The SafeWater Company

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NovaClear

Owners Manual

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ECONOVA NOVACLEAR

Congratulations on buying an EcoNova Aerated Wastewater Treatment System (AWTS) – the NovaClear.

You can be sure that when you chose a NovaClear we will provide outstanding customer service.

We endeavour to maintain this high standard throughout the installation, commissioning, and entire maintenance period.

Our aim is to provide you with a trouble free 'flush and forget' system which, if maintained and serviced correctly, will provide you with years of trouble free wastewater treatment.

The EcoNova NovaClear is an Aerated Wastewater Treatment System (AWTS) which has been designed to comply with the requirements of the Australian/New Zealand Standard 1546.3:2001, and to meet the requirements of the Queensland Plumbing and Wastewater Code.

These stringent standards ensure that the NovaClear has been rigorously tested by an independent accredited assessor, and has been proven to be of robust and reliable construction. It has been designed and tested to provide trouble free operation with little or no owner intervention.

The system utilises an aerobic activated sludge process in the primary section of the treatment unit, with further aerobic treatment and membrane filtration in the MBR section of the treatment unit.

This process ensures that the NovaClear is able to consistently treat domestic wastewater to produce treated water of the highest standard suitable for surface irrigation, without the problems usually associated with anaerobic septic systems.

The NovaClear is a practical solution to sustainable on site domestic wastewater treatment and re-use.

ABOUT ECONOVA

EcoNova has a proven track record in the design, construction and maintenance of potable water treatment, wastewater treatment and water recycling systems.

EcoNova is recognised as having the most advanced systems of ‘on site’ waste water and solid waste treatment known to exist.

EcoNova is an alternative to Local Authority Water and sewerage supply. EcoNova is a registered water service provider in Queensland, under the terms of Water Act 2000. This means that EcoNova has the same status a the Local Authority in terms of Water and sewer provision and can provide this service to any residential, commercial or tourism project in Queensland.

NOVACLEAR DESCRIPTION

The EcoNova NovaClear is a compact domestic wastewater treatment system which has been designed to treat domestic wastewater safely, to a standard suitable for surface irrigation.

The main tank is manufactured to Australian/New Zealand Standard 1546.1 and is constructed, along with the membrane filtration chamber and treated water storage chamber, from high density polyethylene.

Design Loading :

Hydraulic Loading : 2,250 litres per day maximum. Designed to treat typical wastewater only, within the following parameters – Blackwater, e.g. toilet waste, and Greywater, e.g. shower, bath, laundry, and kitchen wastewater.

Influent Loading : BOD_5 (biological oxygen demand) – 300mg/litre
SS (suspended solids) – 300mg/litre
Total Nitrogen – 45mg/litre
Total Phosphorous – 30mg/litre

Capacities :

Peak Design Capacity : 4550 litres maximum.
Normal Operating Capacity : 3000 litres – at minimum working level
Emergency reserve below system inlet : 1100 litres
Additional emergency reserve above system inlet : 450 litres

The main tank is designed as a receptor for incoming sewage and provides a buffering capacity at times of high load. In this main chamber the sewage is aerobically treated (with oxygen). This allows the microbes within the treatment plant to breakdown the impurities within the sewage.

Once the sewage has been treated to the required standard it is pumped into the Membrane Biological Reactor Chamber or MBR chamber.

The MBR houses the membrane filtration unit and air diffuser. Further aerobic (with oxygen) treatment occurs in this chamber and the treated water is drawn off through the membranes and pumped into the treated effluent chamber via a chlorinator.

When the treated effluent chamber has an adequate volume of water in it, the irrigation pump float switch will activate and pump the treated water through the irrigation system.

