Teatwand™ STEPOVER

INSTALLATION MANUAL
FOR ALL MARKETS

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Congratulations on your purchase of a Teatwand™ product.

Teatwand™ STEPOVER

The most recent addition to the Onfarm Solutions product range providing accurate efficient teat spraying for herringbone and parallel parlours.

Teatwand EXACT™

Developed as a solution to accurately deliver teat spray to cows as they pass on rotary platforms.

Teatwand™ RAPID

The result of customer requests for a solution to teat spraying on large fast moving rotary platforms primarily in the USA.

Contents

General Safety Warnings 4
Teatwand™ Stepover System Overview. 5
Teatwand™ Stepover Location. 6
Services required for Teatwand™ Stepover System. 7
Teatwand™ Stepover System Installation procedure. 8
Installing the Teatwand™ Stepover. 8
Installing the Controls Cabinet. 9
Setting up and calibrating the sensors. 13
Teatwand™ Stepover Controller. 14
Teatwand™ Stepover Winter Mode. 15
Teatwand™ Stepover Automatic Wash Cycle 16
Teatwand™ Stepover Automatic Clean Cycle 16
Teat Spray Pump Assembly. 18
Features of the Teatwand™ Stepover System. 19
Care and Maintenance of the Teatwand™ Stepover. 19
Appendix 1. Wiring Diagram. .... Error! Bookmark not defined.
Appendix 2. PCB Detail. 21
Appendix 3. Controls Cabinet. 22
Appendix 4. Stepover Sprayer. 23
Appendix 5. Device Dimensions. 24
Appendix 6. Device Dimensions. 25

General Safety Warnings

For installers and operators

WARNING – **Read all safety instructions and warnings**. Failure to do so may result in personal injury.

Work Area Safety.

Keep work area clean and well lit.

Keep children and bystanders away during installation and operation of machinery.

HAZARDS:

- Wet floors and yards – wear appropriate safety footwear to avoid slips.
- Cows – always maintain a safe distance from the cows.
- Electric Shock – take care using extension leads. Always use an RCD.

Personal Safety

Use appropriate PPE for the task at hand.

Observe manufacturers safety recommendations while using power tools.

Identify the location of all Emergency Stops.

HAZARDS:

- Noise – Milking parlours can be noisy places, use appropriate PPE.
- Pinch Points – Swinging gates in the parlour and yards can create pinch points.
- Crushing Hazards – Maintain a safe distance from cows exiting the parlour and moving through the yards.
- Electric Shock - Electrical connection to power supply is 240/110V. Electrical connection between controller/power supply and the device is 24VDC.
- Compressed Air - Turn off compressed air supply and remove residual pressure from the device when doing service work or maintenance. Immediately repair any compressed air leaks.
- Chemical Hazards - Teat spray can be hazardous. Avoid contact with skin and eyes. Use appropriate PPE.

Teatwand™ Stepover System Overview.

Figure 1

The Teatwand™ Stepover automatic teat sprayer is the most recent product to be developed by Onfarm Solutions for herringbone and parallel dairies. The robust design uses stainless steel for strength and durability and our proven teat spray delivery system uses the same components as other Teatwand™ products. Designed to accurately teatspray cows as they enter and/or exit the milking parlour the Teatwand™ Stepover has four spray nozzles, two sets of two, independantly controlled to provide excellent coverage regardless of how fast the cow is moving.

Clever use of optical sensor technology, a smart program and simple push button controls make this a set and forget tool for the modern farmer. An automatic nozzle wash function periodically cleans the nozzles and purges clean water through the nozzles. No moving parts means minimum maintenance.

Onfarm Solutions recommend that 3/4m of rubber matting is fitted under the Stepover.

The Teatwand Stepover has a Winter Mode to aleviate the potential of teat spray and water freezing in the delivery lines. Refer to the Controller section of this manual for more detail.

Teatwand™ Stepover Location.

Determining the best location for the Teatwand™ Stepover is the first decision to be made when preparing for an installation.

There are two options for locating for the Teatwand™ Stepover.

Option 1. Two Teatwand™ Stepover systems.

For large dairies and dairies with very little exit yard space we recommend installing two Teatwand™ Stepover systems, one for each row in the exit area of the row.

There are many benefits to installing close to the exits.

- Cows are sprayed quickly after milking.
- Reduced contamination from splashing in the yard.
- Less disruption to cow flow.
- Maintenance is less frequent.
- Where wind may be a problem, close to the exit is generally sheltered.

In large rapid exit parallel parlours, it may be necessary to install two systems on each side so as not to disrupt cow flow. Some yard work will be required to create two single file lanes on each side.

Option 2. One Teatwand™ Stepover system in a single file lane.

This option is best suited to small and medium sized dairies where there is an existing single file lane that the cows exit through or there is available yard space to create a single file lane. The Teatwand™ Stepover must be located prior to a drafting/sort gate and as close as practical to the exit area. Ideally a minimum of 3m of clear single file laneway is required for the least disruption to cow flow, however as little as 2m will work in most situations.

NOTE: If the location for the Stepover System is in a windy environment it will be beneficial to fit solid panels to the yard rails on each side of the Stepover unit.

Services required for Teatwand™ Stepover System.

Once the location of the Teatwand™ Stepover has been decided the next consideration is running the required services to the location.

The Teatwand Stepover is supplied with an 8mm tube connection for teat spray, a 12mm tube connection for water and an 8mm tube connection for compressed air to the pump.

To be supplied and fitted by the dealer:

- **8mm spray hose from the pump to the Teatwand Stepover location.**
- **3 core 1.5mm power cable from the 24VDC power supply to the Teatwand Stepover location.**
- **12mm/1/2’’ flexible hose from the farm high pressure wash circuit to the Teatwand Stepover location.**
- **8mm hose from an unregulated compressed air supply to the teat spray pump.**

Teat Spray.

- An 8mm spray hose to go from the pump outlet to the Teatwand™ Stepover. The pump will generally be fitted in a plant room with a bulk supply of teat spray nearby.

Power.

- A 110V or 240V 10 amp connection is needed for a 24VDC power supply that comes with the system. The power supply will generally be fitted in a plant room and a cable from the power supply to the Teatwand™ Stepover controller will need to be installed.

Water Supply.

- A connection to the dairies high pressure wash water circuit is required to supply the Clean In Place (CIP) washer. There will often be an opportunity to tee into nearby pipework. Fit a ball valve and run a flexible 12mm / ½’’ hose to the Teatwand™ Stepover.

Compressed Air.

- A compressed air supply is required to drive the teat spray pump. The teat spray pump will be located in a plant room, close to the bulk supply of teat spray and generally close to a compressed air supply. The pump uses 2.5l/min, less than 0.1 cubic feet/min of compressed air.

Teatwand™ Stepover System Installation procedure.

Installing the Teatwand™ Stepover.

With the Teatwand™ Stepover location decided, the teat spray pump fitted, the power supply fitted and a water connection in place the next thing to do is to mount the Teatwand™ Stepover in the laneway.

