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LAVAC marine toilets

BLAKES LAVAC TAYLORS

The Lavac

Congratulations on the purchase of a Lavac marine toilet. Lavac marine toilets are firm favourites with sailors throughout the world, providing their owner with a long and trouble free working life.

The Lavac is one of the most simple to operate marine toilets available. After use, the seat and lid are closed and the pump is then operated for 14-16 strokes (For full instructions see page 21). As waste is pumped out, the bowl is sealed causing a vacuum which draws in the flushing water. It's as simple as that!

Within this handbook you will find information and practical help on installing, running and maintaining your Lavac. If you require any further help or advice, please contact us either by:

Telephone: **+44 (0)1489 580580**

Fax: **+44 (0)1489 580581**

E-mail: **info@blakes-lavac-taylors.co.uk**

or by writing to:

**Blakes Lavac Taylors
13 Harvey Crescent
Warsash
Southampton
SO31 9TA
United Kingdom**

Over many years we have taken advice from sailors around the world concerning their requirements for marine equipment and our current range is a result of this ongoing commitment. If you have any comments or helpful hints that you would like to share with us, we would be very pleased to hear from you.

Installation kit provided with your lavac

All Lavac marine toilets are provided with the following parts for installation.

- Pump – Hand (T/A: On Bulkhead; U/D: Behind Bulkhead) or Electric (12 volt DC or 24 volt DC, including wiring loom, time switch, fuse and fuse holder)
- Plastic Bleed Plugs (Spares No. TLZ9251)
- Self adhesive operating instructions
- Owners Handbook.

Because the nature of an installation varies from owner to owner, certain components are easier to source locally. We therefore feel it is best for you to purchase the following separately, depending on your requirements.

- 4 x 6mm (1/4") diameter Stainless Steel securing bolts or screws for base
- 4 x 6mm (1/4") diameter Stainless Steel securing bolts or screws for pump
- Reinforced sanitation grade hose – length dependant on installation:
19mm (3/4") bore for inlet
38mm (1 1/2") bore hose for outlet
- Hose clips

The Lavac System

General

The well known Lavac system is unique and probably the only single action, above or below water line, marine WC.

The Lavac has a china pan and is available as either hand or electrically operated. On the electric models 12 or 24V DC can be supplied.

To flush simply close the lid and operate a single pump. Pressure is reduced in the bowl as waste goes out and flushing water is drawn in. A small air bleed valve in the inlet pipe prevents siphoning.

The particularly hygienic operation and quietness are characteristics which in themselves make Lavac a popular choice for discerning owners. Simplicity of operation, robustness and reliability are further important features.

By using a diverter valve the Lavac's pump can also be used for other pumping operations, such as shower tray discharge, bilge pumping or discharge of the holding tank (see page 20).

Because legislation is now prohibiting over-board discharge from toilets, or at least making it impractical, this edition of the Lavac owners handbook now gives guidance on holding tanks (see pages 18).

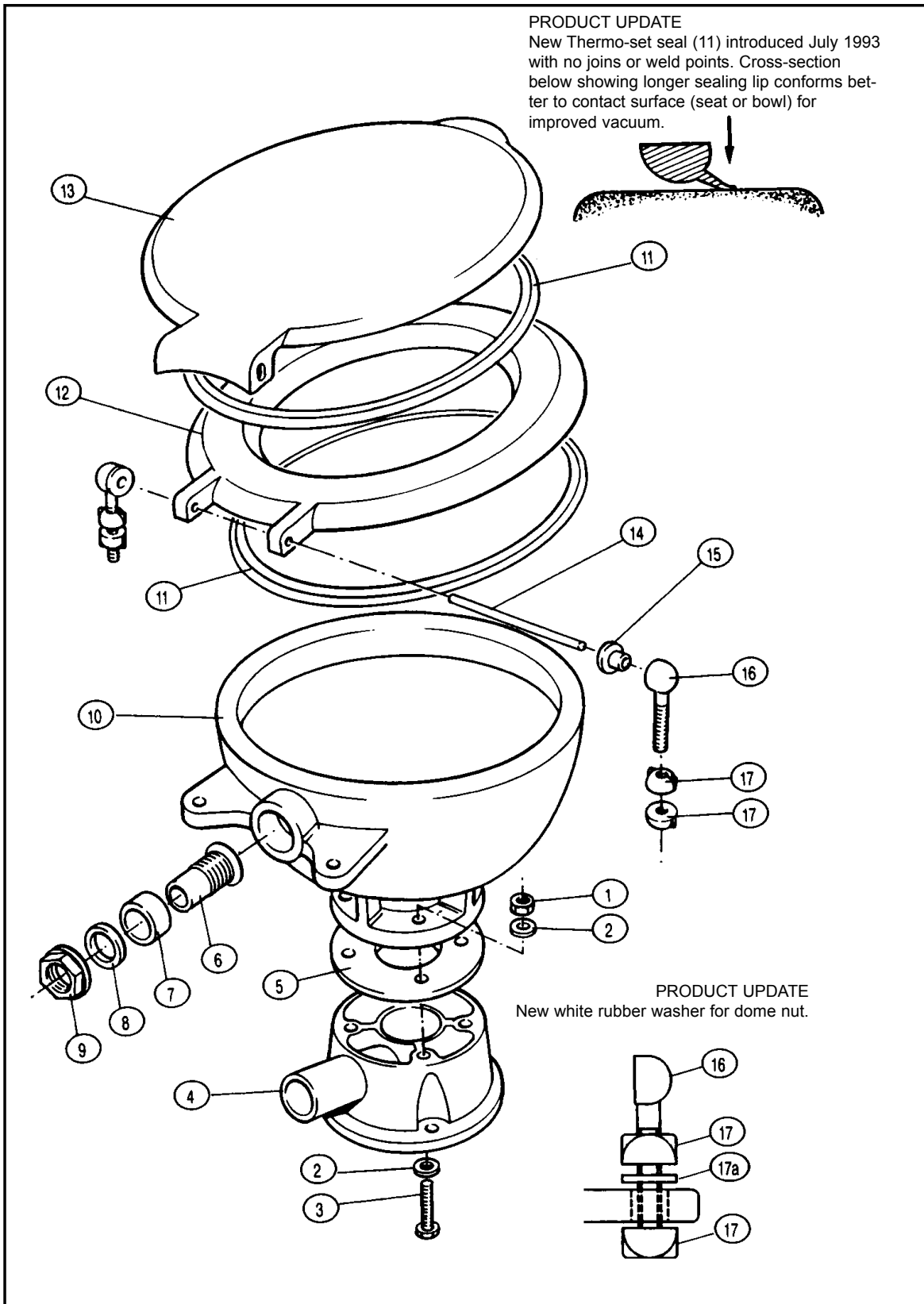
Features

- Easy and versatile in installation.
- Can be mounted under bunk or locker and pulled out for use.
- Pump, separate from bowl, can be mounted in most convenient position (above bowl consistent with instructions). For installation behind bulkhead, a special hand pump option is available (see illustration on p.9).
- Particularly quiet and hygienic in operation.
- Pump can also empty holding tanks, be used as a bilge pump and/or shower tray discharge pump.
- Any type of paper can be used, although tissue is recommended.
- Virtually no maintenance.
- Quick release pump cover for easy access.
- Single action operation.
- Exceptionally sturdy and durable.
- Full flow valve system.
- Low water usage.
- Remote holding tank installation (if chosen).
- A water seal is the only certain and complete way of preventing odour from the waste pipe and/or holding tank.

Electric – Extra Features

- Only marine toilet to offer manual back-up with electric version (see page 17).
- Extremely quiet in operation.
- Fully marinised, automatic, adjustable time switch

Exploded diagram of the Lavac Zenith



Lavac Zenith

Zenith Components

Diagram No	Part No	Description
1	TBB7215 x 4	M6 Nuts
2	TLZ9021 x 4	Pan bolt washers - small
	TLZ9022 x 4	Pan bolt washers - large
3	TLZ9022 x 4	M6 x 35 Pan bolt
4	TLZ9005	Pedestal base
5	TLZ9010	Pan base joint
6, 7, 8, 9	TLZ9031	Spigot assembly
10	TLZ9025	Zenith pan
11	TLZ9065 x 2	Seals for seat and lid
12	TLZ9070	Zenith seat
13	TLZ9075	Zenith lid
14	TLZ9405	Zenith hinge pin
15(x2), 16(x2)	TLZ9056	Hinge set
17(x4), 17a(x2)		

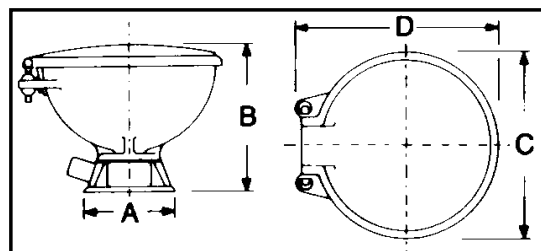
Lavac Zenith - Accessories

Part No	Description
TLZ9096	Clip for pump handle (38)
TLZ9310	Diverter (two-way) valve
TLZ9460	Bulkhead plate and shroud for U/D pump

