



MiniVap
Humidifier
Models LMV2 & LMV4

Please read these Instructions
BEFORE
Installation and Start-up
Failure to observe manufacturer's recommendations may invalidate warranty

Vapac Humidity Control Limited reserves the right to change the design or specification
of the equipment described in this manual without prior notice.

Vapac equipment is manufactured in England by:
Vapac Humidity Control Limited

Vapac

MiniVap

Positioning the MiniVap Unit

DOs

DO mount the unit indoors.

DO mount the unit close to the steam nozzle / steam pipe position.

DO ensure adequate service access to the front of the unit (min 700mm).

DO remove the cylinder, if necessary, to access the mounting holes in the back of the steam section.

DO use M6 projecting type wall bolts or equivalent fixings to mount the unit in position.

DO mount unit with a Room Distribution Unit (RDU) so that the steam discharge is above head height. (An RDU includes a steam nozzle and a small fan with 230Vac motor.)

DON'Ts

DON'T mount the unit outside.

DON'T install the unit close to sources of strong electromagnetic emissions eg variable speed lift motor drives, KVA transformers, etc.

DON'T mount unit in an unventilated enclosure.

DON'T mount in a position requiring ladder access to the unit.

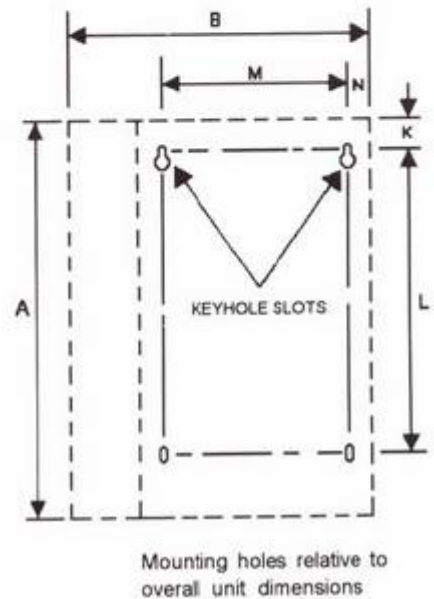
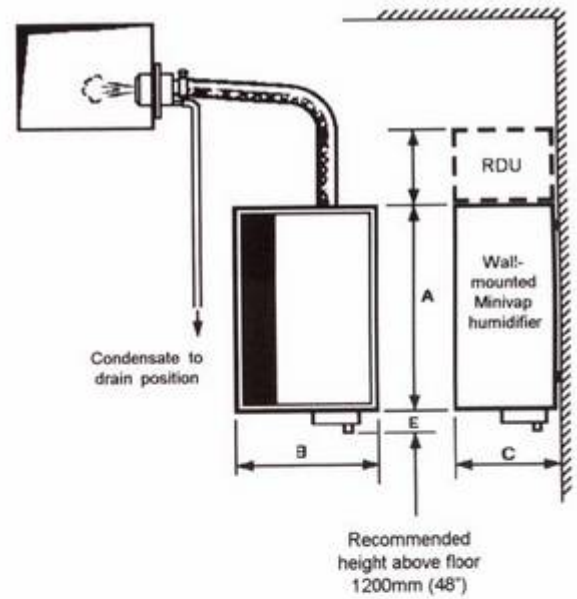
DON'T install the unit behind a false ceiling or other situation where an unusual malfunction (eg water leak) would cause damage.

DON'T install the unit in an area which will be hosed down.

DON'T install the unit where the ambient air temperature can exceed 35°C.

DON'T mount the unit inside a cold-room or other place where temperature and humidity conditions can cause condensation on electrical components.

DON'T mount the unit where the sound of a contactor opening / closing and water flow in a pipe would be unacceptable eg libraries, private apartments, etc.



MiniVap

Plumbing – Cold Water Connections

DO's

- DO connect only to normal town piped water supplies.
- DO install a 'filter-ball valve' or stop-valve / shut-off valve plus strainer close to the unit.
- DO provide a water supply with sufficient pressure and pipe size to ensure an adequate flow rate (1.2 litres/min) to the unit.
- DO use the flexible water connection provided.
- DO thoroughly flush through new pipework before connecting to the unit.

DON'Ts

- DON'T connect to a water supply that has been softened using a salt exchange system (sometimes called base exchange or ion exchange system).
- DON'T connect to demineralised water supplies.
- DON'T over-tighten the water supply connection with a wrench or spanner – a flexible connection with nylon nut and washer is provided to allow a firm hand-tightening – if water seepage occurs, undo the nut, wipe the washer clean and then re-seat it.

