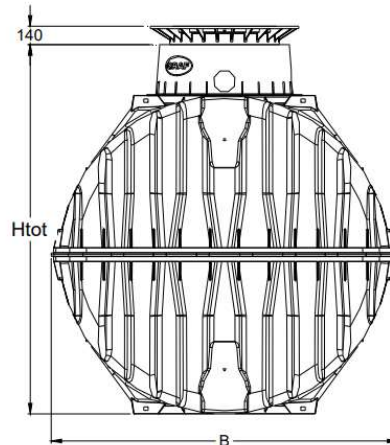
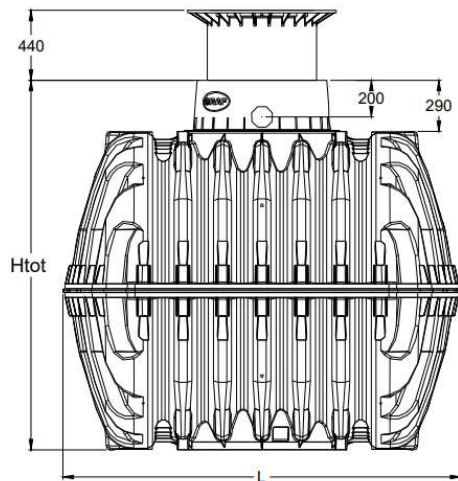


2.1.4. 1,500L

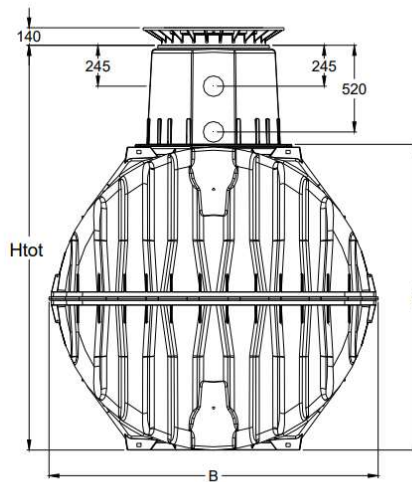
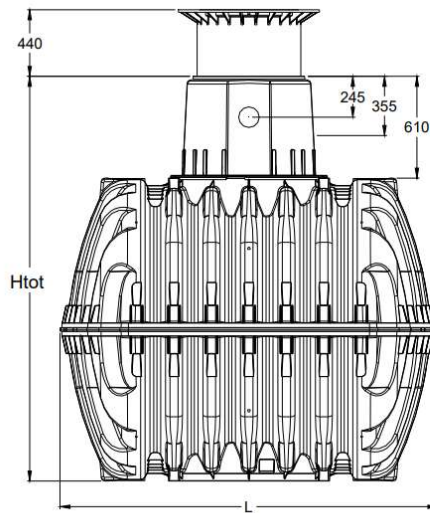


2. Technical Data

2.2. Carat dimensional drawing



with tank dome Mini



with tank dome Maxi

Tank	2,700L	3,750L	4,800L	6,500L
Art. No.	372028	372029	372030	372031
Weight	116 kg	146 kg	181 kg	220 kg
L	2080 mm	2280 mm	2280 mm	2390 mm
B	1565 mm	1755 mm	1985 mm	2190 mm
H	1400 mm	1590 mm	1820 mm	2100 mm
Htot With minii dome	1680 mm	1870 mm	2100 mm	2380 mm
Htot With maxi dome	2010 mm	2200 mm	2430 mm	2710 mm

3. Installation Conditions

3.2. Foundation

The following points must be verified before the installation:

- Structural suitability of the soil
(in accordance with geotechnical report or local regulations);
- Maximum groundwater levels / drainage of the subsoil;
- Types of loading present, e.g. traffic load;



Request a geotechnical report from the local accredited provider to determine the physical properties of the soil.

3.3. Earth cover

- Under pedestrian areas not subject to traffic load

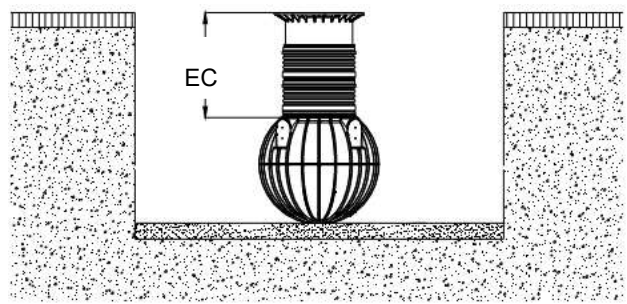
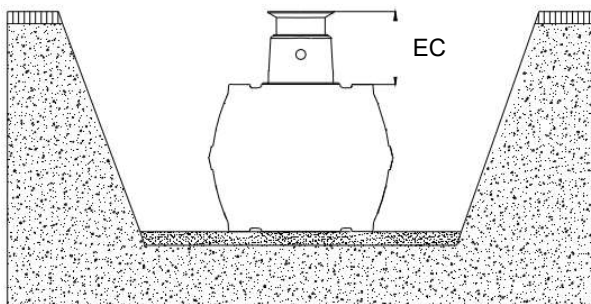
Earth cover	Sapphire	Carat
EC Min	-	-
EC Max	1200 mm	1200 mm

- Under trafficable areas (class B), no groundwater

Earth cover	Sapphire	Carat
EC Min	400 mm	800 mm
EC Max	1000 mm	1200 mm

- Under trafficable areas (class D), no groundwater

Earth cover	Sapphire	Carat (up to 12t)	Carat (over to 12t)
EC Min	Distribution slab required	800 mm	Distribution slab required
EC Max		1200 mm	



Although EC max can be achieved from a structural point of view, GRAF doesn't recommend installing more than one GRAF riser for maintenance

3. Installation Conditions

3.4. Excavation

To ensure that sufficient space is available for working, the base area of the trench must exceed the dimensions of the tank by 500 mm on each side; the distance from solid constructions must be at least 1000 mm.

The trench embankment must be designed so that slippage or collapse of the embankment wall is not to be anticipated. The construction site must be horizontal and plane and must guarantee sufficient load-bearing capacity.

The depth of the trench must be dimensioned so that the max. earth coverage (see point 2 – installation conditions) above the tank is not exceeded. To use the system throughout the entire year, it is necessary to install the tank and those parts of the system which conduct water in the frost-free area. The frost-free depth is usually approx. 600 mm – 800 mm; precise information in this regard can be obtained from the responsible authority.

