



Ulvamast V4



Operator's Manual

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This publication covers the following products:

Ulvamast V4E and Ulvamast V4M

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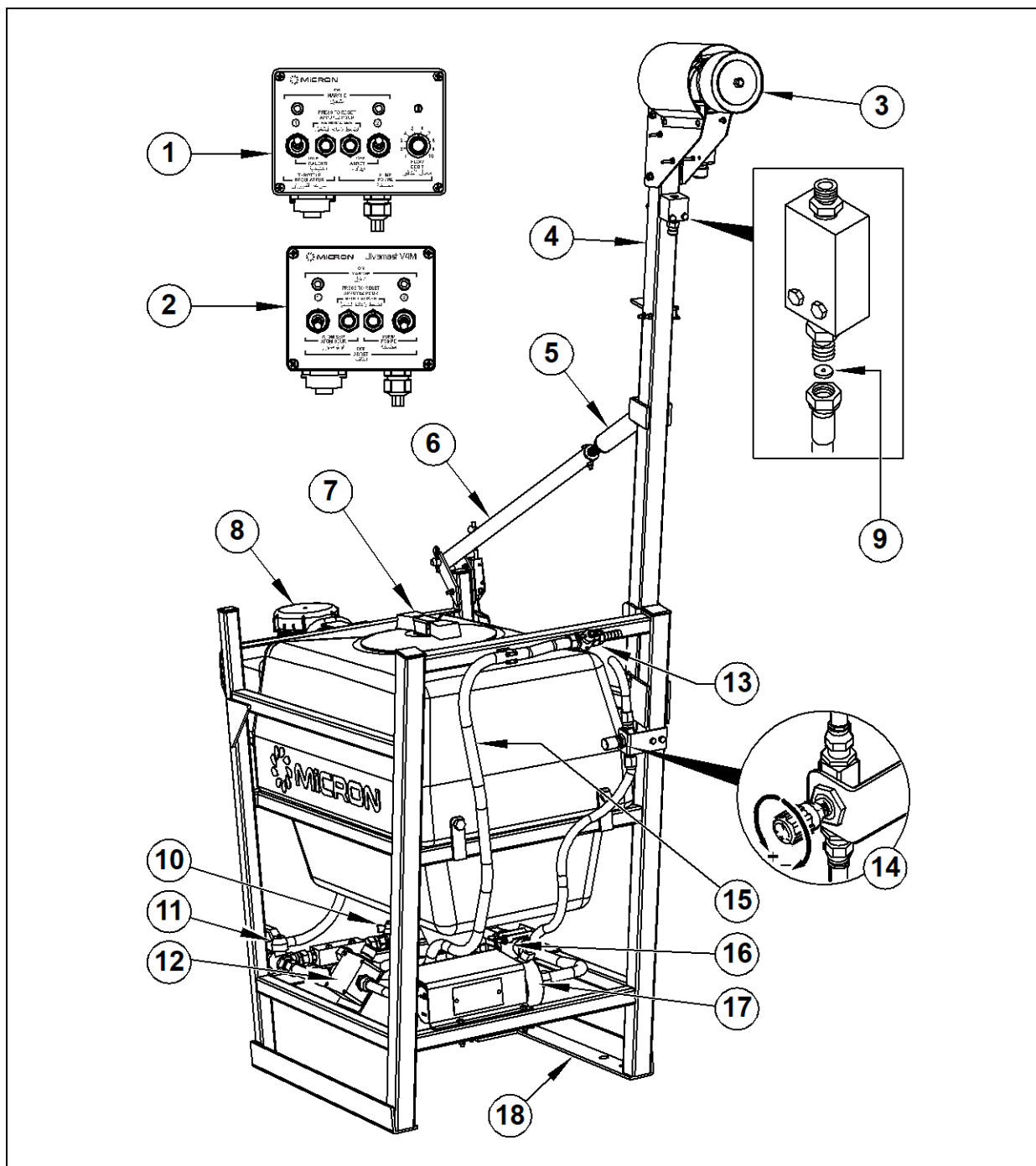
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1 INTRODUCTION

The Ulvamast V4 is the latest generation of vehicle mounted Ultra Low Volume (ULV) sprayers developed specifically for migrant pest control, particularly locusts and grasshoppers. The sprayer incorporates a number of new and innovative features and improvements including a direct drive atomiser, folding mast with locking extension arm, stainless steel braided PTFE lined hoses and a choice of in-cab controller to regulate flow rate and operate sprayer. The sprayer is powered by the vehicle battery.

The sprayer consists of a 100 litre tank, in-line filter and pump mounted on a powder coated steel framework that supports a folding mast. The Micron AU6449 atomiser is mounted on the mast which, when in use, protrudes beyond the back of the vehicle. An in-cab control box allows the driver to operate both pump and atomiser from within the cab for maximum safety. The Ulvamast V4E in-cab switch box is used to adjust flow rate and operate the atomiser and pump. The Ulvamast V4M in-cab switch box is used to operate the atomiser and pump with flow control by means of an in-line orifice restrictor plate and adjustable needle valve. All materials of construction are compatible with ULV (Ultra Low Volume) formulations and resistant to ultraviolet degradation.

1.1 Sprayer and Tank System Features



1	Control box (Ulvamast V4M)	10	Isolation valve
2	Control box (Ulvamast V4E)	11	Tank selector valve
3	Atomiser	12	Electrical junction box
4	Mast	13	Drain valve
5	Locking mechanism	14	Orifice restrictor plate (Ulvamast V4M)
6	Mast extension arm	15	Drain pipe
7	Main tank 100 litres	16	Filter
8	Flushing tank 10 litres	17	Pump
9	Orifice restrictor plate (Ulvamast V4M)	18	Foot mounting plate

Figure 1 – Ulvamast V4 component recognition

1.2 Technical Specification

Product Identification Details		
Trade name:	Ulvamast V4	
Description:	Vehicle mounted rotary atomiser sprayer, specifically designed for migrant pest control	
Model:	Ulvamast V4E / Ulvamast V4M	
Manufacturer:	Micron Sprayers UK part of Goizper S COOP Spain	
Year of manufacture:	Refer to serial number plate	
Paint colour:	RAL 6002 Leaf Green	
Operating voltage:	12 VDC	
Frame:	Strong 30 mm and 40 mm box section mild steel. Folding mast and support arm. Powder coated.	
Tank 1:	100 litre capacity, 5 litre graduations, moulded metal inserts (no straps), UV stabilised HDPE	
Tank 2:	10 litre flushing tank	
Hose material:	Flexible stainless steel braided PTFE lined hose.	
Fittings:	Brass fittings, union nut connections for ease of maintenance	
Electrical cable:	Protected by black nylon conduit	
Atomiser	Direct drive, high speed (7200 rpm) Droplet size 50 – 100 µm (VMD)	
Model:	Ulvamast V4E	Ulvamast V4M
Current consumption:	10 Amps maximum	15 Amps maximum
Control box:	Electronic control, 10 flow control settings, atomiser switch, LED indicator lights for pump and atomiser, resettable circuit breakers,	Switches for pump and atomiser control, LED indicator lights for pump and atomiser, resettable circuit breakers,
Flow Control:	Electronic control, 10 preset flow rates 0.2 – 1.5 l/min.	In-line orifice restrictor plate or hand operated needle valve 0.2 – 2.0 l/min.
Pump:	Magnetically coupled proportionating gear pump	Magnetically coupled centrifugal pump

2 INSTALLATION

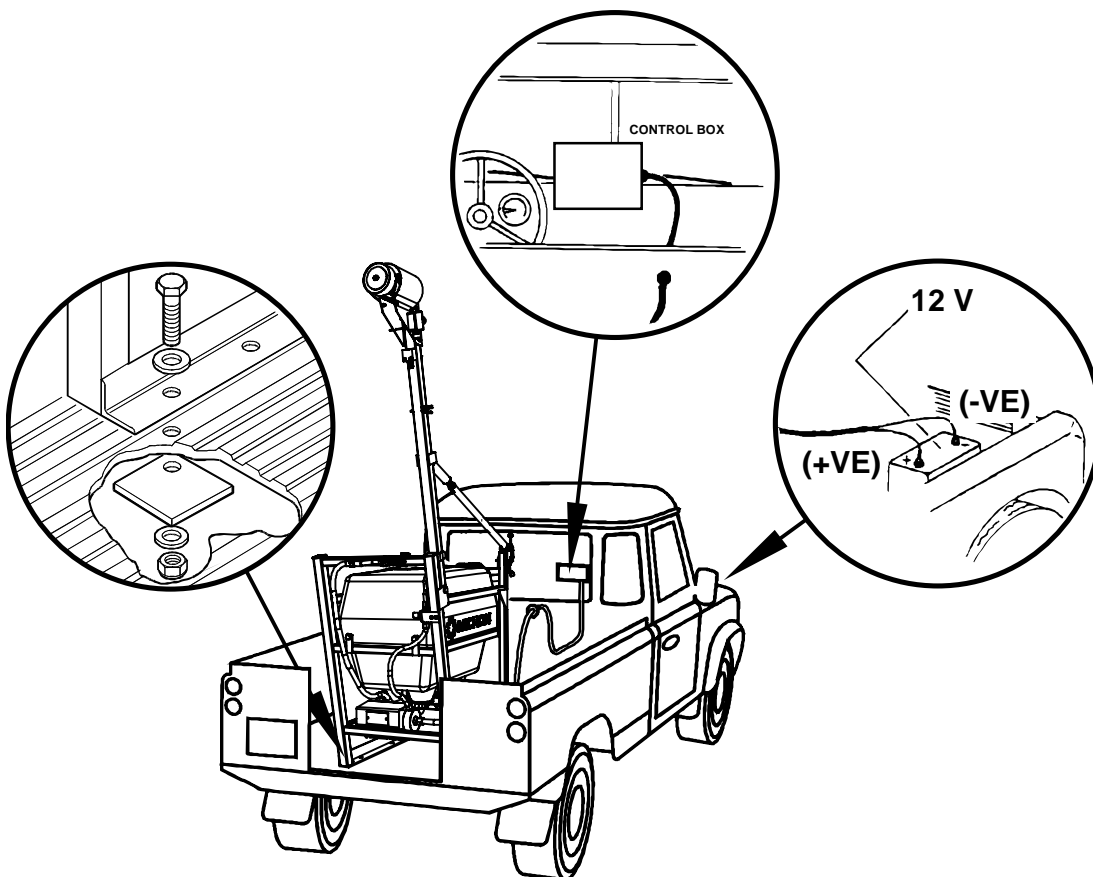
The Ulvamast V4 can be mounted onto any open backed vehicle with an enclosed cab to protect the driver from the spray. The sprayer should be positioned as far to the rear of the vehicle as possible so that, when the mast is extended, the atomiser projects outwards beyond the back of the vehicle.

The Ulvamast V4 should be rigidly secured to the vehicle via four holes drilled in the vehicle bed using Ulvamast foot plates with the M10 bolts, washers and nuts provided. Take care to avoid the vehicle fuel tank when drilling holes. Alternatively the sprayer can be tied down with ropes secured around the frame as a temporary installation.

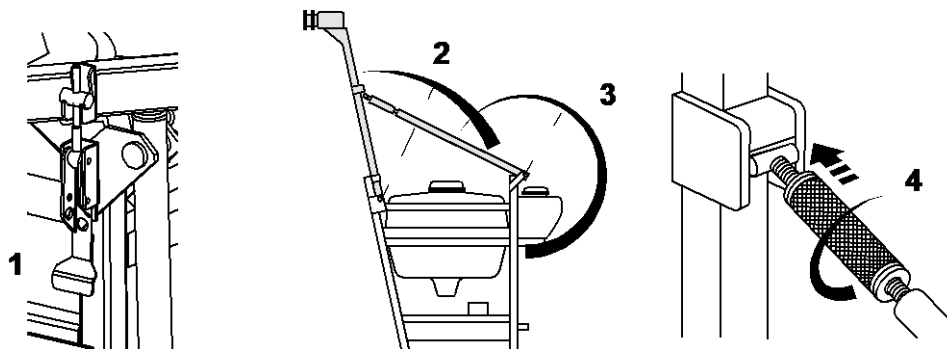
Remove protective packaging from around the atomiser head and mast. Fix the mast to the pivot point using the pivot pin provided. Use the locking mechanism to secure the mast in the field position.

The electrical supply to the Ulvamast V4 is normally provided by the vehicle battery. The conduit containing the electrical cable should be run to the vehicle cab allowing the cable (with the control box detached) to enter the cab either through a small hole in the cab or through a window. The control box can then be located in the cab. The cable from the control box is fitted with a connector at the battery end to enable the sprayer to be disconnected when not in use. The battery cable is fitted with an in-line fuse to protect the cable.

