Liquid Operation

WARNING

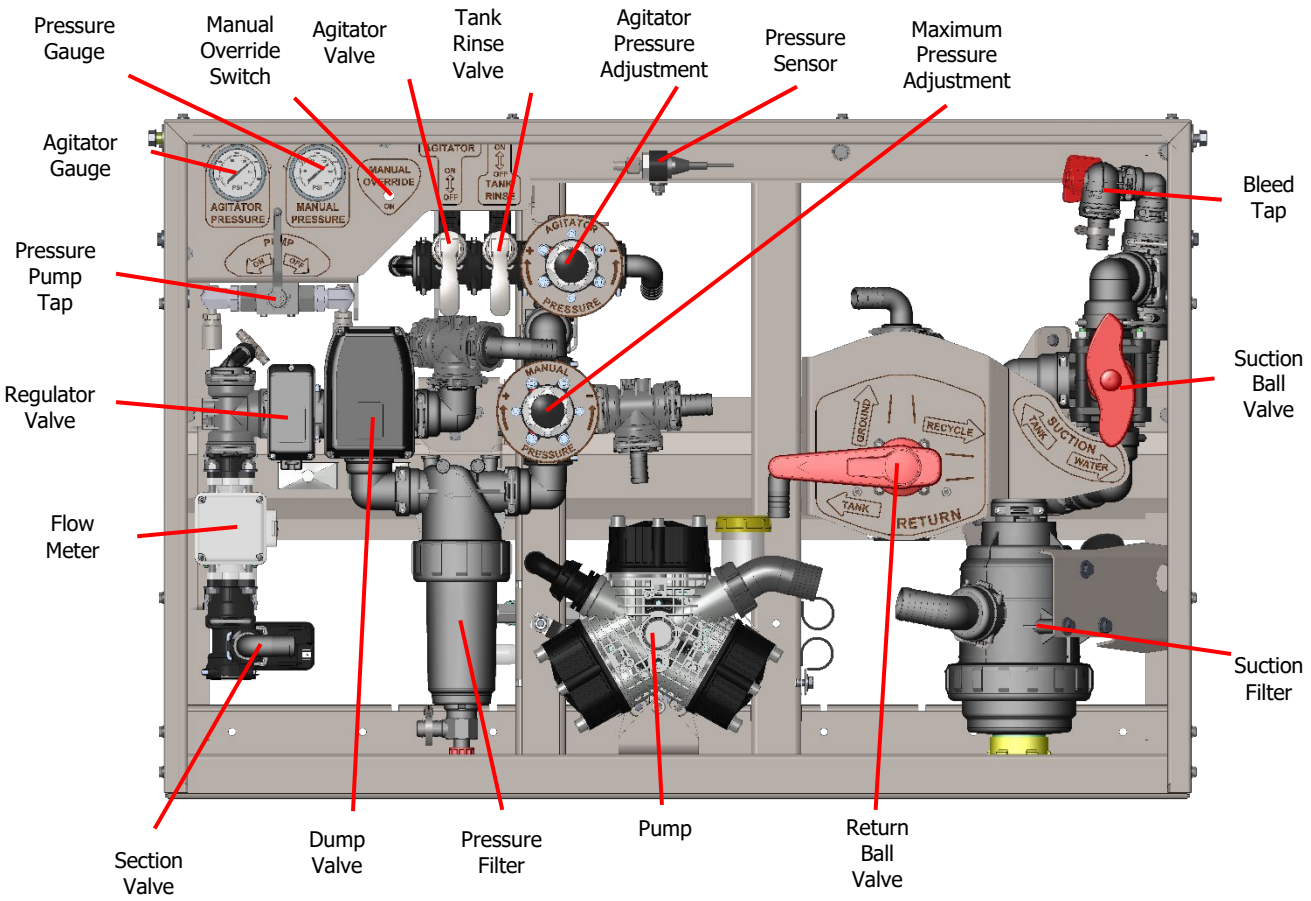
THIS PRODUCT HAS BEEN MANUFACTURED USING QUALITY COMPONENTS ESPECIALLY CHOSEN TO PROVIDE A HIGH LEVEL OF CORROSION RESISTANCE.

THE USE OF LIQUID FERTILISERS WITH HIGH PH PROPERTIES SUCH AS PHOSPHORIC ACID WILL VOID THE WARRANTY

ALWAYS CHECK COMPATIBILITY OF PRODUCTS AND ALWAYS PURGE THE SYSTEM WITH CLEAN WATER PRIOR TO SHUT DOWN. WE RECOMMEND THE USE OF ONLY QUALITY LIQUID FERTILISER PRODUCTS PRODUCED BY REPUTABLE CHEMICAL MANUFACTURERS.

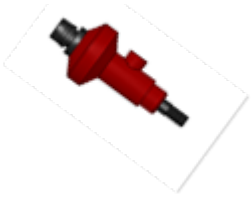
Simplicity Liquid Control Panel

Layout



Inside the Tank

Tank Rinse Nozzle



Agitator Nozzle

Definitions

Agitator Nozzle **Part: 5022042**
An agitator is fitted to ensure that tank mixes remain in suspension. 2.5mm orifice.

Agitation Pressure Adjustment **Part: 475551**
Regulates pressure required for agitation and tank rinse circuits. Priority is given to the agitation circuit to ensure that full agitation is available irrespective of the system operating pressure.

Agitation Pressure Gauge **Part: 914010**
Displays actual agitation pressure.

Agitator Valve **Part: 463T051**
Opens flow to the agitator nozzle.

Bleed Tap **Part: 454612V**
Tap allows for air pockets to be bled from the suction system.

Dump Valve **Part: 853K14S55**
Dump Valve enables system flow to cycle back into the tank when flow is not required.

Flow Meter **Part: 46211A2A5B5**
Measures the flow of liquid through the delivery system.

Maximum Pressure Adjustment **Part: 475551**
Sets the maximum system pressure, and can be used to regulate flow when the manual override switch is operated.

Manual Override Switch
This switch enables to operator to switch on the delivery of liquid to the implement from the seeder, rather than having to go back to the controller console in the tractor.

Pressure Filter **Part: 32621M35**
80 Mesh Element (Yellow) **Part: 32620035.030**
Consisting of an 80 mesh filter, or approximately 180 µm. This filter is self cleaning.

Pressure Sensor **Part: 116904543**
Translates the system pressure into an electronic signal for the controller.