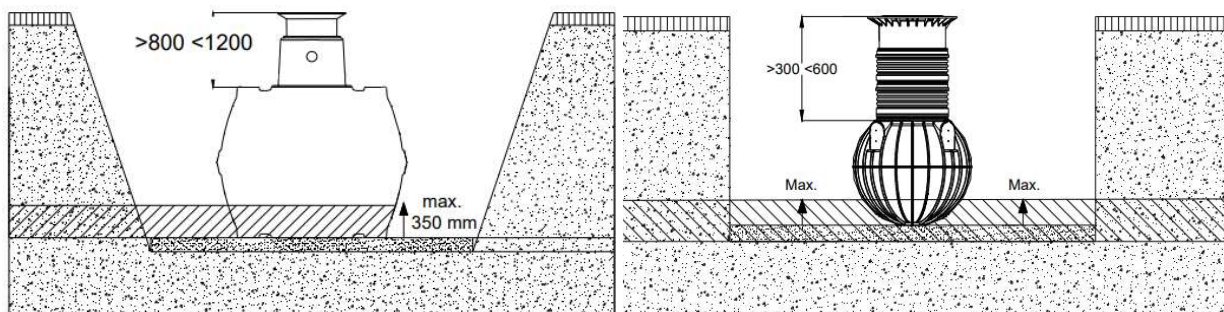
A layer of compacted, round-grain gravel (grain size 8/16, thickness approx. 150 - 200 mm) is applied as the foundation.

3.4.1. Slope, Embankment, etc.

On installation of the tank in the immediate vicinity (< 5 m) of a slope, earthen mound or slope, a statically calculated supporting wall must be erected to absorb the soil pressure. The wall must exceed the dimensions of the tank by at least 500 mm in all directions, and must be located at least 1000 mm away from the tank.

3.4.2. Ground water and cohesive (water-impermeable) soil (e.g. clay soil)

The tank must only be installed into groundwater up to the levels specified in the following table. The minimum earth cover required must be in accordance with the drawings below. If it is to be expected that groundwater/stratum water levels - even if only occasionally - exceed these levels, it must be drained. For other options, contact GRAF Australia.

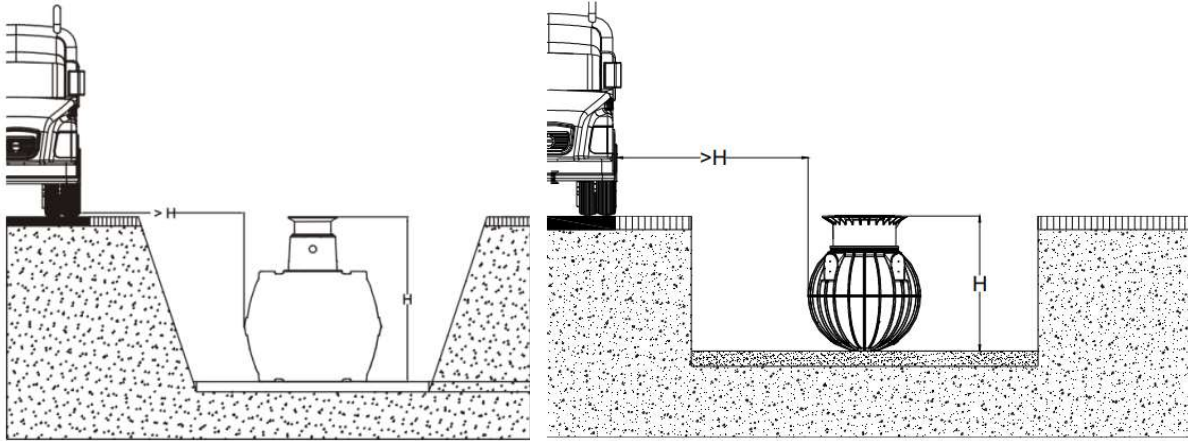


	Sapphire	Carat
Groundwater from the bottom of tank:	430mm (600L & 900L) 550mm (1200L & 1500L)	350mm

3. Installation Conditions

3.4.3. Installation adjacent to surfaces used by vehicles

If the underground tanks are installed adjacent to surfaces which are used by vehicles heavier than passenger cars, the minimum distance away from these surfaces is at least the depth of the trench.



3.4.4. Cover suitable for car traffic Class B (AS 3996)

In case of car traffic, an appropriate cover according to AS 3996 class B must be used. In addition, the telescopic shaft must be equipped with a concrete collar. In reference to this, please see section 4.3.2.

3.4.5. Cover suitable for truck/heavy load Class D (AS 3996)

In case of heavy truck traffic, an appropriate cover according to AS 3996 class D must be used. In addition a load distribution plate must be provided on site (structural drawing available at GRAF).

4. Final Installation

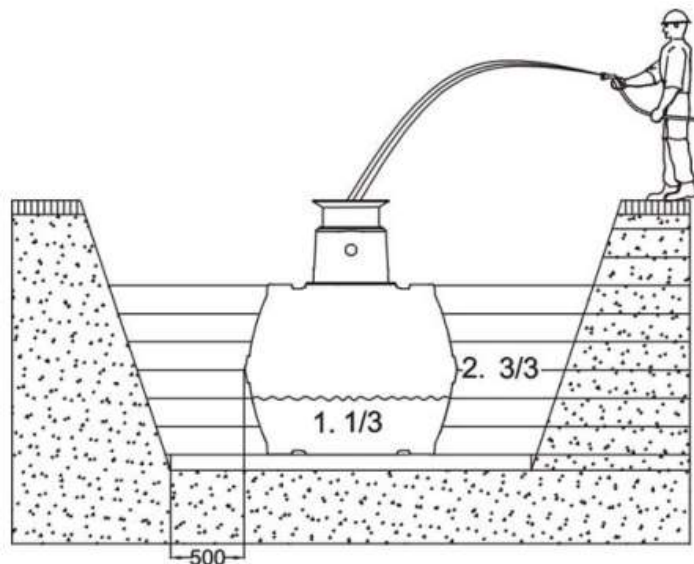
4. Final installation

4.1. Positioning of the tank

The tank must be placed carefully without shocks with adequate equipment into the prepared excavation. After positioning the tank, fill the pit layer by layer according to section 3.2.