Plumbing – Drain Connections

DO's

- DO use copper pipe or plastic pipe rated for 100°C.
- DO arrange to discharge drain water from the unit into a vented and trapped drain at a position where flash steam rising from the drain line tundish will not pose a problem for the Vapac or other equipment.
- DO provide adequate fall for the drain pipework to allow free flow of water drained from each unit.
- DO ensure drain line pipe size will accommodate water being drained at the same time from other equipment connected to it.

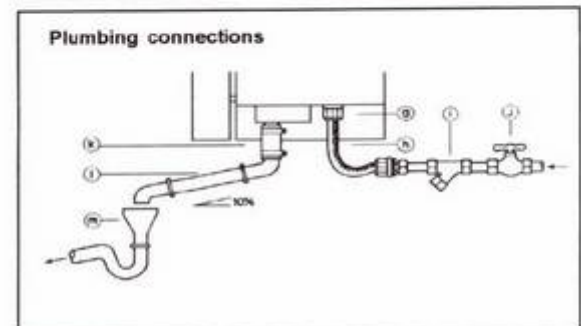
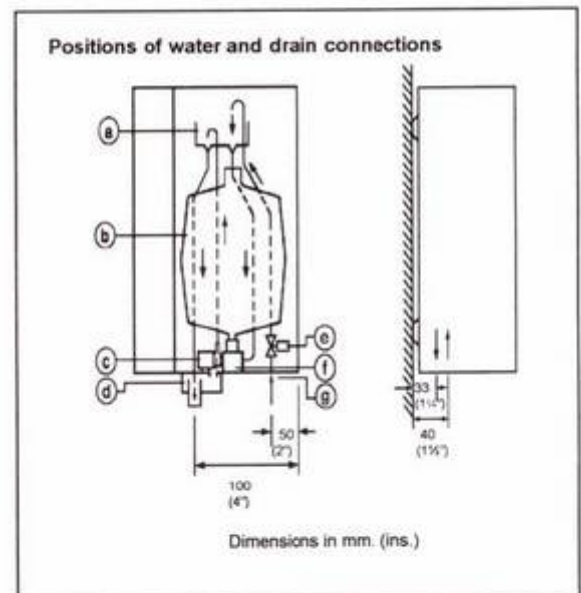
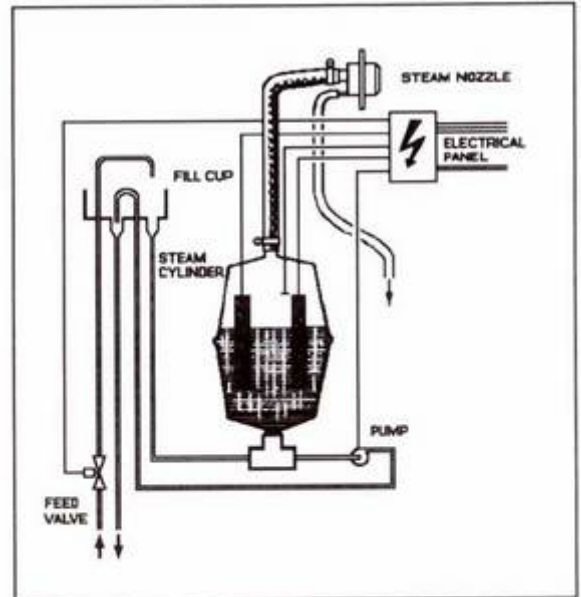
General

- DO ensure metal drain and supply water pipework is grounded electrically close to the unit.

Water quality:

Hardness	50 – 500 ppm (mg/l)
Conductivity:	80 - 1000µS/cm
Water Pressure:	1 – 8 bar
Water Flow Rate:	1.2 litres/min

- a) Tundish fill-cup
- b) Steam cylinder
- c) Drain pump
- d) Drain trap
- e) Feed valve with flow restrictor
- f) Feed/Drain manifold
- g) Water connection 3/4"
- h) Flexible connector with 3/4" nut at both ends
- i) 'Filterball' valve (or strainer plus stop valve)
- j) Ø35mm steam hose + hose clips
- k) Ø35mm copper pipe + support
- l) Tundish



MiniVap

Steam Nozzle / Pipe and Hose

DO's and DON'Ts

General Positioning

The position of the steam nozzle / pipe in the air conditioning system relative to other items – bends, filters, heat exchangers, etc, is critical and must be decided by the design engineer responsible for the project.

DO obtain project engineer's instruction / drawing for chosen location of pipe.

