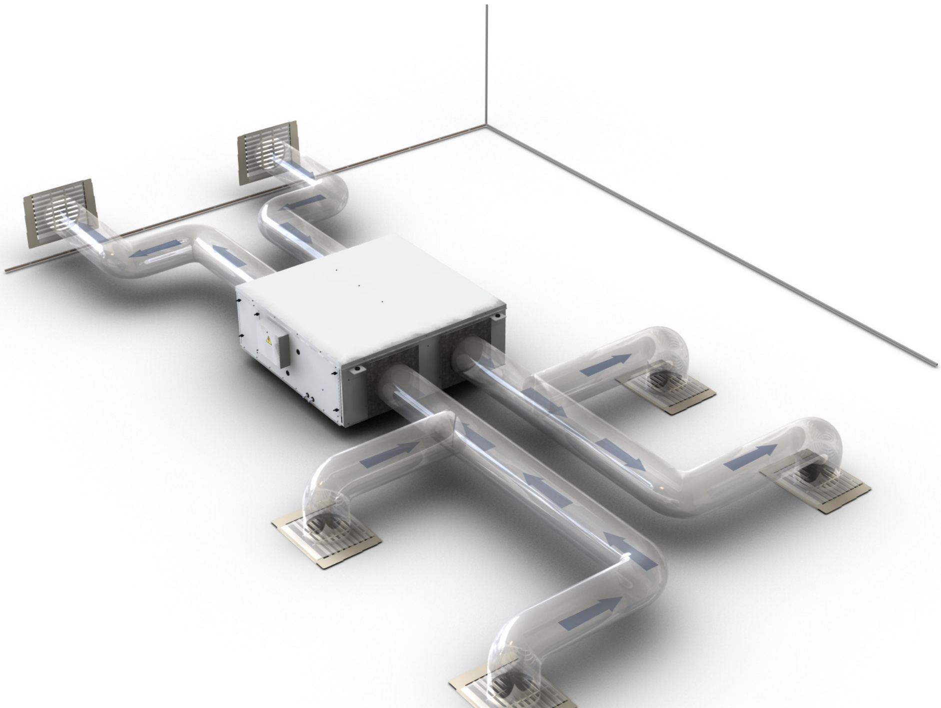
DERV(DX/CHW) UNITS

C/W CHILLED WATER AND SPLIT SYSTEMDX COOLING

INSTALLATION, OPERATING
AND MAINTENANCE INSTRUCTIONS



QA/IOM/63 ISSUE 2 – DERV

1 General Description

SPC DERV(DX/CHW) units are heat recovery ventilator units incorporating heat recovery heat pipes, dehumidifier heat pipes and an active DX cooling coil or chilled water cooling coil. DX units are supplied with a matched condensing unit for external mounting and for piping to the DERVDX unit which acts as the indoor unit in the split system.

The units are intended to fully condition outside air by taking advantage of the cooling potential of dirty extract air and the cooling and dehumidifying potential of a DX evaporator coil or chilled water cooling coil.

The units are constructed in two halves; one half incorporating the extract fan(s) and extract section of the heat recovery heat pipe, the other half contains the supply fan(s), supply section of the heat recovery heat pipe plus chilled water/DX cooling coil c/w heat pipe wrapped around it. The wrap around heat pipe precools the air prior to the cooling coil and reheats it after the cooling and dehumidifying process to generate neutral ventilation air.

Units incorporate filtration on both the supply and extract side and are designed to be mounted out of sight above false ceilings, suspended from the ceiling slab.

The supply and extract sections terminate in sheet metal flanges for the attachment of ducting. Ducting design will be to suit the desired distribution within the premises and is largely beyond the scope of this manual.

Units are supplied with an on/off and three speed controller to control the rotational speed of the backward curved centrifugal fans and hence control the throughput of air on both the supply and extract side. Further control of the air throughput must be made as part of the ducting design with branch sizes matched to air volumes and manual volume control dampers fitted where necessary. DX versions supplied with matched outdoor units incorporate a relay for switching of the compressor and an additional temperature setting switch.

2 Technical Details

The table below gives details of the nominal operating characteristics of the DERV units along with pertinent weights and dimensions. Operating limits for the units are as follows:

Maximum outside air temperature: 55℃
Minimum outside air temperature: 5℃
Maximum extract air temperature: 40℃
Minimum extract air temperature: 5℃
Units should be installed in a non-condensing environment.
Minimum outside air temperature for condensing unit operation of DX model: 20℃

DERV chilled water units

Unit size	80	150	250	500
Nominal supply volume (litres/s)	107	155	236	473
Nominal extract volume (litres/s)	107	155	236	473
Nominal supply external static (Pa)	80	80	80	80
Nominal extract external static (Pa)	80	80	80	80
Total net cooling (W)	6375	9788	15127	30310
Sensible cooling (W)	3313	4929	7561	15155
Cooling coil total capacity (W)	5150	7779	11462	23970
Supply air dry bulb (℃)	20.2	19.5	19.3	19.3
Supply air wet bulb (℃)	17.1	16.0	15.7	15.7
Heat recovery heat pipe cooling load saving (W)	1225	2009	3665	6340
Wraparound heat pipe precool load saving (W)	622	1040	1660	3320
Wraparound heat pipe reheat load saving (W)	622	1040	1660	3320
Power supply (V/Ph/Hz)	230/1/50	230/1/50	230/1/50	230//1/50
Nominal current draw (A)	0.6	1.0	1.7	3.4
Nominal power draw (W)	138	230	391	782
Weight (kg)	75	100	130	190
Water flowrate (litres/s)	0.22	0.33	0.51	1.02
Water pressure drop (kPa)	10	9	18	19
Coil inlet connection size (mm)	15	22	22	28
Coil outlet connection size (mm)	15	22	22	28

