



Operator's Manual

MANSLV-1 - Rev C October 2018

500 Litre Linkage Oktopus Sprayer



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YOUR SPRAYER DETAILS

Record the details of your sprayer here for future reference when discussing service with your Silvan dealer, ordering parts or making a warranty claim.

SERIAL NUMBER _____

MODEL _____

DATE OF DELIVERY _____

SELLING DEALER _____

ADDRESS _____

New Product Warranty

Silvan Australia Pty. Ltd. builds equipment to a high level of specification using components from quality suppliers. The following information is provided to assist you with any repairs required within the warranty period. All warranty repairs on Silvan products are carried out by Silvan dealers. If any warranty repairs are required on Silvan products, it is recommended that the product be returned to the place of purchase. It is good practice to keep a record of equipment maintenance both during and after the warranty period.

The warranty policy below explains the extent and limitations of your Warranty coverage on Silvan Products.

This warranty is the only warranty applicable to Silvan new products ('Products') and, to the maximum extent permitted by law, is expressly in lieu of any other conditions or warranties expressed or implied in relation to the Products.

Subject only to legislative obligations to the contrary, Silvan shall not be liable for incidental or consequential damage resulting from ownership or use of a Product. Silvan does not authorize any person to create for it any other obligation or liability in connection with these products.

Silvan warrants its authorised Dealer, who in turn warrants the original purchaser (owner) of each new Silvan product that it will repair or replace the product, or, pay the cost of repair or replacement, as determined by Silvan without charge for labour or any defective or malfunctioning parts in accordance with the warranty limitations and adjustment schedule below.

The warranty period begins on the date the product is delivered to the first retail purchaser for a period of 12 months

This Warranty Covers: Only conditions resulting directly from defects in workmanship or material under normal use and service.

Warranty Exclusions: The Warranty does not cover:

- Conditions resulting from misuse, use of incompatible chemicals, exceeding machine specifications including overloading, impact damage, negligence, accidental damage or failure to perform recommended maintenance services.
- Any product which has been repaired by other than an authorised Silvan service outlet in a way which, in the sole and absolute judgement of Silvan, adversely affect its performance or reliability.
- The replacement of maintenance items such as diaphragms, batteries, V belts and ground engaging components, etc.
- Loss of time, inconvenience, loss of use of the product, liability to third parties or any other consequential damages.
- Incidental costs associated with a warranty repair including any travel costs, out of hour's labour charges, cleaning costs, transportation costs, freight costs or any communication costs.
- The repair of a defective product qualifying under this warranty will be performed by any authorised Silvan service outlet within a reasonable time following the delivery of the product, at the cost of the owner, to the service outlet's place of business. The product will be repaired or replaced, using new parts supplied by Silvan. Silvan, at its absolute discretion, may choose to pay the cost of replacement or repair of the product.

The owner is responsible for the performance of regular maintenance services as specified in the Owner/Operator Manual applicable to the product. Failure to carry out regular maintenance may invalidate warranty.

Specifications

General

Silvan Linkage Oktopus Air Assist sprayers are for use in the application of agricultural chemicals in vineyards, berries and trellis crops. The sprayers use a high pressure pump and nozzles to atomise the chemical solution, together with a turbine fan and multiple air outlets to distribute the spray.

Tank

Polytuff impact resistant polyethylene.
Capacity 500 litres with calibrated level indicator.
Offset, non spill screw down lid of 255 mm diameter with basket strainer.
Continuous by-pass agitation in bottom of tank.

Pump

Constant displacement oil backed diaphragm pump with Nitrile diaphragms and corrosion resistant, anodised aluminium body.
Pump Model
500 litre APS-96
Pump output and maximum operating pressure at 540 PTO rpm as shown below.

Pump No.	Output		Max. Pressure	
	l/min	gpm	Bar	psi
APS-96	94	20.6	40	580

Fan

The Silvan Oktopus sprayer uses a turbine fan (or centrifugal wheel) 450mm diameter with multiple (5+5) adjustable air ducts with diffusers. The fan unit has a polyethylene cowl with expansion chamber and protective mesh screen.
Two speed oil bath gearbox with neutral position
Max.Speed 540 PTO rpm 2,700 rpm
Air speed – 450 dia fan 80 m/sec
Capacity - 450 dia fan 14,000 m³/hr

PTO Drive

Quality 540 rpm telescopic drive PTO shaft with safety shields.

Controls

12 volt electric valve set with manual pressure regulator, master valve, section valves for left/right sides and electric pressure adjustment. In cab switch box control.

Nozzles

10 twin non-drip nozzles for easy changing of application rate. Flip over action to turn on or off.
Brass body with removable hollow cone ceramic jets.

Filtration

Three stage filtration with removable elements.
Tank lid strainer 18 mesh.
Suction line filter 50 mesh (blue).
Pressure line filter 80 mesh (yellow)

Frame

Heavy duty galvanised steel construction.
Reversible Category I and II linkage pins on 500 litre sprayers.