DO obtain project engineer's instruction / drawing for pipe position relative to the top and bottom of the duct (or sides if airflow is vertical).

Steam Nozzle Installation

Note:

The steam nozzle can be installed in either the side or the bottom of an air-duct.

DO ensure that the condensate outlet is at the lowest point.

DO arrange for a local drain position for the condensate line from the nozzle.

DO use tubing suitable for 100°C for the condensate line.

Steam Pipe Installation

Note:

The steam pipe can only be mounted in the side of an air-duct.

DO ensure that the holes are on the top of the pipe when it is mounted in the duct.

Steam Hose Connection:

DO use steam hose / copper pipe of equivalent size to the steam cylinder outlet (Ø22mm).

Do use Vapac steam hose or well insulated copper pipe.

Do keep steam hose as short as possible – under 2m for maximum efficiency.

DO arrange to have a vertical rise immediately over the unit of 300mm.

DO use the full height available between unit and steam nozzle to provide maximum slope (min 12-20% for condensate to drain back to the steam cylinder (or down to a condensate separator). Always provide a continuous slope.

DO provide adequate support to prevent sagging.

Fit pipe clips every 30-50cm

Support straight lengths on cable trays or in heat resistant plastic pipe.

DO use a Vapac condensate separator or simple trapped pipe connection to drain off condensate from extended steam lines.

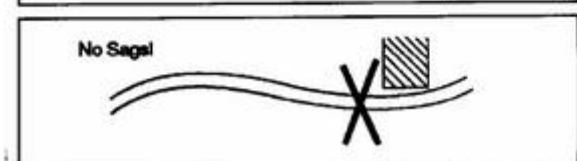
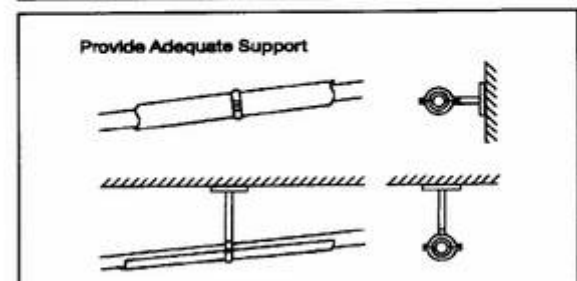
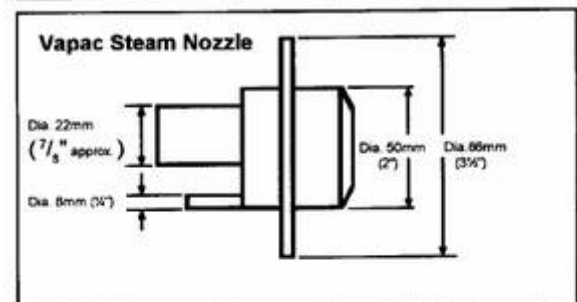
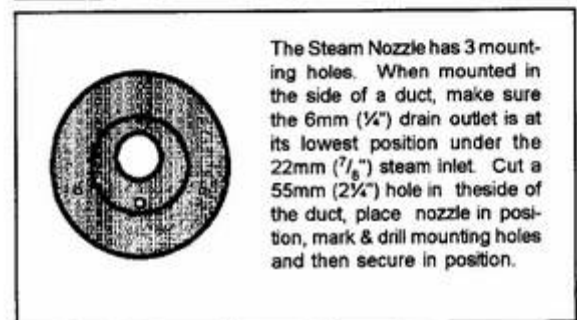
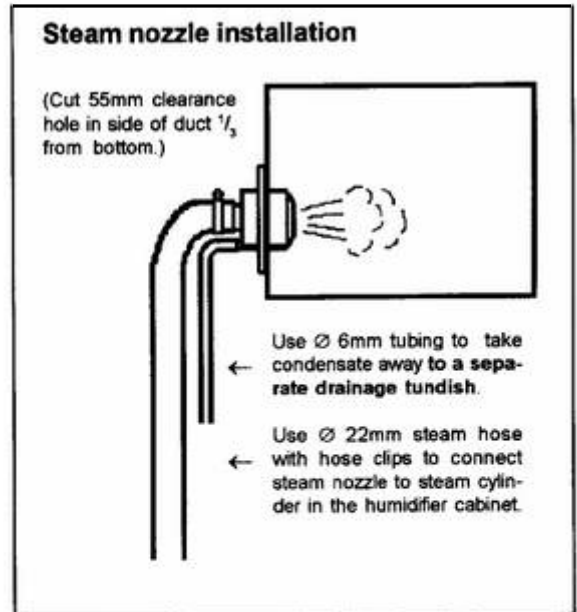
DO ensure radius hose bends are fully supported to prevent kinks developing when in service.