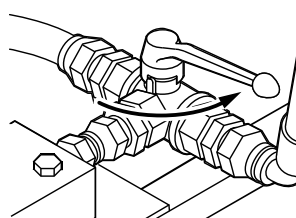
- Red or brown wire to the positive terminal +
- Black or blue wire to the negative terminal –



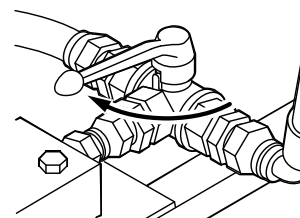
3 PREPARATION



- Release the mast retaining latch (1) and raise the mast to the operating position so that the atomiser is pointing beyond the rear of the vehicle (2). Secure the mast with the extension arm (3) and lock in place by turning the locking mechanism (4).
- Ensure that the gauze cylinder of the atomiser rotates freely when turned by hand.
- Check that the pump and atomiser are working by placing a small amount (5 – 10 litres) of kerosene or diesel oil in the 10 litre tank. Rotate the two way valve to select the 10 litre tank and make sure the isolation valve near the filter is open.



10 Litre Tank Open



Main Tank Open

- Switch on the pump at the control box. After a short period liquid should start flowing from the atomiser. Switch off the pump and then switch on the atomiser at the control box and check that it is running smoothly. Rotational speed of the atomiser can be checked with the Vibratak tachometer supplied.

IMPORTANT: Never let the pump run dry.

- Check that there are no leaks from any of the tubing or connections and that the drain valve is closed.
- Check that the sprayer is properly fixed to the vehicle.
- Before filling the main tank with pesticide, operators should wear appropriate protective clothing such as overalls, boots, gloves and a face mask.



Wear Gloves



Wear Face
Protection



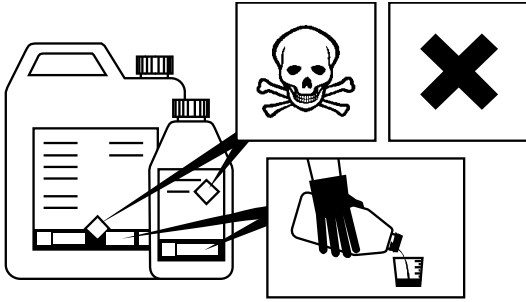
Wear Protective
Clothing



Wear Protective
Boots

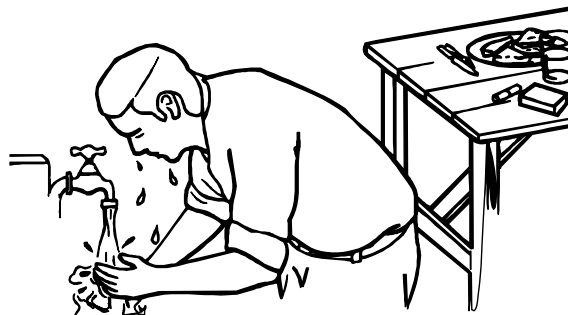
- Proceed to fill the main tank, taking care to avoid spillages. If they do occur, wipe down the tank with a cloth soaked in diesel oil. Any spillage on the skin of the operator should be washed off immediately.

4 SAFETY



- ALWAYS follow the safety instructions on the pesticide label when handling and using pesticides.
- ALWAYS wear appropriate protective clothing during filling and calibration.
- DO NOT spray near people or domestic animals. There should be no people or domestic animals within 200 metres downwind from where spraying is to take place.

- Ensure spraying does not take place near waterways, rivers or lakes.
- DO NOT carry people, bedding, clothing or animals in the back of the spray vehicle when spraying or when it is contaminated with pesticide.
- NEVER carry foodstuffs in the spray vehicle.
- ONLY use a spray vehicle fitted with an enclosed cab.
- ALWAYS wash hands, face and body after filling the spray tank, after spraying and before eating or smoking.
- ALWAYS carry soap and towels for washing in the cab of the spray vehicle and a supply of water, liquid soap and rags for cleaning the vehicle and sprayer.



Acoustic information – the sound pressure level at the operator's ear, as measured inside a typical vehicle cab, is below 70 decibels therefore no ear protection is required.



Wear a Face
Mask



Wear Gloves



Wear Face
Protection



Wear
Protective
Clothing



Wear
Protective
Boots

5 CALIBRATION

To apply the correct volume of spray liquid to an area it is necessary to accurately calibrate the sprayer. This is critically important to prevent under or over dosing. The calibration procedure is as follows:

Measure the forward speed of the vehicle

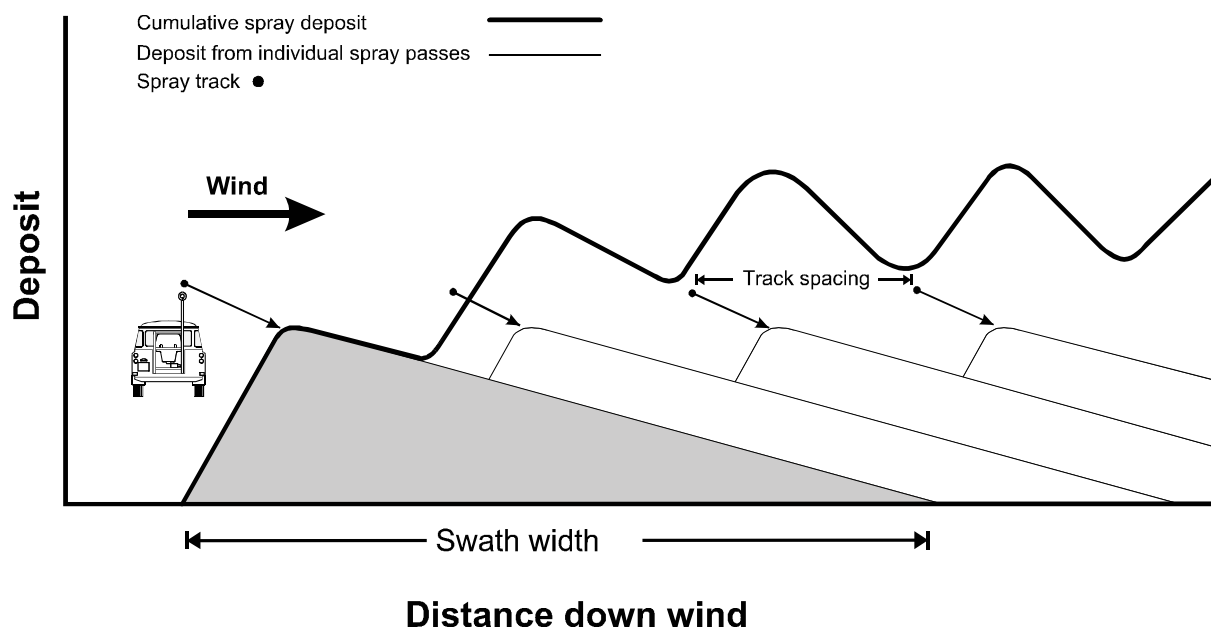
- Select a low gear that will give a practical speed over the terrain and carry out a trial run over a measured distance of 100 metres. Time how long it takes, in seconds, to cover this distance. This time is t seconds.
- Calculate your forward speed using the formula: $\text{speed (km/hr)} = 360/t \text{ (seconds)}$

Example: time to cover 100 metres, $t = 36$ seconds

Then, speed = $360/36 = 10$ km/hr

Select suitable track spacing

The track spacing is the distance between successive spray passes of the vehicle. Spray passes should always be made with the wind at right angles to the direction of the vehicle. Although the peak spray deposit is likely to occur within 30 metres downwind, some spray will be carried more than twice this distance. Spray coverage of the target area is evened out by accumulating spray deposits from overlapping swaths. This is known as an incremental spraying technique.



When using droplets of 50 – 100 μm in diameter in a steady wind (in excess of 7 km/hr or 2 m/sec) track spacings of 30 to 50 metres will be possible in sparse open areas (as found in most migrant pest control situations). Narrower track spacings will be necessary in lighter winds.

5.1 Calculate required flow rate from the atomiser

This is calculated in litres/minute using the following formula:

$$\text{Flow (l/min)} = \frac{\text{volume rate (l/ha)} \times \text{speed (km/hr)} \times \text{track spacing (m)}}{600}$$

Volume rate is chosen so as to apply the recommended dose of active ingredient (see F.A.O. guidelines or pesticide manufacturer's product label)

Example: if required volume application rate = 1 l/h
 Vehicle speed = 10 km/hr
 Track spacing = 30 m

Then required flow rate from atomiser: =
 $\frac{1 \times 10 \times 30}{600} = 0.5 \text{ l/min i.e. } 500 \text{ ml/min}$

Table for determining required flow rate through the atomiser at a volume rate of 1 l/ha:

Track spacing (m)	Atomiser flow rate (ml/min)		
	Vehicle forward speed (km/hr)		
	5.0	7.5	10.0
25	208	313	417
30	250	375	500
35	292	438	583
50	417	625	833

Check that the desired droplet size will be achieved at the flow rate used.

Flow rate (ml/min)	Atomiser RPM	VMD ¹ (µm)
0	7800	-
200	7600	50
300	7400	55
500	7000	60
1000	6800	70
1500	6600	75

¹ VMD = Volume Median Diameter (tests made with Malvern Particle Size Analyser)

5.2 Setting Flow Rate – Ulvamast V4M

The procedure to set the flow rate from the sprayer is as follows:

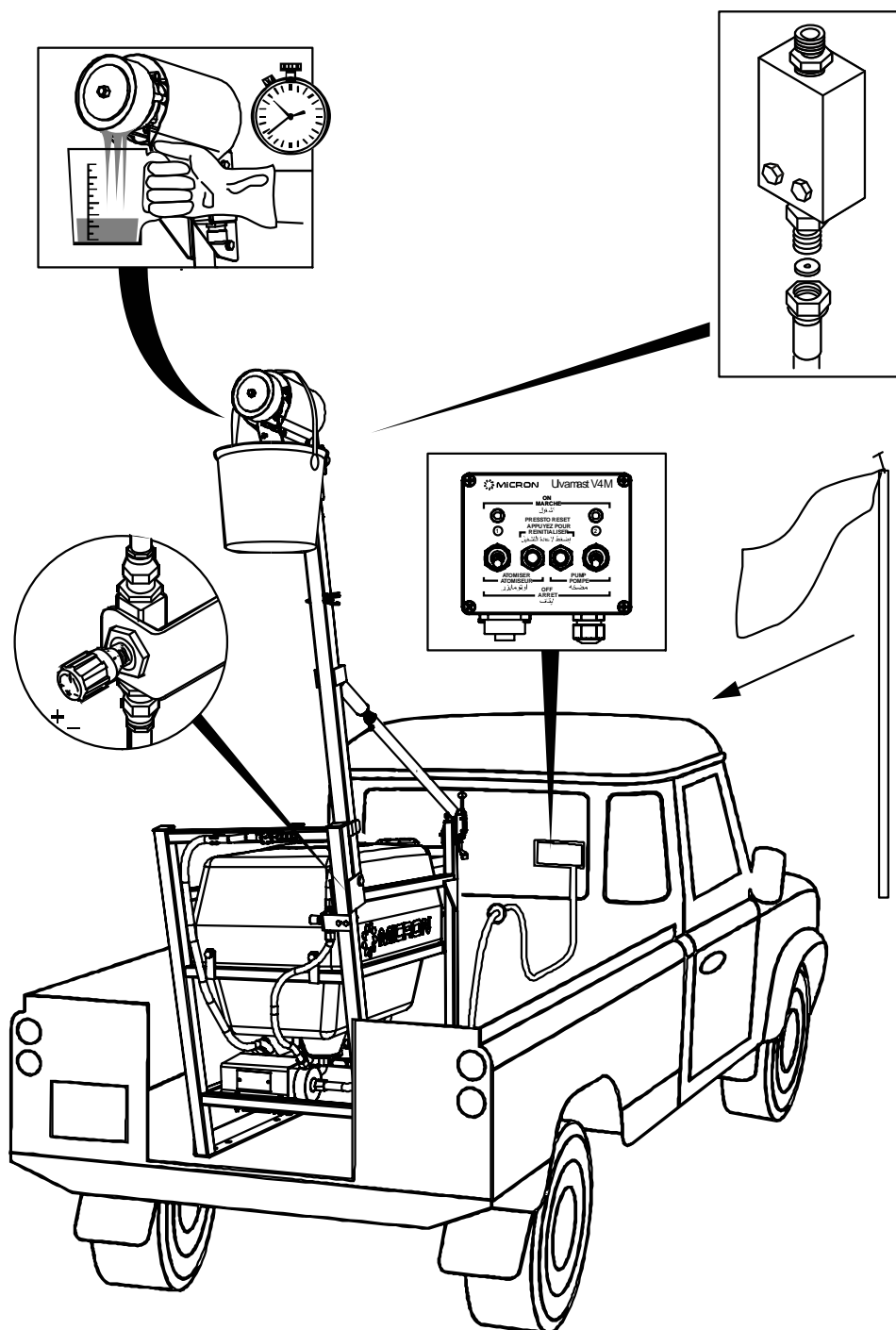
- Ensure the drain valve is closed and the main tank valve open.
- Place a clean bucket directly underneath the atomiser to collect spray liquid (the bucket can be hung from the mast arm - see next page).
- With the vehicle engine running to ensure that the pump is working at the correct operating voltage; switch on ONLY the pump at the control box. DO NOT switch on the atomiser.
- If using the manual flow control valve, open the flow control valve by turning anti-clockwise. Liquid should begin to flow from the atomiser into the bucket (operating at maximum flow rate for a short period will remove any air that may have been entrained in the hose lines and pump). Once liquid is flowing at a steady rate, hold the measuring jug (supplied) underneath the atomiser and check the output over one minute (as measured using a stopwatch).
- Adjust the flow control valve and repeat the flow measurement until the required flow rate is obtained. Secure the control valve position using the Allen key provided in the toolkit.
- Switch off the pump.
- If using orifice restrictor plates, the flow valve is left in the fully open position for calibration and spraying. Referring to the table below, select and fit (as shown) the orifice restrictor plate which gives the flow rate closest to that required. Measure the flow rate. If this is too low or too high use a larger or smaller orifice plate as appropriate. Actual flow rate will vary according to the pesticide used and its temperature and thus calibration MUST be carried out using the actual product. (N.B. the values given in the table are for oil).