Pump **Part: P2073VS**
Diaphragm (HPS) **Part: 95.0040.36.2**
Bertolini Poly 2073VS positive displacement pump. Maximum flow of 75 L/min at 550 rpm. Coupled to a 41cc hydraulic motor with a maximum oil flow requirement of 22 L/min. Polypropylene head to withstand the most aggressive liquid fertilisers. Stainless steel check valves and hardware, and HPS diaphragms.

Pump Pressure Tap **Part: BKHG12-1123MH**
High pressure tap on pump motor hydraulic supply line. Hydraulic pump motor is protected by a preset burst valve, limiting flow to 22 L/min. When maximum flow is exceeded, valve will cut flow and pump will stop. This high pressure tap allows the valve to be reset and for the motor to be restarted slowly.

Regulator Valve **Part: 863T020S**
This valve regulates flow to the implement.

Definitions (cont)

Return Ball Valve **Part: 45305500.030**
This provides the operator with the ability to direct the unused flow from the valve set back into the main tank, recycle back through the valve set (panel rinse), or dump to ground.

Section Valve **Part: 863T001**
This opens to allow flow to the implement. This valve operates opposite to the Dump Valve.

Suction Ball Valve **Part: 453015S66T**
This allows the operator to select source of suction between the main supply tank and the clean water flush tank for rinsing. A one way valve on the clean water supply hose prevents tank mix from contaminating clean water flush tank.

Suction Filter **Part: 31624E3**
50 Mesh Element (Blue) **Part: 3162003.030**
Contains a 50 mesh filter (blue in colour), or approximately 300 µm. To remove yellow drain bung, push up bung and rotate. When bung is removed, a valve on the inlet at the top of the filter closes allowing the mesh to be removed for cleaning.

System Pressure Gauge **Part: 914010**
Displays actual operating system pressure.

Tank Rinse Nozzle **Part: P63408399**
Mounted in the top of the tank to assist in rinsing of the inside of the tank after use.

Tank Rinse Valve **Part: 463T051**
Opens flow to the tank rinse nozzle.

CAPACITIES
(Subject to Change)

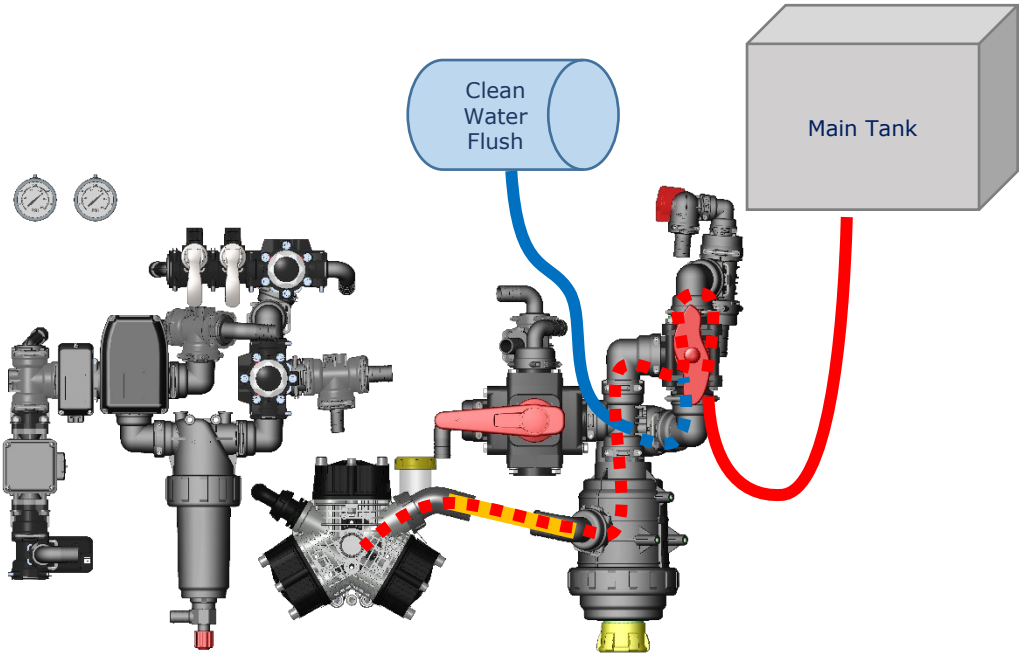
30 Series
28500 = 21500L Granular / 7000L Liquid
22500 = 16500L Granular / 6000L Liquid
20000 = 14000L Granular / 6000L Liquid
19000 = 14000L Granular / 5000L Liquid

TQSL Series
22000 = 12000L Granular / 2x 5000L Liquid
21000 = 16000L Granular / 5000L Liquid
17000 = 12000L Granular / 5000L Liquid
13000 = 9000L Granular / 4000L Liquid
10000 = 7000L Granular / 3000L Liquid

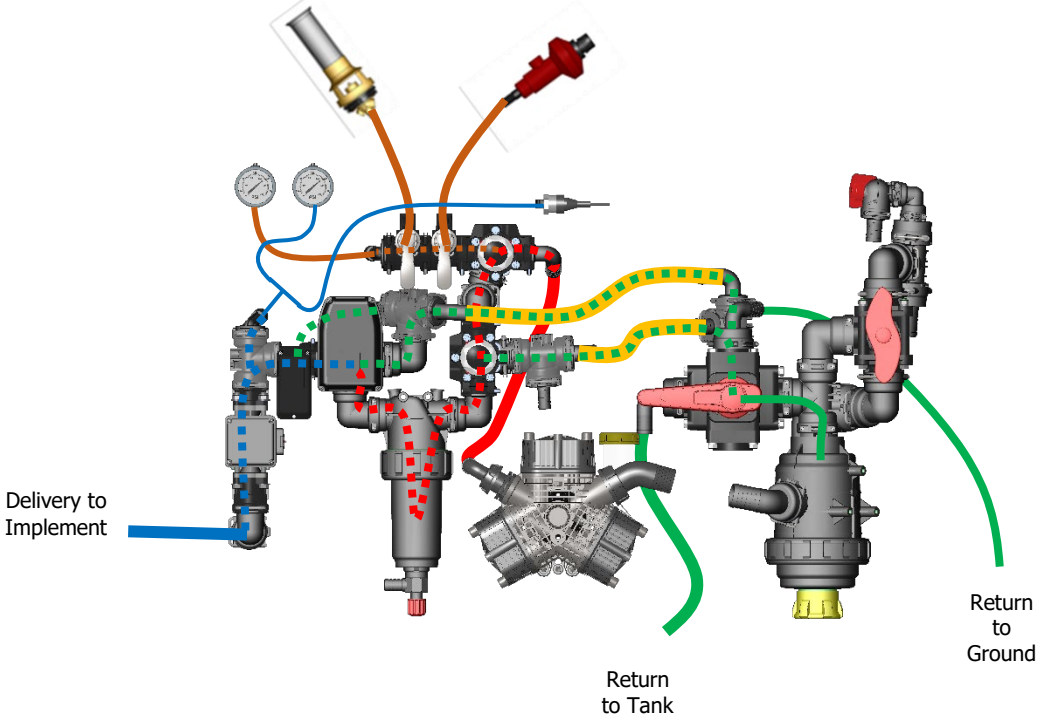
TBL Series
21000 = 16000L Granular / 5000L Liquid
17000 = 12000L Granular / 5000L Liquid
12000 = 8000L Granular / 4000L Liquid