The conditions upon which the above data is based are as follows:
Outside air @ 46/30℃
Extract air @ 25℃
CHW flow/return @ 7.2/12.8℃

DERV DX version

Unit size	150	250	375	500
Nominal supply volume (litres/s)	155	236	358	473
Nominal extract volume (litres/s)	155	236	358	473
Nominal supply external static (Pa)	80	80	80	80
Nominal extract external static (Pa)	80	80	80	80
Total net cooling (W)	9788	15127	22907	30310
Sensible cooling (W)	4929	7561	11470	15155
Supply air dry bulb (°C)	19.5	19.3	19.3	19.3
Supply air wet bulb (°C)	16.0	15.7	15.7	15.7
Cooling coil total capacity (W)	7779	11462	18125	23970
Heat recovery heat pipe cooling load saving (W)	2009	3665	4782	6340
Wraparound heat pipe precool load saving (W)	1040	1660	2504	3320
Wraparound heat pipe reheat load saving (W)	1040	1660	2504	3320
Power supply (V/Ph/Hz)	230/1/50	230/1/50	230/1/50	230/1/50
Nominal current draw (A)	1.0	1.7	2.0	3.4
Nominal power draw (W)	230	391	460	782
Weight (kg)	100	130	170	190
Suction connection (“)	7/8	7/8	1,1/8	1,1/8
Liquid connection (“)	3/8	3/8	5/8	5/8
Outdoor unit power supply (V/Ph/Hz)	230/1/50	230/1/50	400/3/50	400/3/50
Outdoor unit nominal power draw (A)	13.1	18.0	8.4	8.4
Outdoor unit nominal power draw (W)	3013	4140	4143	4143
Compressor	Reciprocating	Reciprocating	Scroll	Scroll
Refrigerant	R22	R22	R22	R22
Expansion device	Capillary	Capillary	Valve	Valve
Outdoor unit size WxHxD (mm)	1020x954x406	1020x954x406	1020x1270x406	1020x1270x406
Outdoor unit weight (kg)	80	90	110	120

The conditions upon which the above data is based are as follows:
Outside air @ 46/30°C
Extract air @ 25°C

Table1: Technical data

Detailed unit dimensions and construction information is highlighted on the figure below:

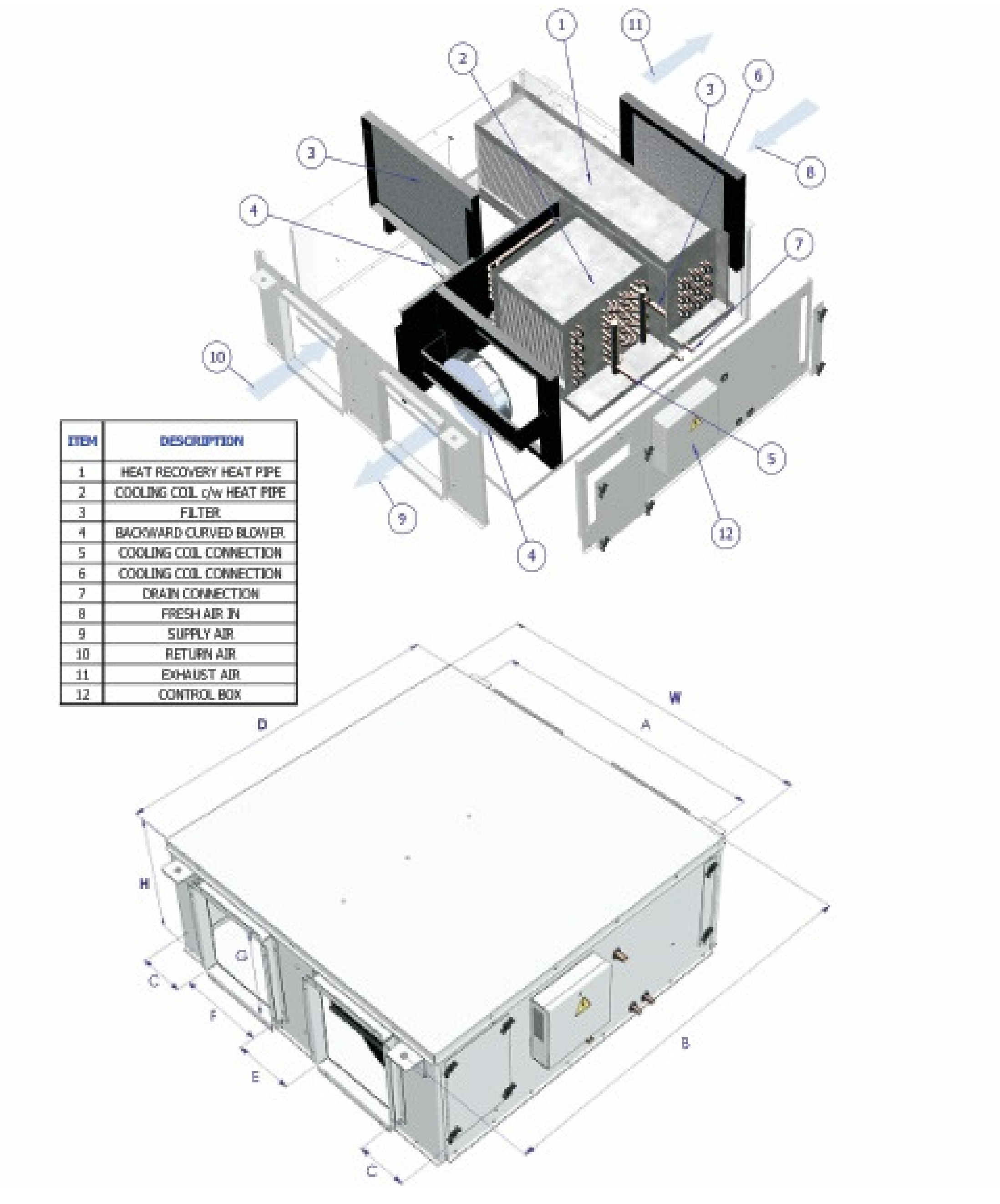


Figure 1: Physical unit data

Outdoor unit sizes for DERVDX models are given in the performance table above.

