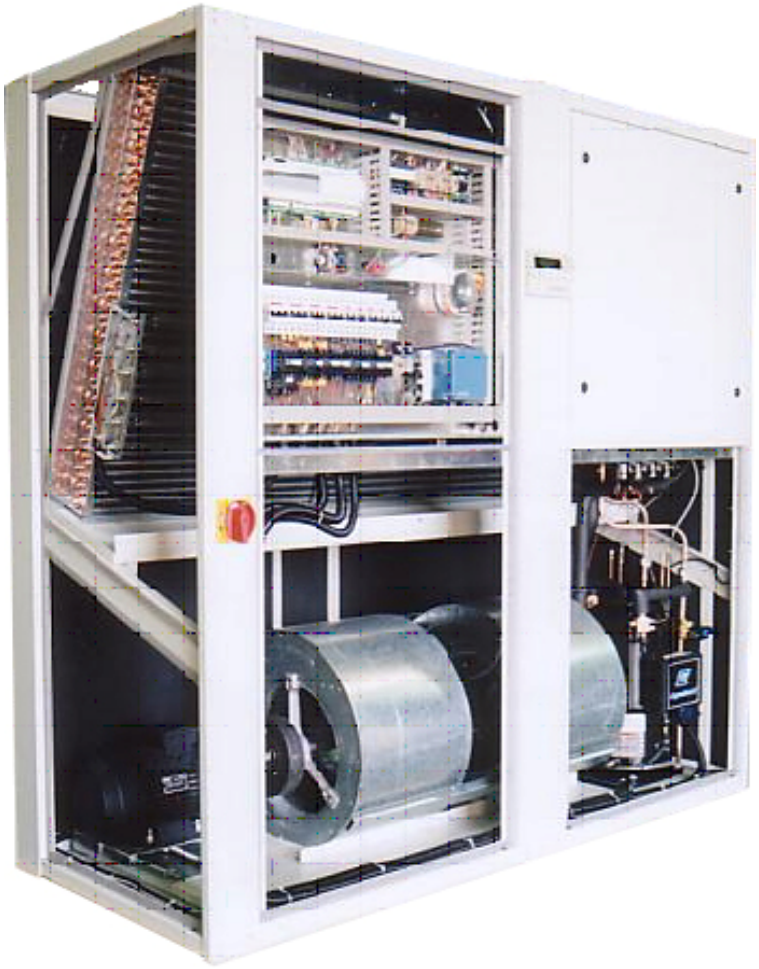
EDPAC®

Close Control Twin Circuit Air Cooled Range



Air Cooled Units
Installation, Operation & Maintenance Manual
50Hz/60Hz

Index

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INSTALLATION

GENERAL

INSPECTION

On receiving the equipment it should be checked to ensure that it is complete and in perfect condition. The carrier should be notified immediately, in writing, of any damage that might have been caused in transit.

HANDLING

Always keep the unit vertically upright and do not leave it out in the open. The unit can be moved with a pallet truck. If a forklift is being used ensure the forks extend beyond the pallet. Care should be taken not to damage the bottom of the unit. If a crane is being used to move the unit leave the packaging intact and place spreader bars across the top of the unit to prevent the slings causing damage. The unit should be moved as near as possible to the installation position before removing the cardboard packing and the pallet.

UNPACKING THE UNIT

1) Cut the three straps binding the unit taking care to avoid any backlash caused by their tightness.
2) Remove the lid.
3) The cardboard sleeve will then unravel itself revealing a plastic dust cover.
4) Remove dust cover. If it is a downflow model, to remove the front panels use the key attached to the sensor on the top of the unit.
5) Remove the two bolts securing the unit to the skid (19 mm spanner).
6) Manoeuvre the unit carefully from the pallet. If it is necessary, use rollers underneath the unit to locate it in its final position.
7) If the unit requires a plenum fix same before final positioning.
8) Ensure the unit is positioned on a level floor.

POSITIONING

The Twin Circuit Air Cooled Range is built on a level base and its positioning is most important. The unit should be firmly supported on the floor itself or on an optional floorstand.
Ensure that the unit is level in all directions as failure to do so will result in operational problems, particularly with regards to drainage. Care should be taken in manoeuvring the unit as the paintwork could be damaged. Use rollers where possible and apply pressure to the bottom of the unit for final positioning. Before final positioning ensure that inaccessible panels are correctly fitted and plenums are secured.

ATTACHING THE PLENUM

The plenum and unit are pre-drilled. At the time of installation remove the grilles from the plenum and secure the plenum internally by means of self tapping screws provided. Also secure to the back of the unit.

AIR COOLED CONDENSERS

Locate these as close to their final position as possible before uncrating. A full set of assembly instructions are attached to the unit. Headers and return bends are not to be used in the moving of the condenser.
When locating the condenser ensure that it is in an open area with unrestricted airflow shaded from direct sunlight.
Install in an environment free of debris to avoid the fins becoming blocked.
Ensure that some form of vibration elimination is installed between the condenser legs and the roof of the building.
Condensers are not to be ducted on either side.
Where noise is critical in relation to the condenser make ensure that this is clearly specified at the time of order.

SERVICE ACCESS

Downflow Units

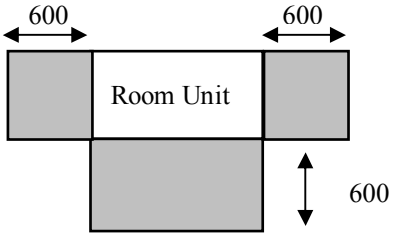
Service of a downflow unit can be generally completed from the front of the unit. To remove certain components from the unit it may be easier and quicker to have side access to assist in these operations.
When positioned there should be a minimum clearance in front of the unit of 0.6m. If it is feasible, leave a distance of 0.6m at the side of the unit. Access to the back of the unit is not necessary. It it strongly recommended to leave a distance of 0.6m at both sides of the unit. There is a minimum distance of 150mm needed above the unit to allow removal of the filters.

Upflow Units
Unlike the downflow, side access is necessary for servicing the upflow. When installing ensure the left-hand side of the unit has access for the purpose of servicing, especially the motor. On the small frame the motor is actually mounted 'piggy-back' on the blower and on the mid and large frame the motor is located on the left-hand side of the blower
On the Twin Circuit upflow units the fan motor arrangement is such that access is required at either end of the unit. The master's motor is located to the left of the blower as standard while the slave's motor is configured to the right handside of the blower. Access to the back of the unit is not required. It it strongly recommended to leave a distance of 0.6m at both sides of the unit. The filters are located in the bottom front panel; a minimum distance of 1m is needed to allow the return air to enter the unit.
Space above the unit will be determined by location. If a standard plenum is being installed the overall height of the unit is extended to 2380mm.

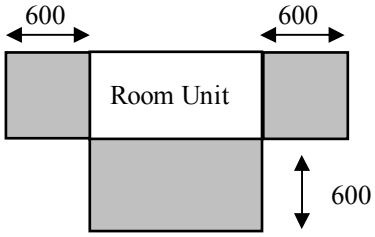
MECHANICAL INSTALLATION

SYSTEM APPLICATION

To achieve maximum performance and efficient energy usage following considerations should be given.
1) The room should be sealed effectively against air and vapour to minimise the loss and infiltration of uncontrolled humidity through concrete slab, walls, ceiling, roof, doors or any other opening or aperture.
2) Room location and orientation should be considered with regard to heat load and external variables should be reduced



Upflow Twin Circuit Unit Service Access



Downflow Twin Circuit Unit Service Access

to a minimum.
3) The room should be kept at a positive pressure by introduction of pre-treated fresh air.
4) Low resistance to conditioned air distribution can be achieved by providing the maximum raised flooring height, minimum cable bunching and correct position of pipework (i.e. parallel to air flow).
5) Pipework that is not isolated or is fastened inadequately can transmit vibration along its full length.

GENERAL PIPING PRACTICES

Refrigerant connections must be made between the indoor unit and the air cooled condenser, i.e. liquid and discharge.
The indoor units are delivered with a holding pressure of 75 p.s.i. /5.4 bar. Discharge this pressure before commencing work on the unit. All pipework should adhere to national and local codes. Extreme care should be taken to keep tubing clean and dry prior to and during installation particular attention should be paid to the following points:

- Use only refrigeration quality copper tubing properly sealed against contamination, and always cap the free end of the tubing while carrying out installation.
- Do not leave compressors or filter driers open to atmosphere any longer than is necessary.
- When brazing refrigerant lines, an inert gas should be passed through the line at low pressure to prevent scaling and oxidisation inside the tubing. Dry nitrogen is preferred.
- Use only copper phosphorous brazing alloys containing at least 5% silver on copper to copper pipe joints. Where one component is other than copper, i.e. brass use a silver solder.

AIR COOLED CONDENSER INSTALLATION

The air cooled condenser should be installed on a level base. For roof installations, condensers should be mounted on steel supports.
For ground installations, a level concrete base is sufficient to provide adequate support. The condenser mounting legs have mounting holes for securing the condenser.
Care should be exercised to provide a minimum clearance of 900mm from the nearest obstruction to the coil face and fan. In addition the air inlet should face towards the prevailing winds.