Dimensions and specifications

Lavac Zenith toilet

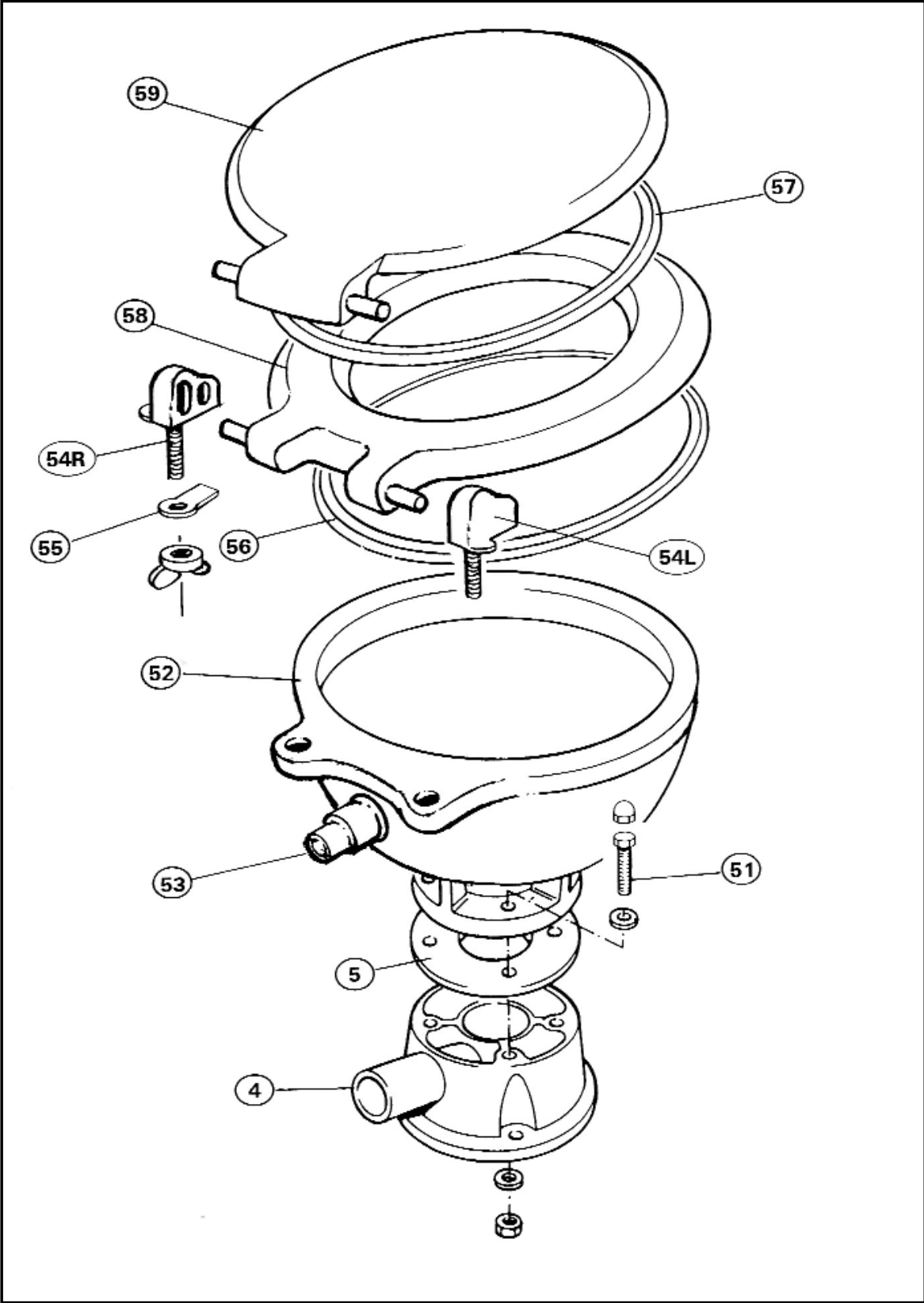
- **Bowl** – vitreous china for easy cleaning and durability
- **Pedestal** – injection mould uPVC. Outlet can be set to either side or rear of toilet.
- **Seat and Lid** – special purpose plastic mouldings.
- **Hinge assembly** – injection moulded acetal. Stainless steel hinge pin.
- **Toilet connections** –
Inlet 19mm (¾") bore hose.
Discharge 38mm (1½") bore hose.



Dimensions:

A - 185mm (7.3")	C - 368mm (14.5")
B - 290mm (11.4")	D - 410mm (16.2")

Exploded diagram of the Lavac Popular



Lavac Popular

Popular Components

Diagram No	Part No	Description
4	TLZ9005	Pedestal base
5	TLZ9010	Pan base joint
51	TLZ8015 x 4	M6 x 50 Pan bolt
	TLZ8010 x 4	Plastic covers
	TLZ8022 x 4	Plastic washer
	TLZ8021 x 4	Stainless steel washer
	TLZ8020 x 4	M6 nuts
52	TLZ8025	Popular pan
53	TLZ8031	Popular inlet spigot
54L, 54R, 55(x2)	TLZ8056	Hinge set
56	TLZ8065	Popular seat seal
57	TLZ8066	Popular lid seal
58	TLZ8070	Popular seat
59	TLZ8075	Popular lid

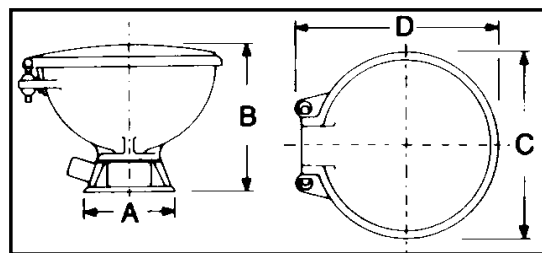
Lavac Popular - Accessories

Part No	Description
TLZ9096	Clip for pump handle (38)
TLZ9310	Diverter (two-way) valve
TLZ9460	Bulkhead plate and shroud for U/D pump

Dimensions and specifications

Lavac Popular toilet

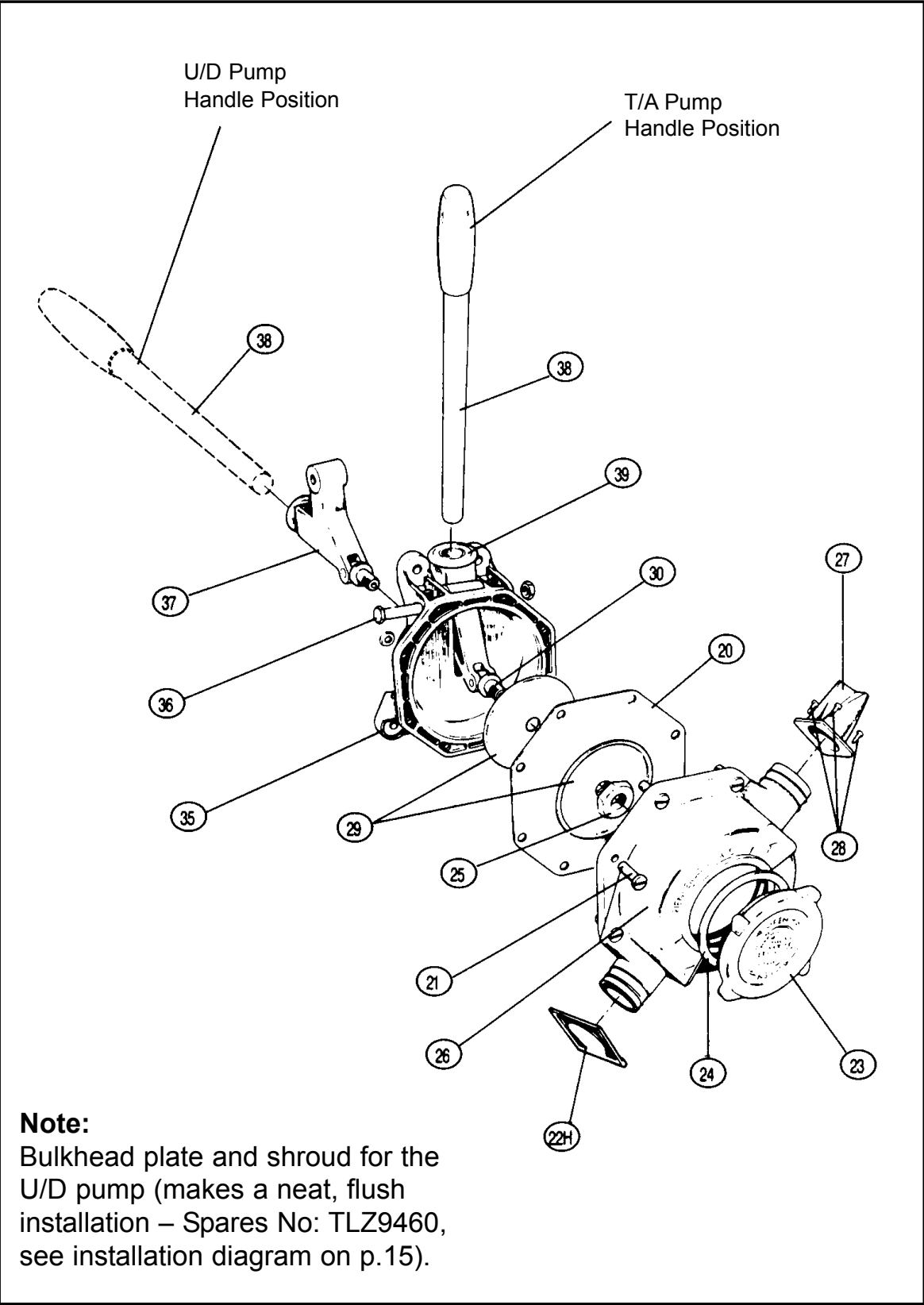
- **Bowl** – vitreous china for easy cleaning and durability
- **Pedestal** – injection mould uPVC. Outlet can be set to either side or rear of toilet.
- **Seat and Lid** – special purpose plastic mouldings.
- **Hinge assembly** – injection moulded acetal.
- **Toilet connections** –
Inlet 19mm (¾") bore hose.
Discharge 38mm (1½") bore hose.