- Complete any necessary yard work. It may be necessary to modify yard rails to create a single file laneway. Where the lane is wide it may be necessary to fit pipework to narrow the lane to ensure cows flow through individually. The finished width of a lane should be 700-800mm. Onfarm Solutions recommend a minimum of 2m of straight single file laneway.
- Fit 3m of rubber mats (not supplied) to the laneway surface, it may be necessary to cut the mat to suit the width of the laneway.
- Place the Teatwand™ Stepover on top of the rubber matting on the centre line of the lane, leaving about 1m of matting on the approach side. The unit is supplied prewired and pre plumbed with 4m of cable and hoses coiled up to be connected appropriately. Take care not to pinch these cables and hoses.
- Bolt the unit through the rubber matting and into the concrete surface of the laneway. Drill and insert all bolts before tightening, then tighten sequentially to avoid distorting the Stepover unit.
- Take the cable cover, it is notched at one end to butt up to the frame of the Teatwand™ Stepover, cut the other end to suit the width of the laneway, lay out the cables and hoses and fit the cable cover over the top.

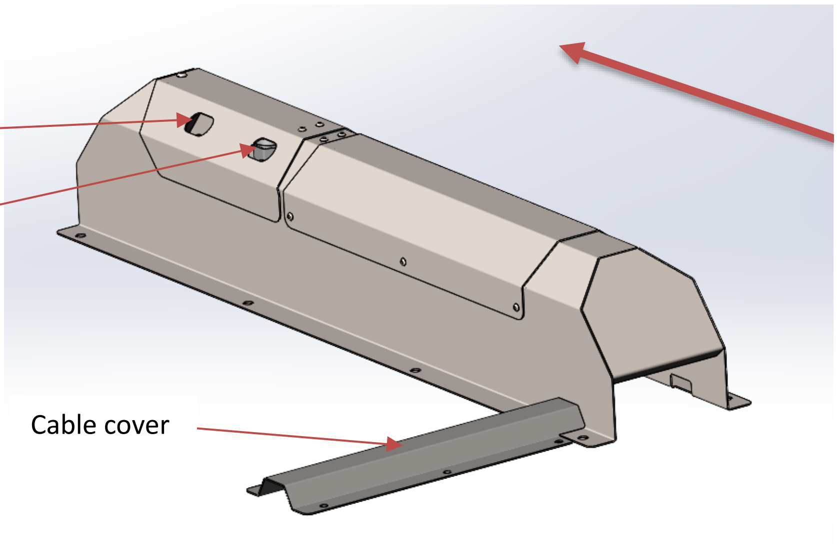


Figure 2

Installing the Controls Cabinet.

Take care to follow the dimensions outlined in Figure 3 when fitting the Controls Cabinet, locating it in the correct position relative to the Stepover unit is important.

The Finish Sensor in the Controls Cabinet – the last sensor the cows will pass – should be positioned 200mm/8inches back from the Front Nozzles.

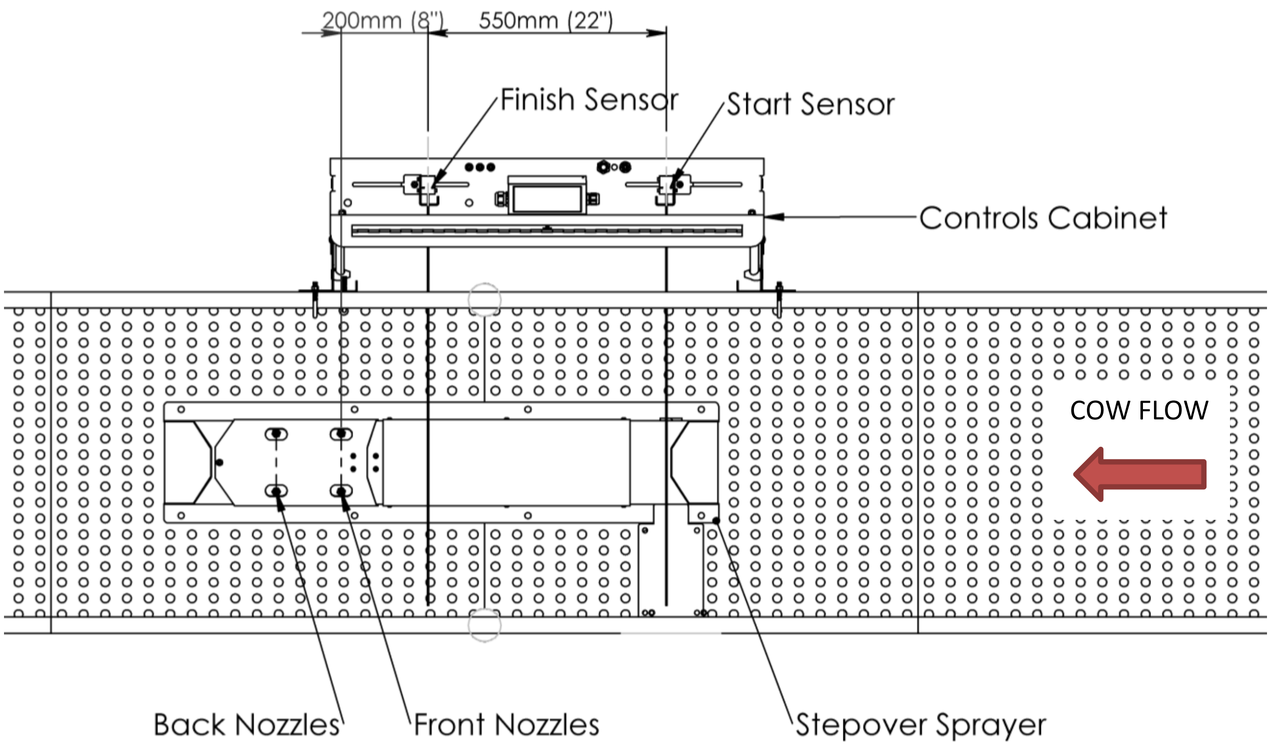


Figure 3

The sensor positions above are recommended default positions. Moving the sensors further apart will increase the duration of the spray time.

To have the spray start earlier move the Start sensor closer to the approaching cow.

To have the spray finish later move the Finish sensor away from the approaching cow.

The default position for the Controls Cabinet and the sensor positions are optimised for local conditions.

Check the spray patterns after the cows have become accustomed to the Stepover and are moving over it calmly. Consider any changes carefully and only after observing a large sample size.

The Controls Cabinet clamps onto the top rail of the laneway pipework or the second rail down depending on the height of the rails. There is adjustment on the mounts to allow for setting the final height position. The target is for the laser to be 1200mm off the mats. Next the braces are fitted with rods and clamps from the Controls Cabinet to the next rail down.

1200mm is the default measurement. This has been optimised for local conditions. If there are a number of small cows that the laser would miss when set at 1200mm the Controls Cabinet will need to lowered so the laser detects these small cows.