4.2. Backfill

Before backfilling the excavation, the tank will be filled with water to $1 \frac{1}{3}$ of the height. Then the trench is backfilled in increments of max. 300mm (rounded gravels with a grain size between 8mm and 16mm) up to the tank's upper edge. The individual layers must be compacted well (manual compactor). In order to prevent damage to the tank, the use of mechanical compacting equipment is not permitted at any time. The trench must be at least 500 mm wide.

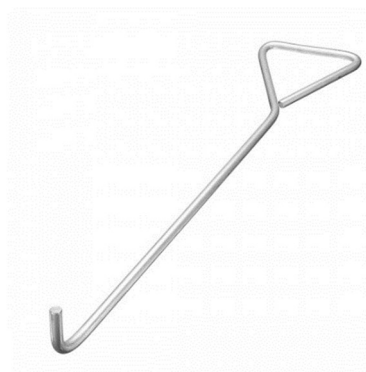


4.3. Installation of the shaft structures

Instructions regarding the covers:

The class B lids can be opened using a lifting key similar to the below picture.

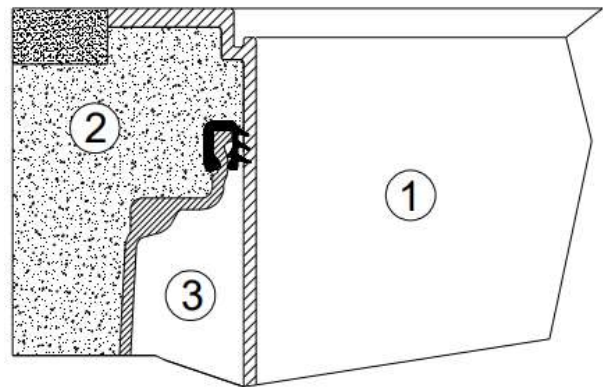
The class D lids can be opened using the common (gatic type) lid lifters.



4. Final Installation

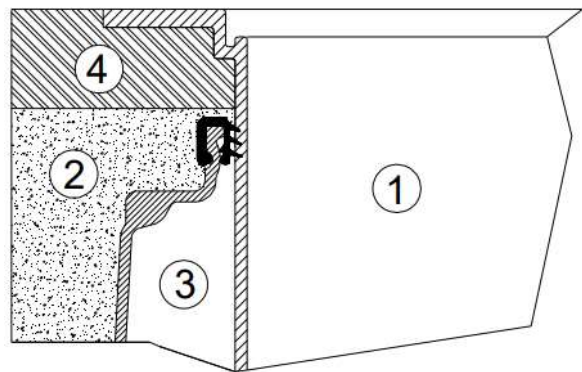
4.3.1. Pedestrian

To prevent loads from being transferred onto the tank, round-grain gravel ② (max. grain size 8/16) is filled in in layers around the telescope ① and is evenly compacted. Damage to the tank dome ③ and telescope ① must be avoided during this step. The cover is then positioned and is sealed to prevent entry by children. Tighten the threaded connection on the cover so tightly that it cannot be opened by a child!



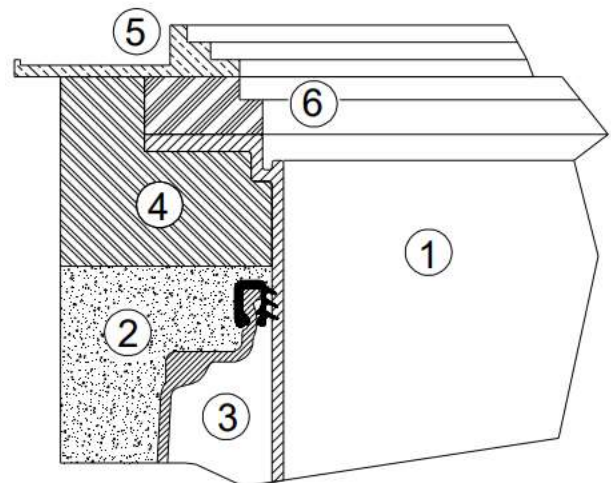
4.3.2. Suitable car traffic (class B)

If the shaft is installed below a surface driven on by vehicles, the telescopic dome shaft ① (colour anthracite) must be lined with concrete in the collar area ④ (load class B25 = 250 kg/m²). The concrete layer must be at least 300 mm wide and approx. 200 mm high all the way round. To extend the shaft, the cast iron telescopic dome shaft (max. useful length 440 mm) and the extension sleeve (max. useful length 300 mm) can be used.



4.3.3. Suitable for heavy load traffic (class D)

When installing below surfaces driven on by HGVs, the telescope is lined ① as described in 3.3.2. The concrete rings ⑥ (diameter 600 mm) and a cast frame ⑤ with star-shaped load distribution are then installed to support the cast cover. The cast frame must have a contact area of approx. 1 m². To extend the shaft, the telescopic dome shaft for HGV loading with class D cover, provided by the customer (max. useful length 440 mm), and the spacer (max. useful length 300 mm) can be used.



4. Final Installation

4.4. Pipework installation

A fully packaged pump station will be delivered with at least one pre-drilled DN100 connection for the inlet pipe. If not drilled, the inlet pipe and tank penetrations to be made on site will require GRAF approved seals. The seal will require a circular hole to be cut in the tank using a 121-124mm hole saw in the correct position. Once the hole is cut, debur the hole and insert the seal available at GRAF. Once the seal is inserted, insert the pipe through the wall seal.

4.5. Pump(s) Installation



WARNING! Electrical danger, only licensed electrician must carry out the work! Disconnect the power supply and secure it against being switched on again.

Most pumps are supplied with a level float switch and power cable as standard. The pump must not be lifted by the power or float switch cable. A clearly marked dedicated circuit of an adequate capacity must be used.

- Check the pump's connections for any loose connections prior to use as items can be affected by vibrations during transport.
- Check the pump's rating plate and ensure that the proposed power supply is suitable.
- Check that the actual delivery head is within the performance capabilities of the pump.
- Always disconnect the electrical supply before performing maintenance.
- If installing a three-phase pump, check the correct direction of rotation before installation in the tank.
- Ensure the tank is of sufficient size for the pump's float switch to operate without obstruction.
- Where possible, pumps should be placed on the flat surface on the bottom of the tank
- Ensure that the tank and pipe work are cleaned on completion of construction work to ensure debris is removed.
- Always ensure a check valve is installed in the correct direction on the discharge side of the pump to prevent back flow.