DO add extra insulation to steam hose for longer runs (2m-5m) and in cold ambient conditions to avoid excess condensate and reduction in delivered output.

DO arrange for the condensate from the steam nozzle to be discharged into the Tundish installed for the drain water from the humidifier. Use 6mm diameter (100°C rated) tubing to connect to 6mm copper pipe or to discharge direct into the tundish.

DON'T allow steam hose to develop kinks or sags.

DON'T include horizontal runs or 90° elbows in the steam line.



MiniVap Electrical Connections

The wiring to the Vapac should be done by a qualified electrician and the external over-current protection and wiring should comply with the appropriate Regulations and Codes of practice. The standard MiniVap unit is designed to suit 230V single phase electrical supply.

External Protection

A fused disconnect / isolator or MCB should be used in the electrical supply to the unit and this should be located adjacent to the Vapac cabinet or within easy reach and readily accessible.

MiniVap Terminals (see Fig.1)

Terminals L1 and L2 are for the power supply connections.

Terminals 1 and 2 are for the external control circuit connections.

Terminals A and B are for connection of an RDU (Room Distribution Unit).

Control Circuit Connection

The MiniVap can be operated by a single step humidistat / hygrostat which has volt-free contacts.

Note: MiniVap terminals 1 & 2 must NOT be used for security circuit purposes.

Security Circuit

When a high limit humidistat, interlock or airflow switch are in use, these should be wired to interrupt the power supply to the MiniVap unit either indirectly or directly.

Cable Entry

Cable glands are provided and must be used to ensure cables are held securely at the entry position.

Output Reduction

There are two standard outputs; LMV2 = 2kg/hr and LMV4 = 4kg/hr. Both units can have their outputs changed from 1kg/hr to 5kg/hr by changing the value of UCP 1. If this is required, please request change from manufacturer or distributor supplier of the unit, or at time of order.

External Connections

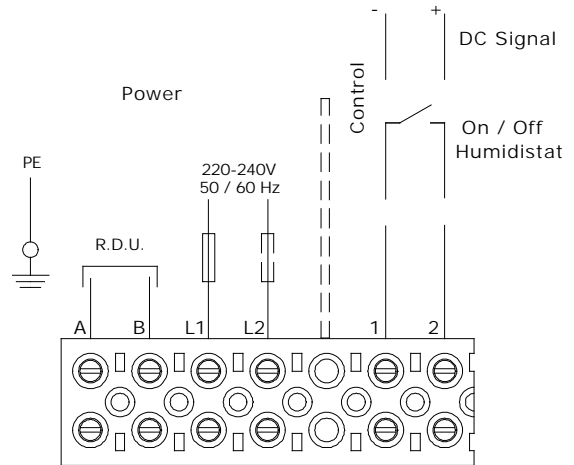
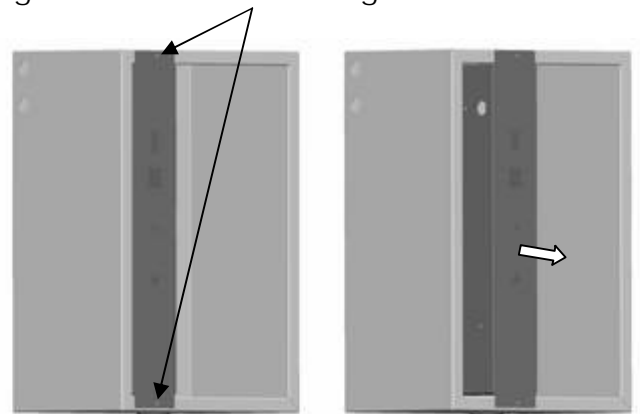


Fig 1

To gain access to the electrical section open front door; undo these 2 screws then ease electrical section out and release it by undoing the two guide screws.

Fig 2.

Fig 3



Making the Electrical Connection

Releasing the Electrical Section:

To make the electrical connections to the unit it is necessary to detach the electrical section. To do this, open the door, disconnect the hose and the electrode caps from the steam cylinder, then remove the steam cylinder from the cabinet by lifting it out of the manifold.

Next undo and remove the two screws which hold the electrical panel to the outer cabinet (see Fig.2) and ease the whole electrical section forward (see Fig.3) to disengage it from the locating slots in the back panel.