Dimensions:

A - 185mm (7.3")	C - 343mm (13.5")
B - 352mm (13.9")	D - 416mm (16.4")

Exploded diagram of Hand Pump



Lavac Zenith & Popular Hand Pump

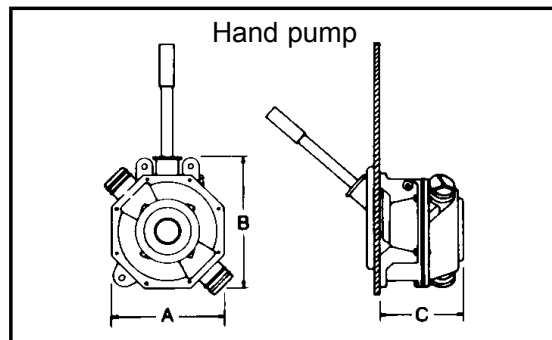
Components

Diagram No	Part No	Description
20	TLZ9110	Diaphragm
21	TLZ9175 x 8	2BA x 1" Bolts
	TLZ9181 x 8	2BA nuts
22H	TLZ9330	Inlet valve - hand
	TLZ9335	Inlet valve plate
23	TLZ9320	Front cover
24	TLZ9325	Front cover seal
25	TLZ9125	Eye bolt nut
26	TLZ9100	Top cover complete with valves
27	TLZ9340	Outlet valve
28	TLZ9345 x 2	Outlet valve screws - long
	TLZ9350 x 2	Outlet valve screws - short
29	TLZ9115 x 2	Diaphragm plates
30	TLZ9120	Eye bolt
35	N/A	Not available as spares item
36	TLZ9406	Rocker arm hinge pin
	TLZ9408 x 2	Circlips (rocker arm pin)
37	TLZ9450	U/D Rocker arm
38	TLZ9265	Pump handle
39	TLZ9455	T/A Rocker arm

Dimensions and specifications

Hand Pump

- Diaphragm type
- Injection moulded plastic body
- Stainless steel fastenings and handle
- All rubber components of oil resistant nitrile



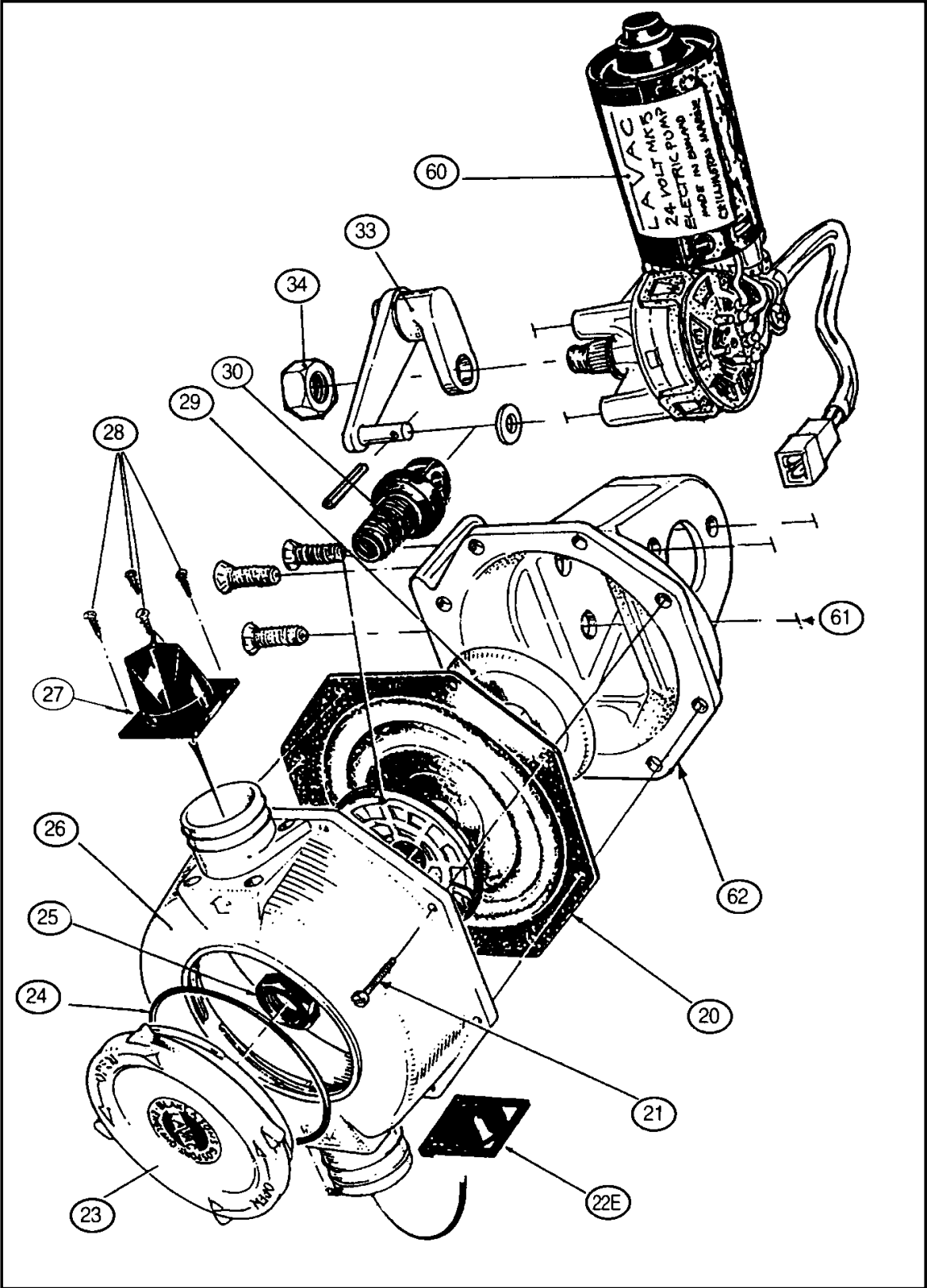
Dimensions:

A - 170mm (6.6")

C - 140mm (5.5")

B - 200mm (7.9")

Exploded diagram of the electric pump – 12&24 Volt



Lavac Zenith & Popular Electric Pump

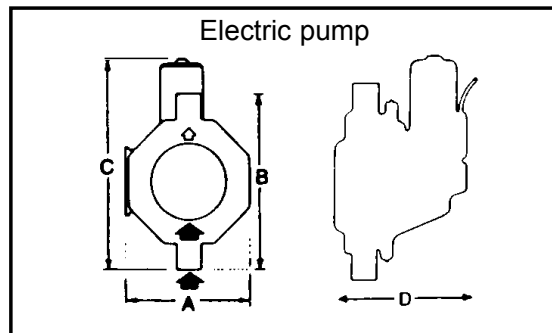
Components

Diagram No	Part No	Description
20	TLZ9110	Diaphragm
21	TLZ9175 x 8	2BA x 1" Bolts
	TLZ9181 x 8	2BA nuts
22H	TLZ9330	Inlet valve - hand
	TLZ9335	Inlet valve plate
23	TLZ9320	Front cover
24	TLZ9325	Front cover seal
25	TLZ9125	Eye bolt nut
26	TLZ9100	Top cover complete with valves
27	TLZ9340	Outlet valve
28	TLZ9345 x 2	Outlet valve screws - long
	TLZ9350 x 2	Outlet valve screws - short
29	TLZ9115 x 2	Diaphragm plates
30	TLZ9120	Eye bolt
33	TLZ9421	Crank assembly
60	TLZ9290	12V Motor
	TLZ9295	24V Motor
61	TLZ9185 x 4	M5 x 22mm bolts
62	TLZ9156	Crank case

Dimensions and specifications

Electric pump

- Diaphragm type 12V or 24V DC
- Injection moulded plastic body
- **Alloy crancase**
- Stainless steel crank mechanism with plain bearing
- Consumption 5 amps at 12v under load. - 5 amp fuse supplied
- **Weight 4Kg**
- **Flow / delivery rate 6 gal per min**



Dimensions:

A - 178mm (7") C - 278mm (11")
 B - 223mm (8.8") D - 225mm (10")