3 Reception & storage

DERV units are delivered in purpose made cardboard containers, if ordered as a DX version with outdoor unit then this will be packaged separately. Upon receipt of the units the packaging should be checked for any obvious damage and the labeling checked against the project requirement. Any damage or delivery discrepancy should be reported to the SPC local office immediately. After checking the packaging the units should be removed and a visual inspection carried out and any damage reported immediately. If the units are not to be installed immediately then they should be returned to the packaging for storage.

It is recommended that the units be stored in a safe location away from site activity and they must not be exposed to the ambient. Units must be stored in non-condensing atmospheres where temperatures cannot exceed 50°C.

4 Installation

4.1 Mounting of Indoor Unit

DERV and DERVDX indoor units must be installed horizontally and are intended to be fitted in a concealed location, ideally above a false ceiling. The units must be suspended from the concrete ceiling slab or other fixed and firm horizontal steelwork. Care must be taken to ensure that the DERV(DX) unit is fixed to a structure that will accept the unit weight as shown in the above table and that vibrations are not transmitted.

DERV(DX) units are supplied with 4-off robust fixing lugs at each of the corners of the unit (6-off on the size 500). Each of these lugs incorporates a rubber bush to prevent unit vibrations being directly transmitted to the mounting/support rods. The units should be mounted from the ceiling/steelwork using threaded drop-rods. These drop-rods are not supplied with the units but we recommend the use of M8 threaded rod.

The ceiling or support structure should first be marked out to match the position of the holes in the DERV(DX) unit fixing lugs. The structure should then be drilled and fitted with suitable anchors capable of accepting the weight of the DERV(DX) unit. Brackets can then be secured to the ceiling anchors for securing the threaded drop rods. The rods should be cut to length and secured to the ceiling bracket or supporting steelwork and the other end passed through the fixing lugs on the DERV(DX) unit.

The drop-rods should be secured with suitable nuts on either side of the fixing lugs around the anti-vibration bushes. It is important that the unit is fitted level in both directions so that correct operation and drainage are ensured. A maximum deviation of 3mm from the horizontal should be maintained and checked on installation using a spirit level and adjusted using the retaining nuts on the fixing lugs.

4.2 Mounting/Location of Outdoor Unit (DERVDX only)

Outdoor units supplied with DERVDX are suitable for floor mounting and are side discharge models. It is important that there is no obstruction on the air inlet and outlet sides of the unit and that there is no possibility of hot discharge air being drawn back into the inlet.

A minimum clearance of 600mm must be ensured on all sides of the unit except the air discharge side where the clearance must be a minimum of 1500mm.

The unit must be located outside and must not be ducted. Ensure that the unit is not subject to direct sunlight and cannot be subjected to any water run-off.

The unit must be mounted on a flat horizontal surface where vibrations cannot be transmitted to the building structure and securely fixed.

A location should be found whereby the length of refrigerant pipes between the outdoor unit and the indoor DERVDX unit is minimized.

4.3 Refrigerant Piping (DERVDX only)

The detailed instructions regarding the refrigerant piping given in the condensing unit IOM manual should be followed. The text below gives general guidance. All refrigeration pipework should be undertaken by a suitably qualified refrigeration engineer.

4.3.1 Liquid/Vapour lines

The table below identifies the recommended liquid and vapour line sizes based on the size of DERVDX unit being installed. All refrigeration piping should be clean, dehydrated refrigeration grade copper and should remain sealed until ready for use. A filter drier and liquid sight glass may be installed in the liquid line upstream of the expansion device.

Unit size	Liquid line OD	Vapour line OD
DERVDX 150	3/8"	5/8"
DERVDX 250	3/8"	7/8"
DERVDX 375	3/8"	7/8"
DERVDX 500	1/2"	1,1/8"

Table 2: Recommended refrigerant line sizes.

Both vapour and liquid lines should be insulated to prevent sweating and performance reduction. A minimum of ½" thick pipe insulation should be used. In order to avoid any reduction in performance it is recommended that the maximum distance between indoor and outdoor unit (including any vertical lift) be limited to 15m.

Whenever tubing is cut it should be carefully deburred so as to prevent any chips falling into the tubing to be used. Any bends in the pipework should be made using proper tube bending equipment so as to prevent any kinking.

Wherever possible tube connections should be of the sweat type and made using copper brazing material. For copper to copper brazing up to 5% silver content brazing rods should be used, for copper to brass or steel then 35% silver content is recommended. Tubing and fittings should be cleaned with wire wool prior to brazing and any debris prevented from entering the pipe. When brazing at or near to the service valves the caps and Schraeder cores should be removed to prevent damage and the valves themselves covered in wet rags. A flow of nitrogen should be directed through a service port and tubing while brazing.

If flare joints are to be used these must be properly made ensuring the following:

- No thinning of the flare tube material
- No cracked or split tubes
- No longitudinal scoring or tool marks
- Correct torque setting used to match diameter of nuts

After having completed the pipework the system should be pressure tested to ensure that there are no leaks. Dry nitrogen up to a maximum pressure of 10 bar should be used and all joints should be tested using leak detection spray or detergent.