Then undo the two holding screws to release it from its top and bottom runner. The electrical panel is then free and can be rested at an angle within the cabinet (see Fig.4) to allow the wiring connections to be made to the terminal block.

Completing the Connection:

Remove the knock-outs in the top and/or side (for MiniVap with RDU) and fit the glands provided. Pass the cables through the cable glands and make secure connections to the appropriate positions of the terminal block then tighten the cable glands.

Note: If an RDU is fitted, there is a small knock-out on the top and a hard plastic grommet provided for the fan motor leads.

On completion, re-attach the electrical panel to its runners, slide it back and secure in position before replacing and reconnecting the steam cylinder.

Important:

- 1 When replacing the cylinder, make sure its o-ring seal and capping ring are in position on the manifold.
- 2 The position for the white cap (water level sensing electrode) has a label marked 'white', the electrode cable N° 1 must be put on the electrode nearest the white cap.

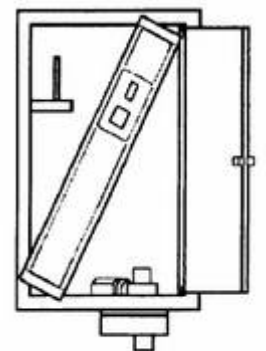


Fig.4

Start-Up Instructions

With the installation, plumbing and electrical connections complete:

- Turn on the water supply to the MiniVap.
- Close the fused disconnect/isolator or circuit breaker on the electrical supply to the MiniVap.
- Put On/Off switch on fascia panel to position 1.
- The MiniVap is now ready to operate when the humidistat / hygrostat switches the unit On.

Commissioning / Start-Up

With the correct electrical and water connections completed, the MiniVap unit can be switched on. When the humidistat/hygrostat switches, electrical power is applied to the electrodes and cold water flows into the cylinder. The MiniVap program arranges for the water to be introduced in stages until the full operating current is reached. The level of electrical current depends on the minerals present in normal town water supply. It is unlikely that the full operating current will be reached when the cold water first enters the cylinder; in this case, the cold water feed valve will close when the water reaches the water level detection electrode which is located at the top of the cylinder and prevents the cylinder overfilling.

The current which flows between the electrodes will heat the water until it boils. The steam produced will be carried up the steam hose to the steam pipe or nozzle. As the boiling continues more cold water will be added bringing in more minerals until the mineral concentration required for full output is reached.

Thereafter, the MiniVap system will continuously monitor and control the concentration of the boiling water by adjusting the amount of water drained from and fed into the cylinder.

During the initialisation process the user LEDs should be in the following state:

User LED State	Description
RED Flashing 2 second period	Unit initialising. If it remains in this state the unit does not have a valid UCP1 fitted.

Prior to the start of the initialisation process, the LEDs will flash Green, Red, Amber repeatedly for 10 seconds to check that the LEDs are operating correctly.

Features of the MiniVap Operation

The MiniVap system of control is designed to adjust the function to keep the unit operating in the face of changing water quality in the cylinder and changing electrode condition even if, in an adverse operational circumstance, this results in some reduction in output whilst the situation exists.

Note: The MiniVap PCB disconnects the power to isolate the electrodes during drainage to avoid earth leakage.

The MiniVap unit will stop operating in response to extreme fault conditions identified as:

- High Over-current STOP
- Drain Fault STOP (no drain function)
- Feed Fault STOP (water not reaching cylinder)

The 'stop' condition on the MiniVap PCB will be cleared by switching the unit off and on. When a 'stop' condition occurs, follow the service and maintenance procedure to inspect the steam cylinder and the drain pump.

	User LEDs	Description
1	OFF	Unit in shutdown.
2	OFF	Unit in standby.
3	Green Amber Flashing variable RED Flashing Variable period or ON	Unit in Start-up. Unit Online. The Variable period is determined by the demand signal. Demand LED ON RED LED OFF <12.5% 0.5second 3.5 seconds <25% 1.0second 3.0seconds <37.5% 1.5seconds 2.5seconds <50% 2.0seconds 2.0seconds <62.5% 2.5seconds 1.5seconds <75% 3.0seconds 1.0second <87.5% 3.5seconds 0.5second >=87.5% ON RED continually

The above are purely indications of the current state of the unit and require no action from the operator. When the state changes, the indication will automatically change.

End of Cylinder Life

The steam cylinder needs to be exchanged for a new one when the output of the unit is excessively reduced by the build up of scale deposits.