Optional Equipment

Automatic rate controller

Dimensions and Weights

With PTO drive and standard equipment fitted.
Length **L**, width **W**, height **H**, all in (mm).
Mass **M** (kg) with tank empty.
To calculate gross mass with tank filled add 1 kg per litre of tank capacity.

500 litre **L**1400 **W** 1190 **H** 2500 **M**140

Power Requirement

Minimum tractor PTO horsepower at 540 rpm.
500 litre 50 HP

Safety Information



Before operating the sprayer read the following safety instructions. Failure to comply with these warnings may result in serious injury or death.

Whilst your Silvan Oktopus Air Assist Sprayer has been designed and manufactured to incorporate all necessary safety features it is essential that any person who operates or works on the machine is aware of the safety precautions that should be exercised.

- ▲ This sprayer is designed and manufactured solely for the purpose of applying agricultural chemicals to crops. Under no circumstances should it be used for any other purpose.
 - ▲ Before using the sprayer carefully read and ensure you understand the contents of this manual and any other manual supplied with the sprayer.
 - ▲ Before operating the sprayer read all the safety warnings which are carried on various parts of the machine. Refer to the next two pages for a location diagram and the wording of these warnings.
 - ▲ Never allow an inadequately trained person to attach or operate the sprayer.
 - ▲ Do not operate the sprayer whilst wearing loose clothing, unrestrained long hair, jewellery or anything which could become entangled in rotating components or limit your vision.
 - ▲ Only operate the sprayer on a tractor fitted with a roll-over protective structure (ROPS), or a cab incorporating a ROPS, complying with AS1636 or equivalent.
 - ▲ Wear ear protection when operating the sprayer on a tractor that is not fitted with a sound proofed cabin.
 - ▲ Ensure the power of the tractor is suitable for the loaded weight and power requirement of the sprayer. Refer to the tractor operator's manual for safe working loads and relevant tractor safety instructions.
 - ▲ Exercise extreme care when operating in hilly or uneven terrain to ensure proper stability. Adjust the tractor wheel track for maximum stability on side slopes. Refer also to the tractor operating and safety instructions.
 - ▲ Do not allow any person to ride on the sprayer or tractor whilst it is in motion. Keep clear of sprayer wheels whilst the unit is motion.
 - ▲ Do not operate the sprayer at speeds greater than 540 PTO rpm.
 - ▲ Do not operate the sprayer without all the tractor and sprayer safety shields in place. Carefully check that PTO and driveline shields are correctly installed.
 - ▲ Stop the tractor, disengage the PTO, apply the parking brake and switch off the tractor engine before performing any service work on the sprayer.
 - ▲ Disconnect the PTO shaft at the tractor and ensure the sprayer is properly supported and restrained before performing any maintenance work.
 - ▲ **Before use of any chemicals** refer to the chemical manufacturer's label and safety instructions for safe handling procedures and correct method of use. Always use the recommended personal protective clothing and equipment. Dispose of empty chemical containers in accordance with the instructions supplied by the chemical manufacturer.
 - ▲ Always wear gloves when removing and cleaning filters.
 - ▲ Ensure that all operators and associated personnel are familiar with the legal regulations and codes of practice that apply to the safe use, storage and disposal of spray chemicals.
- Do not enter the sprayer tank under any circumstances.** If service to the tank is required contact Silvan for correct maintenance procedures.

Safety Information



The locations of the safety decals fitted to Oktopus Air Assist Sprayers are shown in the pictures below. The wording of the decals is shown on the following page.

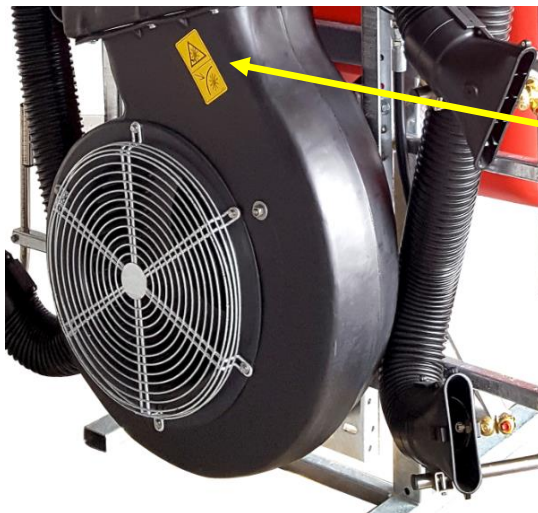
It is important that all operators read and follow the information on all safety decals before operating the sprayer.

Failure to comply with these warnings could result in serious injury or death.

Safety decals should be kept clean and legible at all times. If any decals are missing or unreadable they should be replaced by ordering new decals from your Silvan dealer using the part numbers shown.



Warning decal front corner of tank



Warning decal at fan rear

Safety Information

Wording of Safety Warnings



The wording of the safety decals shown on the previous pages is given below.
Before operating the sprayer read all safety warning decals.
Failure to comply with these warnings could result in serious injury or death

**WARNING**

BEFORE APPLYING CHEMICALS WITH THIS SPRAYER READ THE LABEL OF THE CHEMICAL MANUFACTURER OR SUPPLIER FOR THE RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT AND USE IT AS RECOMMENDED.