AIR COOLED CONDENSER ELECTRICAL CONNECTIONS

In most cases the condenser power is fed from the indoor unit. Please check the unit electrical drawing. If this is not the case a separate electrical supply is required for the condensers. This power supply can either be single phase or three phase depending on the fans supplied. A low voltage control interlock between the indoor unit and the air cooled condenser is required. This interlock is connected between terminals 27 & 28 located within the indoor unit electric panel and in the control package electric box of the air cooled condenser.

REFRIGERANT PIPING (Air Cooled Units)

As a general principle the refrigerant piping and associated components should be considered, selected and installed to ensure:

1) There is an adequate supply of liquid refrigerant to evaporator/s and an unrestricted return of the resulting vapour to the compressor.
2) A positive and continuous return of carry-over oil back to the compressor crankcase.
3) A minimum pressure drop to avoid unnecessary reduction in system capacity and overall efficiency.
4) Liquid refrigerant is prevented from entering the compressor during either running or idle time.
5) There is no possibility of oil binding or logging in sections of the discharge and suction line.

LIQUID LINE

The liquid line delivers a stream of liquid refrigerant to the control valve at a sufficiently high pressure to permit the control device (i.e. Thermal Expansion Valve) to operate with its intended efficiency. Since the refrigerant leaves the condenser under the influence of condensing pressure any carry-over oil that is present will also be carried along so that it passes through the control device and into the evaporator. However, excessive pressure drop should not be overlooked. This can cause the liquid refrigerant to flash or boil off before it reaches the Thermal Expansion Valve. Flash gas (as this condition is called) in the liquid line will have several undesirable effects on plant performance including reduction of the capacity of the flow control device and consequent reduction of system capacity. Also, because of intermittent flow between liquid and liquid rich vapour, erratic operation of the valve will occur and the needle & seat will eventually erode and not able to seal properly when in the closed position. This allows the evaporator to become flooded during idle periods and increases the risk of liquid refrigerant entering the compressor at start-up.
Since the liquid leaving the condenser will normally be sub-cooled by about 5° C, liquid flashing would not normally occur unless the overall pressure drop across this part of the system exceeded around 40 kPa(5-6 psi), provided there is no extra heat picked up by the liquid line from some other external source. If the pressure drop is allowed to become greater than the value above, or if the temperature becomes higher than its sub-cooled temperature, then some flashing will occur due to the pressure on the liquid through the last part of the liquid line is below the pressure corresponding to its saturation temperature.

The same situation can also occur at times of low ambient/low condensing pressure, particularly if the condenser is oversized (which automatically happens with improper or insufficient fan cycling control on the condensers) or the liquid line picks up excessive heat from passing through a warm area. It should be noted that liquid line pressure drop is the sum of liquid flow resistance (frictional loss) from the tubing and all intermediate fittings (including the drier) plus loss of head pressure that may result due to vertical lift or elevation above the condenser which is a direct ratio of the refrigerant weight. At average liquid temperature of around 38°C the static pressure loss applied to elevation is approximately equal to 11.2 kPa (1.6 psi) per metre of lift for R407C. This must be considered when designing the system.

Recommended Liquid Line Sizes - O.D. Copper						
Model	kW	10m	15m	20m	25m	30m
30	15	1/2”	1/2”	5/8”	5/8”	5/8’’
40	20	1/2”	5/8”	5/8”	5/8”	5/8’’
50	25	1/2”	5/8”	5/8”	5/8”	5/8”
60	30	5/8’’	5/8”	5/8’’	3/4’’	7/8”
70	35	5/8’’	5/8”	3/4”	7/8’’	7/8”
80	40	5/8’’	3/4”	3/4”	7/8”	7/8”
100	50	3/4”	7/8”	7/8”	7/8”	7/8”

Capacities for the various sizes of liquid lines are included in the Pipe Size Table. The table indicates the unit type and the refrigerant circuit size in the unit. There are two refrigerant circuits per unit It should be remembered that all on-site aspects are to be taken into account in final piping selection. The fitting of a pressure relief valve & liquid receiver near the condenser is required for correct unit operation..

DISCHARGE (HOT GAS) PIPING

Discharge piping is sized to maintain minimum velocities to ensure oil entrainment and acceptable pressure drop. Pipework should be sized to give a pressure drop which should not exceed 6 psi and to maintain velocities of not less than 2.54m/s in horizontal runs and down runs and not less than 5.1m/s in vertical risers.

Recommended Discharge Line Sizes - O.D. Copper						
Model	kW	10m	15m	20m	25m	30m
30	15	7/8’’	7/8”	7/8”	7/8”	7/8”
40	20	7/8”	7/8”	7/8”	7/8”	1-1/8”
50	25	7/8”	7/8”	7/8”	1-1/8”	1-1/8”
60	30	7/8”	1-1/8’’	1-1/8”	1-1/8”	1-1/8”
70	35	7/8”	1-1/8”	1-1/8”	1-1/8”	1-1/8”
80	40	1-1/8”	1-1/8”	1-1/8”	1-1/8”	1-1/8”
100	50	1-1/8”	1-1/8”	1-3/8”	1-3/8”	1-3/8”

Linear lengths, including any vertical runs should be kept to a minimum and should not normally exceed 45 metres. Vertical risers should be fitted with oil traps at every 5 metres rise. When running liquid and discharge lines together, they should be separated by at least 50 mm and on horizontal runs, the discharge line should be located above the liquid line.

EVACUATION AND LEAK TESTING

After completion of pipework and leak testing, evacuation of the system is next. For satisfactory operation, the system must be leak tight, dry and free of non-condensable gases. The process for leak check and system evacuation are as follows:

1) Connect gauges to the compressor service valve ports.
2) Pressurise the system with R407C refrigerant vapour until the system and the refrigerant drum have equalised. Carry out a preliminary leak test and repair any leaks found. Using dry nitrogen increase the system pressure to 350 p.s.i. Check system for leaks. If any are found release pressure and repair. When the system is leak free release the charge. Always discharge Freon into appropriate vessels or reclaim units. Do not release Freon into the atmosphere.
3) Using a suitable vacuum pump, pull a vacuum on the system to about 20 mbar. If the moisture indicator is reluctant to show “dry” break the vacuum with a dry gas such as nitrogen and repeat the process.
4) Close manifold valves and switch off the vacuum pump.

CHARGING THE SYSTEM (FULL CHARGE)

Use only R407C Refrigerant unless otherwise stated. Isolate the system from the vacuum pump and purge connection lines to prevent air from entering the system. Open the service valves to allow refrigerant to flow into the evacuated system.

Charge system with liquid through the high side only. To allow for correct charging use the tables below. It maybe necessary to complete the charging of the unit when the compressor is running by observing the sight glass, pressures and amperage. Then pipe runs exceed 20m add refrigerant oils for tube wetting and oil level in the compressor. For each 3m of pipework over 20m add 90ml of oil and 40ml per kg of refrigerant.

System Charges			
Indoor Unit		Outdoor Unit	
Model	Charge (kg)	Model	Charge (kg)
DTA/FTA 30	1.9	AGS 401	1.4
DTA/FTA 40	3.0	AGS 402	1.8
DTA/FTA 50	3.2	AGS 403	2.4
DTA/FTA 60	4.2	AGS 501	2.9
DTA/FTA 70	4.4	AGS 502	4.5
DTA/FTA 80	4.6	AGS 503	4.8
DTA/FTA100	4.8	AGS 504	5.4
		AGS 634	5.7

Approximate operating charge per 30m length		
Copper Tube O.D. (in)	Liquid Line (kg)	Discharge Line (kg)
1/2”	3.28	.13
5/8”	5.22	.22
3/4”	7.87	.32
7/8”	10.89	.45
1-1/8”	18.58	.78
1-3/8”	23.30	1.19

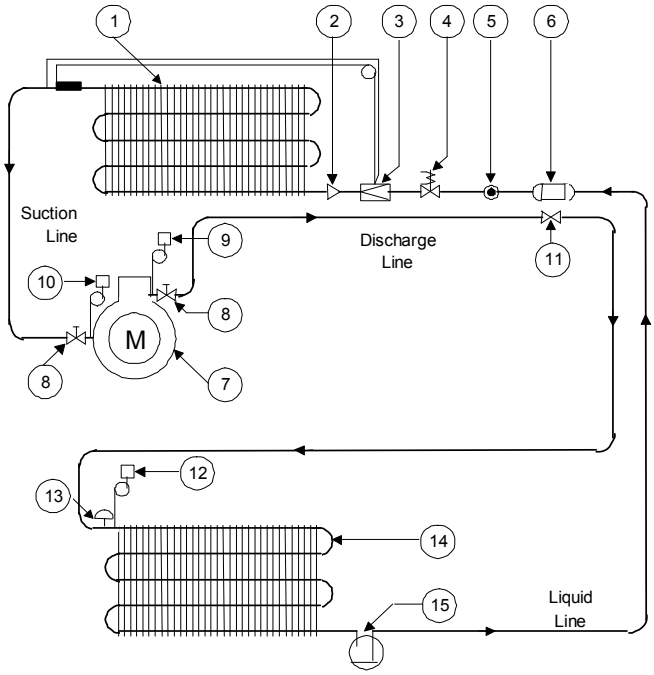
Notes:
1. The indoor unit system change is per circuit.
2. The outdoor unit system change is per condenser. If you have a split circuit condenser, use half the tabulated changer per circuit.