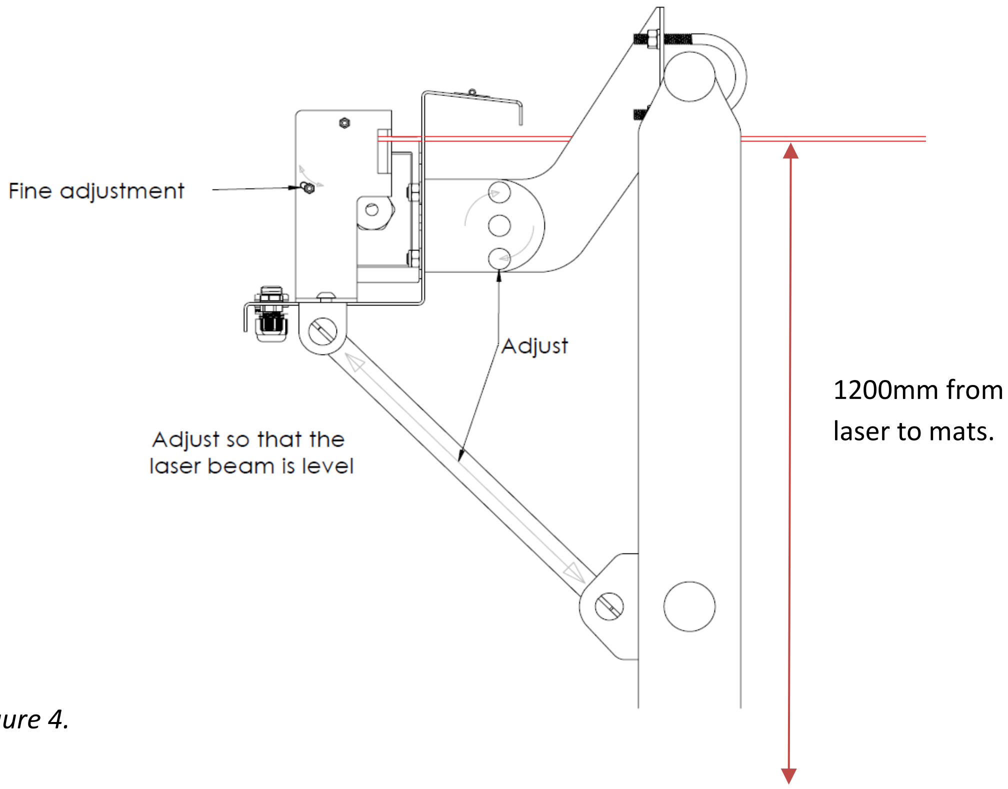


Figure 4.

Level the cabinet lengthways and vertically.

Connect power to the control box. See Appendix 1. Wiring Diagram.

The final set up is best done with the power connected, use the lasers from the sensors to confirm heights and levels are correct, the sensors are parallel to each other and the correct distance apart.

Simply place the end of a tape measure on the mat close to the Controls Cabinet and measure up vertically. Check the laser dot hits the 1200mm mark. Now go to the other side of the lane and do the same, this will confirm the laser is level. Do this for both sensors.

Next check the distance between the sensors, start close to the Controls Cabinet using the laser dots to confirm that the sensors are 550mm apart, now go the other side of the lane and do the same, this will confirm the sensors are set up parallel to each other.

On the far side of the laneway there needs to be something for the sensors to detect. If when set at the correct height the sensors are pointing between the rails it will be necessary to fit something, for example a metal strip welded between the rails as a target for the laser dot. Use the laser dot to determine where these needs to be.

Metal strips - sensor targets

Figure 5.

Fit a conduit for hoses and cables to run from the cable cover on the rubber matting up to the underside of the Controls Cabinet. For durability, this conduit should be well protected or use a piece of steel pipe welded vertically onto the rails as shown in Figure 6.

Figure 6.

With the Controls Cabinet and the Stepover fitted there is now a target for the services to run to.

Run services to Stepover.

- Teat spray hose, 8mm flexible tubing (supplied) from the Teat Spray pump to the Stepover location.
- 24VDC cable from the power supply.
- 12mm/ ½’’ flexible water supply hose.

Terminating the services.

- Teat spray – connect the teat spray supply hose directly to the spray hose from the stepover unit. Use the 8mm straight union supplied.
- The power cable enters the Controls Cabinet through a cable gland on the underside and into the Controller enclosure, it is then hard wired to terminals on the PCB. See Appendix 1. Wiring Diagram.
- Water supply is connected directly to the 12mm hose from the Stepover unit.
- The sensor cables are pre-wired into the controller with enough length for either cable to be plugged in to either sensor. The cables are labelled ‘Start Sensor’ and ‘Finish Sensor’. Fit the ‘Start Sensor’ cable to the first sensor that the cows will pass. Fit the ‘Finish Sensor’ cable to the other sensor, the second sensor the cows pass.

Terminating the outputs.

From the Stepover unit there are 2 cables to run to the Controls Cabinet, one for the teat spray solenoids and one for the wash solenoid, these enter through cable glands on the underside of the Controls Cabinet and into the Controller enclosure. These cables are labelled ‘Teatspray’ and ‘Water’ and are hard wired to terminals on the PCB. See Appendix 1. Wiring Diagram.

Setting up and calibrating the sensors.

There are two sensors, they are identical, they measure distance. The first sensor the cows pass is the 'Start' sensor the second is the 'Finish' sensor. With the controls cabinet mounted in the correct position, set the sensor positions. See Figure 3. Page 9.

Next step is to calibrate the sensors.

Calibration will set a 'near' point and a 'far' point, once calibrated the sensors will measure between these two points. Begin with the 'Start' sensor, the first sensor the cows pass.

- Place an object or a hand in front of the sensor at the position of the near rail.
- Press and hold the 'Calibrate Near' button. There will be a beep.
- There will be something fitted on the far side of the lane for the sensors to detect.
- Press and hold the 'Calibrate Far' button. There will be a beep.
- These settings will automatically transfer to the 'Finish' sensor.

Understanding the Q1 & Q2 indicator lights on the sensors.

There are 3 lights on the sensors, 'run', 'Q1' and 'Q2'. The run light indicates there is power the Q1 illuminates when a 'near' object is detected, Q2 illuminates when a 'far' object is detected.

1. At rest, Q2 light is on for both sensors - because Q2 senses a 'far' distance and there is something on the far side of the race/lane for the sensor to detect.
2. Approaching cow covers first sensor - Q1 lights up on the start sensor
3. Cow progresses to the finish sensor - Q1 lights up on the finish sensor
4. The cow moves past the start sensor and the Q1 light goes off.
5. The time elapsed between start and finish is calculated in the algorithm and a delay is applied before opening the spray solenoid to spray the teats.
6. If the cow is moving quickly the algorithm decides to deploy both front and rear solenoids for a lesser amount of time to ensure the teats are adequately sprayed.
7. The cow moves past the finish sensor and the cycle is complete.

Observing these sensors is a good way to diagnose problems. If both Q1 and Q2 are illuminated when the system is a rest this means either the face of the sensor is dirty or the sensor alignment needs to be adjusted.