Liquid Paths

Suction Path



Pressure / Agitation / Delivery / Return Path



Operation

Filling and Draining

Filling is done via a 2 inch camlock that allows the operator to connect the Air Seeder to an external source and simply pump the fluid in via an external pump. It is recommended that additional filtration be considered so as to avoid any contaminates from entering the main supply tank.

To fill, simply connect to the camlock, turn the tap to the "on" position and start external pump. When full ensure that tap is in the "off" position and remove supply line from camlock. Ensure that camlock cap is put back on to avoid dust contamination.

This camlock can also be used to empty the main tank.

Overflow

An overflow tube is fitted on the inside of the tank. Should the tank be overfilled the excess fluid overflows through this tube onto the ground.

This pipe serves two purposes, the first as the overflow to avoid highly corrosive fluids coming into contact with the chassis etc, and also as a breather for the tank to allow air to pass out of the tank when filling and enter back into the tank when emptying. To avoid contamination the tube is fabricated into an 'S Bend' that forms a fluid filter for the tank.

Pump Motor

The pump is hydraulically driven via a 41cc hydraulic motor, and is positive displacement. The hydraulic drive is fed by a separate hydraulic pressure supply from the tractor, while the return flow is common with the Air Seeder fan motor.

To operate the pump at a maximum rpm of 540, a flow of 22 litres per minute will be required.

The pump should not be rotated faster than 540rpm, as irreparable damage can result to the pump if operated over 540rpm. To protect against this, a flow limiting valve is fitted. This limiting valve simply limits the oil supply to the hydraulic motor to make it impossible to over-rev the pump. This valve is factory set and should not be tampered with. If greater than 540rpm is able to be achieved your Simplicity dealer should be contacted immediately to rectify.

WARNING

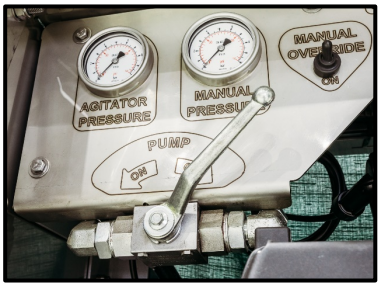
Pump speed should NOT exceed 540 RPM

Should the flow limiting valve close due to excessive flow, the hydraulic system must be placed in float to depressurise the circuit. Hydraulic flow should then be reduced, and then re-engaged.

When the pump sucks a large amount of air (for example when the tank is empty), this can also trigger the flow limiting valve.

The Pump Pressure Tap can also be used to temporarily limit the pump speed, useful to run the pump slowly when priming.

Ensure the Pump Pressure Tap is fully open for operation, as it will generate excessive heat if left partially open.



The Pump Pressure Tap can also be used to reset the flow limiting valve

Pump Speed

The pump has a maximum flow output of approximately 75 litres per minute. For normal operation the pump can be rotated significantly slower and still achieve desired rates.

Consider:

Implement Width 18m
Average working speed of 10 km/h
Application rate of 50 litres/ha

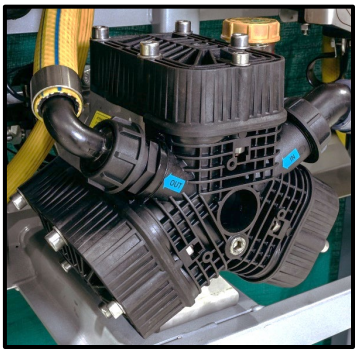
By applying the formulae:

$$\frac{\text{Width (m) x Speed (km/h) x Rate (L/ha)}}{600}$$

We can calculate: (18 x 10 x 50)/600 = 30 litres per minute.

The above example demonstrates that the pump could normally be operated much slower than 540 RPM. It is recommended that minimum pump speed of at least 300 RPM is used to ensure an even and smooth flow of liquid from the pump.

Pump



The Bertolini Pump is a diaphragm pump. The diaphragms and valves can be damaged without proper filtration and care. It is recommended that the filtration elements are serviced regularly and that the system is regularly flushed with clean water.

It is also important to regularly check the oil level in the reservoir on the side of the pump. Check with the pump running with pressure. The oil should be in the area between the minimum and maximum level.

Always use SAE 30 oil.

A detailed specific Users Manual for this pump is also supplied with your Air Seeder.

Suction Ball Valve

The Suction Ball Valve selects which tank is supplying the pump.

When the tap is horizontal, the main tank is selected.

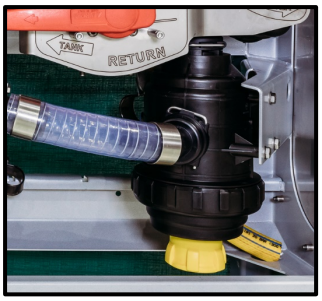
When the tap is vertical, the clean water flush tank is selected.

A Bleed Tap is conveniently positioned above the Suction Ball Valve to assist with purging air from the supply hoses, prior to the Suction Filter.

Filtration

The system has filtration on both the pressure and suction circuits.

Suction Filter



The Suction Filter contains a blue 50 mesh filter. (approximately 300 µm).

Replacement Mesh Re-order part: **3162003.030**

Pressure Filter

The Pressure Filter contains a yellow 75 mesh filter. (approximately 180 µm).