4.3.2 Coil connections

For DERVDX size units 150 and 250 the evaporator coil in the indoor unit is equipped with a capillary type expansion device. This device is factory brazed onto the coil within the casing of the indoor unit. The liquid and vapour connections terminate outside the casing of the unit and are sealed; the coil contains a holding charge of nitrogen which should be heard escaping when the connections are opened with a hole cutter.

For unit sizes 375 and 500 the indoor units are supplied with a loose thermostatic expansion valve. The valves must be fitted outside the casing of the unit and should be installed in line with the instructions supplied with the device. When brazing the TEV into the liquid line it is important that the valve is protected using wet rags so as to avoid any damage to same. The TEV should be fitted as close as possible to the liquid connection on the coil.

4.3.3 Evacuation

After leak testing, the pipework should be evacuated before any of the valves are opened. The vacuum pump should be connected to both the high and low side of the system and a deep vacuum drawn to 500 microns. Triple evacuation is recommended if the vacuum pump cannot achieve such deep vacuum levels.

4.3.4 Refrigerant charge

The outdoor unit is shipped with sufficient refrigerant for operation of the system with up to 5m liquid line distance between the indoor and outdoor unit. The required system charge will be indicated on the charging chart inside the access cover of the outdoor unit.

If the length of the liquid line exceeds 5m then additional charge should be added according to the diameter of the liquid line. For 3/8" diameter pipe refrigerant should be added at a rate of 60 grams/metre and for ½" diameter pipe at a rate of 120 grams/metre.

If the unit is supplied without refrigerant or the refrigerant recovered and the whole system evacuated then the full charge as shown on the charging table will need to be added.

4.3.5 Oil traps

To ensure adequate oil return to the compressor it is recommended that oil traps be fitted with at least one trap for every 3m of vertical height. When the outdoor unit is above the indoor unit the traps should be fitted in the suction line, if the indoor unit is above the outdoor unit then the traps need to be fitted in the liquid line.

4.4 Electrical connections

4.4.1 DERV units

DERV units are designed to allow simple operation with the minimum of electrical power and control wiring required on site. A wiring diagram for the unit is attached to the unit next to the terminal block. A copy of the wiring diagram is shown below.

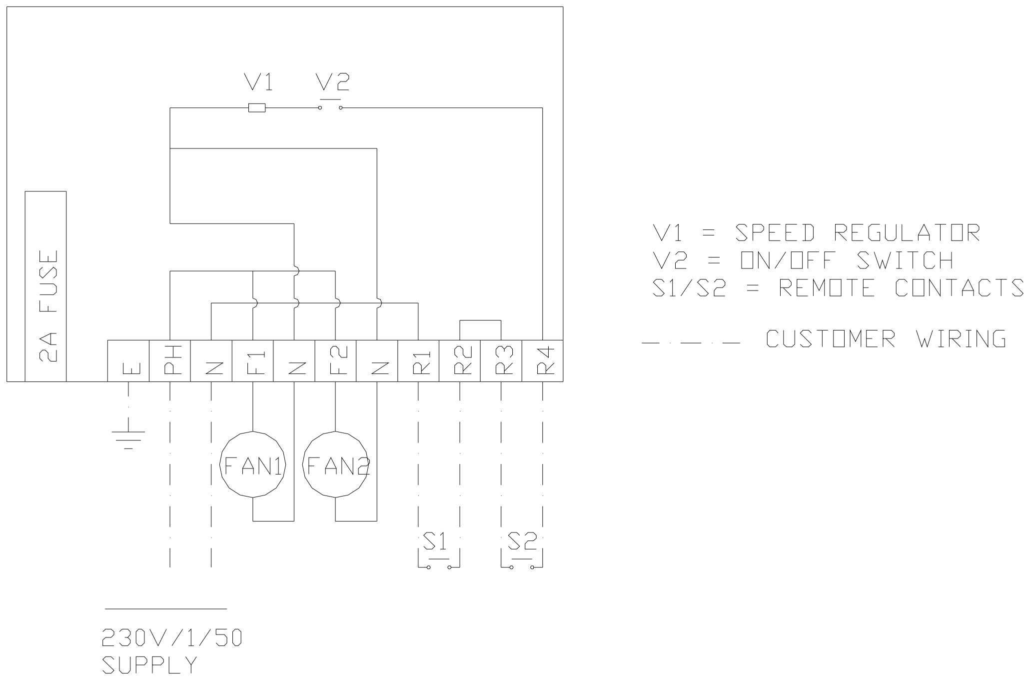


Figure 2. Wiring details DERV units

For the size 500 unit the fuse rating is 5A not 2A as shown above.

Power supply to the units is single phase 230V/50Hz. A three wire supply is required (PH/N/E) and this should be taken from a suitably isolated power supply. Maximum running current and power drawn are given in the technical data table but minimum wire size for the power supply should be 1mm2.