Teatwand™ Stepover Controller.

Located in the controls cabinet between the sensors is the Controller. A series of simple push buttons allow the user to enable/disable the system, manually operate different functions of the system, see the outputs/solenoids are all working and calibrate the sensors at the time of set-up. The QR code can be used to access a link to the website. A login is required to access the manuals.

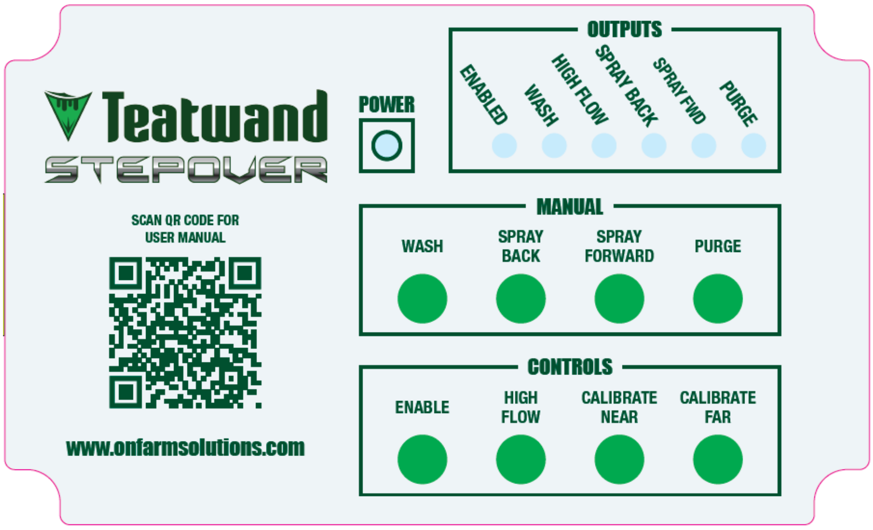


Figure 7.

The Lights.

- Power – indicates when power is on and flashes if there is an output failure. Call your Teatwand™ service agent should this happen.

Outputs

- Enabled – Illuminates when system is enabled. When it flashes it is indicating the sensors need to be calibrated. See page 13 for instructions.
- Wash – Illuminates when the wash function is active
- High Flow – illuminates when the high flow function is selected.
- High Flow light also indicates the status of Winter Mode, see below.
- Spray Back – Illuminates when the back spray nozzles are active
- Spray Forward – Illuminates when the front nozzles are active.

- Purge – This light will illuminate when the purge solenoid is active.

The Buttons.

Manual Buttons.

- Wash – Manually operates the CIP washer nozzle.
- Spray Back – Manually operates the back nozzles.
- Spray Forward – Manually operates the forward nozzles.
- Purge – Manually operates the purge function.

Controls Buttons.

- Enable System button, switches system on and off.
- High Flow button. Selects an option to have all four nozzles spraying every cow. This function is selected when a high volume of teat spray is required for every cow. With High Flow selected the High Flow light will be illuminated and both the Spray Back and Spray Forward lights will illuminate when the spray is activated.
- High Flow button is also used to enable Winter Mode, see below for details.
- Calibrate Near button – used during the set-up procedure to calibrate the Near positon of the sensors.
- Calibrate Far button – used during the set-up procedure to calibrate the Far position of the sensors.

Teatwand™ Stepover Winter Mode.

Winter Mode has been added to the TW Stepover control functions.
This is aimed to mitigate the potential problem of the spray and wash lines becoming frozen in winter conditions. To check if a system has the Winter Mode feature refer to the program version number located on the PCB. Version 1.04 and above will have this feature.

With Winter mode activated both the purge and wash water will spray for 5 seconds every 5 minutes and the teatspray will also spray for 5 seconds every 5 minutes.

To enable 'Winter mode' hold the 'High Flow' button on the controller down for 3 seconds. The 'High Flow' light will flash indicating 'Winter Mode' is enabled.

When the Stepover is operating in ‘Normal Mode’ with just two nozzles spraying and ‘Winter Mode’ is enabled the ‘High Flow’ light will flash slowly.

When the Stepover is in ‘High Flow’ mode with all four nozzles spraying and ‘Winter Mode’ is enabled the ‘High Flow’ light will flash fast.

If ‘Winter Mode’ is not enabled and ‘High Flow’ is enabled the High Flow light will be on continuously.

Guide to the status of the ‘High Flow’ light on the controller.

- No light - High Flow is not enabled - Winter Mode is not enabled.
- Light on continuously - High Flow is enabled - Winter Mode is not enabled.
- Light flashing slowly - High Flow is not enabled - Winter Mode is enabled.
- Light flashing fast - High Flow is enabled and Winter Mode is enabled.

During normal milking sessions when Winter Mode is enabled there is no change to the functionality of the system, the Winter Mode only starts after a period of no cows.

Teatwand™ Stepover Automatic Wash Cycle

After every 10 cows the CIP washer cleans the spray nozzles for 2 seconds. If no cow is seen for 20 seconds the wash runs for 2 seconds.

Teatwand™ Stepover Automatic Clean Cycle

The clean cycle is a longer, more intensive clean that occurs automatically between milkings.

The clean cycle occurs at fixed intervals after no cows have been seen for a certain period time.

- Short Clean: If no cow is seen for 10 minutes, the clean cycle will run for 30 seconds.
- Long Clean: If no cow is seen for 30 minutes, the clean cycle will run for 2 minutes.

This cycle can be configured to run in two different modes.

- Standard Clean: Run the CIP nozzle for 3 seconds and then idle for 2 seconds (Repeating). This is the default setting.
- Auto-Purge Clean: Run the CIP nozzle for 3 seconds and then purge all nozzles with

water for 2 seconds (Repeating). At the end of the clean cycle, purge for 1 second with Teatspray through all nozzles, clearing all water from the spray lines and recharging with teat spray ready for the next cow.

To check which clean mode is active or to swap modes, the controller housing must be opened to expose the circuit board. Beside where the power cable comes in, on the bottom right of the circuit board there are 3 lights and a pushbutton labelled Mode/Save

With none of these lights on the system is in the default mode, the 'Standard Clean' mode.

To enable the 'Auto-Purge Clean' mode hold the "Mode Save" button until the top light of the three labelled 'Slow Speed' lights up. Then hold the "Mode Save" button a second time until the 'TW400 Mode' lights up, this indicates the 'Auto Purge Mode' is activated.

To disable the 'Auto-Purge Mode' tap the 'Mode Save' button until all lights are off.