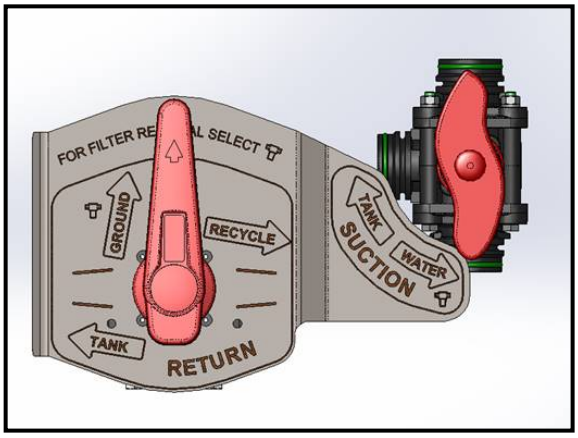
Replacement Mesh Re-order part: **32620035.030**

The pressure filter is fitted with a device to continuously circulate flow around the mesh and back to tank as a self cleaning feature.

Filter Servicing

When servicing either filter please ensure that appropriate safety apparel is worn.

Prior to servicing the filters, ensure that the suction valve and dump valve have been moved to the indicated filter service setting.



Suction & Return Valves correctly set for filter servicing

To remove the suction filter for servicing, simply rotate the yellow base anti clockwise 90 degrees and remove. The volume of liquid in the filter housing will drain out, however a valve in to top of the filter will prevent further flow from the tank. Remove threaded collar so as to split housing and expose filter element. Clean or replace element as required in clean good quality water.

To re-assemble, place clean element back into housing, carefully align and tighten collar hand tight only. Ensure that yellow base is square into housing and quickly push upwards, then turn clockwise to lock.

To remove the pressure filter for servicing, simply undo collar and remove housing to expose filter. Clean or replace element as required as required and re-assemble.

During re-assembly care should be taken to inspect all seals for damage. If damage is apparent, replace seal immediately.

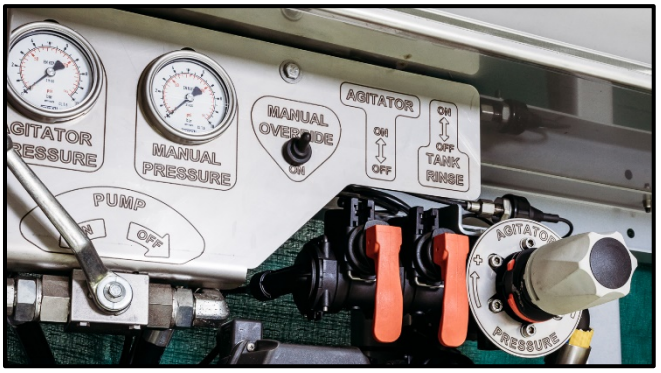
Agitation Operation

The agitation circuit is designed to continually mix the fluid in the main tank to prevent settling of products and chemicals falling from suspension. Care should be taken when tank mixing as some products may not be compatible with each other.

Using the priority flow from the pump, the Agitation Valve allows the operator to direct a required amount of flow into the agitator.

To set:

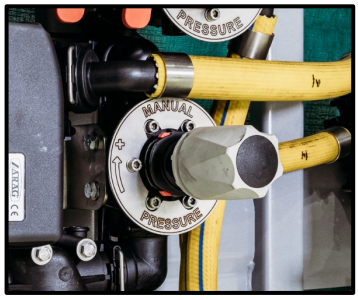
- Run pump at required speed and flow
- Lift Agitator Valve (ensure Tank Rinse Valve is Off)
- Adjust the Agitator Pressure Adjustment clockwise to increase agitation pressure and flow
- Pressure can be easily monitored on the Agitation Pressure Gauge.



Different agitators are available for differing uses. Simplicity fits the 2.5mm orifice as standard. With this orifice fitted the agitator will roll 600 litres of tank mix every minute if pressure set at 5 bar, or 72.5psi. At this setting the agitator is only drawing approximately 7 litres per minute from the pump.

CAUTION: *When using biological ingredients (eg. Rhizobia), seek professional advice regarding operating pressures, as high pressure (in either the delivery system or agitation circuit) has been known to kill the microbes.*

Manual Flow Regulator Valve



Flow not utilised for Agitation will continue through the Manual Flow Regulator Valve. This sets the maximum available pressure the valve set can deliver.

Clockwise rotation will increase pressure, anti-clockwise rotation will decrease pressure.

To Set:

Carefully calculate the maximum pressure required for the outlet system connected, taking into account highest rate and maximum speed.

- Run pump at normal speed
- Activate the manual overide switch (flow will commence)
- Adjust Manual Flow Regulator Valve to set maximum pressure required
- De-activate the Manual Overide Switch

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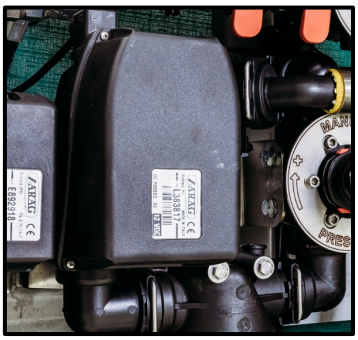
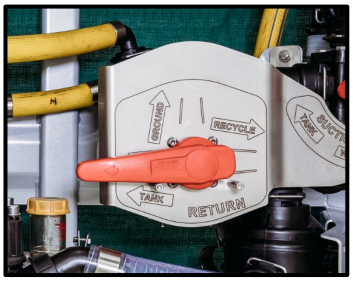
Dump Valve



Once through the pressure filter, flow enters the dump valve. The dump valve works inversely to the Section or delivery valve, so when the section valve is closed, dump valve is open back to the return circuit, allowing all pressure flow back to the return circuit.

Once the section valve is opened for delivery, the dump valve closes and all pressure is directed to the regulation circuit.

Return Circuit



The return circuit allows the operator to direct where any unused pump flow will end up. Under normal operation, return circuit will direct flow back to the main tank.

When rinsing or flushing the system, the return circuit can recirculate the flow back through the valve set to Recycle.

The Manual overide switch can be activated to send flush water through the outlets on the bar, while continuing to recirculate the unused flow.

Return to ground allows all unused flow to be purged onto the ground.

There is a check valve placed in the clean water supply hose, preventing accidental backflow and contamination of the flush water.

Regulator Valve

Rate control is achieved through a combination of delivery pressure, and the restrictive liquid terminal outlets fitted to the toolbar.