Lavac Zenith

Zenith spares kits

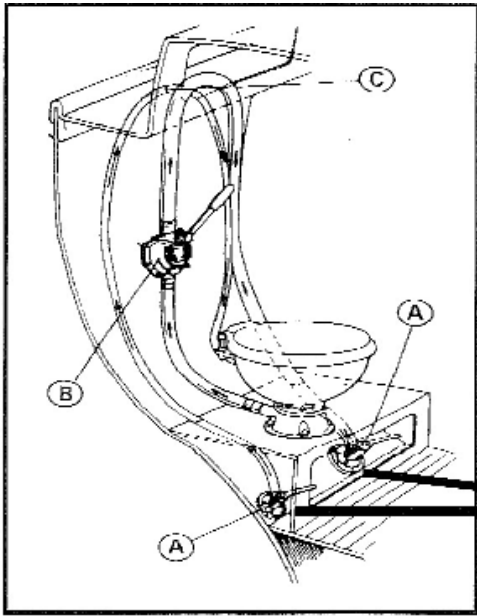
Description	Part No	Hand pump kit	12 or 24V electric pump kit
		TLZ0954	TLZ0952
Hand pump spares kit	TLZ0951	1	-
Electric pump spares kit	TLZ0956	-	1
Pan base gasket (5)	TLZ9010	1	1
Sealing washer for inlet spigot (7)	TLZ9035	1	1
Rubber washer (17a)	TLZ9054	2	2
Hinge bush (15)	TLZ9060	2	2
Seal for seat and lid (11)	TLZ9065	2	2
Handbook	TLZLIT	1	1

Lavac Popular

Popular spares kits

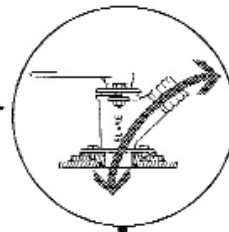
Description	Part No	Hand pump kit	12 or 24V electric pump kit
		TLZ0854	TLZ0852
Hand pump spares kit	TLZ0951	1	-
Electric pump spares kit	TLZ0956	-	1
Pan base gasket (5)	TLZ9010	1	1
Hinge pad (55)	TLZ8061	2	2
Seal for seat (56)	TLZ8065	1	1
Seal for lid (57)	TLZ8066	1	1
Handbook	TLZLIT	1	1

Lavac operation

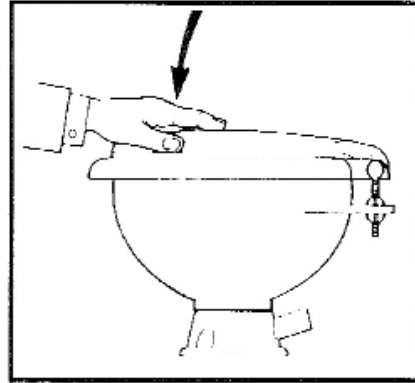


- A. Seacocks
- B. Pump
- C. Air Inlet Valve

1
ENSURE
SEACOCKS
"OPEN"

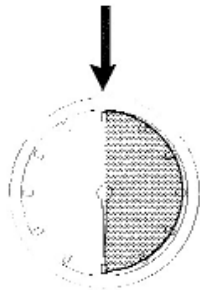
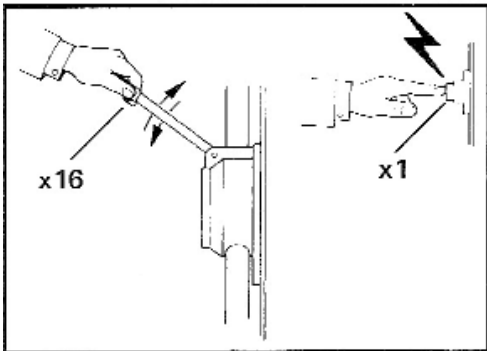


2 CLOSE LID

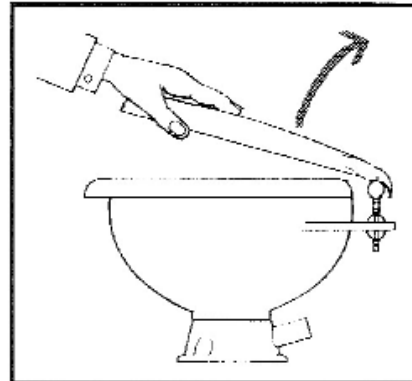


3

HAND PUMP or ELECTRIC PUMP



4
WAIT 60 SEC.
BEFORE TRYING
TO LIFT LID



Installation – seacocks

Siting and installing the seacocks

Having chosen the type of inlet and discharge seacocks required for your particular needs, they should be mounted in the hull. We recommend Blakes Seacocks for use with our marine toilets. The inlet is 19mm ($\frac{3}{4}$ ") and the outlet is 38mm ($1\frac{1}{2}$ ").

The inlet seacock should be about 460mm (18") below the water line and forward of the discharge seacock. On a sailing vessel, the distance below the water line may have to be more to allow for heeling. The discharge seacock should also be below the water line but need not be as deep as the inlet.

The location of both seacocks should be convenient for attaching piping to and from the toilet and easily accessible for turning off. Ensure that they are positioned to accept the hoses before drilling the holes to accept the fixing bolts.

Fitting the seacocks to the boat.

For fibre-glass boats (Glass Reinforced Plastic) we recommend the fitting of a wooden pad, bonded to the hull, slightly greater in diameter than the seacock flange and 13mm to 19mm ($\frac{1}{2}$ " to $\frac{3}{4}$ ") thick (see fig. 1). To ensure watertight joints on

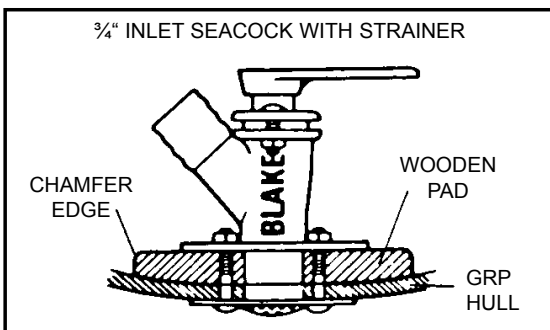


Fig. 1

GRP hulls, a small amount of underwater sealing compound should be put between the inside skin and this pad and also under the seacock flange

For wooden hulls, ensure that drilling is carried out in the centre of

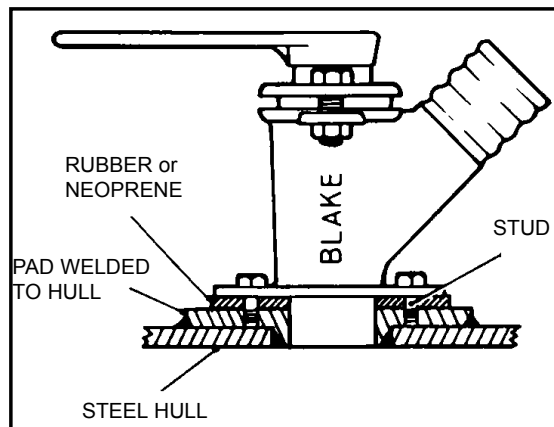


Fig. 2

a hull plank.

For steel hulls. (see fig. 2, the seacocks must not under any circumstances be bolted directly onto the hull. They should be isolated with a gasket and studded with stainless steel fittings. This is to prevent electrolytic action.

For aluminium (alloy) hulls, special aluminium seacocks should be used. Plastic seacocks are often used but are not recommended by Lloyds because of the possibility of melting in the event of a fire.

Seacock spigots should be cut off to suit the outside of the hull. The inlet seacock should be flush with the outside of the hull and a strainer fitted. Similarly the discharge seacock should protrude to enable it to take the discharge plate.

Lavac Installation

Summary

1. INLET SEACOCK

Should be mounted forward of the discharge to avoid recirculating waste. We recommend the use of Blakes seacocks.

2. PUMP (Hand or Electric)

Diagram on the right shows a U/D hand pump installation with U/D pump plate and shroud. The pump (hand or electric) must be mounted so that the water flow is vertically upwards through the pump as shown. The bottom of the pump must not be mounted at a lower level than the top of the bowl.

3. AIR BLEED VALVE

A simple plastic plug with a hole drilled into it. The plug allows air into the system, preventing siphoning and releasing the vacuum when pumping stops. The size of the hole in this valve controls the level of water remaining in the bowl. Two valves with different sized holes are provided (Spares No. TLZ9251 – the larger the hole, the less water remains in the bowl).

4. DISCHARGE SEACOCK

5. BOWL

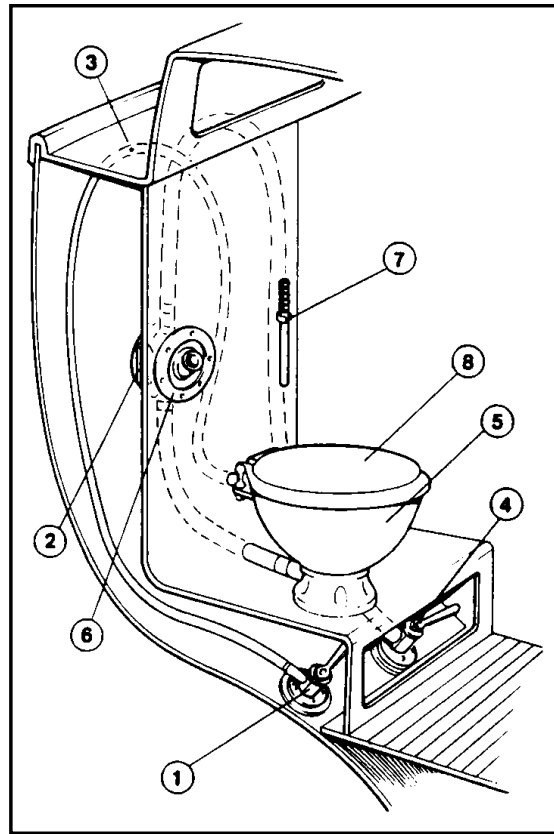
The outlet at the rear of the bowl can be positioned to the left, right or centre. This can be very helpful for difficult installations.