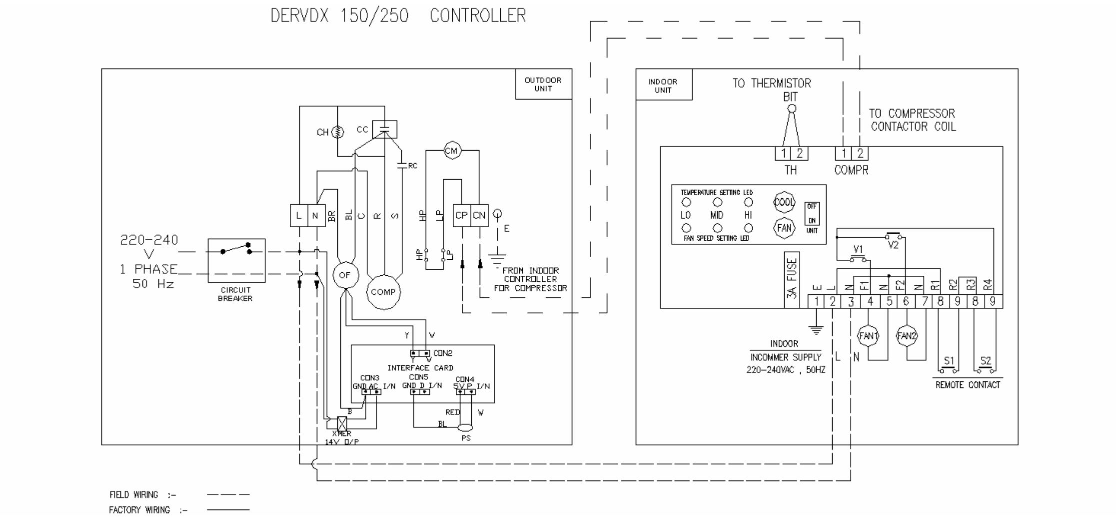
The terminal block is accessible on the side of the indoor unit. The 3-core power cable should be connected to this terminal block as shown on the wiring diagram attached to the unit.

The DERV units incorporate a built-in controller allowing the speed to be changed (speed 1,2 & 3) along with an on/off switch. Provision has also been made for remote control of the DERV units via two volt free contacts. These contacts can be used to switch the units on and off remotely via switches or relays attached to BEMS, occupancy sensors etc. The two remote contacts are wired into terminals R1/R2 and R3/R4 respectively. Again wire should be a minimum of 1mm2 and remote contacts should be rated at a minimum of 2A (5A, 500 unit).

If one or both of the remote contacts are not used then links must be fitted between R1/R2 and R3/R4.

4.4.2 DERVDX units

DERVDX units are designed to allow simple operation with the minimum of electrical power and control wiring required on site. A wiring diagram for the indoor unit and interconnection to the outdoor unit is attached to the indoor unit next to the terminal block. A copy of the wiring diagram is shown below.



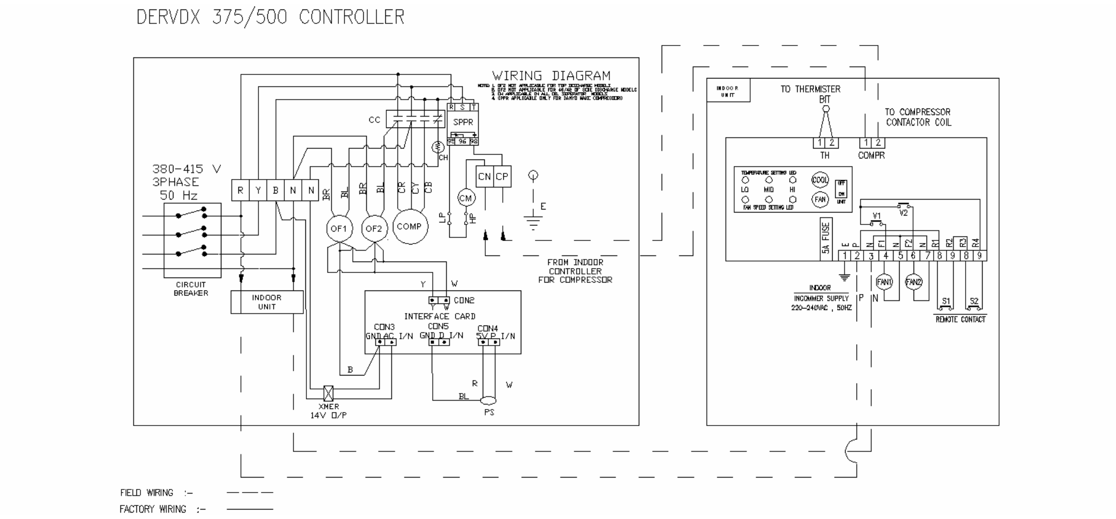


Figure 3. Wiring details DERVDX units

While all indoor units use a single phase supply the outdoor units for the larger models, size 375 and 500 are three phase as shown above.

For the smaller single phase units (150, 250) a three wire supply is required (PH/N/E) and this should be taken from a suitably isolated power supply. Maximum running current and power drawn are given in the technical data table but minimum wire size for the power supply should be 1mm2. Both the indoor and outdoor units must be earthed and the power cables should be taken from the terminal block of the outdoor unit to the indoor unit terminal block.

The larger three phase units (375, 500) require cables for each of the phases and a neutral. Both indoor and outdoor units must be earthed and a phase and neutral cable must be taken from the 3 phase terminal block in the outdoor unit to the indoor unit.

Two control wires must be run between the terminals on the controller of the indoor unit and the relay terminals on the outdoor unit. It is recommended that these wires be a minimum of 1mm2.

The DERVDX units incorporate a built-in controller allowing the speed to be changed (Low, Med & High) along with an on/off switch, see figure below. Provision has also been made for remote control of the DERV units via two volt free contacts. These contacts can be used to switch the units on and off remotely via switches or relays attached to BEMS, occupancy sensors etc. The two remote contacts are wired into terminals R1/R2 and R3/R4 respectively. Again wire should be a minimum of 1mm2 and remote contacts should be rated at a minimum of 2A (5A, 500 unit). If one or both of the remote contacts are not used then links must be fitted between R1/R2 and R3/R4.