4.5.1. Integrated Float Switch

The integrated float switch (if automatic pump is supplied) controls the start and stop of the pump. If the pump station is delivered with a pump controller, the integrated pump float switch must be cable tied to the manifold to close the circuit ('up' position).

The minimum permitted level of operation must be always observed to avoid the pump from running dry. For further details, please refer to the pump's installation and operating instructions which are supplied together with this manual. Contact GRAF Australia immediately if you haven't received the pump's instructions.

4. Final Installation

4.6. Controllers & High-Level Alarm



WARNING! Electrical danger, only licensed electrician must carry out the work! Disconnect the power supply and secure it against being switched on again.



The electric panel must match the ratings on the pump data plate. Improper combinations could damage the motor.

For installing the level control system, see its installation and operating instructions.

When installing the level controllers, the following points must be observed:

- To prevent air intake and vibrations in the pump, the stop level switch must be fitted in such a way that the pump stops before it sucks in air.
- In order to ensure cooling of pumps without internal stator cooling, the stop level switch must be installed according to the specifications in the installation and operating instructions for the pump.
- In case of one-pump operation, the start level switch must be installed in such a way that the pump starts at the required level. However, the pump must always start before the liquid level reaches the lower edge of the bottom inlet pipe.
- In case of two-pump operation:
 - The start level switches must start pump one earlier.
 - Pump two must start before the liquid reaches the lower edge of the bottom inlet pipe.
- The high-level alarm switch must always be installed about 100 mm above the start level switch. However, the alarm must always be activated before the liquid level reaches the inlet pipe.

For further settings, please refer to the controller's installation and operating instructions in the Appendix of this manual.

4.6.1. Start and stop levels

The effective volume of the pit must be large enough so that the number of starts does not exceed the maximum permissible number.

For more information on the maximum number of starts, see the installation and operating instructions for the pump.

4.6.2. Adjustment of float switches

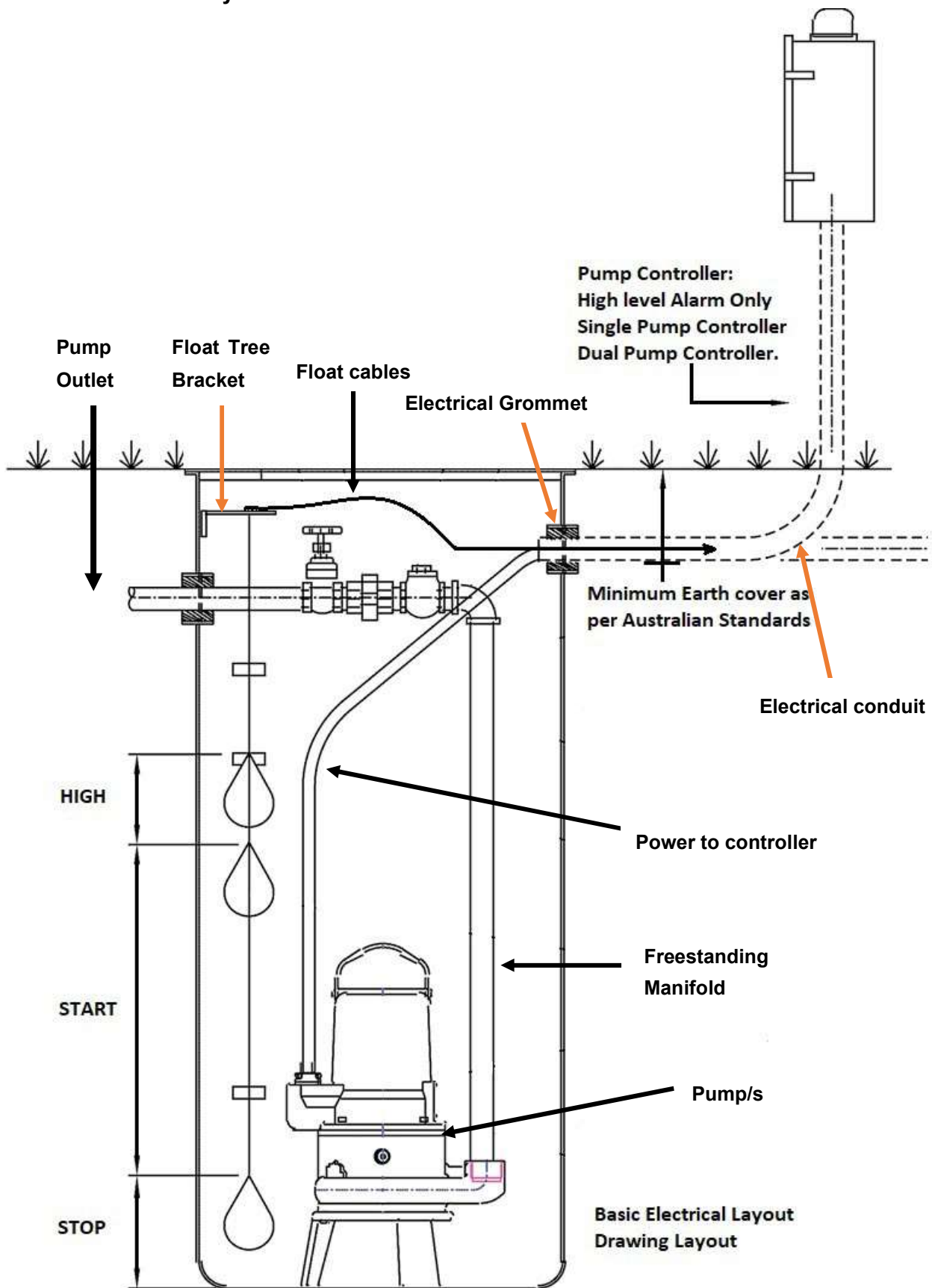
If float switches have been selected, they can be fitted on a tube which can be lifted out of the pit. This ensures easy adjustment of the float switches.



The bottom float switch (stop level) must stop the pump before the liquid level in the pit falls below the minimum level of the pump.

4. Final Installation

4.6.3. General Layout



5. Commissioning

5. Commissioning

This section is designed to give the recommended procedures – and check lists – to start-up and commission the pumping station following completion of installation. These procedures will normally be carried out by Accredited Plumber/Electrician but are included anyway - to provide a record and assist others should the need to recommission the system arise later – e.g.: after a prolonged shut-down.