Restrictor Number	Flow rate* (ml/min) with oil
24	108
30	149
39	294
49	461
59	581
68	709
80	957
98	1210

- Put all the spray liquid collected in the bucket back into the spray tank through the lid filter. DO NOT stand under the atomiser after spray liquid has been fed through it since dripping may occur.
- Clean the bucket and measuring cylinder. Wash down any spillage on the tank and vehicle.
- ALWAYS wash hands and face after handling pesticides.

NOTE: The sprayer must be re-calibrated if the forward speed, track spacing or volume application rate change. Calibration MUST be checked at the beginning of each day's operation.

Setting Flow Rate – Ulvamast V4M (Cont)



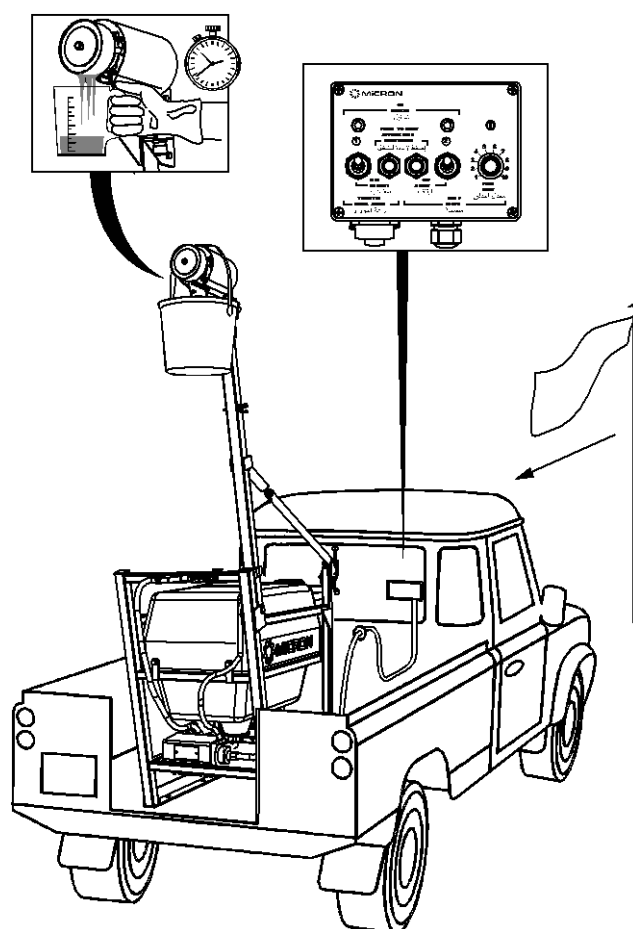
IMPORTANT:

ALWAYS:

- Check the flow rate with the ACTUAL product or spray mix, as viscosity will affect the flow rate.
- Follow the safety instructions on the pesticide label when handling the pesticide. It is recommended that when handling any pesticides, overalls, rubber gloves, boots and a face mask are worn.
- Park the vehicle facing into the wind when setting the liquid flow rate to avoid any possible contamination of the vehicle. Run the vehicle's engine to produce the correct voltage at the pump.

5.3 Setting Flow Rate – Ulvamast V4E

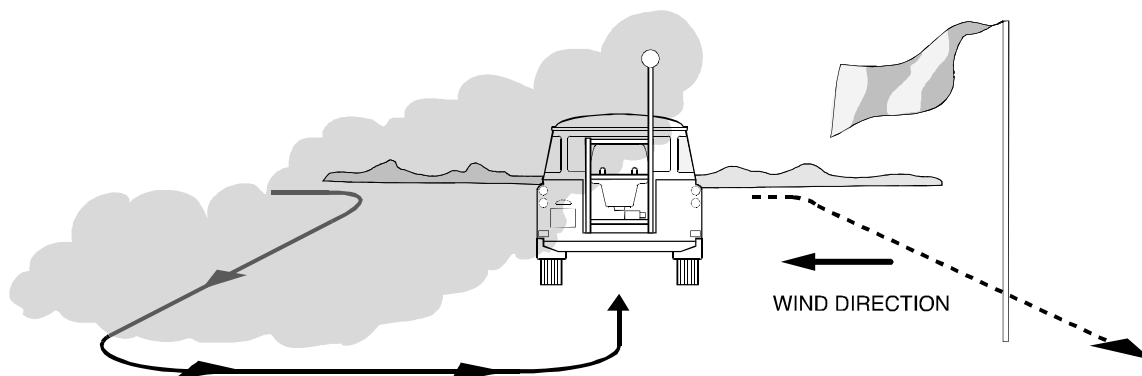
With the V4E model, there are ten pre-set flow rates (shown in the table below) which can be set on the control box. Selected flow rates are independent of liquid viscosity. It is not necessary to measure the flow rate each day or when products are changed as flow rate is not affected by the product used or temperature. Calibration is thus much simpler. The flow rate should be checked periodically as pump wear and supply voltage can affect output. If it is necessary to verify the flow rate follow steps for setting the flow rate for the Ulvamast V4M omitting references to the flow control valve and orifice plates. Check the output at each position of the control unit flow selector. Record the new flow rate at any position that varies from those stated in the table below.



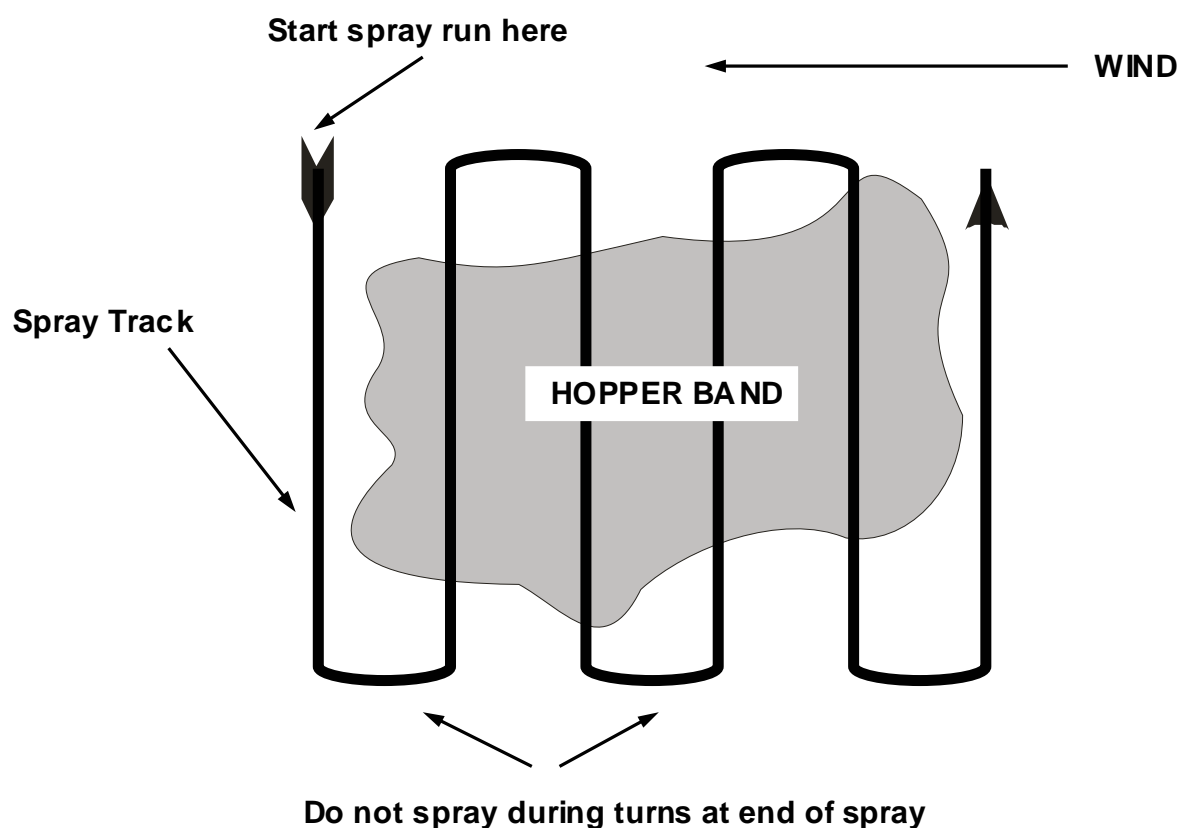
Position	Flow rate (ml/min)
1	200
2	250
3	300
4	400
5	500
6	600
7	800
8	1000
9	1250
10	1500

6 SPRAYING

The Ulvamast V4 can be used for treating large areas (or blocks), for barrier spraying in strips (usually 500 m to 1000 m apart) or for treating individual locust hopper bands. The principles of operation of the sprayer are the same for each.



Example: individual hopper band treatment.



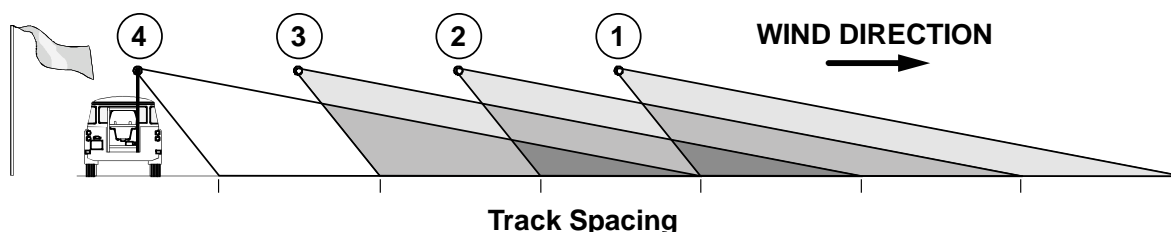
(After F.A.O. Control Guidelines, 1992)

Treating medium and large bands using a vehicle-mounted sprayer:

- Spray cross-wind starting beyond the downwind edge of the band and moving upwind after each spray pass.
- The direction of the vehicle should always be at right angles to the prevailing wind direction.

- When spraying against insect pests other than locust or grasshopper apply the same principles as stated above.
- Spraying should begin at the downwind edge of the target area. If treating an individual band always start spraying beyond the leading edge of the band. Successive spray passes should then be made parallel to one another, each separated 30 – 50 m apart. At the end of each spray pass, the Ulvamast pump should be turned off. The vehicle should always turn into the wind so that each successive spray pass is always upwind of the last.
- If possible, it is recommended that a GPS guidance system or flagmen are used to mark the track spacing at either end of the spray pass with each flagman moving upwind to the next spray pass as the vehicle approaches. Care should be taken to ensure that flagmen are never downwind of the vehicle during spraying.

Even spray coverage is obtained by incremental overlapping of spray passes.



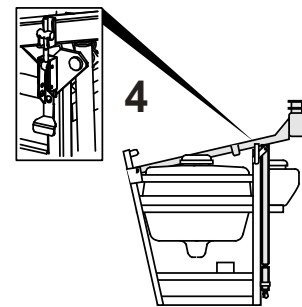
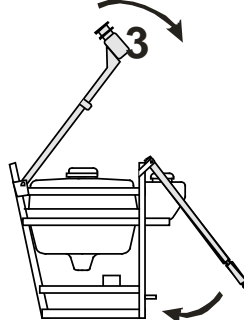
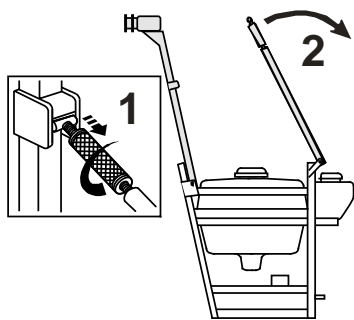
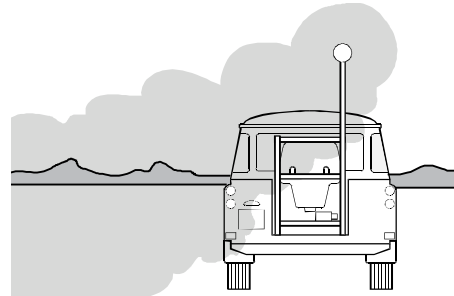
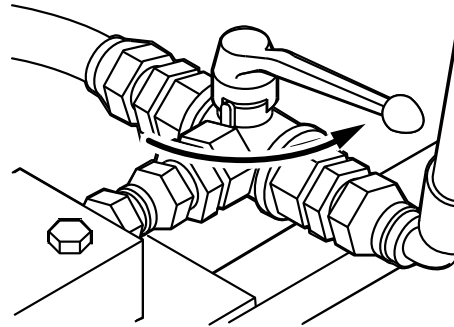
For very small hopper bands (< 0.5 ha in size), it may sometimes be more appropriate to use a hand held ULV sprayer such as the Micron Ulva+.