GENERAL ARRANGEMENT DRAWING

SYSTEM COMPONENTS

1) Evaporator Coil.
2) Liquid Distributor.
3) Thermostatic Expansion Valve (externally equalised).
4) Liquid Line Solenoid Valve (optional).
5) Liquid Sight Glass (include. moisture indicator).
6) Filter Drier
7) Hermetic Compressor.
8) Compressor Service Valves.
9) High Pressure Switch (man. reset).
10) Low Pressure Switch (auto. reset).
11) Check Valve (See Note).
12) Fan speed Controller (pressure operated head pressure control).
13) Pressure relief Valve (See Note).
14) Air Cooled Condenser.
15) Liquid Receiver (See Note).

Note: Items 11, 13 and 15 are field fitted by others.



SETTING THE THERMOSTATIC EXPANSION VALVE

The thermostatic expansion valve is factory-set but if for some reason, the superheat needs to be adjusted, use the following procedure.

1) Have the unit running as near as possible to design conditions. The compressor should be running for a period of at least 30 mins. before any adjustment should be undertaken.
2) Measure the superheat as follows:
   a) Measure temperature at the point where the expansion valve sensing bulb is located. A contact thermometer can be used for this purpose.
   b) Obtain suction pressure at the compressor suction rotolock valve and convert by use of a temp/press chart.
   c) The superheat value is the difference between the two readings.
3) The superheat value must be 7 - 8^{o}C; if not, set the expansion valve as follows:
   a) Remove the protective cover.
   b) As the thermostatic exp. valve is a finely balanced regulator it is strongly advised that the stem is adjusted only half a turn at a time.
   c) Wait for 30 mins.
   d) Measure the superheat again and repeat the operation, if necessary. To **reduce** the superheat adjust stem **anti-clockwise**. To **increase** the superheat adjust stem **clockwise.**

WATER AND DRAIN CONNECTIONS

ELECTRODE BOILER STEAM HUMIDIFIER

Water is fed from the mains supply to the humidifier inlet solenoid valve. The connection to the solenoid valve is a 3/4" male connection. The feed water characteristics should comply with the following values:

Characteristic	Minimum	Maximum
Feed Water Pressure	1 bar	10 bar
Electric Conductivity at 25°C	400 µS/cm	800 µS/cm
Impurity Size	-	0.1 mm
Feed Water Hardness – French Degrees	15	30

In the case of high water pressure, a pressure reducing valve calibrated to between 3 - 4 bar should be fitted. Inlet water temperature must not exceed 50°C. It is recommended to install a shut-off valve and a mechanical filter with the wire mesh size less than 50µm. The humidifier pan drain connection is a 22 mm female connection. The humidifier drain can be discharged into the standard drainage system via a rubber or plastic hose suitable for temperatures up to 100°C. The hose should have a minimum internal diameter of 22mm. A trap or vertical loop should be fitted in the tubing to prevent blow back or odours and ensure that the drain has a fall of not less than 1:50.
Note: Do not feed demineralised water into the humidifier.

CONDENSATE DRAIN

Install a drain pipe from the base of the drainpan (typically a 1" female B.S.P. fitting). Insulating this drain pipe is not necessary. It is advised to fit a trap in this drainpipe. Copper pipe should be used for drains on units with humidifiers.
If the system is equipped with a condensate pump, install a check valve on the discharge line of the pump to prevent backfilling the pump reservoir.

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GENERAL ENGINEERING DETAILS

Downflow or Upflow Unit								
Unit Size		**30**	**40**	**50**	**60**	**70**	**80**	**100**
Coil Data								
Coil Face Area - DX type	m^2	1.5	1.5	1.8	1.8	2.4	2.4	2.8
Circuit Quantity	No.	2	2	2	2	2	2	2
Rows	-	4	4	4	4	4	4	4
Coil Drain Connection BSPF	inch	¾	¾	¾	¾	¾	¾	¾
Air Side Data								
Air Volume	m^3/hr	8250	11000	13750	15500	18000	20500	25000
External Static Pressure ESP	Pa	75	75	75	75	75	75	75
Standard FC Centrifugal Fan								
Quantity	-	1	1	2	2	2	2	2
Fan Motor	kW	1.5	2.2	4.0	5.5	4.0	5.5	7.5
Motor Quantity	-	1	1	1	1	1	1	1
Optional EC Plug Fan								
Quantity		1	1	2	2	2	2	3
Fan Diameter		500	560	500	500	500	560	500
Fan Motor	kW	2.7	3.1	2.7	2.7	2.7	3.1	2.7
Fan Absorbed Power	kW	1.5	2.1	2.2	2.8	3.8	4.0	3.8
Filter Data								
Downflow Filter Size Code	-	1	1	2	2	3	3	4
Downflow Filter Quantity	No.	6	6	6	6	8	8	8
Upflow Filter Size Code	-	1	1	2	2	3	3	4
Upflow Filter Quantity	No.	4	4	4	4	4	4	8
Humidifier Data								
Inlet Connection BSPM	inch	1	1	1	1	1	1	1
Drain Connection BSPF	inch	1	1	1	1	1	1	1
Water Feed Pressure	Bar	1-10	1-10	1-10	1-10	1-10	1-10	1-10
French Degrees Water Hardness	-	15-30	15-30	15-30	15-30	15-30	15-30	15-30
Noise Data								
Freefield SPL	dBA	53	52	58	59	57	59	59
Compressor Data								
Scroll Compressor – 50Hz	-	ZR72	ZR94	ZR108	ZR144	ZR160	ZR190	ZR250
Compressor Quantity	No.	2	2	2	2	2	2	2
Scroll Compressor – 60Hz	-	ZR61	ZR81	ZR94	ZR108	ZR144	ZR160	ZR190
Compressor Quantity	No.	2	2	2	2	2	2	2
Piping Data								
Discharge Connection Size	mm	16	22	22	22	22	28	28
Liquid Connection Size	mm	12	12	16	16	16	16	16
Condenser Connections Inlet/Outlet 30°C	mm	22/18	28/22	28/22	28/22	28/22	28/22	35/28
Condenser Connections Inlet/Outlet 35°C	mm	22/18	28/22	28/22	28/22	28/22	28/22	35/28
Condenser Connections Inlet/Outlet 40°C	mm	22/20	28/22	28/22	28/22	35/28	35/28	42/35
Condenser Connections Inlet/Outlet 45°C	mm	28/22	28/22	35/28	35/28	42/35	42/35	54/42
Dual Cool Chilled Water Data								
Coil Face Area	m^2	1.5	1.5	1.8	1.8	2.4	2.4	2.8
Chilled Water F&R Pipe Size	mm	54	54	54	54	54	54	54
Control Valve Size	mm	40	40	40	40	40	40	40
Control Valve Kv	-	25	25	25	25	25	25	25

Notes:

1. Indoor unit Freefield SPL dBA levels are measured at 3m.
2. Downflow Filter Size Code: 1 = 495mm x 545mm, 2 = 545mm x 622mm, 3 = 545mm x 595mm.
3. Upflow Filter Size Code: 1 = 445mm x 622mm, 2 = 545mm x 622mm, 3 = 545mm x 895mm.
4. All filters are 100mm thick and have an efficiency rating of G4 in accordance with EU Standard EN779.
5. Water feed electrical conductivity for the humidifier should be in the range of 400 - 800 microsiemens.

6. For correct installation pipe sizes refer to Refrigerant pipe sizing tables.

ELECTRICAL CONNECTIONS

A correct electrical connection carried out accurately and in compliance with local regulations, is extremely important in order to prevent accidents and ensure long troublefree operation of the equipment.

Before working on the electric parts of the unit, ensure that the power is off and that the main power disconnect switch on the front pillar is open. The first step is to ensure that the supply voltage corresponds to the nominal data o the unit (voltage, phase, frequency) shown on the unit nameplate. The location of the unit nameplate is above the electric panel on the Downflow Units and the fan blower housing on the Upflow Units.

The electrical supply cable is passed through the knockout provided in the unit base or alternatively through one of the other knockouts provided on the unit panels. The cable should be properly glanded at this point and the flying leads run to the main power disconnect switch. Fix the ends of the supply cable to the switch terminals and tighten the terminal screws.