5.1. Pump Station Information

Customer Name &/or Pump Station Name:	
Installation Address:	
Commissioning Date:	

Qty Pumps:	
Pump Model:	
Serial Number pump 1:	
Serial Number pump 2:	
Controller Model:	
Controller Serial Number:	
Qty Float Switches:	

5. Commissioning

5.2. General Commissioning Procedure

PROCEDURE	CHECK
Double-check all aspects and details covered by this booklet.	
Check all electrical connections are complete and correct.	
Electrical conduits are installed and sealed at all entry points.	
Vent is clear and connected (if applicable).	
Check adequacy of power supply. Switch on all isolating switches.	
Double-check pump rotation (three-phase only).	
Check amp draw of motors. Compare to pump nameplate details.	
Ensure pit is clear of silt, mud, building debris and other foreign objects.	
Double-check thermal overload setting.	
Duty Operation – Start Level	
Dual Operation	
High level alarm test	
Low level pump stop test	
Duty changeover test	
Duty test with Pump One isolated	
Duty test with Pump Two isolated (if applicable)	
All indicator lights and alarms on controller operational	
Return all selector switches to Auto position	

6. Operation and Maintenance

When a pump station is initially commissioned it should be checked daily for the first week to check that all the systems are working correctly. Particular care should be taken with a new installation that foreign matter such as concrete, silt, gravel, timber or tools do not foul the pump.

Routine maintenance and servicing are essential to maintain the plant in a serviceable condition.

The station should be visited on a 6-12month basis to check the pumps operation, record the above data and hose off any build-up of fats or foreign material in the wet well.

The main factors in determining if a major overhaul is required is a falling off in the pump discharge pressure to an unsatisfactory level or a significant increase in power consumption or pump running time.

6.1. Intended Use

6.1.1. Grey water/ Sullage /Drainage Pump

- Grey water pits
- Wastewater treatment systems NO Debris!
- Sullage pumping
- Clean storm water No solids!
 - Pool & tank emptying

6.1.2. Vortex Sump Pump

- Grey water pits (Soft Solids up to 50mm)
- Wastewater treatment systems
- Sullage pumping, storm water
 - Pool & tank emptying

6.1.3. Grinder Pump

- Sewage applications
- Childcare centres and schools
- Recreational facilities
- Waste treatment facilities
 - Industrial plants

6.1.4. Cutter Pump

- Trade waste
- Waste treatment facilities
- Farm waste
- Sewage



GRAF do not endorse Cutter Pumps for public facilities & rental applications due to the common incidence of non-sewage articles being placed in the sewer.

7.Troubleshooting

7. Troubleshooting

The following is a guide to diagnose and rectify the most common problems that may arise. This guide should only be used by qualified maintenance personnel. As with any troubleshooting procedure, start with the simplest solution first:

- Always make the above ground checks before removing the pump from the tank.
- Before embarking on any trouble shooting action ensure you read all the warnings at the beginning of this manual.
- Check Power Supply
- Adjust & check floats are clean and unobstructed
- Check if check valve is working and not blocked.

7.1. Pump troubleshooting

PROBLEM	POSSIBLE CAUSES	ACTIONS
Pump does not start	Power supply cut off	Restore the power supply
	Float low	Adjust the float
	Fuses blown	Replace fuses
	The thermal overload protection of the motor has been triggered	• Reset the thermal overload protection on the control panel, and/or • Check the liquid level, and/or • Disconnect the electric power supply and wait 2 minutes before reconnecting it.
	Supply cord is damaged	Replacement Required
	Control panel faulty	Check and repair or replace the control panel
	Float switches obstructed or not functioning	Check if pump will operate manually where possible
The thermal overload protection triggers	High liquid temperature	Contact the pump manufacturer or the Authorised Distributor
	Presence of solid or fibrous substances in the liquid (unit overload)	Remove the substances
	It is calibrated at a value too low in relation to the rated current of the motor	Recalibrate
	Input voltage outside the rated limits	Make sure the voltage values are correct
	Unbalanced input voltage	Make sure the voltage of the three phases is balanced

7.Troubleshooting

	Wrong working curve (flow rate below or above the permitted limits)	Bring the flow rate back within the permitted limits or upgrade pump to correct duty
	Impeller seized	Contact the pump manufacturer or the Authorised Distributor
	Motor turns in the wrong direction	Check the direction of rotation and change it if necessary
	Motor or cable short circuit	Contact the pump manufacturer or the Authorised Distributor
Pump starts but cuts out almost immediately	Overload settings on power supply incorrect	Check and rectify
	Incorrect voltage	Check and rectify
	Pump is blocked	Isolate power, then check
Pump is running but there is little or no flow rate	Gate valve is closed	Open valve
	Check valve is blocked	Unblock valve
	Tank liquid level too low	Increase the installation depth, and/or adjust the float
	Pump inlet is blocked	Hose and clean out tank
	Pump is air locked	Check that pump does not suck air before switching off.
	Undersized unit	Order correct sized pump – Contact GRAF Technical
	The impeller rotates in the wrong direction.	Check the direction of rotation and change it if necessary
	There are signs of wear on the impeller, pump, and casing.	Replace the worn parts.
Pump will not switch off	Motor turns in the wrong direction	Check the direction of rotation and change if necessary
	Float not adjusted correctly	Adjust the float
	The float cannot move freely	Release the float & reposition
	Float faulty	Replace or Repair
	Undersized unit	Order correct sized pump – Contact GRAF Technical
	Impeller worn	Contact the pump manufacturer or the Authorised Distributor