6. U/D PUMP

Makes a neat, flush installation.

7. HANDLE CUP

Typical installation



Siting and installing the Lavac

1. The Lavac base should be mounted on a hardwood or fibre glass platform approximately 32mm ($\frac{1}{4}$ " thick). A template should be used for drilling the holes necessary in the platform.

2. Securing bolts 6mm ($\frac{1}{4}$ " should be used to hold down the toilet. Do not fix the toilet at this point. It is advisable to wait until the hoses are fixed and installation checked.

3. We recommend the use of reinforced sanitation grade hose for the Lavac installation. Avoid sharp angled or acute bends in either the

Lavac Installation

inlet and, particularly, the outlet hoses. If it is completely unavoidable to use right angled fittings in the outlet hose, then rigid plastic fittings should be used having an inside radius of not less than 31mm (2"). Do not use sharp angled plumbers fittings which can easily cause a blockage.

4. Establish a position for the pump where the pump inlet is no lower than the bowl top.

5. Bolt or screw the pump in position using 6mm (1/4") diameter bolts or screws ensuring that the flow arrow on the pump is vertically up or certainly not more than 45° from the vertical.

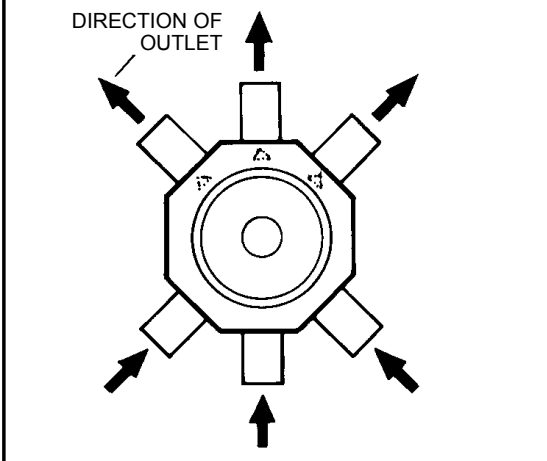
IF THE PUMP IS MOUNTED IN ANY OTHER WAY THE INSTALLATION WILL BE INEFFICIENT IN OPERATION AS THE INLET VALVE CANNOT SEAL EFFECTIVELY.

6. Cut the 38mm (1 1/2") diameter outlet hose to the lengths required. Be sure to allow enough hose from the top of the pump to take the loop above the waterline at maximum heel of the boat. For motor vessels this is high enough at maximum angle of roll. Attach the two cut lengths of hose from the bowl to the bottom (inlet) of the pump and from the top of the pump (outlet) to the outlet seacock.

7. Connect the 19mm (3/4") bore inlet hose to the bowl inlet, having allowed for a loop similar to the outlet (see point 6) and attach the inlet hose to the inlet seacock.
PEASE NOTE: It is absolutely essential that all joints are 100% sealed. No air leakage is permissible

Handle position (angle of operation) and/or outlet direction can be varied by rotating pump body (26) relative to back cover (35) (See exploded diagram p.8).

If back cover (35) is rotated ensure air bleed hole in back cover is re-drilled at lowest point.



therefore all hose clips must be tight.

8. An important part of the Lavac installation is the air bleed valve which has to be located at the top of the loop of the inlet pipe. Drill a 5mm (1/18") diameter hole at the top of the curve of the inlet pipe. If the top of the inlet pipe is in a clothing locker, ensure that the clothes do not obstruct the air bleed valve. Similarly, if the hose is hard up below the deck, drill the hole slightly to one side at the top of the loop. For installations on or above the water line, insert the white plastic bleed plug. For installations below the water line, use the black plastic plug. (Set of bleed plugs TLZ9251).

9. Attach the self-adhesive operating instructions to the bulkhead near the pump. We recommend that a suitable rubber stop is placed on the bulkhead behind the Lavac unit to avoid possible damage to the lid when opened.

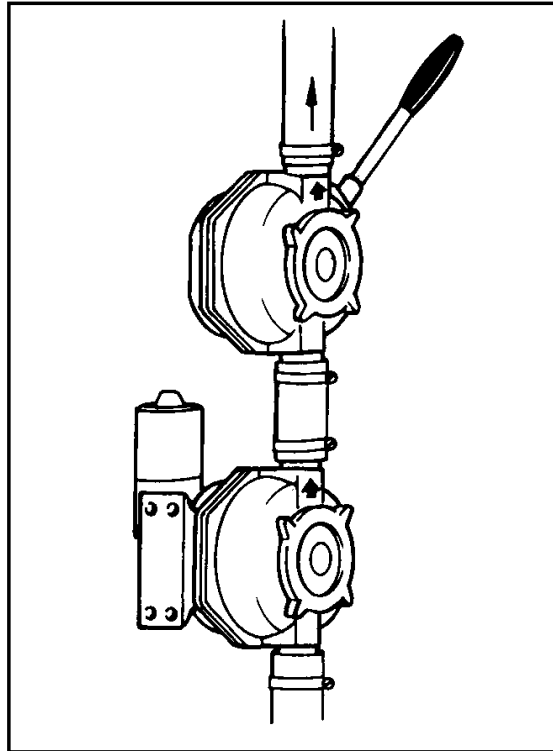
Lavac Electric pump Installation

1. Connect up wiring as indicated in the diagram. The time switch should be mounted through the bulkhead so that only the front flange with push button and shroud are visible to the user. Use only stainless steel screws.

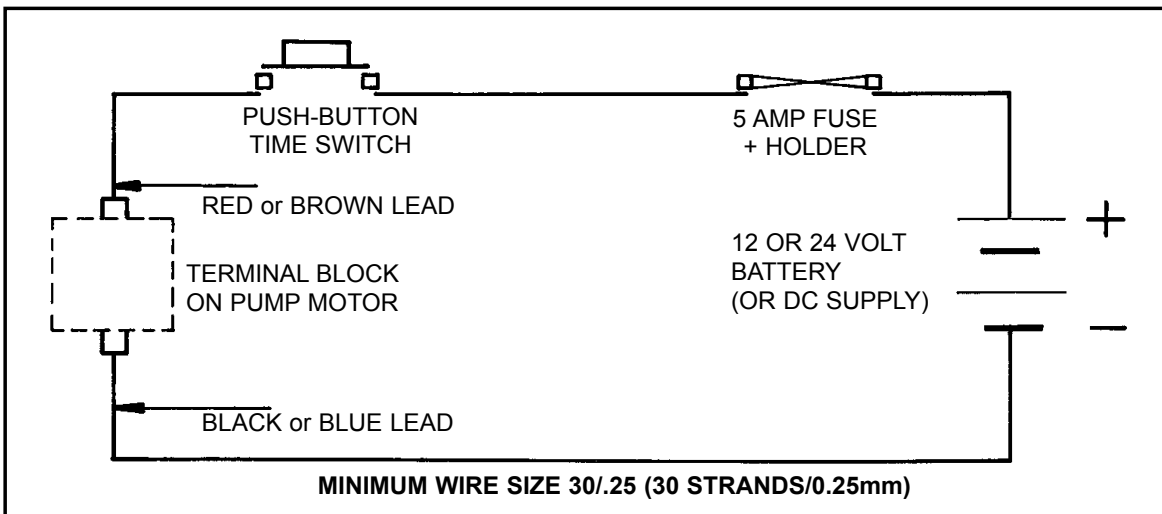
2. The time switch is set for 30-45 seconds. If you wish to adjust the operating time (inlet pipe length will vary between installations), turn the small screw in the centre of the back of the switch very slightly in a clockwise direction to lengthen the time and anti-clockwise to reduce it (time switch is adjustable between approx 1 second and 10 minutes).

3. Ensure when mounting the pump that the flow arrows are facing upwards. Do not mount in a horizontal position. Also ensure that the pump is no lower than the top of the bowl.

4. **WARNING.** Do not operate the switch while using the toilet. As a precaution, mount the switch in such a position that children cannot reach it until after use.



The Electric Lavac can be fitted with a standby manual pump to provide emergency back up. It is easy to upgrade existing hand toilets to electric or add a standby pump to electric toilets.



(Loom) { Black/Blue - Black/Blue } (Pump)
 { Red/Brown - Red/Brown }

Holding Tanks – General

Options

Recirculating pump out – often used for a conversion installation where the toilet compartment is sufficiently roomy. The holding tank is usually integrated with the toilet head, but with the Lavac used in a recirculating system the holding tank can be remote.

Fresh Water Flush with Pump-Out Holding Tank – probably the most acceptable system to the user. Allows for a larger tank installation, as the tank can be positioned anywhere in relation to the toilet head.