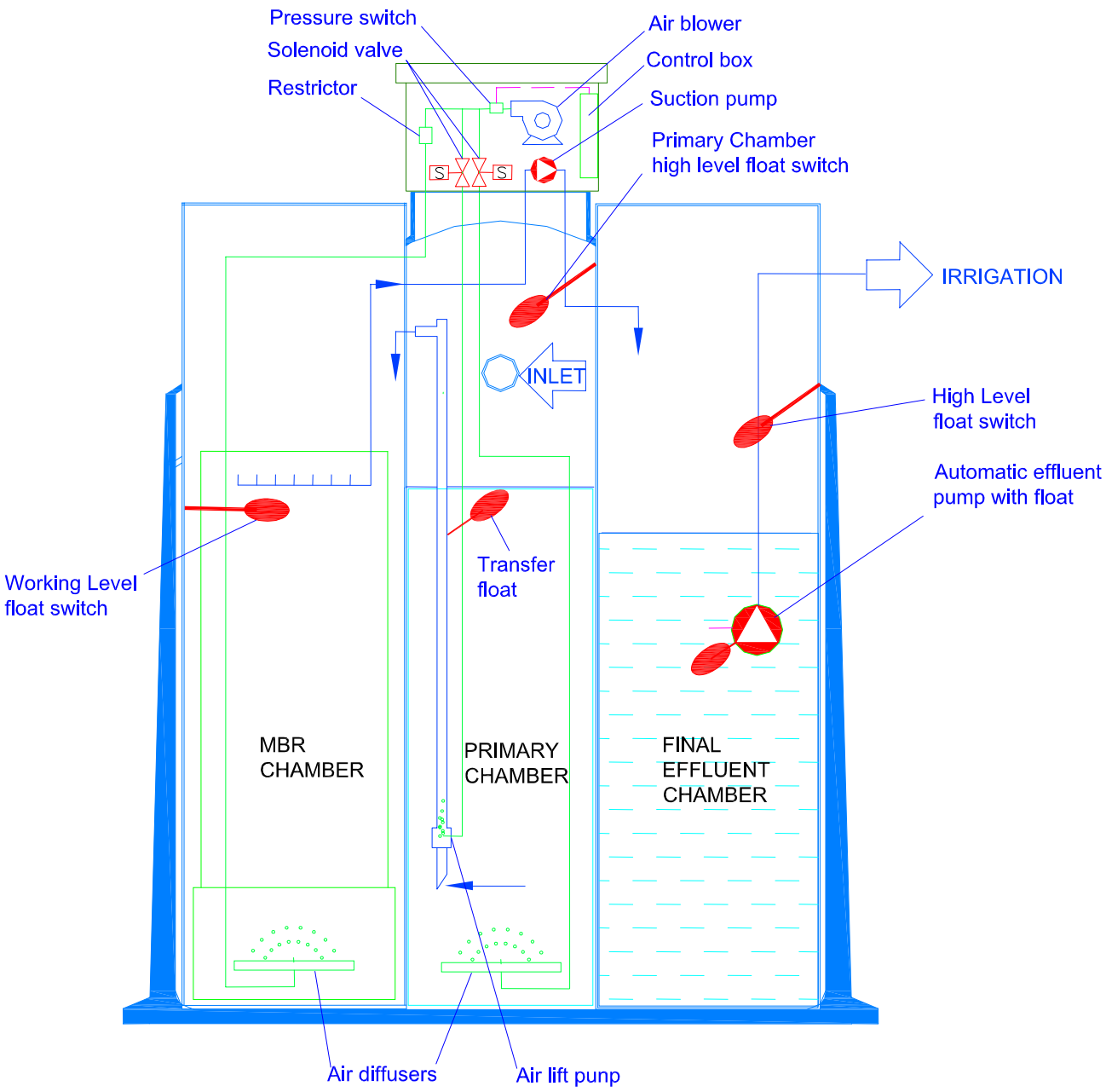
The control box houses:

The air blower, which supplies air to the diffusers.

The suction pump, which draws the treated water through the membrane filters and deposits it in the treated effluent chamber.

The control panel which ensures that the system operates effectively and generates alarms if abnormal conditions occur.