READ THE OPERATORS INSTRUCTION MANUAL BEFORE ATTACHING OR USING THIS PRODUCT.

REFER TO YOUR VEHICLES OPERATION MANUAL FOR THE MAXIMUM LOAD LIMITS AND OPERATING PROCEDURES.

DO NOT EXCEED SPECIFIED SAFE LOAD CARRY AND TOWING CAPACITIES. STABILITY OF THE VEHICLE CAN BE AFFECTED BY THE ATTACHMENT'S WEIGHT AND WEIGHT MOVEMENT.

REDUCE THE SPEED OF THE VEHICLE WHEN CARRYING AN ATTACHMENT AND ALLOW GREATER DISTANCE FOR BREAKING.

DO NOT RIDE ON THIS MACHINE.

DANGER

DISCONNECT TRACTOR BEFORE ADJUSTING, SERVICING, CLEANING OR INSPECTING SPRAYER.

KEEP CLEAR OF OPERATING MACHINERY.

DO NOT OPERATE WITHOUT GUARDS OR SHIELD IN PLACE. FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

IMPORTANT

P.T.O SPEED MUST NOT EXCEED 540 R.P.M & ENSURE P.T.O SHAFT IS CORRECT LENGTH.

EACH DAY: GREASE TELESCOPIC TUBE ON P.T.O SHAFT, GREASE UNIVERSAL JOINTS, CLEAN SUCTION STRAINER, CHECK PUMP OIL LEVEL, FLUSH OUT PUMP WITH WATER AFTER USE. FOR GENERAL MAINTENANCE, REFER TO THE INSTRUCTION MANUAL.

DEC 101213P

Part Number DEC101213P



**DANGER**



ROTATING DRIVELINE
CONTACT CAN CAUSE DEATH
KEEP AWAY!

DO NOT OPERATE WITHOUT —

- ALL DRIVELINE, TRACTOR AND EQUIPMENT SHIELDS IN PLACE
- DRIVELINES SECURELY ATTACHED AT BOTH ENDS
- DRIVELINE SHIELDS THAT TURN FREELY ON DRIVELINE

399141000 MADE IN ITALY



Part Number 399 14 1000

Installation

Attaching to the Tractor

The 500 litre Oktopus sprayer is equipped to fit tractors with either Category I or II linkage systems. The inner end of each lower linkage pin is Category I diameter and the outer end is Category II. The lower holes in the top connection plates are Category I diameter and the upper holes are Category II. For best stability install the lower linkage pin with the end which is to be used to the outside.

Remove the PTO shaft from the sprayer by depressing the locking pin. Lower the tractor linkage and attach to the sprayer's lower hitch pins of the appropriate category, then connect the upper linkage arm using the tractor's link pin. Secure all link pins with the tractor's link pins. Raise the tractor linkage to the desired spraying height and level the sprayer by adjusting the length of the top linkage arm.

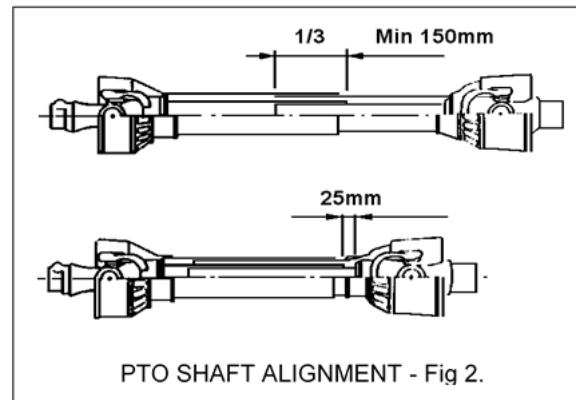
Clean and grease the splines on the tractor and sprayer PTO stub shafts and install the PTO shaft making sure that the spring-loaded locking pins engage in the grooves of both stub shafts. Ensure that the tractor's PTO shaft guard is attached to the tractor.

PTO Shaft Length

Note: Upon delivery of a new sprayer it is the selling dealer's responsibility to install and set the PTO shaft to the correct length. The following information is provided for reference.

Set the linkage height so the ends of the two drive shafts are at their closest. Install the PTO shaft making sure there is at least 25mm of telescopic travel remaining between the male and female sections. Raise and lower the sprayer to check that the PTO telescopic tubes overlap by approximately 1/3rd their length, and not less than 150mm, in all operating positions. See fig.2

If the PTO shaft must be shortened cut equal amounts from both male and female shafts and safety covers. Carefully remove all burrs then clean and relubricate before reassembling.



Cabin Mounted Control Box

Connect the electrical cables provided for the switch box directly to the battery.

Positive = Red Negative = Black

If the cable needs to be extended it is important to use wire of the same diameter. These cables supply power to the electric valves.