Cylinder Exchange

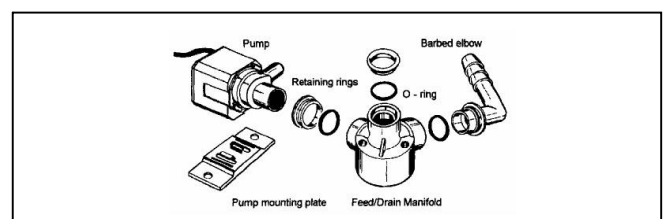
Cylinder Life

The water hardness and humidity demand at site will determine the effective life of a steam cylinder. Units located in areas with naturally soft waters will experience the longer cylinder life, possibly upwards of 12 months in calendar terms. With hard waters, a more frequent cylinder exchange must be expected and cylinder exchange 2 or 3 times a year can be the average situation. The normal scaling up of the Vapac steam cylinder is outside the Vapac warranty.

Procedure for Cylinder Exchange

- 1 With power connected to the unit, use the Manual Drain switch to empty the steam cylinder.
- 2 Disconnect the Vapac from the electrical supply by means of the external isolator / disconnect switch or circuit breaker.
- 3 Open the lockable door to the cylinder chamber and carefully ease off the red electrode caps and the white electrode cap.
- 4 Loosen the hose clip and disconnect the hose from the top of the steam cylinder.
- 5 Using a twisting movement, lift the cylinder clean of its seating in the feed / drain manifold and carefully remove the used cylinder from the unit.
- 6 Inspect the feed / drain manifold to ensure this is clear of sediment.
- 7 The small drain pump can be removed for inspection / cleaning by applying steady hand pressure onto its inlet housing to ease it back on its mounting and to release it from its 'O' ring connection in the side of the feed / drain manifold.

The diagram shows the assembly arrangement of the feed / drain manifold and pump. The pump motor body is a sliding fit into its mounting plate.



- 8 With the pump back in position after cleaning, make sure the o-ring seal and capping ring are in position on the manifold then insert the cylinder into the feed / drain manifold, pushing it down firmly, and reconnect the steam hose.
- 9 The electrode caps must be reconnected in accordance with the details on the collar supplied with the new cylinder – electrode N°1 on the electrode nearest to the white cap.
- 10 The Vapac unit is supplied with electrode cables routed to avoid contact with the door. After a cylinder exchange it is important to replace the cables as close as possible to their original route.

Service and Maintenance

As the operation of the MiniVap is entirely automatic, it normally requires no attention on a day-to-day basis. General cleaning and maintenance of the component parts of the MiniVap are recommended at intervals of about one year but this is largely dependent upon the frequency of its use and the quality of the water supply. Where the MiniVap is part of an air-conditioning system being serviced regularly, the MiniVap should be inspected at the same time.

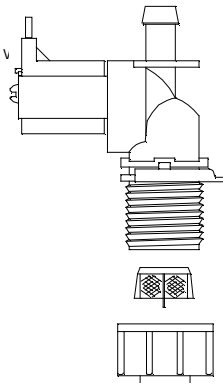
Steam and Condensate Hoses

The hoses used with and in the Vapac should be inspected at the normal service visits as part of normal maintenance. At the first signs of deterioration, a hose should be removed and replaced.

Feed Valve with Strainer

The nylon bodied solenoid valve incorporates a small nylon strainer which is a push fit in the 3/4" inlet of the valve. With a new plumbing installation, loose solid material in the pipework could partially block the strainer after start-up. If, for this or any other reason, a restriction of the water flow is suspected (outside supply pressure considerations), it would be possible to clean the strainer as follows:

Turn off the water supply to the unit.
Undo the nylon nut connecting the flexible v the valve inlet.
The strainer can be removed using 'long-nosed' pliers to grip the centre flange provided on the strainer for this purpose.
Withdraw the strainer.
Wash and replace it..
Reconnect pipework.
Turn on water supply.
Reconnect electrical supply to allow unit to operate.



Note: Always replace the strainer after cleaning as it is needed to prevent material lodging in the valve seat or blocking the small flow control restrictor which is fitted in the valve.

Fault / Service Indications – Requiring Operator Intervention

	User LED 1 State	Description
1	AMBER	Drain fault
2	AMBER flashing 1 second period	Feed fault
3	AMBER flashing 2 second period	Over current fault
4	GREEN	Service now

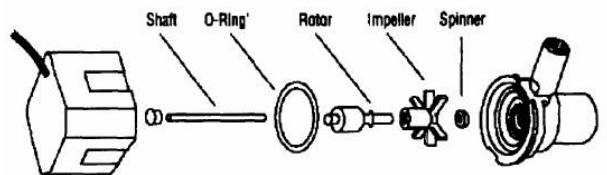
- 1,2&3 Fault Stop: Once the problem has been cleared the fault can be reset by the following procedure:
Power the unit right off using the local isolator (not the unit on/off switch), wait ten seconds then re-apply power.
- 4 Service the unit by following the instructions within the Manual.