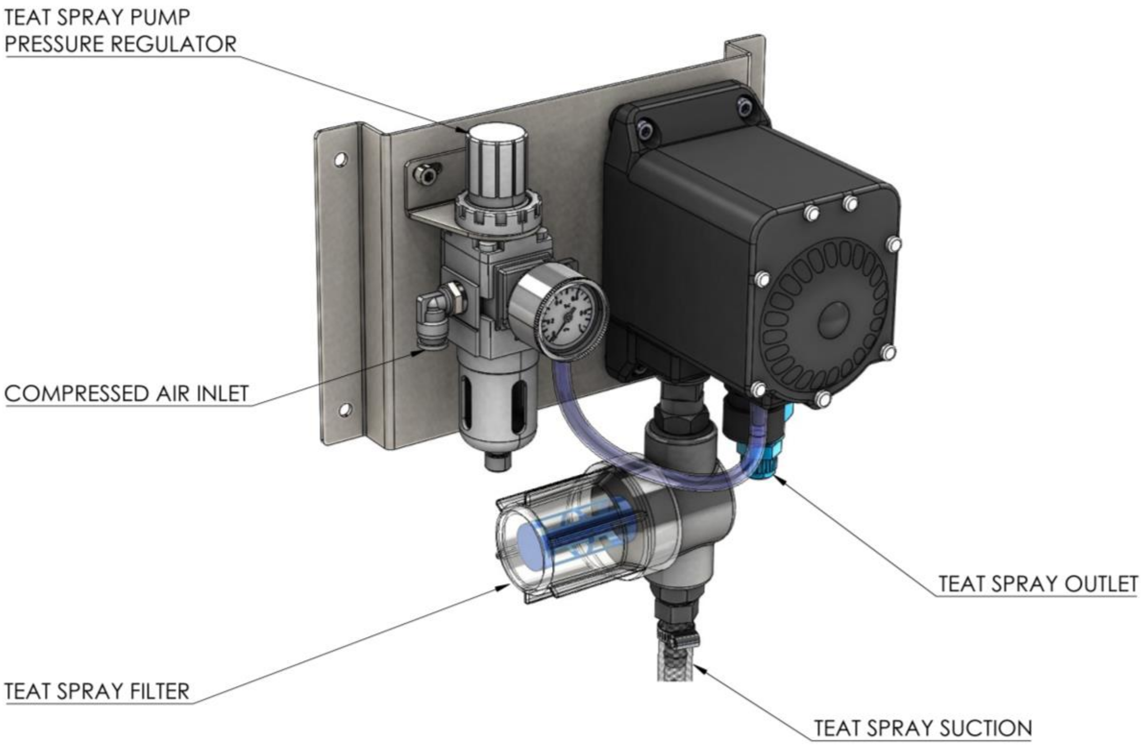
Quick guide to the Teatwand Stepover automatic clean cycle.

By default the system will be in the Standard Clean mode, this is indicated on the circuit board when there are no lights illuminated.

With the 'Auto-Purge Mode' enabled the light labelled 'TW400 Mode' will be illuminated.

Teat Spray Pump Assembly.

- Air supply to regulator is required, 8mm line or ¼'' threaded fitting.
- Install above or close to the teat spray vessel.
- The pump will draw teat spray vertically from a maximum of 15ft/5m and pump up to 750ft/250m.
- Air pressure minimum 20psi maximum 100psi.
- For standard Nozzles the pressure will be between 35-65 PSI. Recommended pressure is 40psi.
- Higher pressure results in more spray being applied.
- The pump will consume 2.5l/min of compressed air.



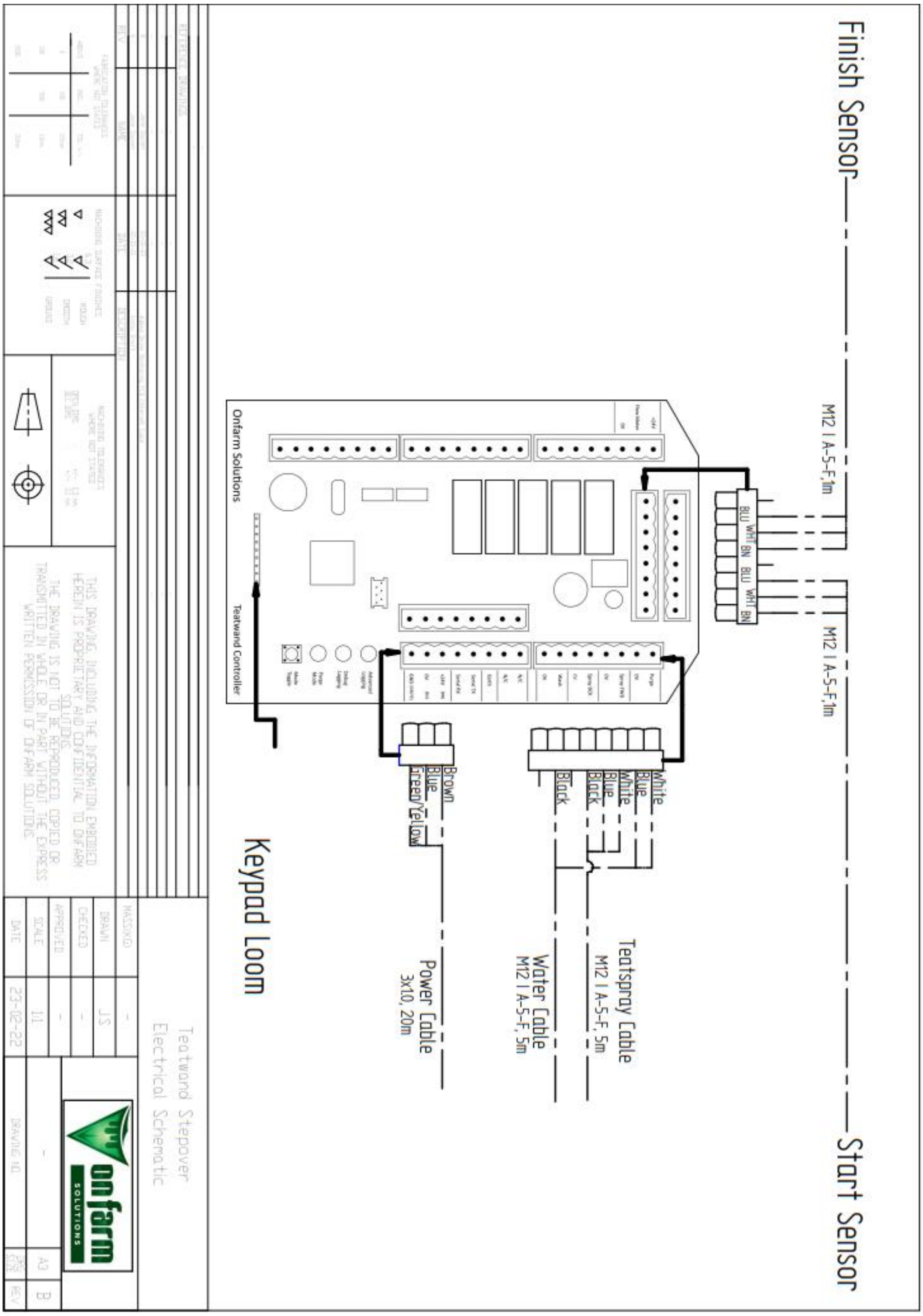
Features of the Teatwand™ Stepover System.