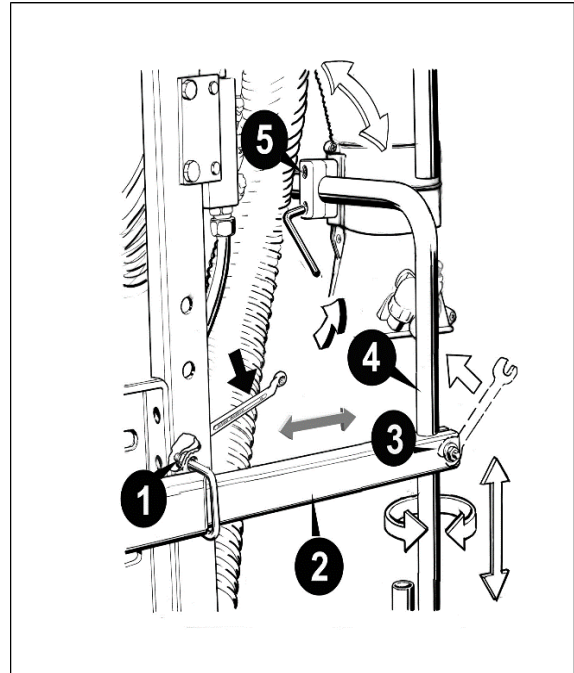
If an automatic rate controller is used refer to appropriate installation manuals.

Run the controller wiring loom back to the sprayer through a convenient outlet in the tractor cabin, ensuring that it does not rub on any sharp edge. Connect the tractor loom to the sprayer loom at the quick release coupling and ensure that all wiring is clear of the PTO shaft and tractor wheels.

Installation

Adjusting the Air Diffusers.

The fan unit has multiple diffusers, Silvan units are fitted with a 5+5 configuration. All of the diffusers are fully adjustable in width, height and angle.



The above illustration shows the adjustment of each individual module (diffuser + nozzle).

Width: Loosen the U-bolt (1) and slide the inside RHS (2) to the desired width. Re-tighten the U-bolt.

Height: Loosen the 8mm bolt (3) and slide the tube outlet mount (4) to the desired height. Re-tighten the bolt.

Forward/Rearward tilt: Loosen the bolt (3) and rotate the tube outlet mount (4) to the desired angle. Re-tighten the bolt.

Upward/Downward tilt: Loosen the 2 Allen head bolts (5) under the plastic outlet and tilt to the desired angle. Retighten the bolts.

Operation

Starting the Sprayer

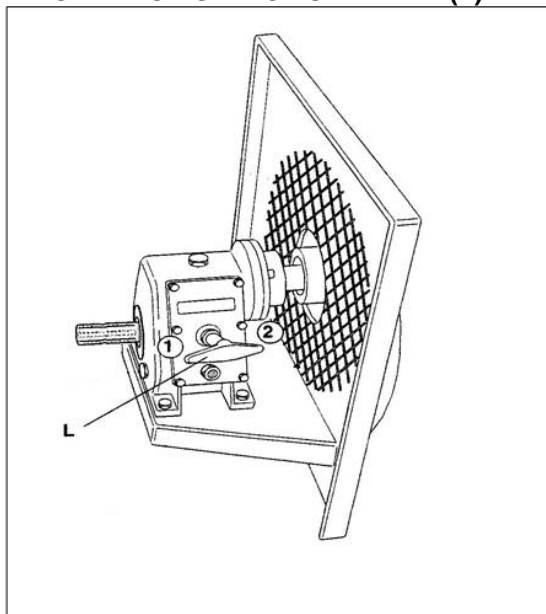
Before starting the sprayer for the first time grease all lubrication points including the PTO shafts. Check that the oil level in the diaphragm pump is level with the mark in the viewer and if necessary top up with SAE 20W-50 multigrade engine oil. Ensure that the gearbox oil level is correct.

Refer Maintenance section for details.

First conduct a trial using clean water only (no chemicals) to become familiar with the controls and to check that all systems are functioning correctly without leakage.

Check that the fan gearbox is engaged and the required speed is selected. Never engage the fan drive with the tractor engine running or the PTO engaged. Moving the gearbox lever to the high position produces maximum airflow. The low position produces less airflow and can be used for small or early season canopies. The neutral position enables the pump to be operated without the fan for putting chemicals into the tank, hand spraying or similar operations.

GEARBOX SELECTION LEVER (L)

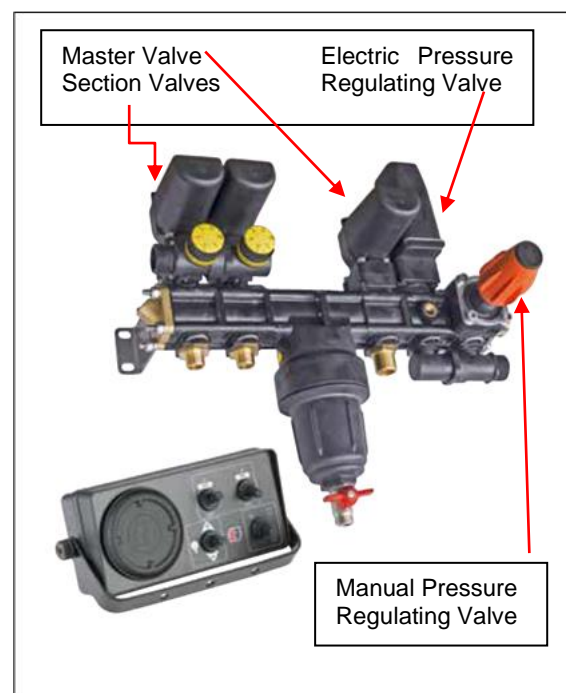


The fan incorporates a centrifugal clutch which protects the gearbox and driveline if the PTO is engaged rapidly. The sprayer should always be operated at 540 PTO rpm to ensure correct operation of the centrifugal clutch and to prevent its premature wear. With electric valve controls, switch the Master valve to the "Off" position before engaging the