The following charts outline the main electrical loadings for each model to be used when calculating the unit full load amps (FLA). The following values indicated are at various nominal supply characteristic of 400V/3Ph/50Hz, 220V/3Ph/60Hz, 380v/3Ph/60Hz, 460V/3Ph/60Hz

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ELECTRICAL DETAILS

	30	40	50	60	70	80	100
400V/3PH/50Hz							
Fans FLA	3.6	4.9	8.3	11.0	8.3	11.0	14.3
Reheat FLA	21.7	21.7	21.7	21.7	35.9	35.9	35.9
Humidifier FLA	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Scroll Compressor FLA	8.3	12.0	12.9	16.3	19.0	24.9	27.7
Condenser FLA @ 30°C	2.4	3.6	3.0	6.0	6.0	6.0	9.0
Condenser FLA @ 35°C	2.4	3.6	3.6	6.0	6.0	6.0	9.0
Condenser FLA @ 40°C	3.0	6.0	6.0	6.0	9.0	9.0	12.0
Condenser FLA @ 45°C	6.0	6.0	9.0	9.0	12.0	12.0	10.0
220V/3PH/60Hz							
Fans FLA	6.6	8.9	15.1	20.0	15.1	20.0	26.0
Reheat FLA	39.5	39.5	39.5	39.5	65.3	65.3	65.3
Humidifier FLA	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Scroll Compressor FLA	14.6	20.2	24.0	25.8	32.6	38.0	49.8
Condenser FLA @ 30°C	2.8	4.2	3.9	7.8	7.8	7.8	11.7
Condenser FLA @ 35°C	2.8	4.2	4.2	7.8	7.8	7.8	11.7
Condenser FLA @ 40°C	3.9	7.8	7.8	7.8	11.7	11.7	15.6
Condenser FLA @ 45°C	7.8	7.8	11.7	11.7	15.6	15.6	16.0
380V/3PH/60Hz							
Fans FLA	3.8	5.2	8.8	11.6	8.8	11.6	15.1
Reheat FLA	22.8	22.8	22.8	22.8	37.8	37.8	37.8
Humidifier FLA	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Scroll Compressor FLA	7.3	10.1	12.0	12.9	16.3	19.0	24.9
Condenser FLA @ 30°C	1.2	1.8	1.6	3.2	3.2	3.2	4.8
Condenser FLA @ 35°C	1.2	1.8	1.6	3.2	3.2	3.2	4.8
Condenser FLA @ 40°C	1.6	3.2	3.2	3.2	4.8	4.8	5.6
Condenser FLA @ 45°C	3.2	3.2	4.8	4.8	5.6	5.6	8.4
460V/3PH/60Hz							
Fans FLA	3.1	4.3	7.2	9.6	7.2	9.6	12.4
Reheat FLA	25.1	25.1	25.1	25.1	41.3	41.3	41.3
Humidifier FLA	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Scroll Compressor FLA	8.8	12.1	14.4	15.5	19.6	22.8	29.9
Condenser FLA @ 30°C	1.6	2.4	1.0	2.0	2.0	2.0	3.0
Condenser FLA @ 35°C	1.6	2.4	2.4	2.0	2.0	2.0	3.0
Condenser FLA @ 40°C	1.0	2.0	2.0	2.0	3.0	3.0	3.0
Condenser FLA @ 45°C	2.0	2.0	3.0	3.0	4.0	4.0	4.0

Notes:

1. FLA = Full Load Amps.
2. Unit maximum FLA is the total of the components, which operate during maximum electrical load conditions. For full function units with humidifier & electric reheat the maximum FLA would be in dehumidification mode ie. cooling + reheat or in cooling and humidification mode ie. cooling + humidifier.
3. In dehumidification mode, calculate the max FLA based on single compressor FLA as only one compressor operates in this mode. Tabulated values for compressors above are for two compressors.
4. In cooling and humidification mode, calculate the max FLA based on dual compressor FLA as both compressors and the humidifier operate in this mode.
5. For 30°C and 35°C ambient (except models 70 and 80 at 35°C ambient), all Air Cooled Condensers have split headers with 2 sets of inlet/outlet connections.

6. For, models 70 and 80 at 35°C ambient and for all models at 40°C and 45°C ambient, 2 no. condensers are required, 1 per refrigerant circuit.

OPERATION

GENERAL

MICROPROCESSOR CONTROLS

All Units shall be fitted as standard with the latest Delta range of DIN rail mounted Microprocessor Controls. The Control System utilises a main Microprocessor Interface Board equipped with a set of terminals necessary to connect the Board to the controlled devices.All software is permanently stored in flash RAM and is therefore protected even in the event of a power failure. Unit software is uploaded to the Microprocessor using a RAM key. On multi unit sites, this quickens unit commissioning. The software can also easily be changed or upgraded on site by qualified service personnel.

Note:

For more detailed information refer to Detailed Controls Manuals.

1) Δ DELTA2 RANGE MICROPROCESSOR CONTROLLER SYSTEM PROGRAMMING MANUAL.

GENERAL SYSTEM OPERATION

Unit operation is completely automatic. The sequence below explains how the unit operates:

- The air, drawn in by the fan(s), enters the unit through top of the unit or the inlet grille.
- The air is immediately filtered.
- The temperature & relative humidity sensor verifies the condition of the inlet air and relays this to the microprocessor controller.
- The controller compares this information to the set point and proportional band values programmed into its memory. it then commands the air conditioner to treat the air as appropriate.

CUSTOMER CONNECTIONS

Power cables to the load break switch should be sized in compliance with local codes (see electrical data for permissible fuse size). Power cables required are 3 phase and a neutral (2.5mm minimum size neutral) and appropriately sized ground. The ground connection is vital. External device power / control connections are as follows:

a) Connections to the condenser
b) Connection to the remote shutdown feature is via terminals 15 & 16. Normally Closed N/C Unit On, Normally Open N/O Unit Off by Remote. A relay is required for this option.
c) Connections for the external alarm relay's are via terminals 18, 19 & 20, (250 VAC rated - 10 Amps). Volt Free Contacts.
d) Externally required A.C. voltage supplies are not to be taken from the unit, interface relays are to be utilised for these applications.

INITIAL START UP

a) On initial start-up, the crankcase heaters must be energised for 3 hours before starting the compressor. Do not engage the `**On/Off'** button on the keypad or run the compressor through the `Service Access' level during this period. The controller will display the following message:

```
SYSTEM BOOT
PLEASE WAIT
```

.

b) After a 5 second delay the controller will display the following:

```
13:58          12/02/97          MOI
 Temperature:   23.4 deg.C
 Humidity:      37.7 RH%
UNIT ON
```

AIRFLOW OPERATION

a) When the electrical power has been energised for at least 3 hours, the unit may be energised by pressing the **"On/Off"** key on the keypad. The fan contactor KM1 will energise establishing airflow.

POWER FAILURE, INTERRUPTION OR SYSTEM RESET

a) Should a `brownout' (where voltage is low enough to cause the electronics to fail) or electrical power failure occur, the controller will be alerted as the voltage begins to drop. It will then de-energise all contactors.
b) During power failure all data entered through the keypad will be held in a memory back-up which is supported by an Eprom. The Eprom will retain data indefinitely without external power.
c) If a unit is in the **"RUN"** mode when a power failure occurs, then, upon power restoration the unit will automatically commence "RUN" operation. The settle timer will count down to zero and at zero the unit will then continue as outlined in the **Airflow, Temperature Control and Humidity Control** sections.

EC FAN OPERATION

GENERAL

The EC plug fan is a backward curved fan with an integrated EC electrically commutated motor which is controlled directly from the microprocessor using a 0-10V output. Options on setup are:

- Strategy 1: Fixed speed
- Strategy 2: Track temperature band
- Strategy 3: Maintain pressure setpoint
- Strategy 4: Control from BMS
- Strategy 5: Maintain airflow setpoint
- Dehumidification control mode

FIXED SPEED

A fixed 0-10V signal is set through the user display to operate the fan at a constant speed.

TRACK TEMPERATURE BAND

The unit is set up to track the heating and cooling bands with set voltage limits. Max voltage / fan air volume is at set point plus control band & min voltage / fan air volume at set point
Max voltage / air volume is typically design air volume and min air volume is typically around 60% for chilled water units. Minimum value needs to insure that there are no hot spots due to lack of airflow and that there is no loss of sensible cooling capacity to latent cooling capacity at the cooling coil.

MAINTAIN PRESSURE SETPOINT

The microprocessor reads the underfloor pressure via a pressure transducer. The fan speed is then controlled to maintain a fixed underfloor pressure at all times. Pressure setpoint and min & max voltages are input through the user display. A reading of the underfloor pressure can also be viewed.

CONTROL FROM BMS

The speed of the fan can be controlled directly from a BMS if one of the optional BMS interface cards are installed in the unit.
The BMS writes a value of between 0 & 100.0% to an analog BMS address. The fan then operates to this speed. Min and max voltage can be input through the user display to insure the fan operates within acceptable limits.

MAINTAIN AIRFLOW SETPOINT

The microprocessor calculates the airflow through the unit with the use of a pressure transducer and a special inlet ring across one of the fans designed for measuring airflow. PID control in then utilized to control the speed of the fans to insure a steady supply air volume. Airflow setpoint and min & max voltages are input through the user display. A reading of the total airflow through the unit can also be viewed.

DEHUMIDIFICATION CONTROL MODE

Unit set up to give a reduced fan air volume in dehumidification mode to conserve energy in dehumidification while quickly achieving the dehumidification effect at the cooling coil. This output voltage is again user selectable.