The regulator valve operates by adjusting the bypass flow back to the return circuit. As the bypass flow is restricted, system pressure increases and more flow can be achieved through the terminal outlets.

Without sufficient resistance from the outlets, rate control is impossible.

Fluid delivery to the bar passes through the flow meter, the section valve, and finally out to the toolbar.

The controller will monitor the total flow with reference to the operating speed, application width and target rate required and automatically adjust the bypass flow until the desired rate is achieved.

Once the target rate has been achieved the pressure should remain static, unless changes in rate or ground speed is detected.

Pressure and Orifice Selection

The operation of the system at a particular application rate will be dependant on the restriction placed against the pump caused by the nozzle on the outlet of the distribution system. Many varied distribution systems are available but all rely on pressure to control flow and rate.

Maximum pressure of the system fitted to the Simplicity product is approximately 6 bar or 87 psi. Too high pressures can cause component failure, while too low pressure can cause unsatisfactory rate control or application.

It is generally recommended that an operating range of between 1 and 5 bar, (approx. 14 to 72 psi), be considered when calculating pressure parameters.

> **CAUTION:** *When using biological ingredients (eg. Rhizobia), seek professional advice regarding operating pressures, as high pressure (in either the delivery system or agitation circuit) has been known to kill the microbes.*

For Low rates, Simplicity recommends use of ***Friction Induced Back Pressure*** distribution by **Liquid Systems.**

Low Volume FIBP	**Standard Line Metre**	**High Rate Line Metre**
• Large bore • Ultra low application • Handles difficult products (particle suspensions) • Fits 3/8" stainless delivery tubes	• Good stream flow across a wide range of rates • Not suitable for products that calcify or are prone to blocking • Fits 3/8" stainless delivery tubes	• Suited for high rate applications • Fits ¼" stainless delivery tubes
		

Pressure and Orifice Selection (cont)

Step 1 Calculate Litres/Minute/Outlet

$$\frac{\text{Width (m) x Rate (l/ha) x Speed (km/h)}}{\text{(600 x Number of outlets)}}$$

Example:

18m width, 72 units on 250mm spacing
Rate of 50 litres/ha of UAN,
10km/h average speed

$$\frac{18 \times 50 \times 10}{(600 \times 72)} = \frac{9000}{43{,}200} = 0.208 \text{ l/m/o}$$

Therefore an outlet that delivers **0.208** l/min should be selected.

Step 2 Consult distribution charts for correct selection

Liquid Systems delivery chart for UAN through FIBP

Yellow 5.0 X 1.2 Bore Tube Tube Length (Metres)	UAN (SG 1.32); 42.5% N (W/V); 32.0% N (W/W) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
0.5 M	0.094	0.167	0.225	0.283	0.328	0.377	0.430	0.468	0.514	0.552	0.590	0.620
0.6 M	0.078	0.135	0.184	0.232	0.275	0.315	0.358	0.396	0.439	0.471	0.514	0.540
0.7 M	0.073	0.125	0.169	0.209	0.250	0.289	0.325	0.360	0.393	0.425	0.461	0.494
0.8 M	0.070	0.115	0.157	0.195	0.232	0.270	0.300	0.334	0.363	0.393	0.424	0.455
0.9 M	0.060	0.101	0.139	0.178	0.208	0.242	0.273	0.303	0.333	0.364	0.391	0.417
1.0 M	0.048	0.087	0.123	0.151	0.180	0.210	0.238	0.266	0.289	0.317	0.342	0.365
1.5 M	0.020	0.070	0.100	0.121	0.152	0.175	0.199	0.221	0.248	0.265	0.285	0.305
2.0 M	0.015	0.060	0.078	0.102	0.125	0.145	0.166	0.185	0.204	0.219	0.244	0.255
2.5 M	-	0.045	0.068	0.088	0.107	0.124	0.140	0.158	0.174	0.190	0.208	0.221
3.0 M	-	0.016	0.050	0.062	0.075	0.091	0.105	0.115	0.132	0.144	0.156	0.166
3.5 M	-	-	0.043	0.051	0.058	0.086	0.095	0.103	0.119	0.131	0.143	0.154

To achieve the desired rate, we use 0.9m of yellow 1.2mm bore tube at 2.5 bar pressure.

NOTE: This number does NOT need to match exactly, as the system will automatically regulate pressure to achieve correct rate.

Pressure and Orifice Selection (cont)

Always allow the system sufficient room above and below the target pressure to allow for variances in speed. In the above example, if the operating speed was temporarily reduced to 7km/h, the rate per outlet would drop to 0.146 l/min. If we are using 0.9m of delivery tube, the system pressure needs to drop to just above 1.5 bar to continue accurate delivery.

Insufficient restriction of the outlet kit will can result in failure to achieve desired application rate.

Example: If a line meter is selected that is too large, than the regulator valve will not be able to restrict flow to the required rate, hence the rate will be over-applied.

Calibration

For the controller to operate correctly, the flow meter needs to be calibrated for the product to be applied. The flow meter fitted is rated from 2-50 litres per minute flow. For liquids like water, with a viscocity or Specific Gravity (SG) of 1, it is calibrated at 600 pulses per litre.

The calibration process fine tunes this for the specific solution being applied.

Each product must be calibrated separately as variations in SG will result in different number of pulses per litre. It is not unusual to have to adjust the flow meter up to 10% either way during this process to account for variances in SG.

To calibrate it is recommended to use a short hose with a 1" camlock connection for the seeder, and a partially closed tap or valve on the other end to provide resistance.

Alternately, you may choose to collect output from all or a number of nozzles.

If you do not collect output from all nozzles, you need to multiply the volume collected by using the formula below:

$$\frac{\textbf{Total No of Nozzles}}{\textbf{Sample No of Nozzles}} \textbf{ x Sample Volume}$$

Eg. If you sample 12 of the 72 outlets, for a sample volume of 625mm:

72 / 12 = 6 x 625mm = 3.75 litres

Calibration Process

1. Connect hose to outlet
2. Slightly open tap
3. Secure tap into a large bucket or container
4. Start pump
5. Commence calibration process on rate controller (see below, or refer to control system Operators Manual)
6. Once activated, product will start flowing into the bucket
7. When sufficient product has been delivered, de-activate flow.
8. Carefully pour product into a graduated measuring jug
9. Record actual flow (in litres) into the control system
10. Confirm and repeat if necessary

Liquid Calibration - ISOBus

Calibration of the liquid tank is relatively simple as essentially it is simply providing the correct information to the controller. The three essential elements are:

1. ***Implement Width***

2. ***Ground Speed***

3. ***Flow***

Implement Width is set within the Virtual Terminal. Refer to ***Section 2.1*** of the Apollo ISOBus Seeder Controller Operators Manual for correct procedure.