PTO. This places the pump into by-pass mode and closes the outlet valves to the spray nozzles on either side of the sprayer. Engage the PTO slowly and allow the sprayer to run in by-pass mode. Once the pump is primed increase the tractor speed to 540 PTO rpm.

Flip the required number of spray nozzles to the open position. Refer to the Calibration section for information on nozzles and jet selection.

Electric Motor Valves



The electric valves consist of a master valve to switch from bypass to pressure, section valves for left and right side nozzles which incorporate regulating bypass compensators and an electric pressure adjusting valve to fine tune the spraying pressure. The compensating ports fitted to the section valves, when adjusted correctly, will keep the system pressure at the same level when individual sections are turned on and off.

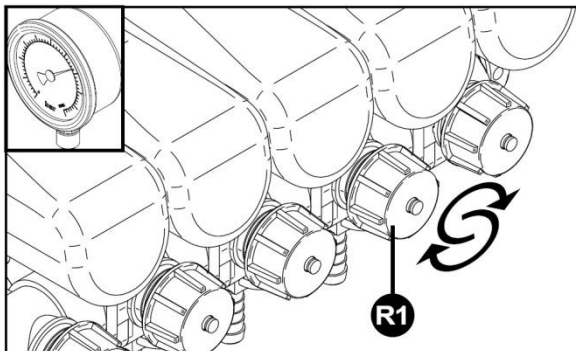
Operation

Pressure Adjustment

With the section switches turned Off and the Master switch turned On maximum pressure can be set by the Manual Pressure Regulating Valve. A clockwise rotation increases pressure and an anticlockwise rotation reduces pressure. If the desired spraying pressure cannot be obtained with the Manual Pressure Regulating knob then holding up the toggle switch on the control box will close the Electric Pressure Regulating Valve and increase the system pressure and vice versa.

To adjust the compensation ports:

Start the sprayer and set the spray pressure with the master On and all sections On. Then turn off the first section and adjust the compensation knob R1 until the pressure is exactly the same as it was with all sections on. Turn the section back on and off to check the remains constant. Turn all sections on again and repeat for the remaining sections. The sprayer is then adjusted correctly.



Adding Chemicals



Before adding chemicals read and follow the chemical manufacturer's instructions and wear the recommended protective clothing.

Chemicals are added to the tank through the top lid opening.

Take care to avoid the spillage of chemicals or mixed solution. Wear gloves, eye protection and the recommended protective clothing whilst filling with chemicals. Wash your hands after filling if they have come into contact with concentrate or mixed solution.

Store unused chemicals and dispose of empty chemical containers as recommended by the chemical manufacturer or relevant authority.

Emptying the Sprayer

At the end of each day partly fill the tank with water and run this through the pump, spray lines and nozzles to purge them of chemicals. Use a cleaning agent such as Silvan All Clear tank cleaner.

Rinse the tank through the lid and empty with the drain valve to remove powdered material. Never leave chemicals in the tank that could settle to the bottom and break into lumps that may block the suction filter.

Dispose of unused chemical mix, rinse water and containers as recommended by the chemical manufacturer or government authority.

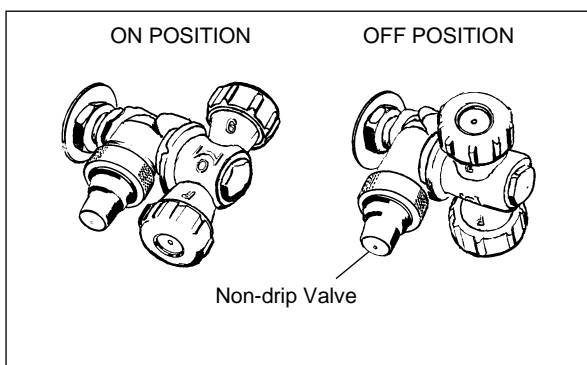
Operation

Spray Nozzles

The spray nozzles have an outlet at each end but only the jet that is flipped to the outward facing position is “on”. This facilitates easy changing between jets of different sizes, for example, when requiring different application rates to suit concentrated and diluted spraying.

Individual nozzles can be turned off when not needed by flipping the nozzle 90 degrees so that neither of its jets is facing outwards. Nozzle direction can be adjusted by loosening the attaching nut and angling the nozzle.

The nozzles include a non-drip valve, which closes when the pressure drops below 1 Bar.



