novaclear™
WATER RECYCLING
The Safe Choice System

Water Gurus
waterwise technologies

WATER RECYCLING

Domestic AWTS

(Aerated Wastewater Treatment System)

Owners Manual

Make the Safe Choice

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NOVACLEAR™ - THE SAFE CHOICE SYSTEM

Congratulations on buying NovaClear – The Safe Choice System, manufactured by WaterGurus.

You can be sure that when you choose 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 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 WATERGURUS

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

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

WaterGurus is an alternative to Local Authority Water and sewerage supply. WaterGurus is a registered water service provider in Queensland, under the terms of Water Act 2000. This means that WaterGurus 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 NovaClear™ is a compact, lightweight, single tank domestic wastewater recycling system which has been designed to recycle all domestic wastewater using MembraneSafe™ technology. The resulting treated water quality is ideal for irrigation and selected household reuse.

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 (toilet waste)
	– Greywater (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 :	
Total system volume:	4550 litres maximum.
Emergency reserve above highest normal working level:	1100 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.

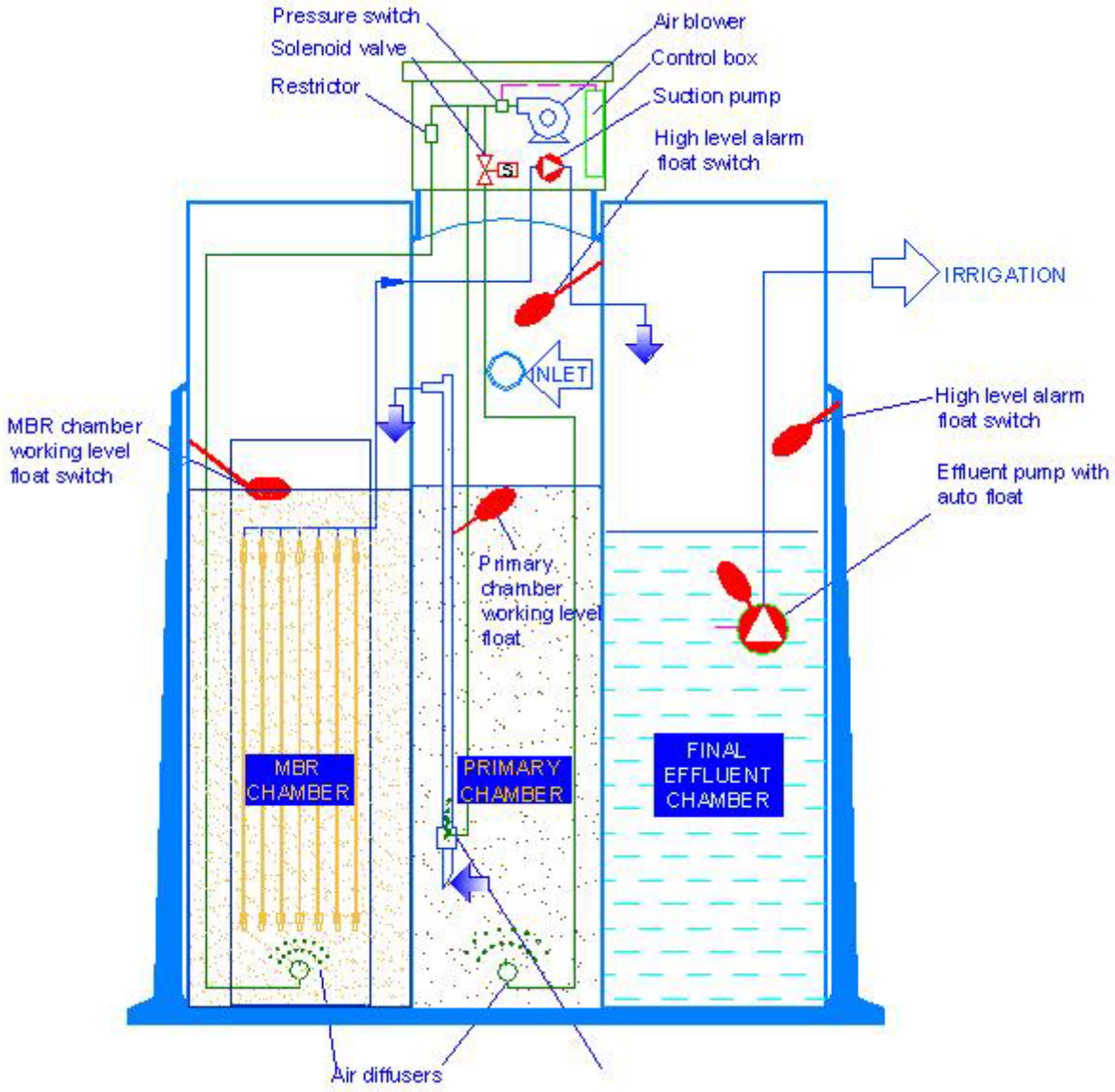
The MBR houses the membrane filtration unit and air diffuser. Further aerobic (with oxygen) treatment occurs in this chamber and the treated water is drawn off through the membranes and pumped into the treated effluent chamber.