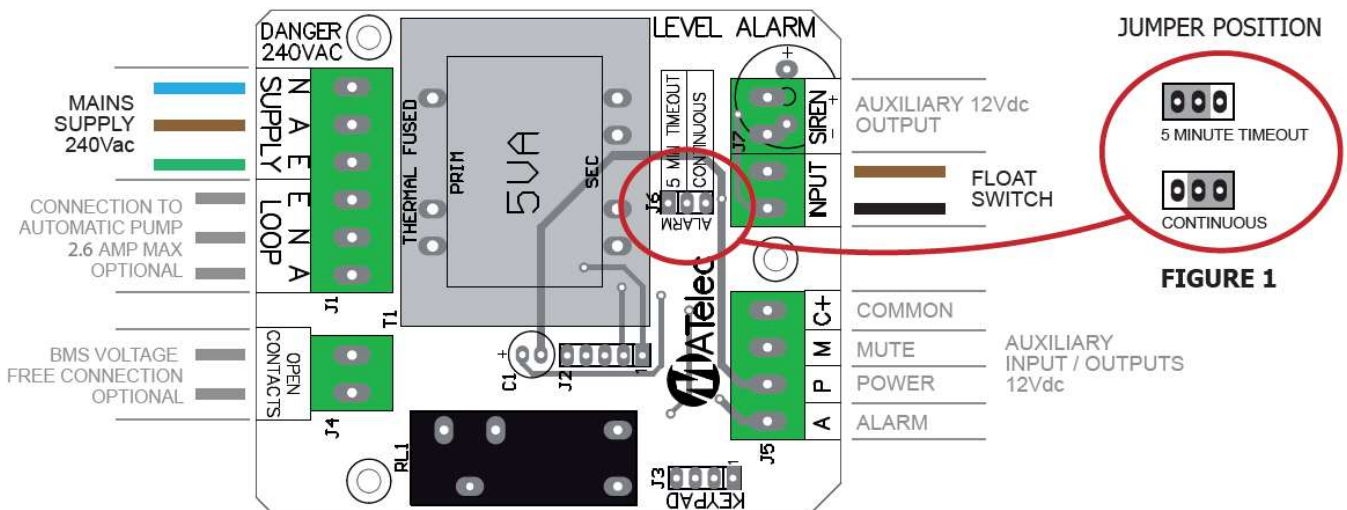
8. Appendix

8. Appendix

8.1. Appendix A – Liquid Level Alarm FPC-12651

- Designed to provide warning indication when storage (Effluent, Grey Water, Rainwater etc) tank is either empty or full.
- Warning condition determined by a Float Switch
- Warning Alarms are: Audio – buzzer
Visual - LED Pilot Light & Strobe
- The buzzer can be muted via the mute button. The visual alarms will remain on until the alarm condition is eradicated.
- If not muted the audible buzzer will automatically silence after 5 minutes. If a continuously sounding audible alarm is required, this can be done by changing the Jumper position (see Figure 1).
- Controller can be installed up to 50m from the tank being monitored. Float Switch cabling is 'safe', low voltage circuitry

NOTE: One float switch supplied with the scope of delivery



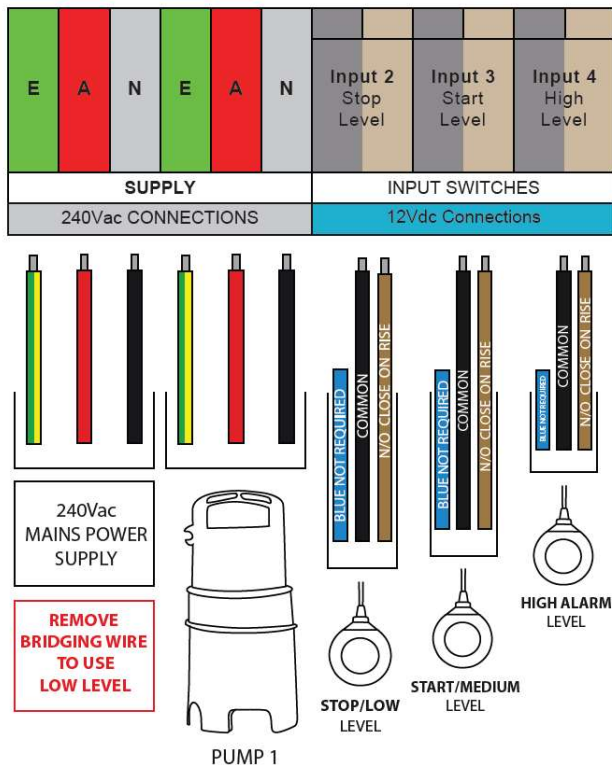
NOTE: Only a licensed electrician can carry out electrical work!

8. Appendix

8.2. Appendix B – Single Pump Controller FPC-15002

There are 6 DIP switches located on the lower side of the control module, which allows for selecting “mode” and “feature” options, as per the following table:

DIP Switch	Position	Function
1/2	Off/Off	Mode A: Standard typical float switch configuration (Start, Stop and High Level). No Low Level
	Off/On	Mode B: Standard configuration plus low level (Start, Stop and High Level).
	On/Off	Mode C: Standard configuration plus Prime Loss enabled, on Low Level (Input 1)
	On/On	Mode D: Pressure Pumping configuration (Lead, Lag and Low Pressure)
3	Off	Operating Pump alternates each time a pump start is triggered, or after 30 minutes continuous running.
	On	Operating Pump alternates after 6 hours continuous running.
4	Off	Anti-seize Timer disabled
	On	Anti-seize Timer 6 seconds every 7 days enabled
5	Off	When placed in Manual Mode, pump remains in Manual Mode
	On	When placed in Manual Mode after 5 minutes the pump will revert to Auto
6	Off	High Level Alarm automatically resets upon open circuit of high level input. High Level alarm has 15 minute delay.
	On	High Level Alarm can only be reset manually. High Level Alarm has 5 minute delay.