- Accurate tracking of cow position and speed of flow
- 2 nozzles spray when cow flow is regular.
- 4 nozzles spray fast moving cows.
- Clean in Place wash for the nozzles. There are 3 wash cycles automatically actuated.
- Purge function. In conjunction with the wash cycles the nozzles are periodically purged with clean water.
- Winter mode for frost mitigation.
- High flow function, all 4 nozzles spray every cow regardless of speed.
- Simple push button controls
- Easy, quick installation.

Care and Maintenance of the Teatwand™ Stepover.

- The system should remain powered up all the time.
- The sensors will require weekly cleaning, lift the hinged lid of the Controls Cabinet, take a damp cloth, and clean the face of each sensor.
- Hose the Stepover unit down after every milking, taking care not to direct high pressure water through the slotted opening in the controls cabinet.
- Open the Nozzle cover and hose down every week.
- If the system is not being used for a period of time flush the teat spray lines with clean water. Place the suction hose from the pump in a 20l bucket of clean water and manually operate the spray back and spray forward buttons on the controller until clean water is seen coming from the nozzles.
- Drain the air compressor regularly, moisture will be detrimental to the Teat Spray Pump.
- If changing teat spray product it is important to flush the old teat spray out of the lines and solenoids. Some teat spray products react with each other causing potential damage to the solenoids and nozzle blockages. Follow the flush procedure described above.

Appendix 1. Wiring Diagram.



Appendix 2. PCB Detail.

The PCB's have 5 fuses to protect the outputs. The Teatwand Stepover uses four outputs.