Note: For detailed recommendations concerning the principles and procedures for spraying locusts, grasshoppers or other migrant pests, refer to the references at the end of this manual.

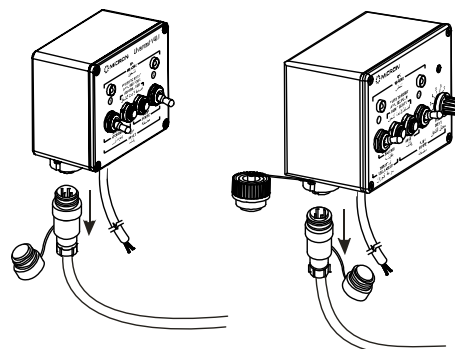
7 AFTER SPRAYING

- The atomiser and hoses should be flushed through with a cleaning fluid, such as kerosene or diesel. Always carry 5 – 10 litres of kerosene or diesel oil in the smaller 10 litre rinse tank for this purpose. Rotate the two way valve to select the 10 litre tank and close the main tank.

The sprayer should be taken to a clear area of non-crop land and, whilst travelling, both the pump and atomiser should be switched on for a few minutes. The drain valve may be used to remove any residue of liquid left in the pipework.



- When spraying has been completed fold down the mast to minimize the risk of damage during transport. Secure the mast with the latch.
- ALWAYS disconnect the plug on the cable from the control box when the sprayer is not in use to prevent either the pump or atomiser from being accidentally switched on.
- If it is necessary to drain the tank, open the drain valve (T-handle along the drain tube) to allow the spray liquid to be dispensed into a suitable container through the drain hose. After the tank has been drained the drain valve must then be closed (T-handle at 90 degrees to the drain tube) and secured in the closed position.
- The sprayer should be washed down after each day to remove any spray residues and dirt. Rags soaked in soapy water can be used to clean all external surfaces.



8 MAINTENANCE

- Regularly wipe down external surfaces with a cloth soaked in soapy water to remove pesticide deposits.
- Regularly flush the sprayer through with kerosene or diesel from the auxiliary 10 litre flushing tank.
- Check that all pipe connections are secure and free of leaks.
- Check that the atomiser spins freely and that the gauze cylinder is in good condition.
- Never run the pump without liquid.
- Occasionally check that the in-line filter is clean.
- During transport between sites the mast should always be secured in the folded position.

9 FAULT FINDING

Atomiser does not rotate

- Check electrical connections and the circuit breakers.
- Check the battery fuse.
- Check the battery condition.
- Check if the atomiser spins freely on the motor.

No flow from pump (check flow with diesel or kerosene only)

- Check that there is sufficient liquid in the tank.
- Check that the in-line orifice restrictor is not blocked (where used).
- Check electrical connections and circuit breakers in the control box.
- Check fluid flow to atomiser by disconnecting the feed tube pipe at atomiser.
- Check that the atomiser is not blocked.
- Check that the in-line filter is not blocked.
- Check that pump impeller is operating and is not obstructed (motor runs but no flow). This will require disassembly of pump head (see Ulvamast V4 pump diagrams pages 25 and 26).

Pump runs but spray liquid is not being emitted from the atomiser

- Check that the tank selector valve is in the correct position.
- Check for blockages in the pipework and fittings.
- Check that the in-line filter is not blocked.

9.1 Ulvamast V4M Wiring Diagram

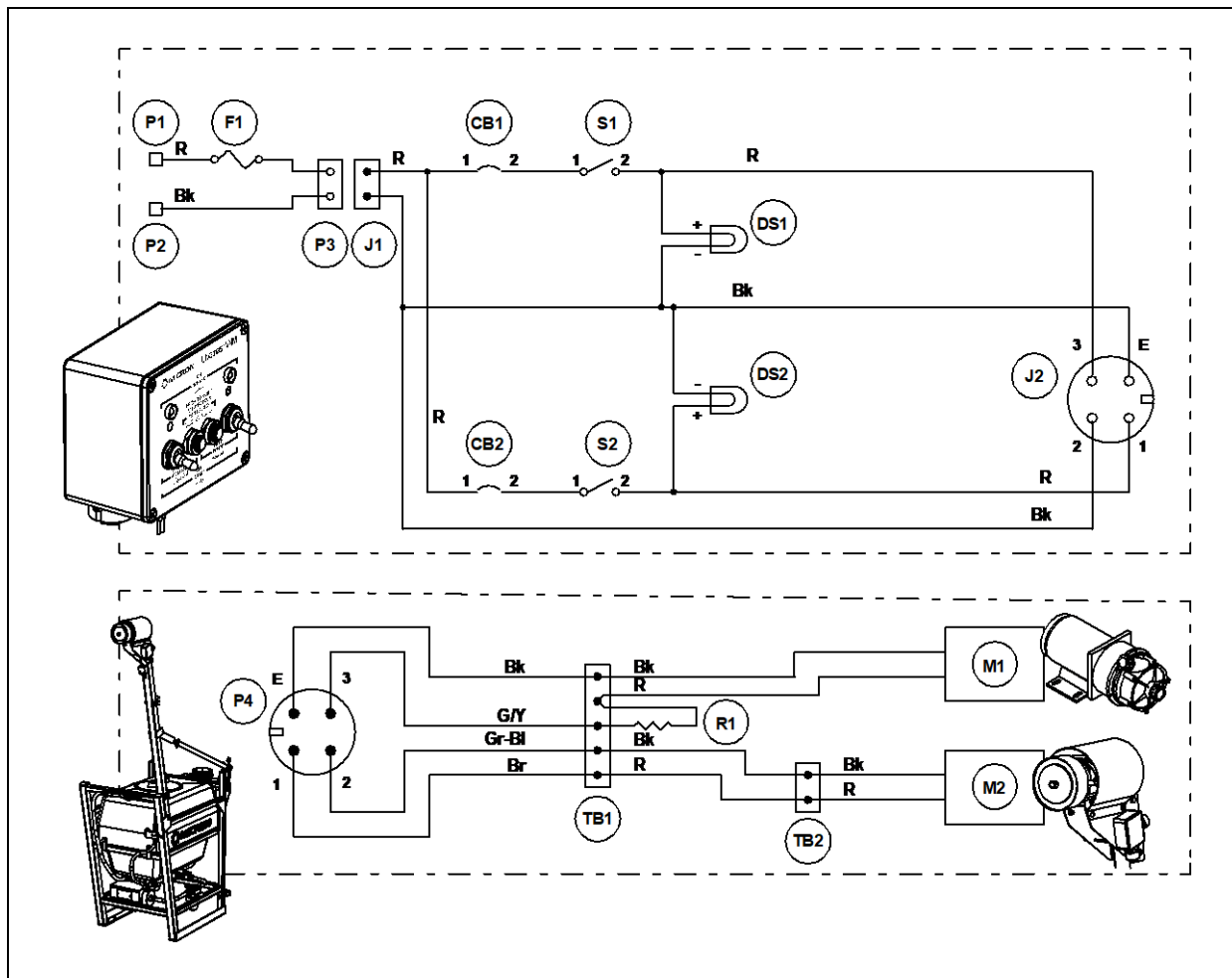


Figure 2 – Ulvamast V4M Wiring Diagram

Components			
CB1	Circuit Breaker, 15 amp (pump)	P1	Connector, Positive battery terminal
CB2	Circuit Breaker, 25 amp (atomiser)	P2	Connector, Negative battery terminal
DS1	Indicator lamp (pump)	P3	Connector on cable, 2 way
DS2	Indicator lamp (atomiser)	P4	Connector on cable, 4 way
F1	Fuse, 60 amp	R1	Resistor 0.2 ohm
J1	Connector on control box, 2 way	S1	Switch, pump on/off
J2	Connector on control box, 4 way	S2	Switch, atomiser on/off
M1	Pump	TB1	Junction box on frame
M2	Atomiser	TB2	Junction box on mast

Wire Colours			
Bk	Black	G/Y	Green and Yellow
Bl	Blue	Gr	Grey
Br	Brown	R	Red

9.2 Ulvamast V4E Wiring Diagram

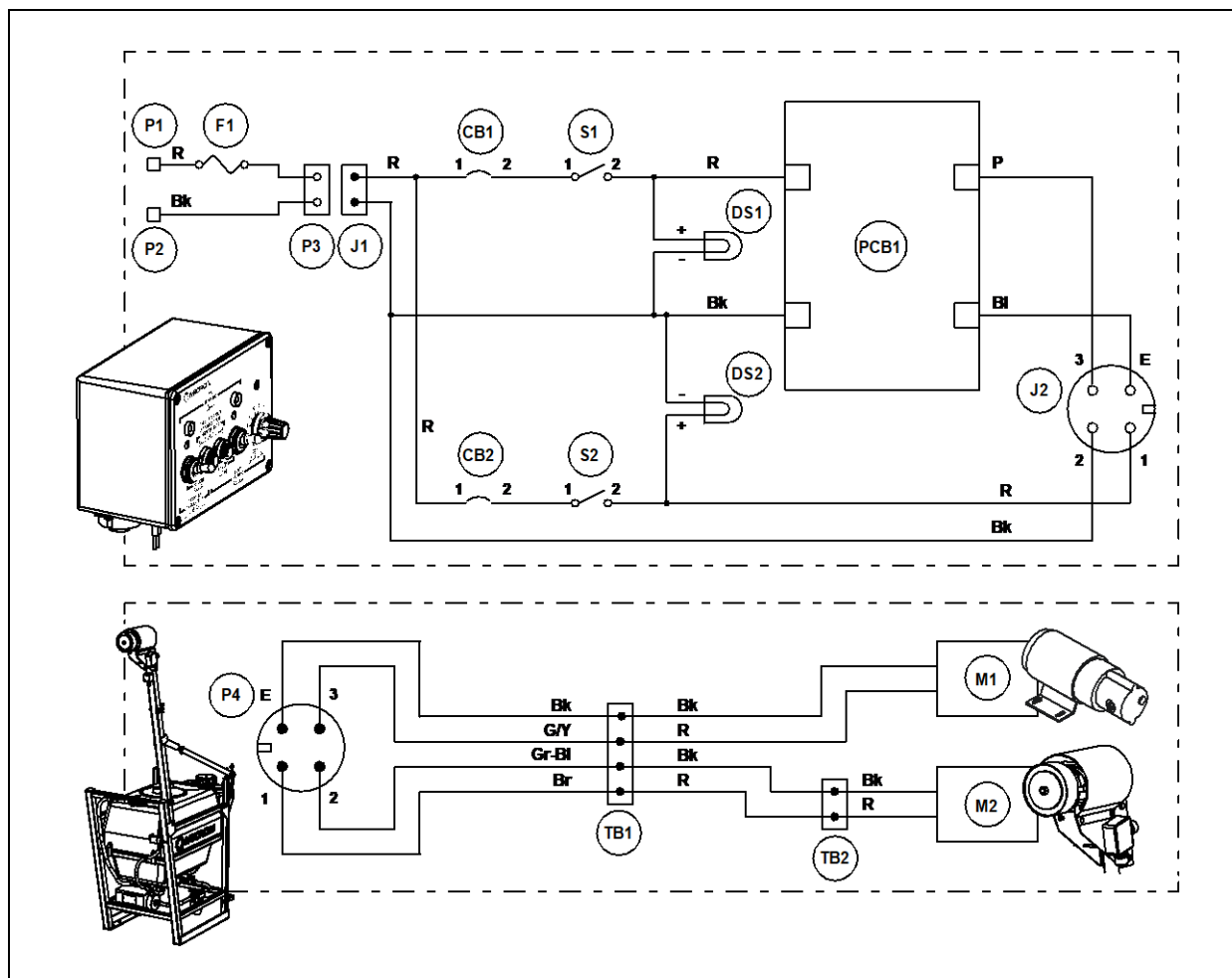


Figure 3 – Ulvamast V4E Wiring Diagram

Components			
CB1	Circuit Breaker, 15 amp (pump)	P1	Connector, Positive battery terminal
CB2	Circuit Breaker, 25 amp (atomiser)	P2	Connector, Negative battery terminal
DS1	Indicator lamp (pump)	P3	Connector on cable, 2 way
DS2	Indicator lamp (atomiser)	P4	Connector on cable, 4 way
F1	Fuse, 60 amp	PCB1	Printed circuit board
J1	Connector on control box, 2 way	S1	Switch, pump on/off
J2	Connector on control box, 4 way	S2	Switch, atomiser on/off
M1	Pump	TB1	Junction box on frame
M2	Atomiser	TB2	Junction box on mast