Drain Pump

The pump should be inspected and cleaned regularly. It is recommended that this be done at each cylinder exchange, especially in hard water areas. Failure to keep the pump clear and operational will result in reduced cylinder life.

To remove the pump for maintenance purposes, proceed as follows:

- 1 Depress and hold the manual drain switch to empty the cylinder. The pump 'sound' changes distinctly once the cylinder is empty. When this occurs release the switch.
- 2 Disconnect unit electrical supply and follow the cylinder exchange procedure.
- 3 If, due to an electrical or mechanical fault, the cylinder cannot be emptied by the pump it will be possible to drain most of the water into a bucket by disconnecting and lowering the top end of the tube which feeds cold water to the cylinder from the fill cup. The remaining cold water will run into the base tray when the pump is withdrawn from its 'o' ring connection and / or the cylinder is lifted out.
- 4 Ease the pump free of the feed / drain manifold 'o' ring connection, slide it fully off its base plate and release the connecting tube.
- 5 To dismantle and re-assemble pump, refer to diagram below.



- 6 In operation, the stainless steel shaft remains stationary whilst the rotor and impeller rotate on it. Remove all scale build-up on the shaft so the impeller can rotate freely.
- 7 Ensure that the 'o' ring seal is correctly positioned when fitting the inlet housing to the main pump motor body. When re-assembling, make sure the brass spinner is replaced on the shaft in front of the impeller. A smear of multi-purpose grease should be applied to the 'o' ring so that the impeller housing can be rotated into position without distorting the 'o' ring underneath it and so maintain the water seal.