PROCESS FLOW DIAGRAM



TREATMENT PROCESS

Primary aeration chamber

This is the main receptor for incoming sewage. Sewage enters the chamber from the sewer connection. The incoming sewage is aerated on a cyclic basis (aerated for a set period followed by a set period where no air is added).

Air is supplied by an air blower housed in the control box mounted directly above the main tank. The aeration process allows micro-organisms contained within the MBR tank to mix with the wastewater and through biological activity break down and consume the organics and nutrients within the wastewater. Aeration is supplied to the primary chamber via a fine bubble air diffuser. Operation of the air blower is monitored via a pressure switch that activates the 'aeration fault' alarm, should the air output drop below the required limit.

The partially treated sewage is periodically pumped into the secondary MBR chamber for further aeration and filtration.

Frequency of operation of the transfer pump is determined by the hydraulic loading applied to the treatment plant.

In this type of AWTS there is almost no build up of excess sludge, as all of the organic matter and excess bio-mass should be oxidised, to keep the sludge build up within the aerated chambers to a minimum.

It should however be noted that the contents of the NovaClear may need to be removed and the process "re-seeded" if the microbes are subjected to discharges of toxic substances (see the section called 'optimising performance').

As a precaution sludge levels should be monitored and recorded at the prescribed service intervals to ensure the treatment process is working correctly. Your service agent will carry this out during normal servicing.

MBR chamber

The MBR chamber contains the membrane housing, membranes and diffuser assembly. The incoming sewage is aerated along with the existing biomass already contained within the MBR.

The MBR Tank is aerated by a diffuser attached to the bottom of the membrane housing. Air is supplied by an air blower housed in the control box mounted directly above the primary chamber. The aeration process allows micro-organisms contained within the MBR tank to mix with the wastewater and through biological activity break down and consume the organics and nutrients within the wastewater. Aeration is continuously supplied to the MBR chamber via a fine bubble air diffuser. Operation of the air blower is monitored via a pressure switch that activates the 'aeration fault' alarm, should the air output drop below the required limit.

The membranes are self cleaning, utilising the shearing action of the diffused air and mixed liquor as it rises, to scour the external face of the membranes breaking off any trapped particles, or build up of bio-mass. Transfer of the treated effluent through the membranes to the treated effluent chamber is controlled by a working level float. The float is set to operate at a differential of 200mm.

Primary disinfection is provided via the MBR process, membranes with a pore size of 0.2 microns are utilized allowing for removal of all faecal coliforms and a proportion of viruses.

Final effluent chamber

The final effluent chamber contains the effluent pump which is used to supply the irrigation system.
The treated effluent is discharged, automatically, through the irrigation system at a frequency determined by the level in the final effluent chamber.

Should the final effluent chamber reach a high level, a high level float switch is activated and the suction pump will be locked out to prevent overflow of the system.
If secondary disinfection is required, an ultra violet treatment unit, or a chlorinator are available as optional extras.

Control Box

The control box houses all of the electrical devices required to ensure that the Treatment Plant operates effectively and consist of:

- The air blower, which supplies air to the diffuser.
- The suction pump, which draws the treated water through the membrane filters and deposits it in the treated water chamber.

- The control panel, which ensures that the system operates effectively and generates alarms if abnormal conditions occur.

Control Philosophy

Incoming sewage enters primary aeration chamber through the incoming sewer line from the domestic property.

Should a high level occur within the primary tank a high level float (H/L) alarm switch situated within the primary aeration chamber activates a “high level” alarm.
Aerated, partially treated sewage from primary aeration chamber is periodically pumped to the MBR chamber via a transfer pump.

The level within the MBR chamber is maintained via a W/L (working level float) situated within the MBR chamber.

High -: activates suction pump and de-activates transfer pump.
Low -: De-activates suction pump and activates transfer pump.

An air blower situated within the motor box operates continuously providing an air supply to the MBR diffuser.

A pressure switch is fitted to the air blower circuit. If the pressure switch is not activated, indicating no air flow detected, then the “air blower alarm” will be activated and the suction pump will lock out.