HEATING OPERATION

GENERAL

This can take one of two forms:

- Electrical heating: The electric elements heat the air passing over them. Heating is supplied by 3 elements configured to support 2 stages of heating. Airflow has to be established before the elements are energised. The heaters are protected by a manual reset thermostats. This thermostat is a capillary type stat positioned across the coil near the elements.
- Hot Water Heating (optional): If hot water is available this flows through the hot water coil thus heating the air passing over it. The hot water flow is controlled by an on-off (2 or 3-way) valve.

ELECTRIC HEATING

CAUTION: When commissioning the heater stage, be aware that the electric heater elements may at first give off smoke and may cause smoke detectors on site to alarm, e.g. Halon System.

When the supply airflow is established, a drop in return air temperature below the return air setpoint (default 22.0 Deg. C) will cause the controller to call for Heating Stage 1. The contactor KM6 will energise.
If the return air temperature falls (default 1.0 Deg. C) below the return air setpoint, the controller will call for Heating Stage 2. The contactor KM7 will energise.
A rise in return air temperature below the return air temperature setpoint will cancel heating stage 2. Contactor KM7 wills de-energise.
As the return air temperature rises still further, Heating Stage 1 will be cancelled above the return air temperature setpoint, contactor KM6 will de-energise.

ELECTRIC HEATER PROTECTION & ALARMS

a) The electric heaters are protected by one high temperature stats (RS1) which is fitted in the heater termination box.
b) RS1 is a capillary type temperature stat. This capillary wrapped around the electric heater elements. If the temperature of the heater elements rises above 145 Deg. C the stat contacts will open and electric heating will be terminated.
c) When the return air temperature drops sufficiently RS1 can be manually reset. Electric heating will continue as normal.

HOT WATER REHEAT

a) Hot Water Heating occurs when the return air temperature falls below the return air temperature setpoint. The solenoid valve or modulating valve will energise.
b) As the return air temperature rises above the return air setpoint the controller will cancel the heating process by de-energising the solenoid valve or modulating valve.

Note: Heating can occur when compressor 1 is operating in the dehumidification mode and the return air temperature is below the return air temperature setpoint by the appropriate amount.

COOLING OPERATION

COOLING FOR AIR COOLED UNITS

A winter start timer is activated when cooling is required. The low pressure switch is by-passed to allow the suction pressure to stabilise at start up. It is preset for 5 minutes. If after the 5 minutes has timed out the low pressure switch has not made, then the display will indicate a "Low Compressor" alarm.

COOLING OPERATION – 1st CIRCUIT

a) Mechanical cooling can only occur when airflow has been established.
b) After the initial switch on period the refrigeration circuit should be in a pumped down status, ready for commencement of cooling stages. Contactor KM3 de-energised.

c) When the return air temperature rises above the return air temperature setpoint, plus control band, the controller will activate the cooling process. The winter start timer (KT1) will by pass the low pressure switch for a set period of time and energise the compressor contactor (KM3).
d) After the time-out period of the timer (KT1-default 3 min.) the evaporator pressure will have stabilised allowing the compressor contactor (KM3) to be fed through the low pressure switch (LP1).
e) When the return air temperature decreases above the return air temperature setpoint the controller will cancel the cooling stage. When the low pressure switch (LP1) opens the compressor will de-energise.

COOLING OPERATION - BOTH CIRCUITS

a) Mechanical cooling can only occur when airflow has been established. After the initial switch on period both refrigeration circuits should be in a finished pumped down status ready for a commencement of cooling. Contactors KM3 & KM4 will be de-energised.
b) When the return air temperature rises above the return air temperature setpoint (default 22.0 Deg. C) the controller will activate one stage of cooling. The refrigeration circuits work on an auto rotating, lead/lag compressor basis.
c) If the return air temperature rises further above the return air temperature setpoint the controller will activate the second stage of cooling.
d) If the return air temperature decreases above the return air temperature setpoint the controller will revert to one stage of cooling.
e) If the return air temperature decreases further above the return air temperature setpoint the controller will cause the unit to stop cooling.

COMPRESSOR PROTECTION

All compressors are protected by low and high pressure switches. When a Cooling Stage is energised, the low pressure switch is ignored by the controller for the first three minutes. After this period the refrigerant evaporator pressure should have stabilised. The high pressure stat HP1 is monitored from commencement of the cooling process. Should a high or low pressure alarm be detected by the controller, the affected cooling stage will be de-energised. The other cooling stage (Duplex/Twin Circuit) will be energised if not already energised.

DEHUMIDIFICATION CONTROL

Dehumidification is provided by the cooling mode of the unit. In air, glycol or water cooled units the compressor provides the dehumidification operation. On chilled water units dehumidification is provided by having the modulating valve fully open. On Duplex/Twin Circuit models dehumidification is handled by the master module.
Dehumidification only takes place when airflow is established.

a) With the airflow established, an increase in return air relative humidity above the return air relative humidity setpoint (default 50.0%) will prompt the controller to call for dehumidification. The winter start timer (KT1) will by-pass the low pressure switch (LP1) for 3 minutes and feed the compressor contactor
b) Should the return air relative humidity drop above the return air relative humidity setpoint, the controller will cancel the dehumidification stage.
c) Heating can only occur when compressor 1 is operating in the dehumidification mode and the return air temperature is below the return air temperature setpoint by the appropriate amount.

DEHUMIDIFICATION OVER-RIDE

a) During dehumidification, should the return air temperature drop below temperature setpoints then the controller will override the call for dehumidification until the heaters cause the return air temperature to be within setpoint tolerances and will then re-energise the dehumidification stage if it is required

HUMIDIFICATION CYCLE

When a call for humidification exists, the microprocessor controller sends a 24V ac signal to the humidifier contactor supplying power to the boiler cylinder electrodes. The electric power dissipated in the boiler is kept constant by measuring the amount of current flow on phase (L3) via a current transformer. As evaporation proceeds, the controller opens the fill valve allowing water to enter the cylinder via a filter and a capacity regulator to the filling cup, and from there, by gravity, to the boiler. When the water level is so high that it touches the electrodes at the top of the boiler, the fill valve is closed and the excess water is drained through overflow tube. The drain valve opens periodically to drain water and reduce salt concentration in the boiler. It is also used to drain the humidifier completely under alarm conditions.

The humidifier interface PCB maintains the electric current dissipated in the boiler at the programmed set point The PCB therefore changes the immersion level of the electrodes by adding or draining water from the boiler through the respective valves. The operating current may be programmed on the front display panel between 30% and 100% of the rated value of the equipment. The functions of the equipment are described below:

FILL VALVE - maintains absorbed current between -10% and +10% of set point (percentages refer to rated current) by opening or closing respectively, with the first or second thresholds. The fill valve is automatically closed when:

- The drain valve is opened
- The free surface of the water reaches the level electrodes
- The system is in a state of alarm

DRAIN VALVE - this is opened when:

- The absorbed electrical current reaches set point +30% (it closes as soon as current falls set point +10%)
- The washing cycle (initial or periodic) is activated
- The system is in a state of alarm

TOP LEVEL ELECTRODES - these prevent water overflowing from the boiler. When they are covered with water for approx. three seconds the valve is closed. After the level electrodes have been out of water for approx. 25 seconds, the fill valve opens again. The level electrodes also controls topping-up when absorbed current does not reach the programmed threshold because:

- The water conductivity is too low
- The electrodes are partially or totally encrusted