HCC Hollow Cone Ceramic Jets

HCC hollow cone ceramic jets produce a superior droplet spectrum and are fitted to both sides of each nozzle body.

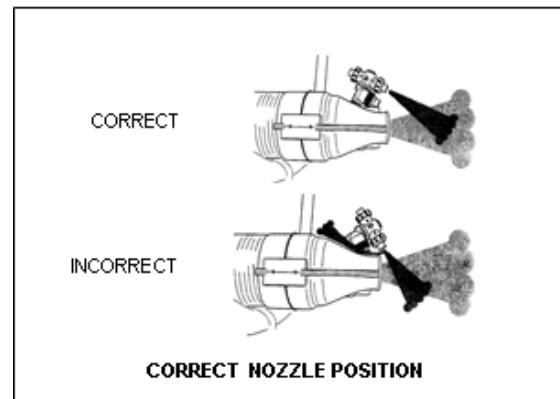
The HCC components fit the standard nozzle body and use the standard nozzle cap.

Nozzle output can be varied by fitting different size ceramic jets. Refer to the HCC Jet Chart on page 13.

Due to the ceramic cores of HCC nozzles, they normally have a long wear life and require little maintenance other than regular checking and cleaning. The spray pattern should be observed periodically against a dark background to detect signs of wear, which will be indicated by a streaky or broken pattern. If worn nozzles are detected, then the full set of nozzles and gaskets should be replaced.

Nozzle Alignment

The Oktopus sprayer is assembled at Silvan with the air ducts and modules placed in the standard positions. If their position should be changed, make sure that the jet is spraying into the air stream and not fouling on the diffuser as shown below.



Calibration

Nozzle Selection and Calibration Checking

Chemical application rates and hence nozzle selections will vary greatly depending on the crop type, and the stage of crop development. Information on application rates should be available from your chemical supplier.

Nozzle selection can be made by following the four simple steps shown below. The final step, checking calibration after nozzle selection, is essential for spraying efficiency by ensuring a known amount of spray is applied per hectare.

STEP 1 *Operating Factors*

First establish the following factors.

- a) **Application rate (l/ha)** in litres per hectare.
- b) **Travel speed (km/hr)** The speed indicated by your tractor can be checked by timing the sprayer over a measured distance. The timing should be done in seconds over 100 metres with the PTO engaged and water in the tank to simulate real spraying conditions. In hilly terrain the sprayer should be timed driving up and down the hill and the two times averaged. The speed can be calculated according to the following formula.

$$\text{Speed (km/hr)} = \frac{360}{\text{Time in Seconds for 100m}}$$

- c) **Row width (m)** The distance between rows measured in metres. For single side spraying use half the row width.
- d) **Spray pressure (Bar)** A pressure of between 10 and 20 Bar is usually selected.

STEP 2 *Total Output Required*

Calculate the total spray output required in litres per minute (l/min) using the following formula.

$$\text{Total Output (l/min)} = \frac{\text{Application rate (l/ha)} \times \text{Speed (km/hr)} \times \text{Row width (m)}}{600}$$

Check that the calculated output does not exceed the rated capacity of the pump. If it does, reduce the travel speed or the application rate.

STEP 3 *Nozzle Selection*

Decide on the number of nozzles to be used in total. Note, that if not all nozzles are used, the number of nozzles will be the number of those "on" only.

$$\text{Nozzle Output (l/min)} = \frac{\text{Total Output}}{\text{Total No. of Nozzles Used}}$$

Add up the flow rates of the individual jets to check that the total output matches the calculated value. Small variations can be corrected by increasing pressure to increase output or reducing pressure to reduce output.

STEP 4 *Calibration Checking*

After installing the selected jets, test the sprayer with water to confirm the application rate. Fill the tank to the brim or a specific mark then run the sprayer for a measured time at operating pressure and with the nozzles spraying. A run time of two minutes should be sufficient. Measure the volume of water, in litres, required to refill the sprayer to the brim or the specific mark chosen then divide this volume by the time of the run.

$$\text{Output (l/min)} = \frac{\text{Volume to refill (litres)}}{\text{Time (min)}}$$

Verify that the measured output matches the total output value calculated at Step 2.