A dedicated “aeration timer” controls the operation of the aeration solenoid valve. This allows air from the air blower to periodically feed the primary aeration tank diffuser.

A suction pump transfers the treated, filtered effluent to the treated effluent chamber. As the treated effluent enters the chamber it flows over the tablet chlorinator and double barrier disinfection is provided.

An automatic effluent pump discharges treated water to the irrigation area.

A high level float (H/L) alarm switch within the treated effluent chamber activates a “high level” alarm which will lock out the suction pump.

MAINTAINING THE NOVACLEAR

The NovaClear has been designed to give you years of trouble free wastewater treatment with little or no intervention by the owner. However it is very important that the NovaClear is serviced and maintained at four monthly intervals by a competent service engineer.

When the system is installed a “Licence to Operate a Sewage Management Facility” will be issued to you by the local council. In order that you comply with the licence you must have an annual service agreement in place.

Your responsibilities regarding operation and maintenance of the NovaClear are :-

- Ensuring that you have a continuous service agreement with a certified EcoNova service provider.
- Reporting any alarms to the service provider.
- Ensure that only domestic waste is put into the system.
- Ensure that no unusually high volumes of chemicals or household cleaners are put into the system. And that the products are used according to the manufacturer’s specifications.
- Advise the service provider if the system power is to be switched off for any period, or if the system is not going to be used for a period longer than six months.

The first years servicing is provided by EcoNova as part of the warranty period, following this you have the option of choosing your own maintenance and service provider, however EcoNova would be more than happy to extend the service agreement past the warranty period. Service people must be approved by EcoNova to ensure correct operation, and to avoid voiding any warranty conditions.

Each 4 monthly service will include a thorough inspection of all of the following:

- Tank structure.
- Control box structure.
- Visual inspection of:
- Incoming sewage.
- Activated sludge in MBR chamber.
- Quality of treated water.
- Suction pump and associated pipe work.
- Air blower and associated pipe work.
- Air diffuser and membrane assembly (6 monthly remove and clean)
- Control panel and alarms.

- Irrigation pump, pipe work and sprinklers or drippers.
- Security of lids and covers.
- Float switches
- Effluent quality, this will include checks on
    - pH.
    - Residual chlorine (if chlorinator is fitted).
    - Turbidity.
    - Solid levels.

At 12 month intervals samples of the final effluent should be tested in a laboratory for

- BOD_5 (Biochemical Oxygen Demand).
- Residual chlorine.
- Suspended solids.
- E. coli.
- MLSS (mixed liquor suspended solids) taken from both Primary and MBR chambers.

These results will indicate a more accurate value to determine the quality of effluent being produced.

Sample	**Test**	**Values**
Activated sludge	MBR tank MLSS	**3000mg/l – 12000mg/l** Minimum value - 3000mg/l Optimum value – 9000mg/l – 12000mg/l
	pH	6.5 – 8.0
Final Effluent	BOD	0 – 10 mg/l
	Suspended Solids	0 – 10 mg/l
	Residual Chlorine	0.5 – 2 mg/l
	E. coli	0 – 10cfu/100ml
	Nutrients (TN + TP)	As per License

Removal of excess sludge is only required infrequently if MLSS levels exceed 20,000 mg/litre. Service personnel will determine when this is necessary.
Excess sludge build up is dependant on system loading.

Following each visit a maintenance record will be completed and a copy provided to the homeowner. To ensure that the NovaClear is maintained and serviced correctly and at the required intervals, Econova will maintain a register of service intervals work carried out and test results.

TREATED WATER QUALITY

The NovaClear has been designed to produce treated wastewater to a very high standard. It should be clear and free from offensive odours and particulate matter and will be safe to apply to planted areas via surface irrigation.

The quality of the treated water discharged from the treatment plant will be:

Biochemical Oxygen Demand (BOD_5)..... <10mg/l

Suspended Solids (SS) ..... <10mg/l

Faecal Coliforms..... <10cfu/100ml

ALARMS LIST / ACTIONS

We recommend that fault finding be carried out by a qualified service technician to ensure that problems are not created.