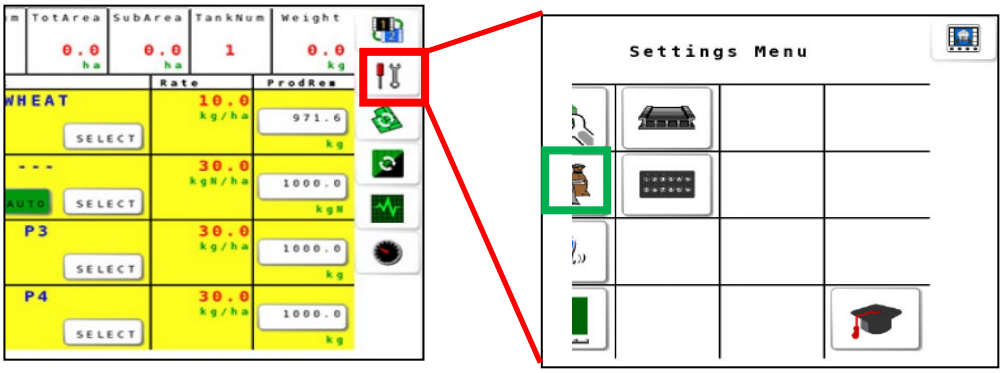
Ground Speed is nominally set to match seeding operations during the calibration procedure in the Apollo. Ensure a manual speed has been set.

The next essential point is the Flow, measured by the flow meter.

Accurate calibration of the flow meter is essential. Simplicity Australia fits a 5 to 100 litre per minute flow meter. It is pre-set to produce 600 pulses per litre. Calibration of the flow meter 'fine tunes' this number of pulses per litre to improve accuracy. It is not unusual to have to adjust the flow meter up to 10% either way during this process to account for variances in product viscosity.

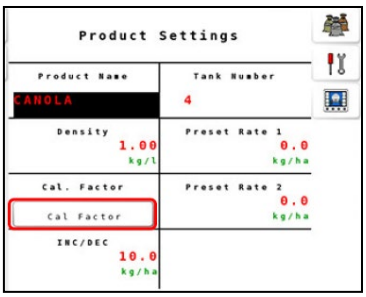
Refer to Section 5.2.1 of the Apollo Seeder Controller Operators Manual for detailed procedure for calibrating the flow meter.

From Operations Screen 2, open the **Settings** menu, and select **Products**, then choose relevant product.



Liquid Calibration – ISOBus (cont)

Select ***Cal Factor*** in Product Settings



If the product does NOT have a calibration factor, manually enter 600 pulses/litre as a base.

Check that tank output hose for tank to be calibrated is secure into a calibration bucket.

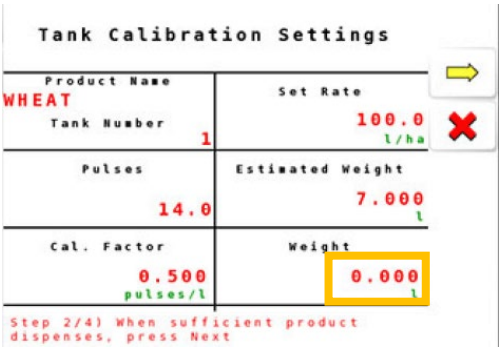
Select  to start the calibration. Flow will start immediately.

Run until sufficient liquid product has been obtained

The larger the sample, the more accurate the calibration will be.

Press  Next arrow to stop flow.

Measure the volume of product in the calibration bucket.



Select Weight and enter the amount of liquid measured, then press  to confirm.

Press Next arrow  to complete the calibration.

For best results, repeat the calibration process to confirm results.

Liquid Calibration – X35

For detailed instructions, refer to section 5.2 of the X35 Operators Manual.

Calibration of the liquid tank is relatively simple as essentially it is simply providing the correct information to the controller. The three essential elements are:

1. ***Implement Width***
2. ***Ground Speed***
3. ***Flow***

Implement Width is set within the Implement Profile, under tools, select Implement / Geometry (refer to X35 Operators Manual section 2.4 for details).

Ground Speed is nominally set to match seeding operations during the calibration procedure in the X35. Ensure a manual speed has been set in the Configuration panel.

Flow is measured by the flow meter, however it must be accurately calibrated in order to operate successfully. Simplicity Australia fits a 5 to 100 litre per minute flow meter. It is pre-set to produce 600 pulses per litre of water.

Calibration of the flow meter 'fine tunes' this number of pulses per litre to improve accuracy, and also incorporate differences relating to the specific gravity or viscosity of the liquid being pumped.

Refer to Section 5.2.2 of the Apollo Seeder Controller Operators Manual for detailed procedure for calibrating the flow meter.

Liquid Calibration – X35 (cont)

From the Configuration panel, select "Manual Speed" and confirm that the manual speed is set correctly for the operation.

Use the left/right arrows to select the liquid tank to be calibrated.

Select Calibration, and the calibration window will open.

If the product is new or does not have a calibration factor set, select "Manual Entry", and enter a calibration factor of **600 pulses/litre**, and confirm.

Once this is set, select "Automatic Calibration" to open the Auto Flow calibration wizard.

Check that the calibration hose is secure in the calibration bucket.

Turn on the master switch – this will enable the next arrow in the calibration wizard.

When ready, press next. Valves will open and flow will commence immediately.

NOTE: If using a tillage switch, it will need to be activated in order for the calibration to commence.

When sufficient volume has been captured, turn off the master switch.

Select Next.

Enter the volume collected into the calibration wizard, and select Next.

Confirm the displayed calculated factor.

For best results, repeat the calibration process to confirm results.

Clean Water Flush Tank

A separate clean water flush tank is provided in order to have ready access for rinse and flush cycles.

Flushing distribution system without contaminating tank contents

1. Turn pump off
2. Set Suction Valve to "Water"
3. Set Return Valve to "Recycle"
4. Ensure Agitation and Talk Rinse valves are closed
5. Turn on Manual override switch
6. Activate Pump

This will commence pumping rinse water through the valve set, and will send the regulated amount through the delivery lines on the bar.