The controller is connected to a thermistor sensor located between the heat recovery heat pipe and the dehumidifier heat pipe inside the indoor unit and senses the temperature at this point. The three temperature settings available equate to 22, 24 and 26℃ respectively, when the sensed temperature falls below the set temperature then the outdoor unit will switch off. It is recommended that the lowest temperature setting is used to provide continuous operation of the outdoor unit.

The controller incorporates a built in time delay on the compressor to prevent hunting and has a non-volatile memory allowing the settings to be saved.

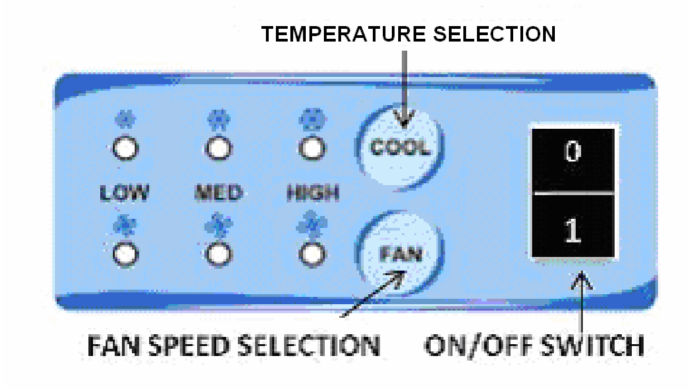


Figure 4. Controller display

When the compressor delay timer is operating the set temperature LED will blink on and off for half a second each. The on delay timer is set at 180 seconds.

When the compressor is not running according to the temperature setting the LED blinks on for 0.1 seconds and off for 0.9 seconds.

The compressor is set to run if the sensed temperature >= to the set temperature+1 and set to off if the sensed temperature < set temperature.

The variable indoor unit fan speed is achieved using phase angle control. When the phase angle is changed the RMS value of the voltage at the fan motor is changed and hence the fan speed.

When the input AC Voltage is 230 V, 50 Hz the following voltage is applied at the fan motor.

Fan Speed	AC Voltage applied at fan motor
Low	195 V
Medium	205 V
High	Input AC voltage

Table 3: Fan speed details

If there is a thermistor fault this will be indicated on the display by flashing of all the cooling LEDs and remote on/off by flashing of the fan speed LEDs.

4.5 Drain connection piping

The DERV(DX) units incorporate two internal draintrays; one beneath the heat recovery heat pipe and one beneath the cooling coil/heat pipe section. There is an individual drain pipe extending out from the side of each drainpan. These drainpipes are 30mm diameter plastic and must be properly trapped in order to ensure than condensate is not held within the unit. The drainpans are both on the suction side of the supply fan and subject to negative pressure and if not fitted with drain traps will draw air into the unit and prevent the release of moisture. As these two drain points are adjacent to one another and subject to very similar levels of vacuum it is permissible to join the two together prior to the trap.

Suction pressures at the inlet to the supply fan can be as high as 200Pa depending on the external resistance of the systems and traps should be sized to cope with this level of pressure. Incorporating a safety factor to account for the effect of dirty filters etc, the required minimum dimensions are shown in the diagram below.

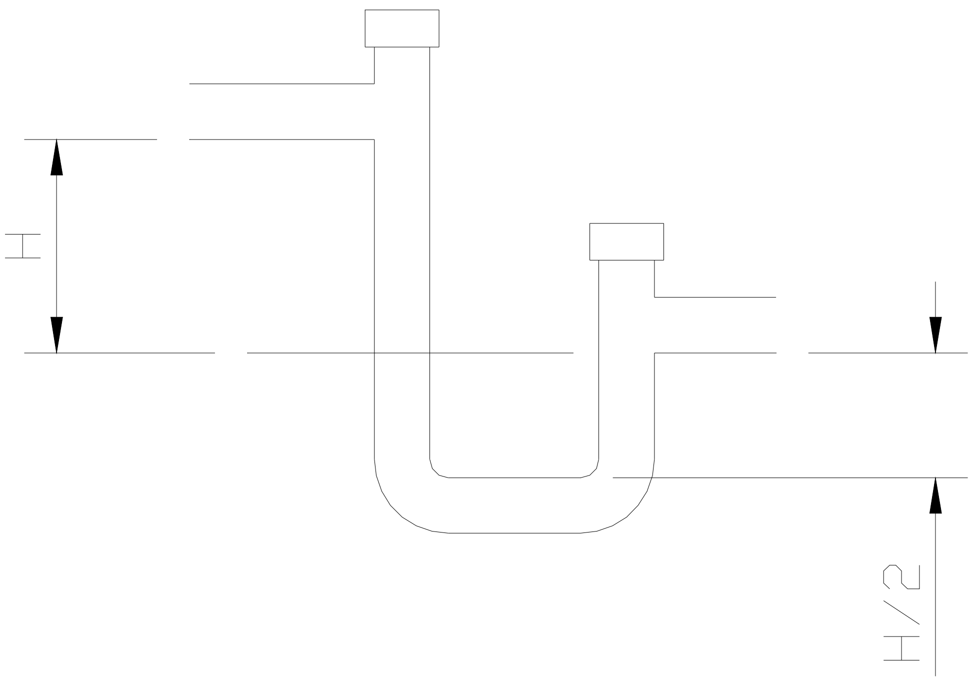


Figure 5. Trap dimensions

The minimum value for H should be 40mm which represents an equivalent water column height of 400Pa.

Traps should be regularly inspected, particularly after periods of inoperation, to ensure that they are not dry.

Immediately downstream of the drain trap there should be an air break to prevent any back pressure. From this point the drain piping should either slope to waste or a condense pump should be included. As the drain piping contains cool condense it should be insulated to prevent sweating.