We recommend that you contact your service person should any alarms be activated.

Alarm	Response
High level P Chamber (Primary chamber high level alarm)	Check transfer pump is plugged in, switched on and running. Check circuit breaker has not tripped. Check transfer pump is not blocked. Check high level float switch is not stuck in on position. Check that the MBR working level float switch is not stuck in the UP position.
Aeration fault (Air blower alarm)	Check air blower is plugged in, running and discharging an air flow. Check circuit breaker has not tripped. Check pressure switch air tube is connected at both ends.
High level E Chamber (Treated effluent chamber high level alarm)	Check effluent pump is plugged in, switched on and running. Check circuit breaker has not tripped. Check the treated effluent pump is not blocked. Check high level float switch is not stuck in on position. Check that the MBR working level float switch is not stuck in the DOWN position.
Circuit breaker tripped	Check transfer, treated effluent, and suction pumps for blockages or signs of over heating. Check that air blower is not faulty. Check for water ingress onto electrical components causing possible short circuit. (if in doubt switch off the unit and contact service engineer). Re-set breaker (once only) if breaker trips again contact service engineer.

OPTIMISING PERFORMANCE

The EcoNova NovaClear has been designed to give trouble free operation, without intervention, for periods of up to 4 months, however there are things which you can do to ensure that the treatment plant continues to operate at its best.

Sewage treatment is a natural, biological process which utilises living organisms to breakdown the impurities in wastewater. These organisms are normally quite hardy and robust but can be affected by small doses of strong household chemicals or high doses of some milder chemicals.

<u>Important:</u> Please don't put industrial chemicals, paint or fuels into the system as they will kill the bacteria utilised in the wastewater treatment process.

EQUIPMENT SPECIFICATIONS

Primary Chamber

Number of tanks	1
Tank Capacity	4550Litres
Overall Tank Height	2300mm
Tank Diameter	2000mm
Tank Construction	Heavy Duty Polyethylene
Tank installation	Below Ground

MBR Chamber

Tank Capacity	610 Litres
Overall Tank Height	2200mm
Tank Diameter	600mm
Tank Construction	Heavy Duty Polyethylene
Tank installation	Below Ground

Treated Effluent Chamber

Tank Capacity	610 Litres
Overall Tank Height	2200mm
Tank Diameter	600mm
Tank Construction	Heavy Duty Polyethylene
Tank installation	Below Ground

Aeration Equipment – Primary and MBR Chambers

Number of Air Blowers	1
Air Blower Type	Diaphragm
Number of Air Diffusers	2
Air Diffuser Type	Fine Bubble – Membrane

Membrane Units

Membrane Type	Submerged Flat Sheet Microfilter
Number of Membranes plates	7
Max. Flow rate / MBR	2.8KL/d

Membrane Material	Polyethersulfone
Dimensions	490mm (W) x 1200mm (H) x 16mm
Pore size	0.2 μm
Initial Flux (LMH) by pure water	410
Suction pressure	0.6kgf/cm2~0

Design Specification

Application :	Separated Sludge by submerged membrane into activated sludge tank
Operating Type :	Suction Type
Demand of Air Diffusion :	10~12 ℓ/min per module
Differential Pressure :	It should be under 25cmHg (However, it depends on the activated micro-organism)
Cleaning Chemical :	Sodium Hypochlorite (NaOCl : 0.2%~0.5%)
Temperature Range :	5~45 °C
pH :	3~13

Transfer Air Pump

Number of Pumps	1
Type of Pump	Air pump
Pump output	18 litres/min

Suction Pump

Number of Pumps	1
Type of Pump	Diaphragm pump
Pump Output	2 litres/min

Effluent Pump

Number of Pumps	1
Type of Pump	Submersible
Pump Output	40 litres/Min @ 14M head

WARRANTY

Statement of Serviceable Life

The NovaClear Wastewater Treatment Unit has been constructed using quality materials and has been meticulously checked and rigorously tested to ensure that it provides many years of trouble free service in the harsh environment in which it operates.