Holding Tank Capacity

If sink and shower waste is also being contained the holding tank must be substantially larger. Used with care, a shower will require about three gallons each time it is used. Obviously both sink and shower waste quantities depend entirely on how the facilities are used, as well as the frequency of use. The size of a holding tank is entirely dependent on the berth/size of the boat and anticipated duration between pump-outs. A holding tank can never be too large but it can easily be inconveniently small.

Restriction on size depends on available space for installation and effect on the boats trim. The following formula will provide an approximate guide to the minimum size of tank which is acceptable:

- Berths x days between pump-out x Y = gallons capacity of tank.
- For recirculating systems factor Y = 0.5
- For fresh water flush systems factor Y = 2.5

These calculations assume low water use toilets are being used.

Materials

If a holding tank system is being considered, some careful thought must be given to the design and construction of the tank. Four materials are commonly used for holding tank construction, polypropylene, glass fibre, stainless steel and galvanised steel. Polypropylene – the smooth internal and external finish of this material has the benefit of preventing matter from adhering to the walls of the tank and at the same time presenting a clean, trim appearance.

Glass Fibre – provides considerable flexibility in design and is easy to alter during or after installation, should the need arise.

Stainless Steel – is strong and resistant to corrosion but is expensive, in both material and construction.

Galvanised Steel – provides the cheapest solution but is not totally corrosion resistant. Once corrosion starts it spreads rapidly.

Flexible Tanks

Flexible tanks are very easy to install in retrofit situations. Ideal on craft where holding facility is seldom used, but two points should be considered carefully:

- (i) If the boat is likely to encounter much sea movement then flexible tanks are prone to wear and chaffe
- (ii) some materials, although fluid-tight, will omit odour and a suitable grade flexible tank must be used.

Holding Tanks – Lavac

Economy of Flushing Water

Economy of flushing water is a valuable Lavac characteristic for holding tank installations. This is also important when flushing water is being drawn from the craft's own water tank. Using the on-board fresh water supply for flushing should be seriously considered. It prevents scaling in the system from salt water and dirty/oily water entering the bowl. The Lavac uses approximately only 3 pints of flushing water per operation. With the electric Lavac, the quantity of flushing water can be controlled accurately by the time switch. This may be helpful for owners frequently entertaining visitors inexperienced on boats. Two time switches can be used if a long and short flush option is thought worth while.

Flexibility

Lavac provides the facility to site tanks anywhere in the boat. Therefore, as well as making maximum use of the tank capacity, because of the economy of flushing water used, the holding tank can be housed where space is less critical, allowing a larger tank to be installed than is possible with some other systems. With the Lavac system it is practical to install a high tank. Why not consider, for example, a full height floor to roof bulkhead tank? (This can be in conjunction with either sea water or fresh water flush systems).

Diverted Pump Action

In conjunction with a two-way valve, it can carry out other tasks. See figs 2, 3 and 4 on pages 21 and 22. Fig. 5 shows how this saves the cost of a separate pump and hull fitting.

Ideal for Recirculating System

Although the Lavac has ideal features for fresh water flushing systems, in extreme circumstances it may be preferred to minimise the holding tank size and operate a recirculating system. Lavac, incorporating a sealed seat and lid to the bowl, reduces odour considerably below levels encountered with other recirculating toilet systems. If the Lavac is being used on a recirculating principle, the flushing water pick up pipe, in the holding tank, must be surrounded by a fine aluminium or brass gauze filter.

Vacuum Fragments Waste

The vacuum fragments waste as it passes through the base opening. Solid matter will remain in suspension in the tank, thus allowing more efficient tank emptying. This eliminates the need for a macerator. Macerators are best avoided if possible because their mechanically operated cutting blades can be jammed with even small objects. Macerators are also very noisy!

Holding Tank Plumbing

Key Points

- For all systems where pump-out via deck fitting, or via seacock, is not required either can be omitted.
- If Holding Tank is above the waterline no pump is required for discharge to sea, i.e. open seacock to drain, close to hold. (Also open seacock to allow discharge to sea via the tank, direct from toilet. Tank outlet must be installed at bottom of tank and fall continuously to seacock).
- When inlet or Outlet Hoses are plumbed overboard, to a below-waterline position, they must be looped above the waterline to prevent siphoning (If toilet is below the waterline).
- Ball Check Valve for $\frac{3}{4}$ " bore hose (only required if draw is more than 36" below toilet) *or* vented loop required if toilet is below waterline.

Useful statistics

- One cubic foot contains 6 gallons.
- One gallon contains $\frac{1}{6}$ cubic feet.
- One gallon of water weighs 10 lbs.

Suggested Systems

1 - For craft permanently on waters where overboard discharge is prohibited. This is a basic system. Use of a dock side marina pump out station is used or a DIY outboard pump can also discharge the holding tank.

- A Toilet discharge flow
- B Pump-out flow to quay
- C Discharge to sea

1. Vent/breather pipe connect to 1" ID hose
2. Microvent filter (see p.20)
3. Rinse-out facility connect to ID hose
4. Ball check valve or vented loop.
5. Seacock

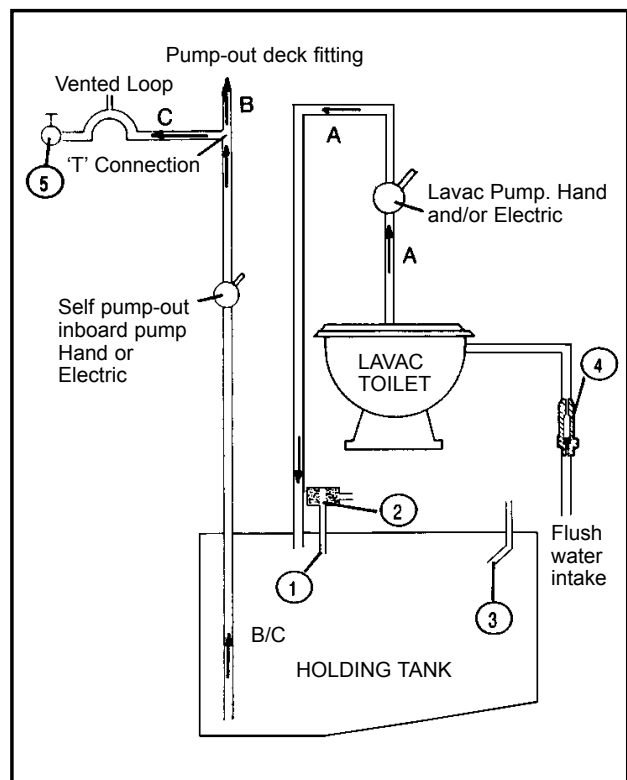


Fig. 1

2 - For craft visiting waters where overboard discharge is prohibited. This system is simple to operate. Use of quay side marina pump out station is not restricted by the on board, in line, pump. Holding tank contents can be drawn through it.

- A Toilet discharge flow
- B Pump-out flow to quay
- C Discharge to sea

1. Vent/breather pipe connected to 1½" ID hose.
2. Microvent filter – see page 20.
3. Rinse-out facility, connect to ¾" ID hose.
4. Ball check valve or vented loop.
5. Seacock.

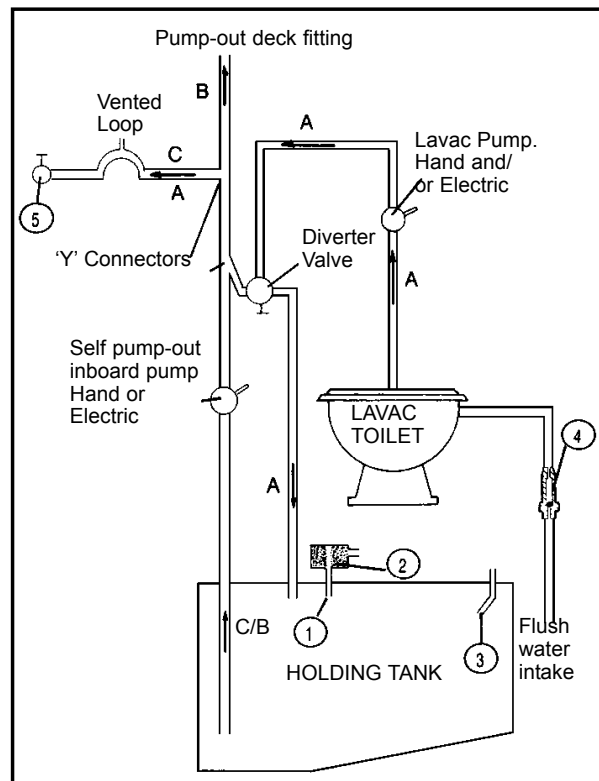


Fig. 2

3 - For craft requiring toilet discharge to sea or holding tank and pump-out of holding tank using the one toilet pump. Only installations with Lavac toilets can operate this system.

- A Toilet discharge flow
- B Pump-out flow using Lavac pump
- C Pump-out flow using quay side pump
- D Discharge to sea

1. Vent/breather pipe connected to 1½" ID hose.
2. Microvent filter – see page 20.
3. Rinse-out facility, connect to ¾" ID hose.
4. Ball check valve or vented loop.
5. Seacock.