Calibration

HCC Hollow Cone Nozzle Chart

COD.	q (l/min)																	
	3 bar	4 bar	5 bar	6 bar	7 bar	8 bar	9 bar	10 bar	11 bar	12 bar	13 bar	14 bar	15 bar	16 bar	17 bar	18 bar	19 bar	20 bar
HCC005	0.19	0.22	0.25	0.27	0.29	0.31	0.33	0.35	0.36	0.38	0.40	0.41	0.42	0.44	0.45	0.47	0.48	0.49
HCC0075	0.30	0.35	0.39	0.42	0.46	0.49	0.52	0.55	0.57	0.60	0.62	0.65	0.67	0.69	0.71	0.73	0.75	0.77
HCC01	0.40	0.46	0.52	0.57	0.61	0.65	0.69	0.73	0.77	0.80	0.83	0.86	0.89	0.92	0.95	0.98	1.01	1.03
HCC015	0.60	0.69	0.77	0.85	0.92	0.98	1.04	1.10	1.15	1.20	1.25	1.30	1.34	1.39	1.43	1.47	1.51	1.55
HCC02	0.80	0.92	1.03	1.13	1.22	1.31	1.39	1.46	1.53	1.60	1.67	1.73	1.79	1.85	1.90	1.96	2.01	2.07
HCC025	1.00	1.15	1.29	1.41	1.53	1.63	1.73	1.83	1.91	2.00	2.08	2.16	2.24	2.31	2.38	2.45	2.52	2.58
HCC03	1.20	1.39	1.55	1.70	1.83	1.96	2.08	2.19	2.30	2.40	2.50	2.59	2.68	2.77	2.86	2.94	3.02	3.10
HCC035	1.40	1.62	1.81	1.98	2.14	2.29	2.42	2.56	2.68	2.80	2.91	3.02	3.13	3.23	3.33	3.43	3.52	3.61
HCC04	1.60	1.85	2.07	2.26	2.44	2.61	2.77	2.92	3.06	3.20	3.33	3.46	3.58	3.70	3.81	3.92	4.03	4.13
HCC05	2.00	2.31	2.58	2.83	3.06	3.27	3.46	3.65	3.83	4.00	4.16	4.32	4.47	4.62	4.76	4.90	5.03	5.16

Nozzle Sets for Typical Spraying Applications

The nozzle sets in the following examples are suitable for typical applications when spraying grapes, orchard fruits and berries.

1. Grapes

Application rate	600 l/ha
Travel speed	5 km/hr
Row width	3.0 m
Spraying pressure	10 Bar

$$\text{Total Application Rate (l/min)} = \frac{\text{Application rate (l/ha)} \times \text{Speed (km/hr)} \times \text{Row width (m)}}{600}$$

$$\frac{600 \times 5 \times 3}{600} = 15 \text{ l/min}$$

If using all 10 nozzles (5/side) then each nozzle needs to apply 1.5 l/minute. From the HCC nozzle chart above the HCC02 (Orange) at 10-11 Bar pressure will give the desired output. An alternative would be to use HCC025 (Red) at 7 Bar pressure to give the equivalent output.

2. Orchard Fruits

Application rate	1200 l/ha
Travel speed	4 km/hr
Row width	4.5 m
Spraying pressure	15 Bar

$$\text{Total Application Rate (l/min)} = \frac{\text{Application rate (l/ha)} \times \text{Speed (km/hr)} \times \text{Row width (m)}}{600}$$

$$\frac{1200 \times 4 \times 4.5}{600} = 36 \text{ l/min}$$

If using all 10 nozzles (5/side) then each nozzle needs to apply 3.6 l/minute. From the HCC nozzle chart above the HCC04 (Black) at 15 Bar pressure will give the desired output. An alternative would be to use HCC05 (Blue) at 10 Bar pressure to give the equivalent output.

Calibration

3. Berries

Application rate	400 l/ha
Travel speed	5 km/hr
Row width	3 m
Spraying pressure	13 Bar

$$\begin{aligned}\text{Total Application Rate (l/min)} &= \frac{\text{Application rate (l/ha)} \times \text{Speed (km/hr)} \times \text{Row width (m)}}{600} \\ &= \frac{400 \times 5 \times 3}{600} = 10 \text{ l/min}\end{aligned}$$

If using 8 nozzles (4/side) with two turned off due to a smaller canopy then each nozzle needs to deliver 1.25 l/min. From the HCC nozzle chart HCC015 (Yellow) at 13 Bar pressure will give the desired output. An alternative nozzle would be the HCC02 at approximately 7 Bar to give an equivalent output.

Calibration Worksheets

The worksheets below can be used to record the results of calibration tests on your sprayer.

Date of Test:	_____
Application Rate:	_____ litres/ha
Speed of Travel:	_____ km/hr
Row Spacing:	_____ metres
Output (l/min) =	$\frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width}}{600}$
	$= \frac{\quad \times \quad \times \quad}{600}$
	=
No. of nozzles :	_____
Output per nozzle :	_____ litres/min
Nozzle Selection :	_____
Pressure Setting:	_____ Bar
Measured Output:	_____ litres/min
(from test run)	

Date of Test:	_____
Application Rate:	_____ litres/ha
Speed of Travel:	_____ km/hr
Row Spacing:	_____ metres
Output (l/min) =	$\frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width}}{600}$
	$= \frac{\quad \times \quad \times \quad}{600}$
	=
No. of nozzles :	_____
Output per nozzle :	_____ litres/min
Nozzle Selection :	_____
Pressure Setting:	_____ Bar
Measured Output:	_____ litres/min
(from test run)	

Lubrication and Maintenance

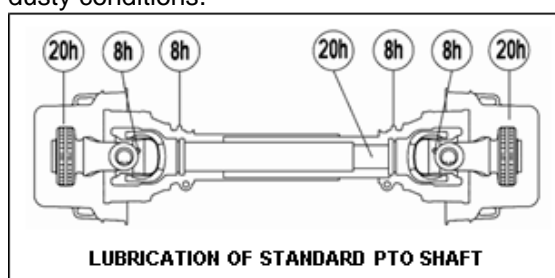
Daily Maintenance

General

During the first few days of operation, before starting each day, check that all hardware is tight and tighten all hose clamps. Inspect the unit for leaks while running.