We at EcoNova are very confident about the reliability of the systems we design and construct.

To demonstrate our confidence in the units we produce we offer the following warranties:

Electrical equipment	**2 years**
Mechanical equipment	**2 years**
Membranes	**3 years**
Polyethylene tanks	**15 years**

This warranty is a return to base warranty which means that the item must be returned to EcoNova for repair.

Any warranty claim is limited to the cost of replacement or repair of defective equipment.

This warranty is only valid when the equipment has been used in a normal manner and in accordance with the owner's manual, and has been serviced at the proscribed service intervals by a service person approved by EcoNova.

This warranty does not cover any equipment that has been improperly installed, misused, neglected, damaged in transport, or repaired or modified without the authorisation of EcoNova.

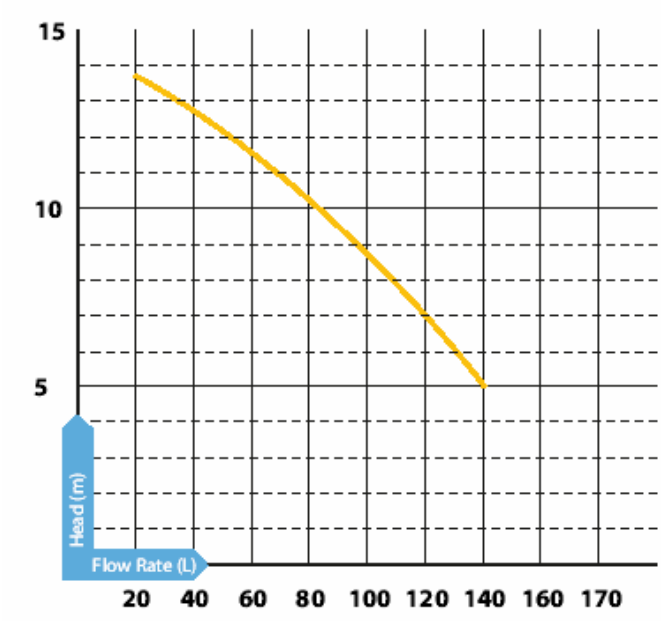
This warranty does not cover a service agent's time for removal or replacement of any faulty equipment, or for any travel expenses (such as vehicle and travel time).

Any warranty work will not be carried out unless the owner of the system has accepted the price quoted for any expense not covered by the warranty.

TREATED EFFLUENT PUMP

The ClayTech Bluesub 15 is unique, designed specifically for the Australian waste water treatemnt system. It was designed for above surface irrigation applications. The unique design allows the pumping system to operate at the best efficiency point of the pump during normal operation. This means longer pump life.
Most comparable pumps on the Australian market have a maximum head capacity of 11m. This means that they operate towards the top of their curve under normal operating conditions. This causes a reduction in the pumps life expectancy. The BlueSub 15, at 10m head is at the centre of its curve, and still produces 80 lpm.

Model	BlueSub15
Voltage	240
Power Absorbed (W)	750
Max Head (m)	14.5
Max Flow Rate (L/min)	170
Outlet Size	1 1/4 "
Pump Diameter (mm)	150
Height (mm)	325
Weight (kg)	5



SUCTION PUMP Johnson Aquastar WPS 2.4

The WPS 2.4 is a five chamber positive displacement diaphragm pump. This pump is the ideal choice or pressurizing water in a closed system.
It can easily build the pressure required for a pressurized water supply system.

Features

- Quiet operation
- Smooth flowing
- Self priming
- Integrated pressure switch turns pump on and off automatically when tap is opened and closed
- Dry running without damage
- Low power consumption
- Quick disconnect fittings

Working principle

As the pump runs, pressure builds until reaching 2.8 bar/41 psi. At this point, the integrated pressure switch automatically shuts the pump off. The pump is equipped with positively checking outlet valves which ensure that the pressure is maintained after the pump shuts off. When water is demanded (at the faucet, shower et.c.) the pressure decreases. After a moderate drop in pressure, the integrated pressure switch automatically turns the pump back on.
Due to it's durable construction and thoughtful design, the WPS 2.4 pump will provide many years of service.
Important! The pressure setting of this pump is made at the factory.
Warranty invalidated by pressure switch interference.