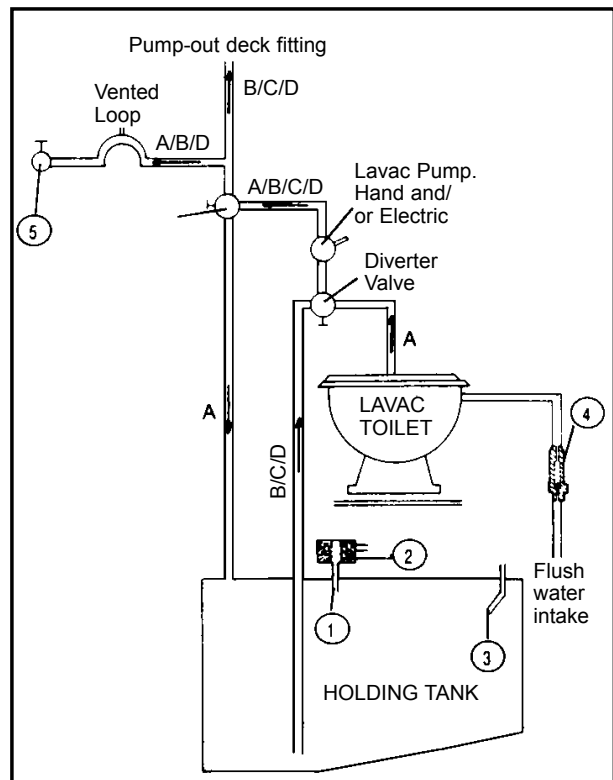


Fig. 3

4 - An alternative to fig.3. This system provides a self pump-out facility to shore or sea, using the one toilet pump. Only installations with Lavac toilets can operate this system. When being pumped out by quayside facility this arrangement avoids the tank contents being drawn through the pump and uses only one sewage pipe connection to the tank.

- A Toilet discharge flow
- B Pump-out flow using Lavac pump
- C Pump-out flow using quay side pump
- D Discharge to sea

1. Vent/breather pipe connected to 1½" ID hose.
2. Microvent filter – see p. 20
3. Rinse-out facility, connect to ¾" ID hose.
4. Ball check valve or vented loop.
5. Seacock.

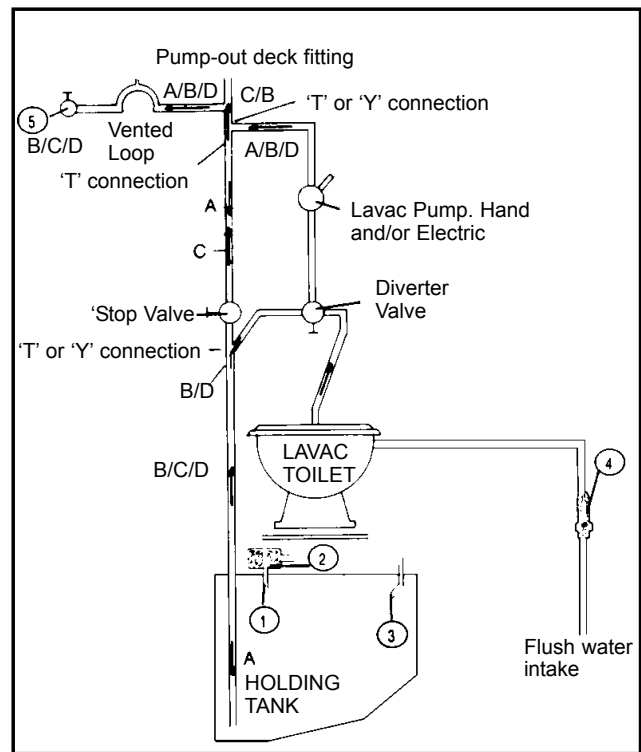


Fig. 4

Holding Tank – Accessories

1. Two-way valve

(Spares No, TLZ9310)

The two-way valve in the systems above shows how, in conjunction with the separate pump on the Lavac toilet, bilges, showers, washbasins, holding tanks, etc, can be emptied. Exemplified in fig. 5, this clearly saves the cost of separate pump and hull fitting. The two-way valve we supply has a positive action, is almost maintenance free and has no parts to wear or corrode.

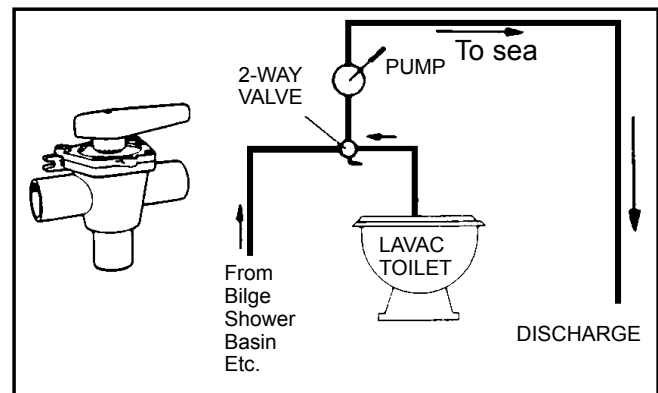


Fig. 5

2. Holding Tank Breather Filter

Microvent Filter. This activated Carbon Filter absorbs noxious and unpleasant odours and gases. The microvent filter is installed either vertically or horizontally within the breather pipeline in such a way as to minimise the possibility of it coming into direct contact with solid or liquid contents inside the holding tank. The carbon filters are easily replaced when their time life has expired.

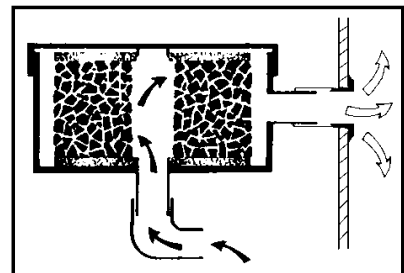


Fig. 6

Operation

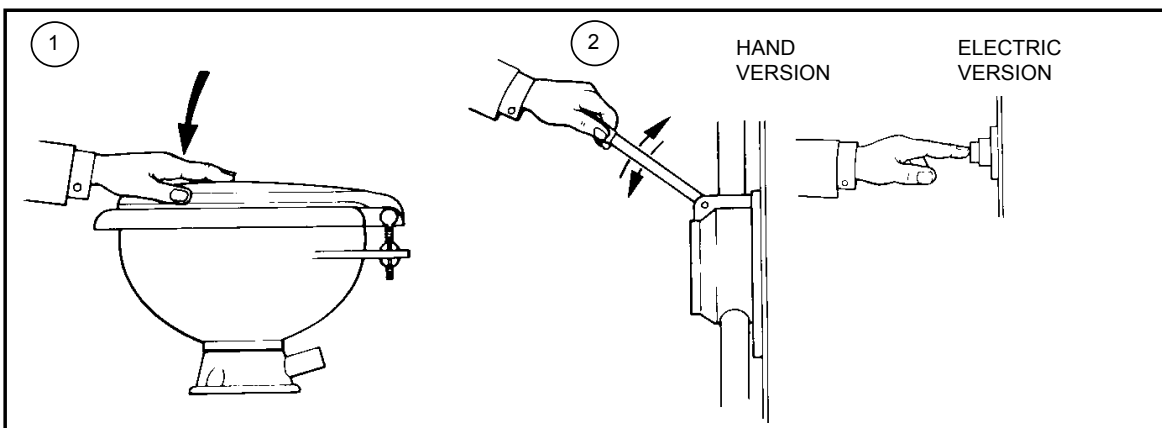
Manual pump operation

1. To flush the toilet, close the seat and lid and give 8-10 steady pulls using the full movement of the handle. Pause for five seconds and then continue pumping as before for a further 5-6 strokes. The higher the base of the bowl is above the waterline, the more strokes are needed. (Also see note 8, page 16).
2. It is essential that a sufficient number of strokes are used to clear the system completely. Use the full movement of the pump handle. Avoid using short jerky strokes. The number of strokes required will vary according to the length of the hoses.

NOTE: TO LEAVE TOILET BOWL EMPTY OF WATER, LIFT SEAT (13) AND THEN OPERATE PUMP.

Electric pump operation

1. To flush the toilet, close the seat and lid and press the push button fully in and release it.
2. The Lavac electric pump, whether incorporated in the Lavac electric toilet or used independently as a pump for fluids, should never be operated against a seacock or any other type of valve that is closed or partially closed as this may cause costly damage to the pump. (Note: similar circumstances can arise if the hose is blocked – see section on Check points.)
3. Where a two-way valve or diverter valve is used in the system, the pump should be switched off whilst the direction of flow is being changed as the valve has a midway closed position.
4. Similarly where two or more two-way diverter valves are in the system, ensure that both valves are set for a free discharge before starting the electric pump.



Maintenance

Toilet cleaners

Seat and lid

Only use soapy water. Difficult stains can be removed with alcohol, e.g. methylated spirits.

Pump

A useful approach to remove scale build-up is to introduce a solution of vinegar into the pump (by putting it into the bowl and with the lid open operate the pump for a few strokes). Leave for 24 hours and then flush thoroughly with clean water.

Bowl

The best cleaner for a marine toilet is frequent flushing, provided that the seawater is reasonably clean. Do not use harsh, abrasive cleaners and avoid using domestic cleaners that may contain bleach. Flushing through with soapy fresh water from time to time is a good idea. This will help in delaying scale deposit and keep the neoprene valves in the pump supple.