4.6 Ductwork connections

DERV(DX) units are complete with four rectangular spigots; two for the supply air and two for the extract air. The spigots are sized to give a resultant velocity which is sufficiently low as to allow air distribution through ducting or direct to diffusers without transformation of the duct size.

The ducting can be transformed to a smaller size after the outlet spigot and can be transformed to circular ducting if this is preferred. A single DERV(DX) unit can be arranged to take its extract air from one or more sources and its supply ducting can be arranged to supply one or a number of different areas. Extract and supply grilles and diffusers should be used in line with good air distribution practice.

Duct sizes should be selected to maintain an air velocity of less than 5m/s in all main ducts and branches. This will not only minimize the external static pressure that the unit is operating against but will also eliminate any noise problems. If the ducting runs through areas subject to high humidity then the ducting should be lagged to prevent moisture formation, this is particularly important for the supply ducting from the DERV(DX) unit which will be carrying cool air at around 20℃. Supply diffusers should be fitted with plenum boxes to reduce the velocity of the air before introducing it to the occupied space.

If designing against a maximum duct velocity of 5m/s than a good approximation to the pressure drop associated with the straight ducting is 2Pa/m. Fittings, branches, bends and grilles offer additional dynamic resistances due to momentum changes of the air flow. A reasonable approximation is to sum the number of the above fitting losses and allow 5 Pa for each. The above will allow duct sizes to be reasonably approximated but the final design should be undertaken by a designer/installer qualified in duct design and space air diffusion.

It is recommended that manually operated butterfly dampers are incorporated in the final branch of all duct connections. This will simplify the commissioning process and provide the facility for accurately setting the airflows to and from each zone. Without the use of dampers the air volumes from each zone will only vary with the length and diameter of the ducting runs.

5 Operation

DERV(DX) units are supplied with a speed controller, on/off switch and the possibility to incorporate remote contacts to switch the units on and off. The above controls vary the throughput of air by varying the power supply to the fans. The units incorporate two-off fans; one for the supply air and one for the extract air (375 and 500 units have two pairs of fans). In addition, DERVDX units are supplied with a matching condensing unit and are interconnected via two wire control of the compressor relay.

For DERVDX units with crankcase heaters it is not recommended that the units are turned off by disconnecting the mains. On/off control should be via the controller and remote contacts.

The units will have been selected to provide a particular supply and extract air volume; these will be equal for a balanced ventilation application. If the area is to be pressurized then the supply air volume will be higher than the extract and vice versa if the space is to be kept under negative pressure.

The respective air volumes must be set by both adjusting the fan speed on the controller located in the unit electrical box and manual adjustment of damper blades in the ducting. The speed of the fans can be adjusted between speeds 1, 2 and 3 and the power supplied to the fan motors is then controlled by the phase angle controller which varies the RMS value of the voltage. This controller provides the same voltage to both supply and extract fans so the speed selection switch should be used to achieve just in excess of the required air volume through the least favoured leg of ducting. Accurate balancing of the air distribution system should then be carried out by adjustment of the dampers.

The units can be put into operation by simply switching the on/off switch in the control box but under normal circumstances this would be inaccessible to users. More obvious control possibilities are to break the supply to the units via a switched fuse spur box or to take advantage of the remote contacts provided. These contacts are discussed in the installation section and allow on/off control of the units via switched contacts (manual switching or via relay). If the units are to be controlled from a central system or BEMS then the requirement for ventilation should be sensed via occupancy or carbon dioxide sensors.

DERVDX units have their outdoor units controlled by a temperature sensor connected to the indoor unit controller; when the sensed temperature drops below the set point the compressor is switched off as no further cooling of the ventilation air is required.

DERV units require a supply of chilled water to achieve the necessary dehumidification of the ventilation air. The correct flowrate and flow temperature will be documented with the quotation documents for the project. If these are unavailable then the values given in the technical data table can be used. To ensure that the chilled water arrives at the cooling coil connections ensure that all isolating valves are open and that the coil has been properly vented through the vent plug provided. The pump system for the DERV units should be sized against the total flowrate for the units and the waterside resistance figures with due consideration given to additional losses associated with pipework, fittings and other flow regulating valves. All valving and control of the chilled water flow is by others but it is recommended that the flow of chilled water bypasses the DERV unit when the outside temperature drops considerably below the space temperature.

Under normal operating conditions the DERV(DX) units will generate considerable amounts of condensed moisture. This must be adequately trapped and run to waste as described in the installation section above.

6 Maintenance

It is suggested that the DERV(DX) units should be maintained on a monthly basis so as to ensure continued correct operation. The maintenance routine should involve the following:

Filter cleaning: The indoor units incorporate two filters; one on the extract air side and one on the supply air side. Access is provided for filter withdrawal from the sides of the unit via the slimmer removable panels on either side of the unit, held in place by wing nuts (see diagram above). After removing the panel the filters can be slid out of the unit and cleaned using a vacuum hose or pressure line. During cleaning the air should be drawn/blown through the filter in the opposite direction to the operating airflow.

Airflow check: A check should be made to ensure that both the supply and extract fans are operating. This can usually be ascertained by placing a hand over the supply/extract grilles within the space. If there is no airflow through either the supply or the extract system then a further investigation should be made. The fans and their associated wiring are accessible from either side of the unit via the larger access panels which are released by unscrewing the wing nuts. Any electrical servicing must be undertaken by qualified personnel after electrically isolating the unit.

Drain trap check: Drain trap(s) should be regularly checked to ensure that they are not dry and that there is a liquid seal.