Design features

Pump body:	Nylon/Polypropylene
Valve housing:	Polypropylene
Valves:	Santoprene/EPDM
Connection:	3/8" BSP or 1/2" hose (ø 13 mm)[WPS 2.4, 3.4 & 5.0] 1/2" BSP or 3/4" hose (ø 18 mm)[WPS 3.4 & 5.0]

Fuse size

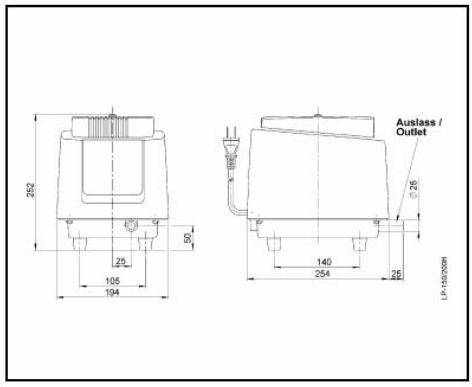
WPS 2.4 & 3.4 12V 10 amp

Air Blower LP 150H

Linear Diaphragm Pumps
LP-150H, LP-200H

Rietschle Thomas
A Thomas Industries Company

Flow at rated pressure **150 to 200 l/min**



Pneumatic Data		
Description	LP-150H	LP-200H
Part number	52500150	52500200
Flow at rated pressure	150 l/min	200 l/min
Rated pressure	200 mbar	200 mbar
Operating range	100 to 300 mbar	100 to 300 mbar

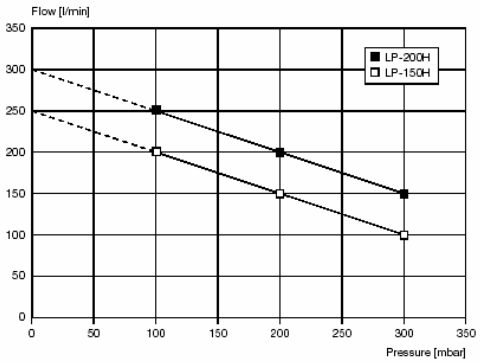
Electrical Data		
Motor type	Linear drive	Linear drive
Voltage	230 V 50/60 Hz	230 V 50/60 Hz
Consumption at free flow	1,4 A/185 W	2,4 A/270 W
Consumption at rated pressure	1,2 A/135 W	2,3 A/220 W

General Data		
Ambient temperature	-10 to 40 °C	-10 to 40 °C
Weight	11,0 kg	11,0 kg
Outlet diameter	26 mm	26 mm
Average noise level	43 dB (A)	44 dB (A)

Service Parts	Part Numbers	
Chamber block set	700042	700042
Air filter and gaskets kit	700048	700048
Air filter kit	700171	700171
Protective switch	700149	700149

Please refer to operating instructions and service manual for additional information.
All listed values are measured at standard atmospheric conditions and at 50Hz.

Flow Curves



Service parts:

Chamber block consists of:
2 x Pump head
2 x Valve plate gasket
2 x Pump body with valves
2 x Diaphragm
2 x Diaphragm ring
2 x Diaphragm nut
2 x Diaphragm washer

Filter and gaskets kit consists of:
1 x Air cleaner element
1 x Air cleaner gasket
1 x Tank gasket
2 x L-Hose
2 x L-Clamp

Air filter kit consists of:
5 x Air cleaner element
5 x Air cleaner gasket

Protective switch consists of:
1 x Microswitch with bracket

Supplied as standard:

Cable/Euro-plug

Air connector (part number 700050) consists of:
1 x Outlet hose, 150 mm
2 x Hose clamp