When the treated effluent chamber has an adequate volume of water in it, the irrigation pump will turn on automatically and pump the treated water to the irrigation system.

The motor box houses:

- The air blower, which supplies air to the aeration diffusers, and the CTS.
- The suction pump, which draws the treated water through the membrane filters and deposits it in the treated effluent chamber.
- The control box 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 motor box mounted directly above the main tank. The aeration process allows micro-organisms contained within the primary and MBR chambers 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.

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

The flow rate of the Carlyle Transfer System (CTS), from the primary chamber to the MBR chamber is determined by the hydraulic loading applied to the treatment plant.

In this type of AWTS there is limited 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 motor 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 coarse bubble air diffuser.

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.

Primary disinfection is provided via the MBR process, membranes with an average 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.

MOTOR 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 box, 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 continuously pumped to the MBR chamber via the CTS (Carlyle Transfer System).

The level within the MBR chamber is maintained via the drain hole back into the primary chamber. Should the transfer from the primary chamber to the MBR chamber stop, the MBR working level float drops and turns off the suction 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 fault 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. It is typically set at 60 minutes on, and 60 minutes off.

A suction pump transfers the treated, filtered effluent from the MBR chamber to the treated effluent chamber.

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. (I.e. should there be a problem with the pump or irrigation connections)

MAINTAINING THE NOVACLEAR™

The NovaClear has been designed to give you years of trouble free wastewater recycling with little or no intervention by the owner. However it is very important that the NovaClear is serviced and maintained at three or four monthly intervals (depending on which state your system is installed in) 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

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

- Ensuring that you have a continuous service agreement with a certified NovaClear 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.
- Try using baking soda, vinegar or a mild soap solution.
- 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 three months.

Maintenance and Service providers must be approved by WaterGurus to ensure correct operation, and to avoid voiding any warranty conditions.

Each 3 or 4 monthly service will include a thorough inspection of all of the following:

- Tank structure.
- Motor 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.

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.

Please note that toxic substances may have an effect on the sludge levels and may greatly affect the need for, or frequency, of pump outs.

To minimise unnecessary pump outs please ensure that you follow the guidelines in section 9.

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

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, WaterGurus 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 suction pump is plugged in, switched on and running. Check circuit breaker has not tripped. Check CTS is not blocked. Check high level float switch is not stuck on. I.e. 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 the irrigation area connections for blockages, e.g. taps turned off. Check high level float switch is not stuck on. I.e. in the up 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 NovaClear system 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.

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

In addition to this, **in-sinkerators can not be used** with the NovaClear system.