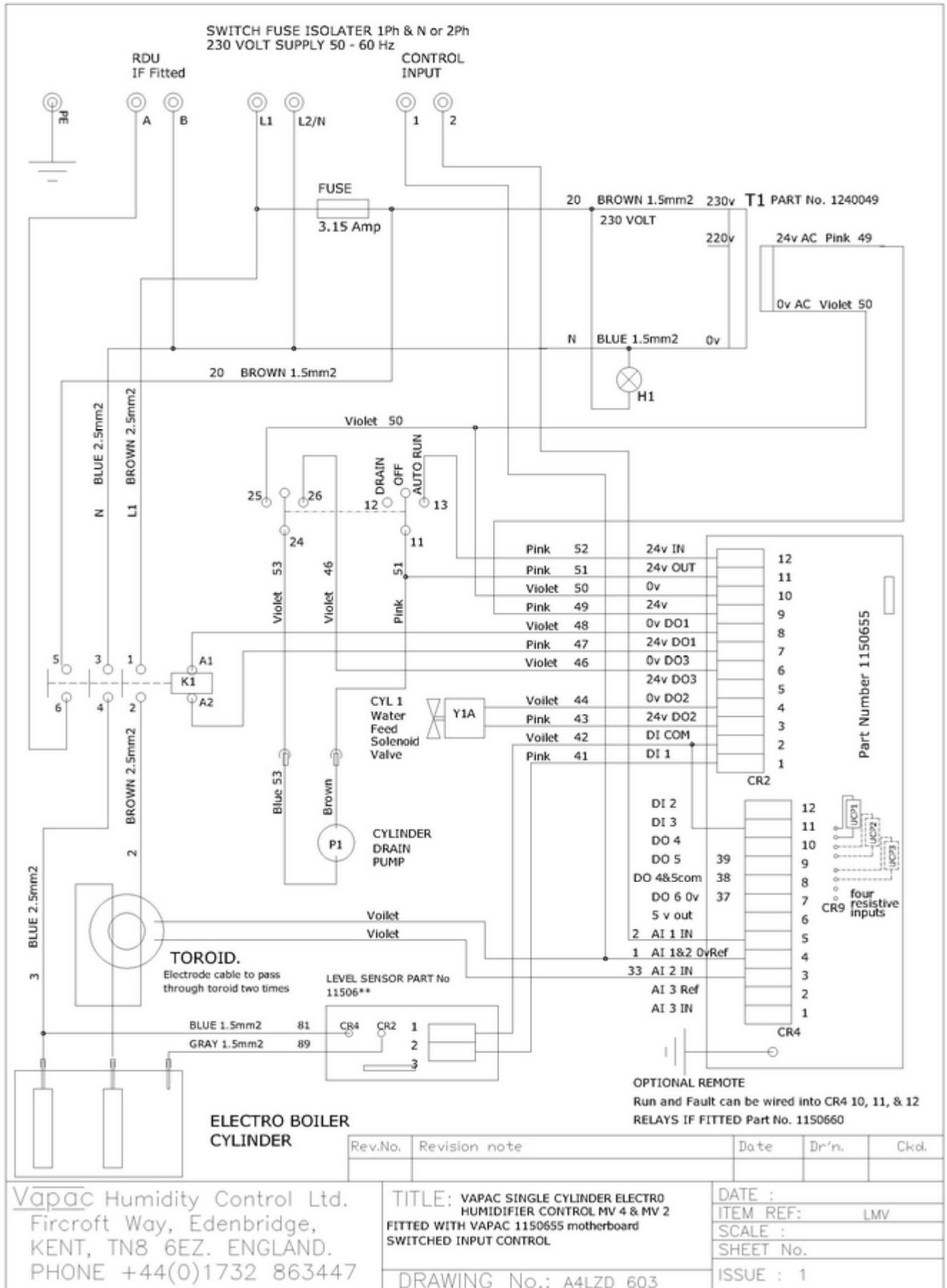
MiniVap Trouble-Shooting Check-List

- Preliminary Check: - Use manual drain position of the switch to check pump operation.
- Symptom: Check / cause / remedy
 Red 'Power-On' Neon – not lit - Check main power is connected and switched on.
 - Check security circuit is complete (fan interlock, high humidity over-ride).
 - Check power supply fuses.
 - Check Power-on neon.
- Red 'Power-On' Neon – lit
 Water in the cylinder
 No current - Check the switch is in the position marked 1 (unit On position).
 - Check MiniVap internal control circuit fuse.
 - Check humidistat is calling for Demand.
- Slow start-up situation with a new cylinder.
 Low conductivity (soft) water. Add Alka Seltzer to boost conductivity of the water.
 If above action is not successful and condition returns, an alternative lower resistance cylinder may be necessary.
- Red 'Power-On' Neon – lit
 Water at top of the cylinder
 and low current. - Reduced output due to scale deposits.
 Remove cylinder for rinsing out and re-use or fit a new replacement cylinder.
 - Water level circuit not functioning.
 Check that 230V phase is connected to electrode that is nearest to the white cap.
- Feed Fault: - Check the water supply is turned on; check the mains pressure is greater than 1Bar; check there are no obvious leaks; check the feed water is entering the cylinder and not running to drain (too much back pressure in steam hose or problem with Tundish fill cup internal u-tube),
- Drain Fault: - Check drain pump operates; check when draining the water runs to drain and doesn't return to the cylinder via the Tundish fill cup (blocked internal drain hose or problem with the Tundish fill cup internal u-tube).
- Over-Current Fault: - check the unit drains correctly; check the cylinder electrodes are not damaged or mis-aligned in the cylinder.

MiniVap Specification

Model Ref		LMV2 & 4				
Nominal Output	Kg/hr	1	2	3	4	5
Nominal Output	Lb/hr	2.2	4.4	6.6	8.8	11
Voltage	V	230	230	230	230	230
Average Power Input	kW	0.77	1.53	2.3	3.07	3.72
Electrical Supply	Ph	ph + N or 2ph	ph + N or 2ph	ph + N or 2ph	ph + N or 2ph	ph + N or 2ph
N° Electrodes		2	2	2	2	2
Full Load Current	A	3.5	7	10.5	14	17
Maximum Over-current	A	5.25	10	15.75	20	25
Fuse Rating / Phase	A	10	10	16	20	25
Cable Terminals Size	mm ²	4	4	4	4	4
Wiring Diagram	A4-LZD-603					
Cabinet Size	1					

- Control System - On / Off (unless specified at time of order when water level control is available with the following control signal options: 0-5V; 0-10V; 2-10V; 1-18V; 0-20V & 4-20 mA.
- Steam Hose - Internal Diameter 22mm
- Steam Hose Length - Recommended maximum 2m with continuous fall back to the MiniVap Unit
- Condensate Hose - Internal diameter 6mm
- Water Connection (underside) - ¾ threaded connection to MiniVap feed valve – use flexible connector supplied with unit which has ¾ threaded nylon nut at each end
- Drain Connection (underside) - Has connection size 35mm diameter unthreaded – use short length of hose to interconnect onto copper pipe and discharge drain water to one side of unit into an open tundish.



INSTALLATION NOTES