F1 – Spray FWD

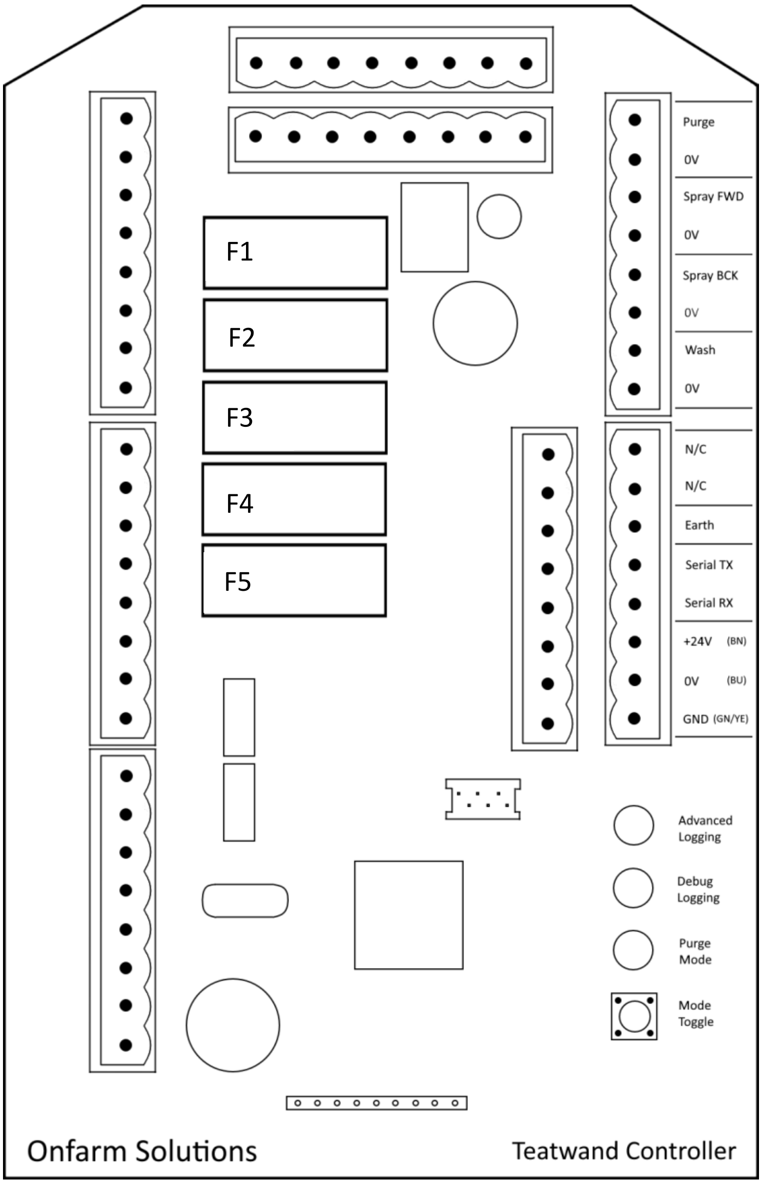
F2 – Spray BACK

F3 - Wash

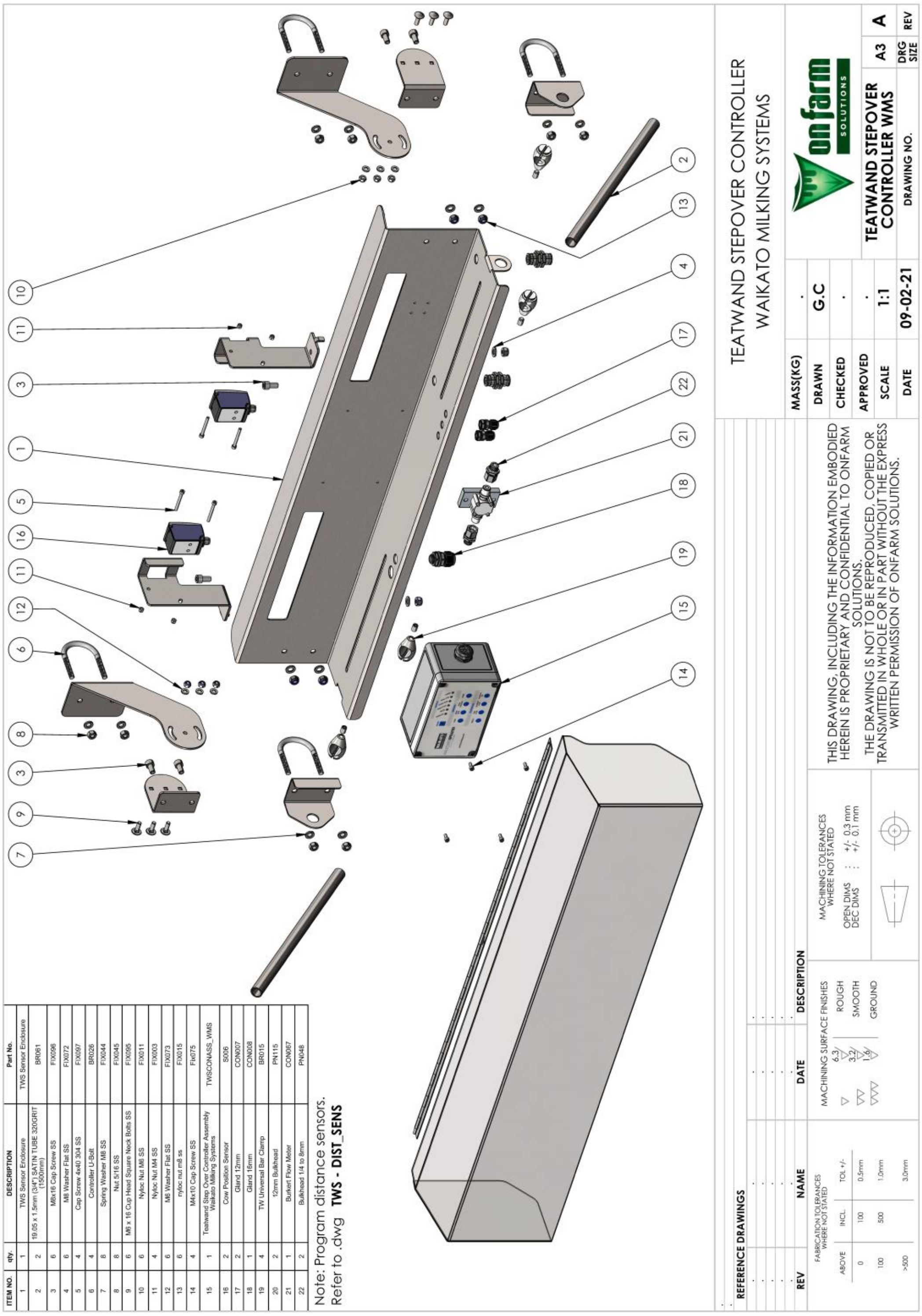
F4 - Purge

F5 – Auxiliary (not used)

NOTE: If there is a blown fuse it will have blown for a reason. There will be a faulty solenoid or a damaged cable or plug. The fuses are - Glass 315mA Slow Blow # CON057

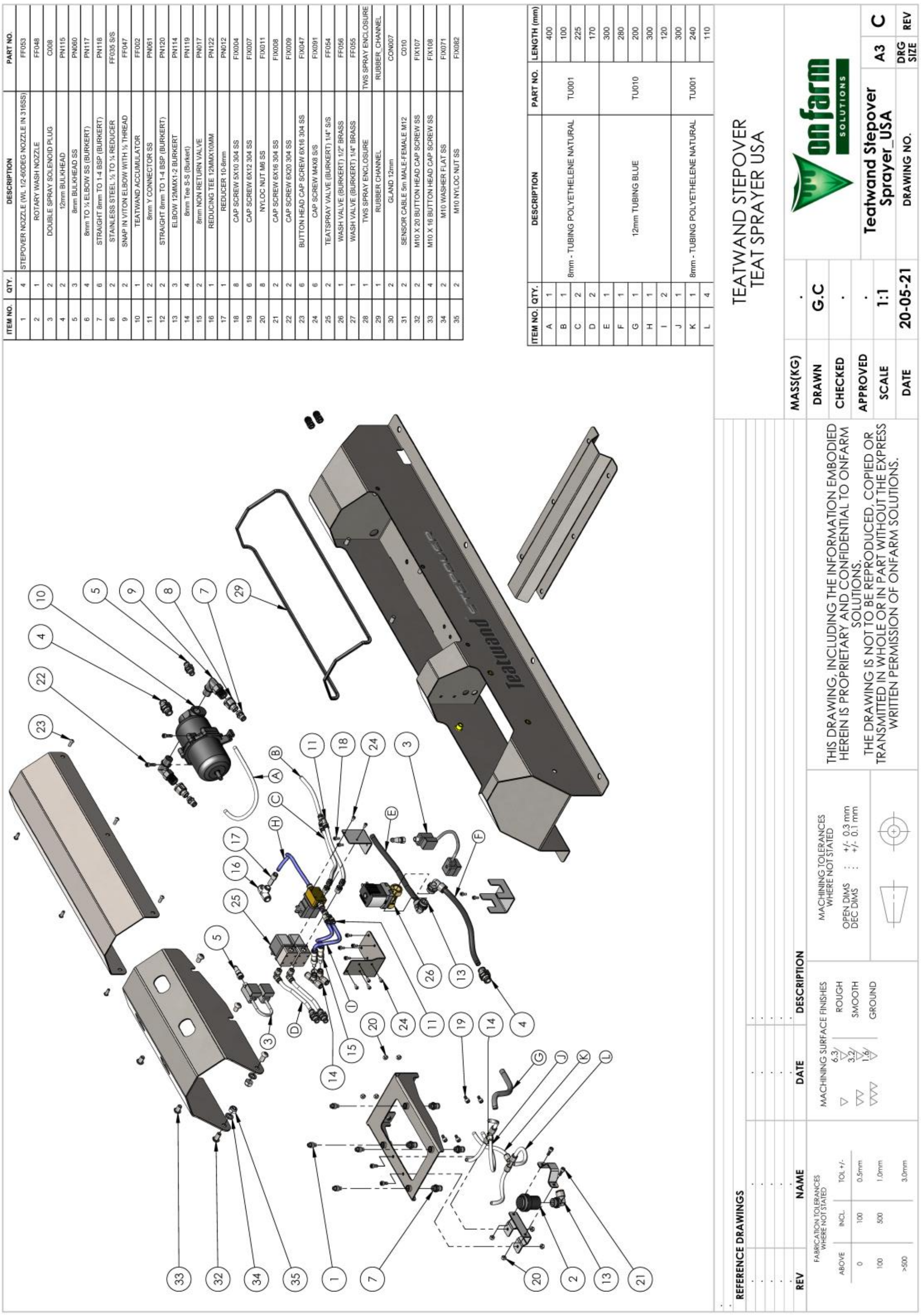


Appendix 3. Controls Cabinet.



ITEM NO.	qty.	DESCRIPTION	Part No.
1	1	TWS Sensor Enclosure	TWS Sensor Enclosure
2	2	19.05 x 1.5mm (3/4") SATIN TUBE 320GRIT (1500mm)	BR061
3	6	M8x16 Cap Screw SS	FIX096
4	6	M8 Washer Flat SS	FIX072
5	4	Cap Screw 4x40 304 SS	FIX097
6	4	Controller U-Bolt	BR026
7	8	Spring Washer M8 SS	FIX044
8	8	Nut 5/16 SS	FIX045
9	6	M6 x 16 Cup Head Square Neck Bolts SS	FIX095
10	6	Nyloc Nut M8 SS	FIX011
11	4	Nyloc Nut M4 SS	FIX003
12	6	M6 Washer Flat SS	FIX073
13	6	nyloc nut m8 ss	FIX015
14	4	M4x10 Cap Screw SS	Fix075
15	1	Teatwand Step Over Controller Assembly Waikato Milking Systems	TWSCONASS_WMS
16	2	Cow Position Sensor	S006
17	2	Gland 12mm	CON007
18	1	Gland 16mm	CON008
19	4	TW Universal Bar Clamp	BR015
20	2	12mm Bulkhead	PN115
21	1	Burkert Flow Meter	CON067
22	2	Bulkhead 1/4 to 8mm	PN048