Mode A: Standard Configuration

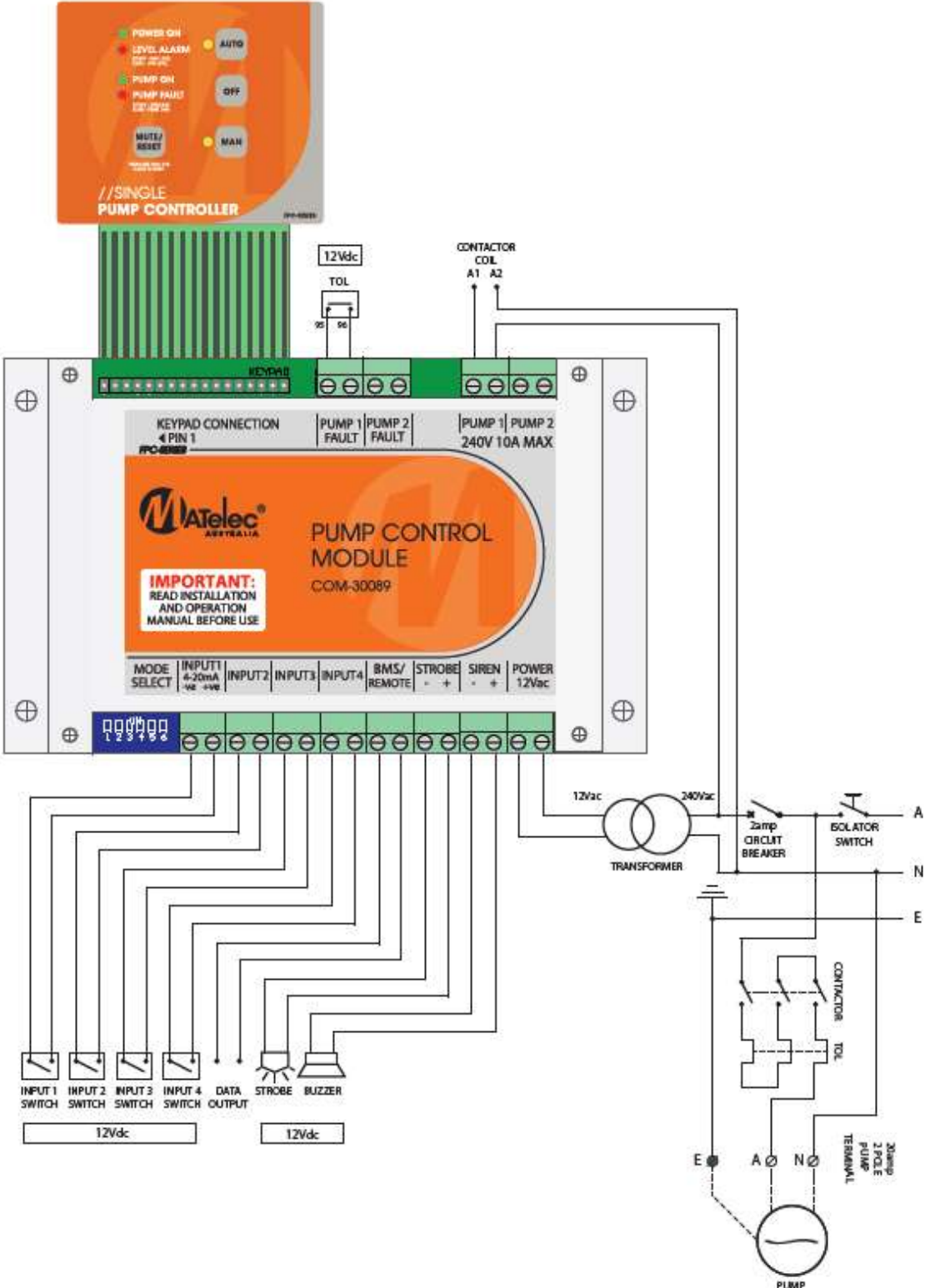
Start/Stop/High Level operation. When the Pump Start input is closed contact (triggered), the Duty Pump will be turned on. The pump will remain on until both the Pump Start and Pump Stop Inputs have turned off (Open Circuited). Upon High Level, both pumps will run until the Pump Stop Input turns off.

In addition to this, there is a maximum idle timer, which will trigger a Pump Start condition, if either pump has not run for 4 hours, and the Stop Float Contacts are closed. The pump will continue to run until the Stop Float Contacts open. Input functions are as follows:

Input	Function
Input 1	Not used
Input 2	Pump Stop
Input 3	Pump Start
Input 4	High Level

NOTE: For the other modes (B, C & D), please refer to the installation instructions supplied with the controller.

8. Appendix

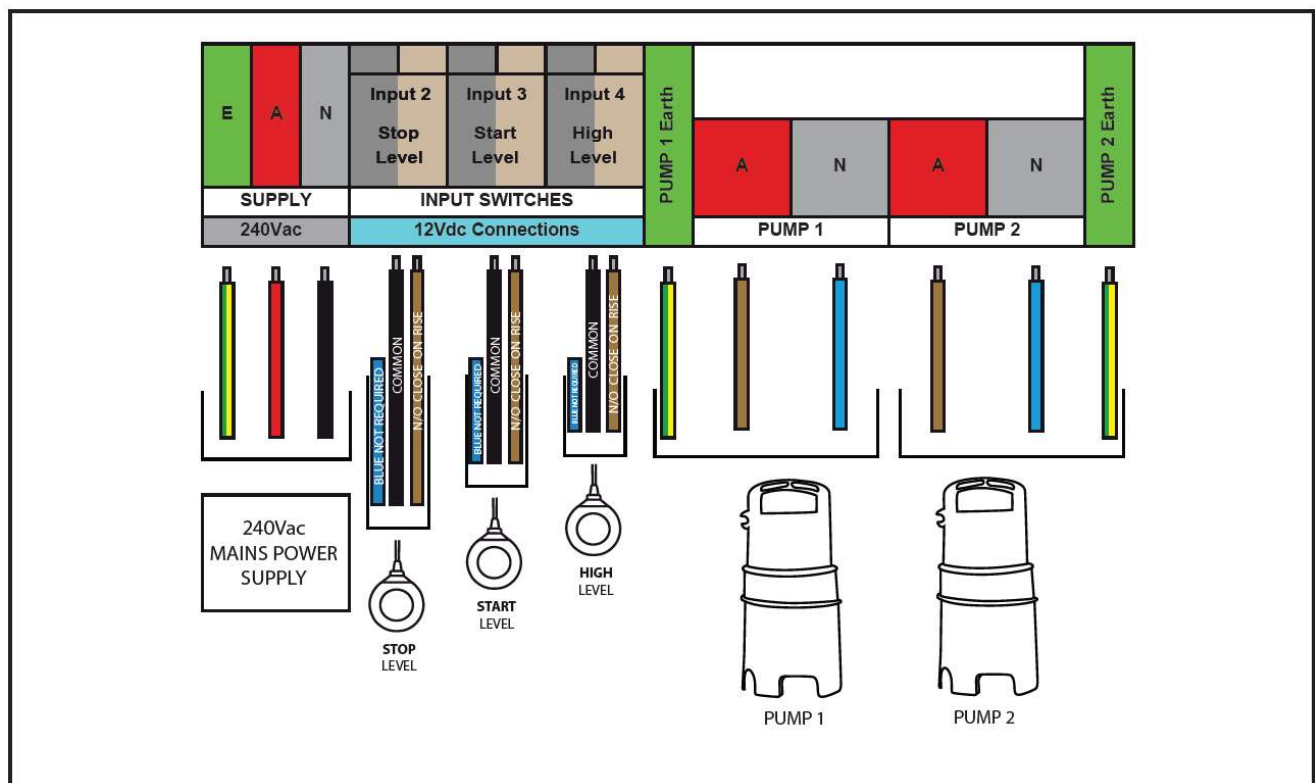


8. Appendix

8.3. Appendix C – Dual Pump Controller FPC-30010

There are 6 DIP switches located on the lower side of the control module, which allows for selecting “mode” and “feature” options, as per the following table:

DIP Switch	Position	Function
1/2	Off/Off	Mode A: Standard typical float switch configuration (Start, Stop and High Level). No Low Level
	Off/On	Mode B: Standard configuration plus low level (Start, Stop and High Level).
	On/Off	Mode C: Standard configuration plus Prime Loss enabled, on Low Level (Input 1)
	On/On	Mode D: Pressure Pumping configuration (Lead, Lag and Low Pressure)
3	Off	Operating Pump alternates each time a pump start is triggered, or after 30 minutes continuous running.
	On	Operating Pump alternates after 6 hours continuous running.
4	Off	Anti-seize Timer disabled
	On	Anti-seize Timer 6 seconds every 7 days enabled
5	Off	When placed in Manual Mode, pump remains in Manual Mode
	On	When placed in Manual Mode after 5 minutes the pump will revert to Auto
6	Off	High Level Alarm automatically resets upon open circuit of high level input. High Level alarm has 15 minute delay.
	On	High Level Alarm can only be reset manually. High Level Alarm has 5 minute delay.



8. Appendix

Mode A: Standard Configuration

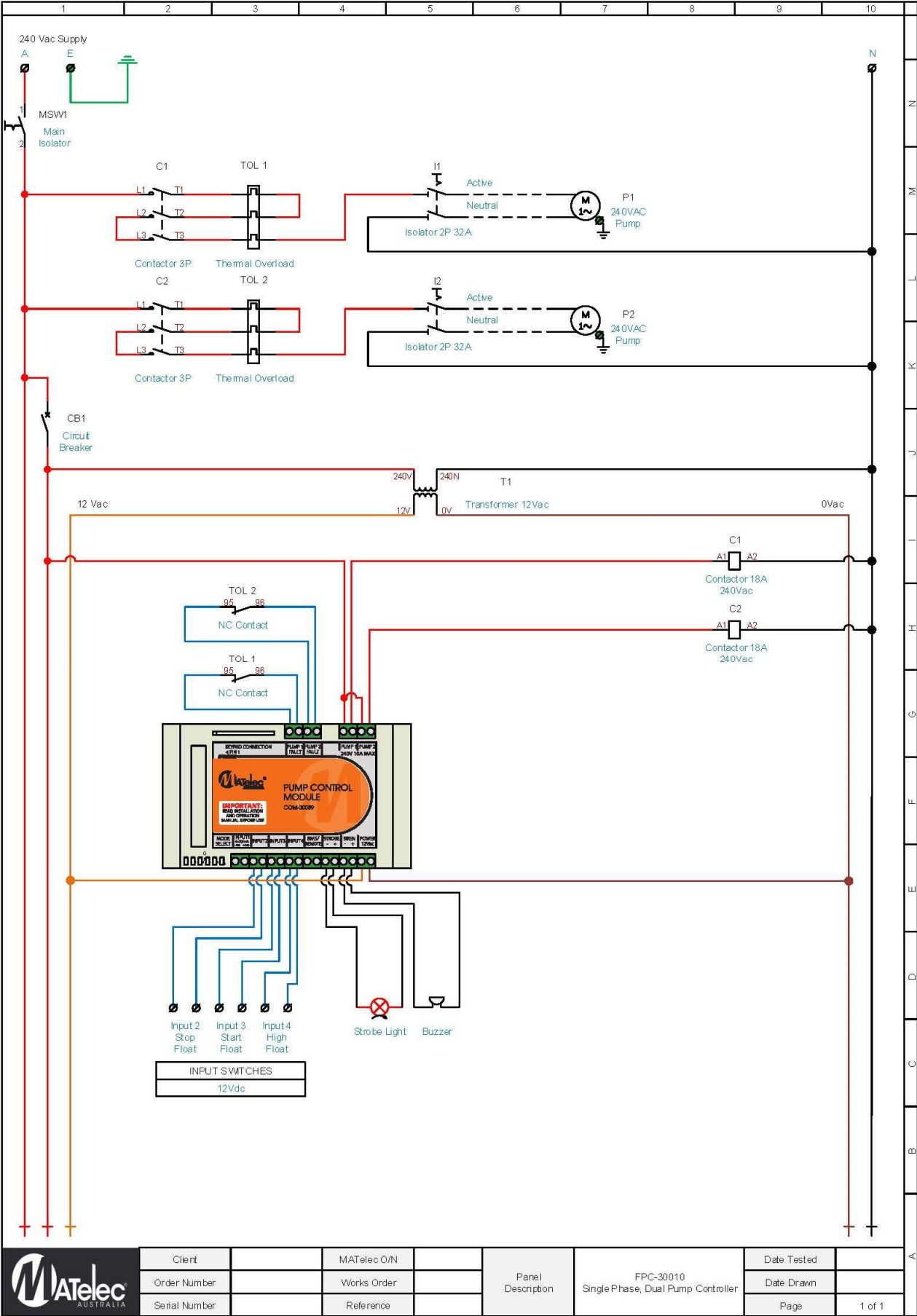
Start/Stop/High Level operation. When the Pump Start input is closed contact (triggered), the Duty Pump will be turned on. The pump will remain on until both the Pump Start and Pump Stop Inputs have turned off (Open Circuited). Upon High Level, both pumps will run until the Pump Stop Input turns off.

In addition to this, there is a maximum idle timer, which will trigger a Pump Start condition, if either pump has not run for 4 hours, and the Stop Float Contacts are closed. The pump will continue to run until the Stop Float Contacts open. Input functions are as follows:

Input	Function
Input 1	Not used
Input 2	Pump Stop
Input 3	Pump Start
Input 4	High Level

NOTE: For the other modes (B, C & D), please refer to the installation instructions supplied with the controller.

8. Appendix



Client		MATELEC O/N		Panel Description	FPC-30010 Single Phase, Dual Pump Controller	Date Tested	
Order Number		Works Order				Date Drawn	
Serial Number		Reference				Page	1 of 1