Wire Colours			
Bk	Black	Gr	Grey
Bl	Blue	P	Pink
Br	Brown	R	Red
G/Y	Green and Yellow		

10 PARTS LISTS

10.1 Ulvamast V4 Frame Parts Diagram (V4E and V4M Models)

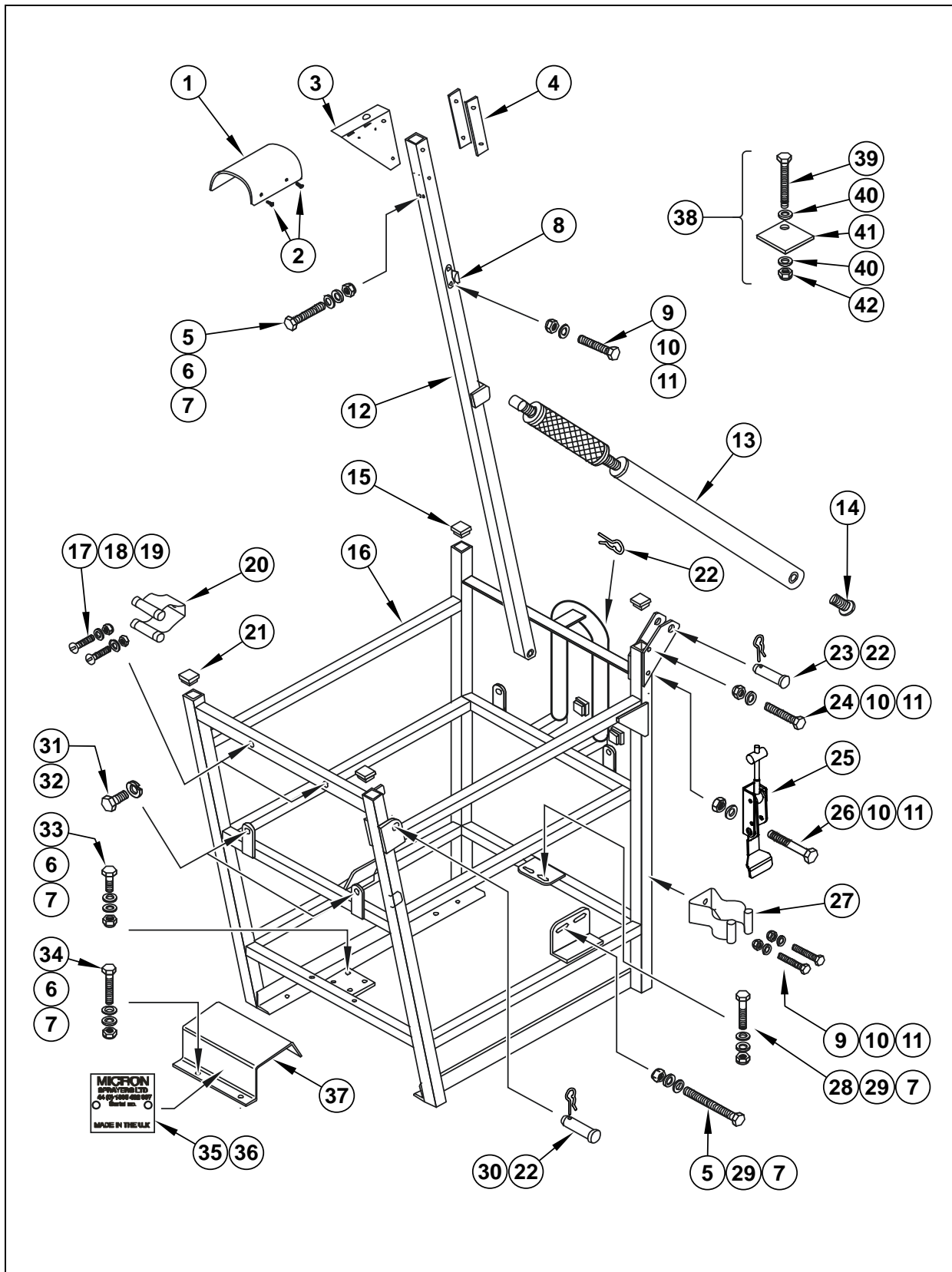


Figure 4 – Ulvamast V4 Frame Parts Diagram

Ulvamast V4 Frame Parts List

ITEM	PART NO.	DESCRIPTION	Qty.
1	7234	ATOMISER PROTECTIVE HOOD	1
2	7230	SCREW M5 X 10 S/S	7
3	7232	ATOMISER MOUNTING BRACKET	1
4	7233	PACKER	2
5	5968	BOLT, M6 X 80MM, HEX, S/S	4
6	6017	WASHER, M6, FLAT, FORM B, S/S	18
7	5984	NUT, M6, NYLOC, S/S	14
8	7678	CATCH PLATE,	1
9	5996	BOLT, M5 X 40MM, HEX, S/S	2
10	5997	WASHER, M5, FLAT, S/S	6
11	5998	NUT, M5, NYLOC, S/S	6
12	7691	MAST, MILD STEEL, NYLON COATED	1
13	5908	TURNBUCKLE	1
14	5915	INSERT, DIA. 28MM, LDPE	1
15	5914	INSERT, 30 X 30 SQUARE, LDPE	4
16	7687	MAIN FRAME, MILD STEEL,	1
17	5977	SCREW, M3 X 40MM, SLOTTED CHEESEHEAD, S/S	4
18	5974	WASHER, M3, FLAT, S/S	4
19	5976	NUT, M3, NYLOC, S/S	4
20	5960	CLIP, ROLLER JAW (TO GRIP 16-19MM), ZINC PLATED	2
21	5913	INSERT, 40 X 40 SQUARE, LDPE	3
22	5671	CLIP, 'R', 89.102	3
23	5889	PIVOT PIN, TURNBUCKLE, MILD STEEL - ZINC PLATED	1
24	4915	SCREW M5 X 16MM, HEX, S/S	1
25	7677	LATCH, ADJUSTABLE	1
26	7682	BOLT M5 X 55 S/S	3
27	5957	CLIP, BROOM (TO GRIP 35-38MM), ZINC PLATED	1
28	5969	BOLT, M6 X 55MM, HEX, S/S	2
29	6001	WASHER, 1/4", TABLE 2 HEAVY, ZINC PLATED	8
30	5890	PIVOT PIN, MAST, MILD STEEL - ZINC PLATED	1
31	5967	BOLT, M10 X 20MM, HEX, S/S	4
32	5972	WASHER, M10, SPRING (RECTANGULAR), SINGLE COIL, S/S	4
33	5983	SCREW, SET, M6 X 20MM, HEX, S/S	4
34	6026	BOLT, M6 X 45MM, HEX, S/S	2
35	6316	SERIAL NO. PLATE, ALUMINIUM	1
36	5651	RIVET, POP, 3MM X 12MM LONG, ZINC PLATED	2
37	5922	PROTECTIVE COVER, PUMP, MILD STEEL - ZINC PLATED	1
38	EX6728	HOLD DOWN ASSEMBLY – COMPRISING THE FOLLOWING ITEMS:	-
39	6523	SCREW, SET, M10 X 80MM, HEX, S/S	4
40	6527	WASHER, 10 X 30MM X 1.5 S/S	8
41	5992	PLATE, BOLT-DOWN, MAIN FRAME, MILD STEEL - ZINC PLATED	4
42	5975	NUT, 10MM, NYLOC, S/S	4

10.2 Ulvamast V4E Pipework Parts Diagram

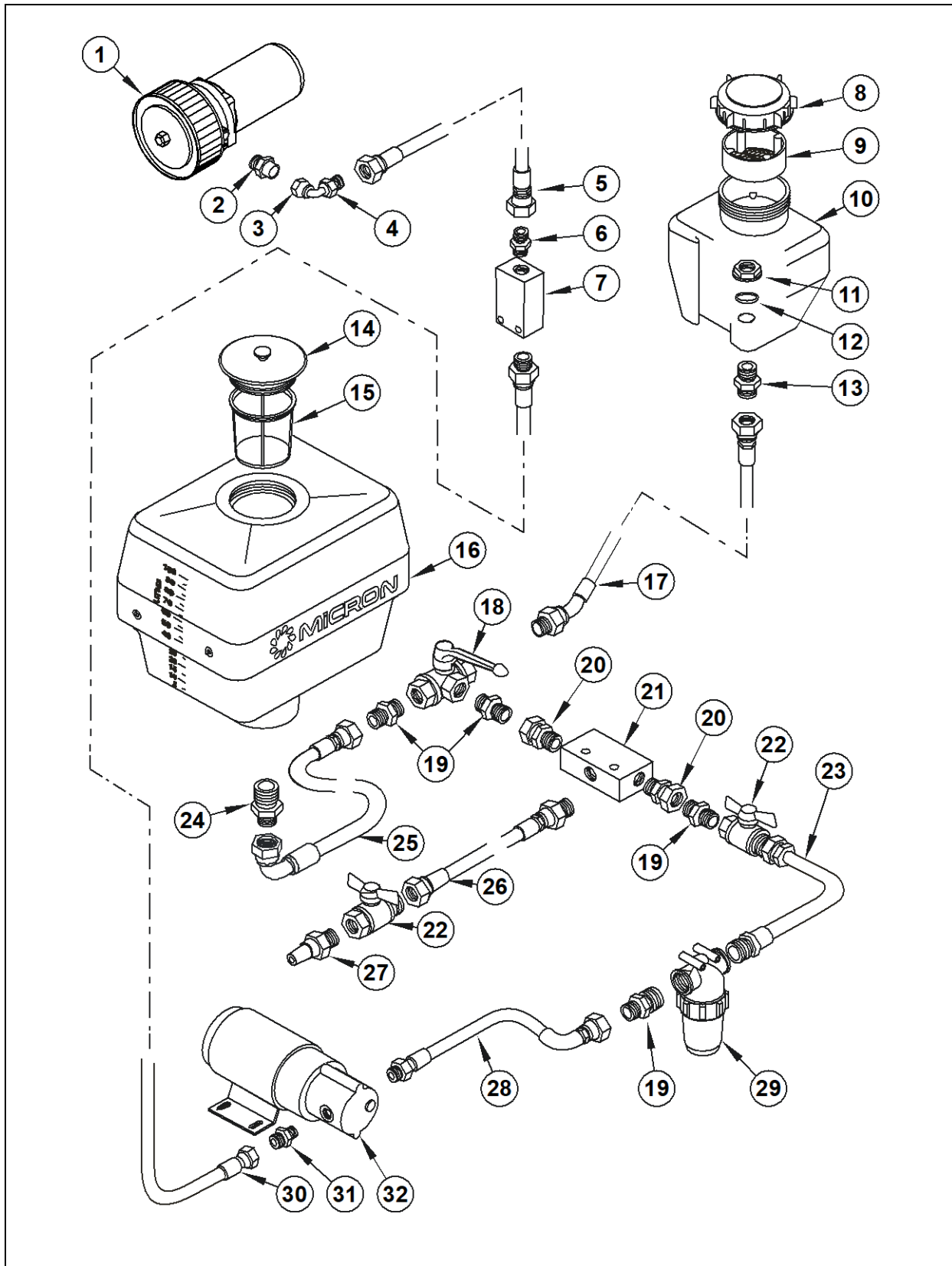


Figure 5 – Ulvamast V4E Pipework Parts Diagram

Ulvamast V4E Pipework Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	7235	ATOMISER, COMPLETE - see section 0	1
2	7237	ADAPTOR 1/8" BSP M/F	1
3	7238	ELBOW 1/8" BSP M/F	1
4	7239	ADAPTOR 1/8 - 1/4" BSP M/M	1
5	7241	HOSE, 1/4" - MANIFOLD TO SPRAY HEAD	1
6	6777	ADAPTOR, 1/4" BSP MALE - 1/4" BSP MALE, BRASS	1
7	7240	MANIFOLD, MAST, 1/4" BSP IN - 1/4" BSP OUT, BRASS	1
8	5208A	CAP ASSEMBLY, BACKPACK	1
9	5449	FILTER BOWL	1
10	5955	TANK, FLUSHING, 10 LITRE, UV STABILISED MDPE	1
11	6797	NUT, 1/2" BSP, FLANGED, BRASS	1
12	6721	'O' RING, BS116 VITON	1
13	7126	ADAPTOR 1/2 X 1/2" BSP M/M BULKHEAD	1
14	AJ6201A	TANK LID WITH AIR VENT	1
15	AJ6200	FILTER BASKET STRAINER	1
16	5823	TANK, 100 LITRE, HDPE - UV STABILISED HDPE	1
17	7681	HOSE, 1/2" - FLUSHING TANK TO 3 WAY VALVE	1
18	5901	VALVE, 1/2" BSP F, 3 WAY, L-HANDLE, BRASS/PLATED STEEL	1
19	7135	ADAPTOR, 1/2" BSP MALE - 1/2" BSP MALE TAPER, BRASS	4
20	7132	ADAPTOR, 1/2" BSP MALE - 1/2" BSP FEMALE, BRASS	2
21	5882	MANIFOLD, MAIN FRAME, MILD STEEL - ZINC PLATED	1
22	5900	VALVE, 1/2" BSP MALE/1/2" BSP FEMALE, T-HANDLE, BRASS/PLATED STEEL	2
23	7680	HOSE, 1/2" - MANIFOLD TO FILTER	1
24	7131	ADAPTOR, 3/4" BSP MALE - 1/2" BSP MALE, BRASS	1
25	7692	HOSE, 1/2" - 100 LITRE TANK TO 3 WAY VALVE	1
26	7127	HOSE, 1/2" - DRAIN	1
27	7128	HOSETAIL 3/8 - 1/2" BSP MALE	1
28	7683	HOSE, 3/8" - FILTER TO PUMP	1
29	5881A	FILTER, 1/2" BSP FEMALE, C/W VITON 'O' RINGS	1
30	5939	HOSE, 1/4" - PUMP TO MANIFOLD	1
31	7139	ADAPTOR, 1/4" BSP MALE - 1/4 NPT MALE, BRASS	1
32	7140	GEAR PUMP COMPLETE S/S	1