Indoor unit coil cleaning: The coil fin blocks should be regularly checked and cleaned with a soft brush, vacuum or pressure hose to clear any debris from the surfaces. This will involve removal of access panels and in some instances removal of the ducting attached to the spigots of the DERV unit.

Indoor unit general cleaning: The outer casing of the DERV(DX) unit is finished in corrosion resistant epoxy paint and can be wiped down with a wet cloth or with dilute cleaning agents.

DERVDX units are supplied with matching condenser units. The outer casing of the units should be kept clean with a proprietary cleaner, the blades of the axial fan and the condenser coil should also be regularly inspected/cleaned to ensure continued efficient performance.

If the condenser coil in the outdoor unit becomes contaminated by dirt, dust etc. then the system performance will be reduced as the airflow is throttled; this leads to high operating pressures. Before cleaning the condenser coil the power to the unit must be cut-off, material blocking the coil can then be removed, manually, using compressed air or a water spray. If a spray is used it must be directed from the inside of the casing to the outside in the opposite direction to normal airflow. Ensure that the condensing unit is clean and dry before reconnecting the power, the unit should then be left for several hours before switching on via the controller or remote contacts.

7 Fault finding

The tables below details faults that may occur, their cause and means of rectification

Fault	Cause	Remedy
One fan does not run	Motor failure	Replace faulty fan/motor assemby
	Loose wire	Check integrity of wiring on fan terminal
	Capacitor burn-out	Look for signs of damage and replace capacitor
Both fans do not run	Unit switched off	Switch on at unit or remote switch
	Unit held off by remote contact/switch	Check power at terminals and remote contact signals
	Power failure	Check power supply to unit
	Fuse blown	Replace fuse
	Loose wire	Check and tighten
Low airflow	Dirty filter	Remove and clean
	Low speed selected	Increase speed setting
	Ducting blocked	Check dampers, grilles etc
High airflow	High speed selected	Reduce speed setting
	Unbalanced ducting	Check damper positions
High supply air temperature	No chilled water available	Check chilled water supply
	Chilled water flowrate too low	Check position of valves and pump operation
	Chilled water temperature too high	Check chiller operation or temperature of chilled water supply
	Air trapped in coil	Vent coil
Humid supply air	No chilled water available	Check chilled water supply
	Chilled water flowrate too low	Check position of valves and pump operation
	Chilled water temperature too high	Check chiller operation or temperature of chilled water supply
	Air trapped in coil	Vent coil
Moisture in supply airstream	No drain trap fitted	Fit drain trap
	Drain trap dry	Prime trap
	Drain trap too small	Increase trap height
No moisture from unit	No drain trap fitted	Fit drain trap
	Drain trap dry	Prime trap
	Drain trap too small	Increase trap height
Ductwork sweating	Humid environment	Insulate ducting
Pipework sweating	Uninsulated piping	Insulate all piping

Table 4. Fault finding DERV units

Fault	Cause	Remedy
One indoor unit fan does not run	Motor failure	Replace faulty fan/motor assemby
	Loose wire	Check integrity of wiring on fan terminal
	Capacitor burn-out	Look for signs of damage and replace capacitor
Both indoor unit fans do not run	Unit switched off	Switch on at unit or remote switch
	Unit held off by remote contact/switch	Check power at terminals and remote contact signals
	Power failure	Check power supply to unit
	Fuse blown	Replace fuse
	Loose wire	Check and tighten
Low indoor unit airflow	Dirty filter	Remove and clean
	Low speed selected	Increase speed setting
	Ducting blocked	Check dampers, grilles etc
High indoor unit airflow	High speed selected	Reduce speed setting
	Unbalanced ducting	Check damper positions
Insufficient cooling	No chilled water available	Check chilled water supply
	Chilled water flowrate too low	Check position of valves and pump operation
	Chilled water temperature too high	Check chiller operation or temperature of chilled water supply
	Air trapped in coil	Vent coil
Moisture in supply airstream	No drain trap fitted	Fit drain trap
	Drain trap dry	Prime trap
	Drain trap too small	Increase trap height
No moisture from unit	No drain trap fitted	Fit drain trap
	Drain trap dry	Prime trap
	Drain trap too small	Increase trap height
Ductwork sweating	Humid environment	Insulate ducting
Pipework sweating	Uninsulated piping	Insulate all piping
Outdoor unit does not run	Loose connection	Check terminal wiring
	Thermostat not calling	Check temperature setting
	Defective contactor	Check voltage at contactor coil
	High pressure trip	Reset
Outdoor fan runs, compressor doesn't	Start capacitor/relay defective	Replace

	Loose connection	Check compressor wiring
	Compressor jammed or motor winding open	Wait for overload to reset (2 hours). Replace compressor if necessary.
Compressor short cycles	Incorrect voltage	Must be within 10% of nameplate
	Defective overload protector	Replace
High head pressure, low vapour pressure	Restriction in liquid line, expansion device or filter drier	Remove or replace
High head pressure, normal vapour pressure	Dirty outdoor coil	Clean coil
	Refrigerant overcharge	Correct system charge
	Outdoor fan not running	Repair or replace
	Air in system	Recover, evacuate and recharge
Low head pressure, high vapour pressure	Defective compressor valves	Replace
Low vapour pressure, cold compressor & indoor coil	Low indoor unit airflow	Increase speed of indoor blowers or reduce restriction
High vapour pressure	Excessive load	Check load calculations
	Defective compressor	Replace
Pulsing at expansion device	Air in system	Recover, evacuate and recharge
Fluctuating pressures	Air in system	Recover, evacuate and recharge

Table 5. Fault finding DERVDX units

8 Spares

Spare filters, fans, coils and other components are available for DERV(DX) units. These can be ordered with the units or subsequently. Please contact the local SPC office for details.

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