PTO Shaft

Grease the PTO shaft with multi-purpose grease at the intervals shown below. This is the amount of lubrication recommended for normal operation. More frequent inspection and lubrication may be needed under very dusty conditions.



Pump

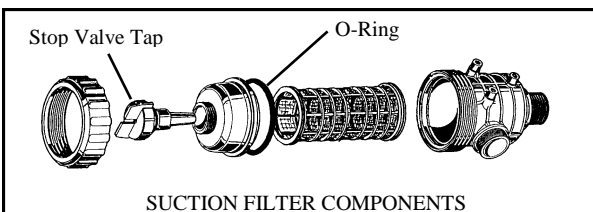
Check the oil level in the viewer daily and if necessary top up with SAE 20W-40 multigrade engine oil. The oil must reach the mark on the side of the oil level viewer.

Filters

Clean all filters as stated below. More frequent cleaning may be found necessary depending upon circumstances. The best method for cleaning filters is to wash them with a soft bristle brush. Check for any tears or holes and replace if damaged.

Check and if necessary clean the basket strainer under the tank lid before each fill.

Always clean the suction filter before each tank refill and at the end of the day. Close the stop valve by pushing in and unscrewing the yellow/red tap, then unscrew the filter cover to remove the element. Ensure the O-ring is in good condition when refitting.



Tank, Pump and Spray Lines

At the end of each day run clean water through the pump and lines to purge them of chemicals. Rinse out the tank to remove powdered material.

Never leave chemicals in the tank that may settle to the bottom, harden and break into lumps as this may block the suction filter.

Dispose of unused chemical, chemical mix, rinse water and chemical containers as recommended by the chemical manufacturer or appropriate government authority.

Weekly Maintenance

PTO Shaft (Every 20 Hrs) Slide the PTO shaft apart, clean the telescopic tubes with kerosene and apply multi-purpose grease to the sliding surfaces, then reassemble.

This is most important in dusty conditions.

Monthly Maintenance

Gearbox. Check the oil level every 50 hours and if required top up with SAE 80W-90 gear oil.

The oil should be level with the centre of the input shaft and can be checked through the filler plug in the top of the gearbox using a piece of wire as a dip stick.

Annual Maintenance

Diaphragm Pump. Drain the oil from the pump annually, or at the end of each spraying season.

Remove the pump heads, carefully inspect the diaphragms and replace if necessary. Also check the inlet and outlet valves, seats and springs for wear, damage or chemical corrosion and replace as necessary. Refill with SAE 20W-40 multi-grade engine oil.

Check the air pressure in the surge chamber at the end of the pump. The air pressure behind the chamber's diaphragm smoothes out the pulsations in fluid flow and should be set in accordance with the spraying pressure being used - refer chart below. Adjust the pressure at the valve fitting on the chamber using a compressed air hose fitted with a tire valve connection and a reliable pressure gauge.

Spraying (Bar)	2 - 5	5 - 10	10 - 20	20 - 50
pressure (psi)	29 - 73	73 - 145	145 - 290	290 - 725
Surge air (Bar)	2	2 - 5	5 - 7	7
pressure (psi)	29	29 - 73	73 - 102	102

Trouble Shooting

Driveshaft noisy

- PTO shaft not secured properly to shafts.
- Universal joint crosses worn.
- PTO geometry not correct.

Air volume reduced

- Fan mesh blocked with leaves or debris.
- Not operating at full speed of 540 rpm.
- Fan gearbox not in gear.

Poor tank agitation

- Chemical left in tank whilst not operating.
- Chemical insufficiently mixed before filling.

Pump and hoses vibrating.

- Pump surge chamber pressure incorrectly adjusted or surge diaphragm ruptured.
- Air entering the suction line through loose or damaged fittings.
- Pump valves or valve springs worn or damaged.
- Worn nozzles or nozzles too big for the capacity of the pump.
- Air trapped in filter or suction lines.

Pump does not prime

- No liquid in tank or not covering suction inlet.
- Suction filter blocked.
- Suction filter stop valve closed.
- Suction filter bowl loose or missing O-ring.
- Suction line loose allowing pump to suck air.
- Bypass control not in by-pass position.
- Pump valve springs broken or valves worn.

Pump does not reach correct pressure

- Pump not operating at full 540 rpm.
- Suction filter blocked.
- Suction filter stop valve partly closed
- Pressure regulator not correctly adjusted
- Pressure regulator valve and seats worn.
- Pressure gauge faulty
- Pump diaphragms ruptured (pump oil grey).
- Worn nozzles or capacity of nozzles greater than capacity of the pump.

Fan noisy and/or vibrating

- Gearbox bearings worn.
- Fan damaged or out of balance.
- PTO incorrectly installed.
- PTO geometry not correct.



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