Day to day points to remember

1. Ensure that the operating instructions are mounted where your guests will see them.
2. Always fully flush the toilet.
3. Occasionally flush through with soapy water.
4. Put a notice on the toilet if you turn off the seacocks. You may burst a pipe or damage the toilet otherwise.
5. Close the seacocks when you leave the boat. This will keep them free and is seamanlike practice.

Avoidance of frost or cold damage

1. When laying up the boat for the winter, ensure that all the water has been pumped from the system to avoid frost damage. The outlet seacock should be closed and the discharge hose disconnected from it. Operate the pump into a bucket to empty remnants of water.
2. Close off the inlet seacock, disconnect the hose and drain it off.
3. During the laying up period, check the interior of the pump and remove any scale that has accumulated and also check that the hole in the bleed valve is clear.

Maintenance – Perishable parts

Replacing the seat and lid seals

1. Hook one end of the seal under the rim of the lid, stretch the seal around the rim and clip under all way round.

Photo 1.

2. Repeat for the seat.



Photo 1

Replacing the perishable pump parts

1. Unscrew the front cover (23) and loosen eyebolt nuts (25).

Photo 2

Replace the front cover seal ('o' ring) (24).



Photo 2

2. Unscrew the 8 screws (21) around the edge of the octagonal pump body (26) and remove.

Photo 3.

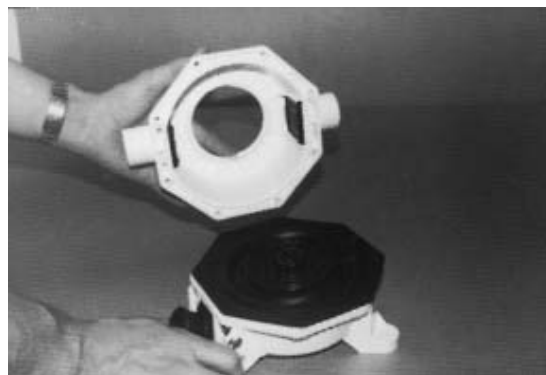


Photo 3

Maintenance – Perishable parts

3. Unscrew the eyebolt (25) nut and remove diaphragm (20) complete with diaphragm plates (29) Replace diaphragm (20).



photo 4

5. Unscrew 2 short and 2 long screws (28) to remove the outlet valve (27) Replace.

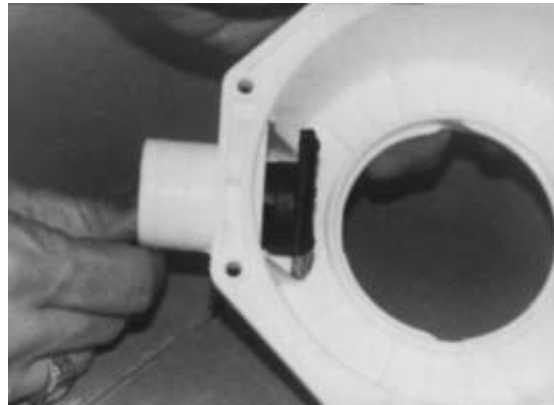


Photo 6

4. The inlet valve and plate (22E or 22H) simply clips out. Replace.



Photo 5

6. Re-assemble in reverse order, replacing all the stainless steel screws (21 & 28). When re-assembling the pump ensure all screws are tight. If air can be drawn into the pump, the toilet will not operate. To prevent leaking it is advisable to use a clear silicone sealant on all screws and joints. Spares kits, detailed on pages 12 include the perishable parts needed.

Operational Solutions

Fault	Possible cause	Solution
<p>No flushing water drawn in when bowl emptied.</p>	<p>Inlet seacock closed.</p> <p>Failure of vaccum</p> <p>Inlet hose looped greater than 5 feet (1.5m) above water line.</p> <p>Inlet pipe or seacock inlet outside the boat blocked.</p>	<p>Open inlet seacock and check that the outlet seacock is open as well.</p> <p>When the seat and lid are closed and the pump operated, the bowl should be sealed for around 30 seconds, i.e. you cannot lift the lid. Anything less indicates excess air bleeding into the system. Check the condition of the seat and lid seals.</p> <p>Are all the hose clips tight? Check air bleed plug is in place and that the hole is not too large.</p> <p>In this instance it may be necessary to fit a non-return valve in the inlet hose just above the water line. This maintains a head of water to facilitate the initial syphoning of flushing water.</p> <p>In this condition the bowl will seal. Check seacock by closing it, removing the hose and then turning on. Check inlet hose for blockage.</p>
<p>Pump will not empty the bowl and is hard to operate</p>	<p>Closed seacock, blocked hose or blocked pump.</p>	<p>Stop pumping.</p> <p>The pump will be hard and then impossible to operate as it builds up pressure. You could easily blow a hose connection off.</p> <p>Check the hose for blockage from bowl to pump and from pump to seacock. The pump is checked via the opening front cover. If pressure has built up through excess pumping, be very careful to ease the front cover slowly. Do not attempt to remove it completely until the pressure has gone.</p>

Operational Solutions

Fault	Possible cause	Solution
Pump handle easy to operate but bowl will not discharge	<p>Pump blockage</p> <p>Scale build up in pump.</p> <p>Pump lost prime</p> <p>Diaphragm split</p>	<p>Check through the front cover for blockage holding the inlet valve open.</p> <p>This scale, which builds up over a variable time depending on the salinity and temperature of the water (warm and very salty water is the worst condition), will gradually reduce pump efficiency to the point of not working. The scale can be removed by physically chipping off after stripping the pump or it can be dissolved in vinegar if the parts are left to soak. Scale will also build in the discharge hose. This is best removed by physically bending and 'working' the pipe so that scale is dislodged and will fall out. If it is possible to remove the hose this job is much easier.</p> <p>Pump very rapidly to see if you can regain prime, or remove front cover and pour as much water as possible into the pump and retry. Loss of prime may be due to lower valve not seating properly and water draining from the pump back to the bowl.</p> <p>Check diaphragm and replace if necessary</p>
A bad smell is apparent when the toilet is first used after the boat has been left for some time.	<p>Sulphur dioxide.</p> <p>Algae deposit in the inlet hose.</p>	<p>When the toilet is first used, the stale air from the inlet is drawn into the boat. Give the system several good long flushes immediately you go aboard. If you can remove the hose, filling it and leaving it to soak in disinfectant will help. Pumping disinfectant through the pump will NOT help because the problem originates in the inlet hose.</p>
Too much water left in bowl after use.	Diameter of hole in air bleed valve needs increasing	Use a hot needle to slightly increase hole diameter of the air bleed valve or replace air bleed plugs.

Operational Solutions

Fault	Possible cause	Solution
Electric pump does not flush system properly	<p>Pump not running long enough.</p> <p>Incorrect inlet valve fitted.</p> <p>Pump not mounted vertically.</p>	<p>The pump should run for a minimum of 1 minute and possibly longer in installations where the pipe runs are unusually long. Running time can be increased/ decreased by fractional turns of the small screw located in the centre rear of the time switch. Viewed from rear of time switch, clockwise adjustment increases running time. Only a few degrees of movement should be necessary.</p> <p>The electric pump is fitted with a special weighted inlet flap valve and if this is replaced by the normal hand pump valve it can, though not invariably, detract from pump efficiency.</p> <p>Please check that the arrow on the pump is pointing vertically upwards or that at worst, not more than 45° from vertical.</p>
Leak from back of pump.	Leakage past Eyebolt (30). Nut (25) loose. Diaphragm (20) split.	<p>Leakage is occurring past diaphragm into back of pump.</p> <p>If the pump body is mounted with the handle vertical the leakage will quickly manifest itself as a drip through the air bleed hole at the back of the pump.</p> <p>Tighten eyebolt nut (25).</p> <p>For this operation remove front cover (23) as explained in Point 2, Page 25. Silicone sealant is recommended. It should be applied to thread of eyebolt before the nut is tightened onto it</p> <p>If problem continues, check diaphragm (20) for splitting and replace.</p>

Operational Solutions

Blockages in the pump

- 1** If a blockage occurs in the pump, first pour half a bucket of water in the bowl and then, with the lid open, pump with even firm strokes until the water leaves the bowl.
This should clear the pump but repeat if necessary and then close the lid and pump again to replace the correct amount of water in the bowl.
- 2** If the pump will not operate and empty the bowl, remove the front cover of the pump. This is a quick release fitting that has to be turned in an anti-clockwise direction to unscrew. A bucket should be held below the pump whilst doing this as the contents of the pump will escape. (Note: the old Mark 3 pump has fixing screws to the front cover.)
- 3** Check that the inlet and outlet valves are not being held open by an obstruction. If so, remove the obstruction. Replace the front cover and seal and check the operation of the pump. If it still does not operate (i.e. empty the bowl with the lid open) it will be necessary to remove the pump body from the pump base by unscrewing the 8 bolts around the octagon perimeter and replacing the valves.
See page 25-26
- 4** When re-assembling the pump, ensure that all screws are tight (not over-tight). If air can be drawn into the pump, the toilet will not operate.

Note