10.3 Ulvamast V4M Pipework Parts Diagram

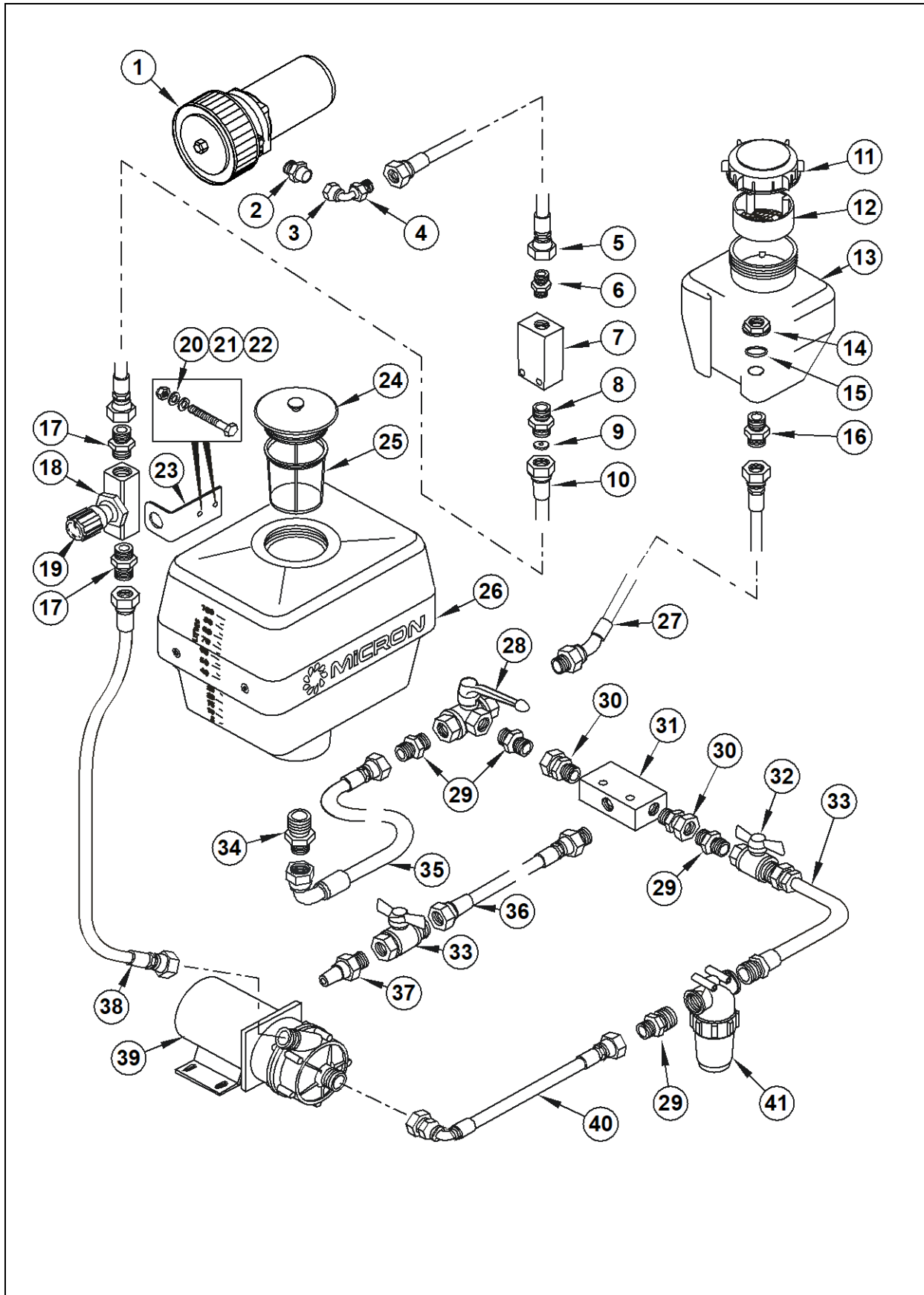


Figure 6 – Ulvamast V4M Pipework Parts Diagram

Ulvamast V4M Pipework Parts List

ITEM	PART NO.	DESCRIPTION	Qty.
1	7235	ATOMISER, COMPLETE – SEE SECTION 10.4	1
2	7237	ADAPTOR 1/8" BSP M/F	1
3	7238	ELBOW 1/8" BSP M/F	1
4	7239	ADAPTOR 1/8 - 1/4" BSP M/M	1
5	7241	HOSE, 1/4" - MANIFOLD TO SPRAY HEAD	1
6	6777	ADAPTOR, 1/4" BSP MALE - 1/4" BSP MALE, BRASS	1
7	7240	MANIFOLD, MAST, 1/4" BSP IN - 1/4" BSP OUT, BRASS	1
8	AJ6379	LFM BODY, 1/4" BSP, BRASS	1
9	EX6727	RESTRICTOR KIT	1 set
10	7242	HOSE, 3/8", BRASS F, 3/8" BSP x 1.0 M, S/S PTFE LINED, F, 3/8" UNION,	1
11	5208A	CAP ASSEMBLY, BACKPACK	1
12	5449	FILTER BOWL	1
13	5955	TANK, FLUSHING, 10 LITRE, MDPE - UV STABILISED	1
14	6797	NUT, 1/2" BSP, SINGLE CHAMFERED, BRASS	1
15	6721	'O' RING, BS116 VITON	1
16	7126	ADAPTOR 1/2 X 1/2" BSP M/M BULKHEAD	1
17	7136	ADAPTOR, 3/8" BSP MALE - 1/4" BSP MALE TAPER, BRASS	2
18	6003	NUT, M17, HEX, PANEL MOUNTING, ZINC PLATED	1
19	6002	VALVE, 1/4" BSP FEMALE, NEEDLE, BRASS NICKEL PTD (VITON SEAL)	1
20	5984	NUT, M6, NYLOC, S/S	2
21	6017	WASHER, M6, FLAT, FORM B, S/S	4
22	5969	BOLT, M6 X 55MM, HEX, S/S	2
23	6008	BRACKET, NEEDLE VALVE, MAIN FRAME	1
24	AJ6201A	TANK LID WITH AIR VENT	1
25	AJ6200	FILTER BASKET STRAINER	1
26	5823	TANK, 100 LITRE, U.V. STABILISED HDPE	1
27	7681	HOSE, 1/2" - FLUSHING TANK TO 3 WAY VALVE	1
28	5901	VALVE, 1/2" BSP FEMALE, 3 WAY, L-HANDLE, BRASS/PLATED STEEL	1
29	7135	ADAPTOR, 1/2" BSP MALE - 1/2" BSP MALE TAPER, BRASS	4
30	7132	ADAPTOR, 1/2" BSP MALE - 1/2" BSP FEMALE,	2
31	5882	MANIFOLD, MAIN FRAME, MILD STEEL - ZINC PLATED	1
32	5900	VALVE, 1/2" BSP MALE / 1/2" BSP FEMALE, T-HANDLE,	2
33	7680	HOSE, 1/2" - MANIFOLD TO FILTER	1
34	7131	ADAPTOR, 3/4" BSP MALE - 1/2" BSP MALE,	1
35	7692	HOSE, 1/2" - 100 LITRE TANK TO 3 WAY VALVE	1
36	7127	HOSE, 1/2" - DRAIN	1
37	7128	HOSETAIL 3/8 - 1/2" BSP MALE	1
38	5932	HOSE, 3/8" - PUMP TO NEEDLE VALVE	1
39	7252	PUMP, DC 40/10, 12 V	1
40	7679	HOSE, 1/2" - FILTER TO PUMP	1
41	5881A	FILTER, 1/2" BSP FEMALE, C/W VITON 'O' RINGS	1

10.4 Atomiser Diagram (7235)

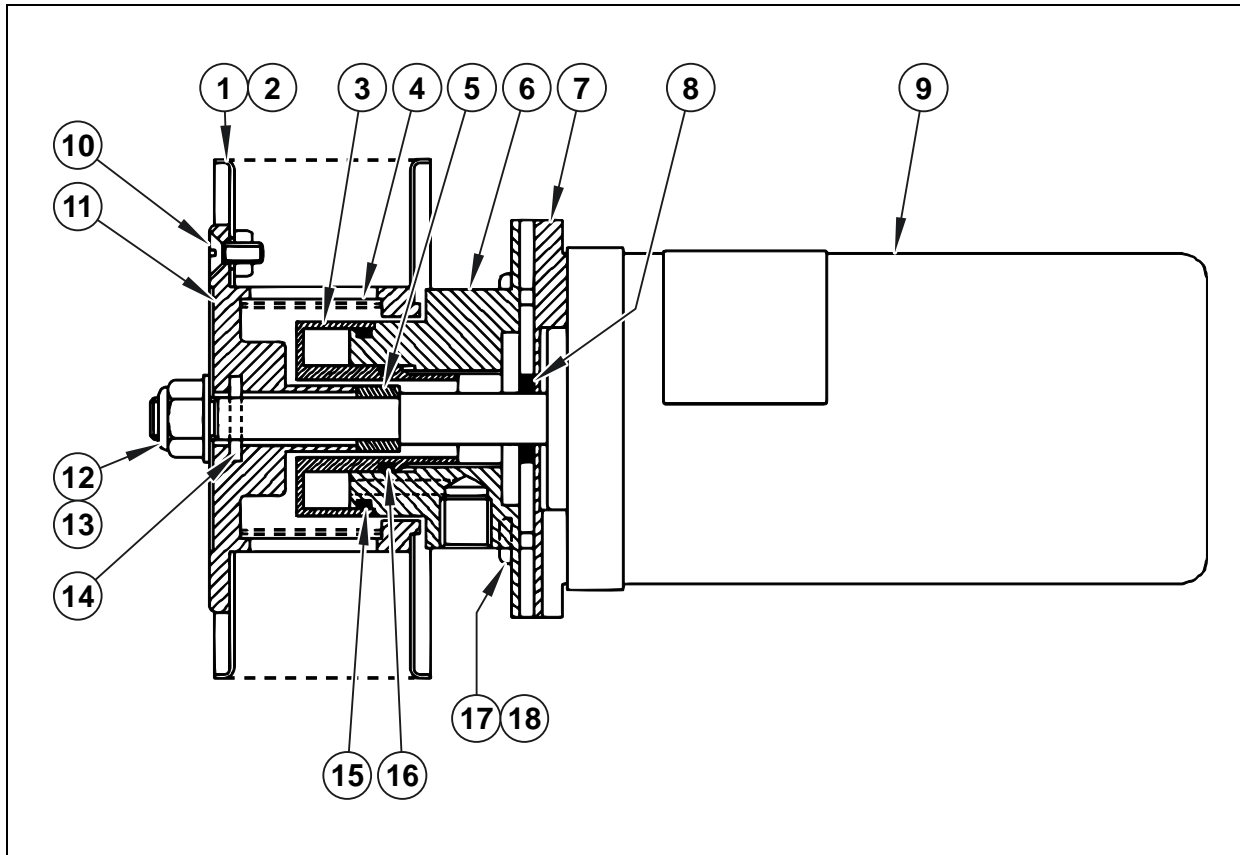


Figure 7 – AU6449 Atomiser Parts Diagram

Atomiser Parts List (7235)