Gradually the liquid in the valve set will be replenished from the clean water flush tank and diluted. Continue operation until delivery lines are rinsed sufficiently.

IMPORTANT

The higher the manual pressure the more water will go through your distribution system.

In order to quickly purge the valve set of chemical first, set the Return Valve to "Ground" and Activate the pump for a short time. This will pump the chemical out of the drain hose onto the ground. Once purged, stop the pump, set the Return Valve to "Recycle" and activate the pump again.

Flushing valve set and rinsing tank

1. Turn pump off
2. Set Suction Valve to "Water"
3. Set Return Valve to "Recycle"
4. Ensure Tank Rinse valve is open
5. Open Agitation valve if you would also like to rinse this circuit
6. Activate Pump

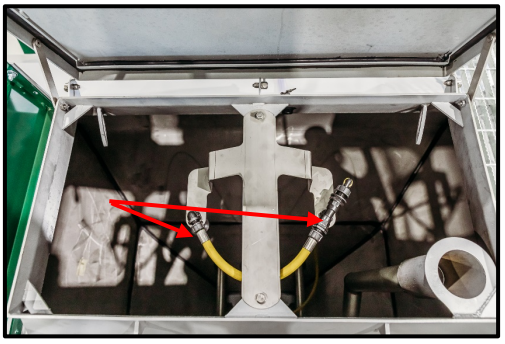
The Tank Rinse flow will accumulate in the bottom of the tank unless the fill/drain tap is opened, allowing it to drain.

NB: If manual override is switched on, distribution system will also be flished.

Tank Rinse Nozzles

Tank rinse nozzles provide a quick and simple way of rinsing the inside of the tank.

Simply lift the Tank Rinse Valve to direct flow through these nozzles.



Hand Wash

A 20 litre hand wash container is provided for rinsing hands in the event any liquid fertilizer coming into contact with the operator when filling/draining.

Troubleshooting

Concern	Probable Cause	Suggested Remedy
Unable to achieve Rate – Rate too high	a) Not enough restriction from distribution terminals. b) Pump speed too high	a) Recalculate nozzle flow and check against rate charts b) Decrease pump speed
Unable to achieve Rate – Rate too low	a) Blocked Filters b) Pump speed too low c) Pressure valve set too low d) Too much restriction from distribution terminals	a) Clean filters b) Increase pump speed c) Increase manual pressure d) Recalculate nozzle flow and check against rate charts
Low system pressure	a) Pump speed too low b) Agitator flow too high c) Blocked suction filter	a) Increase pump speed b) Decrease flow to agitator c) Check suction filter and clean or replace if necessary
High system pressure	a) Pump speed too high b) Blocked pressure filter c) Blocked delivery tubes	a) Decrease pump speed b) Check pressure filter and clean or replace if necessary c) Check delivery tubes and clean or replace if necessary
Pump not operating	a) Flow limiting valve shut b) Tractor hydraulic system failure c) Hydraulic lines not connected d) Breakaway coupling failed	a) Refloat hydraulic circuit b) Consult the authorized tractor dealer c) Check all breakaway couplings between the airseeder and the tractor are connected d) Check all coupling ball or pintle ends are free, in position and not under pressure
Pump pulsating	a) Blocked suction filter b) Suction supply blocked	a) Check suction filter and clean or replace as necessary b) Check for blockages in suction supply and address as necessary

Appendix 1 – FIBP Charts

Liquid Systems

METRIC FIBP RESISTANCE CHART

Yellow 5.0 X 1.2 Bore Tube Tube Length (Metres)	WATER (SG 1.0) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
0.5 M	0.180	0.272	0.343	0.404	0.457	0.514	0.560	0.604	0.658	0.682	0.718	0.752
0.6 M	0.156	0.252	0.315	0.370	0.420	0.464	0.508	0.542	0.586	0.622	0.660	0.682
0.7 M	0.138	0.232	0.292	0.344	0.391	0.431	0.468	0.505	0.544	0.576	0.606	0.634
0.8 M	0.127	0.214	0.271	0.320	0.361	0.397	0.433	0.468	0.502	0.534	0.562	0.596
0.9 M	0.118	0.200	0.255	0.298	0.340	0.376	0.410	0.440	0.472	0.502	0.530	0.552
1.0 M	0.109	0.188	0.243	0.281	0.319	0.352	0.385	0.416	0.442	0.472	0.496	0.524
1.5 M	0.100	0.168	0.210	0.245	0.283	0.309	0.339	0.360	0.395	0.415	0.435	0.461
2.0 M	0.085	0.150	0.180	0.211	0.245	0.266	0.290	0.315	0.341	0.355	0.370	0.400
2.5 M	0.075	0.121	0.160	0.183	0.215	0.238	0.260	0.280	0.300	0.317	0.337	0.353
3.0 M	0.065	0.105	0.146	0.165	0.192	0.210	0.235	0.246	0.265	0.280	0.296	0.310
3.5 M	0.055	0.096	0.135	0.159	0.170	0.196	0.219	0.230	0.250	0.262	0.277	0.290

Yellow 5.0 X 1.2 Bore Tube Tube Length (Metres)	UAN (SG 1.32); 42.5% N (W/V); 32.0% N (W/W) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
0.5 M	0.094	0.167	0.225	0.283	0.328	0.377	0.430	0.468	0.514	0.552	0.590	0.620
0.6 M	0.078	0.135	0.184	0.232	0.275	0.315	0.358	0.396	0.439	0.471	0.514	0.540
0.7 M	0.073	0.125	0.169	0.209	0.250	0.289	0.325	0.360	0.393	0.425	0.461	0.494
0.8 M	0.070	0.115	0.157	0.195	0.232	0.270	0.300	0.334	0.363	0.393	0.424	0.455
0.9 M	0.060	0.101	0.139	0.178	0.208	0.242	0.273	0.303	0.333	0.364	0.391	0.417
1.0 M	0.048	0.087	0.123	0.151	0.180	0.210	0.238	0.266	0.289	0.317	0.342	0.365
1.5 M	0.020	0.070	0.100	0.121	0.152	0.175	0.199	0.221	0.248	0.265	0.285	0.305
2.0 M	0.015	0.060	0.078	0.102	0.125	0.145	0.166	0.185	0.204	0.219	0.244	0.255
2.5 M	-	0.045	0.068	0.088	0.107	0.124	0.140	0.158	0.174	0.190	0.208	0.221
3.0 M	-	0.016	0.050	0.062	0.075	0.091	0.105	0.115	0.132	0.144	0.156	0.166
3.5 M	-	-	0.043	0.051	0.058	0.086	0.095	0.103	0.119	0.131	0.143	0.154