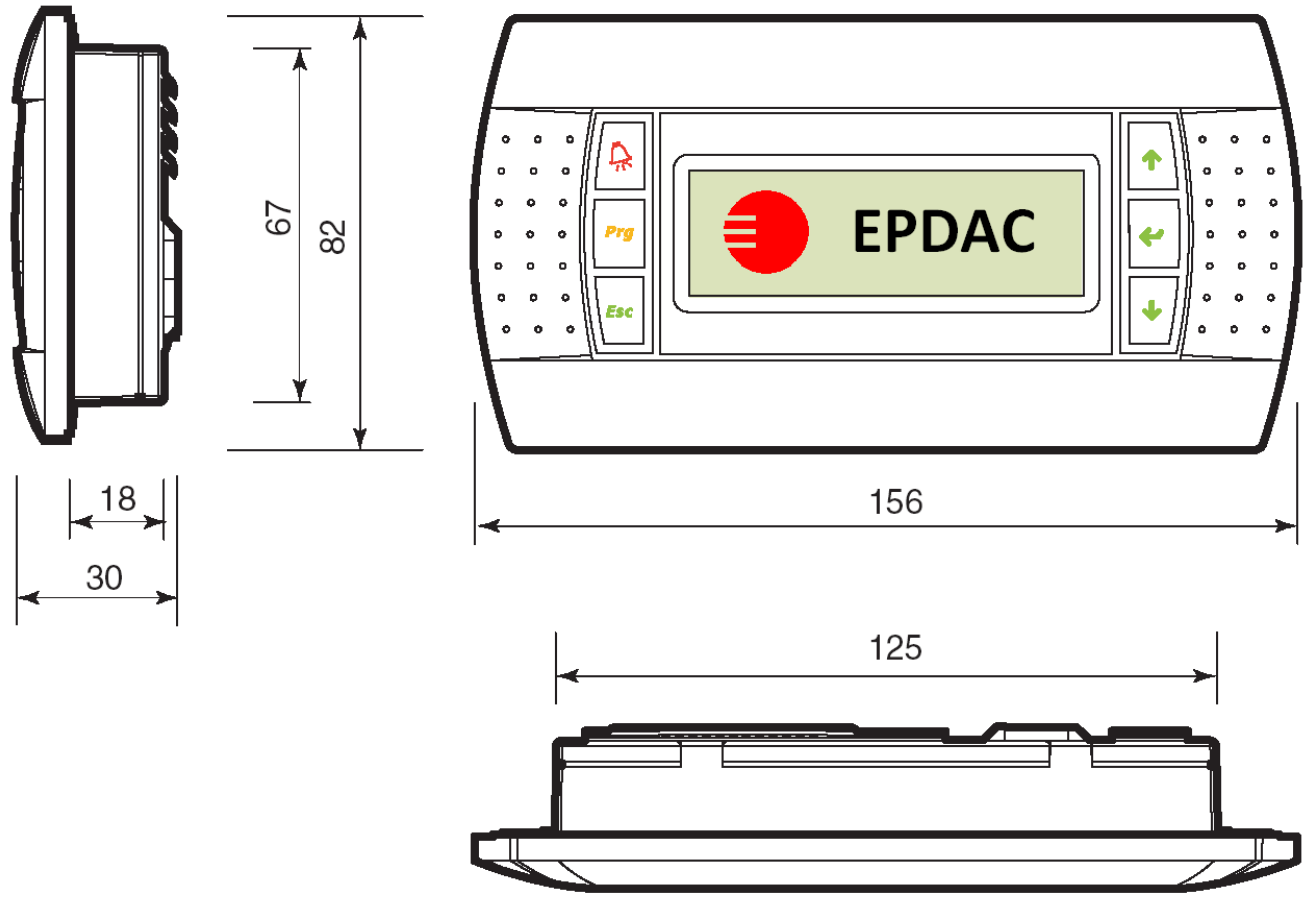
WASHING CYCLE - this prevents excessive salt build-up inside the boiler. It is activated as follows:

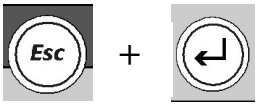
- At regular intervals, programmable according to the size of the equipment on the basis of cumulative time of humidification, memorised while the equipment is supplied with power.
- Every time the electrical supply is applied or restored

ALARM CONDITION - The red ALARM button on the front display panel lights up, the drain valve opens and electrical supply to the boiler is cut off when:

- Absorbed current exceeds 1.8 times the rated current (generally due to the fill valve overload)
- The valve remains open for more than 10 minutes without the threshold of current set point +10% being reached and without the level electrodes intervening (e.g., due to failure in the water supply, blocked intake filter, defective fill valve, power probe current transformer, contactor, blown fuses, encrusted electrodes, etc.).

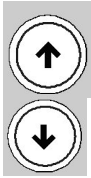
PGD DISPLAY





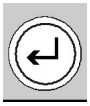
Turning the unit On/Off : Pressing the **" ESC"** & the **" Enter / Return"** arrow buttons together turns on and off the unit at the display. Pressing the up arrow button followed by the **" Enter / Return"** arrow button also turns unit on/off. Follow on screen instruction.

Alarm button: By pressing this button you can display the alarm that has occurred & reset it manually. When the red led indicator lights up, at least one alarm condition has occurred. If there are multiple alarms then using the arrow " **up** " & " **down** " buttons lets you scroll through them.



Up arrow button: Displays the program windows and allows the user to set the value of the control parameter

Down arrow button: Displays the program windows and allows the user to set the value of the control parameter. In default menu, pressing down arrow button displays unit operating mode.



Enter / Return arrow button: Confirms the set data.

Escape button: By pressing this button, you go back one level from where you are.

Program button: By pressing this button, you get a range of sub-menu's.

ALARMS

The following alarms can be activated in an alarm condition & displayed on the display screen. All alarms can be set as serious or non-serious through the keypad

ALARM LIST

AL 01	Compressor 1 HP / Thermal Overload
AL 02	Compressor 2 HP / Thermal Overload
AL 03	Compressor 1 LP
AL 04	Compressor 2 LP
AL 05	Air Flow Alarm (Serious Alarm)
AL 06	Air Flow Alarm – Slave
AL 07	Alarm Electric Reheat High Temp Trip
AL 08	Condensate Pump / High Water Level
AL 09	Smoke/Fire (Serious Alarm)
AL 10	Alarm Air Filter
AL 11	High Temperature Alarm
AL 12	Low Temperature Alarm
AL 13	High Humidity Alarm
AL 14	Low Humidity Alarm
AL 15	High Entering Water Temperature
AL 16	Low Entering Water Temperature
AL 17	Compressor 1 Run Hours
AL 18	Compressor 2 Run Hours
AL 19	Fan Run Hours
AL 20	Return Air Temperature Probe Fault Or Offline
AL 21	Entering Water Temperature Probe Fault Or Offline
AL 22	External Air Temperature Probe Fault Or Offline
AL 23	Supply Air Temperature Probe Fault Or Offline
AL 24	Return Air Humidity Probe Fault Or Offline
AL 25	Leaving Water Temperature Probe Fault Or Offline
AL 26	High Leaving Water Temperature
AL 27	Low Leaving Water Temperature
AL 28	High Current Into Humidifier
AL 29	Lack Of Water Into Humidifier
AL 30	Lack Of Current Into Humidifier
AL 31	Alarm Clock
AL 32	Spare / Custom
AL 33	Spare / Custom
AL 34	Spare / Custom
AL 35	Water Under Floor
AL 36	Loss of Water Flow Alarm

Default List : Actual Alarms Model Dependant

MAINTENANCE

GENERAL

CHECKLIST

SAFETY NOTE

This equipment is designed for safe operation provided it is installed, maintained and serviced in accordance with the guidelines laid down in this section of the manual. They should therefore be studied in advance by any person wishing to work on the equipment

The equipment contains electrical components at high voltage. The main power isolation switch should therefore be opened before access is gained to the equipment

Care should be taken to avoid hands and clothing becoming entangled in the rotating parts.

Care should be taken when working near the steam outlet pipe. This can remain hot for some time after the unit is shut down.

Any service and maintenance operations requiring access to the inside of the equipment while in operation should be carried out by an appropriately qualified or experienced person who is fully aware of the potential dangers and precautions to be taken.

The following should be incorporated in a planned maintenance schedule to ensure that the equipment is well maintained. In all cases the various sections of the equipment should be examined and any defects logged for replacement/repair. For performance analysis a detailed service/maintenance log book should be kept outlining problems encountered and defects found during routine maintenance. Examples can be found at the end of this section.

COMMON COMPONENTS

CABINET AND FRAME - EXAMINE

1) Examine the cabinet exterior for any obvious defects or damage and repair as necessary.
2) Remove the front, side and rear panels and examine the cabinet interior for signs of damage or corrosion. Repair any damage found and restore the surface finish where corrosion has occurred.
3) Refit the front, side and rear panels and restore the electrical supply to the unit.
4) Record and report any defects found during the inspection.

DRIVE PACKAGE

1) Remove the unit front panels and inspect the fan motor for any loose electrical connections and retighten as necessary.
2) Inspect the fan impellers and remove any debris.
3) Check that the fan impellers are securely mounted on the fan shaft. Rotate the impellers and ensure freedom of movement.
4) Inspect the bearings for signs of wear. If any excessive movement is noticed the bearings must be renewed.
5) Check the drive belts monthly for signs of wear and proper tension. Pressing on the belts midway between the sheave and pulley should produce approx. 12.5mm

DRIVE BELT RE-TENSIONING

1) Correctly tension the belts by adjusting the fan motor slide base as necessary.

NOTE:

IF BELTS APPEAR CRACKED OR WORN, THEY SHOULD BE RENEWED WITH MATCHED BELTS (IDENTICALLY SIZED). ON UNITS WITH TWIN BELT DRIVES BOTH BELTS SHOULD BE RENEWED AT THE SAME TIME. WITH PROPER CARE, BELTS SHOULD PROVIDE A LONG SERVICE LIFE.

2) After adjusting or renewing the belts, always check that the motor mounts are tight. Loose mounts will produce vibration that may damage the unit.

AIRFLOW SWITCH

1) Open the unit front panel and inspect the airflow switch located below the electric panel for any loose electrical connections and retighten as necessary.
2) Examine the pressure sensing tube between the switch and the fan casing for defects, damage and loose connections. Renew the tube if necessary.
3) Refit the unit front panel and restore the electrical supply to the unit.
4) Record and report any defects found during the inspection.

AIR FILTERS

To maintain efficient operation, the air filters should be checked monthly and renewed as required. Because renewal intervals may vary with environmental conditions and filter type, each unit is equipped with a filter clog switch which warns of restricted air flow through the filter compartment by activating the 'Change Filter' alarm.