ITEM	PART NO.	DESCRIPTION	Qty.
1	EX6221	ATOMISER GAUZE	1
2	EX7263	GAUZE AND HUB ASSEMBLY	1
3	EX6225	FEED RING	1
4	EX6226	INNER GAUZE	1
5	EX6321	WASHER SPACER	1
6	EX6224	FEED BODY	1
7	EX6393	SEPARATOR PLATE	1
8	CBP2541	'V' RING SEAL INNER	1
9	EX6279	ELECTRIC MOTOR	1
10	A206C10	SCREW CSK	3
11	EX6222	GAUZE HUB	1
12	CBP1909	NUT M8 NYLOC	1
13	SP127G	WASHER	1
14	EX6227	DRIVE PIN	1
15	CBP2479	O-RING	1
16	CBP2478	O-RING	1
17	CBP2098	SCREW M5x20 PAN	4
18	CBP1672	WASHER M5	4

10.5 Ulvamast V4 Filter (5881A) Diagram

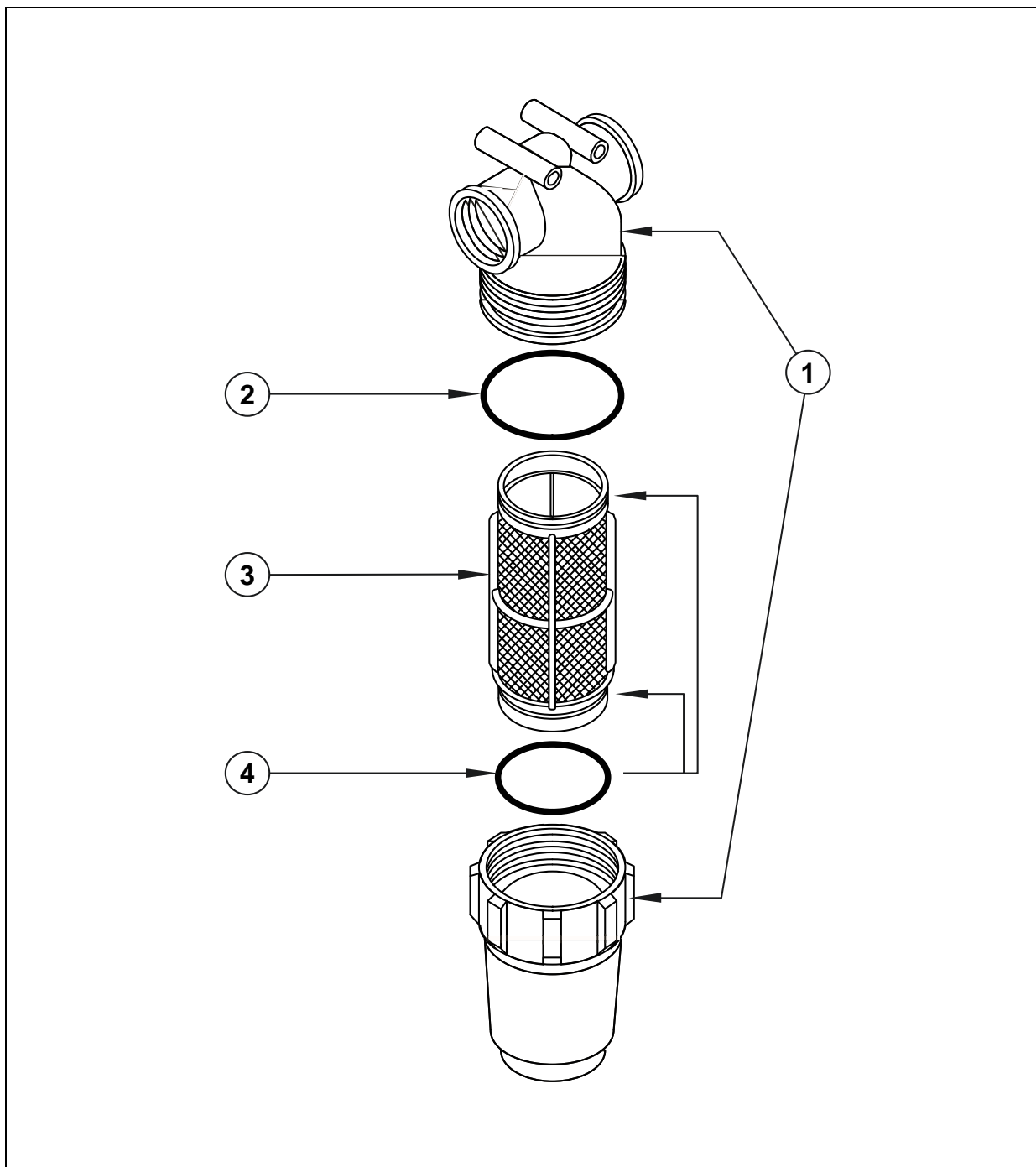


Figure 8 – Ulvamast V4 Filter (5881A) Diagram

Ulvamast V4 Filter (5881A) Parts List

ITEM	PART NO.	DESCRIPTION	Qty.
1	5881	FILTER BODY, 1/2" BSP FEMALE, 50 MESH, PRESSURE LINE	1
2	AJ6146	'O' RING, IN-LINE FILTER, VITON	1
3	LF5136	FILTER, IN LINE, 50 MESH	1
4	5403	'O' RING, FILTER MESH, VITON	2

10.6 Ulvamast V4E Pump (7140) Diagram

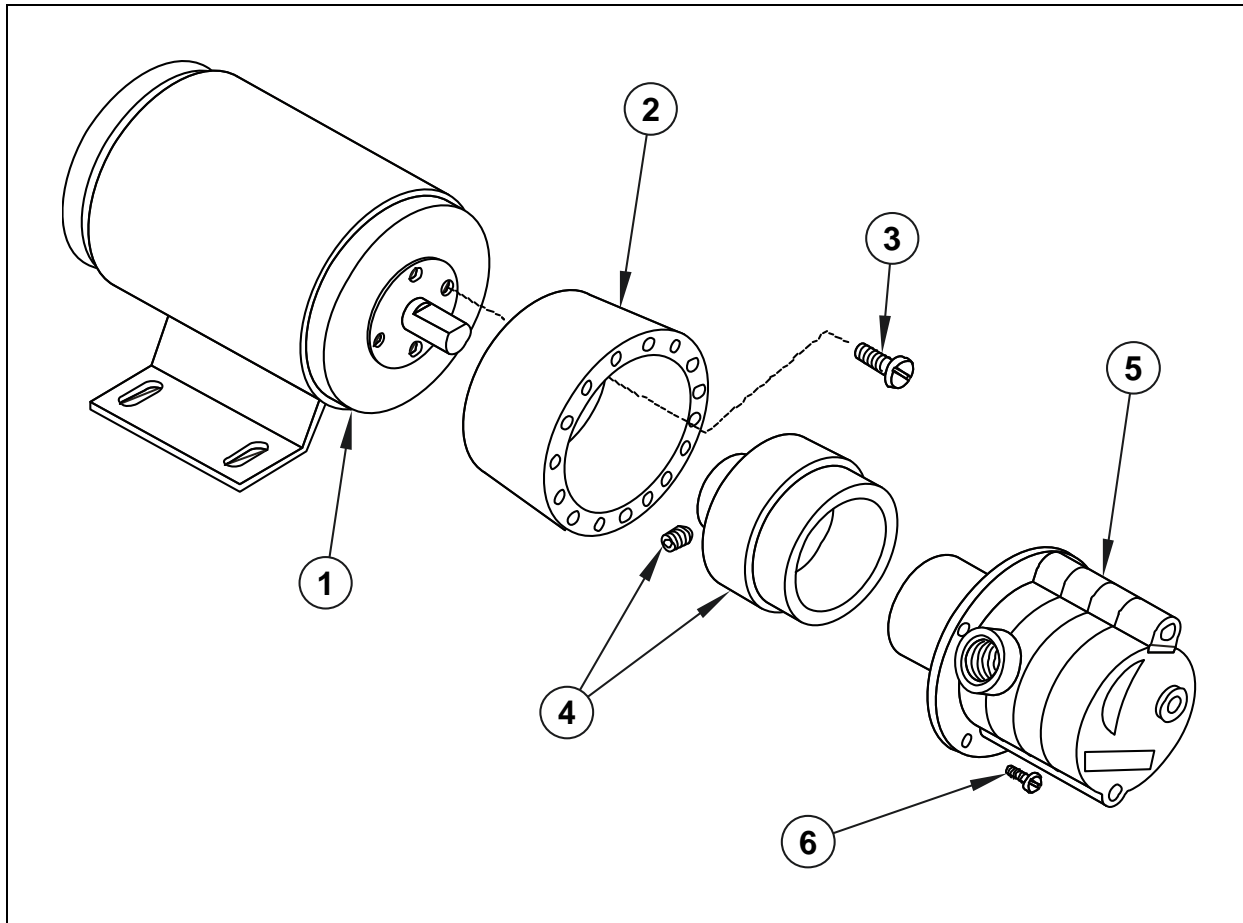


Figure 9 - Ulvamast V4E Pump (7140) Diagram

Ulvamast V4E Pump (7140) Parts List

ITEM	PART NO.	DESCRIPTION	Qty.
1	5866	MOTOR, 12V, GEAR PUMP	1
2	5986	ADAPTOR, PUMP/MOTOR, GEAR PUMP	1
3	5989	SCREW, NO. 8 UNC X 1/2", SLOTTED PANHEAD, S/S	4
4	5987	DRIVE, MAGNETIC, GEAR PUMP, COMPLETE WITH GRUB SCREW	1
5	7256	PUMP HEAD, GEAR PUMP S/S	1
6	5990	SCREW, NO. 4 UNC X 3/8", SLOTTED PANHEAD, S/S	4
-	7259	SERVICE PACK, PUMP HEAD S/S HEAD ONLY	1

10.7 Ulvamast V4M (7252) Pump Diagram

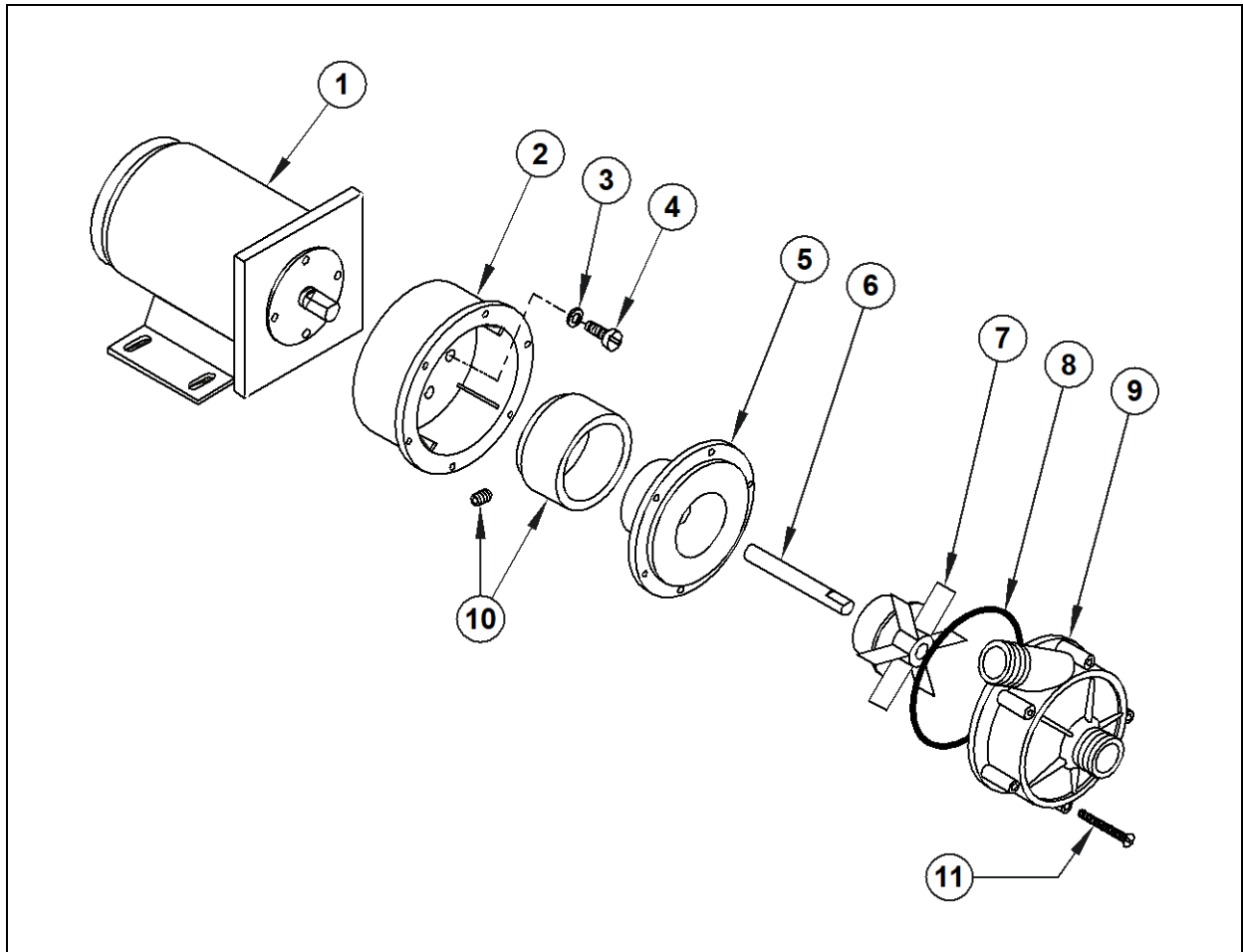


Figure 10 – Ulvamast V4M (7252) Pump Diagram

Ulvamast V4M Pump (7252) Parts List

ITEM	PART NO.	DESCRIPTION	Qty.
1	AJ6420	MOTOR, 12V DC DIMPLED	1
2	5767	PUMP MOTOR ADAPTER	1
3	4220	WASHER, 2.BA SHAKEPROOF	4
4	5768	SCREW, M5 X 12MM, CHEESEHEAD	4
5	5773	SPINDLE HOUSING, PC BLUE, PP	1
6	5772	SHAFT, CERAMIC HILOX 961	1
7	5771	IMPELLER, 10 POLE, 37 OZINS, PP	1
8	5774	'O' RING, 200-148, VITON, BLACK	1
9	CBP3141	PUMP BODY, 1/2" BSP IN/OUT, PP	1
10	5766	DRIVE MAGNET COMPLETE WITH GRUB SCREW	1
11	5775	SCREW, NO. 6 X 1.5", POZI, S/T	6