YOUR RESPONSIBILITIES

Please ensure that you, or your visitors, don't put these or similar items down the toilet:-

- Nappy liners
- Moistened wipes, e.g. 'Wet Ones' or 'Baby Wipes'
- Feminine hygiene products
- Condoms - Please discard these with normal household garbage. Their poor biodegradability may damage or overload the NovaClear:-
- Cooking oil or grease
- Kitchen scraps

Things you can do in the bathroom:

- repair leaking taps
- install a low flow shower head to save water
- don't leave taps running unnecessarily
- install a dual flush cistern
- investigate the use of biodegradable products such as toilet paper

Things you can do in the kitchen:

- use a sink strainer, this will prevent food scraps from getting into the system
- don't pour oils and fats down the sink
- wipe scraps and fats off plates and pans before washing
- use detergents labelled as being low in phosphates, nitrates and sodium

Things you can do in the laundry:

- wash you laundry in stages over several days, this will avoid flooding the system with large amounts of water at one time
- Use low-phosphorous or phosphorous free detergents

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

TREATED EFFLUENT CHAMBER

Tank Capacity	600 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)x1200mm(H)x16mm
Pore size	0.2 µm average
Initial Flux (LMD) 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

CARLYLE TRANSFER SYSTEM (CTS)

Number of Pumps	1
Type of Pump	Air pump
Pump output	Varies with loading

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™ Domestic Water Recycling System 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 WaterGurus 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 WaterGurus 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 WaterGurus.

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

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).

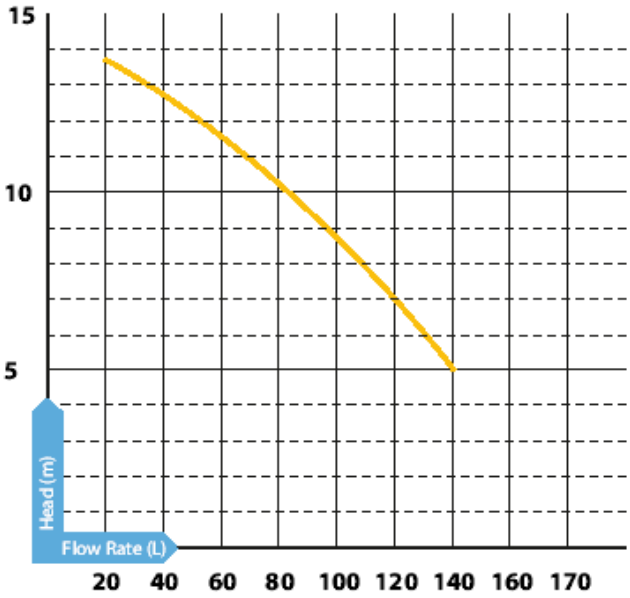
Any warranty work will not be carried out unless the owner of the system has accepted the price quoted for any expense not covered by the warranty.

EQUIPMENT MANUALS

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 2.9

The WPS 2.9 is a five chamber positive displacement diaphragm pump.

Features

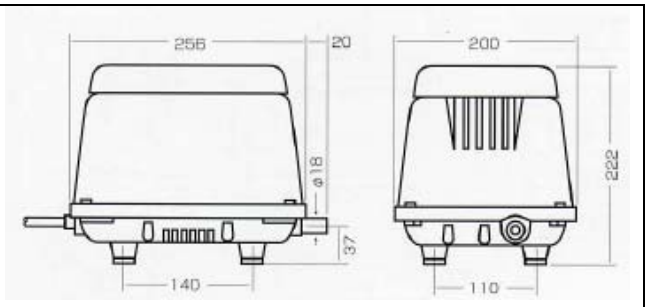
- Quiet operation
- Smooth flowing
- Self priming
- Dry running without damage
- Low power consumption
- Quick disconnect fittings

Due to its durable construction and thoughtful design, the WPS 2.9 pump will provide many years of service.

Design features

Pump body:	Nylon/Polypropylene
Valve housing:	Polypropylene
Valves:	Santoprene/EPDM

AIR BLOWER HP 150



SPECIFICATIONS

HP - 150
HP - 200

TYPE		HP-150		HP-200	
Rated Voltage	V	240			
Power Supply Frequency	Hz	50	60	50	60
Normal Pressure	kPa	20.0			
Exhaust Volume	l/min	150		200	
Power Consumption	W	125	155	210	250
Noise level	dBA(1m)	45.0	47.0	46.0	48.0
Weight	kg	9.0		9.0	

PERFORMANCE CURVES