Yellow 5.0 X 1.2 Bore Tube Tube Length (Metres)	APP (SG 1.42); 16% N, 23% P, 0% K (W/V) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
0.5 M	0.000	0.000	0.041	0.055	0.068	0.081	0.095	0.110	0.125	0.138	0.151	0.165
0.6 M	0.000	0.000	0.000	0.043	0.053	0.064	0.075	0.085	0.094	0.106	0.119	0.130
0.7 M	0.000	0.000	0.000	0.000	0.043	0.052	0.059	0.067	0.076	0.085	0.094	0.102
0.8 M	0.000	0.000	0.000	0.000	0.034	0.042	0.049	0.056	0.062	0.070	0.077	0.085
0.9 M	0.000	0.000	0.000	0.000	0.000	0.035	0.041	0.047	0.053	0.059	0.065	0.071
1.0 M	0.000	0.000	0.000	0.000	0.000	0.030	0.035	0.040	0.045	0.050	0.055	0.060
1.5 M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.042	0.044
2.0 M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030
2.5 M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0 M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Appendix 2 – Line Meter Resistance Chart

METRIC LINE METER RESISTANCE CHART

Line Meter Size	WATER (SG 1.0) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
Red 0.55	0.116	0.145	0.166	0.190	0.210	0.232	0.250	0.265	0.275	0.295	0.310	0.325
Green 0.70	0.143	0.212	0.255	0.290	0.330	0.360	0.395	0.430	0.460	0.480	0.504	0.524
Blue 0.85	0.256	0.365	0.380	0.442	0.496	0.546	0.590	0.630	0.666	0.702	0.730	0.766
Purple 1.0	0.426	0.448	0.512	0.686	0.764	0.842	0.892	0.964	1.004	1.060	1.104	1.156
Orange 1.1	0.484	0.582	0.690	0.768	0.872	0.938	1.048	1.124	1.168	1.244	1.284	1.356
Yellow 1.2	0.502	0.620	0.800	0.920	1.004	1.120	1.196	1.268	1.348	1.424	1.480	1.544
White 1.3	0.536	0.668	0.888	1.004	1.160	1.284	1.340	1.404	1.548	1.620	1.668	1.780
Pink 1.5	0.724	0.980	1.204	1.380	1.492	1.700	1.820	1.984	2.052	2.196	2.322	2.418
Black 1.7	1.236	1.748	2.010	2.070	2.412	2.700	2.910	3.050	3.200	3.300	3.500	3.700
Grey 2.5	2.640	3.030	3.800	4.300	4.800	5.300	5.700	6.100	6.400	6.780	7.100	7.580

Line Meter Size	UAN (SG 1.32); 42.5% N (W/V); 32.0% N (W/W) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
Red 0.55	0.090	0.128	0.144	0.165	0.190	0.210	0.223	0.238	0.255	0.261	0.270	0.290
Green 0.70	0.142	0.198	0.235	0.270	0.299	0.325	0.350	0.375	0.399	0.416	0.435	0.455
Blue 0.85	0.200	0.284	0.340	0.382	0.433	0.471	0.514	0.546	0.580	0.604	0.632	0.660
Purple 1.0	0.304	0.442	0.504	0.574	0.632	0.690	0.744	0.804	0.850	0.890	0.940	1.004
Orange 1.1	0.380	0.516	0.622	0.710	0.782	0.844	0.932	0.960	1.036	1.128	1.192	1.204
Yellow 1.2	0.396	0.580	0.702	0.802	0.908	0.960	1.044	1.160	1.224	1.300	1.352	1.400
White 1.3	0.492	0.680	0.816	0.924	1.036	1.128	1.216	1.364	1.384	1.440	1.504	1.604
Pink 1.5	0.660	0.896	1.088	1.252	1.380	1.532	1.660	1.760	1.900	2.000	2.100	2.200
Black 1.7	1.000	1.380	1.760	1.980	2.180	2.320	2.580	2.650	2.810	2.940	3.080	3.250
Grey 2.5	1.880	2.860	3.650	4.300	4.700	5.200	5.340	5.450	5.680	6.000	6.060	6.250

Line Meter Size	APP (SG 1.42); 16% N, 23% P, 0% K (W/V) Litres Per Minute											
	0.5 Bar	1.0 Bar	1.5 Bar	2.0 Bar	2.5 Bar	3.0 Bar	3.5 Bar	4.0 Bar	4.5 Bar	5.0 Bar	5.5 Bar	6.0 Bar
Red 0.55	0.065	0.090	0.120	0.146	0.162	0.186	0.210	0.230	0.244	0.262	0.280	0.292
Green 0.70	0.128	0.180	0.240	0.272	0.306	0.336	0.362	0.400	0.430	0.474	0.500	0.514
Blue 0.85	0.182	0.260	0.320	0.380	0.420	0.450	0.490	0.520	0.550	0.600	0.630	0.660
Purple 1.0	0.260	0.380	0.480	0.572	0.640	0.690	0.760	0.816	0.870	0.916	0.934	1.000
Orange 1.1	0.290	0.466	0.560	0.666	0.740	0.790	0.846	0.920	0.990	1.041	1.092	1.158
Yellow 1.2	0.361	0.550	0.680	0.790	0.880	0.960	1.065	1.116	1.194	1.260	1.320	1.380
White 1.3	0.396	0.603	0.801	0.942	1.050	1.125	1.215	1.320	1.401	1.500	1.540	1.620
Pink 1.5	0.580	0.904	1.056	1.240	1.388	1.500	1.640	1.740	1.806	1.860	1.950	2.040
Black 1.7	0.630	0.960	1.242	1.497	1.620	1.803	1.980	2.160	2.370	2.520	2.670	2.820
Grey 2.5	1.060	1.500	2.010	2.460	2.850	3.280	3.760	4.080	4.320	4.800	5.100	5.400

User Calibration Factors

Product / Tank Mix	**Calibration Factor** *(Pulses per Litre)*
Water	600

Notes