10.8 Ulvamast V4 Electrics Diagram

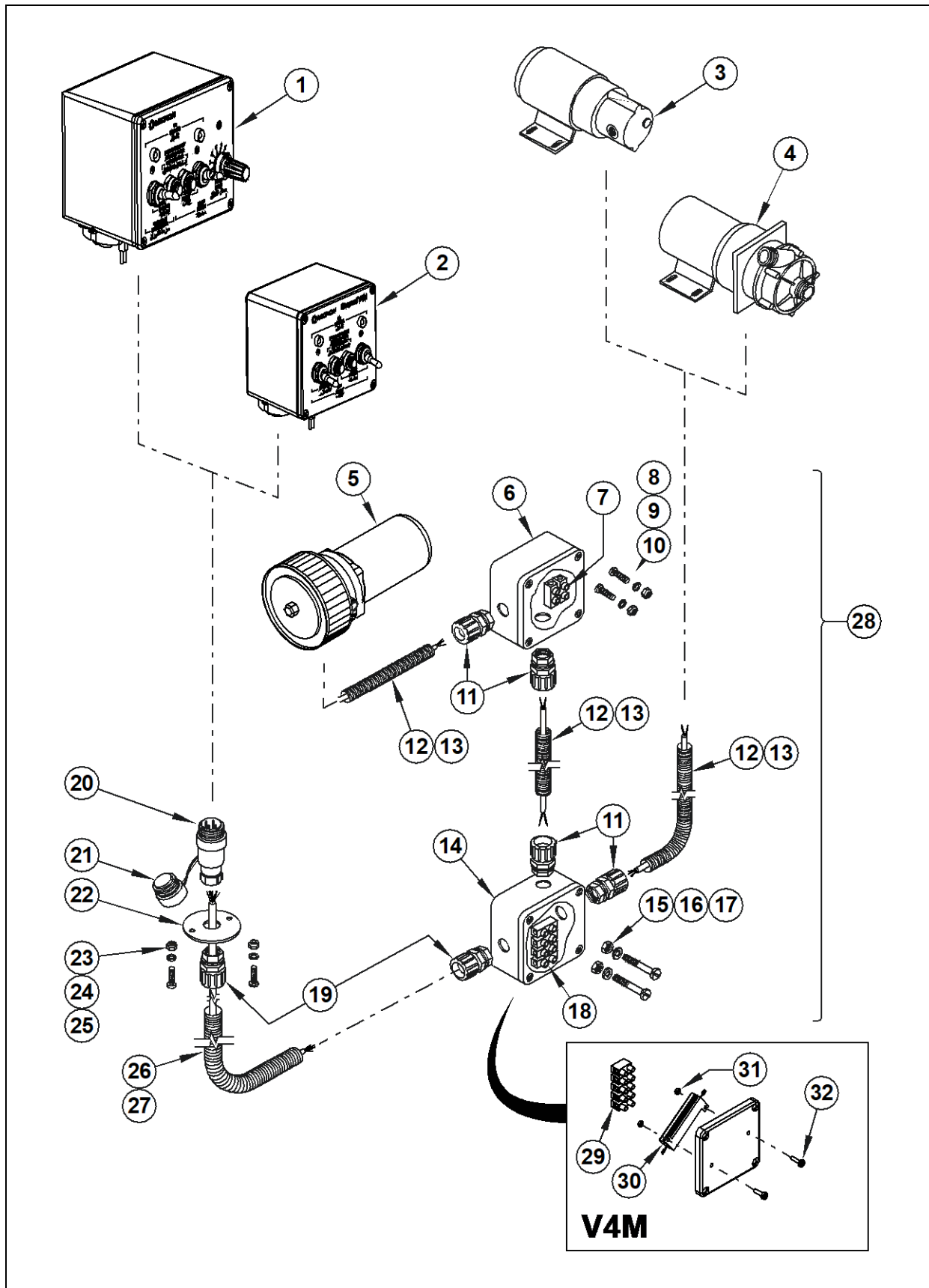


Figure 11 – Ulvamast V4 Electrics Diagram

Ulvamast V4 Electrics Parts List

ITEM	PART NO.	DESCRIPTION	Qty.
1	EX7255	CONTROL BOX, ULVAMAST V4E (INCLUDING BATTERY CABLE AND LABELS)	1
2	7990	BOX, SWITCH, ULVAMAST V4M (COMPLETE WITH LABELS)	1
3	7140	PUMP, GEAR , ULVAMAST V4E	1
4	7252A	PUMP, D.C. 40/10 12 V, ULVAMAST V4M	1
5	7235	ATOMISER, COMPLETE	1
6	5894	BOX, JUNCTION, MAST, ALUMINIUM	1
7	CBP3312	TERMINAL BLOCK, 2, 16A, NYLON 6,6	1
8	6728	SETSCREW M4 X 60 C/H S/S	2
9	6729	NUT M4 NYLOC S/S	2
10	6730	WASHER M4 S/S	2
11	5946	CABLE GLAND, 16MM DIAMETER	4
12	5943	CONDUIT, NC 16, FLEXIBLE, NYLON - PER M	A/R ¹
13	5903	CABLE, 2 CORE, 1.5MM, BLACK, PVC - PER M	A/R1
14	5896	BOX, JUNCTION, MAIN FRAME, ALUMINIUM	1
15	3667	NUT, 4 BA, NYLOC, ZINC PLATED	2
16	4756	WASHER, 4 BA, FLAT, ZINC PLATED	2
17	4693	SCREW, 4 BA X 7/8", CHEESE HEAD, ZINC PLATED	2
18	CBP3312	TERMINAL BLOCK, 5, 16A, NYLON 6,6	1
19	5953	CABLE GLAND, 20MM DIAMETER	2
20	5904	PLUG, 4 PIN	1
21	5905	CAP, PROTECTIVE (FOR 5904)	1
22	5948	PLATE, BULK HEAD	1
23	3691	NUT, M6, NYLOC, ZINC PLATED	2
24	5966	WASHER, M6, FLAT, MILD STEEL - PLATED	2
25	5952	SCREW, M6 X 25MM, SLOTTED, PAN HEAD, BZP	2
26	AJ6187	CONDUIT, FLEXIBLE, 20MM DIA. - PER M	A/R1
27	5902	CABLE, 4 CORE, 1.5MM, BLACK, PVC - PER M	A/R1
28	5965	WIRING LOOM ASSEMBLY – COMPRISING ITEMS 6 – 27	-
29	5942/5	TERMINAL BLOCK, 4, 16A, NYLON 6,6	1
30	CBP2715	RESISTOR R22, 50W	1
31	CBP2717	NUT,STIFF,M3,STST,SELF LOCKING A	2
32	CBP2716	SCREW,M3X12MMSTST,CROSS PAN HEAD	2

¹ As Required. When ordering these items please state the length required in metres

Ulvamast V4 Toolkit and Spare Parts (not Shown)

ITEM	PART NO.	DESCRIPTION	Qty.
1	5736	VIBRATAK, HIGH SPEED	1
2	CBP3312	TERMINAL BLOCK, NYLON 32A	1
3	5967	BOLT, M10 X 20, HEX, S/S	2
4	CBP1904	SCREW, SET, M6 X 25MM, HEX, S/S	4
5	5984	NUT, M6, NYLOC, S/S	10
6	RM0496	TAPE, PTFE	1
7	6015	SCREWDRIVER / WIRE STRIPPER	1
8	6018	TIE, CABLE (MEDIUM)	2
9	5968	BOLT, M6 X 80MM, HEX, S/S	2
10	AJ6146	'O' RING, IN-LINE FILTER	2
11	5403	'O' RING, FILTER MESH	2
12	AJ6357	SPANNER, 10", ADJUSTABLE	2
13	AJ6360	REVERSIBLE SCREWDRIVER, 6MM X NO.2	1
14	AJ6363	ROLL, TOOL, 12 POCKET	1
15	AJ6418	TIE, CABLE (SMALL)	4
16	LF2177	MEASURING JUG, 1 LITRE	1
17	CBP2843	FUSE, 60A	1
28	CBP3341	VELCRO, HOOK STRIP	1
19	CBP3342	VELCRO, LOOP STRIP	1
20	EX6728	HOLD DOWN BOLT ASSEMBLY (SHOWN ON FRAME DIAGRAM)	4

Ulvamast V4E Additional Spare Parts

ITEM	PART NO.	DESCRIPTION	Qty.
1	4105	KEY, ALLEN, 3/32" A/F	1

Ulvamast V4M Additional Spare Parts

ITEM	PART NO.	DESCRIPTION	Qty.
1	6013	KEY, ALLEN, 1/16" A/F	1
2	EX6727	RESTRICTOR KIT	1 set

11 USEFUL REFERENCES

- The Desert Locust Guidelines
Section IV. Control
Food and Agriculture Organisation of United Nations, Rome. 1992
- Locust Handbook (3rd edition)
Editor: Steedman, A. 1990
Natural Resources Institute, London, UK
ISBN 0-85954-281-5
- Precis de lutte Antiacridienne, Les Pulverisations d'insecticides
Tahar Rachadi
CIRARD/PRIFAS, Montpellier, France 1991
- A Guide to Migrant Pest Management in Africa
Editor: Meinzingen, W.F.
Food and Agriculture Organisation of United Nations, Rome, Italy. 1993
ISBN 92-5-103339-0
- Workshops on Spray Equipment Used in Desert Locust Control
F.A.O. Commission for Controlling the Desert Locust in the Near East, Cairo, Egypt
21st – 23rd August 1994, 23 – 25 September 2002 and 10 – 14 May 2009
- Controlling Desert Locust Nymphs with Bendiocarb applied by a vehicle mounted spinning-disc sprayer
P.M. Symmons, C. J. Boase, J.S. Clayton and M. Gorta
Crop Protection, Vol 8. 1989

Appendix A -**Conversion Factors**

1 yard	=	3 feet	=	0.91 metre
1 metre	=	39.37 inches	=	1.09 yards
1 statute mile	=	0.87 nautical mile	=	1.61 kilometres
1 nautical mile	=	1.15 statute mile	=	1.85 kilometres
1 kilometre	=	0.62 statute mile	=	0.54 nautical mile
1 statute mile	=	1760 yards	=	5280 feet
1 nautical mile	=	2027 yards	=	6081 feet
1 kilometre	=	1094 yards	=	3282 feet
1 metre/sec	=	2.237 miles per hr	=	196.9 ft/min
1 acre	=	43560 sq feet	=	4840 sq yards
1 acre	=	4047 sq metres	=	0.40 hectare
1 hectare	=	107600 sq feet	=	11955 sq yards
1 hectare	=	10000 sq metres	=	2.47 acres
1 sq mile	=	640 acres	=	259 hectares
1 sq kilometre	=	247 acres	=	100 hectares
1 US gal	=	0.83 Imp gal	=	3.78 litres
1 Imp gal	=	1.20 US gals	=	4.54 litres
1 litre	=	0.26 US gal	=	0.22 Imp gal
1 US pint	=	16 US fl ounces	=	0.47 litres
1 Imp pint	=	20 Imp fl ounces	=	0.57 litre
1 US gal/acre	=	8 US pint/acre	=	9.45 litres/hectare
1 Imp gal/acre	=	8 Imp pints/acre	=	11.35 litres/hectare
1 litre/hectare	=	0.11 US gal/acre	=	0.081 Imp gal/acre
1 pound	=	16 ounces	=	0.45 kilogram
1 kilogram	=	2.20 pounds	=	35.3 ounces
1 ounce	=	28.35 grams		
1 pound/sq inch	=	0.068 atmosphere	=	0.067 bar
1 atmosphere	=	14.70 pounds/sq in	=	1.01 bar
1 bar	=	14.50 pounds/sq in	=	0.98 atmosphere
1 kilopascal	=	0.01 bar	=	0.145 pounds/sq in

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