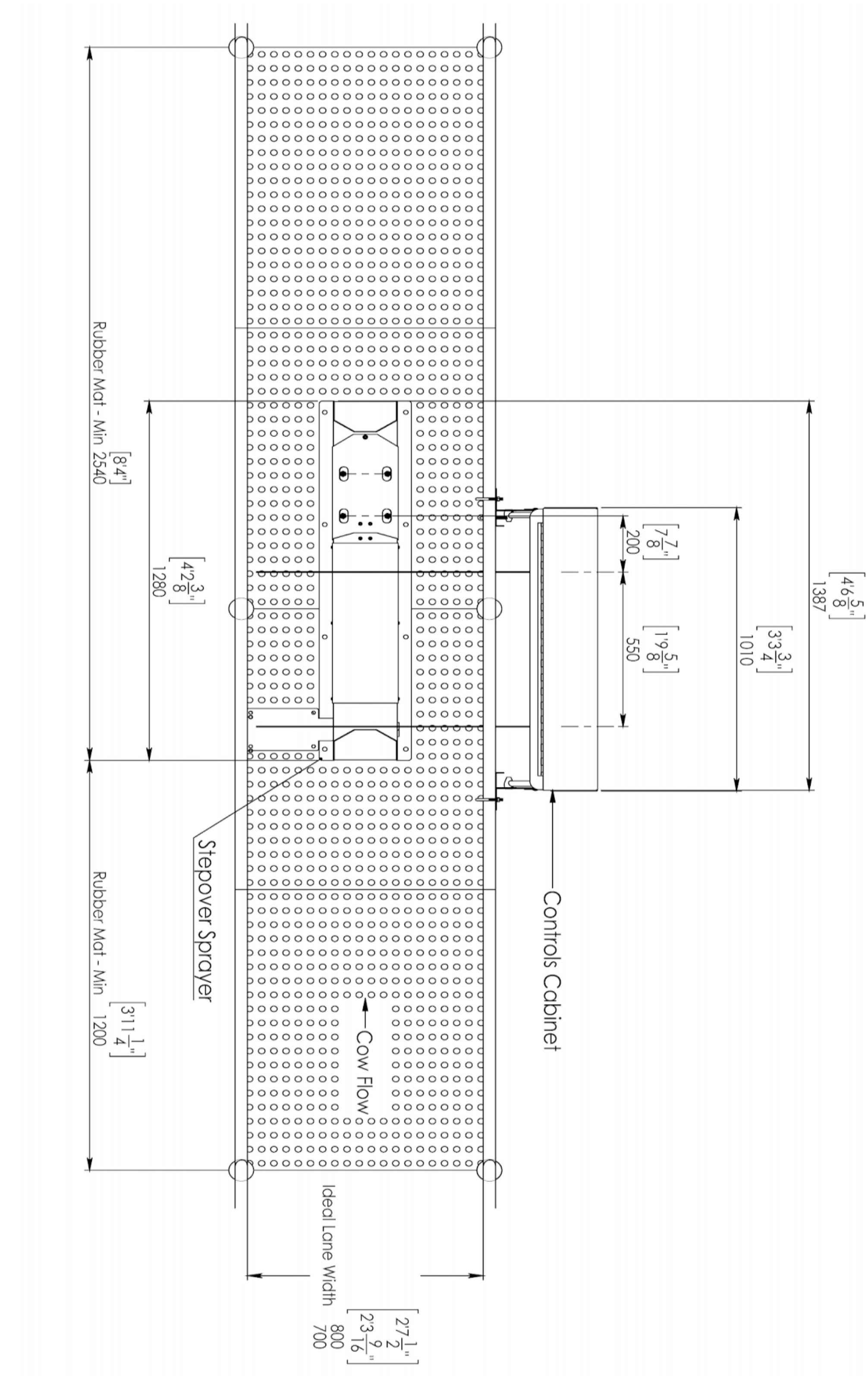
Appendix 4. Stepover Sprayer.



ITEM NO.	QTY.	DESCRIPTION	PART NO.
1	4	STEPOVER NOZZLE (WL 1/2-60DEG NOZZLE IN 316SS)	FF053
2	1	ROTARY WASH NOZZLE	FF048
3	2	DOUBLE SPRAY SOLENOID PLUG	C008
4	2	12mm BULKHEAD	PN115
5	3	8mm BULKHEAD SS	PN060
6	4	8mm TO ¼ ELBOW SS (BURKERT)	PN117
7	6	STRAIGHT 8mm TO 1-4 BSP (BURKERT)	PN118
8	2	STAINLESS STEEL ½ TO ¼ REDUCER	FF035 S/S
9	2	SNAP IN VITON ELBOW WITH ½ THREAD	FF047
10	1	TEATWAND ACCUMULATOR	FF002
11	2	8mm Y CONNECTOR SS	PN061
12	2	STRAIGHT 8mm TO 1-4 BSP (BURKERT)	PN120
13	3	ELBOW 12MMX1-2 BURKERT	PN114
14	4	8mm Tee S-S (Burkert)	PN119
15	2	8mm NON RETURN VALVE	PN017
16	1	REDUCING TEE 12MMX10MM	PN122
17	1	REDUCER 10-8mm	PN012
18	8	CAP SCREW 5X10 304 SS	FIX004
19	6	CAP SCREW 6X12 304 SS	FIX007
20	8	NYLOC NUT M6 SS	FIX011
21	2	CAP SCREW 6X16 304 SS	FIX008
22	2	CAP SCREW 6X20 304 SS	FIX009
23	6	BUTTON HEAD CAP SCREW 6X16 304 SS	FIX047
24	6	CAP SCREW M4X8 S/S	FIX091
25	2	TEATSPRAY VALVE (BURKERT) 1/4" S/S	FF054
26	1	WASH VALVE (BURKERT) 1/2" BRASS	FF056
27	1	WASH VALVE (BURKERT) 1/4" BRASS	FF055
28	1	TWS SPRAY ENCLOSURE	TWS SPRAY ENCLOSURE
29	1	RUBBER CHANNEL	RUBBER_CHANNEL
30	2	GLAND 12mm	CON007
31	2	SENSOR CABLE 5m MALE-FEMALE M12	C010
32	2	M10 X 20 BUTTON HEAD CAP SCREW SS	FIX107
33	4	M10 X 16 BUTTON HEAD CAP SCREW SS	FIX108
34	2	M10 WASHER FLAT SS	FIX071
35	2	M10 NYLOC NUT SS	FIX082

ITEM NO.	QTY.	DESCRIPTION	PART NO.	LENGTH (mm)
A	1	8mm - TUBING POLYETHELENE NATURAL	TU001	400
B	1			100
C	2			225
D	2			170
E	1	12mm TUBING BLUE	TU010	300
F	1			280
G	1			200
H	1			300
I	2			120
J	1	8mm - TUBING POLYETHELENE NATURAL	TU001	300
K	1			240
L	4			110

Appendix 5. Device Dimensions



Appendix 6. Device Dimensions