1) On downflow models the filters can be removed from the top of the unit, whereas on upflow units the bottom front panel contains the filters.
2) Fit new filters, refit the unit front panel on upflow units and restore the power supply.

STEAM GENERATING HUMIDIFIER

Remove the unit front panels and examine the humidifier for any loose electrical connections. Retighten any loose connections. Examine all pipes and connections for defects, damage and security of attachment.
Ensure that the steam generating canister is properly secured to the unit frame.
Refit the unit front and side panels and restore the electrical supply to the unit.
Record and report any defects found during the inspection.

REFRIGERATION COMPONENTS

COMPRESSOR

1) Remove the front panel and examine the compressor for any obvious defects. Correct any defects found.
2) Examine the compressor vibration isolation mounts for defects and security. Retighten the mounts if necessary.
3) Inspect the refrigerant pipework connections for signs of oil leaks.
4) Examine the service valves for defects and signs of oil leaks.
5) Remove the compressor terminal cover and examine the electrical connections for damaged insulation. Retighten any loose connections.
6) Refit the compressor terminal cover and refit the unit front panel.
7) Restore the electrical supply to the unit.
8) Record and report any defects found during the inspection.

REFRIGERANT LINES

1) Remove the unit front panel.
2) As far as possible, examine the refrigerant pipework for defects, damage and signs of oil leaks.
3) Examine the pipework for frictional or mechanical damage, particularly where pipes pass through the frame structure.
4) Check pipe brackets/clamps to ensure that they are properly secured.
5) Ensure that the insulation is sound and properly secured around the pipes.
6) Refit the unit front panel.
7) Restore the electrical supply to the unit.
8) Record and report any defects found during the inspection.

EVAPORATOR COIL

1) Remove the unit front panels and inspect the coil for defects, damage and corrosion.
2) Check that the coil fins are in good condition. If they are found to be bent, they should be carefully straightened using a proprietary fin comb.
3) Inspect the refrigerant pipework connections for signs of oil leaks
4) Refit the unit front panels and restore the electrical supply to the unit.
5) Record and report any defects found during the inspection.

LIQUID LINE SIGHT GLASS

1) Check the sight glass moisture indicator. If moisture is shown to be present in the system a new filter dryer must be fitted.
2) Refit the unit front panels and restore the electrical supply to the unit.
3) Record and report any defects found during the inspection.

FILTER-DRYER

1) Open the unit front panels and locate the filter-dryer.
2) Examine the filter-dryer canister for defects or damage. Correct any defects found.
3) Inspect the refrigerant sight glass for dirt particles. If present, renew the filter-dryer.
4) Inspect the refrigerant pipework connections for signs of oil leaks.
5) Refit the unit front panels and restore the electrical supply to the unit.

6) Record and report any defects found during the inspection.

AIR COOLED UNITS

AIR COOLED CONDENSER

Restricted airflow through the condenser coil will reduce the unit operating efficiency and can result in high compressor head pressure and loss of cooling.

1) Clean the condenser coil of all debris that will inhibit air flow. This can be done with compressed air or commercial coil cleaner.
2) Check for bent or damaged coil fins and repair as necessary. If the fins are found to be bent, they should be carefully straightened using a proprietary fin comb.
3) Check all refrigerant lines and capillaries for vibration isolation and support as necessary.
4) Visually inspect all refrigerant lines for signs of oil leaks.
5) Record and report any defects found during the inspection.

ELECTRIC PANEL – INSPECTION AND FUNCTIONAL CHECKS

GENERAL

Open the unit front, inspect the electric panel for any damage or loose electrical connections and re-tighten as necessary.
NOTE: -THE FUNCTIONING OF ALL CONTROL CIRCUITS CAN BE TESTED BY ACTUATING EACH OF THE MAIN FUNCTIONS, BY ADJUSTING THE SET POINTS.

COOLING FUNCTIONAL TEST

Select a set point for a temperature of 6^{o}C below room temperature.

a) A call for cooling should be observed.
b) The compressor contactor should energise, and the equipment should begin to cool.
c) A high temperature alarm may enunciate. Disregard it.

Return the set point to the room temperature.

REHEAT FUNCTIONAL TEST

Select a temperature set point for 6^{o}C above the room temperature.

a) A call for heating should be observed.
b) Both heating contactors should energise, and the heating elements should begin to heat.
c) Disregard the low temperature alarm.

Return the set point to the desired temperature.

HUMIDIFICATION FUNCTIONAL CHECK

Set the humidification to 10%RH above the room humidity reading.

a) For a steam generating humidifier, you will immediately hear clicks as it energises. After a short delay, the canister will fill with water. The water will heat and steam will be produced.

Return the humidity setting to the desired room relative humidity setting.

DEHUMIDIFICATION FUNCTIONAL CHECK

Set the humidification setpoint to 10%RH below the room humidity reading. Make sure that the temperature set point is at or above room temperature.

a) The compressor contactor should energise and the system should begin to cool/dehumidify. Return the humidity setting to the desired room relative humidity setting.

NOTE: - IN CHILLED WATER SYSTEMS THE VALVE OPENS PROPORTIONALLY.

THE BASIC CONTROL CHECKS ARE NOW COMPLETED.

1) Replace the unit front panels and restore the electrical supply to the unit.
2) Record and report any defects found during the inspection.

STEAM GENERATING HUMIDIFIER – CLEANING AND RENEWAL

NOTE: REGULAR MAINTENANCE IS LIMITED TO DESCALING OR RENEWING THE BOILER. THIS IS NECESSARY WHEN SCALE ON THE ACTIVE SURFACES OF THE ELECTRODES PREVENTS SUFFICIENT PASSAGE OF ELECTRICAL CURRENT.

1) Drain the water completely. (See Controls Manual for details on drain procedure).
2) Disconnect the power supply to the equipment.
3) Unscrew the steam pipe from the boiler.
4) Disconnect the wiring to the main electrodes and the level electrodes.
5) Unhook the holding spring and unscrew the humidifier bottle by rotating it anti-clockwise on its axis.
6) Remove the bottle.
   NOTE: - THE BOILER MAY GENERALLY BE USED AGAIN AFTER DESCALING.
7) Unscrew the ring nut and extract the bottom filter. Remove any scale and deposits under a jet of water and clean the grids mechanically or chemically with a commercially available cleaner.
   NOTE: WHEN ELECTRODE WEAR IS SUCH THAT REGENERATION IS INSUFFICIENT, THE BOILER MUST BE RENEWED.
8) Reassemble the boiler in the reverse sequence after checking and if necessary, renewing the washer between the threaded connection and the discharge outlet.

In the case of serviceable humidifiers the bottle can be dismantled and thoroughly cleaned.

THERMOSTATIC EXPANSION VALVE - CALIBRATION

SUPERHEAT - CALCULATION AND ADJUSTMENT

CALCULATION

1) Measure the temperature of the suction line at the point where the TEV bulb is clamped.
2) Obtain the gauge pressure at the compressor suction valve.
3) Convert the sum of the two pressures to the equivalent temperature.
4) Subtract this temperature from the actual suction line temperature obtained in Step 1. The difference is the superheat value.

ADJUSTMENT

1) Remove the cap at the bottom of the thermostatic expansion valve.

NOTE: - MAKE NO MORE THAN A 1/4 TURN OF THE STEM AT A TIME. AS LONG AS 15 MINUTES MAY BE REQUIRED FOR THE NEW BALANCE TO TAKE PLACE.

2) Turn the adjusting stem counter-clockwise to lower the superheat.
3) Turn the adjusting stem clockwise to increase the superheat.

REFRIGERANT CONTROL SETTINGS

The pressure switches fitted are of the encapsulated type and are set and tested by the manufacturer prior to despatch. Switch settings are as indicated in the chart opposite:

	OPENS	CLOSES
LOW PRESSURE SWITCH	40 PSI	65 PSI
HIGH PRESSURE SWITCH	365 PSI	MANUAL

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FAULT FINDING GUIDE

SYMPTOM	POSSIBLE CAUSE	REMEDY
No Power (Green On/Off control button not lit	No power to the unit electric panel	Check that the electrical power source is live and the main disconnect switch is closed
	No power to the control circuit	1) Check that the control circuit breaker is closed 2) Check the 24V secondary fuse
THE UNIT DOES NOT OPERATE	The display does not operate the unit	1) Check the display connection. 2) Check the processor connections 3) Refer to the unit electrical schematic and user control manual
ROOM TEMPERATURE TOO HIGH Unit high Temperature Alarm	1) Controls not properly set	Check the room temperature setpoint - Refer to User Control Manual
	2) Lack of airflow	See "LACK OF AIRFLOW" section
	3) The compressor does not work when required by the controller	See "THE COMPRESSOR DOES NOT WORK" section
	4) Insufficient compressor output	1) See "COMPRESSOR HIGH DISCHARGE PRESSURE" section
		2) See "COMPRESSOR LOW SUCTION PRESSURE" section
	5) The control system does not operate properly	See "User Control Manual". Check that the display and processor and/or the sensor function properly
	6) Heat load higher than expected	Check the room heat load Check the condition and volume of fresh air make-up check the quantity of infiltration of external air
ROOM TEMPERATURE TOO LOW Unit High Temperature Alarm	1) Controls not properly set	Check the room temperature setpoint - Refer to User Control Manual
	2) The heater does not work properly (if fitted)	1) Check the heating elements 2) Check the electric heater MCB 3) In the case if electric heater alarm, eliminate the cause and re-set the safety thermostat
	5) The control system does not operate properly	See "User Control Manual". Check that the display and processor and/or the sensor function properly
	6) Thermal losses higher than expected	Check the room heat loss calculations, check the quantity of infiltration of external air
ROOM RELATIVE HUMIDITY TOO HIGH Controller high humidity alarm	1) Controls not properly set	Check the room humidity setpoint - Refer to User Control Manual
	2) Latent load higher than expected	Check the room latent load, check the quantity of infiltration of external air
	3) The compressor does not work in the dehumidification mode	see "THE COMPRESSOR DOES NOT WORK" section
	4) The control system is not functioning properly	See "User Control Manual". Check that the display and/or the sensor are functioning properly
ROOM RELATIVE HUMIDITY TOO LOW Controller low humidity alarm	1) Controls not properly set	Check the room humidity setpoint - Refer to User Control Manual
	2) Latent load higher than expected	Check the room latent load, check the quantity of infiltration of external air
	3) the humidifier does not function properly	Check the make-up water pressure Check the humidifier and cylinder

SYMPTOM	POSSIBLE CAUSE	REMEDY
LACK OF AIRFLOW Loss of Airflow alarm	1) No power to the fan motor	Check the fan motor MCB and electric supply at the motor box terminals
	2) Clogged filters	Replace the filters
	3) The airflow is obstructed	check fan inlets, air intake and supply paths are free
	4) the main fan overload has tripped	check the electrical resistance of the motor windings. After re-set, measure the supply voltage and current drawn.
	5) The pressure drop in the air distribution system (ducts, ceilings, flooring, plenum, grilles, etc.) is too high	Check the design and sizing of the air distribution system
COMPRESSOR HIGH DISCHARGE PRESSURE	1) Presence of air or non condensable gases in the refrigeration circuit	Purge the system and recharge
	2) The airflow of the remote heat exchanger is insufficient or too warm	1) Check the remote heat exchanger fan 2) Check that the remote heat exchanger is not clogged, remove all foreign (leaves, paper, etc.) 3) check for any short circuiting of cooling air 4) check that the cooling air temperature is not higher than the design value
	3) The condensing pressure control system is not working properly	1) check the operation of the condenser fan and its overload protection. 2) Check the adjustment and operation of the condenser fan speed controller see (CONDENSING PRESSURE CONTROL) section.
	4) The water flow to the water cooled condenser is insufficient or too hot	1) check the temperature and pressure of the cooling water 2) check the adjustment and operation of the pressure operated water regulating valve
	5) circuit overloaded with refrigerant, condenser partially flooded	Remove some refrigerant from the circuit
	6) service valve on the high pressure side partially closed	Check that all service valves are open
COMPRESSOR LOW DISCHARGE PRESSURE	1) The condensing pressure control system does not work properly	Check the set point and the operation of the remote condenser fan pressure switch or of the fan speed controller (see CONDENSING PRESSURE CONTROL section
	2) Cooling water flow rate too high or temperature too low	1) Check the temperature of the cooling water 2) Check the adjustment and operation of the water regulating valve
COMPRESSOR HIGH SUCTION PRESSURE	1) Heat load higher than expected	Check the room heat load Check the condition and volume of fresh air make-up check the quantity of infiltration of external air
	2) High discharge pressure	See COMPRESSOR HIGH DISCHARGE PRESSURE
	3) Circuit overloaded with refrigerant	Remove some refrigerant from the circuit
	4) Return of liquid refrigerant to the compressor	1) Check the superheat of the expansion valve is correct 2) check that the valve bulb has not lost it's charge and is positioned properly, fixed and insulated

SYMPTOM	POSSIBLE CAUSE	REMEDY
COMPRESSOR LOW SUCTION PRESSURE (and possible coil freezing)	1) Low room temperature	See ROOM TEMPERATURE TOO LOW
	2) Lack of air	See LACK OF AIR FLOW
	3) Refrigerant suction valve not completely open	Open the valve completely
	4) insufficient liquid refrigerant supply to expansion valve: bubbles in the sight glass	1) Check the refrigerant filter and replace it if blocked up 2) Check the refrigerant charge and rectify any leaks and recharge system
	5) Thermostatic expansion valve maladjusted or defective	1) Check the superheat of the expansion valve is correct 2) check that the valve bulb has not lost it's charge and is positioned properly, fixed and insulated
	6) Low discharge pressure	See COMPRESSOR LOW DISCHARGE PRESSURE
THE COMPRESSOR SUCTION LOW PRESSURE SWITCH CUTS OUT (L.P. alarm)	1) Shortage of refrigerant at the thermostatic expansion valve inlet	Check that there is sufficient refrigerant in the system
	2) Low pressure switch faulty	Replace the switch
	3) The suction pressure in the circuit is too low	See COMPRESSOR LOW SUCTION PRESSURE
THE COMPRESSOR DOES NOT WORK	1) The MCB has tripped	Reset the MCB and check the cause of the fault
	2) The internal protection of the compressor has tripped	Check the electrical resistance of the compressor winding, after reset measure the supply voltage and current drawn
	3) The compressor contactor is faulty	Check the contacts and the coil of the contactor
THE COMPRESSOR IS NOISY	1) Return of liquid refrigerant to the compressor	check the operation and the superheat of the thermostatic expansion valve
THE HEATER SAFETY THERMOSTAT CUTS OUT (Heater trip alarm)	1) Lack of airflow	See LACK OF AIR FLOW
	2) thermostat faulty connection wire	Check the electrical continuity of the safety thermostat connection to the controller
	3) Defective thermostat	replace the heater safety thermostat

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MONTHLY MAINTENANCE INSPECTION CHECK

MODEL NUMBER SERIAL NUMBER

DATE INSPECTOR

FILTERS

- ☐ Check filter switch (if fitted)
- ☐ Inspect filters and replace if necessary

DRIVE PACKAGE

- ☐ Blower impellers moving freely and free of debris
- ☐ Check belt tension and condition
- ☐ Bearings in good condition
- ☐ Check airflow switch setting and operation.
- ☐ Check pulley and sheave are secure
- ☐ Inspect blower anti-vibration mounts

AIR COOLED CONDENSER (IF APPLICABLE)

- ☐ Condenser coil clean
- ☐ Fans rotating freely
- ☐ Refrigerant lines properly secured

STEAM HUMIDIFIER

- ☐ Check humidifier bottle for deposits
- ☐ Check condition of steam hoses

COMPRESSOR

- ☐ Check service valves are open

REFRIGERATION SECTION

- ☐ Check refrigerant lines are properly secure
- ☐ Check sightglass for indication of moisture
- ☐ Check suction pressure
- ☐ Check discharge pressure
- ☐ Check expansion valve

GENERAL NOTES AND OBSERVATIONS

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ANNUAL MAINTENANCE INSPECTION CHECK

MODEL NUMBER SERIAL NUMBER

DATE INSPECTOR

FILTERS

- [ ] Check filter switch (if fitted)
- [ ] Inspect filters and replace if necessary

DRIVE PACKAGE

- [ ] Blower impellers moving freely and free of debris
- [ ] Check belt tension and condition
- [ ] Bearings in good condition
- [ ] Check airflow switch setting and operation
- [ ] Check pulley and sheave are secure
- [ ] Inspect blower anti-vibration mounts

AIR COOLED CONDENSER (IF APPLICABLE)

- [ ] Condenser coil clean
- [ ] Fans rotating freely
- [ ] Refrigerant lines properly secured

WATER/GLYCOL CONDENSER (IF APPLICABLE)

- [ ] Copper tube clean
- [ ] Water regulating valves function properly
- [ ] Glycol solution
- [ ] Check capillary tube for fracture/secure
- [ ] Check for water/glycol leaks

GLYCOL PUMPS

- [ ] Glycol leaks
- [ ] Pump operation
- [ ] Standby pump operational

STEAM HUMIDIFIER

- [ ] Check humidifier bottle for deposits
- [ ] Check condition of steam hoses
- [ ] Inspect inlet filter
- [ ] Check fill/drain valves

COMPRESSOR

- [ ] Check service valves are open

REFRIGERATION SECTION

- [ ] Check refrigerant lines are properly secure
- [ ] Check sightglass for indication of moisture
- [ ] Check suction pressure
- [ ] Check discharge pressure
- [ ] Check expansion valve
- [ ] check evaporator coil and clean if necessary

AIR DISTRIBUTION

- [ ] Ensure that inlet/return airways are unrestricted

ELECTRIC PANEL

- [ ] Check MCB's
- [ ] Check electrical connections
- [ ] Check operational sequence

GENERAL NOTES AND OBSERVATIONS